working areas for movement and operation of cranes, preparing and leveling areas for assembly and erection, dewatering of surface and sub-soil water and protection of existing works, drains, pipes, trenches, cables overhead and underground works and other facilities and utilities falling within the job site and/or approximate thereto and repair and/or re-placement of any and all existing works, drains, pipes, trenches, cables, wires and facilities and/or utilities damaged or destroyed by the CONTRACTOR or which may have to be temporarily or permanently diverted or re-routed to enable the contractual works.

23.1.8 The CONTRACTOR shall also provide and maintain, at or about the job site, an office for the working accommodation of the CONTRACTOR"s engineer and staff. Such office shall remain open and attended at all hours during which work is being performed at the job site, for the receipt of instructions, notices, and other communications.

23.1.9 Deleted

23.1.10 The CONTRACTOR shall co-operate with and afford the OWNER and other contractors engaged at site, access to the work and shall supply at cost as determined by the E-I-C (whose decision will be final), power and water for the performance of the work entrusted to them and/or for the carriage and storage of materials by them and whenever any work by the CONTRACTOR is being done in association, collaboration or in proximity with any other contractors, the CONTRACTOR shall co-operate with the OWNER or other contractor(s)/ agency(ies) involved in such work and shall ensure the harmonious working between the CONTRACTOR and the OWNER/contractor(s)/agency(ies) involved, and shall comply with any instructions issued by the E-I-C for the purpose.

23.1.11 The OWNER shall be entitled, at its discretion, to appoint one or more engineers and/or other personnel at or about its job site on behalf of the OWNER to do such acts, deeds, matters and things as may be necessary to safeguard the OWNER'S interests including (but not limited to), at the discretion of the OWNER, supervision and testing of the works being conducted by the CONTRACTOR at the job site and/or for rendering such assistance to the CONTRACTOR relative thereto as the OWNER or such Engineer(s) or personnel shall or may deem fit, it being understood, however, that the presence of any engineers or personnel of the OWNERS at or about the job site for any supervision, inspection or test performed or conducted by any such engineer(s) or any personnel of the OWNER in respect of any work(s) or any other assistance rendered by such engineer(s) and/or personnel to the CONTRACTOR relative thereto, shall be without any attendant obligation or liability of the OWNER vis-à-vis the CONTRACTOR, nor shall relieve the CONTRACTOR of his/its full responsibility in respect of the work(s) under the contract or bind the OWNER to accept as satisfactory or complete and/or in accordance with the contract, any work(s) performed by the CONTRACTOR which has/ have been supervised, inspected, tested or assisted by the said engineer(s) and/or personnel of the OWNER.

23.1.12 If the CONTRACTOR"s work or any part thereof shall be consequent or resultant upon any works performed by any other person or shall be in continuance thereof or otherwise based or founded or dependant thereon, the CONTRACTOR shall before commencing with his/its work, bring to the notice of the Engineer-in-Charge, in writing, any defects existing in said prior works.

23.1.13 It is an expressed condition of this Contract that the CONTRACTOR shall not engage the services of the other contractors and/or their employees/workers presently working in the Refinery, without prior written permission of the Owner.

23.1.14 Contractor to refer Project Execution Philosophy for the EPC Package attached as **per Technical Section of Bidding Document.**

23.1.15 During the Scope of Works, the Contractor shall maintain a round-the-clock vigil over the Site and shall ensure and procure that no encroachment thereon takes place and shall protect the Site from any and all occupations, encroachments or encumbrances, and shall not place or create nor permit any sub-contractor or other person claiming through or under the agreement to place or create any encumbrance or security interest over all or any part of the Site or Plant or Unit, or on any rights of the Contractor therein or under this Contract, save and except as otherwise expressly set forth in this Contract. In the event of any encroachment or occupation on any part of the Site, the Contractor shall report such encroachment or occupation forthwith to the OWNER and undertake its removal at its own cost and expenses.

23.2 THE JOB SITES

23.2.1 OWNER/ CONSULTANT shall furnish the relevant existing grid point with Bench Mark, on the land. It shall be CONTRACTOR'S responsibility to set out the necessary control points in and to

set out the alignment of the various works. The CONTRACTOR shall employ an efficient survey team for this purpose and the accuracy of such setting out works shall be the CONTRACTOR'S responsibility.

23.2.2 The CONTRACTOR shall provide, fix and be responsible for the maintenance of all stakes, templates, level marks, profiles and the like and shall take all precautions necessary to prevent their removal or disturbance and for their efficient and timely reinstatement. The CONTRACTOR shall also be responsible for the maintenance of all survey marks, boundary marks, distance marks, whether existing or supplied/fixed by the CONTRACTOR.

23.2.3 Before commencing the work, the CONTRACTOR shall at his/its own cost and initiative provide all necessary reference and level posts, pegs, flags, ranging rods, strings and other materials for proper layout of the work in accordance with the scheme for bench marks acceptable to the E-I-C. The CONTRACTOR shall give the E-I-C not less than 24 (Twenty four) hours advance notice in writing of his intention to set out or give levels for any part of the work so that arrangements may be made for checking the same. Work shall be scheduled so as to enable checking lines and levels on any part of the work. The CONTRACTOR shall within the scope of work provide all assistance, tools, gauges and instruments required to enable the E-I-C to check the setting out of works. The centre, longitudinal or face line and cross line shall be marked by means of small masonry pillars. Each pillar shall have a distinct mark at the centre to enable a theodolite to be set over it. No work shall be started until all these points are approved by the E-I-C in writing, but such approval shall not relieve the CONTRACTOR of any of his responsibilities in respect of the adequacy or accuracy thereof. The CONTRACTOR shall also provide all labour, material, tools and other facilities necessary for the proper checking of layout and inspection of the points during construction.

The CONTRACTOR shall be exclusively responsible for the provision and maintenance of horizontal and vertical alignments and levels and for the correctness of every part of the work in accordance therewith and shall, at his own cost, rectify any error or imperfections therein.

Pillars bearing geodetic marks located at the sites of units of works under construction should be protected and fenced by the CONTRACTOR. On completion of works, the CONTRACTOR must submit to the E-I-C the geodetic documents according to which the work was carried out.

23.3 SITE CLEARANCE, FILLING AND LEVELLING

23.3.1 The CONTRACTOR shall clear the job site of all unwanted trees, bushes, undergrowth and over-ground and underground structures, pipes and installations, and shall re-route, if necessary, any private utilities located on or within the job sites and shall take care to keep the job site clean at all times for easy access to the job site and also from the safety point of view to the satisfaction of the E-I-C.

23.3.2 The CONTRACTOR shall clean and keep clean the work site from time to time to the satisfaction of the E-I-C for easy access to work site and to ensure safe passage, movement and working. All dismantled material shall be shifted /removed by CONTRACTOR at his own cost to designated place. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required in accordance with Good Industry Practice, Applicable Laws and instructions of the E-I-C, unless required to be maintained at the Site as per the express instructions of E-I-C.

23.3.3 If the work involves dismantling of any existing structure in whole or part , any RCC foundation, paved area care shall be taken to limit the dismantling up to the exact point and/ or lines as directed by the E-I-C and any damage caused to the existing structure beyond the said line or point shall be repaired and restored to the original condition at the cost and risk of CONTRACTOR to the satisfaction of the E-I-C, whose decision shall be final and binding upon the CONTRACTOR.

23.3.4 The CONTRACTOR shall dispose off the unserviceable materials, debris etc. outside the Refinery complex with due permission and approval of Local Municipal Authorities or other relevant authorities. The CONTRACTOR shall indemnify OWNER/EIL from any claims from Local Municipal bodies or other authorities arising in this context. The Lumpsum Prices shall be inclusive of the above activities also. The CONTRACTOR shall sort out, clear and stack the serviceable materials obtained from the dismantling/ renewal at places as directed by the E-I-C.

23.3.5 No extra payment-shall be paid on this account. The Prices quoted in Schedule of Price are deemed to be inclusive of all the costs towards all the above activities as well.

23.3.6 The CONTRACTOR shall be the custodian of the dismantled materials till the E-I-C takes charge thereof.

23.4 COMPLIANCE WITH CODES AND STANDARDS

(a) The Work and all systems, components and parts of the Works shall comply with:

i) Those design criteria, codes and standards which are specified in this Contract, Scope of Contract and as agreed between CONTRACTOR and EIL/OWNER, and

ii) The requirements of all relevant Indian authorities, including without limitation :

(a) Factories Act;
(b) Indian Petroleum Rules;
(c) Petroleum and Natural Gas Regulatory Board (PNGRB) Act
(d) Tariff Advisory Committee Guidelines;
(e) Liquid effluent discharge, as per Minimal National Standards for liquid effluents and air emissions conforming to Pollution Control Board Standards;
(f) Civil Aviation Rules;
(g) Indian Boiler Regulations;
(h) Indian Electricity Rules;
(i) Requirement of Chief Controller of Explosives;
(j) Requirement of Town & Country Planning Department;
(k) Requirement of Labour Laws and The Building and other construction workers Act 1996
(l) Requirements of other authorities concerned with the Project or with any license, permission, sanction, approval or no objection relative thereto, and the terms thereof.

(b) Any modification to the agreed design criteria will be subject to the CONTRACTOR providing detailed justification and OWNER's/ E-I-C's approval of the same.

23.5 CONDITIONS OF WORK:

Provisions of Clause No. **48, 49 and 50 of GCC** stands modified to the following extent:

23.5.1 If necessary, the CONTRACTOR shall work overtime or in two or more shifts in a day. The CONTRACTOR shall not be entitled to any extra compensation or remuneration for overtime or double or triple shift working.

23.5.2 The CONTRACTOR will be expected to work on Sundays and holidays, if necessary, without extra compensation.

23.5.3 The CONTRACTOR shall plan and organise all operations taking into account all suspensions or shut downs necessitated by weather conditions and the severity of weather conditions (foreseen or unforeseen) shall on no account constitute a ground for extension of time for completion nor shall entitle the CONTRACTOR to claim any idle charges or additional compensation howsoever designated.

23.5.4 Notwithstanding the shut down or suspension of any operations necessitated by weather conditions, the CONTRACTOR shall, without entitlement to any additional compensation or remuneration, at his own cost and initiative take all steps necessary to protect the job site, and works, materials, equipment and machinery at site during adverse weather conditions and the effects thereof and shall, at his own cost and initiative, do and perform, to the satisfaction of the E-I-C, all such consequential rectification, repairs and/or reworking as shall be necessary.

23.5.5 The CONTRACTOR shall plan, well in advance for the collection of materials and equipment and the erection of such tarpaulins, sheds, wind breakers and/or other protection as shall or may be necessary for work during adverse weather conditions.

23.5.6 The CONTRACTOR shall also arrange and bring to job site and install such pumps and special equipment and machinery as may be necessary to enable work during the monsoon or adverse weather conditions and shall, at his own cost and initiative, arrange for dewatering the job sites so as to keep the construction site and areas to be worked upon free of water.

23.5.7 The CONTRACTOR shall not be entitled to any extra compensation or remuneration for or relative to any work during the monsoon or adverse weather conditions or for or relative to any special arrangements to be made and/or equipment or machinery to be brought to the job sites and/or operated to enable such workings.

23.6 TIME FOR COMPLETION

23.6.1 The CONTRACTOR shall complete in all respects in accordance with the Contract, the entire work within the time specified in this behalf in the Time Schedule given in **Annexure- I to this SCC.**

23.6.2 Within **4 (Four) Weeks** from the date of receipt of notification of award, the CONTRACTOR shall submit to the EIL/OWNER for approval a detailed Progress Schedule in graphical or other suitable form, giving dates of starting and finishing of various operations and works within the scope of work, providing sufficient margin to cover for contingencies and for final testing and commissioning and consequential reparation, replacement and/or supply. The E-I-C and the CONTRACTOR shall thereafter within another **14 (Fourteen) days** settle the Progress Schedule and the Progress Schedule so settled shall be the approved Progress Schedule and shall form part of the contract with attendant obligations upon the CONTRACTOR to commence the various works/operations involved on or before date(s) mentioned in this behalf in the approved Progress Schedule and to conclude the said works/operations on or before date mentioned in this behalf in the approved Progress Schedule and default by the CONTRACTOR to commence or complete within prescribed date(s) any work or operation shall for the limited purpose of Clause **40.1** hereof be deemed to be a breach by the CONTRACTOR to which the provisions of clause **40.1** hereof relating to termination of contract shall apply, but without prejudice to any other rights or remedies which the OWNER may have in this behalf.

23.6.3 The said Progress Schedule(s) to be submitted to the E-I-C for approval shall be accompanied as part thereof by a document which will list, relative to each operation, the labour, machinery and equipment to be employed by the CONTRACTOR to achieve the desired rate of progress, it being understood, however, that the quantity and types therein indicated shall merely constitute an indication of minimums, and shall not in any way absolve the CONTRACTOR from his/its obligations to complete the work in all respects within the time for completion specified in this behalf elsewhere in the bid documents and/or to employ additional labour, machinery and equipment necessary to achieve the desired rates of progress and/or to complete the work within the specified time.

23.6.4 If the CONTRACTOR shall fail to submit to the EIL/OWNER a Progress Schedule as envisaged above or if the E-I-C and CONTRACTOR shall fail to agree upon the Progress Schedule as envisaged above, then the E-I-C shall in consultation with the CONTRACTOR prepare the Progress Schedule (the dates of progress as fixed by the E-I-C being final and binding upon the CONTRACTOR except as herein otherwise expressly provided), and shall issue the Progress Schedule so prepared to the CONTRACTOR, and the provisions of clause **23.6.2** shall apply relative thereto as though it was as approved Progress Schedule.

23.6.5 Any reference in the contract documents to the “approved Progress Schedule” or to the “Progress Schedule” shall mean the “approved Progress Schedule” specified in clause **23.6.2** above or the “Progress Schedule” prepared and issued by the E-I-C as specified in clause **23.6.4** above, whichever shall be in existence.

23.6.6 Within **7 (Seven) days** of the occurrence of any OWNER’s hold-up or change, alteration or instruction by the OWNER or E-I-C in accordance with the provisions hereof or of the occurrence of any act, event or omission which, in the opinion of the CONTRACTOR, is likely to lead to delay in the commencement or completion of any particular work(s) or operation(s) or the entire work at any job site(s) and is such as would entitle the CONTRACTOR to an extension of time specified in this behalf in the Progress Schedule(s), the CONTRACTOR shall inform the OWNER and the E-I-C, in writing, of the occurrence of the change, alteration or instruction or of the act, event or omission and the date of commencement of such occurrence. Thereafter, within **7 (seven) days** of such notice in the case of a change, alteration or instruction, and, if even upon the cessation of such act or event or the fulfillment of the omission in any other case, the CONTRACTOR is of the opinion that an extension of the time specified in the Progress Schedule relative to particular operation(s) or item(s) of work or the entire work at the job site(s) is necessary, the CONTRACTOR shall, **within 7 (Seven) days** after the cessation or fulfilment as aforesaid, make a request to the E-I-C for extension of the relative time specified in the Progress Schedule. The E-I-C may on such request at any time prior to completion of the works extend the relative time of completion in the Progress Schedule for such period(s) as he considers necessary, if he is of opinion that such act, event, or omission constitutes a ground for extension of time in terms of the Contract and that such act, event, or omission has in fact resulted in insurmountable delay to the CONTRACTOR. The opinion/decision of the E-I-C in this behalf and as to the extension

necessary shall subject to the provisions of clause **23.6.7**hereof, be final and binding upon the CONTRACTOR.

23.6.7 Notwithstanding the provisions of clause **23.6.6** hereof, the OWNER may at any time after final completion of the Unit or works in all respects of its own initiative consider a request for extension of time made by the CONTRACTOR to the E-I-C under Clause **23.6.6** or against the E-I-C"s failure to take a decision under the said clause, if satisfied of the existence of any ground(s) justifying the delay, extend the date for completion of the work or any item or operation thereof for such period(s) as the OWNER may consider necessary, and the decision of OWNER as to the existence or otherwise of any grounds justifying the extension and as to the period(s) of extension necessary shall be final and binding upon the CONTRACTOR.

23.6.8 Subject as elsewhere herein or in the Contract documents expressly provided, only the existence of force majeure circumstances as defined in clause **23.6.9** hereof shall afford the CONTRACTOR a ground for extension of time for completion of the work or any part of the work or any operation(s) involved therein, and specifically without prejudice to the generality of the foregoing, inclement or unforeseen weather, strike (except for strikes at national or state-wide level or industrial disputes at a national or state-wide level in any country where Works are performed), lockouts, third party breach, delay in supply of materials(s) or commercial hardship shall not afford the CONTRACTOR a ground for extension of time or relieve the CONTRACTOR of his full obligations under the Contract, nor will any forced shutdown or idleness or other impediment in progress or completion of the work due to any reason whatsoever afford the CONTRACTOR a ground for extension of time or relieve the CONTRACTOR of his/its full obligation under the Contract except and to the extent otherwise elsewhere herein specifically provided.

23.6.9 Provisions of **"Force Majeure"** shall be as per Clause No. **15.10** hereof.

23.6.10 Upon an extension of the time for completion of the work or any part of the work or any operation(s) involved therein, the extended date of completion shall be deemed to be the relative date of completion in the Progress Schedule.

23.6.11 The extension of time shall be the sole remedy of the CONTRACTOR for any cause or event of delay and the CONTRACTOR shall not be entitled in addition to or in lieu of such extension, to claim any damages or compensation for extended stay or otherwise whether under the law governing contracts or quasi-contracts or any other relationship, and the CONTRACTOR hereby waives and disclaims any and all contrary rights.

23.6.12 No assurance, representation, promise or other statement by any personnel, Engineer or representative of the OWNER in relation to extension of time for commencement or completion of any work(s) or operation thereof or of the entire works under the Contract shall be binding upon the OWNER or shall constitute an extension of time for commencement or completion of the entire work(s) or any part or operation thereof within the provision of Clause **23.6.6** or Clause **23.6.7** hereof, unless the same is communicated to the CONTRACTOR by the E-I-C under Clause **23.6.6** or by BPCL, under Clause **23.6.7** and the writing specifically states to embody an extension of time within the provisions of Clause **23.6.6** or **23.6.7** as the case may be, and without prejudice to the foregoing, the mere agreement or prescription of a Progress Schedule by the E-I-C or any representative of the OWNER at variance with the Progress Schedule, or approved Progress Schedule, as the case may be, referred to in Clause **23.6.2**, **23.6.3** and/or **23.6.4** or containing an extended time of commencement or completion in respect of the entire work(s) or any part or operation thereof shall not in any way constitute an extension of time in terms of the contract so as to bind the EIL/OWNER or to relieve the CONTRACTOR of all or any of his/its liabilities under the Contract, nor shall constitute a promise on behalf of the OWNER or a waiver by the OWNER of any of its rights in terms of the Contract relative to the performance of the contract within the time specified or otherwise, but shall be deemed only (at the most) as a guidance to the CONTRACTOR for better organising his work on a recognition that the CONTRACTOR has failed to organise his work and/or to perform the same within the time specified in the Progress Schedule established within the provisions of clause **23.6.2**, **23.6.3** or **23.6.4.** here of as the case may be.

23.7 PRICE REDUCTION FOR SLIPPAGES IN COMPLETION

23.7.1 Provisions of Clause No. **22 of GCC** stands replaced as follows:

23.7.1.1 Time shall be of the essence in the performance of the Contractor's obligations. If any time period specified herein is extended for the reasons specified in the Agreement (including any delay by

the OWNER), such extended time shall also be of the essence. In case the contractor fails to achieve completion of the entire work within specified Time Schedule as per **ANNEXURE-I to SCC** (Excluding delay caused by owners obligations not being met with)or if any works for which a separate Progress Schedule has been established is/are not achieved by the date of completion thereof specified in the relevant Progress Schedule (each of the said date(s) is hereinafter referred to as the "starting date for discount calculation"), the OWNER shall be entitled to a discount in the Lumpsum Price in a sum equivalent to the Lumpsum Price as specified **Annexure XIX of SCC** [Titled "PRICE REDUCTION FOR SLIPPAGE IN COMPLETION & PRICE REDUCTION FOR DELAY IN ACHIEVING INTERMEDIATE MAJOR MILESTONES"] for each week or part thereof that the work remains incomplete beyond the starting date.

23.7.1.2 The parties agree that this is a genuine pre- estimate of the loss/damage which will be suffered by the owner on account of delay on the part of the contractor and the said amount will be payable on demand without there being any proof of the actual loss or damages having been caused by such delay/breach. The owner shall be at liberty to adjust or deduct the said amount of Price Reduction from any amount due to the contractor including Security Deposit. In case where the concluded contract value is different from the original contract value due to the change orders/variation in executed quantities/extension of time, etc., the concluded contract value should be considered for recovery of Price Reduction for late delivery/delayed completion.

23.7.1.3 The owner shall be at liberty to deduct or retain from any amount payable to the contractor periodically, the proportionate or full amount of liquidated damages as the case may be for the delay periodically caused by the contractor.

23.7.1.4 Application of Price Reduction under clause **23.7.1.1** above shall be without prejudice to any other right of the OWNER, including the right of termination under Clause **40.1** and associated clauses thereunder.

23.7.1.5 Nothing in Clause **23.7.1** above shall prevent the OWNER from exercising its right of termination of Contract under Clause **40.1** hereof and associated clauses there under, and the OWNER shall be entitled, in the event of exercising its said right of termination after the last date for Mechanical Completion of the Unit(s) and/or for final completion of the works as the case may be, as specified in the Progress Schedule or any extension thereof, without prejudice to any other right or remedy available to the OWNER, to discount as aforesaid in the contractual price of services in addition to any amount as may be due consequent to a termination under Clause **40.1** hereof and associated clauses there under.

23.7.1.6 It is specifically acknowledged that the provisions of this Clause **23.7** and associated Clauses thereunder are purely a provision for price reduction and/or fixation and are not to be understood or construed as a provision for liquidated damages or penalty under Clause **74** of the Indian Contract Act or otherwise, and that the OWNER shall be entitled to damages or compensation, as the case may be, for breach or delay, independently of these provisions for price reduction.

23.7.1.7 GST (if applicable) on account of Price reduction for slippages in Completion as detailed in **Annexure XIX of SCC** would be borne by Contractor. Alternatively, CONTRACTOR shall invoice after adjusting the amount against Price Reduction for Slippages in Completion from the RA Bill and claim the GST accordingly.

23.7.1.8 Delay by OWNER in providing Utilities and Feedstock will not be reason for waiver of price reduction, if concurrently CONTRACTOR has delayed the completion of the Progress Schedule.

23.7.1.9 The Contractor further agrees that the price reduction amount is over and above any right which owner has to risk purchase under Clause **24.2** of the GCC and any right to get the defects in the work rectified at the cost of the contractor.

23.7.2 EXCESS CONSUMPTION OF UTILITIES

23.7.2.1 In the event that the total consumption/generation of respective utility as detailed in **Annexure-II to SCC (if applicable)** exceeds the guaranteed utility consumption/generation by more than as specified in Schedule of Prices, as applicable, then the CONTRACTOR shall first remedy/rectify the problem or make necessary replacements within such time as may be fixed on this behalf by the E-I-C after consulting the CONTRACTOR, so as to ensure that the consumption/generation of utility is brought within the guaranteed utility consumption/generation. If even after remedy/rectification / replacement of the equipment the total utility exceeds the guaranteed utility Consumption/generation, the OWNER shall be entitled to remedies/penalties as defined in **Annexure-II to SCC (if applicable)**.

23.7.2.2 The Contractor shall not be entitled to any extension of time for any remedy/replacement/rectification as specified above.

23.8 SCHEDULE OF ACTIVITIES

23.8.1 The CONTRACTOR shall within **4 (Four) weeks** from the date of issue of the LOA, furnish to the EIL/OWNER a detailed Schedule of Activities specifying in detail the various activities which the CONTRACTOR would be required to perform and the milestones with respect to each which the CONTRACTOR would have to achieve in order to set-up, complete, establish and successfully commission the UNIT/ works in accordance with the Contract.

23.8.2 Each activity entered in the Schedule of Activities and each milestone, of these schedule of activities provided under the Project Schedule herein, shall be priced so as to break-up so far as possible, the Lumpsum Price of services into various priced milestones of achievements and priced activities required to achieve those milestones. The Schedule of Activities and the said priced break-up of activities therein are intended only to provide a basis for the purpose of calculating on account payments for services and for calculating payments due to the CONTRACTOR under clause **42 of GCC** hereof upon cancellation of Contract, and for no other purpose.

23.8.3 The prices in Schedule of Activities shall be in conformity with the price(s) quoted by the CONTRACTOR for the various activities and the Contractual provisions for on account payments.

23.8.4 The OWNER shall review or cause to be reviewed the prima facie adequacy, sufficiency, validity and/or suitability of the activities listed in the Schedule of Activities for the works for which they are intended, and of the prices indicated in the Schedule of Activities in respect thereof. Such review shall be performed in conjunction with the design, engineering, specification and other technical reviews to be done by the EIL/OWNER and all provisions applicable thereto shall be applicable to the review of the Schedule of Activities. EIL/OWNER shall approve or comment on such schedule of activities submitted by the CONTRACTOR within a period of **3 (Three) Weeks** from the date of submission by CONTRACTOR.

23.8.5 The priced Schedule of Activities as approved by the EIL/OWNER shall constitute the Schedule of Activities envisaged in the contract documents. However, no such approval shall in any manner absolve the CONTRACTOR of his full responsibility under the contract to perform within the lump-sum price of services specified in the Price-Schedule, all services and to perform and undertake the work(s) required to set up, establish and commission the Unit in accordance with the Contract and the specification, complete in all respects, whether or not any particular work or activity required is included within the Schedule of Activities and whether or not the price thereof is included in the price indicated in the Schedule of Activities and whether or not the price thereof is in conformity with the price thereof indicated in the Schedule of Activities.

23.8.6 The Schedule of Activities shall be subject to amendment in both items and prices in so far as necessary consequent upon any amendment in any relevant related technical particulars or consequent upon a Change Order, and upon any amendment, the amended Schedule of Activities as approved by the EIL/OWNER shall thereafter constitute the Schedule of Activities as envisaged in the Contract Documents, provided that no such amendment shall by itself in any way oblige the OWNER to pay any amount in addition to Lumpsum Price of services as specified in the Price Schedule or oblige the OWNER to pay or bear any tax or duty which it would not have had to pay or bear but for such amendment.

23.9 REPORT AND RECORDS

23.9.1 The CONTRACTOR shall from time to time maintain at each job site (in addition to any records or registers required to be maintained by the CONTRACTOR under any law, rule or regulation having the force of law), such records and registers with respect to the materials and/or works as the E-I-C/OWNER shall require the CONTRACTOR to keep and/or maintain from time to time.

23.9.2 In addition to any other records or registers to be maintained by the CONTRACTOR from time to time and/or reports required to be furnished by the CONTRACTOR, the CONTRACTOR shall submit to the E-I-C and to the OWNER a Daily Progress Report of all work done and/or progress achieved by the CONTRACTOR at each job site within the preceding day.

23.9.3 The said daily Progress Report shall also contain category-wise the labour and equipment deployed in the various activities during the previous day.

23.9.4 The CONTRACTOR shall also submit to the E-I-C and OWNER at the end of each week (terminating on Sunday), a weekly Progress Report of all work done and/or progress achieved by

the CONTRACTOR at each jobsite within the preceding week. The Report shall also indicate the targets and the slippage (if any) in the achievement of targets, and the cause(s) for such slippage.

23.9.5 The CONTRACTOR shall also at the end of each English Calendar month submit to the E-I-C and OWNER, a Monthly Progress Report of all work done and/or progress achieved by the CONTRACTOR at each job site within preceding month. Such Report shall also indicate the slippages of any achievement in the targets upto the previous month and the steps being taken and to be taken to catch up and the catch up plan of the CONTRACTOR relative thereto. The said Report shall also indicate in a separate statement, the equipment(s) received at the job site during the previous month, the date of receipt of each equipment at site and whether the equipments have been erected or deployed or not.

23.9.6 The failure by the CONTRACTOR to submit the reports as specified in Clause **23.9.2, 23.9.3, 23.9.4** and/or **23.9.5** hereof shall disentitled the CONTRACTOR from submitting any R.A. Bill or other Bill or Invoice for material or equipment or for work done until the CONTRACTOR shall have duly made up any shortfall in the compliance(s).

23.9.7 The receipt and/or acceptance of any such report by the E-I-C and/or the OWNER shall be without prejudice to the full rights and remedies of OWNER and obligations/liabilities of CONTRACTOR under the Contract, and shall not in any way operate as an estopped against OWNER by reason only of the fact that no notice or objection was taken of any information contained in any such report; nor shall any statement in any such report be deemed to be correct merely by virtue of the existence of such statement, and it being uncontroverted by the OWNER or the E-I-C.

23.10 QUALITY ASSURANCE/QUALITY CONTROL PROGRAMME

23.10.1 The CONTRACTOR shall establish, document and maintain an effective Quality Assurance Programme conforming to ISO 9001. Within **28 (Twenty Eight) days** of the issue of the LOA, a detailed Quality Assurance Programme conforming to the said specifications to be followed for the execution of the contract shall be submitted by the CONTRACTOR to the E-I-C for approval.

23.10.2 The Quality Assurance Programme, plans and procedures shall be furnished in the form of a Quality Assurance “QA” manual. This document should cover details of the personnel responsible for the quality assurance plan or procedures to be followed for quality control in respect of design, engineering, procurement, supply, work(s), fabrication, installation, testing and commissioning. The quality assurance system should indicate organisational approach for Quality Control and quality assurance of the construction activities, at all stages of work at site as well as at manufacturer's works and despatch of materials.

23.10.3 The E-I-C shall review the Quality Assurance Programme within **3 (three) weeks** of receipt.

23.10.4 The CONTRACTOR shall within the Scope of Supply, arrange for and carry out inspection activities in respect of imported equipment/ materials through an approved Third Party Inspection Agency (“TPIA”). Third party inspection shall be carried out by TPIA office of the country (ies) from where materials are being procured/ sourced. The TPIA shall within its scope of work, examine the existence, correctness and completeness of all test and other certificates and Reports required to be furnished under the approved Quality Assurance Procedure (QAP), the applicable codes and specifications and the contract documents.

23.10.5 Subject to provisions of Clause **29.18** hereof, payments to be made to the TPIA shall be the responsibility of the CONTRACTOR. The responsibility for ensuring inspection/ testing as per specifications, approved documents and agreed QAP and plans shall be that of the CONTRACTOR. Inspection activities of the TPIA shall be coordinated by the Inspection Coordinator of the CONTRACTOR.

23.10.6 The CONTRACTOR shall ensure the following to maintain utmost quality in supply of equipment/materials:

a) No supply will be accepted unless drawings (wherever required) are approved under Code-1.

b) The TPIA shall carry out inspection based on Code-1 approved drawings and approved QAP.

c) The Inspection Release Note (“IRN”) issued by the TPIA shall clearly stipulate that materials/ equipment(s) has/have been inspected as per Code-1 approved drawings and approved QAP, and that the Certificate and Reports referred to in Clause **23.10.4** which have been examined by the TPIA are correct and complete and have been signed by the Inspection Agency in token

thereof. Payment shall be released only after receipt of the said IRN from the TPIA.

d) No clearance shall be given to the CONTRACTOR for erection works or for installation of the equipment without receipt of the Inspection Release Note as indicated in para (c) above.

e) Pre-commissioning and commissioning of the plant and equipment and of the UNIT shall be undertaken only after complete satisfaction/ verification of supplies as per final approved drawings (Code-1) and QAP (Code-1).

23.10.7 The CONTRACTOR has to ensure the deployment of Quality Assurance and Quality Control ("QA/QC") Engineer(s) depending upon the quantum of work. This QA/QC group shall be fully responsible to carry out the work as per standards and all code requirements. In case the E-I-C feels that QA/QC Engineer(s) of the CONTRACTOR or any of them are incompetent or that the designated Engineer(s) are insufficient, the CONTRACTOR shall deploy other experienced Engineer(s) to the satisfaction of E-I-C.

23.10.8 If the CONTRACTOR fails to comply with the requirements of the QAP and the above provisions or to follow the instructions of E-I-C under Clause. **23.10.7**, the next payment due to him shall not be certified, or if already certified, shall not be released unless the CONTRACTOR complies therewith to the satisfaction of E-I-C.

23.10.9 If TPI is specifically excluded from the CONTRACTOR"s responsibility under the Contract, the inspection shall be carried out by the EIC or by any other Inspection Agency nominated by the EIC/OWNER, and Clause. **23.10.4**, **23.10.5**, **23.10.7** and **23.10.8** shall stand accordingly modified.

23.10.10 Detailed documents related to Inspection Philosophy for the subject Contract has been covered elsewhere in bidding document.

24.0 EXECUTION OF THE WORK

Provision of Clause No. **46** of GCC stands modified to the following extent:

24.1 The CONTRACTOR shall provide sufficient labour, staff (qualified and unqualified), machinery, tools and equipment, material and things whatsoever necessary for the proper performance of the work and to ensure the rate of progress as envisaged in the Progress Schedule.

24.2 If in the opinion of the E-I-C (the opinion of either of whom in this behalf shall be final), the work(s)/operation(s) at any job site or as a whole is/are not meeting the progress necessary to achieve the relative date of completion in the Progress Schedule, the E-I-C may instruct the CONTRACTOR to employ/provide additional labour, staff, machinery, tools, equipment or material necessary to achieve the required progress and the CONTRACTOR shall forthwith comply with such instruction(s).

24.3 Should the CONTRACTOR fail to comply with such instruction(s) or fail to comply therewith to the satisfaction of the E-I-C (whose opinion in this behalf shall be final and binding upon the CONTRACTOR), the E-I-C may, at his discretion, at the risk and cost of CONTRACTOR, and after consulting the CONTRACTOR, appoint, procure or provide the material(s) and/or the additional labour/personnel and or equipment as the E-I-C (whose decision in this behalf shall be final and binding upon the CONTRACTOR) considers necessary to achieve the necessary progress in relation to any particular work/operation or the work as a whole, or may appoint subcontractor(s) for the performance of any particular work or operation and/or for the supply of any requisite material. In so doing, the E-I-C shall be deemed to be acting for and on behalf of and as agent of the CONTRACTOR and any such appointment(s), procurement or provision shall be deemed to have been made by the CONTRACTOR and shall be paid for by the CONTRACTOR and/or out of any monies payable to the CONTRACTOR. The OWNER shall also be entitled in this event to **10% (Ten Percent)** as supervision charges on the total cost of such appointment(s), procurement(s) and/or provision(s), and the OWNER shall be entitled (without prejudice to any other mode of recovery) to deduct the same from the running account/final bills of the CONTRACTOR or any amount howsoever becoming payable to the CONTRACTOR from time to time and the decision of the E-I-C as to the cost incurred in this behalf shall be final and binding upon the CONTRACTOR.

Should the total amount thereof exceed the amount due to the contractor, the Contractor shall pay the difference to the Owner within **15** days of making demand for payment failing which the Contractor shall be liable to pay interest at **SBI base rate (on date of enquiry issuance) +1%** on such amounts till the date of payment.

24.4 Should the E-I-C at any stage (notwithstanding that the time for completion of the relative work or item of work as specified in the Progress Schedule has not expired) be of the opinion (the opinion of the E-I-C in this behalf being final) that the performance of any work or item of work by the CONTRACTOR is unsatisfactory (whether in the rate of progress, the manner, quality or workmanship of the performance or in the adherence to specifications, or in the omission, neglect or failure to do, perform, complete or finish any works or item, or for any other cause whatsoever), the E-I-C shall be entitled (without prejudice to any other rights of the OWNER and/or obligations of the CONTRACTOR under the Contract) at his discretion and after consulting the CONTRACTOR at the risk and cost of the CONTRACTOR either to appoint, procure and/or provide such labour, staff, machinery, tools, materials etc. as the E-I-C (whose decision shall be final and binding upon the CONTRACTOR) considers necessary to achieve satisfaction in relation to the particular work, operation or item or work, or the work as a whole, as the case may be, or to appoint one or more subcontractors for the satisfactory performance thereof or any part thereof, or to undertake the performance thereof or any part thereof departmentally, and the provisions of clause **24.3** hereof shall mutates mutandis apply to any action taken by the E-I-C pursuant to this clause in the same manner as applicable to an action taken under the said clause.

24.5 After and so far as the performance of any work or supply of any materials under Clause **24.3** or under Clause **24.4** shall involve payment of any advance(s) or down payment(s) or any other payment in advance of the payments for relative works or supplies to the CONTRACTOR, such payment(s) shall be funded out of the amounts payable or becoming payable on the R.A. Bills or other Bills of the CONTRACTOR and/or out of any Bank Guarantees to secure advance(s) or otherwise held by the OWNER pursuant to this contract.

24.6 Any action, taken by the E-I-C under clause **24.3** and/or **24.4** shall be without prejudice to the full liability of the CONTRACTOR under the Contract including but not limited to the OWNER'S full rights under clauses 23.7 and associated clauses thereunder, and under clauses **40.7** and **40.8** hereof.

24.7 During the progress of the works, the CONTRACTOR shall keep the site reasonably free from all unnecessary obstruction and shall store or dispose of any constructional plant and surplus materials and clear away and remove from the site, any wreckage, rubbish or temporary works no longer required.

24.8 The Contractor acknowledges that prior to the execution of this Contract, the Contractor has, after a complete and careful examination, made an independent evaluation of the scope of the Project, Specifications, Site, local conditions, physical qualities of ground, subsoil and geology, traffic volumes, suitability and availability of access routes to the Site and all information provided by the OWNER or obtained, procured or gathered otherwise, and has determined to its satisfaction the accuracy or otherwise thereof and the nature and extent of difficulties, risks and hazards as are likely to arise or may be faced by it in the course of performance of its obligations hereunder. The Owner makes no representation whatsoever, express, implicit or otherwise, regarding the accuracy, adequacy, correctness, reliability and/or completeness of any assessment, assumptions, statement or information provided by it and the Contractor confirms that it shall have no claim whatsoever against the OWNER in this regard.

24.8.1 The Contractor acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth in Clause **24.8** above and hereby acknowledges and agrees that the OWNER shall not be liable for the same in any manner whatsoever to the Contractor, or any person claiming through or under any of them, and shall not lead to any adjustment of Contract Price or scheduled completion date.

24.8.2 The Parties agree that any mistake or error in or relating to any of the matters set forth in Clause **24.8** above shall not vitiate this Contract or render it voidable.

24.8.3 Refer Technical Section of Bidding Document for **Project Execution Plan** for the EPC Package.

25.0 SUB-CONTRACTS

25.1 The CONTRACTOR shall not assign, sub-contract or subject the whole or any part of the work in any manner to any third party lien, right or interest, provided that the CONTRACTOR may, with the prior written approval of E-I-C and subject to the terms and conditions of Clause **67.0** and other provisions in this behalf, sub contract any particular work or part of the work to a subcontractor approved by the E-I-C.

25.2 Each Sub-Contractor shall be covered by the contract on the same basis as the CONTRACTOR, provided, however, that notwithstanding approval of the Sub-Contract as aforesaid and

notwithstanding that the OWNER/E-I-C shall have received a copy of the Contract between CONTRACTOR and Sub-Contractor, the CONTRACTOR shall be and shall remain exclusively responsible to the OWNER, for which purposes the Sub-Contractor shall, vis-a-vis EIL/OWNER, be deemed to be the servant/agent of CONTRACTOR employed for the performance of the particular work with full responsibility on CONTRACTOR for all acts, omissions and defaults of the Sub-Contractor and no default under any such agreement shall excuse the Contractor from its obligations or liability hereunder.

25.3 Subject as herein above in this behalf specifically permitted and provided under Clause **67.0**, the CONTRACTOR shall not sub-contract or sub-let or assign any work under the Contract, and any sub-contract or sub-let in breach hereof shall be deemed to be an assignment of the Contract or part or portion thereof sub-contracted, as the case may be and shall be considered as Contractor's default under this Contract and shall entitle the OWNER to terminate the Contractor in accordance with **Clause 40.0**.

25.4 If any sub-contractor engaged upon the work at the site executes any work which in the opinion of the E-I-C is not of the requisite standard (the opinion of the E-I-C being final in this behalf), the E-I-C may after consulting the CONTRACTOR, by written notice to the CONTRACTOR require the CONTRACTOR to terminate such sub-contract, and the CONTRACTOR shall upon the receipt of such notice, terminate such sub-contract at the risks and cost of the CONTRACTOR, and shall keep OWNER and its employees, directors, representatives indemnified against the consequences

25.5 Notwithstanding such sub-contract being approved by E-I-C as herein envisaged, the CONTRACTOR shall, at the commencement of every month, furnish the E-I-C with a list of all sub-contractors engaged and working at the site during the previous month, with particulars of the general nature of the works performed by them.

26.0 SUB-CONTRACTOR FOR CONSTRUCTION WORKS

Clause No. **35** of GCC stands modified to the following extent:

26.1 Following the issue of the LOA, the CONTRACTOR will submit to the OWNER and E-I-C for approval the details of sub-Contractors for construction in the Format prescribed by the OWNER for the purpose. The CONTRACTOR shall ensure that only competent and resourceful agencies with proven track record and performance should be proposed for the work to be sub-contracted.

26.2 Unless, stated otherwise the list of construction sub-contractors proposed by the Bidders in the Bid shall be considered as indicative only.

26.3 CONTRACTOR to refer Technical Section of Bidding Document for the construction activities which shall be performed by the CONTRACTOR directly and shall not be sub-contracted.

26.4 Additionally, the CONTRACTOR must deploy its own manpower for planning, supervision and quality of works at site including Project Manager(s), Quality Control Engineer(s) for various disciplines, Planning Engineer(s) and front line supervisors for Civil, Electrical, Mechanical, Piping and Instrumentation jobs. Sub-contracting of these activities shall not be permitted under any circumstances.

27.0 ENGINEERING SUB-CONTRACTOR

27.1 Subject to the provisions of IFB/NIT, the CONTRACTOR/ Engineering sub-contractor executing residual process design and detailed engineering shall follow inter alia the methodology mentioned below:

27.1.1 Residual Process Design and detailed Engineering shall be done by the CONTRACTOR or specified Engineering sub-contractor identified by the CONTRACTOR in his Bid and approved by the E-I-C/OWNER. No other or further subcontracting shall be permitted.

27.1.2 The Residual Process Design and detailed Engineering shall be carried out at the Principal Design Office of the CONTRACTOR/ Engineering Subcontractor, as the case may be, with adequate strength of technical personnel and support design aids.

27.1.3 The CONTRACTOR/ Engineering Subcontractor shall extensively use latest design software including 3D Modelling as specified in Technical Section.

27.1.4 In the case of Residual Design Engineering and/or Detailed Engineering being done by engineering subcontractor, the CONTRACTOR shall locate its Lead Engineers of the respective disciplines viz CIVIL, STRUCTURAL, PRESSURE VESSELS, STATIC & ROTATING

EQUIPMENT, PIPING, ELECTRICAL and INSTRUMENTATION at the design Centre (office) of the engineering subcontractor to control, monitor and approve the engineering design work/deliverables of the engineering subcontractor prior to their issue for Review or Construction, as applicable. Such placement shall be a pre-condition for the issue of any drawings for review or construction, to which end the CONTRACTOR shall keep the OWNER informed of such deployment with particulars of the Lead Engineers deployed, and the relevant dates of their deployment, and all drawings issued for review or construction shall be countersigned by the concerned Lead Engineer. All interactions on Design/ Review/ Discussions with OWNER/ OWNER's representative shall be done under single point responsibility of the CONTRACTOR.

After start of construction work, the CONTRACTOR and/or its engineering subcontractor, as the case may be, shall position at work site a field engineering team essentially consisting of General Civil, Piping and Structures initially and followed by Electrical and Instrumentation who have been involved in carrying out the design at the design centre in order to closely co- ordinate with site construction group to resolve any issues related to design/construction and provide additional drawings/documents as required. Other specialists as required shall also be deployed. The field engineering team shall be equipped with all their design aids (both hardware and software) and with effective communication network facilities with their Principal Design Office.

28.0 MISCONDUCT

28.1 If and whenever any of the CONTRACTOR's or Sub-contractor's agents, sub-agents, assigns, consultants or employees shall in the opinion of the E-I-C (whose opinion in this behalf shall be final), be guilty of misconduct or be incompetent or indifferently qualified or negligent in the performance of his/their duties, or if in the opinion of the E-I-C (which shall be final), it is undesirable for any reason (which need not be disclosed to the CONTRACTOR) for such person(s) to be employed in the works, the CONTRACTOR, if so directed by the E-I-C, shall forthwith remove or cause to be removed such person(s) from employment thereon, and any person(s) so removed shall not be re-employed in the works except with the prior permission in writing of the E-I-C. Should the CONTRACTOR be requested to repatriate any person removed from the works, the CONTRACTOR shall do so forthwith at his own cost. Any person(s) so removed from the works shall be immediately replaced at the expense of CONTRACTOR by a qualified and competent substitute.

28.2 The CONTRACTOR shall keep the EIL/OWNER, including their employees, directors, representatives, indemnified from and against all personal and third party claims whatsoever (inclusive of all costs incurred between attorney and client) arising out of any act or omission on part the of any sub-contractor or agent, sub-agent, consultant or employee of the CONTRACTOR or any Sub-contractor, whether committed, omitted or arising within or without the scope of the contract, sub-contract, agency or employment, as the case may be.

29.0 INSPECTION AND TESTING OF MATERIALS

29.1 All materials to be supplied by the CONTRACTOR within the scope of supply shall each be individually inspected, tested and analysed in terms of the specifications, applicable codes and the relevant practices specified therein or elsewhere in the contract document by expression or implication.

29.2 Inspection, tests and analysis shall be carried out in so far as possible, at the place of manufacture, production or fabrication of the materials, at the cost of the CONTRACTOR/manufacturer.

29.3 In each and every instance, the CONTRACTOR shall give the EIL/OWNER, adequate advance **(minimum 15 (fifteen) days)** notification of the schedule of inspection or test so that the OWNER/its representative may witness the same. The CONTRACTOR shall afford the EIL/OWNER/its authorised representatives, access to any and all parts of manufacturer's facilities or other places where manufacture, production or fabrication is being done, of any material intended for supply within the scope of supply.

29.4 OWNER shall be entitled at all times whether prior to despatch of stores, by itself and/or through inspectors appointed by the OWNER to inspect, test and/or analyse and/or to direct the manufacturers to inspect, test and/or analyse, any materials used or proposed to be used in the manufacture, production or fabrication of any material to be supplied by the CONTRACTOR within the scope of supply. The said inspection, test and analysis as far as required, shall be conducted in the presence of the inspector. The manufacturer shall ensure that the inspecting personnel referred to above are given free access to all the required places and information

connected with their work, besides working facilities to carry out their functions. The said inspection, test and analysis shall be so conducted as not to interfere with the manufacturer's normal production.

29.5 The OWNER shall be entitled at any time at the risk of the CONTRACTOR to inspect and/or test by itself or through any independent person(s) or agency(ies) appointed by the OWNER any materials, items and components whatsoever supplied or proposed to be supplied for incorporation in the works.

29.6 Further, the OWNER may, if so considers necessary for reasons to be recorded in writing, direct the CONTRACTOR to conduct such inspection or tests in addition to the inspection/tests specified in the Contract or the applicable codes, standards and/or practices. The inspection (subject to provisions of Clause No. **29.18** hereof) and/or tests, if conducted by the CONTRACTOR, shall be conducted at the expense of CONTRACTOR and may be directed by the EIL/OWNER to be conducted by agency(ies) nominated by the OWNER. Such tests may include destructive and/or non-destructive tests by ultrasonic, electromagnetic, radiological, visual and other means.

29.7 Where the manufacture or fabrication of any materials intended for incorporation in the works is being done by any person(s) other than the CONTRACTOR, and/or in the premises/workshop of any person other than the CONTRACTOR, the CONTRACTOR shall procure and arrange for the inspection (subject to provisions of Clause No. **29.18** hereof) or testing and/or analysis thereof by such other person(s) and shall provide EIL/OWNER and/or its authorised representative(s) every facility and assistance necessary for the inspection and/or testing thereof.

29.8 The CONTRACTOR shall also, on receipt of intimation or any communication of any inspection or tests by the OWNER or any agencies nominated by the OWNER in this behalf, present himself or his authorised representative(s) at the place of inspection and/or testing to receive any orders or instructions consequent thereto, as shall be necessary.

29.9 The CONTRACTOR shall furnish to the OWNER and/or agency specified by the OWNER for the purpose of inspection or approval when requested, or as required by the inspection or other contract documents, adequate samples of all materials and finishes intended for incorporation in the works. Such samples shall be submitted before the work is commenced, permitting sufficient time for tests/examination(s) thereof by the OWNER. All materials furnished and finishes incorporated in the work shall conform to the approved sample(s) in all respects.

29.10 The CONTRACTOR/manufacturers including their authorised Sub- contractors/ Suppliers shall make available to the EIL/OWNER and any other individual/agency authorised by the OWNER, for the purpose of inspection, all its records and results in respect of inspection, test and analysis conducted by it as part of their manufacturing and testing operations under the applicable codes and practices.

29.11 Should the manufacturers fail to comply with any of the provisions aforesaid relating to inspection, testing and/or analysis, the OWNER shall be entitled by itself and/or through inspector to conduct the inspection, test and/or analysis at the risk and expense of the manufacturer/CONTRACTOR in all respects.

29.12 No rejected material, component or sub-assembly shall be used or reused for manufacture, production or fabrication of any material(s) intended for permanent incorporation in the works.

29.13 Unless otherwise specifically authorised by the OWNER in writing, the supplier shall not ship or dispatch for shipment, within the scope of supply, any store(s) which have not been priorly inspected, tested and/or analysed as herein contemplated and in respect of which a certificate of quality has not been issued or signed by the inspectors.

29.14 If the rejection rates at the OWNER's inspection for defects exceeds **5% (Five percent)**, the OWNER shall be entitled to halt production until the cause thereof is rectified, without any liability to the OWNER and without in any manner relieving the CONTRACTOR of its full liabilities under the Contract.

29.15 The E-I-C shall be entitled for reasons to be recorded in writing to reject at any time even after delivery to the job site any defective materials (including specially manufactured or fabricated items and components) supplied by the CONTRACTOR for incorporation in the works, notwithstanding previous inspection and/or testing thereof by or on behalf of the OWNER without rejection or previous approval thereof by or on behalf of the OWNER and upon such rejection the CONTRACTOR shall either perform such work or improvement thereon or in respect thereof as

shall be necessary to bring the material, item or component to the requisite standard, or shall if so required by the E-I-C(whose decision in his behalf shall be final), remove the rejected material/item/component from the job site within the time specified by the E-I-C and replace it at his own cost and expense (without additional remuneration or compensation in respect thereof) with material (s)/item(s)/component(s) approved by the E-I-C.

29.16 Should the CONTRACTOR commit a breach of its obligations under Clauses **29.12, 29.13** or **29.15** hereof, the CONTRACTOR shall be deemed to be in breach of contract within the provisions of Clause **40.1** hereof with regard to termination of Contract, and the provisions of the said Clause and associated provisions thereunder shall apply to such breach.

29.17 Notwithstanding anything provided in the foregoing clauses hereof and notwithstanding that the OWNER and/or its representative or any agency appointed by the OWNER has inspected, tested and/or approved any raw material intended to be incorporated in any material(s) to be supplied pursuant to the Scope of Supply and/or has inspected, tested and/or approved any such material(s), the CONTRACTOR shall be and remain fully responsible under the Contract for and in relation to specification fulfillments and performance guarantees. The said inspection, tests and related procedures are intended only for the EIL/OWNER's satisfaction that prima facie the raw material and/or material(s), as the case may be, intended for incorporation and/or supply under the Contract, are in order.

29.18 **Notwithstanding anything mentioned in the SCC, Inspection of item(s)/equipment(s) shall be as per Inspection Methodology provided in the Technical Section of the bidding document. Wherein as per the Inspection Methodology inspection is in EIL scope, the inspection charges shall be excluded from quoted prices. Whereas, in case inspection is in scope of TPIA, inspection charges shall be included in quoted prices.**

30.0 INSPECTION AND TESTING OF WORKS

Provision of Clause No. **47, 66 and 68 of GCC** w.r.t to inspection stands modified to the following extent:

30.1 The CONTRACTOR shall at all times ensure highest standards of workmanship relative to the work to the satisfaction of the E-I-C. The E-I-C shall have the power to inspect or cause to be inspected the works in all respects at any and all times up to completion of the works, as also, to test or to instruct the CONTRACTOR to test the works or any structure, material or component thereof at the risk and cost of the CONTRACTOR, either by the CONTRACTOR or by any agency(ies) nominated by the E-I-C in this behalf.

30.1.1 The CONTRACTOR shall provide all facilities, instruments, material, labour and equipment required for testing the work (including checking the setting out of the works) and shall afford the E-I-C all assistance necessary to conduct or have conducted the inspection and tests.

30.1.2 The CONTRACTOR shall also provide and keep at all times during the progress of the work and maintenance period, proper means of access to the works and every part thereof by means of ladders, gangways etc. and the necessary attendants to move and set up the same as directed by the E-I-C for inspection or measurement of the works.

30.2 On no account shall the CONTRACTOR proceed with cover up or otherwise place beyond reach of inspection, test or measurement any work before necessary inspection entries are filled in the Site Inspection Register by the E-I-C or his authorised representative unless OWNER has been permitted sufficient time for test/examination(s) in accordance with foregoing provisions hereof. Should the CONTRACTOR do so, the same shall be uncovered at CONTRACTOR'S risk and expense for carrying out of the inspection, test and/or measurement.

30.3 Should the CONTRACTOR fail to comply with any provisions foregoing relative to inspection and/or testing of the works, the E-I-C shall in his absolute discretion be entitled to remove, dismantle and/or uncover, as the case may be, at the risk and cost of the CONTRACTOR, such cover-up thereof installed, erected or put up by the CONTRACTOR and to conduct or have conducted the test(s) and/or examination at the risk and cost of the CONTRACTOR. In such event the CONTRACTOR shall also bear the risk and cost of the replacement, reinstallation or re-erection of the concerned work(s) or part thereof, as case may be.

30.4 Notwithstanding anything provided in the foregoing clauses hereof, the CONTRACTOR shall be and remain liable at his own cost and initiative to conduct all tests at all relevant times during performance, erection and installation of any work(s), as shall be required in terms of the contract documents or the codes, standards or practices referred to therein, or as reasonably required by

the E-I-C, such tests to be conducted through agency(ies) or Laboratory(ies) specified or approved by the E-I-C in this behalf.

30.5 Should the E-I-C on inspection or test be not satisfied with the quality or workmanship of any work(s), or any part thereof (the decision of the E-I-C being final in this behalf), the CONTRACTOR shall re- perform, replace, re-install and/or re-erect, as the case may be, such work(s) or part as the case may be and no such rejected work(s) or part shall be used or reused with reference to the works except with the prior permission of the E-I-C and the provisions of Clause **30.7** hereof shall apply to default by the CONTRACTOR of the provisions of this clause.

30.6 Notwithstanding anything provided on foregoing clauses hereof and notwithstanding that the E-I-C and/or his representative has inspected, tested and/or approved any particular work(s) or structure or part thereof, such inspection, test or approval shall not absolve CONTRACTOR of his full responsibility under the contract inclusive of and relative to specification fulfillments and performance guarantees. The said inspection and test procedure is intended basically to satisfy EIL/OWNER that prima facie the work(s) done and/or structure or system installed is/are in order.

30.7 Should the CONTRACTOR fail to re-perform, replace, reinstall and/or re- erect, as the case may be, any work(s) or structure, or part thereof rejected or found defective in terms of clause **30.5** hereof within such period as the OWNER or E-I-C may specify by written notice to the CONTRACTOR in this behalf, without prejudice to the rights of the E-I-C under Clause **24.3** and Clause **24.4** thereof, the CONTRACTOR shall be deemed to be in breach of contract within the provisions of clause **40.1** hereof with regard to termination of Contract and the provision of the said clause and associated provisions thereunder shall apply to such breach, and the OWNER shall be entitled (without prejudice to any other right or remedy available to the OWNER) upon expiry of the period specified in said notice, to demolish and/or remove the rejected/defective work(s) and/or structure, or part thereof and to re-perform, replace, re-install and/or re-erect, as the case may be, the same by itself or through other agency or CONTRACTOR at the risks and cost of the CONTRACTOR in all respects, and to recover the costs incurred by the OWNER in this behalf together with a supervision charge of **10%** (**Ten percent**) thereon admissible to the OWNER, and the OWNER shall be entitled (without prejudice to any other mode of recovery) to deduct the same from the R.A./ Final Bill(s) of the CONTRACTOR or any monies becoming due to the CONTRACTOR from time to time and the decision of the charge E-I-C as to the cost incurred by the OWNER as aforesaid shall be final and binding upon the CONTRACTOR.

31.0 TESTS, COMMISSIONING AND POSSESSION OF WORKS

31.1 As soon as the works at any Site have been completed in all respects to the satisfaction of the E-I-C, and prior to the start-up of the UNIT, Final Tests of the different equipments, sub-systems, and systems comprised in the works/UNIT shall be undertaken by the CONTRACTOR at the risks and costs of the CONTRACTOR in the presence of the E-I-C/OWNER or his authorised representative. The EIL/OWNER may at its discretion permit Final Tests, piece-meal in respect of particular part(s) or section(s) or group(s) of the works.

31.1.1 As soon as all the Final Tests have been completed in all respects to the satisfaction of the E-I-C, pre-commissioning & start up of the complete system, plant(s), equipment(s), vessels and machinery, and associated systems or the UNIT, as the case may be shall be undertaken by the CONTRACTOR at the risk and cost of the CONTRACTOR under the overall supervision of the E-I-C or his authorised representative and/or of the Process Licensor.

31.2 Upon satisfactory completion of the Final Tests in respect of all plant, machinery, equipment, sub-systems and systems constituting the works/UNIT and Mechanical Completion of the UNIT to the satisfaction of the EIL/OWNER, the E-I-C shall prepare a Final Test Certificate or Mechanical Completion Certificate which shall certify the date on which Final Tests in respect of various plant, machines, equipment, sub-systems and systems have been successfully completed and the date of Mechanical Completion of the UNIT.

31.3 Following Mechanical Completion of the UNIT to the satisfaction of the OWNER the CONTRACTOR shall, as soon as feasible, commission the UNIT insofar as the Scope of Contract comprises of a UNIT, in accordance with the contractual requirements.

31.4 Once the UNIT has been successfully commissioned to the satisfaction of OWNER, E-I-C shall issue a Commissioning Certificate to CONTRACTOR which will set out the date of successful commissioning of the UNIT solely in order to facilitate the CONTRACTOR to claim the milestone payment against Commissioning and to fix the Defect Liability Period. The issue of the Commissioning Certificate to CONTRACTOR shall not, however relieve the CONTRACTOR of

any obligations, which CONTRACTOR has to perform until issue of the Commissioning and Performance Test Certificate as per the Contract. Subsequent to successful commissioning of the UNIT, and after the operation of the UNIT has been stabilized, the CONTRACTOR shall undertake Performance Tests for the UNIT to establish that the UNIT performs according to the contractual requirements. Such Performance Tests will be undertaken by the CONTRACTOR at the risks and costs of the CONTRACTOR under the overall supervision of the E-I-C/OWNER or his authorized representative and/or of the Process Licensor.

31.5 On successful completion of the Performance Tests to the satisfaction of the OWNER, the E-I-C shall issue a Commissioning and Performance Test Certificate to the CONTRACTOR, which will set out the date of successful commissioning of the UNIT and the date of successful completion of the Performance Tests of the UNIT.

31.5.1 On completion of all jobs in all respects to the satisfaction of the OWNER, the E-I-C shall issue a Completion Certificate to the CONTRACTOR, which will set out the date of successful Completion of the Scope of Work under the Contract.

31.6 If within the scope of work, the Contractor is required to load the Catalyst into the UNIT, such loading shall include within its scope the handling and removal of the catalyst from the OWNER's godown or warehouse, located within the Refinery, where the Catalyst is stored, its transportation to the job site, opening of packing or containers in which the catalyst is loaded, loading of the catalyst in accordance with the specifications and/or instructions of the Licensor and/or the E-I-C, and return of empties to the OWNER's designated warehouse. Loading of the catalyst shall be part of Mechanical Completion of unit.

31.7 As and from the date of issue of Performance Test Certificate, the OWNER shall be deemed to have taken over the work(s) as mentioned in the Performance Test Certificate but without prejudice to CONTRACTOR's liability under clause **32.4** hereof. In respect of works where Commissioning is in the CONTRACTOR's scope and Performance Test is not in the CONTRACTOR's scope, the OWNER shall be deemed to have taken over the works as and from the date of successful commissioning of the works and stated in the Commissioning Certificate, but without prejudice to the CONTRACTOR's liability under Clause **32.4** hereof. In respect of works which are not required to be commissioned by the CONTRACTOR, the OWNER shall be deemed to have taken over the works as and from the date of successful completion of the final tests and stated in the Final Test Certificate, but without prejudice to the CONTRACTOR's liability under Clause **32.4** hereof.

31.8 If during Final Tests and/or pre-commissioning, start-up, commissioning and/or Performance Tests or at any time prior thereto, any defect(s) in the design or in any work performed or structure erected or component installed or in any installation or erection(s) or material(s) incorporated in the works is/are noticed, the CONTRACTOR shall forthwith within the scope of the work remove and/or demolish the same and re-perform, replace, re-install and re-erect the same and otherwise do and provide whatever is necessary to be done to correct, repair and/or rectify the defect(s) to the satisfaction of the E-I-C, and if the defect(s) be discovered during Final Tests or commissioning or Performance Tests, the CONTRACTOR shall thereafter repeat the Final Tests or commissioning or Performance Tests or such of them as may be required to be repeated, and so on until successful conclusion of Final Tests, commissioning of the total system without defect, and/or successful completion of the Performance Tests. Any and all lubricants, consumables and spares required for commissioning the UNIT and to undertake the Performance Tests shall be provided by the CONTRACTOR within the scope of supply.

31.9 Should the CONTRACTOR fail to correct, repair or rectify any defects as aforesaid, the provision of Clause **30.7** hereof shall mutatis mutandis apply as for defects under Clause **30.5**.

31.10 Notwithstanding anything provided in Clause **31.7**, **31.8** and **31.9** hereof, the OWNER shall be entitled without prejudice to any other rights of the OWNER or liabilities of the CONTRACTOR under the foregoing provisions hereof or otherwise under the Contract, including the rights of the OWNER under clause **23.7** hereof and associated clause thereunder and clause **40.1** hereof and associated clauses thereunder:

i If by reason of any default on the part of the CONTRACTOR a Commissioning Certificate and/or Performance Test Certificate has not been issued in respect of the entire works within **4 (Four) weeks** after the date fixed for completion of the entire works in the Progress Schedule(s), to take over and use any portion of works in respect of which Commissioning Certificate and/or Performance Test Certificate has not been issued, with or without affording

the CONTRACTOR further opportunity for completing the work for issue of the Commissioning Certificate and/or Performance Test Certificate.

ii At any time during the progress of the works, notwithstanding that time for the completion of the entire works or concerned part, portion or section thereof according to the Progress Schedule(s) shall not have expired, to take over and/or use for any purpose the incomplete or partially completed works/UNIT or any part or portion or section thereof, as the case may be , and give the CONTRACTOR an opportunity for completing the work or relative part or portion or section thereof, as the case maybe, within the time for completion permitted there for under the Progress Schedule and if in the opinion of the CONTRACTOR, such taking over and/or use shall require an extension of time for completion, the provision of Clause **23.6.6** hereof and associated clauses thereunder relating to extension of time shall apply.

Provided always that takeover, possession or use of the works/UNIT or any part or portion or section thereof by the OWNER within the provisions of item (i) and/or item (ii) above shall not be deemed to be an acceptance of work or relative part or portion or section thereof by the OWNER or relieve the CONTRACTOR of his full obligations in respect thereof under the Contract.

31.11 The CONTRACTOR shall be deemed to have successfully commissioned the UNIT contracted for when the following conditions are satisfied:

i The UNIT and all its components/facilities have been successfully tested after installation at site individually and as a whole and Final Test Certificate shall have been issued in respect thereof.

ii The UNIT is successfully commissioned as per provisions of **Annexure-VIII** to SCC or as defined in Technical Section of Bidding Document.

iii The OWNER shall have issued a Commissioning Certificate in respect of the UNIT.

32.0 COMPLETION CERTIFICATE

Provision of Clause No. **83,84 and 85** of **GCC** stands modified to the following extent:

32.1 After the final tests have been successfully completed in respect of all the works envisaged in the contract, or after the UNIT has been Mechanically completed, as the case may be, the CONTRACTOR shall clear the job site of all scaffolding, wiring, pipes, surplus materials, CONTRACTOR's labour, equipment and machinery and shall demolish, dismantle and remove all CONTRACTOR's site offices and quarters and other temporary works, structure and constructions and other items and things whatsoever brought up on or erected at the job site or on any land allotted to the CONTRACTOR by the OWNER and not incorporated in the permanent works and shall remove all rubbish from the job site and the land allotted to the CONTRACTOR and shall clear, level and dress the job site and said land to the satisfaction of the E-I-C and shall put the OWNER in undisputed custody and possession of the job site and all land allotted by the OWNER to the CONTRACTOR and unless the CONTRACTOR shall have fulfilled the provisions of the clause, the works shall not be deemed to have been completed.

32.2 Upon the satisfactory fulfilment by the CONTRACTOR of the provisions of Clause **32.1** hereof, the CONTRACTOR shall be entitled to apply to the E-I-C, for a Completion Certificate in respect of the entire work or work at any job site, as the case may be, upon submission of the following documents:

I. The Technical Documents according to which the work was carried out.

II. Complete set of working drawings showing therein corrections and modifications (if any) made during the course of execution of the works, signed by the E-I-C.

III. Statement of final levels asset for various works, signed by the E-I-C.

IV. Final Test Certificate issued by the E-I-C (if commissioning is not within the CONTRACTOR's scope of the work with respect to which the Final Test Certificate has been issued) and Commissioning Certificate (if Performance Tests are not within the CONTRACTOR's scope of work) and a Commissioning Certificate and a Performance Test Certificate (if Performance Tests are within the CONTRACTOR's scope of work) issued by the E-I-C/OWNER.

V. Confirmation of E-I-C of satisfactory fulfilment of the provisions of the Clause **32.1** hereof.

VI. Item-wise list of surplus materials including the quantity & estimated value of each surplus item (out of the materials issued by the OWNER or brought at site by the CONTRACTOR) returned to the OWNER's Store or otherwise disposed of, duly signed by the Engineer-in-Charge.

VII. Materials-at-site accounting for OWNER- supplied materials, signed by the E-I-C.

VIII. Discharge in respect of OWNER-supplied equipment and machinery, signed by the E-I-C, and

IX. Declaration by the CONTRACTOR that he has duly cleared any and all of the dues payable by him to his Labour/Piece rate workers (PRWs), Sub-Contractors, Suppliers, Vendors, Income Tax, GST and Customs, Provident fund, ESI and royalties, if any , as applicable to the Scope of Work under the Contract."

X. Proof of payment in full of the cess payable under the Building and other Construction Workers' Welfare Cess Act, 1996.

32.3 If the E-I-C is satisfied of the completeness in all respects of all documents specified in Clause **32.2** and of proper reconciliation and accounting of all materials the E-I-C shall, within **1 (One) month** of receipt of the application for the Completion Certificate, issue a Completion Certificate in respect of the works for which the Completion Certificate has been applied. If the CONTRACTOR cannot produce to the satisfaction of the E-I-C, the statement of reconciliation or other explanation of issues, utilisation and balance of materials, the E-I-C shall (after taking into account irrecoverable losses, if any, determined to be reasonable by E-I-C) debit the CONTRACTOR the reasonable cost of such material plus **10% (Ten percent)** thereof under the provision of Sl No. (ix) of clause **14.1** hereof and issue the Completion Certificate subject thereto. The decision of the E-I-C as to the acceptability of the material reconciliation furnished by the CONTRACTOR and as to the irrecoverable losses, if any, permissible shall be final and binding upon the CONTRACTOR.

32.3.1 The issue of a Completion Certificate shall be without prejudice to the OWNER's rights and CONTRACTOR's liabilities under the Contract, including the CONTRACTOR's liability for the defect liability period under clause **33.1** hereof nor shall the issue of a Completion Certificate in respect of the works be construed as a waiver of any right or claim of the OWNER against the CONTRACTOR in respect of works or any of them.

32.4 Up to and until issue of the Completion Certificate as provided for herein above in respect of the works, the work(s) and all materials incorporated therein shall be and remain at the risks of the CONTRACTOR in all respects, including (but not limited to) accident, lightning, earth- quake, fire, storm, flood, tempest, riot, civil commotion and/or war.

32.5 OWNER shall arrange Insurance as per provision of clause no. **65** of SCC.

PROVIDED ALWAYS THAT:

(i) Notwithstanding anything herein provided, the CONTRACTOR shall be and remain solely and exclusively liable to repair, restore or replace, as the case may be, works (including the materials therein incorporated) damaged or destroyed as a result of any force majeure or other act or omission, notwithstanding the existence or otherwise of any policy(ies) of insurance aforesaid, with the intent that any policy(ies) of insurance aforesaid taken out by the CONTRACTOR or by the OWNER, shall not in any way absolve the CONTRACTOR from his full liability under Clause **32.4** hereof or otherwise but shall constitute merely an additional security and not a substitution of liability.

(ii) It shall be the exclusive responsibility of the CONTRACTOR to lodge and pursue any or all claims in respect of the insurance aforesaid.

32.6 APPLICATION OF PROCEEDS OF INSURANCE

(a) Proceeds of any policy(ies) of insurance received by the OWNER pursuant to Clause **14.1(vii)** or Clause **32.5** hereof shall be utilized at the sole discretion of the OWNER either for payment to the CONTRACTOR for repair, restoration or replacement, as the case may be, of the relative materials or works, or to meet the costs of repair, restoration or replacement in the event of the CONTRACTOR refusing or failing or neglecting to undertake such repair, restoration and/or replacement, as the case may be, without prejudice to any other right or remedy available to the OWNER in respect of such default, failure or neglect.

(b) If the CONTRACTOR repairs, restores or replaces, as the case may be, the lost, damaged or destroyed materials or works affected to the satisfaction of the OWNER, the CONTRACTOR shall be entitled to the disbursement by the OWNER of the full monies received by the OWNER under the relative policy(ies) of insurance with respect to such materials or works repaired, restored or replaced, as the case may be, by the CONTRACTOR.

33.0 DEFECT LIABILITY PERIOD AND LATENT DEFECTS

The Provisions under Clause **74 of GCC**- PERIOD OF LIABILITY FROM THE DATE OF COMPLETION OF WORK stands replaced by below clause:

33.1 The primary Defect Liability Period for the complete works/Unit(s) shall be **12 (twelve) months** from the date of the issue of the Commissioning Certificate or **8000 (Eight Thousand) hours** of run whichever shall be earlier, provided that if the Unit(s) cannot be commissioned for a cause solely attributable to the OWNER within **12 (Twelve)** months from the Mechanical Completion, the primary Defect Liability Period shall be **18 (Eighteen)** months from the date of Mechanical Completion.

Notwithstanding the expiry of the primary Defect Liability Period aforesaid, the CONTRACTOR shall be and remain liable:

(i) To correct and/or rectify or replace, as the case may be, the defective works or materials with respect to which a greater defect liability period than as stated above has been specified in any of the Contract Documents, for the entirety of the period so specified; and

(ii) To pass on to the OWNER the benefit(s) of any or all warranties or guarantees which may be available to the CONTRACTOR from its vendors in respect of materials or parts or components thereof which enure(s) for a period in excess of the primary Defect Liability Period specified above.

33.1.1 It is hereby clarified that if any defects in the Supplies supplied and the Works performed by the CONTRACTOR which is not discoverable by reasonable inspection and testing procedures, and which materially affects the operation and performance of the Project, becoming apparent only after a certain period of operation post-completion of the Project ("**Latent Defects**"), the CONTRACTOR shall warrant that the Project and each Unit shall be free from such Latent Defects.

33.2 The CONTRACTOR shall at its own cost and initiative, within the scope of work, correct, repair and/or rectify to the satisfaction of the OWNER/E-I-C any and all defects and/or imperfections in the design of the work and/or in the works performed and/or systems, materials (including plant, equipment and machinery) incorporated therein as shall be discovered during the said defect liability period and if it be not possible to correct, repair and/or rectify any defective works and/or system(s), incorporated therein, the CONTRACTOR shall at his own cost and initiative replace and/or re-install the defective works, system(s) and/or materials and shall, insofar as necessary for the purpose, at his own cost and initiative re-perform in whole or in part the relative and/or any associated works to the satisfaction of the OWNER/E-I-C, and shall within the scope of supply, supply any and all materials required to correct, repair and/or rectify the defect and/or imperfections and/or to replace or re-install the defective works.

33.2.1 The responsibility under Clause **33.1 (i)** hereof shall, without prejudice to the foregoing, include the responsibility on the part of the CONTRACTOR at his own cost and initiative (and without cost to the OWNER), to provide and furnish, within the scope of work, all labour, equipment, crafts and inputs, whatsoever required in and relative to the correction, repair, rectification, replacement, installation and/or re-performance of the relative work(s) and/or system(s), and to supply within the scope of supply, all materials and other items to be incorporated therein including, without prejudice to the generality of the foregoing, the supply by the CONTRACTOR of all materials.

33.3 The defect liability period for any works re-performed and/or systems, materials, components or other items supplied and incorporated therein pursuant to the obligations of the CONTRACTOR under Clause **33.1** shall be **12 (Twelve) months** from the date of correction, repair, rectification, replacement and/or re-installation thereof, as the case may be, with the intent that the provisions of Clause **33.2** hereof and associated provisions thereunder shall apply thereto in respect of all defects discovered during a period of **12 (Twelve) months** from the date of completion of the relative correction, repair, rectification, replacement and/or re- installation, as the case may be, in the same manner and to the same extent as applicable in respect of the original works. For the purpose of clarification, it is stated that such extended defect liability period shall be applicable

only to the particular work, system, material, component or other item corrected, repaired rectified, replaced, re-performed or re-installed, as the case may be (example: if the shaft(s) of an equipment are replaced, the extended defect liability shall be applicable only with respect to the shaft(s), while the basic defect liability period shall be applicable to the relative equipment).

33.4 Should the CONTRACTOR fail to fulfil his obligations under Clause **33.1**, **33.2** and / or **33.3** and associated clauses thereunder, the provisions of Clause **30.7** hereof shall mutatis mutandis apply.

33.5 In fulfilment of the CONTRACTOR's obligations relative to defects, the CONTRACTOR shall so arrange the working as to cause the least inconvenience to the OWNER in operating the UNIT and/or avoid shut-downs thereof except during the periods of planned shut-down or idleness in the course of normal operation of the system (s).

34.0 CONTRACTOR'S GUARANTEES

34.1 The guarantees herein set forth are without prejudice and in addition to any other guarantees or liabilities of the CONTRACTOR. The CONTRACTOR guarantees and undertakes that:

34.2 GENERAL

(i) The UNIT designed, supplied and installed and/or erected by the CONTRACTOR shall on operation under local conditions when operated under the specified operating conditions operate to the desired capacity to produce the desired product(s) of desired purity(ies) and quantity(ies) at desired economy(ies). Excluded from the scope of this guarantee are defects and shortcomings arising wholly out of defects in design(s) furnished by a Process Licensor other than CONTRACTOR.

(ii) The materials supplied and incorporated in the UNIT including plant and machinery and instruments shall be of good quality, fit for purpose and workmanship and shall conform in all respects to the specifications and the provisions of the Contract.

(iii) The work performed pursuant to the Contract including civil and associated work shall be of good quality, fit for purpose and workmanship and shall conform in all respect to the specifications and the provisions of the Contract.

(iv) The plant, machinery and systems incorporated in the UNIT shall be so designed and arranged that even after the expiry of the said **2 (Two) years period** from defect liability period, the spares, spare parts and/or suitable replacement parts shall be and remain available at reasonable cost to enable trouble free operation of the UNIT for its reasonable life expectancy.

34.3 ENGINEERING GUARANTEE

34.3.1 Since residual process design and detailed engineering (including Hazop & Hazans specified) is within the CONTRACTOR's scope and the work shall be executed and UNIT established based on the engineering performed, it shall be the prime responsibility of the CONTRACTOR to carry out such design and engineering in accordance with good and sound engineering practices.

34.3.2 In case any error or omission in design or engineering within the CONTRACTOR's scope i.e. the residual process design or detailed engineering (including Hazop & Hazan) requires re-engineering which results in any new requirements for equipment/materials, the same shall be supplied and re-engineering shall be carried by the CONTRACTOR within the scope of relative Work and/or supply and within the contractual period without extra cost to the OWNER or entitlement of extension of time to the CONTRACTOR.

34.3.3 The CONTRACTOR shall guarantee that the system design for the UNIT/PLANT shall meet and comply with the OWNER's requirements and :

- the equipment approved and/ or selected
- the Site Criteria
- the Engineering specifications, standards and design guides and codes the Front End Engineering Design(FEED) as mentioned in Bidding Document.

34.3.4 The Contractor shall check and satisfy itself the Front End Engineering Data (FEED) for any discrepancy, deficiency and with regard to completeness to meet CONTRACTOR'S proposed guarantee and in case of any discrepancy, deficiency or incompleteness, Contractor shall inform the OWNER/Consultant immediately for further action.

The Contractor, if required, shall carry out corrective technical studies and engineering based on action suggested by OWNER/EIL as may be required without any extra cost to OWNER.

34.3.5 Contractor to endorse the Front End Engineering Data as per provisions of **Annexure-XXIII** to SCC and furnish certificate as per prescribed format accordingly as token of acceptance along-with bid.

34.4 WORKMANSHIP GUARANTEE

34.4.1 Workmanship for manufacture and construction shall be carried out in accordance with the requirements of the Contract and the codes and standards and practices therein specified. Any defective material supplied or defective works done, shall be made good and shall, if so required by the OWNER or the E-I-C, be replaced by new materials within the relative scope of Work and/or supply without any additional cost to Owner.

34.4.2 The CONTRACTOR accepts full responsibility for the quality and correctness of all materials (including plant and equipments and all components/parts) and Works within the CONTRACTOR's scope of supply and/or scope of work including but not limited to :

a. Selection of materials;
b. Material specifications and metallurgy;
c. Work specifications;
d. Fabrication/manufacturing workmanship
e. Engagement of experienced, reliable and qualified suppliers, engineers and/or sub-Contractors.

34.5 PERFORMANCE GUARANTEE

34.5.1 The CONTRACTOR is not responsible for the process guarantees of the LICENSOR. However, within and to the extent applicable to the scope of supply & work, the CONTRACTOR shall be responsible for performance guarantees of the UNIT in terms of product quality and design and rated capacities, including turndown capacity and facilities/systems incorporated therein as well as for guaranteed consumption of power. This guarantee shall cover the guaranteed mechanical performance for each and every related equipment, their efficiencies and their performance as laid down in the Process Package including guarantee for power consumption. Equipment which does not perform to the guarantees shall, in consultation with the OWNER/E-I-C either be replaced or altered or repaired in parts or components or wholly (including dismantling, transportation, erection, hook-up, commissioning etc.) within the relative scope of supply and/or services at no extra cost to the OWNER and without entitlement of extension of time to the CONTRACTOR. Although the CONTRACTOR is not responsible for process guarantees, he shall carry all activities in collecting the required data during Performance Tests or other process guarantee runs to identify problems of non-performance, for further analysis and modifications required to meet process performance parameters.

34.5.2 The CONTRACTOR shall select the equipment considering the economy of power consumption and minimum effluent or pollution discharge.

34.5.3 All instruments required to establish performance are within the CONTRACTOR's scope of contract at no extra cost to the OWNER.

34.5.4 The CONTRACTOR shall provide a list of laboratory test procedures and frequencies thereof required for validating the CONTRACTOR's Performance Guarantees.

34.5.5 Performance tests shall be performed as per Technical Section of Bidding Document.

34.5.6

(a) If on any testing, any material or equipment or the UNIT does not meet the design, rated or guaranteed performance relative thereto, the CONTRACTOR shall forthwith, within the CONTRACTOR's scope of Work and at no additional cost to the OWNER, undertake such additional tests and/or operations as are necessary to identify the cause of such failure. Such tests and/or operations shall be conducted in conjunction with the Process Licensor, if the UNIT as a whole fails to meet the Process Licensor's process guarantees.

(b) If as a result of such tests and/or operations it is determined that the design, rated and/or guaranteed outputs or capacities have not been met because of a defect in any material(s) (including plant and equipments) supplied by the CONTRACTOR, the CONTRACTOR shall forthwith in consultation with the OWNER/E-I-C take steps necessary to cause the defect to be identified and rectified, either by replacement of the defective material, plant or equipment

or part there of or by repair or replacement thereof. After such repair/replacement is carried out, the guarantee performance tests shall be repeated. The costs for such repeated tests (including charges payable to the Process Licensor or any other agency) shall be borne by the CONTRACTOR. The CONTRACTOR shall forthwith establish a Time Schedule acceptable to the OWNER/E-I-C for such replacement/rectification bearing in mind the exigencies of the Project requirement. Should the CONTRACTOR fail to establish such Time Schedule, the E-I-C shall establish the Time Schedule, and the Time Schedule so established shall be binding on the CONTRACTOR.

(c) Should the CONTRACTOR thereafter fail to adhere to a Time Schedule so established for the replacement/rectification, the OWNER may (but without obligation to do so) takeover in whole or part such replacement/rectification at the risk and cost of and as agent of the CONTRACTOR. In so doing, the OWNER shall be entitled to identify and employ through private negotiations, the quickest available resources of supply and/or Work without resorting to the tender process or any other form of competitive bidding.

34.6 COMMISSIONING

34.6.1 The CONTRACTOR shall be responsible to commission the UNIT and to prove the CONTRACTOR's performance guarantees with respect thereto. The commissioning shall, to the extent necessary, be carried out under the supervision of Licensor, E-I-C and with the assistance of the OWNER's personnel. The CONTRACTOR shall, within his responsibilities for and the scope of Commissioning the UNIT, train OWNER's personnel at the site of the UNIT in such number and for such period as the CONTRACTOR considers reasonably necessary for Commissioning the PLANT.

34.6.2 It is envisaged that the UNIT will be commissioned within Time period for Commissioning specified in **Annexure-I to SCC**, and the mobilisation and/or retention of the CONTRACTOR's personnel until completion of Final Testing and Commissioning shall be included within the Lumpsum Price of services. If, however, for any reason not attributable to the CONTRACTOR the Commissioning of the UNIT cannot be undertaken within **3 (three) months** of Mechanical Completion of the UNIT, the CONTRACTOR may, in consultation with the OWNER, demobilise some or all of its personnel brought to or retained at the site for the purpose of Commissioning. The CONTRACTOR shall re-mobilise the required personnel on receipt of notice for Commissioning, and the OWNER and the CONTRACTOR shall agree upon the reasonable cost to be incurred by the CONTRACTOR for re-mobilisation of such personnel, which shall be payable in addition to the price of services specified in the Contract, and this additional amount shall be included within and form part of the Final Bill of the CONTRACTOR.

34.6.3 In addition, within the CONTRACTOR's responsibilities for Commissioning and within the price of services, the CONTRACTOR shall be required to maintain watch and ward of and ensure the safety and integrity of the UNIT until successful completion of Commissioning and issue of Commissioning Certificate for the UNIT. If Commissioning of the UNIT commences later than **3 (three) months** of Mechanical Completion of the UNIT for any reason not attributable to the CONTRACTOR, the OWNER and the CONTRACTOR shall agree upon the reasonable cost incurred for maintaining watch , ensure mothballing and preservation and insurance of the UNIT beyond the said **3 (three) months** period and upto commencement of Commissioning, which shall be payable to the CONTRACTOR in addition to the price of services and this additional amount shall be included within and form part of the Final Bill of the CONTRACTOR. If the Commissioning of the UNIT is delayed beyond **12 (twelve) months** of Mechanical Completion of the UNIT, the OWNER and the CONTRACTOR shall work out the modalities for the takeover of the UNIT by the OWNER without prejudice to the CONTRACTOR's obligation for and related to and consequent to Commissioning.

34.6.4 As and when the UNIT is ready to be commissioned, the OWNER shall give the CONTRACTOR notice of not less than **10 (Ten) days** for Commissioning the UNIT.

34.6.5 *The relevant terms and conditions regarding provision of utilities, consumables, catalysts, feed, raw material etc. for pre-commissioning, commissioning and guarantee test run etc. shall be as per Technical Section of the Bidding Document.*

34.6.6 If Commissioning of the UNIT and/or the conduct of the Performance Test is delayed beyond **12 (twelve) months** from the date of Mechanical Completion of the UNIT for reasons not attributable to the CONTRACTOR, the OWNER shall (subject to such adjustments as permissible) release to the CONTRACTOR, the undisputable balance payable on commissioning and Performance Tests against the CONTRACTOR furnishing a Bank Guarantee from a List of Bank as per **Annexure-**

XX to SCC acceptable to the OWNER in a form at prescribed by the OWNER for an amount equivalent to the amount of the payment(s) to be released. The validity of such Bank Guarantee(s) shall be initially for a period of 6 (six) months and shall be extended for one further period of 6 (six) months. If the commissioning and/or Performance Test cannot be conducted within such extended period for reasons solely attributable to the OWNER, the Bank Guarantee will be substituted by Corporate Guarantee of the CONTRACTOR in a format acceptable to the OWNER. If however, the UNIT cannot be commissioned within the said period for reason(s) attributable to the CONTRACTOR or if commissioning and/or the Performance Test conducted indicates that the UNIT does not perform to the contractual specifications and requirements, then the Bank Guarantee(s) shall even after the extension aforesaid continue to be extended upto and until successful commissioning and Performance Tests of the UNIT. In either event, the OWNER will be entitled to encash the Bank Guarantee(s) if the Bank Guarantee is not extended or substituted by an acceptable Corporate Guarantee, as the case may be, at least **14 (Fourteen) days** prior to the date of expiry of Bank Guarantee(s).CONTRACTOR to agree that all the costs for furnishing and maintaining the bank guarantee(s) and corporate guarantee, shall be solely borne and be payable by the CONTRACTOR.

34.7 GUARANTEE PERFORMANCE TESTS

34.7.1 For the purpose to demonstrate that the UNIT meets CONTRACTOR's contractual guarantees, one or more performance tests shall be carried out by the CONTRACTOR under the technical direction of the Process Licensor, the CONTRACTOR and the E-I-C and/or their designated representatives after commissioning the UNIT in accordance with the stipulated and/or agreed procedures and conditions.

34.7.2 The Performance Tests shall be carried out in accordance with a detailed technical programme to be drawn up by E-I-C and the CONTRACTOR in consultation with OWNER prior to the commencement of the performance tests.

34.7.3 Within five days after completion of a performance test, all relevant operating and production figures having any bearing on CONTRACTOR's guarantees or in connection therewith and actually achieved during the performance test conducted shall be recorded in a protocol to be signed by authorised representatives of OWNER and the CONTRACTOR.

34.8 SPARE PARTS

34.8.1 COMMISSIONING SPARES

The CONTRACTOR shall procure and supply all spare parts required during commissioning of the UNIT and various systems. The price of supply shall be deemed to be inclusive of the provision of all such commissioning spares required till successful commissioning of the UNIT. The CONTRACTOR should make available all the commissioning spares required at site at least **4 (four) weeks** prior to commissioning.

CONTRACTOR shall carry out SAP codification of surplus materials/mandatory spares, in consultation with PMC/ Owner. CONTRACTOR shall also submit Spare Parts Interchangeability List (SPIR) as per OWNER's format, attached as **Annexure-XXVI** to this SCC. The provisions shall also be applicable for spares referred to under Clause **34.8.3** & **34.8.4** hereof.

34.8.2 MANDATORY SPARES

The CONTRACTOR shall within the Lumpsum Price supply all the mandatory spares as specified elsewhere in Bidding Document required for the UNIT. The handing over of the spares will be followed through ERP/Computerised system and the templates against individual category of items shall be duly filled in by the CONTRACTOR including price for each item before handing over the mandatory spares to OWNER. Methodology/Modalities to be followed for handing over of spares as per ERP/Computerised system shall be provided by EIL/OWNER during Kick off Meeting.

34.8.3 OPERATION AND MAINTENANCE (O&M) SPARES

a) In case any Operation and Maintenance spares are required during DLP the same shall be provided by the Contractor free of cost to the Owner without any implication/tax liability to the Owner.

b) The CONTRACTOR shall, within **3 (three) months** from finalisation of all suppliers by CONTRACTOR, furnish to the OWNER the price list for O&M spares for **2 (two) years** operation beyond the DLP as recommended by manufacturers of various equipment (other than

commissioning, mandatory and O&M spares required during the defect liability period).The prices shall remain valid upto a period of 2 (two) years operation beyond DLP. Price lists of these spares shall not be included in quoted Lumpsum Price.

34.8.4 The Contractor shall provide the Owner with all the addresses and particulars of its Sub-contractors and/or the manufacturers and sub-vendors while placing the order for items, components, equipment covered under this Contract and will further ensure with its Sub-contractors and/or the manufacturers or vendors that the Owner, if so desires, will have the right to place an order for O&M Spares directly with them on mutually agreed terms based on offers of such Sub-contractors/manufacturers or vendors.

34.8.5 The Contractor shall ensure continuous availability of the Spares.

34.8.6 The QAP and the inspection procedure applicable to the main equipment will also apply to the corresponding Spares.

34.8.7 All Spares shall be delivered by the target date for completion of delivery of the Spares so as to conform with the Delivery Schedule.

34.8.8 If at any time, the Contractor learns that any Spares will be discontinued, or that a Manufacturer will no longer be able to provide certain mandatory Spares ("**Discontinued Spare**"), the Contractor shall promptly provide the Owner with reasonable advance notice that such Spares will be a Discontinued Spare and shall source an alternative as promptly as possible. The Contractor reserves the right to substitute a suitable alternative, in Contractor's reasonable discretion, provided, however, that the Contractor shall have:

I. delivered an advance notice to the Owner of the Discontinued Spare, as far as in the reasonable knowledge of the Contractor;

II. used commercially reasonable efforts to source an alternative; and

III. first obtained the Owner's approval of the proposed substitution

34.8.8.1 If the Owner, at any time during the term of this Contract, notifies to the Contractor that the Spares provided by the Contractor are defective or not fit for purpose, the Contractor shall replace such defective Spares at no additional cost or risk to the Owner. The Owner and Contractor shall mutually agree on timelines for replacement of defective Spares.

34.8.9 In case of emergency requirement of Spares, the Contractor shall make every effort to expedite the manufacture and delivery of such Spares on the basis of a mutually agreed time schedule.

34.8.10 If the Contractor fails to supply the Spares in accordance with this Contract, the Owner shall be entitled to purchase the same from the alternate sources at the risk and the cost of the Contractor and recover from the Contractor, the excess amount paid by the Owner plus **10% (ten percent)** towards Owner's Overhead charges ,over the rates set out in this Contract. Any such purchase of Spares from alternate sources shall be without prejudice to the Contractor's Warranty obligations under this Contract.

35.0 MEASUREMENTS, CERTIFYING INSPECTIONS AND PAYMENTS

35.1 CERTIFYINGINSPECTIONS

All provisions hereinafter referred to in Clauses **35.2** in respect of measurement shall mutatis mutandis apply to all inspections required to be made in order to qualify the CONTRACTOR for any payment(s) under the Contract and any reference in the said clauses to measurements shall, for the purpose of this clause, be deemed to be a reference to certifying inspections and any reference therein to the measurement book shall, for the purpose of this clause, be deemed to be a reference to the certifying inspection book.

35.2 MEASUREMENT

Clause **76 i)** of **GCC** stands replaced with following:

35.2.1 All measurements shall be in the metric system, and except where expressly indicated to the contrary in the Contract, all measurements shall be taken in accordance with the procedure set forth in the Contract documents notwithstanding any provision(s) in the relative standard method of measurement or any other general or local custom to the contrary.

35.2.2 All measurements shall be taken jointly by the E-I-C or his representative on the one hand and the CONTRACTOR or his representative on the other hand, and the CONTRACTOR shall be bound to present himself or his authorised representative for measurement(s) whenever so

required by the E-I-C or his designated representative, and shall remain present throughout the time required for joint measurements.

35.2.3 If the CONTRACTOR absents himself for any reason whatsoever on any date appointed for joint measurements, the joint measurements shall be taken by the E-I-C or his representative in the absence of the CONTRACTOR and such measurements signed by the E-I-C or his representative shall be final and binding upon the CONTRACTOR. Such a measurement shall not be questioned by the Contractor and no dispute can be raised by the Contractor for purpose of Arbitration.

35.2.4 Measurements shall be signed and dated on each page by the CONTRACTOR/CONTRACTOR's representative and E-I-C or his representative. If the CONTRACTOR objects to any of the measurements recorded, including the mode of measurement, such objection shall be noted in the Measurement Book/Sheet against the item objected to and such note shall be signed by the CONTRACTOR/CONTRACTOR's representative and E-I-C or his representative. In the absence of any noted objections as aforesaid, the CONTRACTOR shall be deemed to have accepted the relative measurements as entered in the Measurement Book/ Sheets and shall be barred from subsequently making or recording any objection in respect of the measurements recorded in the Measurement Book/Sheets.

35.2.5 All measurement(s) relative to which any objection have been noted in the Measurement Book/Sheet shall be submitted to the E-I-C for his decision, and the decision of the E-I-C relative thereto (whether on the correct measurement to be adopted or on the mode of measurement to be adopted) shall be final and binding upon the CONTRACTOR.

35.3 FINAL BILL

35.3.1 On the basis of the Lumpsum Price provided in the Contract, the CONTRACTOR shall prepare a Final Bill in the prescribed form with reference to the total supplies covered by the scope of supplies and shall prepare a separate Final Bill with reference to the total services covered by the scope of services. Such Bill shall be prepared by applying the price of materials specified in the Schedule of Prices in respect of supplies broken up with respect to the indigenous materials and with respect to imported materials (including plant, parts and components) in accordance with the further break-up of the Price of Materials given in various formats thereunder, and by applying the price of services specified in respective forms of Schedule of prices in respect of works/services broken up with respect to the various heads of services/works in accordance with the break- up of respective forms of Price Schedule. Additions claimed to the Lumpsum Price or reductions therefrom resultant upon any Change Order(s) shall be separately indicated in the Final Bill with reference to the relative Change Orders(s).

35.3.2 The Final Bill shall, in addition to the payment entitlements arrived at according to the provisions of Clause **35.3.1** hereof separately state and include therein all claims of the CONTRACTOR as provided for in Clause**36.3**hereof.

35.3.3 The Final Bill drawn in accordance with Clause **35.3.1** shall be submitted together with the Completion Certificate to the E-I-C for certification, who shall certify the Final Bill, if drawn in accordance with Clause **35.3.1**. After certification of the E-I-C, the Final Bill shall be submitted in quadruplicate (or in such other number of copies as the OWNER may prescribe) accompanied by the Completion Certificate to the OWNER for payment.

35.3.4 All monies payable under the Contract for works to be performed and materials to be supplied upto and including successful completion and final tests and commissioning of the system and performance tests shall become due and payable to the CONTRACTOR as per terms of payment (**Annexure-X** to SCC). The Final Bill shall be prepared in accordance with the provisions of Clause **35.3.1** hereof and associated provisions thereunder accompanied by the Completion Certificate in respect of the works.

35.3.5 Payments of the amount(s) due on the Final Bill to the extent certified by the E-I-C, shall be made within **12(Twelve) weeks** from the due date as specified in Clause **35.3.4** hereof, subject to the deductions provided in Clause **35.3.5.1**. The disbursement of payment shall be subject to submission all requisite documents complete in all respect.

35.3.5.1 All payments due to the CONTRACTOR on the Final Bill shall be subject to deduction of "on-account" payments and other amounts due from CONTRACTOR to the OWNER, tax deductions as provided for in Clause **35.6.2** and associated clauses thereunder, and any other deduction provided for herein or agreed to between the parties or required to be made under any law, rule or

regulation having the force of law for the time being applicable, or elsewhere provided for in the Contract documents.

35.4 PRICE SCHEDULE/SCHEDULE OF PRICES(SOP)

Provision of Clause No. **75** of GCC stands replaced:

35.4.1 The remuneration determined due to the CONTRACTOR as provided for in Clause **35.3.1** hereof shall constitute the entirety of the remuneration and entitlement of the CONTRACTOR in respect of the work under the Contract, and no further or other payment whatsoever shall be or become due or payable to the CONTRACTOR under the Contract.

35.4.2 Without prejudice to the generality of the provisions of Clause **35.4.1** hereof, the Price Schedule and Lumpsum Price shall be deemed to include and cover (unless otherwise expressly specified to the contrary in any contract document(s):

35.4.2.1 All costs, expenses, outgoings and liabilities of every nature and description whatsoever and all risks whatsoever (foreseen or unforeseen, including force majeure) to be taken or which may occur in or relative to execution, completion, testing, commissioning and/or handing over the works to the OWNER and/or in or relative to acquisition, loading, unloading, transportation, storing, working upon, using, converting fabricating, or erecting any item, equipment, system, material or component in or relative to the works, and the CONTRACTOR shall be deemed to have known the nature, scope, magnitude and the extent of the works and items, materials, equipment, and components required for the proper and complete execution of the works though the Contract documents may not fully and precisely set out, describe or specify them, and the generality hereof shall not be deemed to be in any way limited, restricted or abridged because in certain cases the Contract documents or any of them shall or may and/ or in other cases they shall or may not expressly state that the CONTRACTOR shall do or perform any particular labour or service or because in certain cases the Contract documents state that a particular work, operation, supply, labour or service shall be performed/made by the CONTRACTOR at his own cost or without additional payment, compensation or charge or without entitlement of claim against the OWNER or words to similar effect, and in other cases they do not, or because in certain cases it is stated that the same are included in or covered by the Price Schedule and in other cases it is not so stated.

35.4.2.2 The cost of all construction and related vessels, craft, vehicles, movements, plant, equipment, supply of water and power, construction of temporary roads and access, temporary works, pumps, wiring, pipes, scaffolding, piling, shuttering and other materials, supervision, labour, insurance, fuel, stores, spares, supplies, appliances and materials, items, articles and things whatsoever(foreseen of unforeseen)by expression or implication to be supplied, provided or arranged in or relative to or in connection with the performance and /or execution of the works and/or related or incidental thereto, complete in every respect in accordance with the Contract document, and the plans, drawing, designs, orders and/or instructions;

35.4.2.3 The cost of mobilisation including but not limited to mobilisation of vehicles, movements, machinery, equipment, gear, tools, tackle, consumables and other items and goods and personnel necessary for or to perform the works contemplated under the Contract, preparation and erection of work yards and other workplaces and facilities necessary for or to perform the works contemplated under the Contract and/or to supply the material included within the scope of supplies including all work, labour, inputs, goods, equipment, and other items and things whatsoever necessary for the performance of the works, dismantling and/or removal of the same and restoration of the site, lifting the materials and transporting them to CONTRACTOR's stock piles/work yard, job sites and loading, stacking and/or storing the same.

35.4.2.4 The costs and risks of all rents, royalties, licenses, permits, permission and other fees, duties, penalties, levies, and damages whatsoever payable for or in respect of any protected or patented goods, materials, equipment or processes employed in or relative to the works and of all rents, royalties, licenses, permits, permissions and any other fee, duty, penalty, levy, loss or damages payable on the excavation, removal or transportation of any material or acquisition or use of any right of way or other right, licenses, permit, privilege, permission or uses required for or relative to the performance of the work.

35.4.2.5 The cost of all taxes payable in India with regard to materials supplied by the CONTRACTOR within the scope of supplies, all customs and import duties (as applicable as per contract), GST, Indian Income Tax, Sales Tax and other direct and indirect taxes and duties, quay, wharfage, demurrage, detention and landing charges and all other duties, taxes, fees, charges, levies,

and/or cesses whatsoever imposed or to be imposed by the Central Government or State Government or Municipal or Local Bodies or other Government Authorities whatsoever and payable on any materials supplied and/or on works performed without any entitlement to the CONTRACTOR for any exemption, remission, refund or reduction thereof.

35.4.2.6 The cost of all indemnities under the Contract, and insurance premia on insurance required in terms of the Contract documents or otherwise under any law, rule or regulation, and the cost of all risks whatsoever(foreseen and unforeseen) including but not limited to risks of delay or extension of time or reduction or increase in the work or scope of work and/or cancellation of Contract, and/or accident, strike, civil commotion, war, strike, labour trouble, third party breach, fire, lighting, inclement weather, storm, tempest, flood, earthquake and other acts of God, Government regulation or imposition or restriction, dislocation of road, rail, sea, air and other transport, access or facility, flooding of site and/or access roads and approaches thereto, suspension of work, sabotage and other cause whatsoever.

35.4.2.7 The cost of all inspections, tests and certificates relative thereto including third party tests and/or inspections where necessary, and of items, instruments, plant and/or tools and appliances required to conduct such inspection and tests.

35.4.2.8 The cost of all materials supplied and/or intended for incorporation in the works supplied within the scope of work, delivery thereof to the job site, loading, transportation and unloading thereof, waste on materials, and return of empties and surpluses.

35.4.2.9 The cost of all escalations(foreseen and unforeseen)including but not limited to increase in Government taxes and duties, labour costs and material costs and other inputs whatsoever, except for new, altered or increased taxes elsewhere specifically provided for in these SCC or other Contract document(s).

35.4.2.10 All supervision charges, establishment's overheads, finance charges and other costs and expenses and charges to the CONTRACTOR, and the CONTRACTOR's profit of and relative to the work and/or supply.

35.4.2.11 The cost of all deductions, reductions, discounts, adjustments and withholdings whatsoever under or in connection with the Contract.

35.4.3 The rates/Lumpsum Price(s) stated in the Price Schedule shall not be subject to escalation or increase for any reason whatsoever, except for provisions of Clause **35.4.3.1** hereof.

35.4.3.1 The price variation (escalation/de-escalation) for steel shall be applicable as per **Annexure-XVII to SCC**.

35.4.4 Notwithstanding any provision to the contrary in these conditions, the E-I-C may at his absolute discretion agree to accept as complete any incomplete works or items of work performed or supply made by the CONTRACTOR at variance with the specifications, subject and upon the terms and conditions of this clause. Upon such acceptance in writing by the E-I-C, such works/materials shall be deemed to have been accepted as complete (but without prejudice to any right(s) of the OWNER or obligation(s) of the CONTRACTOR relative thereto under the Contract) subject to the terms and conditions of this clause. The conditions of such acceptance shall be that the CONTRACTOR shall be entitled to reduced remuneration therefor only as determined by the E-I-C in accordance with the provisions of Clauses **7.2** hereof, and the provisions of the said clause shall in all respects mutatis mutandis apply to such work and/or supply, as the case may be, and for the determination of the reduced remuneration to the CONTRACTOR in respect thereof, provided always that the remuneration therefor shall on no account exceed the Lumpsum price or remuneration therefor payable under the Price Schedule in respect of the relative completed works or supply.

35.5 ON ACCOUNT PAYMENT

Provision of Clause No. **80** of GCC stands stands modified to the following extent:

35.5.1 Without prejudice to the provisions of Clause **35.3.4** hereof, the OWNER shall by way of assistance to the CONTRACTOR, make "on-account" payments to the CONTRACTOR during the progress of the work and/or supply on the basis of Running Account Bills (R.A. Bills) or otherwise as elsewhere more specially provided for in the Contract documents. Payment shall be released only after receipt of CPBG of requisite amount as per Clause No. **4.0** hereof.

35.5.2 Deleted.

35.5.3 The approved Bill of Materials shall form the basis for the calculation of "on-account" payments with respect to supplies of materials. It is understood, however, that the Bill of Materials or approval thereof by the OWNER shall not in anyway relieve the CONTRACTOR of its full responsibility to supply to the OWNER within the scope of supply, any and all materials whatsoever required for the performance of the work within the scope of work, or otherwise howsoever confine the responsibility of the CONTRACTOR within the scope of supply to the supply of materials indicated in the Bill of Materials, nor shall it otherwise be assumed or be deemed or construed as an acceptance by the OWNER of the adequacy or sufficiency of the materials listed in the Bill of Materials to meet the quantitative and/or qualitative requirements of the materials required to be supplied by the CONTRACTOR under the scope of supply or otherwise in any manner operate to bind the OWNER or to limit the liability of the CONTRACTOR, such Bill(s) of Materials being designed only to provide a basis for making "on account" payments to the CONTRACTOR for materials supplied, with a view that the OWNER shall make "on account" payments to the CONTRACTOR for the various materials supplied on the basis thereof in the manner and at the time in this behalf provided for in the contract.

35.5.4 The approved Schedule of Activities shall form the basis for the calculation of on account payments with respect to services/works performed by the CONTRACTOR. It is however understood that the Schedule of Activities or approval thereof by the EIL/OWNER shall not in any way relieve the CONTRACTOR of his full responsibility to perform within the scope of services/works whatsoever is required for the performance of the work covered by the scope of work or otherwise however confine the responsibility of the CONTRACTOR to the performance of the services indicated in the Schedule of Activities, nor shall otherwise be assumed or be deemed or construed as an acceptance by the OWNER of the adequacy or sufficiency of the work/activities listed in the Schedule of Activities to meet the quantitative and/or qualitative requirements of services required to be performed or work required to be done by the CONTRACTOR under the scope of services or otherwise in any manner operate to bind the OWNER or to limit the liability of the CONTRACTOR, such Schedule of Activities being designed primarily to provide a basis for making On Account payments to the CONTRACTOR for works/services performed, with a view that the OWNER shall make "On Account" payments to the CONTRACTOR for the work/services performed on basis thereof in the manner and at the time in this behalf provided for in this Contract.

35.5.5 For the purposes of making "on account" payments for the work performed, monthly or otherwise as the E-I-C may specify in this behalf, the CONTRACTOR shall make a quantitative assessment of the work performed by the CONTRACTOR as listed in the Schedule of Activities during the preceding month or other specified period and shall submit a R.A. Bill (in the form prescribed by the OWNER) in quadruplicate to the E-I-C for the works performed during the said month/period with detailed measurement thereof, the said R.A. Bill(s)to be drawn by applying the rates applicable under the Schedule of Activities to the applicable items, which shall be subject to certification by the E-I-C specified for the purpose. The E-I-C shall thereafter have a summary verification undertaken of the work and quantities entered in the R.A. Bills and shall certify the R.A. Bills for payments on basis of such verification.

35.5.5.1 For the purpose of making "On Account" payment for materials supplied within the scope of supply as the E-I-C may specify in this behalf, the CONTRACTOR shall make a quantitative list of material supplied by the CONTRACTOR within the scope of supplies at the job site and of the "On Account" payment made in respect thereof prior thereto, and of the "On Account" payment(s) becoming due in respect thereof during the preceding month or other specified period as the case may be supported by the Certificate of Verification and Good Condition given by the E-I-C in order to qualify for the relative on account payment claimed as due. The CONTRACTOR shall submit such assessment in the form of a R.A. Bill prepared in the format prescribed or approved by the OWNER in this behalf in quadruplicate to the Engineer-in-Charge. The R.A. Bill(s) shall be drawn by applying applicable parts of the price(s) for relative materials as indicated in the Bill(s) of materials for the applicable item(s) and shall be subject to certification by the E-I-C. The E-I-C shall thereafter have a summary verification undertaken of the materials and quantities entered in the R.A. Bill(s) and of the amount claimed and shall certify the R.A. Bill(s) for payment on the basis of such verification.

35.5.6 The amount certified for payment by the E-I-C on any R.A. Bill within the provisions for "on account" payments in the Contract documents shall be conclusive for the determination of any "on account" payments and no claim shall be entertained by the OWNER contrary thereto or in contradiction thereof.

35.5.7 In any certificate for on account payment, the E-I-C shall be authorised to adjust in whole or part, any previous amount certified by error.

35.5.8 All "on account" payments shall be subject to deduction of previous payments on account and of all claims of the OWNER, adjustments and/or deductions provided for in the Contract or agreed to between the parties, tax deductions and any other deductions required to be made under any law, rule or regulation for the time being in force.

35.5.9 All "on account" payments shall be regarded merely as advance payments against the amounts due to the CONTRACTOR in terms of the Contract, and any such payments shall be without prejudice to the full rights of the OWNER under the contract and the liabilities of the CONTRACTOR thereunder, and specially shall not be regarded as an acceptance or completion of any works or the acceptance of any materials paid for in terms of any R.A. Bill or otherwise, notwithstanding any verification or certification by the E-I-C or otherwise in respect thereof.

35.5.10 Except as elsewhere herein to the contrary provided, the Schedule of Activities or Bill of Materials or other criterion applied by the CONTRACTOR in respect of any work or supply in his R.A. Bill(s) or acceptance thereof by the E-I-C in verifying the bill in respect of such work or supply or criterion applied shall not be deemed to be binding upon the OWNER as determining the completeness, acceptance or price payable for relative work or supply.

35.5.11 Unless or until an extension of time has been granted by the E-I-C under Clause **23.6.6** hereof or by the OWNER under Clause **23.6.7** hereof on account payments made under R.A. Bills raised by the CONTRACTOR for the works executed after the expiry of the date of Mechanical Completion of the works under the approved Progress Schedule, shall be subject to provisional withholding of an amount towards adjustment by way of discount in the price calculated in accordance with the provisions of Clause **23.7** hereof. The amount so withheld shall be adjusted towards the Price Reduction(if any) finally determined after Mechanical Completion of the works, without prejudice to the OWNER's right to recover from the CONTRACTOR any shortfall between the Price Reduction finally determined and the amount provisionally withheld. Any excess amount provisionally withheld in excess of Price Reduction finally determined shall upon such determination be paid to the CONTRACTOR.As an alternative, the CONTRACTOR shall have an option to provide a Bank Guarantee from List of banks as per **Annexure-XX to SCC** and in a format acceptable to the OWNER for a sum equal to **5% (five percent)** of the total contract value which shall be available for recovery of the Price Reduction For Slippage In Completion (if any) finally determined after Mechanical Completion of the works/Unit(s). This Bank guarantee shall be in addition to any other guarantee to be provided by the CONTRACTOR and shall be valid for a period of not less than **12 (twelve) months** from the date of Mechanical Completion of the works.

35.6 MODE OF PAYMENT AND TAX DEDUCTIONS

35.6.1 All payments to be made by the OWNER to the CONTRACTOR under or in terms of the Contract shall be paid by bank transfer to the designated account of the CONTRACTOR notified in this behalf by the CONTRACTOR to the OWNER for which purpose, the CONTRACTOR shall furnish to the OWNER such documents and information as required by the OWNER to effect the bank transfer.

35.6.2 **The clause 80 of GCC stands modified to the following extent for payment towards Design & Engineering and Supply :**

"Payments will be made by the OWNER against Bills certified by the EIL within 30 days from the date of receipt of complete and correct R.A. bill from Contractor certified by E-I-C.

Provisions related to release of **75% (seventy five percent)** of bill amount within **15 calendar days** of certification by E-I-C as per Clause No. **80** of GCC shall be applicable for release of payment towardsConstruction/Installation only."

35.6.2.1 In case the Contractor misrepresents the completion of Work in order to avail this **75% (Seventy Five percent)** down payment facility fully mentioned under Clause No. **35.6.2** hereof and the certified value is less than the released down payment, the facility will be stopped for next **3 (three)** R.A. Bills at the first instance and will be stopped completely for the second instance of misrepresentation.

35.6.2.2 It shall be the sole responsibility of the Contractor to ensure that GST invoices are raised within timelines as specified in GST Act read with relevant rules therein. Further, any delay/ non-compliance in GST Laws by Contractor which results in loss to Owner, the same shall be duly recovered from the Contractor.

35.6.3 Indian CONTRACTOR who have indicated materials or services to be imported into India, and who have indicated the Foreign Currency price for such materials and/or services in the SOP, shall on proof of payment be paid the Indian Rupee equivalent of the Foreign Currency paid for the relevant materials and/or services imported into India limited to the maximum of the Foreign Currency indicated in the Schedule of prices(SOP) in relation to such supplies or services at the SBI TT(Telegraphic Transfer) Sale Rate prevailing on the date of payment by CONTRACTOR. If as a result, there shall remain any unutilized foreign currency indicated in the Schedule of prices(SOP) in relation to such supplies or services, these shall be considered to be the CONTRACTOR's fee for the relative procurement or services, as the case may be, and shall be added to and paid for separately, in the Final Bill, in addition to the price of services, in Indian Rupees equivalent of such unutilized foreign currency balance(s) converted at SBI TT (Telegraphic Transfer) Sale Rate prevailing on the date of Mechanical Completion, whichever is less. However, in such a case, the CFR price indicated in the Contract shall stand reduced by the price attributable to such supplies.

35.6.4 If in the performance of the Contract CONTRACTOR obtains or procures within India any materials or services which at the time of the bid were indicated to be procured or provided from outside India, such CONTRACTOR shall be paid only the Indian Rupee equivalent of the foreign currency cost of such materials or services as indicated in the priced bid relevant to the formation of the Contract, converted at the currency SBI TT(Telegraphic Transfer) Sale Rate prevailing on the date of payment by the CONTRACTOR or prevailing on the day of priced bid opening, whichever is less, for such supplies or services. Any change in such sourcing shall be subject to the OWNER's prior consent. However, in such a case, the CFR price indicated in the Contract shall stand reduced by the price attributable to such supplies.

35.6.4.1 If in the performance of the Contract the CONTRACTOR obtains or procures from outside India any materials or services which at the time of the bid were indicated to be procured or provided from within India, such CONTRACTOR shall be paid only the Indian Rupees indicated in the Bill of Materials or in the Schedule of Activities, as the case may be, for such materials or services. Owner shall not be obliged to make any further payment.

In case the supply materials mentioned in Clause No. **35.6.5.1** above, are imported under MOOWR scheme at time of execution, wherein the Owner becomes consignee of goods by filing Bill of Entry in name of Owner, then the amount payable towards Custom Duties & Related levies as on date of Custom Clearance based on respective CIF value as per Bill of Entry and custom duty rates prevailing on the date of Custom Clearance, shall be deducted from the amount payable against such supplies. Prior consent of EIL/BPCL shall be obtained in this regards.

35.6.4.2 If in the performance of the Contract the CONTRACTOR imports materials under MOOWR scheme, wherein the Owner becomes consignee of goods by filing Bill of Entry in name of Owner , which they have indicated to be imported in name of the Contractor for Home Consumption in their offer then the amount payable towards Custom Duties & Related levies as on date of Custom Clearance based on respective CIF value as per Bill of Entry and custom duty rates prevailing on the date of Custom Clearance ,shall be deducted from the amount payable against such supplies. The Custom Duties & related levies plus owner's overhead shall be converted to the currency of payment considering the SBI TT(Telegraphic Transfer) Sale Rate prevailing on the date of custom duty payment. Prior consent of EIL/BPCL shall be obtained in this regards.

35.6.5 Foreign Contractor shall be required to open a Project office (PO) under general / specific permission of RBI and thereafter open a foreign currency bank account subject to RBI Regulations. Foreign currency account could be in USD or EURO. Payment in foreign exchange can be made by OWNER to such foreign currency bank account. In such case, invoices shall be raised by the Project office of the foreign contractor in USD or EURO.

35.6.6 Payment to Consortium/Joint Venture Members/Partners(In case Consortium Bidding is permissible):

35.6.6.1 The OWNER may accept the distribution of payment between the consortium/ joint venture members/ partners and make payment accordingly, subject to the following :

i) Payment for works under the Contract shall be made by Owner only as per bid document of bidder. This shall be clearly specified in the Bids itself. The options for payments are:

(a) fully to Consortium or,

(b) fully to the Prime member (Leader) of the Consortium or,

(c) to each constituent member, as per their share specified in the Bid.

If payment is made as per (a) or (b) above, and the Owner shall not in any manner be responsible or liable for the inter-se-allocation of payments among members of the Consortium.

ii) However, in case payment to each constituent is requested by the Consortium members corresponding to their part of scope of work, as per (c) above, the same shall be clearly indicated in the unpriced bid and the constituent wise details of the price break up shall be clearly indicated in the priced bid in the respective SP Forms.

iii) Bidder shall clearly specify the above details with respect to payment (i.e. to whom payment is to be made) they desire in the unpriced bid as per any one of the above options.

iv) In case of separate payment to each member of the Consortium, the invoice of the Consortium member shall be endorsed by the Leader of the consortium.

v) In case the details with respect to payment, as aforementioned is not clearly specified in the unpriced bid and / or constituent wise details of the price break up is not specified in the priced bid, all payments against this contract shall be made only to the Leader of the consortium.

vi) Deleted

vii) The consortium should obtain and submit its GST & IT-PAN registration.

viii) In case payment is sought directly to the members of the consortium, then the members of the consortium should also obtain and submit their GST & IT-PAN registration.

ix) In any situation, the Consortium and all members shall be responsible and liable for all Direct and Indirect Tax compliances and consequences.

x) The constitution of the Consortium or the relative distribution of the Work(s) and/or activities amongst the consortium members as approved by PMC /OWNER shall not be altered or assigned, as the case may be except with the prior written consent of PMC/OWNER and any contrary alteration or re-assignment shall be deemed to be an unauthorized assignment of the Contract with attendant liabilities including termination of the Contract. Provided that the assignment or alteration of the Lead Member of the Consortium is not permitted under this Contract.

xi) If the Consortium/ Joint venture contains a foreign member or partner, deduction of tax at source on all payments shall be as per the rate certified by the Indian Income Tax authorities in respect of each member/ partner for such payments.

xii) Payments shall be made by the OWNER to the separate members/ partners against their separate certified Invoices transmitted through the consortium leader and any such payment shall constitute payment to the consortium/ joint venture and shall give a valid discharge to the OWNER in the same manner as if made directly to the Consortium Leader.

xiii) It shall be up to the consortium members/ partners claiming the separate payments to obtain such sanctions, consents and/ or permits required from the Reserve Bank of India or other authorities concerned to authorize separate payments to and/or separate accounts of each consortium member, failing of which all payments will be made only to the Consortium leader disregarding of any agreed distribution.

35.6.7 The Owner shall have the right to dispute such amounts in the invoice raised by the CONTRACTOR ("**Disputed Amount**") within **7 (seven) Business Days** of receipt of such invoice, which it believes have been wrongly invoiced by the Contractor. If the Owner decides to dispute any amounts set out in the Invoice, it shall only make payments towards such amounts which it approves to be correctly invoiced and shall state in writing the reasons for paying such lesser sum. Any dispute regarding Disputed Amounts must be raised by the Contractor within **15 (fifteen) days** of receipt of payment. Dispute in respect of the Disputed Amount shall be resolved in accordance with the provision of Clause **99.0** hereof. During the pendency of any such dispute and the resolution thereof, the Contractor shall continue to provide Supplies and / or perform the Works in accordance with the provisions set forth herein.

35.6.8 No payment and no partial or entire use or occupancy of the Project by the Owner shall:

a) be deemed a representation that the Owner has inspected the Materials and / or the Works;

b) constitute or be deemed an acceptance, in whole or in part, of any portion of the Supplies and Works or the Project; or

c) operate to release the Contractor from any obligations or liabilities under this Contract.

35.7 CHANGE IN LAW

35.7.1 If as a result of Change in Law, the Contractor suffers any additional costs in the execution of the Works or in relation to the performance of their other obligations under this Contract, the Contractor shall, within **15 (fifteen) days** from the date it becomes reasonably aware of such addition in costs, notify the OWNER with a copy to the E-I-C of such additional costs due to Change in Law.

35.7.2 If as a result of Change in Law, the Contractor benefits from any reduction in costs for the execution of this Contract or in accordance with the provisions of this Contract, either Party shall, within **15 (fifteen) days** from the date it becomes reasonably aware of such reduction in costs, notify the other Party with a copy to the E-I-C of such reduction in costs due to Change in Law.

35.7.3 E-I-C/OWNER shall, within **15 (fifteen) days** from the date of receipt of notice from the Contractor or the Authority, as the case may be, determine any addition or reduction to the Contract Price, as the case may be, due to the Change in Law.

35.7.4 Provisions of this Clause **35.7** shall be admissible provided that the Change in Law were notified after the final bid due date. Further, wherein any provision of bidding document which stipulates that any cost impact on account of changes in law to be borne by CONTRACTOR, then such provisions are specifically excluded from the ambit of this Clause **35.7**.

36.0 CLAIMS BY THE CONTRACTOR

36.1 Should the CONTRACTOR consider that he is entitled to any extra payment or compensation in respect of the direct costs of the Works or Supplies at actual over and above the amounts due in terms of the Contract as specified in Clause **35.4.1** hereof, the CONTRACTOR shall give notice in writing of its claim in this behalf to the E-I-C and the OWNER within **14 (Fourteen) days** from the date of the issue of orders or instructions relative to any work(s) for which the CONTRACTOR claims such additional payment or compensation, or from the date of the happening of any other event upon which the CONTRACTOR bases such claim, as the case may be. Such notice shall give full particulars of the nature of such claim, grounds on which it is based, and the amount claimed. The OWNER shall not anywise be liable in respect of any claim by the CONTRACTOR unless notice of such claim shall have been given by the CONTRACTOR to the E-I-C and the OWNER in the manner and within the time aforesaid, and the CONTRACTOR hereby waives and relinquishes any and all claims and all his rights in respect of any claim which is not notified by the CONTRACTOR to the E-I-C and the OWNER in writing in the manner and within the time aforesaid.

36.2 The E-I-C and/or the OWNER shall be under no obligation to reply to any notice of claim given or claim made by the CONTRACTOR within the provisions aforesaid or otherwise, or to otherwise reject the same, and no omission or failure on the part of the E-I-C or the OWNER to reject any claim made or notified by the CONTRACTOR nor any consideration thereof or dealing there with shall be deemed to be an admission by the OWNER of the validity of such claim or waiver by the OWNER of the provisions of Clause **36.1** hereof

36.3 Any or all claims of the CONTRACTOR notified in accordance with the provision of Clause **36.1** hereof as shall remain/persist at the time of preparation of the Final Bill by the CONTRACTOR shall be separately included in the Final Bill prepared by the CONTRACTOR in the form of a Statement of Claims attached thereto, giving particulars of the nature of such claim, grounds on which it is based, and the amount claimed, and shall be supported by copy(ies) of the notice(s) sent in respect thereof to the E-I-C and the OWNER under Clause **36.1** hereof. In so far as such claim shall in any material particular be at variance with the claim notified by the CONTRACTOR within the provisions of Clause **36.1** hereof, it shall be deemed to be a claim different from the notified claim with consequence in respect thereof indicated in Clause **36.1** hereof, and with consequence in respect of the notified claim as indicated in Clause **36.4** hereof.

36.4 Any and all notified claims not specially reflected and included in the Final Bill in accordance with the provisions of Clause **36.3** hereof shall be deemed to have been waived and relinquished by the CONTRACTOR, and the CONTRACTOR hereby waives and relinquishes all rights to raise or include in the Final Bill any claim(s)other than a notified claim conforming in all respects to and in accordance with the provisions of Clause **36.3** hereof.

36.5 No claim(s) shall on any account be made by the CONTRACTOR after the Final Bill, with the intent that the Final Bill prepared by the CONTRACTOR shall reflect any and all claims whatsoever of the CONTRACTOR against the OWNER arising out of or in connection with the Contractor any supply made or work performed by the CONTRACTOR thereunder or in relation thereto, and notwithstanding any enabling provision in any law or Contract and notwithstanding any claim in quantum meruit that the CONTRACTOR could have with respect thereto, the CONTRACTOR hereby waives and relinquishes any and all such claims not included in the Final Bill and absolves and discharges the OWNER from and against the same, even if in not including the same as aforesaid, the CONTRACTOR shall have acted under a mistake of law or off act, or shall claim to have acted under economic compulsion or necessity.

36.6 Notwithstanding the existence of any claim by the CONTRACTOR in terms hereof or otherwise, the CONTRACTOR shall continue and be bound to continue and perform the works and supplies to completion in all respects according to the Contract (unless the contract be priorly determined by the OWNER).

36.7 The payment of any sum on account to the CONTRACTOR during the performance of any work or the making of any supply in respect of which a claim has been notified by the CONTRACTOR in terms of Clause **36.1** hereof or the making or negotiation of any interim arrangement(s) by the OWNER in respect of the performance of such work or item of work or the making of any supply or item of supply by the CONTRACTOR shall not be deemed to be an acceptance of the related claim by the OWNER, or any part or portion thereof unless specifically signed by the authorised representative of the OWNER and the CONTRACTOR as an Amendment to Contract, or as an Agreed Variation, with the intent that any such payment or arrangement shall (unless signed as an amendment or variation aforesaid) constitute merely a facility or assistance to the CONTRACTOR, and not an obligation upon the OWNER.

36.8 If required by the OWNER, the E-I-C shall be authorised to require the CONTRACTOR to furnish, and the CONTRACTOR shall, upon the request of the E-I-C /OWNER, furnish all invoices, vouchers and accounting records as may be deemed necessary by the E-I-C /OWNER for the purpose of verifying any CONTRACTOR's claim.

37.0 DISCHARGE OF OWNER'S LIABILITY

37.1 The acceptance by the CONTRACTOR of any amount paid by the OWNER to CONTRACTOR in respect of the Final Bill of the CONTRACTOR in settlement of all said dues to the CONTRACTOR under the Final Bill shall, without prejudice to the claims of the CONTRACTOR included in the Final Bill in accordance with the provisions of clause **36.3** hereof, be deemed to be in full and final satisfaction of all such dues to the CONTRACTOR notwithstanding any qualifying remarks, protestor condition imposed or purported to be imposed by the CONTRACTOR relative to the acceptance of such payment, with the intent that upon acceptance by the CONTRACTOR of any payment made as aforesaid, the contract (including the arbitration clause) shall stand discharged and extinguished insofar as relates to and/or concerns the entitlements of the CONTRACTOR under the Contract except for the CONTRACTOR's right, if any, to receive payment in respect of his notified claims included in his Final Bill and the right to receive payment of the unadjusted balance of the CPBG in accordance with the provisions of Clause **38.3** hereof on successful completion of the DLP. But nothing herein stated shall affect the CONTRACTOR's undischarged liabilities and obligations under the Contract.

37.2 The acceptance by the CONTRACTOR of any amount paid by the OWNER to the CONTRACTOR in respect of the notified claims of the CONTRACTOR included in the Final Bill, in settlement of the claims of the CONTRACTOR, shall be deemed to be in full and final settlement of all claims of the CONTRACTOR notwithstanding any qualifying remarks, protest or condition imposed or purported to be imposed by the CONTRACTOR relative to the acceptance of such payment made as aforesaid with the intent that upon acceptance by the CONTRACTOR of any payment made as aforesaid, the Contract shall stand discharged and extinguished insofar as relates to and/or concerns the claims of the CONTRACTOR except for the CONTRACTOR's rights to receive payments of the unadjusted balance, if any, of the CPBG in accordance with clause **38.3** hereof on successful completion of the defect liability. But nothing herein stated shall affect the CONTRACTOR's undischarged liabilities and obligations under the Contract.

37.3 Notwithstanding anything provided in Clause **37.1** and/or Clause **37.2** hereof, the CONTRACTOR shall be and remain liable for defects in terms of Clause **33.0** and associated clause thereunder and for any indemnity to the OWNER in terms of Clause **38.2** and shall be and

remain entitled to receive the unadjusted balance of the CPBG remaining in the hands of the OWNER in terms of Clause **38.3** hereof and associated clauses thereunder.

38.0 FINAL CERTIFICATE AND RELEASES OF SECURITY DEPOSIT

Provision of Clause No. **84 of GCC** stands modified to the following extent:

38.1 Forthwith on the CONTRACTOR's application made after the expiry of the period of defect liability provided for in Clause **33.0** hereof and associated clauses thereunder and satisfaction of all liabilities of the CONTRACTOR in respect thereof, the OWNER shall issue a Final Certificate to the CONTRACTOR certifying that the CONTRACTOR has performed his obligations in respect of the DLP in terms of Clause **33.0** hereof and associated clauses thereunder, and until issue of such Final Certificate, the CONTRACTOR shall be deemed not to have performed such liabilities notwithstanding issue of the Completion Certificate or payment of the Final Bill by the OWNER.

38.2 Upon application for the Final Certificate, the CONTRACTOR shall:

(i) Be deemed to have warranted that it had been fully paid and satisfied all claims for or arising out of the work, labour, materials, supplies and equipment used in or connected with the Contract and all other liabilities whatsoever touching or affecting the Contract, or its performance, including in relation to sub-contractors and suppliers, and

(ii) To have undertaken to indemnify and keep indemnified the OWNER/Consultant from and against all claims, demands, debts, liens, obligations and liabilities whatsoever arising therefrom or relating thereto.

38.2.1 Upon issue of the Final Certificate, the CONTRACTOR shall be deemed to have released, acquitted and discharged the OWNER from and against all claims (known or unknown), liens, demands or causes of action of any kind whatsoever arising out of or relating to the Contract or otherwise howsoever touching or affecting the same.

38.3 Forthwith on application made by the CONTRACTOR in this behalf accompanied by the Final Certificate, or within **12 (Twelve) Weeks** of the OWNER passing the CONTRACTOR's Final Bill, whichever shall be later, the OWNER shall cancel and return to the CONTRACTOR all previous Bank Guarantees remaining unutilised in the hands of the OWNER, and upon such cancellation and return, the OWNER shall stand discharged of all obligations/liabilities under the Contract provided that the cancellation and return of any Bank Guarantee(s) furnished by the CONTRACTOR as and by way of CPBG shall be subject to the CONTRACTOR replacing such Bank Guarantee(s) with a Bank Guarantee from List of Bank as per **Annexure-XX** to SCC in a format acceptable to the OWNER covering **10% (ten percent)** of the value (as determined by the OWNER) of equipments/works replaced or repaired during the DLP for the unexpired term of defect liability in respect thereof plus a **6 (six) months** claim period.

38.4 Notwithstanding the aforesaid, the **Parties** agree that the OWNER shall not be obliged to release the CPBG until all defects identified during the Defects Liability Period or the extended Defects Liability Period, as the case may be, have been rectified.

39.0 CLAIMS OF OWNER

In addition to clause **91 (ii)** of GCC following clauses are applicable:-

39.1 No release/payment of any unadjusted balance of the CPBG(furnished in the form of a Bank Guarantee or otherwise) by the OWNER to the CONTRACTOR as aforesaid or otherwise shall be deemed or treated as a waiver of any right(s) or claim(s) of the OWNER or shall stop or prevent the OWNER from there after making or enforcing any claim or any rights against the CONTRACTOR with the intent that the claims of the OWNER, against the CONTRACTOR shall continue to survive and shall not get extinguished notwithstanding the issue of Final Certificate and/or the release of CPBG to the CONTRACTOR.

40.0 TERMINATION

Provision of Clause No. **24** and **41** of GCC stands modified to the following extent:

40.1 Notwithstanding anything elsewhere herein provided and in addition to any other right or remedy of the OWNER under the CONTRACT or otherwise (including the right of the OWNER to discount by way of Price Reduction under the provisions of Clause **23.7** hereof and associated Clauses thereunder), the OWNER shall be entitled to terminate the CONTRACT by written notice at any time during its currency on or after occurrence of any one of the following events/contingencies, namely:

40.1.1 Breach or failure by the CONTRACTOR of any of the obligations of the CONTRACTOR under the Contract, including:

a) Failure to start the work within **12 (Twelve) weeks** of the date of issue of the Acceptance of Bid by the OWNER, notwithstanding the OWNER having made available to the CONTRACTOR the work front necessary for the commencement of work.

b) Failure to commence work at site within **3 (Three) Weeks** of the time prescribed in this behalf in the Progress Schedule or to commence supply of any material within **3 (Three) Weeks** of the time prescribed in this behalf in the Delivery Schedule.

c) Failure to carry out or carry on the works or any of them to meet the Progress Schedule resulting in a delay of **4 (Four) Weeks** or more in the actual performance of the work, or failure to complete any supplies to meet the Delivery Schedule resulting in a delay of **4 (Four) Weeks** or more in the scheduled deliveries of materials.

d) Failure to provide at the job site, within **3 (Three) Weeks** of being required to do so by the E-I-C, sufficient labour, material, equipment, machinery, temporary works and/or facilities required for the proper and/or due execution of the work or any part thereof.

e) Failure to execute the works or any of them in accordance with the Contract or disobedience of any order or instruction of the E-I-C or negligence or lack of expertise in the performance of the work, or failure to supply materials of quality conforming to the requirements of the contract.

f) Abandonment of the works or any part thereof.

g) Substantial suspension of the works or any part thereof for a period of **2 (Two) Weeks** or more without the authority of the E-I-C.

h) Failure to execute the Contract in terms of the Form of Contract forming part of the Bid Documents within **30(Thirty) days** of the date of issue of the LOA by the OWNER or within such extended period as may be permitted by the OWNER in this behalf;

i) Failure to furnish the Bank Guarantee(s) as per provisions of GCC.

j) Any other event which is an event of termination under the Contract or which in the opinion of the OWNER, reasonably impinges on the CONTRACTOR's capability to fulfil its contractual commitments.

k) Dissolution of the CONTRACTOR (if a firm), or commencement of liquidation or winding up (whether voluntary or compulsory) of the CONTRACTOR (if a company) or of any member (if the CONTRACTOR is a consortium), or insolvency of the CONTRACTOR or of any partner (if a firm), or appointment of a receiver or manager of the CONTRACTOR's assets or of any partner/member of the CONTRACTOR (if a firm or consortium) by a court;

l) Distress, execution, or other legal process being levied on or upon any of the CONTRACTOR's goods and/or assets involved in or relative to the performance of the work or supply;

m) Death of a CONTRACTOR (if an individual);

n) If upon any voluntary change in the partnership/constitution of CONTRACTOR's organisation (if a partnership or Company) the OWNER refuses in its sole discretion to Continue the Contract with the re-constituted firm or Company;

o) If the CONTRACTOR or any person employed by him shall make or offer for any purpose connected with the contract, any gift, gratuity, royalty, commission, gratification or other inducement (whether money or in any other form) to any employee or agent or CONSULTANT of OWNER;

p) If the CONTRACTOR shall assign or attempt to assign his interest or any part thereof in or under the Contract.

q) If CONTRACTOR does not start to remedy the breach within **7(seven)days** from receipt of EIC/OWNER's notice.

r) If the CONTRACTOR has acted in any manner to the detrimental interest, reputation, dignity, name or prestige of the Owner.

s) If the CONTRACTOR has become untraceable.

t) If the CONTRACTOR has without authority acted in violation of the terms and conditions of this contract and has committed breach of terms of the contract in best judgement of the owner.

u) If the CONTRACTOR shall sub-contract or sub-let the Contract in breach of the provisions of this Contract.

40.1.2 The decision of the OWNER and its authorised representative**,** as to whether any of the events or Contingencies mentioned in Clause **40.1** hereof entitling the OWNER to terminate the Contract has occurred or not shall be final and binding upon the CONTRACTOR.

40.1.3 The methodology for processing Termination for default shall be as follows:

a. Any material breach in contractual obligations shall be dealt on mutual discussion basis, so as to correct breach. In case of failure to correct the breach, OWNER shall initiate Termination action

as per the contract.

b. Deleted

c. Deleted

d. In case of non-submission of CPBG as per provisions of bidding document, coupled with non-mobilization / non-performance within the period stipulated for the same, the Termination action along with other contractual penal provisions shall be initiated, as per the contract provisions.

e. Further, in case of submission of CBPG within scheduled period, but CONTRACTOR being at default in terms of Contract, a) above shall be applicable.

f. In case of occurrence of any of the above specified events, CONTRACTOR shall be understood to have defaulted and the OWNER shall have the right to terminate the contract, at its sole and absolute discretion by issuing a Show Cause notice of **15 (fifteen)calendar** days to the CONTRACTOR, stating the reason and the intention of OWNER to terminate the Contract and to take other penal actions in terms of the contract including OWNER's extant policy for Suspension / Banning.

g. The CONTRACTOR may also request for a personal hearing.

h. OWNER based on the CONTRACTOR's response to the Show Cause Notice and the personal hearing, shall decide the action regarding Termination and/ or Suspension / Banning or otherwise.

i. The decision taken as above shall apply to both Termination as well as Suspension / Banning."

40.2 The notice of termination shall set-forth, in addition to statement of the reason or reasons for terminating the Contract, the time(s) and place(s) for conducting a survey and inspection/measurement of the work performed and materials supplied under the Contract upto the date of termination for the purpose of determining the final amount(s) due to the CONTRACTOR therefor. The reasons for the termination stated in the notice of termination shall be final and binding upon the CONTRACTOR.

40.2.1 Forthwith upon receipt of notice of termination, the CONTRACTOR shall at his own risks and costs within the scope of relative work, do and perform to the satisfaction of the E-I-C all and whatsoever is necessary, in the opinion of the E-I-C (which shall be final and binding upon the CONTRACTOR) to secure and protect all complete and incomplete works performed by the CONTRACTOR upto termination, and should it fail to do so, the OWNER shall be entitled by itself or through an independent Contractor(s) or partly by itself and partly through an independent Contractor(s), to do and perform at the risks and costs of the CONTRACTOR all such work(s) not done by the CONTRACTOR, and the provisions of Clause **40.9** therefore shall mutatis-mutandis apply thereto.

40.3 For the purpose of measurements, the provisions of Clause**35.1** and **35.2** hereof shall apply. The decision of the E-I-C as to whether or not any works have or supply has been completed for the purpose of measurement shall be final and binding upon the CONTRACTOR. Incomplete items or works shall be measured and paid for only on the basis of materials (if any) supplied by the CONTRACTOR, and the decision of the E-I-C as to the quantity of material involved in or relative to any incomplete works shall be final and binding upon the CONTRACTOR.

40.4 Work done and/or supplies made by the CONTRACTOR qualifying for payment under Clause **40.3** hereof shall be paid for in respect of work done on the basis of on account payment due thereon based on Schedule of Activities, and for materials supplied on the basis of on account payment due thereon on the basis of Bill of Materials and the provisions of Clause **35.5.6, 35.5.7, 35.5.8, 35.5.9, 35.5.10, 35.5.11** hereof shall mutatis mutandis apply and accounting done and bill prepared by the CONTRACTOR on the basis thereof shall be the Final Bill and no other amount(s) shall be due to the CONTRACTOR in respect thereof, subject to the provisions of **Clause36.0** and associated clauses thereunder with regard to the notified claim(s) of the CONTRACTOR included in the Final Bill in accordance with the provisions of Clause **36.3**.

40.5 Within **4 (Four) Weeks** of completion of the inspection/measurements, the CONTRACTOR shall clear the job site(s) made available by the OWNER to the CONTRACTOR of all surplus materials, CONTRACTOR's labour, equipment and machinery and shall demolish, dismantle and remove such temporary works, structure and construction and other items and things brought upon or erected at the job site(s) and not incorporated in the permanent works and shall remove all rubbish from the job site(s) and shall clear, dress and restore the job site(s) to the satisfaction of

the E-I-C and shall put the OWNER in undisputed custody and possession thereof and the entire works. Upon termination of this Contract in accordance with the provisions of this Clause **40**, the Contractor shall comply with and conform to the following: (a) deliver to the OWNER all Plant and Materials which shall have become the property of the OWNER under this Contract; (b) deliver all relevant records, reports, intellectual property and other licences pertaining to the Works, other design documents; and (c) transfer and/or deliver all applicable permits to the OWNER to the extent permissible under Applicable Laws.

40.6 Should a CONTRACTOR fail to comply with the provisions of Clause **40.5** hereof in the manner and within the time specified therein, the OWNER shall have the right at the risk and costs of the CONTRACTOR in all respects to clear the job site(s) of all surplus materials, CONTRACTOR's labour, equipment and machinery and other materials and things and/or demolish/dismantle and remove any temporary works, structures and/or construction and other items and things brought upon or erected at the job site(s) and to remove all rubbish from the job site(s) and the land allotted to the CONTRACTOR and clear, dress and restore the said land to the satisfaction of the E-I-C and take undisputed possession and custody thereof and of the works and CONTRACTOR's stores thereon and dispose of and/or otherwise deal with any and all equipment and machinery etc., stores and other items and things aforesaid and recoveries of any demolition/dismantling as the OWNER shall in its absolute discretion deem fit, and the CONTRACTOR shall forthwith on demand pay the OWNER the entire costs/expenses of the OWNER relative to the above together with **10% (Ten percent)** thereof to cover the OWNER's supervision, with right in the OWNER (without prejudice to any other mode or recovery) to recover the same from the proceeds of any sale or disposal as aforesaid or from any monies whatsoever of the CONTRACTOR held by the OWNER or dues of the CONTRACTOR and the CONTRACTOR hereby irrevocably nominates, constitutes and appoints the OWNER (with right to the OWNER to delegate any and all of its rights in terms hereof to such of its officer(s) and/or other person(s) as it shall deem fit) for and on behalf of and as attorney of the CONTRACTOR to do, commit and/or sign all acts, deeds, matters and things as shall or may be necessary to be done, committed and/or signed by the CONTRACTOR to put in to effect the provisions of this clause with full right to enter into arrangements with third parties for or relative to the storage, sale and/or other disposal of any goods, equipment and machinery and other items and things and to enter in to or upon any of the CONTRACTOR's premises and to break open if necessary any locks, bolts, fasteners, bonds or other devices restricting entry there to and to do all other acts, deeds, matters and things as shall or may be necessary to give full effect to the provision of this Clause.

PROVIDED ALWAYS THAT:

I. The OWNER shall be entitled, without prejudice to the foregoing and in addition thereto, upon the CONTRACTOR failing to comply with the provisions of Clause **40.5** hereof after removing/demolishing/ dismantling from the job site any of the CONTRACTOR's goods, temporary works and other items and things ,by written notice to the CONTRACTOR, to require the CONTRACTOR to take delivery of, lift and/or clear the same within **7(seven) days** (or such other period as may be specified in said notice) of date of said notice failing which the OWNER shall abandon the same at the risks and costs of the CONTRACTOR, and should the CONTRACTOR fail to take delivery of, lift and/or clear the same within the period in this behalf specified in the said notice, the OWNER shall be entitled at anytime thereafter to abandon the same at the risks and costs of the CONTRACTOR, where upon (without prejudice to any other rights of the OWNER) the OWNER shall stand absolutely discharged and absolved in respect of all and any material ,equipment, machinery and other item and things whatsoever abandoned as aforesaid.

II. Notwithstanding anything to the contrary herein provided, nothing herein stated shall constitute the OWNER as a trustee or bailee of any of the CONTRACTOR's material, equipment, machinery or other items or things removed, cleared, demolished, dismantled or abandoned as aforesaid, nor shall the OWNER be bound in law or fact by any duty of care in respect thereof, with the intent that all actions, dealings and disposals within the provisions of this clause shall be exclusively at the risk and liability of the CONTRACTOR (including relative to any loss or damage) and the OWNER shall not be howsoever responsible, accountable or liable in respect thereof.

40.7 If for any cause (including but not limited to resistance put up by the CONTRACTOR and/or his servants or agents or any court order consequent upon a suit or proceedings filed by the

CONTRACTOR), the OWNER is unable to fully take over possession of the entire works within **7 (Seven) days** from the date of completion of the measurements as contemplated above, the OWNER shall, in addition to all discounts, compensations and/or damages recoverable from the CONTRACTOR in terms hereof (including but not limited to OWNER's entitlements under Clause **23.7** and Clause **40.9** hereof) or otherwise, be entitled to discount from the CONTRACTOR a Price Reduction in the amount equivalent to **1% (one percent)**of the Lumpsum Price for each week or part thereof that the said taking over possession of any works is delayed beyond the period of **7 (seven) days** specified above, subject to a maximum of **5% (five percent)**of the Lumpsum Price.

40.8 Notwithstanding anything provided in Clause **40.5** hereof, the OWNER shall have the right at any time prior to the removal of the same from the jobsite, to take possession of such of the CONTRACTOR's goods or equipment at any and all job sites as the OWNER shall deem fit, and the CONTRACTOR shall be entitled to compensation for any such goods or equipment taken over at cost thereof to the CONTRACTOR or depreciated value thereof in the case of equipment, whichever shall be less, such cost or value not to include the cost of transport, carriage or handling or storage, but to include the cost of freight to India on imported goods. The cost of goods and/or depreciated value of equipment taken over as determined by the E-I-C shall be final and binding upon the CONTRACTOR.

40.9 Upon termination of the Contract, the OWNER shall be entitled at the risk and expenses of the CONTRACTOR in all respects to either engage one or more contractors to complete the work and/or supplies and/or to redesign, re-perform and/or redo and/or to alter, modify and/or replace the materials supplied by the CONTRACTOR and/or supply other materials or substitutes to the extent necessary to setup, install , erect, establish and operate the Unit and tools and spares in accordance with the Contract and/or to complete the works in accordance with the Contract, notwithstanding that the contractor(s) so engaged shall adopt design and/or processes or methods or materials different from those proposed or projected and/or adopted by the CONTRACTOR for any purpose. Contractor's liability under clause **40.9** shall be limited to **100%(One Hundred Percent)** of the Lumpsum price.

In case contract awarded for the tendered work have to be terminated due to CONTRACTOR's default and a separate tender have to be floated to get the remaining/ complete work executed, such defaulting CONTRACTOR will not be considered for tenders issued for the refloated works of same project.

40.10 In addition to rights under clauses **40.8** and **40.9**, the OWNER shall, upon termination of the contract have an option to take over from the CONTRACTOR, in whole or part, any subsisting order or sub-contract entered into by the CONTRACTOR in or relative to performance of the CONTRACTOR's obligations under the contract, for which purpose the provisions here of shall operate as an assignment by the CONTRACTOR to OWNER of the orders and sub-contract opted to be taken over by the OWNER, with right in the OWNER as attorney for and on behalf of and in the name of the CONTRACTOR to sign, execute and/or deliver any document, notice or other communication as may be required under the law applicable to the relative contractor order to complete the assignment there of in favour of the OWNER, and the provisions hereof shall constitute appropriate appointment by the CONTRACTOR in favour of the OWNER in this behalf, with right in the OWNER to act in this behalf through any of its directors or officers.

40.11 No amount shall be due and payable to the CONTRACTOR upon or in the event of termination of the Contract unless and until the entirety of the works as contemplated in the scope of services and the entirety of the supplies as contemplated in the scope of supplies shall have been completed in all respects and all payments finally due on any account to the OWNER and/or other contractor(s) in respect of the balance works and supplies have been finally settled and the OWNER has been discharged from all liabilities in respect thereof.

40.12 If upon the satisfaction of the clause **40.9** and **40.11** hereof there shall remain in the hands of the OWNER any excess/balance after all accounting and adjustment of all dues from the CONTRACTOR to the OWNER, the OWNER shall forthwith pay over the excess/balance to the CONTRACTOR and in the event of the security deposit and other dues of the CONTRACTOR in the hands of the OWNER being insufficient to meet the dues of the OWNER as aforesaid, the CONTRACTOR shall forthwith on demand by the OWNER pay the OWNER the shortfall. For calculating the excess/balance aforesaid in the hands of the OWNER any price discount or adjustment due to the OWNER from any other contractor under the provisions of Clause **23.7** hereof for any equivalent or similar provisions in the Contract in this behalf between the OWNER and the other CONTRACTOR shall not be reckoned.

40.13 **Termination for Convenience:** As per Clause No. **10 of SCC**.

40.14 Notwithstanding anything to the contrary contained in this Contract, any termination pursuant to the provisions of this Contract shall be without prejudice to the accrued rights of either Party including its right to claim and recover money damages, insurance proceeds, security deposits, and other rights and remedies, which it may have in law or Contract. All rights and obligations of either Party under this Contract, shall survive the termination to the extent such survival is necessary for giving effect to such rights and obligations.

40.15 In the event of termination of this Contract and settlement of all outstanding amounts and dues of the Contractor until such date, the Owner shall return the CPBG and bank guarantee / corporate guarantee provided under Clause **34.6.6**, unless already encashed or returned in accordance with the provisions of this Contract.

41.0 PERSONAL ACTS AND LIABILITIES

Provision of Clause No. **31 of GCC** stands modified to the following extent:

The CONTRACTOR shall not be entitled to any increase in the rate(s) mentioned in the Price Schedule or in any of them or to any other payment, right, benefit or claim whatsoever by reason of any representation, explanation, statement, assurance or understanding given or alleged to have been given to him by the E-I-C or authorised representative of the OWNER, nor shall any director, officer or other employees or the E-I-C or authorised representative of the OWNER be personally liable for or in respect of any representation, explanation, statement or assurance or understanding given or alleged to have been given by him to the CONTRACTOR or any other person relative to the contract, nor shall the OWNER be responsible in respect thereof unless the same has been jointly signed by the CONTRACTOR and the OWNER as an agreed variation or amendment to Contract.

42.0 LABOUR LAWS AND REGULATIONS

Provision of Clause No. **89 of GCC** stands modified to the following extent:

42.1 The CONTRACTOR shall be responsible for strict compliance of and shall ensure strict compliance by its sub-contractors, servants and agents of all laws, rules or regulations having the force of law affecting the relationship of employer and employee between the CONTRACTOR/sub-contractors and their respective employees and/ or otherwise concerning labour, social welfare and provident fund, pension, bonus, gratuity and other benefits to employees. Without prejudice to the generality of this provision, the CONTRACTOR shall comply with and ensure that his subcontractors and other agencies employed by him comply with the provisions of the Payment of Wages Act 1936, Minimum Wages Act 1948, Employers Liability Act1938, Workmen's Compensation Act 1923, Industrial Disputes Act 1947, Maternity Benefit Act 1961, Mines Act 1952, **The Child Labour (Prohibition & Regulation) Act 1986**, Contract Labour (Abolition & Regulation) Act 1970, Payment of Bonus Act, Gratuity Act, Factories Act and the Employees Provident Fund and Miscellaneous Provisions Act 1952 and Employees State Insurance Act 1948, as amended from time to time and all rules, regulations and schemes framed thereunder from time to time.

42.1.1 In addition, the CONTRACTOR shall abide by and observe the provisions of Applicable Law including:

(i) The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979,

(ii) The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996,(BOCW)

(iii) The Building and Other Construction Workers' Welfare Cess Act, 1996,

(iv) The Child Labour (Prohibition and Regulation) Act, 1986.

42.1.2 The CONTRACTOR shall also be responsible at its own cost and initiative to pay directly to the prescribed authorities and bear any and all cess(es) payable under the BOCW Act, 1996 with respect to the contract and work covered thereunder and with respect to any subsidiary contract or sub-contract entered into by the CONTRACTOR for the performance thereof, and shall indemnify and keep indemnified the OWNER from and against any liability in respect thereof.

42.1.3 To this end, the CONTRACTOR shall as a document to be submitted to the E-I-C for the Completion Certificate under Clause 32.2 hereof, submit to the E-I-C satisfactory proof of having paid in full the cess payable with respect to the contract under the BOCW Act, 1996.

42.2 The contractor and sub-contractor(s) of the CONTRACTOR shall obtain from the authority(ies) designated in this behalf under any applicable law, rule or regulation (including but not limited to) the Factories Act and Labour (Abolition and Regulation) Act, 1970 (in so far as applicable) any and all such licence(s), consent(s), registration(s) and/ or other authorisation(s) as shall from time to time be or become necessary for or relative to the execution of the work or any part or portion thereof or the storage or supply of any material(s) or otherwise in connection with the performance' of the Contract and shall at all times observe and ensure due observance by the sub-contractors, servants and agents of all terms and conditions of the said licence(s), consent(s), regulation(s) and other authorisation(s) and laws, rules and regulations applicable thereto Without prejudice to the generality of this provision, the CONTRACTOR shall obtain and ensure that his sub-contractors and other agencies employed by him on the Work, obtain a valid Licence under the Contract Labour (Regulation & Abolition) Act, 1970 and shall duly and faithfully observe and comply with the provisions of the **The Child Labour (Prohibition & Regulation) Act 1986**, Contract Labour (Regulation & Abolition) Central Rules 1971 and other Central and State Rules as amended from time to time and applicable to the work, and shall duly, promptly and faithfully maintain and/ or cause to be maintained all records and facilities required to be maintained and or provided in terms thereof or any licence granted thereunder.

42.3 The CONTRACTOR shall ensure that wages are paid by himself or by his sub-contractors to their workmen directly without the intervention of any Jamadars or Thekedars and that no amount by way of commission or otherwise is deducted or recovered by the Jamadars from the wages of the workmen.

42.4 The OWNER shall be entitled at all times to carry out any check(s) or inspection(s) of the CONTRACTOR's facilities, records and accounts to ensure that the provisions aforesaid are being observed by the CONTRACTOR and the sub-contractors and that the workmen are not denied the rights and benefits to which they are entitled under such provisions. Any violation shall, without prejudice to any other rights or remedies available to the OWNER, constitute a ground for termination of the Contract as though specifically set forth under Clause **40.1** thereof.

42.5 Nothing in the Contract Documents stated shall anywise constitute any workman/employee of the CONTRACTOR or any sub-contractor as or to be a workman/employee of the OWNER, or place obligation or liability in respect of any such workman/employee upon the OWNER.

42.6 The CONTRACTOR shall not employ in connection with the work any person below the prohibited age of employment.

42.7 The establishment of the CONTRACTOR and its sub-contractors shall be duly registered under the Employees' Provident Fund and Miscellaneous Provisions Act, 1952 and the Employees' State Insurance Act, 1948 and the CONTRACTOR shall duly and timely pay and ensure payment by its subcontractors of contributions and its/their employees to the Government Authorities prescribed under the said Acts and any schemes framed thereunder in respect of all labour employed by it/them for the execution of the contract. Copies of challans/receipt of such payments along with the list showing persons employed together with emoluments paid for the purpose of P.F. deductions shall be submitted to the OWNER before the end of every calendar months. In case the Provident Fund Authority's receipted challan referred to above are not furnished, the OWNER shall deduct **5% (five percent)**of the payable amount from the CONTRACTOR's running bill for services and retain the same as a security for the payment of the Provident Fund. Such retained amounts shall be released to the CONTRACTOR only on production of challan/receipts of the Provident Fund Authority for the period covered by the related deduction.

42.8 On receiving information of any breach, non-fulfilment and/or non-observance by the CONTRACTOR and/or his sub-contractors and other agencies engaged by him in connection with the Works or any of the provisions or requirements of any of the Labour Laws, rules and regulations and/or as to the inaccuracy of any of the returns or statements furnished by the CONTRACTOR and/or his sub-contractors and/or any records or accounts maintained by any of them with respect to which the OWNER as the principal employer or otherwise can have a liability, the OWNER shall be entitled to deduct from the bills and any amounts due or becoming due to the CONTRACTOR, under this or other contract(s) with the CONTRACTOR, any sum(s) required or estimated to be required, in its judgement which shall be final and binding on the CONTRACTOR, for making good or compensating for the liability or possible liability of the OWNER by reason of the said breach, non-fulfillment or non-observance and/or inaccuracy aforesaid.

42.9 The CONTRACTOR shall indemnify and keep indemnified the OWNER from and against all actions, claims, demands and liabilities whatsoever under and in respect of the breach of any of the provisions hereof and/ or against any claim, action or demand by any workman/ employee of the CONTRACTOR or any subcontractor and/or from any liability anywise to any subcontractor under any law, rules or regulation having the force of law including (but not limited to) claims against the OWNER under the Workmen's Compensation Act 1923, the Employees Provident Funds and Miscellaneous Provisions Act 1952, the Employee's State Insurance Act 1948, the Contract Labour (Abolition & Regulation) Act 1970 and/ or The Child Labour (Prohibition & Regulation) Act 1986 and BOCW Act.

42.10 The CONTRACTOR and his sub-contractors and agents employed by him for and/or in the performance of the Works shall strictly abide by and observe the provision of the "Labour Compliances" & "Specifications/Guidelines for Labour welfare facilities at Camp and at Project site" as set out in **Annexure- XV** to SCC, which shall be binding on the CONTRACTOR, his sub-contractors and agents.

42.11 Deleted.

42.12 In the event of irreconcilable conflict between the provisions of **Annexure- XV** to **SCC** and any applicable law, rule or regulation, the law, rule or regulation, then the later shall prevail over the provisions of **Annexure- XV** to **SCC**, as the case may be, and shall be complied with.

43.0 RISK, ACCIDENT AND DAMAGE

43.1 The CONTRACTOR shall take due precaution to avoid damages to any pipelines, Railway lines, roads, canals, cables, culverts, bridges, drains, sewer, telegraph and telephone lines, water mains, dykes, poles, pillars, fences, wires, supports and embankments and other underground or over ground works, structural or constructions whatsoever and shall at his own cost and initiative forthwith restore and repair any damage thereto to the satisfaction of OWNER and/or the person or authority concerned relative to the line, pipe or other works, construction of installation as the case may be.

43.2 The CONTRACTOR shall be responsible at his own cost in and relative to performance of the work(s) and contract to observe and to ensure observance by his sub-contractor's agents and servants, of the provisions of the safety code as hereinafter appearing and all fire, safety and security instructions and regulations as may be prescribed by the OWNER, the Central Government or any State Government, any Marine or Port Authority or any other body or authority legally authorised to issue such instructions or regulations, from time to time and such other precautions and measures as shall be necessary, and shall employ/deploy all equipment necessary to protect all works, materials, properties, structures, equipment, installations, communications and facilities whatsoever from damage, loss or other hazard whatsoever (including but not limited to fire, collision or explosion) and shall during construction and other operations, minimise the disturbance and inconvenience to the OWNER, shipping, transportation, the public and the adjoining land and property of the OWNER and occupiers, and crops, trees and vegetation.

43.3 The CONTRACTOR shall indemnify and keep indemnified the OWNER and their employees, directors and representatives from and against all losses and damages (including relative to any gas, crude oil, refined products and other commodities lost) and costs, charges and expenses and penalties, actions, claims, demands and proceedings whatsoever suffered or incurred by or against the OWNER, as the case may be, by virtue of any loss, alteration, displacement, disturbance or destruction or accident to any vessel, works, material, property, structure, equipment, installation, communication and facility and land and property of the OWNER and occupiers and crops, trees and vegetation as aforesaid, with the intent that the CONTRACTOR shall be exclusively responsible for any accident, loss, damage, alteration, displacement, disturbance or destruction as aforesaid directly or indirectly from any breach by the CONTRACTOR of his obligations aforesaid or upon any operation, act or omission of the CONTRACTOR, his Sub-contractor(s) or his or their agent(s) or servant(s).

44.0 INDEMNITY

The Provision of Clause No. **91 (i)** and **(iii)** of GCC shall be read in conjunction with the following:

44.1 The CONTRACTOR shall at all times indemnify and keep indemnified the OWNER and their officers, servants, agents, directors, representatives from and against all third party claims whatsoever (including but not limited to property loss and damage, personal accident, injury or death of/or to property or person of any Subcontractor and/or the servants/agents of the

CONTRACTOR or any Subcontractor(s) and/or the OWNER) arising out of any act or omission of the CONTRACTOR and the CONTRACTOR shall at his own cost and initiative at all times upto the successful conclusion of the defect liability period specified in Clause **33.1** hereof take out and maintain all insurable liabilities under this Clause, including but not limited to third party insurance and liabilities under the Motor Vehicles Act, Worker's Compensation Act, Fatal Accidents Act, Personal Injuries Insurance Act, Emergency Risk Insurance Act and/or other Industrial Legislation from time to time in force in India with Insurance Company(ies) approved by the OWNER, and such policy(ies) shall be of not lesser limit then the limits hereunder specified with reference to the matters hereunder specified, namely.

a) Workmen's Compensation Insurance to the limit to which compensation may be payable under the laws of the Republic of India.

b) Deleted

44.2 Should the CONTRACTOR fail to take out and/or keep afoot insurance as provided for in the foregoing clause the OWNER shall be entitled (but without obligation to do so) to take out and/or keep afoot such insurance at the cost and expense of the CONTRACTOR, and without prejudice to any other rights or remedies of the OWNER in this behalf, to deduct the sum(s) incurred therefore from any amounts howsoever becoming payable to the CONTRACTOR.

44.3 In addition, the CONTRACTOR shall protect, defend, indemnify and hold the OWNER and their officers, servants, agents, directors, representatives harmless from and against:

a) Any and all losses arising directly or indirectly from or incurred by reason of the acts or omissions of the CONTRACTOR, its Affiliates, Subcontractors or Suppliers or any of the irrespective officers, directors, employees, servants or agents in the performance of CONTRACTOR's obligations under this Contract, whether or not resulting from any defect in or condition of the premises on which the Works are or are to be performed, or any equipment thereon or any materials furnished by OWNER, including any losses arising from or in respect of or in consequence of any illness, accident or injury to any employees, directors, servants or agents of the CONTRACTOR, its affiliates, subcontractors or suppliers.

b) Any and all losses, arising directly or indirectly from or incurred by reason of claims or sanctions or penalties imposed by any Governmental Authorities or others for any actual or asserted failure by the CONTRACTOR or its affiliates, sub-contractors or suppliers or any of their respective officers, directors, employees, servants or agents to comply with any applicable law or applicable consent(s), sanction(s) and/or authorization(s) or with any rules or regulations applicable to it or them or to obtain or maintain any such consent, sanction or authorization.

c) any and all losses, arising directly or indirectly from or incurred by reason of any failure of CONTRACTOR or any sub-contractor or supplier (i) to pay any taxes relating to income or any other taxes required to be paid by such person (ii) to pay any amounts in respect of taxes which are to be paid by such person in connection with the performance of its obligations relating to this Contract or (iii) to file tax returns as required by applicable laws or comply with reporting or filing requirements under applicable law relating to taxes or (iv) arising directly or indirectly from or incurred by reason of any misrepresentation by or on behalf of such person to any competent authority in respect of taxes (nothing in this clause shall restrict any person's right to bonafide contest the amount of any tax or other liability owed to a competent authority provided such contest is bonafide and made in good faith); and

d) any and all losses arising directly or indirectly from or incurred by reason of hazardous materials introduced to the job site or works or any other location by the CONTRACTOR, its affiliates, sub-contractors or suppliers or its or their agents in or in connection with the performance of the Contract.

45.0 EFFECTS OF INSURANCE

45.1 The obligations of CONTRACTOR to indemnify and hold harmless the OWNER under the Contract shall not be limited or reduced to any insurance provided pursuant to the Contract or otherwise, provided always that the proceeds of any such insurance shall in the first instance be applied to meet the obligations of the CONTRACTOR under the relative indemnity(ies).

46.0 CONTRACTOR'S LIABILITY

The contractor's liability shall be as per the provisions of Clause No. **97** of GCC .

47.0 TRAINING OF APPRENTICES

Provisions of **Clause No. 90 of GCC** shall be read in conjunction with the following:

The CONTRACTOR shall if so required under Applicable Laws, himself engage and/or procure engagement by his subcontractor(s) of such number of apprentices and for such period as may be required in this behalf in accordance with the provisions of the Apprentices Act, 1961 and any other act, rule and/or regulation having the force of law, regulating upon the employment of apprentices, and the CONTRACTOR shall be responsible at his own cost and initiative and without entitlement to any extra compensation or remuneration from the OWNER in this behalf, to fulfill all obligations of the employer under the said Act, including liability for payment to apprentices as required thereunder.

48.0 RECORDS AND INSPECTION

48.1 The CONTRACTOR shall if and when required by the E-I-C relative to the execution of the Contract produce or cause to be produced before the E-I-C or any other person designated by the E-I-C in this behalf, for examination, any records and documents in the possession of the CONTRACTOR or any subcontractor or subsidiary or associated firm or company or the CONTRACTOR or any sub-CONTRACTOR, and/or copies or extracts thereof and/or other information or returns relative thereto. Such returns shall be verified in the manner prescribed by the E-I-C or other officer aforesaid designated in this behalf. The CONTRACTOR shall in addition produce and/or caused to be produced before the E-I-C or any other person designated by the E-I-C in this behalf, for examination any vouchers, bills and orders etc. required for verifying or ascertaining the cost of any material, labour, service or item or thing, to calculate any monies payable under the Contract for which item rates are not mutually agreed. The decision of the E-I-C as to whether any book, record, document, information or return is relevant for any of the purpose aforesaid, shall be final and conclusive.

49.0 PATENTS AND ROYALTIES

Provision of Clause No. **43 of GCC** stands modified to the following extent:

49.1 The CONTRACTOR undertakes that all equipment, machinery, instruments and materials used or supplied by the CONTRACTOR or methods or processes practiced or employed by the CONTRACTOR in the works shall not be covered by any third party patent, design or other rights, with the intent that the OWNER shall be entitled to the unfettered use of and right to the same and any subsequent works in which the same are incorporated without any third party right, claim or entitlement.

49.2 If any equipment, machinery, instruments and/or materials, used or supplied by the CONTRACTOR, or methods or processes practiced or employed by the CONTRACTOR in the performance of this contract or resultant works, is/are covered by a patent, design or other rights under which the CONTRACTOR, is not licensed, the CONTRACTOR shall before supplying or installing or using or employing or practicing the same obtain such license(s) and pay such royalty(ies) and license fees as may be necessary in connection with the performance of this contract. In the event that the CONTRACTOR fails to pay such royalty or obtain such license, the CONTRACTOR shall defend at its own expense, any suit for infringement of patent, design or other right which is brought against the CONTRACTOR and/or the OWNER as a result of the failure, and shall pay any damages and costs awarded in such suit and shall keep the OWNER indemnified from and against all other consequences thereof, including (but not limited to) the costs incurred by the OWNER relative to such proceedings and in obtaining legal advice or opinion(s) relative to such proceedings, and shall perform all remedial and consequent works as shall be necessary, and the provision of Clause **49.3** shall mutatis mutandis apply.

49.3 Forthwith upon the CONTRACTOR acquiring any knowledge or information of any patent, design or information or other right in respect of which a claim for infringement of patent, design or other right could be brought involving any equipment, machinery, instrument or materials used or supplied by the CONTRACTOR or methods or processes practiced or employed by the CONTRACTOR in the performance of the contractual works, the CONTRACTOR shall notify the OWNER in respect thereof and shall, at its own cost and initiative take such steps as shall be necessary to procure the relative rights or licenses, or compound the relative claims, and/or

shall at his own cost and initiative re-design, re- fabricate, re-supply, re-place and/or install, as the case may by alternative systems and works necessary to avoid such patent, design or other rights within the CONTRACTOR's scope of work and within the time for completion in this behalf prescribed in the contract documents, without entitlement to any additional remuneration in respect thereof, and the CONTRACTOR shall, meanwhile, keep the OWNER indemnified from and against all consequences and liabilities and losses, claims and damages whatsoever. Excluded from the scope of this indemnity is any patent, design information or other right arising out of work done or performed or materials supplied strictly in accordance with the process design provided by the Process Licensor within the exclusive scope of the Process Licensor.

49.4 As between the Parties, the Contractor shall retain the copyright and other Intellectual Property rights in the Contractor's documents and other design documents made by (or on behalf of) the Contractor. The Contractor shall be deemed (by signing this Contract) to give to the OWNER a non-terminable transferable non-exclusive royalty-free licence to copy, use and communicate the documents and designs, including making and using modifications of them. This licence shall: (a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works, (b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and (c) in the case of documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by this Agreement, including replacements of any computers supplied by the Contractor.

50.0 ARTICLES OF VALUE FOUND

As per **Clause No. 60** of GCC

51.0 MATERIALS OBTAINED FROM DISMANTLING

The phrase "and will be disposed off to the best advantage of the Owner" against Clause No. **59** of GCC stands replaced by "Serviceable items of dismantled materials to be properly stored or transported to designated location as per the instructions of E-I-C/OWNER".

52.0 LIENS AND LIABILITIES

Following has been added after Clause No. **44.1 of GCC**:

In case contractor fails to make such payment within **10(ten) days** or demand by the OWNER in this behalf, shall be liable to pay interest on the amount due from the date of demand upto and until the date of payment in full at the **SBI base rate plus1% (one percent)** per annum at time of payment and the provisions hereof (insofar as such notice shall be deemed to be necessary in addition to the contractual provisions herein) shall be deemed to constitute a notice for the payment of interest under the provisions of the Indian Interest Act,1978.

53.0 COLLECTION OF INDEBTEDNESS

53.1 Without prejudice to any other rights or remedies of the OWNER and in addition to any other provisions thereof, the OWNER shall be entitled to deduct out of the CPBG or the proceeds of any Bank Guarantee or any monies for the time being of the CONTRACTOR in its hands and any payment then due or becoming due to the CONTRACTOR on any account, any and all amounts claimed by the OWNER from the CONTRACTOR arising out of or in connection with the Contract.

53.2 Where the OWNER makes any deduction pursuant to the provisions of Clause **53.1** hereof, the OWNER shall furnish to the CONTRACTOR all details of the deduction(s) with copies of the documents, if any, in support of the deduction(s).

54.0 LIABILITIES OF SUB – CONTRACTOR (S)

54.1 Without prejudice to any other liabilities or obligations of the CONTRACTOR relative to Sub-contractor(s) in terms hereof or otherwise, the CONTRACTOR shall require every Sub-contractor to whom any portion of the work to be performed under the contract has been sub-contracted, to comply with the provisions of the Contract insofar as applicable to each Sub-contractor, and the CONTRACTOR shall hold the OWNER and its officers, servants, agents, directors, representatives harmless and indemnified, from and against any and all penalties, actions, claims and demands and costs, charges and expenses whatsoever arising out of or

occasioned by failure of the CONTRACTOR or any Sub-contractor(s) to fully and properly comply with any of the terms and conditions of Contract.

55.0 CONFIDENTIAL HANDLING OF INFORMATION

55.1 The CONTRACTOR and his employees, agents and Sub-contractors and employees and agents of the Sub-contractors shall treat as strictly confidential and shall take all steps necessary to ensure confidential handling of all maps, plans, charts, designs, drawings, photographs, data, reports, tests, specifications, methods and other information developed or acquired by the CONTRACTOR from or by means of the tender documents or any facility extended to the CONTRACTOR pursuant thereto or the award or performance of the contract or any of them or otherwise disclosed or made available to the CONTRACTOR or any aforesaid persons and without prejudice to the generality of the foregoing, the CONTRACTOR, its subcontractor(s) and their respective employees and agents shall not report, disclose or reproduce the same in any book, article, speech or other publications, provided always that, the OWNER may, upon application by the CONTRACTOR to the OWNER in this behalf, permit report, disclosure or reproduction of the same in any book, article, speech or the publications if it is satisfied that this would not involve the disclosure of any classified or other proprietary information which would not be in the interest of public or security to disclose and/or which should not be in breach of any obligation of confidentiality.

55.2 Application for such consent shall be submitted to the OWNER in writing outlining the intended use of the relative material and shall be submitted to the OWNER at least one month prior to the expected use accompanied by the text of the relative publication in which it is sought to be used. Photographs should be accompanied by their caption. An application shall not be understood to have been permitted unless expressly permitted in writing by the OWNER.

56.0 WAIVER

56.1 It shall always be open to the OWNER, by written communication to the CONTRACTOR, to waive in whole or part any right or the enforcement of any right or remedy which the OWNER may have against the CONTRACTOR or of any obligations which the CONTRACTOR may have hereunder, provided always that:

56.1.1 No waiver shall be presumed or inferred unless made in a written communication addressed by the OWNER to the CONTRACTOR and specifically communicated as a Waiver;

56.1.2 No waiver of any right or part of any right on one occasion shall be deemed to be a waiver or abandonment of that right for all occasions with the intent that a waiver once given shall be limited to the specific waiver and shall be without prejudice to the right of the OWNER to insist upon the strict adherence of the attendant obligations of the CONTRACTOR and/or the future enforcement of the right by the OWNER in respect of the same and/or any other dependent obligation.

57.0 CONTRACTOR'S ESTABLISHMENT

57.1 It is understood that the establishment of the CONTRACTOR(and any of their Sub-contractor's) constitutes an independent establishment involved inter-alia in undertaking works and/or services for others of the nature and kind forming the subject matter of the Contract. It is consequently understood that all the employees of the CONTRACTOR (and any of their Sub-contractor's) are the employees of the independent establishment of the CONTRACTOR or Sub-contractor (as the case may be)who have been and will be appointed solely for and/or with reference to the work of that establishment, and have not been and will not be appointed specifically or otherwise for the sole purpose of the work covered by the present Contract. To this end, each CONTRACTOR (and their Subcontractor) shall issue to each of its employees deputed to the job-site to perform any work in relation to the Contract, a regular letter of appointment for employment in the CONTRACTOR's/Sub-contractor's independent establishment, with authority in the CONTRACTOR/ Sub-contractor to employ or depute him for or in relation to any work or engagement assumed by the CONTRACTOR/Subcontractor from time to time in the course of its business and the production of a certified copy of each letter of appointment duly acknowledged by the concerned employee shall be a pre-condition for the issue of a Gate Pass to any employee of the CONTRACTOR/Sub-contractor into any area, the entry to which is restricted by the OWNER.

57.2 OFFICE ACCOMMODATION, SERVICES AND FACILITIES FOR PMC / OWNER'S PERSONNEL AT BIDDER'S WORK STATIONS/OFFICES

At any stage during the currency of Contract, in case if so required, PMC/OWNER may depute their Personnel (maximum 10 Numbers at one occasion) to CONTRACTOR's Home Office in India/Abroad for expediting/reviewing the Design & Engineering Jobs or for any other specific job in connection with the subject Contract. This shall include the Offices (In India/ Abroad) of CONTRACTOR's Design/Engineering Consultant, Supplier(s), Vendor(s) etc. Normally such deployment/deputation shall be for shorter durations only. In such situations, CONTRACTOR shall ensure that the PMC/Owner's Personnel are facilitated with necessary Office Space, Office furniture & equipment, communication facilities including High Speed Internet, other office supplies etc. which are reasonably required for the effective completion of the intended job of PMC/Owner's personnel. Also, facilities and assistance for Printing, Photocopying and Scanning shall be ensured by the CONTRACTOR. Further, the CONTRACTOR shall ensure that the common facilities like Canteen Services, Courier Services, Clerical/Secretarial Services etc. are also provided to the Personnel during such a period(s) of their deputation/deployment to the concerned Offices.

58.0 OBSERVANCE OF ENVIRONMENTAL REGULATIONS AND ENVIRONMENTAL PROTECTION.

58.1 The CONTRACTOR shall ensure that its servants and agents and subcontractors and their servants and agents shall duly comply with all environmental laws, rules and regulations and the conditions of any permit, permission, consent and/or no-objection granted in this behalf by any authority with respect to or concerning the work, and shall independently so organise and conduct its operations and cause its sub-contractors to so organise and conduct their operations as not to cause any hazard or pollution to health, life, property or environment including (but not limited to) discharge of any noxious substance or effluent into the atmosphere or into the earth or into any drain, canal, stream, river, pond, lake or other water body.

58.2 The CONTRACTOR shall indemnify and keep indemnified the OWNER and their officers, servants, agents, directors, representatives from and against the breach, non-observance, infraction or dereliction of any of the provisions of Clause **58.1** hereof, and against any and all claims, actions or proceedings, prosecutions and liabilities, and losses and damages, and costs (including legal costs), charges and expenses whatsoever suffered or incurred or instituted against the OWNER as the case maybe.

58.3 Advisory Guidelines on environmental criteria which contractors to follow shall be as per **Annexure-XXI of SCC**.

59.0 REGISTRATION OF THE CONTRACTOR WITH STATUTORY AUTHORITIES

59.1 Within **2 (Two) Months** from the date of issue of LOA (LOA), the CONTRACTOR shall, in so far as necessary, register itself and the Contract at its own cost with the Reserve Bank of India(RBI), Income Tax, GST and other statutory authorities as required under the rules and regulations governing in India. A copy of all documents related to all such registrations shall be submitted to the OWNER for record.

59.2 Immediately after notification of the LOA, the FOREIGN CONTRACTOR shall, in so far as necessary obtain permission for opening of office(s) in Madhya Pradesh, India from the RBI.

59.3 CONTRACTOR to obtain GSTIN registration at the location where Works Contract Services are to be performed or carried out. In case of other type of services, bidder is requested to obtain GSTIN in the state where job is required to be carried out/ executed. The bidder shall indicate in its bid the Goods & Service Tax registration No.

60.0 STATUTORY APPROVALS

60.1 Unless otherwise specified, it shall be the CONTRACTOR's sole responsibility to obtain all approvals from any authority (except for environment clearance) required under any statute, rule or regulation of the Central or State Government concerned with the performance of the Contract and/or the contractual work (as defined in CONTRACTOR's scope under Technical Scope of work). The application on behalf of the OWNER for submission to relevant authorities along with copies of required certificates complete in all respects shall be prepared and submitted by the CONTRACTOR well ahead of time so that the actual construction/commissioning of the works is not delayed for want of the approval/inspection by the concerned authorities. The CONTRACTOR shall arrange for the inspection of the works by the authorities and will undertake

necessary coordination and liaison required and shall not been titled to any extension of time for any delay in obtaining such approvals.

60.2 Any deficiency(ies) as pointed out by any such authority shall be rectified by the CONTRACTOR within the scope of relative supply and/or Work at no extra cost to the OWNER. The inspection and acceptance of the Works by such authorities shall, however, not absolve the CONTRACTOR from any of its responsibilities under this Contract.

60.3 Statutory Approval of Oil Industry Safety Director (OISD) is also required to be taken by the CONTRACTOR and any deficiency(ies) as pointed out by Internal, Third party and OISD audit team shall be rectified by the CONTRACTOR within the scope of relative supply and/or Work at no extra cost to the OWNER.

60.4 No extension of time shall be granted for meeting the requirement and/or obtaining approval of statutory authorities.

60.5 Statutory fees paid, if any, for all such inspections and approvals by authorities shall be deemed to be included in the quoted prices, if not specified otherwise.

61.0 RENTS & ROYALTIES

61.1 Unless otherwise specified, the CONTRACTOR shall pay all tonnage and other royalties, rents and other payments or compensation (if any) for getting stone, sand, gravel, clay, bricks or other materials required for the works or any temporary works and the price quoted shall be deemed to be inclusive of such payment.

61.2 The Contract Price shall include the royalty on different applicable items as per the prevailing State Government rates. In case OWNER is able to obtain the exemption of royalty from the State Government, the CONTRACTOR shall pass on the same to the OWNER for all the items involving royalty. Any increase in prevailing rates of royalty shall be borne by the CONTRACTOR at no extra cost to the OWNER.

62.0 UTILISATION OF LOCAL RESOURCES

62.1 The CONTRACTOR shall ascertain the availability of local sub-Contractor's and skilled/unskilled manpower and engage them to the extent possible for performance of the works. Contractor to follow Government Regulation if any for utilisation of local resources.

62.2 The CONTRACTOR shall not recruit personnel of any category from among those who are already employed by the other agencies working at the site, but shall make maximum use of local labour available.

63.0 GOVERNMENT REGULATIONS

The CONTRACTOR shall comply with and ensure strict compliance by his/its subcontractors, servants and agents of all applicable Central, State, municipal and local laws and regulations of any Central, state or local bodies and authorities and undertakes to indemnify the OWNER and their officers, servants, agents, directors, representatives, from and against all levies, damages, penalties and payments whatsoever as may be imposed by reason of any breach or violation by the contractor or its sub contractors or agents or by the respective personnel of any law, rule or regulation whatsoever and from and against all actions, claims and demands arising there from and/or relative thereto.

64.0 TERMS OF PAYMENT

64.1 For Payment terms refer Annexure**-X** of this Special Conditions of Contract.

65.0 INSURANCE

The Provisions of the Clause No. **87** of GCC with respect to Insurance of materials for permanent incorporation and services stand partially modified to the following extent:

65.1 Owner shall take Comprehensive Project Insurance covering all aspects of the Project construction including Procurement, Fabrication, Construction, Offsite storage, Testing & commissioning and contractor and sub-contractor of any tier shall be covered for on-site activities only with respect to Project Value. Contractor is not supposed to take any Project Insurance nor Marine policy. This policy will also cover Third Party Liability arising out of bodily injury and/or property damage to Third Party only.

65.2 Owner's policies will absolutely exclude the following for which contractor shall take adequate insurance:

a) Cover for Contractor's Plant & Machinery used for construction
b) Liability arising out of above equipment
c) Cover for Employees/ workers of the Contractor
d) Any statutory insurance like motor insurance for the vehicles used by contractors
e) Cover for any vessels used for construction activities by the contractor including any associated liabilities
f) Cover for any aircraft or helicopter and/or aviation assets used for construction activities by the contractor including any associated liabilities
g) Cover for Professional Liability Insurance for design, project management, detailed engineering, design & build activities by the contractor and/or any consultant
h) All **uninsured costs** in the Owner's policies primarily EAR, Marine, Third Party Liability **either due to application of** exclusion, deductible or limits, will be borne by the contractor.

65.3 **Contractor shall ensure that all its personnel deployed under this contract have obtained additional insurance coverage under the Pradhan Mantri Suraksha Bima Yojna (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojna (PMJJBY) through the participating banks and submit the proof of such insurance coverage to the satisfaction of Owner. The cost of the insurance premium amount for both the above schemes shall be borne by the contractor giving evidence / proof to EIL in this respect and Contractor shall suitably consider the same in their bid.**

Details of these schemes are to be regulated continuously on yearly basis and the same should be renewed on each successive relevant date in the subsequent years.

65.4 **Contractor shall submit to BPCL/EIL copies of all insurance policies taken by them for the contract.**

65.5 CONTRACTOR shall also obtain all insurance as stipulated in the GCC including Clause no **44.0** (Indemnity) of the SCC.

65.6 Although the insurance is taken by the OWNER as mentioned in the bidding document, any theft/loss/ damage of OWNER consigned materials/ equipment (issued as free issue basis) while in custody of the CONTRACTOR during the execution of the contract, the contractor shall be responsible for the watch and ward and safety and security of Material. Storage and safe custody of all materials shall be the sole responsibility of the contractor. After the materials have been delivered by the Owner to Contractor, it shall be the responsibility of the contractor to keep them in good condition and if the materials are damaged or lost, at any time, they shall be repaired and/ or replaced by him at his own cost, according to the directions of E-I-C.CONTRACTOR shall not be entitled to for any extension in time. The CONTRACTOR shall be solely responsible for the consequences such as delay in project schedule and implication of any penalty thereof. In such eventuality, the contractor shall promptly take all necessary corrective action at his own cost to arrest the delay in Project Schedule. As such, the CONTRACTOR for its own interest shall keep and maintain all security measures as deemed necessary at all times and the quoted price shall include such provisions.

65.7 BPCL shall not be liable for any loss or costs that fall within the deductibles or are outside the insurance policies. The Contractor further releases, assigns and waives any and all rights of recovery against BPCL, other parties as reasonably requested by BPCL and their affiliates, subsidiaries, successors, permitted assigns, insurers and underwriters, and against other contractors and sub-contractors participating in the overall project.

65.8 The Contractor shall ensure that BPCL, and their assignees, subsidiaries and affiliates, will be included as Co-assured parties in each of the insurance policies they purchase with the exception ofAuto liability.

65.9 Contractor to include a waiver of subrogation in favour of BPCL including its subsidiaries, affiliates and JV's as well as lenders in all their policies except Automobile liability Policy. EIL and consultants can also be included for their site activities only.

65.9.1 All insurance policies, except Automobile liability Policy, in respect of the insurance obtained by the Contractor pursuant to this Clause shall include a waiver of any and all rights of subrogation or recovery of the insurers thereunder against, inter alia, the OWNER, and its assigns, successors, undertakings and their subsidiaries, affiliates, employees, insurers and underwriters, and of any right of the insurers to any set-off or counterclaim or any other deduction, whether by attachment or otherwise, in respect of any liability of any such person insured under any such

policy or in any way connected with any loss, liability or obligation covered by such policies of insurance.

65.10 The Contractor shall keep BPCL and any other Insured Party, as may be required by BPCL, advised of any claim and informed of the progress and outcome of such claim under the insurance policies described above. The Contractor shall render all assistance and cooperation to BPCL as may be required to facilitate any insurance claim under the insurance policies.

65.11 The **responsibility** of compliance with insurance warranties, subjectivities, conditions rests with the contractor.

65.12 All insurances obtained by the CONTRACTOR in accordance with this Clause shall be maintained with insurers on terms consistent with Good Industry Practice. **Within 20 (twenty) days** from the date of execution of this Contract, the CONTRACTOR shall furnish to the OWNER notarised true copies of the certificate(s) of insurance, copies of insurance policies and premia payment receipts in respect of such insurance, and no such insurance shall be cancelled, modified, or allowed to expire or lapse until the expiration of **at least 45 (forty-five) days** after notice of such proposed cancellation, modification or nonrenewal has been delivered by the CONTRACTOR to the OWNER.

65.13 If the CONTRACTOR shall fail to effect and keep in force all insurances for which it is responsible pursuant hereto, the OWNER shall have the option to either keep in force any such insurances, and pay such premia and recover the costs thereof from the CONTRACTOR, or in the event of computation of outstanding dues, treat an amount equal to the insurance cover as deemed to have been received by the CONTRACTOR.

66.0 DELETED

67.0 SUB-CONTRACTING OF CONSTRUCTION WORKS

67.1 Subject to Clauses **25** and**26** hereof,if the CONTRACTOR is required to engage a Construction Sub Contractor for any part of work then such sub-Contractors shall have prior proven experience of similar work and shall require specific approvals by OWNER after award of this Work.

67.1.1 However, in case a Contractor has been qualified based on experience of an Subcontractor(s) and engagement of such Subcontractor(s) is mandatory in event of award as per provisions of Bidding Document, then separate approval as above is not required. However, the Contractor shall furnish the agreement/ contract with such Subcontractor(s) as per the provisions mentioned elsewhere in the Bidding Document.

67.2 Following the notification of acceptance of Bid the CONTRACTOR will submit to the OWNER for approval, the details of Sub-Contractors as per **Annexure-III to SCC**. CONTRACTOR shall ensure that every competent and resourceful agencies with proven track record and performance should be proposed for the work to be sub-contracted.

68.0 QUALIFICATION AND EXPERIENCE OF THE SUPERVISORY PERSONNEL

68.1 Qualification and experience of key supervisory construction personnel to be deployed for this works shall be as per **Annexure-IV to SCC.** CONTRACTOR shall submit bio data of key supervisory personnel meeting the requirement of this Annexure after award, which will be reviewed and approved by E-I-C.

68.2 All key staff employed at the site by the CONTRACTOR shall be considered essential to the performance of the work, and all key staff shall be subjected to approval of OWNER/E-I-C. However such approval shall not relieve the CONTRACTOR of any of his contractual obligations. No staff including Resident Engineer and other technical supervisory staff shall be removed or transferred from the work with the prior written permission of the OWNER/ E-I-C. The OWNER / E-I-C shall however have the authority to order the removal of staff from site of any undesirable personnel, the replacement of such personnel shall be carried out by the CONTRACTOR within **15 (fifteen) days** from the notification from OWNER/ Engineer-in-Charge. If key staff becomes unavailable for assignment to the work for reasons beyond the CONTRACTOR's control, the CONTRACTOR shall immediately notify the OWNER/ E-I-C to evaluate the impact on the project. Prior to substitution or addition of any key staff, the CONTRACTOR shall obtain OWNER's / E-I-C's written consent as to the acceptability of replacements or additions to such personnel. The CONTRACTOR shall at all times be fully responsible for the acts, omissions, defaults and neglect of all his representatives, agents, servants, workmen and suppliers and this of his Sub-Contractors.

68.3 The Contractor shall ensure that the personnel engaged by them or by their Subcontractors for performance of its obligations under this Contract are at all times appropriately qualified, skilled and experienced in their respective functions in conformity with Applicable Laws and Good Industry Practice.

69.0 CRITICAL EQUIPMENTS

As per List covered in **Annexure-VI to SCC** and Technical Section of bidding document.

70.0 MAJOR TAGGED EQUIPMENTS

As per List covered in **Annexure-VI** to SCC.

71.0 FREE ISSUE MATERIAL

As per List covered in **Annexure-VII** to SCC.

72.0 REQUIREMENT OF DOCUMENTATION (TECHNICAL)

72.1 The CONTRACTOR shall adhere to the requirements for Documentation as per Technical Section of Bidding Document.

73.0 UNDERGROUND OBSTRUCTIONS:

73.1 Site shall be handed over to the bidder after removal of underground obstructions. However, in case any underground obstructions are encountered by the CONTRACTOR during execution of the job, same shall be cleared off by the CONTRACTOR to the extent required for the execution of the job within the boundary limits defined for the package – with prior intimation to the PMC/ OWNER.

73.2 No time implication is permitted. Cost implication – if admissible, shall be considered at actuals, basis certification of the PMC/OWNER.

74.0 CONSEQUENTIAL LOSSES:

As per **Clause No. 97** of GCC, Neither Party shall be liable to the other Party for any kind of indirect or consequential loss or damage like, loss of use, loss of profit, loss of production or business interruption which is connected with any claim arising under the Contract.

75.0 RELATIONSHIP WITH CONSORTIUM

75.1 Where the CONTRACTOR is a consortium, the members of the consortium shall nominate or appoint one amongst them to be the consortium leader/ prime member(as during the bidding stage) and to represent them in all dealings with the OWNER and to do all acts, deeds, matters and things required to be done by the CONTRACTOR under the contract, including (but not limited to) exchange of correspondence, raising invoices, drawings, documents and receiving payments(“Prime Member” or “Leader/Lead Member” of a Consortium). The Consortium leader must be a person/entity who satisfies the qualification criterion for bidding.

It may be noted that “**Prime Member**”, “**Lead Member**” and “**Leader**” of a Consortium/Unincorporated Joint Venture referred to in the Bidding document are synonymous.

75.2 All dealings had with and/or all acts, deeds, matters and things done by or payments made to and invoices/documents drawn and/or negotiated by a person/entity appointed or nominated by the consortium or the OWNER as aforesaid shall be binding upon the CONTRACTOR and each member of the consortium, and in so far as the OWNER shall require a discharge in respect of any dealing had or act, deed, matter or thing done or payment made as aforesaid, the same shall constitute a valid discharge to the OWNER.

75.3 Each and every member of the consortium shall be jointly and severally liable to the OWNER for and in respect of all liabilities and obligations of the CONTRACTOR under the Contract. Provided that if any member of the consortium is unable to carry out its obligations and liabilities under this Contract, then the Lead Member of the Consortium is severably liable for carrying out such obligations and liabilities as if such obligations were of the Lead Member of the Consortium.

75.4 The Contractor shall ensure that the constitution of the Consortium or the relative distribution of work(s) and/or activities amongst the Consortium members within the relative expertise of each as approved by the OWNER shall not be altered or assigned, as the case may be, except with the prior written consent of the OWNER with the intent that any contrary alteration or assignment shall be deemed to be an unauthorised assignment of Contract with attendant liabilities including termination of Contract. If there is any change in the relative distribution of work(s) and/or

activities amongst the Consortium members, the CONTRACTOR is required to inform the OWNER in accordance with Clause **35.6.6.1 x)**. Provided that an alteration or assignment of the Lead Member of the Consortium is not permitted under this Contract.

76.0 ERRANT BIDDER

In case Contract awarded for the tendered works have to be terminated due to Contractor's default and a separate enquiry have to be floated to get the remaining/ complete work executed, such defaulting Contractor will not be considered for enquiries issued for the refloated works of same project.

77.0 CORRUPT AND FRAUDULENT PRACTICES

77.1 The OWNER requires that Bidders/Vendors/Contractors observe the highest standard of ethics during the award/execution of Contract. "Fraudulent Practice" means a misrepresentation of facts in order to influence the award of a Contract to the detriment of the OWNER, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the OWNER of the benefits of free and open competition.

77.2 The OWNER will reject a bid for award if it determines that the bidder recommended for award has engaged in fraudulent practices in competing for the Contract in question.

77.3 Bidder is required to furnish the complete and correct information/ documents required for evaluation of their bids, if the information/ documents forming basis of evaluation is found to be false/ forged, the same shall be considered adequate ground for rejection of bids and forfeiture of Earnest Money Deposit.

77.4 In case, the information/ document furnished by the Bidder/vendor/Contractor forming basis of evaluation of his bid is found to be false/ forged after the award of the contract, OWNER shall have full right to terminate the contract and get the remaining job executed at the risk & cost of such Bidder/Vendor/ Contractor without any prejudice to other rights available to OWNER under the contract such as forfeiture of PBG/Security Deposit, withholding of payment etc.

77.5 In case, this issue of submission of false document comes to the notice after execution of work, OWNER shall have full right to forfeit any amount due to the Bidder/Vendor/Contractor along with forfeiture of CPBG/Security Deposit furnished by the Bidder/Vendor/Contractor.

77.6 Further, such Bidder/Vendor/ Contractor shall be put on Holiday/Negative List of OWNER debarring them from future business with OWNER and EIL for a time period, as per the prevailing policy of OWNER and EIL.

77.7 For the purposes of this provision, the terms set forth below as follows:

a) "Corrupt Practice" means the offering, giving, receiving, or soliciting of anything of value to influence the action of public official in contract execution;

b) "Fraudulent Practice" means a misrepresentation of facts in order to influence the execution of a Contract to the detriment of OWNER, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive OWNER of the benefits of free and open competition.

c) "False/Fake" means to make or construct falsely. "Faked alibi" is a made, manufactured, or false alibi. Something that is not what is purports to be; counterfeit, an imposter.

d) "Forgery" means the false making or the material altering of a document with the intent to defraud. A signature of a person that is made without the person's consent and without the person otherwise authorizing it. A person is guilty of forgery if, with the purpose to defraud or injure anyone or with knowledge that he is facilitating a fraud or injury to be perpetrated by anyone, the actor (i) alters any writing of another without his authority (ii) makes, completes, authenticates, executes, issues or transfers any writing, so that it purports to be the act of another who did not authorize that act or to have been executed at a time or place or in a numbered sequence other than was in fact the case, or to, be a copy of an original when no such original exists. Utters any writing which he knows to be false in a manner specified in d) (i) & (ii) above.

77.8 OWNER may terminate the Contract if it discovers subsequently that the CONTRACTOR had engaged in Corrupt Practices or Fraudulent Practices in competing for the Contract.

78.0 SITE ORGANISATION

78.1 The CONTRACTOR shall without prejudice to his overall responsibilities and liabilities to provide adequate qualified and skilled personnel on the work. and augment the same as decided by the E-I-C from time to time depending on the exigencies of work. In addition to this CONTRACTOR shall deploy qualified and experience Safety Supervisors to ensure safer working conditions at site in accordance with Safety Policy/Guidelines attached as **Annexure-IXto SCC**& qualification requirements as per **Annexure-IV toSCC**. In case where the works are Sub-Contracted by the main CONTRACTORs, Safety Supervisors are to be provided by the main CONTRACTOR.

79.0 GENERAL GUIDELINES DURING AND BEFORE ERECTION:

79.1 The CONTRACTOR shall be responsible for organizing the lifting of the equipment in the proper sequence for orderly progress of the work and to ensure that access routes for erecting the other equipment's are kept open.

79.2 Orientation of all foundations, elevations, lengths and disposition of anchor bolts and diameter of holes in the supports and saddles shall be checked by the CONTRACTOR well in advance of the installation. Rectifications, including chipping of foundations, shall be carried out where necessary in consultation with the E-I-C. If a structural member needs to be dismantled to facilitate the equipment erection, this shall be done by the CONTRACTOR after ensuring proper stability of the main structure, based on design calculations, safe workloads etc with the approval of E-I-C. All such dismantled members shall be put back in position to the satisfaction of E-I-C after the completion of the equipment erection.

79.3 During the performance of the work the CONTRACTOR shall at his own cost keep structures, materials and equipment adequately braced by guys, struts or other approved means which shall be supplied and installed by the CONTRACTOR as required till the installation work is satisfactorily completed. Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by the CONTRACTOR or other agencies.

79.4 The CONTRACTOR shall duly comply with manufacturer(s) recommendations and detailed specifications for the installation of the various equipment and machines.

79.5 Various tolerances required as marked on the drawings and/or in accordance with the specifications and/or instructions of the E-I-C shall be maintained. Verticality shall be verified with the Theodolite and shall be maintained.

79.6 CONTRACTOR shall comply to OWNER's work permit system before any erection activities.

80.0 MECHANISATION OF CONSTRUCTION ACTIVITIES AND MOBILISATION OF CONSTRUCTION EQUIPMENT

80.1 Mechanisation of Construction Activities

80.1.1 The CONTRACTOR shall mechanise the construction activities to the maximum extent by deploying all necessary construction equipment/machinery in adequate numbers and capacities.

80.1.2 The responsibilities of CONTRACTOR shall include establishing and maintaining of a proper fabrication workshop with transportation facilities to site to carryout fabrication of steel structures, piping specials etc., preparing approaches working areas for the movement/operation of cranes and levelling the areas for assembly / erection to ensure effective mechanisation on the works. It shall be the responsibility of the CONTRACTOR to carry out leveling / dressing / grading with a proper approach for the movement of equipment and machinery, at his own cost. No extra payment shall be made by the OWNER for leveling / dressing / grading. The CONTRACTOR shall acquaint himself with availability of access, facilities such as railway siding, local labour etc. and the CONTRACTOR may have to build temporary access roads to aid his work and the Lumpsum contract Prices shall be deemed to include the same.

80.1.3 For speedy execution of work, CONTRACTOR shall also ensure use of latest computer software for at least the following:

a) Billing
b) Planning & Scheduling
c) Progress Reporting
d) Material Control & Warehousing
e) Safety Records
f) Resource Deployment

g) Communication

80.1.4 CONTRACTOR further agrees that Contract price is inclusive of all the associated costs, which he may incurred for actual mobilization, demobilization required in respect of use of mechanized construction techniques and that the OWNER/ PMC in this regard shall entertain no claim whatsoever.

80.2 Mobilisation of Construction Equipments

80.2.1 The CONTRACTOR shall without prejudice to his responsibilities to execute and complete the work as per the specifications and time schedule, progressively deploy minimum construction equipment, tools and tackles and further augment the same depending on the exigencies of work and as decided by the E-I-C so as to suit the construction schedule within scheduled completion date without any additional cost to OWNER. The bidder shall submit a list of construction equipments he proposes to deploy for the subject work along with deployment schedule. No construction equipment shall be supplied by the OWNER, unless specified by owner specifically in the bidding document.

80.3 Work in Summer/Monsoon Season

80.3.1 In addition to the Clause **Section No. V** –clause no**. 48** of GCC and Clause No. **23.5** of SCC, CONTRACTOR shall submit within **15 (fifteen) days** of award of work to the E-I-C / OWNER, his contingency plan for work during monsoon or summers clearly stating their methodology/ strategy to progress uninterruptedly during monsoon mentioning the deployment of resources viz, numbers, capacity, category of Equipment and manpower on a weekly basis for approval and their strategy to progress uninterruptedly during summers mentioning the deployment of adequate resources and utilities. During monsoon and other periods, it shall be the responsibility of the CONTRATOR to keep the construction work site free from water at his own cost by deploying suitable dewatering pumps. During summers and other periods, it shall be the responsibility of the CONTRACTOR to, within the quoted price, make alternative arrangements to cope with such deficiency. The CONTRACTOR shall adhere to provisions specified in **Annexure-IX of SCC and related other clauses** specified in Project Execution Methodology/Philosophy provided elsewhere in bidding document.

81.0 DISTINCTION BETWEEN SUB-STRUCTURE AND SUPERSTRUCTURE

81.1 To distinguish between work in sub-structure and superstructures, the following criteria shall apply:

81.1.1 For all Equipment pedestals, pipe racks, other foundation and R.C.C. Structures, work done upto 300 mm level above Highest Pavement Point / Finished Floor Level will be taken as work in substructure and work above this level will be treated as work in superstructures and payments would be made accordingly.

81.1.2 For Buildings only, all works upto level corresponding to finished floor level (Ground Floor) shall be treated as `Work in substructure ' and all works above the finished floor level shall be treated as "Work in superstructure".

81.1.3 Irrespective of what has been stated above, all pavements, R.C.C. Retaining wall, all pipe sleepers and any similar item would be taken as work done in substructure irrespective of locations, nomenclature and levels given anywhere.

Where not specifically pointed out all works in Cellars/ sumps, Drains, Manholes, Tank Pads, Cable trenches, or such similar item would be taken as work in substructure.

82.0 COMPLETION DOCUMENTS

82.1 The CONTRACTOR shall carryout various tests as called for in bidding document either on field or at outside approved laboratories at his own cost. All test results and related documents shall be submitted in 2 (Two) hard copies plus 4 (Four) soft copiesas part of completion documents for the work.

82.2 The following documents in-addition to documents specified in SCC/GCC shall be submitted in hard binder by the CONTRACTOR as a part of completion documents:

a) Test Certificate from manufacturers for all supply material.
b) Welding Procedure Qualification Report and Welder Qualification Report if applicable.
c) Execution drawing with all corrections / alterations duly marked and carried out during the execution of the work and in as built condition.

d) Field Test report for all Civil, Structural and Electrical, Instrumentation system.
e) Material Inspection / Test report for supply of all material.
f) Original "No Demand Certificate" from the Administration & Personnel Department regarding vacation of Land, housing accommodation if any, recovery of rents, hire charges, return of surplus material, reconciliation statement for all the material issued etc.
g) Original "No Demand Certificate" regarding surrendering of Gate Passes etc.
h) All other requirements as specified in the respective specifications.
i) Any other drawing/ document/ report specified elsewhere in the Bidding Document

Note: CONTRACTOR shall be eligible to apply for issue of completion certificate only after submission of completion documents as mentioned above.

83.0 COORDINATION WITH OTHER AGENCIES

83.1 Work shall be carried out in such a manner that the work of other agencies operating at the site is not hampered due to any action of the CONTRACTOR. Proper coordination with other agencies will be responsibility of the CONTRACTOR. In case of any dispute, the decision of E-I-C shall be final and binding on the CONTRACTOR.

83.2 The CONTRACTOR recognises and acknowledges that other contractors have been or may be engaged by the OWNER to advise the OWNER and to perform other work and services in respect of the Project. The CONTRACTOR shall cooperate and coordinate with the OWNER, the other contractors and their respective personnel, subcontractors, consultants and advisers, and shall provide all information and assistance and undertake all actions as may be required from the CONTRACTOR. If required by the OWNER, the CONTRACTOR shall enter into such arrangements with the other contractors, as may be required by the OWNER, to coordinate the performance of other work and services in respect of the Project.

83.3 If any part of the CONTRACTOR's work is dependent upon the work of any other contractor, it shall be the CONTRACTOR's responsibility to inspect and promptly report to the E-I-C/OWNER of any defect in such works which may affect the performance of the Scope of Supply and/or the Scope of Work. Any failure of the CONTRACTOR to notify the OWNER shall constitute an acceptance by the CONTRACTOR of the other contractors' work, and the CONTRACTOR shall not be entitled to any adjustment to the Progress Schedule or the Contract Price or any other terms of the Contract on account of such failure. Notwithstanding the above, the CONTRACTOR shall not be responsible for any inherent defects in the works performed by other contractors.

83.4 The CONTRACTOR shall consult with the E-I-C/OWNER with respect to issues pertaining to the Scope of Work and the other contractors' work, and shall participate in periodic meetings with the E-I-C/OWNER and the other contractors at the Site or such other location as may be specified, in respect thereof.

83.5 The CONTRACTOR hereby acknowledges that failure to comply with its obligations under this Clause **83.0** may result in claims by the other contractor(s) against the E-I-C/OWNER. The CONTRACTOR hereby undertakes to defend, indemnify and hold harmless the E-I-C/OWNER in respect of and against any such claim if the E-I-C/OWNER makes a determination, from the information provided to it by the other contractor(s), that such claim arose due to reasons attributable to the CONTRACTOR and that the amounts claimed by the other contractor(s) are payable.

83.6 Save as provided in this Clause **83.0**, the CONTRACTOR hereby releases and forever discharges the OWNER from all actions, suits, claims, demands, costs and other liabilities of any nature which the CONTRACTOR now has or at any time may have, might have had against the OWNER arising out of or in connection with the performance, or any negligent performance, by any of the parties, of any of their individual or collective obligations under any agreement in relation to the Project.

84.0 DELETED

85.0 COORDINATION WITH CONSULTANT

85.1 CONTRACTOR shall coordinate with CONSULTANT for his day-to-day activities and provide free access and assistance during the inspections and other activities to be carried out by E-I-C. CONTRACTOR shall comply to the requirements of CONSULTANT and obtain all the clearances from CONSULTANT for his work.

86.0 ELECTRICAL CONTRACTOR'S LICENCE

86.1 The CONTRACTOR or its nominated Sub-CONTRACTOR (s), as the case may be, shall have a valid electrical CONTRACTOR's license and electrical supervisor License for working in the State

in which the job site is located. The CONTRACTOR shall furnish a copy of the same to E-I-C before commencement of any electrical work or work pertaining to Electrical System.

86.2 No Electrical work or work pertaining to electrical system (s) shall be permitted to be executed without a valid Electrical CONTRACTORs License being produced by the CONTRACTOR or Sub-CONTRACTOR, as the case may be, intending to execute the work.

87.0 PROCUREMENT OF TMT BARS, CEMENT AND STRUCTURAL STEEL.

As per **Annexure-XXXI of SCC**.

88.0 DELETED

89.0 ERECTION OF EQUIPMENT / BARRICADING

89.1 All erection shall be carried out by deploying a crane(s) of suitable capacity. Erection by derrick shall not be permissible. The CONTRACTOR shall submit erection schemes for erection of critical equipment / Barricading to E-I-C for his approval. No equipment / barricading shall be erected in the absence of an approved erection scheme for such equipment.

89.2 Movement of Hydra is not permitted inside the Refinery premises. Contractor to refer instructions mentioned in **Annexure-XXXII** ('**DISCONTINUATION OF HYDRA CRANES WITHIN BINA REFINERY PREMISES)**

89.3 The Lumpsum Price of the CONTRACTOR shall be deemed to include load testing of the crane as required to establish the lifting capacity of the crane. The load testing shall be witnessed and certified by competent authority.

90.0 SPECIAL REQUIREMENT

a) ERECTION and Barricading Works shall be carried out as per Drawings and Technical Specifications attached with the Tender Document and as per instructions of Engineer-in charge (EIC).

b) Job shall be carried out on round the clock 24 x7 basis with intermittent break as per agreement with EIC.

c) All materials, equipment, D.P. Test Kits, Equipment for Ultrasonic Testing (if applicable), etc. to carry out Radiography and other NDT .Radiography, if carried out by Gamma Ray (using IRIDIUM 192 Source) shall meet BARC's regulations including storage and operating personnel. Radiography by X-ray, within quoted Prices, will be insisted upon if Radiographs by Gamma Ray does not meet required quality standards. CONTRACTOR to use "SAFERAD" machine for radiography to reduce radiography time.

d) Air Conditioned Dark Room with facilities like running water and those required for developing and viewing radiographs.

e) CONTRACTOR should ensure testing of Construction materials at local approved OWNER's authorized approved testing laboratory prior to starting of the job and get approval of CONSULTANT.

f) Maintenance personnel with all tools & tackles and spares should be available on round the clock basis for attending the breakdown of equipments, machinery, pump etc immediately after breakdown.

g) Contractor shall use wire rope of reputed make only along with valid Test Certificate to avoid accidents. Spare wire rope shall be kept readily available to avoid downtime.

h) Winch & Fly wheel to be provided with Safety Guard without which the rig shall not be allowed to be operated.

i) 100% PPE to be used by all workmen and personnel engaged for the job, otherwise penalty shall be imposed as per SCC.

j) The CONTRACTOR shall deploy and ensure availability of qualified supervisor including safety supervisor having full knowledge of jobs and safety on round the clock basis.

k) Dress code: All the CONTRACTOR's workers and officers should use uniform during working hrs at site and reflecting jackets in night working hours.

l) OWNER/ CONSULTANT reserves the right to physically check/verify the ownership /availability of the equipments at any stage prior to award of work. Bidder shall organize and coordinate the inspection process. OWNER/CONSULTANT's option shall be final and binding in this regard

m) CONTRACTOR to confirm that these equipments are available for deployment in this project site and shall be timely mobilized in good working condition to maintain work progress. CONTRACTOR has option to propose equipments OWNED or HIRED sources against this category.

n) CONTRACTOR to deploy well qualified ASNT Level III interpret or and Level II Personnel for scanning and reporting for NDT.

o) In case of any discrepancy between provisions of above clause **90.0** and provisions as per Technical Section of the Bidding Document, CONTRACTOR shall follow the provisions as per Technical Section of the Bidding Document.

91.0 LIABILITY OF GOVERNMENT OF INDIA

91.1 It is expressly understood and agreed by and between the CONTRACTOR and the OWNER/Consultant that the OWNER/Consultant is entering into this Contract solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this agreement and has no liabilities, obligations or rights there under. It is expressly understood and agreed that the OWNER/Consultant is/are an independent legal entity with power and authority to enter into contract, solely in its own behalf under the applicable laws of India and general principal of Contract Law. The CONTRACTOR expressly agrees, acknowledges and understands that the Employer/Consultant is not an agent, representative or delegate of Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Contract. Accordingly, CONTRACTOR hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Govt. of India arising out of this Contract and covenants not to sue to Govt. of India as to any manner, claim, and cause of action or thing whatsoever arising of or under this Contract.

92.0 GENERAL REQUIREMENTS FOR RADIOGRAPHY & OTHER NDT

92.1 CONTRACTOR shall appoint radiography/ NDT agency (ies) only after acceptance of such agency(ies) by OWNER/PMC. However, acceptance of radiography/ NDT agency by OWNER/PMC shall not absolve the CONTRACTOR of his responsibility to execute radiography work as per requirements of the Contract.

92.2 CONTRACTOR shall mobilize Radiography/ NDT agency at site along with adequate number of radiography resources/ NDT equipments & appliances, commensurate with the welding activity and quantum of Radiography/ NDT work load to avoid delays in Radiography/ NDT and consequent generation of back log. In the event of generation of back log leading to Delay/ Holdup of subsequent, activities OWNER/PMC has right to engage additional agency for carrying out the radiography at the risk and cost of CONTRACTOR including 100%(one hundred percent) overhead charge.

92.3 Radiography Check Shots

a) To verify that radiographs are being taken on the prescribed / selected welds / spots only, 5% (five percent)of already radiographed spots shall be selected by the E-I-C or his designated person for check shots. The check shots shall be taken up before any further radiography work.

b) Radiography of all check shots shall be taken by CONTRACTOR at no extra cost to EIL/OWNER. If mismatch / variation is found in any of the check shot as per para **92.3 a)**, CONTRACTOR shall have to take re-radiography of the entire lot represented by mismatched check shot (a days production or more as decided by Engineer In-Charge) at his own cost

c) In the event of any non-matching / variation is observed in re-radiography of the entire lot as per para **92.3** b) above with reference to the earlier radiographs taken, the radiography agency shall be forthright debarred from site. CONTRACTOR shall then carryout re-radiography up to maximum of 100% of all the prescribed / selected welds/ spots radiographed by the debarred radiography agency (as per direction of the Engineer In-Charge) at his own cost by engaging a separate Radiography agency acceptable to OWNER/EIL. The process for verification of radiographs through check hots shall be continued as per clause **92.3a)** above from the lots selected by the Engineer In- Charge till 2 (two) consecutive lots are found with matching check shot radiographs to the satisfaction of EIL/ OWNER.

92.4 Digital recorded close proximity/PAUT/TOFD only allowed inside the refinery /unit premises except in fabrication yards.

92.5 In case of any discrepancy between provisions of above clause **92.0** and provisions as per Technical Section of the Bidding Document, CONTRACTOR shall follow the provisions as per Technical Section of the Bidding Document.

93.0 DELETED

94.0 THIRD PARTY INSPECTION AGENCIES

94.1 Pursuant to clause no **23.10.4** of SCC the CONTRACTOR shall carry out the various tests as enumerated in the bidding document and as per direction of E-I-C either on field or outside laboratories concerning the execution of work and supply of the material by CONTRACTOR. All the expenses shall be borne by the CONTRACTOR and shall be considered as included in the quoted Lumpsum price. The inspection shall be done by following:

a) All identified capital goods, brought for permanent incorporation in site by the contractor shall be inspected as per Inspection Methodology enclosed with Technical Section of Bidding Document.
b) Representative deputed by Statutory Authority.
c) Representative deputed by Owner/EIL.

CONTRACTOR shall give prior notice sufficiently ahead of time to the E-I-C and also to the authorities / TPI to conduct inspection/ to witness such tests.

94.2 All the tests either on the field or at outside laboratory or at any other place, concerning the execution of the work and supply of materials by the CONTRACTOR shall be carried out by the CONTRACTOR at his own cost.

94.3 The work is subject to inspection at all times by the E-I-C. The CONTRACTOR shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of this bidding document, the technical documents that will be furnished to him during performance of work and the relevant codes of practice furnished to him during the performance of the work.

94.4 The CONTRACTOR shall provide, for purposes of inspection, access ladders, lighting and necessary instruments at his own cost including Low Voltage (24V) lighting equipment for inspection of work. Compressed air for carrying out works shall be arranged by the CONTRACTOR at his own cost.

94.5 Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the CONTRACTOR shall carry out the rectifications at his own cost.

94.6 All results of inspection and test will be recorded in the inspection reports, proforma of which will be approved by the E-I-C. These reports shall form part of the Completion Documents.

94.7 For materials supplied by OWNER(if any), CONTRACTOR shall carryout the tests, if required by the E-I-C, and the cost of such tests shall be reimbursed by the OWNER at actual to the CONTRACTOR on production of documentary evidence.

94.8 Inspection and acceptance of the work shall not relieve the CONTRACTOR from any of his responsibilities under this contract.

94.9 Cost towards repeat tests and inspection due to failures, repairs etc. for reasons attributable to the CONTRACTOR shall be borne by the CONTRACTOR.

94.10 Various tests as specified in specifications shall be carried out to the entire satisfaction of OWNER/ PMC.

94.11 Inclusion/exclusion of Inspection charges in the Contractor's Lumpsum quoted prices shall be as per provisions of Clause **29.18** hereof.

95.0 COMPUTERISED CONTRACTOR'S BILLING SYSTEM

Without prejudice to stipulation in GCC, CONTRACTOR should follow the following billing system:

95.1 The bills will be prepared by the CONTRACTOR on their PCs as per the standard formats and codification scheme proposed by OWNER/ CONSULTANT. The CONTRACTOR will arrange for necessary software (CONSULTANT / OWNER may indicate any specific software) for data entry to capture the relevant billing data for subsequent processing.

95.2 The CONTRACTOR will submit these data to OWNER/CONSULTANT in an electronic media along with the signed hard copy of the bill, necessary enclosures and documents. The

CONTRACTOR will also ensure the correctness and consistency of data so entered with the hard copy of the bill submitted for payment.
OWNER/CONSULTANT will utilise these data for processing and verification of bill of the CONTRACTOR.

96.0 QUALITY ASSURANCE SYSTEM

96.1 The CONTRACTOR shall adhere to the quality assurance system specified in **the Technical Section of Bidding Document.** After the award of the contract, detailed quality assurance programme to be followed for the execution of contract shall be submitted by CONTRACTOR.

97.0 DELETED

98.0 PASSES, PERMITS,HSE MANAGEMENT / SAFETY NORMS

98.1 WORKING HOURS

98.1.1 Contractor shall follow central/ BPCL enactment for working hours and shall obtain due permissions from Owner/ EIL under such enactment wherever required. Contractor shall solely be responsible for any infringements and consequential penalties or payments. The working in operational area shall be allowed between sunrises to sunset hours. Hot / cold work permits against specific safety conditions shall be required to be obtained by Contractor in advance as per guidelines of BPCL Plant authorities. Contractor may be allowed to work for 24 hours to meet project schedule. All necessary arrangements including lighting for working during night shall be in contractor's scope of work.

98.1.2 Normally Contractor shall be allowed to work on **6 (six) days** a week. For carrying out work beyond working hours; and on Sunday and holidays, Contractor shall approach the E-I-C or his authorized representative and obtain his prior written permission and permits.

98.1.3 It shall be clearly understood that such overtime working of Contractor’s personnel and equipment deployment therefore shall solely be to the cost and account of Contractor and Owner/EIL shall in no way be responsible to compensate him for the same. No extra claim shall be entertained by OWNER on any account.

98.1.4 Contractor shall be ready to arrange for additional manpower and machinery for the work in late evenings / night hours if required and ordered by Owner/EIL for completion of work as per the permissions given by Plant authorities.

98.2 IDENTITY CARDS

Contractor shall ensure that the proper identification card are issued by Contractor or its Sub-Contractor to their employees/ workers to be deputed by him for the work, duly signed by the Contractor or an authorized person on behalf of the Contractor.

98.3 ENTRY PASSES

98.3.1 The CONTRACTOR has to apply for photo Entry Passes for its workers and staff and the workers and staff of its SUB-CONTRACTOR in a prescribed proforma provided by the OWNER. The Application shall be accompanied by a Statement and Declaration in the form prescribed by the OWNER signed by the employees for whom the Entry Passes are sought and confirmed by the employer. The photo Entry Passes shall be issued by the OWNER for a maximum period of 3 (three) months, which will be extendable upon application of the CONTRACTOR.As a special case Temporary Passes may be issued for a maximum period of **7 (seven) days**. Necessary administration charges for above as applicable to be absorbed by the CONTRACTOR.

98.3.2 Unutilized / expired Entry Passes/ Identity Cards shall have to be immediately surrendered to the OWNER.

98.3.3 IncaseofthelossofanEntryPass/IdentityCardtheCONTRACTORshallimmediately lodge an FIR with the local police station and inform the E-I-C of the loss and shall pay a charge as per BPCL guidelines against Entry Pass / Identity Card lost. The CONTRACTOR is required to keep an account and track of all Entry Passes issued and surrendered.

98.3.4 Employees of the CONTRACTOR or SUB-CONTRACTOR while working inside the Plant shouldalwaysdisplaygatePasses/IdentityCardsissuedbytheSecuritySection. Entry inside BPCL Refinery premises is allowed only with all necessary PPE’s required for execution of works at site.

98.3.5 It shall be the responsibility of the Contractor to fully comply with the following Security Provisions:

(i) Entry/Access to any field / facility is governed by rules & regulations formulated from time to time by the Government of India and / or its concerned departments / agencies, which are binding on the EIL/ BPCL and Contractors, etc. All such rules and regulations (including amendments if any) are to be complied without any time and cost impact to the EIL/ BPCL. The present requirements in this regard are as follows:

For all the personnel (Indian/Foreigners) of Contractor and/or their subcontractors (of Contractor), the Procedure for security clearance as listed below will have to be strictly followed/complied with before entering the Work Site. Any subsequent changes/modifications as may be issued from time to time in this regard shall also have to be duly complied without any time and cost impact to the EIL/ BPCL.

BPCL Security Section has right to deny permission to any person to go to the Site in case either the required procedures are not complied with or any person comes without stipulated advance notice, and in that case the EIL/ BPCL will not be liable for any cost and time impact.

Duty/ Entry Passes for all the personnel are to be obtained well in advance from the Security Section of the EIL/ BPCL after providing the prescribed Declaration Forms along with 2 stamp size photographs in respect of each person.

(a) Indian nationals: Before mobilising/deputing Contractor's persons (Indian nationals) at Site and/or its subcontractor/ vendor representative (of Contractor), etc. Contractor will submit minimum 2 weeks in advance a complete list of the persons along with necessary police verification to enable BPCL's Security Section to issue necessary non employee duty (NED) passes without which no person of Contractor/subcontractor or vendor (of Contractor)is allowed to proceed to Site.

(b) For Foreign nationals: The Contractor will submit documents for obtaining necessary clearances from Ministry of Home Affairs (MHA) etc. a list of all foreign nationals required to be mobilised to site. Following information shall be provided:

i. Name& Surname
ii. Clear Scanned Copy of Passport No.
iii. Nationality
iv. Date of Birth
v. Parentage
vi. Present Address
vii. Permanent Address
viii. Clear Scanned Copy of VISA.
ix. Date visited India last
x. Purpose
xi. Duration of the last visit and
xii. Occupation.

The above documents can be sent through email prior to sending physical copy.

Contractor is to ensure that only such expatriates who are having valid passports and valid business visas are deployed for work under the Contract. Expatriates having Tourists visas are not permitted to work at site.

Contractor's personnel (crew/workers) should not be in possession of any personal camera/photography materials, Arms/ ammunition, liquor, prohibited drugs etc.

All duty/ entry passes issued for the Construction activities should be surrendered to security section of the EIL/ BPCL promptly after construction activities are over in a particular working season.

Contractor is to ensure that all the personnel engaged by them abide by the Security & Discipline Rules prescribed from time to time by the Security Section of the EIL/ BPCL.

(ii) The schedule(s) prescribed in the foregoing paras for advance submission of details regarding personnel clearance is indicative only as the clearances are to be accorded by the concerned departments of the Govt. of India. Hence EIL / BPCL will not be liable for any time & cost impact due to any delays on this account or due to change of procedures etc. in this regard.

98.4 Gate Passes

To bring materials, equipment, tools and tackle and other things inside the Refinery for construction work, the CONTRACTOR has to produce proper documents of title or authority relative there to for

inspection by personnel of the OWNER at gate. These shall be checked thoroughly by personnel of the OWNER at the Gate and recorded in their Register before permitting the same to be brought inside the Refinery limits. It is the responsibility of CONTRACTOR to see that the entry is duly recorded in the Register with proper Entry Number, date and signature of authorized representative of OWNER and that the supporting challans/documents are stamped and signed by personnel of OWNER at the gate at the time of entry.

98.5 WORK PERMIT

98.5.1 In order to keeps the E-I-C/OWNER (as applicable) informed of the various jobs being undertaken within the Refinery and to enable the OWNER to regulate the same to ensure the observance of safety regulations relative thereto. When work is to be carried out in hazardous areas, a Hot Work Permit is to be obtained by the CONTRACTOR from the E-I-C/OWNER (as applicable) before start of work on jobs which are capable of generating a flame, spark or heater, gas-cutting, grinding, welding, use of any electrical, diesel, petrol or battery operated prime mover, machine, tool or equipment or generator set, mixer machine, drilling machine; pump, crane, fork lift or hand truck or trailer or chipping or breaking of rocks or concrete or hacksaw cutting and drilling. Similarly the CONTRACTOR is to obtain a Cold Work Permit from the E-I-C/OWNER (as applicable) for jobs which do not come under the category of hot work and in respect of which there is no risk of fire e.g. transportation, backfilling of ordinary soil by manual process, pile testing, hydrotesting, shuttering, fixing of reinforcement, hand mixed concreting, plastering and brick work.

98.5.2 Depending on the nature of the work and the equipment and tools involved the CONTRACTOR shall apply for Cold/Hot Permit in a prescribed format at least 7 (seven) days before the work is planned to start. No Work Permit shall be issued by E-I-C unless proper arrangement is made by the CONTRACTOR to ensure safe performance of the work inside the Refinery limit. Job-wise and area wise permits shall be issued to the CONTRACTOR and for work against each permit the CONTRACTOR shall post at site at least one Construction Supervisor and one Safety Supervisor of required level to ensure the due observance of all safety requirements. Proper barricading as per EIL/BPCL requirement shall be installed by Contractor.

98.6 Vehicle Permit

Permits are to be obtained separately for entry/use of vehicles / trailers and other mobile equipment inside the Refinery limits. All the vehicles of CONTRACTOR should have a valid PUC certificates. The following requirements are to be met to obtain vehicle permit:

a. Vehicle/Equipment shall be in good condition and fitted with spark arrestor.
b. Vehicles should carry, wherever applicable, Valid Road tax certificate and fitness certificate from the competent authority and insurance policy.
c. Valid operating/driving license of driver/operator.
d. Type of vehicle which is allowed inside the plant shall be as per the directions given by OWNER.

98.7 Validity of the Permit

a. Any Hot or Cold Work Permit issued is issued as per BPCL Project /Operation shift rotation
b. Thereafter clearance must be renewed for each shift (Morning & Evening) by the shift in-charge/ shift representative of the OWNER.
c. The permit for defined project areas may be renewed for a maximum period of one week from the date of issue and if extension is required, the CONTRACTOR has to apply for a fresh permit.
d. The permit is not valid for work on holidays unless special permission of the OWNER is obtained for the purpose. The information given above is general in nature. Prevailing work permit system will be applicable.

98.8 Safety Regulations

Regarding Work Permit

a. The work shall be carried out inside the Refinery limits to conform to the OWNER'S safety section and in accordance with any instructions of E-I-C issued from time to time. Sometimes working hours may be drastically reduced or increased to satisfy safety requirements and the CONTRACTOR shall meet these requirements without any time and cost implications. No claim for idling of machinery, plant, manpower or equipment shall be entertained for reason of delay in the

issue of a Work Permit and it shall be the exclusive responsibility Of the CONTRACTOR to apply for, pursue and obtain the requisite Work Permit(s) well in advance of the relative requirement(s). The CONTRACTOR shall abide by all safety regulations of the plant and ensure that safety equipment for specific jobs as stipulated in the Factories Act Safety Handbook is issued to all employees during the execution of work, failing which all the works at site shall be suspended.

98.9 Regarding Hot Work

a. When doing hot work inside the plant the CONTRACTOR must ensure that the fire hose is hooked up with a fire water system and extended to the work spot. In addition, at least one fire extinguisher must be kept near the working spot. The area around and below the place of hot work must be adequately protected from sparks and hot metals by a booth made of asbestos, cloth/sheet and by wetting with water. In addition, depending on the location and hazard of the work, the CONTRACTOR shall at its own cost arrange sufficient number of additional fire hoses and such firefighting equipment of approved quality as may be required at his own cost to carry out hot job inside the plant.

b. Welding & electrical cables should be of approved quality and no jointing or loose connection shall be permitted.

c. At the end of the working day the CONTRACTOR must inform the electrical section to switch off power at sub-station end.

d. The CONTRACTOR must provide cotton clothes, safety shoe, safety helmet, safety belt, and hand gloves of approved quality to his workers to meet the safety requirement of various jobs to be carried out inside the Plant.

98.10 HOUSEKEEPING & SCRAP MANAGEMENT

98.10.1 The contractor shall maintain good housekeeping on day to day basis at the site/fabrication yard. All construction material brought by the contractor (like sand, coarse aggregate, shuttering material, scaffolding pipes etc.), steel scrap (like structural steel, reinforcement steel etc.) & other debris (like earth, shrubs, rubbish etc.) generated at site shall be stacked neatly in well defined spaces at no extra cost. Additional manpower as & when required for housekeeping shall be arranged by contractor immediately as per direction of E-I-C.

98.10.2 Cart away all the debris generated from the work outside the Refinery at his own cost and dispose it keeping BPCL indemnified of any liability and without giving rise to any complaints from local, municipal and government authorities. Metal scrap or any other scrap including wooden material shall be disposed at BPCL scrap yard category wise at his own cost as indicated by the E-I-C.

98.10.3 All moveable, salvageable, serviceable material shall be dismantled carefully and transported/ stored within refinery premises/scrap yard as directed by E-I-C.

98.10.4 In case the contractor fails to maintain the housekeeping at work site / fabrication yard / office space within refinery complex, the same shall be carried out by EIL/BPCL by deploying other agencies at risk and cost of the contractor. In addition of the same a financial penalty as per financial deterrent for violation of HSE norms against poor housekeeping will be imposed on the contractor. The financial implication of above, if any should be taken care in the quoted rate and no separate claim shall be entertained on this account.

98.10.5 The final bill of the contractor shall be linked with the area cleaning in all respects including disposal of debris/scrap etc. to the entire satisfaction of E-I-C.

98.11 HSE Compliance

98.11.1 Safety is to be given prime importance. During construction, Contractor shall strictly follow the safety procedures, precautions & norms as per SAFETY CODE, specifications on Health, Safety and Environment (HSE) Management (enclosed as ANNEXURE-XI) and requirement of latest OISD guidelines.

98.11.2 The Contractor shall also be responsible to comply with code requirements of International Standard Organization (ISO), Occupational Safety & Health Administration (OSHA), ISO-14000 series, American Petroleum Institute (API) RP and other relevant international practices. In case of conflict between the requirements of the various specifications and/or the requirements specified in the bid document, the more stringent requirement shall be followed.

98.11.3 In case of noncompliance, E-I-C shall give notice to the Contractor. In case of repeated failure of the Contractor, E-I-C is free to take actions such as withholding of bills, heavy penalty etc. The quantum of such actions will be decided by the E-I-C, considering the contract conditions.

98.11.4 The Contractor shall establish document and maintain an effective Health, Safety and Environment

(HSE) management system. After the award of the contract, detailed Health, Safety and Environment (HSE) programme to be followed for execution of contract under various divisions of works will be mutually discussed and agreed to.

98.11.5 The Contractor should be required to:

- Have in place a Safety Management System, approved by a recognized, approved authority.
- Prepare a project-specific Safety Plan for each Site
- Implement the Safety Plans.
- Ditto the above for Environmental Management

98.11.6 In case, Contractor fails to follow the instructions of E-I-C with respect to above clauses, next payment due to him shall not be released unless until he complies with the instructions to the full satisfaction of E-I-C

98.11.7 The CONTRACTOR may take suitable Insurance Policy with a view to cover themselves against the above penalties and submit a copy of the said policy to the Engineer-in-charge.

98.11.8 In case of conflict between the requirements of the various specifications and/or the requirements specified in the bidding document including penalties, the more stringent requirement shall be followed

98.12 SAFETY/FIRE PROTECTION

98.12.1 Contractor shall take all necessary measures to protect the work and Workmen against accidents and occupational disease. They shall observe and comply with all Governmental safety regulations as well asthe safety regulations prescribed by EIL/BPCL and accepted industry safety practices as required for this work.

98.12.2 The Contractor will be required to demonstrate that:

i. the management systems and the installation are adequate to ensure that the design and the operation of the installation and the equipment are safe;
ii. the potential hazards of the installation and the risks to personnel and environment have been identified and appropriate controls provided;
iii. adequate provision is made for ensuring, in the event of a major emergency affecting the installation, the safe evacuation and rescue of personnel and
iv. the statutory and OWNER's requirements relating to safety and pollution control measures are complied with.

98.12.3 Contractor shall conduct a Safety Studies Methodology which shall be completed and submitted to OWNER. Further, the Contractor shall implement the findings of the Safety Studies without impact on Schedule or Contract Price.

98.13 Rules And Regulations

Contractor shall observe national and local laws, ordinances, rules and regulations pertaining to the Works and shall be responsible for extra costs arising from violations of same.

The Contractor shall not do any exploratory excavations, including drilling/boreholes, without the previous written permission of the OWNER's Representative.

98.14 Watching and Lighting

The Contractor shall, in connection with the Works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required by the EIL/ BPCL for the protection of the Works or for the safety and convenience of the Public or others.

98.15 Safety Audits:

98.15.1 Contractor shall within 30(thirty) days of commencement of Contract and also once every 3 (three) months thereafter submit a safety report.

98.15.2 In the event of any accident or dangerous occurrence the Contractor shall forthwith send a notice of accident in the proforma (to be provided by EIL/ BPCL).

Contractor shall maintain a record of the relevant statutory and Company requirements relating to safety and pollution control measures and compliance.

The Contractor shall be responsible for following the proper procedures, as outlined below, in reporting accidents or incidence.

1) The EIL/ BPCL safety officer will be immediately notified by fastest means possible (Radio or email) of any accident which involves the following:

   a) Death from any cause whatsoever.
   b) A fractured skull, pelvis, arm, thigh or spine, forearm or leg.
   c) A dislocated shoulder.
   d) The amputation of an arm or hand, or of one or more fingers of the same hand, or of a leg or a foot.
   e) The loss of sight of an eye.
   f) Any other serious bodily injury, including internal bleeding or burns or asphyxia where such injury is likely to endanger life, cause permanent incapacity, or temporary incapacity of 5(five) days or more.

2) In case of death, the Contractor shall be responsible for immediately notifying the nearest Indian police so that they can make the proper investigation in accordance with the Applicable Laws.

3) Also in case of death, the Contractor shall immediately notify the Labor Officer of the Federal Ministry of the area in which the death occurred.

98.16 Safety Procedure:

Contractor should submit a safety procedure prior to start of the construction activities. The procedure should include the safety measures to be taken during construction work, fire fighting / safety equipment available which will be provided to terminal in case of any emergency, number of safety / fire officers and their role, periodical exercise on awareness of workers towards safety. Familiarization of workers with safety equipment, teams for fire fighting etc. In case of any emergency, Contractor should immediately mobilize all resources to combat the emergency and co-ordinate with BPCL/ EIL suitably.

Contractor should ensure that the contractor's supervisory personnel have undergone the approved basic training on fire fighting and Elementary First Aid before deployment and adequate number of trained personnel to be deployed at all times during execution at site.

In case of any accident at site causing injury to personnel, Contractor shall inform EIL/ BPCL immediately. Contractor shall also arrange for pickup and immediate medical attention for the injured personnel.

98.17 Safety Audit By Contractor/Owner:

EIL/ BPCL may conduct safety Audits at any stage of project execution and before taking over the facilities. The audit shall be based on a protocol that covers elements which can affect the safety during execution or the safe operation of the facilities in the contractor's scope of work. The protocol shall cover documentation, process hazard analysis, fire detection and suppression system, lifesaving appliances and escape routes, operating procedures, pre-startup safety review, safe work practices, safety and shut down devices, management of change, assurances of quality and mechanical integrity, emergency response control investigation of accidents, personnel protective equipments, audit team which could be conducted by the EIL/ BPCL's personnel or any agency appointed by the EIL/ BPCL for the purpose, accord full access to site and provide all relevant information, comply with the observations and recommendations of the audit.

99.0 ARBITRATION

The Clause No **94** of GCC stands replaced by the following:

99.1 Mediation and Arbitration:

99.1.1 In the event of a dispute arising out of or in connection with this contract, including any question regarding its existence, validity or termination, the parties shall first seek settlement of that dispute by mediation in accordance with the Mediation Act, 2023.

99.1.2 If the dispute is not settled by mediation within [90] days of the appointment of the Mediator, or such further period as the parties shall mutually agree in writing, the dispute shall be referred to and finally resolved by arbitration as per India International Arbitration Centre (Conduct of Arbitration Proceedings) Regulations for the time being in force, which Regulations are deemed to be incorporated by reference into this Clause.

99.1.3 The language to be used in the mediation and in the arbitration shall be English.

99.1.4 The governing law of the contract shall be the substantive law of India.

99.1.5 In any arbitration commenced pursuant to this clause:

(i) The number of arbitrator/s shall be:

a. 1 (One) - if the total claim including counterclaim, if any, under arbitration is INR 50 Crores (Indian Rupees Fifty Crores)or less; or

b. 3 (Three) – if total claim including counterclaim, if any, is of more than Rs. INR 50 Crores (Indian Rupees Fifty Crores).

(iii) The seat of arbitrationshall be Mumbai, India

(iv) The cost of the proceedings shall be equally borne by the parties, unless otherwise directed by the arbitrator/s.

(v) Neither party shall be entitled to and claim for any pre-reference or pendente-lite interest, i.e. form the date of cause of action till date of Award by Arbitral Tribunal and claim for any such interest shall not be entertained by Arbitral Tribunal and be void. Further, Arbitral Tribunal shall have no power or authority to award pre-reference or pendent-lite interest in the matter.

99.1.6 In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs) / Port Trusts inter se and also between CPSEs and Government Departments / Organizations (excluding disputes relating to Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in DPE OM No. 05/0003/2019-FTS-10937 dated 14th December 2022 and the decision of AMRCD on the said dispute will be binding on both the parties.

100.0 CHANGE IN SOURCE OF SUPPLY

100.1 Change in source of supply should be without any implication (including tax implication) to OWNER as defined elsewhere in the SCC. However any tax benefit shall be passed on to the OWNER.

101.0 MISCELLANEOUS:

In case of any dispute or disagreement in terms of the contract provisions and/or decisions of Engineers-in-Charge (EIC) /Owner during execution of the Contract, the Engineers-in-Charge (EIC) /Owner's decision shall be final and binding to the Contractor. In case of any disagreement with such decision, the Contractor shall have the right to contest such decision in writing with reasons and documentary evidence, expressing their disagreement and also have the right to take other contractual provisions for final resolution of dispute.

However, Contractor's disagreement or such action shall not affect the work in any manner and **the CONTRACTOR shall continue and be bound to continue and perform the works to completion in all respects according to the Contract (unless the Contract or Works be determined by the OWNER) and the CONTRACTOR shall remain liable and bound in all respects under the Contract as per time schedule**.

102.0 SUBMISSION OF FALSE/FORGE/FAKE DOCUMENT

102.1 In case, the information/ document furnished by the CONTRACTOR forming basis of evaluation of its Bid is found to be false / fake/ forged after the award of the Contract, OWNER shall have the right to terminate the Contract and get the remaining Works executed by a third party at the risk & Cost of the CONTRACTOR and without any prejudice to other rights available to OWNER under the Contract such as forfeiture of the Contract Performance Bank Guarantee, withholding of payment etc.

102.2 In case, this issue of submission of false/fake documents comes to the notice after execution of the Works, OWNER shall have full right to forfeit any amount due to the CONTRACTOR along with forfeiture of the Contract Performance Bank Guarantee furnished by the CONTRACTOR.

102.3 Further, any CONTRACTOR which is found guilty of any Corrupt or Fraudulent Practice or submission of false/fake /forged documents, shall be put on the negative/ holiday list of OWNER debarring them from future business with OWNER.

103.0 Governing law

This Agreement shall be construed and interpreted in accordance with and governed by the laws of India.

104.0 Deleted

105.0 MODIFICATIONS TO GCC

105.1 Following clauses of GCC stands modified:

i. GCC Clause. **18.3** shall partially modified as be as:

All compensation or other sums of money payable by the contractor to the BPCL under terms of this contract maybe deducted from his security deposit/retention money or from any sums which may be or may become due to the contractor by the BPCL on any account whatsoever under this Contract or any other Contract(s) and in the event of his security deposit/retention money being reduced by reasons of any such deductions. The contractor shall within ten days thereafter make good any sum or sums, which may have been deducted from his security Deposit/retention money. No interest shall be payable by the BPCL from sum deposited as security deposit/retention money or on any moneys due to the contractor.

ii. The word "Rates" appearing anywhere in GCC stands replaced with "Lumpsum Price & Rates".

105.2 Following clauses of **GCC** stands deleted as under:

(i) **Clauses: 30 stand deleted**.

106.0 TERMS & CONDITIONS FOR POST WARRANTY COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT (PWCAMC):

If Post Warranty Comprehensive Annual Maintenance Contract) is applicable as per Technical Section of Bidding Document, the Commercial Terms & Conditions shall be **as per Annexure – XXV of SCC**.

107.0 CONDITIONS FOR ISSUE AND RECONCILIATION OF MATERIALS:

107.1 Free Issue Materials (FIM), if any, shall be issued as per terms and conditions set forth in the GCC from Owner's stores or other issue points of EIL/BPCL as defined elsewhere in bidding document.

107.2 Every month, Contractor shall submit an account for all materials issued by Owner's in the Proforma prescribed by the E-I-C. On completion of work the Contractor shall submit "Material Appropriation Statement" for all materials issued by the Owner's.

107.3 Wherever materials are under Contractor's scope of supply, no allowances towards wastage/scrap etc. shall be accounted for.

107.4 The conditions for issue of materials by Owner's and reconciliation of such materials shall be as per specification No. 7-82-0001 attached herewith as **Annexure-XXVII** to SCC. This shall not be applicable for the materials supplied by Contractor.

107.5 Contractor shall arrange to handover piping and cables scrap arising out of civil, structural, mechanical piping and electrical & instrumentation works to OWNER at OWNER's scrap yard. The scrap shall be put in OWNER designated scrap yard properly segregated and weighed. Contractor shall refer **Annexure-X** to SCC for definition of Scrap **(applicable for Free Issue Materials)**

108.0 DELETED

109.0 CONTRACT/ CONTRACT DOCUMENT/ CONTRACT AGREEMENT:

Instead of Contract Signing between BPCL and EPCC Contractor, BPCL will issue a digitally signed/ signed Contract Agreement to the successful Bidder. Cost of Stamp paper shall be borne by CONTRACTOR.

110.0 REIMBURSEMENT OF CUSTOMS DUTY, GST & CESS/SURCHARGE ON SPECIFIED FREE ISSUE MATERIALS (FIMs) AS DETAILED IN TECHNICAL SECTION:

110.1 Subject to provisions of Clause **18.0**, FIMs shall be generally handed over to Contractor at designated location/warehouse of BPCL within the Refinery premises. However, in case as per

provisions of bidding document the FIMs are handed over to Contractor on Vendor's Ex-Work for indigenous FIMs or on FOB/CFR basis for imported FIMs following shall apply:

110.1.1 For indigenous FIMs provided to Contractor on Ex-Works basis from vendor's/manufacturer's works (if applicable as per Technical Section):

Scope of loading, Handling, Transportation upto Project Site & unloading at project site or location designated by BPCL and transportation from the designated location to work site during execution shall be in Contractor's Scope and charges towards the same shall be included in the Contractor's quoted Lumpsum price including all taxes & duties except GST.GST shall be reimbursed at actual on submission of requisite tax invoices as per provisions of SCC.

110.1.2 For imported FIMs provided to Contractor at CFR Indian Port of Entry (if applicable as per Technical Section):

Scope of Handling and Transportation for specified (Licensor supplied) FIMs is detailed in Technical section shall be Contractor's Scope. Contractor shall be responsible for all formalities related to port handling & custom clearance, transportation of FIM from CFR/CPT port of Entry in India upto Project Site & unloading at project site or location designated by BPCL and transportation from the designated location to work site during execution and charges towards the same shall be included in the Contractor's quoted Lumpsum price including all taxes & duties, except Customs duty & related levies and IGST & cess/surcharge applicable during custom clearance for these FIMs which shall be discharged by BPCL and GST. GST shall be reimbursed at actual on submission of requisite tax invoices as per provisions of SCC.

110.1.3 For imported FIMs provided to Contractor at FOB International Port of Exit (if applicable as per Technical Section):

Scope of Handling and Transportation for specified (Licensor supplied) FIMs is detailed in Technical section shall be Contractor's Scope. Contractor shall be responsible for transportation of FIM from international FOB/FCA Port of Exit, arranging ocean/air transportation from port of exit to CFR/FCA port of Entry in India, all formalities related to port handling & custom clearance , transportation upto Project Site & unloading at project site or location designated by BPCL and transportation from the designated location to work site during execution and charges towards the same shall be included in the Contractor's quoted Lumpsum price including all taxes & duties, except Customs duty & related levies and IGST & cess/surcharge applicable during custom clearance for these FIMs which shall be discharged by BPCL and GST. GST shall be reimbursed at actual on submission of requisite tax invoices as per provisions of SCC.

Contractor has to effect High Sea Sales with Owner for the FIMs before the item(s) enters custom frontier of India.

111.0 ENERGY NOTE

BPCL Bina Refinery is an ISO:50001:2018 certified Refinery and is focused on energy efficiency. In line with the same, all contractors providing services for BPCL Bina Refinery should preferably deploy energy efficient equipments such as energy efficient welding machines, LED / CFL temporary lighting and temporary window AC of BEE 4-star rating and above for execution of the work.

Energy Policy is attached as **Annexure-XIV to SCC.**

112.0 PLANNING AND DESIGNING IN PURVIEW OF VULNERABILTY ATLAS OF INDIA

112.1 Vulnerability Atlas of India (VAI) is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT – wise hazard maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation stage.

112.2 This Atlas is one of its kind single point source for the various stakeholders including policy makers, administrators, municipal commissioners, urban managers, engineers, architects, planners, public etc. to ascertain proneness of any city/location/site to multi-hazard which

includes earthquakes, winds, floods, thunderstones, cyclones and landslides, while project formulation, approvals, and implementation of various urban housing, buildings and infrastructures schemes, this Atlas provides necessary information for risk analysis and hazard assessment.

112.3 The Vulnerability Atlas of India has been prepared by Building Material and Technology Promotion Council under Ministry of Housing and Urban Affairs, Government of India and available at their website www.bmtpc.org.

112.4 It is mandatory for the bidders to refer Vulnerability Atlas of India for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning and designing the project in terms of:

i Seismic zone (II to V) for earthquakes,
ii Wind velocity (Basic Wind Velocity: 55, 50, 47, 44,39 & 33 m/s)
iii Area liable to floods and Probable max. surge height
iv Thunderstorms history
v Number of cyclonic storms/severe cyclonic storms and max sustained wind specific to coastal region
vi Landslides incidences with Annual rainfall normal
vii District wise Probable Max. Precipitation

113.0 EXTENDED STAY COMPENSATION

Extended Stay Compensation is not applicable.

114.0 OUTBREAK OF PANDEMIC

In case of any outbreak of pandemic during the execution of the contract, sub-contractor to follow all guidelines/Standard Operating Procedures issued by central govt /state govt/local authorities. Sub-Contractor to also submit compliance report to Owner/EIC. Sub-Contractor to note that quoted price isinclusive of this provision & no extra compensation on this account shall be admissible.

115.0 DELETED

116.0 SOCIAL MEDIA POLICY FOR BUSINESS PARTNER:

Social Media Terms & Conditions shall be as per **Annexure-XVI of SCC**.

117.0 PROCEDURE FOR VENDOR INVOICE PROCESSING

Refer **Annexure-XXII to SCC** for procedure for Contractor/vendor Invoice Processing.

118.0 DIGITALIZATION:

118.1 Client intends to deploy multiple digital solutions to achieve complete transparency in project execution. The digital solutions include Control Tower (dashboards) for monitoring project progress, Electronic Project Drawings & Documents Management System (EPDDMS) for repository of project drawings and documents, Project Management Information System(PMIS) for streamlining Project Monitoring, Digital Quality Inspection System(DQIS) for monitoring shop and site inspections, Digital Safety Management System(DSMS) for monitoring HSE compliance during construction, Manpower Productivity Monitoring System(MANPS) for monitoring and tracking manpower deployment at siteto monitor location and utilization of Construction equipment, Transport Management System(TMS) for tracking of critical equipment, LLIs, ODC items, Welding Management Solution, Cabling Management Solution, Piping Fabrication Sequencing (Spool Management System) etc. W.r.t. the same contractor has the following obligations:

118.2 It is mandatory for Contractor, their vendor/ subcontractor, personnel and other stakeholders engaged by the contactor to use/ provide input/ support/ implement the digital solutions as per scope documents and as directed by E-I-C.

118.3 Contractor shall be required to provide seamless interface with their systems that are used to manage the Project Planning, Scheduling & Monitoring, Engineering, Procurement, Inspections, Expediting, Construction, Pre-commissioning, Material Management, Contract Management, etc (as applicable) through APIs as per scope documents and as per directions of E-I-C.

118.4 Multiple Systems deployed by Client shall capture multiple types of data including personal data of the contractor employees by DSMS and MANPS. Contractor shall provide consent for implementation of DSMS and MANPS.

118.5 Frequency of updates to the digital solutions shall be mandatory as per requirements defined in scope documents.

118.6 Failure to provide data/info on timely basis shall be considered a breach of contract and may lead to contract termination.

118.7 Client will arrange training for the systems for contractor personnel. Contractor shall be required to make their relevant personnel available for the training as per the training schedule.

118.8 Contractor shall be liable for penalties for damaging the digitalization hardware, sensors, devices etc. as per tender documents.

118.9 Contractor shall comply with cyber security guidelines/advisories/acceptable use policy issued by BPCL/EIL.

118.10 In case, any of the systems are not deployed, or are stopped during the course of the contract; executing, reporting and monitoring of the work will continue through traditional methods, other platforms as directed by the E-I-C.

118.11 Non availability of platforms will not be a reason for seeking time extension, change orders pertaining to time and/ or cost.

118.12 Wherever applicable, the contractor to update the progress, quality and safety through the mobile app.

118.13 For refinery area, the contractor to bring flame-proof mobile devices and to install the SI suggested apps.

118.14 Detailed scope of digitalisation for the subject contract has been covered in the Technical Section of Bidding Document.

119.0 REPRESENTATION AND WARRANTIES

119.1 The CONTRACTOR represents and warrants to the OWNER that:

119.1.1 they are duly organised and validly existing under the laws of India, and has full power and authority to execute and perform its obligations under this Contract and to carry out the transactions contemplated hereby;

119.1.2 they have taken all necessary corporate and other actions under Applicable Laws to authorise the execution and delivery of this Contract and to validly exercise their rights and perform its obligations under this Contract;

119.1.3 this Contract constitutes their legal, valid and binding obligation, enforceable against them in accordance with the terms hereof, and their obligations under this Contract will be legally valid, binding and enforceable obligations against them in accordance with the terms hereof; and

119.1.4 they are subject to the laws of India, and hereby expressly and irrevocably waives any immunity in any jurisdiction in respect of this Contract or matters arising thereunder including any obligation, liability or responsibility hereunder.

119.2 The OWNER represents and warrants to the CONTRACTOR that:

119.2.1 they have full power and authority to execute, deliver and perform their obligations under this Contract and to carry out the transactions contemplated herein and that they have taken all actions necessary to execute this Contract, exercise its rights and perform its obligations, under this Contract;

119.2.2 they have taken all necessary actions under Applicable Laws to authorise the execution, delivery and performance of this Contract;

119.2.3 they have the financial standing and capacity to perform its obligations under this Contract; and

119.2.4 this Contract constitutes a legal, valid and binding obligation enforceable against them in accordance with the terms hereof.

119.2.5 In case the contractor is a foreign party, they shall obtain all permits/registrations from Competent Authority in India for performance of the Contract and shall comply with provisions of the Contract, shall remain valid, binding and enforceable against the CONTRACTOR thorughout the term of this Contract.

120.0 FURTHER ASSURANCES

Each Party must do, sign, execute and deliver and must procure that each of its employees and agents does, signs, executes and delivers all deeds, documents, instruments and performs all such further acts reasonably required of it or them, render any and all such assistance and do all such further things as may be necessary, expedient or desirable to ensure the complete and prompt fulfilment, observance and performance of the provisions of the Contract and give full effect to this Contract and the rights and obligations of the Parties under it.

121.0 CONTRACTORS PERFORMANCE EVALUATION (APPLICABLE FOR ESTIMATED VALUE MORE THAN INR 50 CRORES)

The performance evaluation of BIDDER shall be done as per the enclosed **Annexure-XVIII** to this SCC.

122.0 Except as otherwise specified in the Contract: (a) the CONTRACTOR accepts complete responsibility for having foreseen all difficulties and costs of successfully completing the Works; (b) the Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs; and (c) the scheduled completion date in accordance with the Project Schedule shall not be adjusted to take account of any unforeseen difficulties or costs. For the purposes of this Clause, unforeseeable difficulties include physical conditions like man-made or natural physical conditions including sub-surface and hydrological conditions which the CONTRACTOR encounters at the Site during execution of the Works

BINA PETCHEM AND REFINERY EXPANSION PROJECTS (BPREP)

SUPPLEMENT TO SPECIAL CONDITIONS OF CONTRACT (SSCC)

FOR
STEAM GENERATION PACKAGE OF BPREP

The clauses of SPECIAL CONDITIONS OF CONTRACT (SCC) have been modified/altered/replaced to the following extent:

S.NO.	CLAUSE NO.	CLAUSE HEADING	AMENDED/ NEW CLAUSE
1.	1.2.9	GENERAL - Catalyst	Deleted.
2.	1.2.35	GENERAL - Foreign Currency	This clause stands deleted.
3.	1.2.45	GENERAL - Licensor/ Process Licensor	Deleted
4.	1.2.62	GENERAL – Price of Materials	**Clause 1.2.62 is replaced as under:** "Price of Materials" shall mean the price of permanent materials and equipment which are finished goods and included under PRICE OF SUPPLY; and shall also include the Construction Materials which are included under the PRICE OF CONSTRUCTION/ INSTALLATION including the taxes and duties as per provisions of Bidding Document.
5.	1.2.59	GENERAL - Plant	**Clause 1.2.38,1.2.60, 1.2.73 stands replaced as under:** "UNIT/ Plant/ PLANT" shall mean the totality of Facilities for STEAM GENERATION PACKAGE as per the provisions of the Technical Specifications of the Bidding Document.
6.	1.2.81	GENERAL - Unit	
7.	1.2.85	GENERAL - Plant	
8.	1.2.73	GENERAL - Security Deposit (SD) / Contract Performance Bank Guarantee (CPBG)"	This clause stands modified to the following extent: Bank Guarantee(s) shall include e-Bank Guarantees & Insurance Surety Bond.
9.	4.0	Security Deposit (SD)/ Contract Performance Bank Guarantee (CPBG)	"Bank guarantee(s)" or "Bank guarantee" or "BG" mentioned in Clause 4.0 of SCC shall mean "Bank guarantee/e-Bank Guarantee/Insurance Surety Bond"
10.	4.1	Security Deposit (SD)/ Contract Performance Bank Guarantee (CPBG)	a) Para 3 of Clause 4.1 of SCC is Deleted. b) Following has been added to Clause 4.1 of SCC: *"Insurance Surety Bond" in lieu of Bank Guarantee towards SD/CPBG shall also be acceptable as per provisions of Clause No. 18 of GCC.* *In case of Insurance Surety Bond, the same shall be from the Insurance company as approved by Insurance Regulatory and Development Authority of India (IRDAI)."*
11.	4.6	Security Deposit (SD)/ Contract Performance Bank Guarantee (CPBG)	Rate of Interest shall be **11.40%** i.e., SBI base rate prevailing on the date of issue of enquiry plus 1% (10.40% + 1%)

S.NO.	CLAUSE NO.	CLAUSE HEADING	AMENDED/ NEW CLAUSE
12.	5.1.3 (f)	PLANS, DRAWINGS AND APPROVALS FURNISHED BY OWNER	The word “Licensor’s” stands replaced by PMC/Owner.
13.	11.5 & 11.6	SUSPENSION OF WORK & SUPPLIES	a) Following has been deleted from Clause 11.5 to SCC: *“in accordance with the provisions of Clause No. 42 of GCC”* b) **“Clause 40.1.1”** in Clause **11.6** to SCC shall be read as “**Clause 40.1.1 g)”**
14.	20.11.4	SHIPPING AND OTHER DOCUMENTS	Following has been added to Clause No. **20.11.4**: The charges for Stamp Duties or other incidental charges (except for payment for Custom Duties for items imported under MOOWR scheme), as applicable, for Custom Clearance shall be borne by Contractor.
15.	23.1.14	PERFORMANCE OF WORKS	“Project Execution Philosophy” mentioned anywhere in SCC and “Project Execution Plan” are synonymous.
16.	23.7.1.8	PRICE REDUCTION FOR SLIPPAGES IN COMPLETION	The words “and Feedstock” stands deleted.
17.	24.3	EXECUTION OF THE WORK	“SBI base rate (on date of enquiry issuance)” mentioned in para.2 of Clause No. 24.3 of SCC shall be read as “SBI base rate (as on the due date of such payment)”
18.	27.0	ENGINEERING SUB-CONTRACTOR	Clause no. 27.0 stands deleted.
19.	31.1.1 & 31.4	TESTS, COMMISSIONING AND POSSESSION OF WORKS	The words “and/or of the Process Licensor” stands deleted.
20.	34.3	ENGINEERING GUARANTEE	“residual process design” appearing in clause 34.3 and its sub-clause shall be read as “residual process design (if applicable as per Technical Section of the Bidding Document)”
21.	34.3.1 and 34.3.2	ENGINEERING GUARANTEE	Phrase “(including Hazop & Hazanas specified)” as appearing in the respective clauses stands replaced by “(including Hazop & Hazanas, if applicable as per Technical Section of the Bidding Document)”.
22.	34.3.3	ENGINEERING GUARANTEE	Words *“the Front-End Engineering Design (FEED)”* as appearing in the clause stands deleted. Words *“the Technical Section of”* are added before the words *“Bidding Document”*

S.NO.	CLAUSE NO.	CLAUSE HEADING	AMENDED/ NEW CLAUSE
23.	34.5.6(a)	PERFORMANCE GUARANTEE	The last sentence *"Such tests and/or operations shall be conducted in conjunction with the Process Licensor, if the UNIT as a whole fails to meet the Process Licensor's process guarantees."* appearing in Clause No. 34.5.6(a) stands deleted.
24.	34.5.6(b)	PERFORMANCE GUARANTEE	Words *"the Process Licensor or"* appearing in Clause no. 34.5.6(b) stands deleted.
25.	34.6.1	COMMISSIONING	The words "Licensor," stands deleted in fourth line.
26.	34.6.2	COMMISSIONING	Words "3 (three) months of Mechanical Completion" specified in Clause 34.6.2, stands replaced with "Time period for Commissioning specified in Annexure-I to SCC"
27.	34.6.6; 38.3; 40.1.1 i)	COMMISSIONING; FINAL CERTIFICATE AND RELEASES OF SECURITY DEPOSIT; TERMINATION	"Bank Guarantee(s)" mentioned in Clause No. 34.6.6, 38.3 and 40.1.1 i) of SCC shall also include "Insurance Surety Bond". In case of Insurance Surety Bond, the same shall be from the Insurance company as approved by IRDAI.
28.	34.7.1	GUARANTEE PERFORMANCE TESTS	The words *"the Process Licensor,"* stands deleted in third line.
29.	34.8.1	COMMISSIONING SPARES	Last sentence of para.2 of Clause No. 34.8.1 of SCC shall be read as "The provisions shall also be applicable for spares referred to under Clause 34.8.2, 34.8.3 & 34.8.4 hereof.
30.	34.8.3	OPERATION & MAINTENANCE (O&M) SPARES	Clauses 34.8.3 stands modified to the following extent: a) Clause 34.8.3 a) stands deleted b) The CONTRACTOR shall, within **3 (three) months** from Letter of Acceptance (LOA) or as mutually agreed between CONTRACTOR and Owner, furnish to the OWNER the price list for O&M spares for **2 (two) years Operation & Maintenance** as recommended by manufacturers of various equipment (other than commissioning and mandatory spares). The prices shall remain valid up to Defect Liability Period. Price lists of these spares shall not be included in quoted Lumpsum Price.
31.	35.6.4.3 (New Clause)	MODE OF PAYMENT AND TAX DEDUCTIONS	Following Clause has been added as under: If during the performance of the Contract the CONTRACTOR, owing to CONTRACTOR's default, imports materials for Home Consumption (wherein the CONTRACTOR become consignee of the goods by filling Bill of Entry in their name of the CONTRACTOR), which they have indicated to be imported under MOOWR scheme in their offer, then in such case CONTRACTOR shall be paid only the Indian Rupee equivalent of the foreign currency amount (i.e. the CFR price) of such

S.NO.	CLAUSE NO.	CLAUSE HEADING	AMENDED/ NEW CLAUSE
			materials as indicated in the priced bid/ Bill of Materials or in the Schedule of Activities relevant to the formation of the Contract, converted at the currency SBI TT(Telegraphic Transfer) Sale Rate prevailing on the date of payment by the CONTRACTOR or prevailing on the day of priced bid opening, whichever is less, for such supplies. The liability of payment of Custom Duties & related duties in such cases shall be in CONTRACTOR's scope and OWNER will not reimburse CONTRACTOR any Custom Duties & related duties or pay for any variations of Custom Duties. Any change in such sourcing shall be subject to the OWNER's prior consent. However, in such a case, the CFR price indicated in the Contract shall stand reduced by the price attributable to such supplies.
32.	35.6.5.4 (New Clause)	MODE OF PAYMENT AND TAX DEDUCTIONS	Following Clause has been added as under: If during the performance of the Contract the CONTRACTOR, owing to reason(s) attributable of OWNER, has to imports materials for Home Consumption wherein the CONTRACTOR become consignee of the goods by filing Bill of Entry in their name of the CONTRACTOR, which have been indicated to be imported under MOOWR scheme in the Contract, then the payment of Custom Duties & related levies to the relevant Customs Authorities for such supply items shall be in CONTRACTOR's scope. BPCL shall reimburse to the CONTRACTOR such Import Duties paid by the Contractor at actuals in Indian Rupee subject to furnishing requisite proof of payment of Custom Duties to the Customs Authorities. However, such reimbursement shall be limited to the amount of the Custom Duties & related levies as quoted by the CONTRACTOR for such items in the respective format of Schedule of Prices (**FORM-SP-9A**) converted to Equivalent INR considering Foreign Exchange (RBI reference rate. In case RBI reference rate is not available SBI TT Sell rate shall be considered) prevailing on the date of Price Bid Opening. In the above case, provisions of variations of Basic Customs Duties & Social Welfare Surcharges etc. as per provisions of Annexure-XXIV of SCC shall be admissible.
33.	35.6.6	MODE OF PAYMENT AND TAX DEDUCTIONS	Clause 35.6.6 stands deleted.
34.	42.0	LABOUR LAWS AND REGULATIONS	• Clause No. 42.1.2 of SCC stands replaced as below: *"Contractor shall adhere to provisions of BUILDING AND OTHER CONSTRUCTION WORKERS CESS(BOCW) as per Clause No. 100 of GCC."*

S.NO.	CLAUSE NO.	CLAUSE HEADING	AMENDED/ NEW CLAUSE
			• Clause No. 42.1.3 of SCC stands deleted.
35.	49.3	PATENTS AND ROYALTIES	Last Sentence *"Excluded from the scope of this indemnity is any patent, design information or other right arising out of work done or performed or materials supplied strictly in accordance with the process design provided by the Process Licensor within the exclusive scope of the Process Licensor."* appearing in Clause No. 49.3 stands deleted.
36.	80.3.1	Work in Summer/Monsoon Season	"Project Execution Methodology/Philosophy" mentioned in Clause No. 80.3.1 shall be read as "Project Execution Plan"
37.	94.12 (New Clause)	THIRD PARTY INSPECTION AGENCIES	Following clause has been added: In case, inspection of material as per Inspection Methodology is in Scope of TPIA, then such Materials shall be inspected as per scope of inspection by TPIAs which are registered under "NABCB accredited bodies as per requirement of ISO/IEC 17020 as Type A" in QCI's NABCB website as on the date of Inspection of Goods. The link is as below: http://nabcb.qci.org.in/accreditation/reg_bod_inspection_bodies.php
38.	105.3 (New Clause)	MODIFICATIONS TO GCC	"MEMORANDUM OF AGREEMENT" enclosed with GCC dated 08.01.2025 stands replaced by "FORM OF CONTRACT" attached as Annexure-XXX to SCC.
39.	121.0	CONTRACTORS PERFORMANCE EVALUATION	Provisions of Clause No. 121.0 shall be applicable for this tender.
40.	General	Refinery / Refinery Complex / Refinery premises	The subject tender is for "STEAM GENERATION PACKAGE FOR BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF BPCL" and accordingly, the reference of Refinery / Refinery Complex / Refinery premises in SCC shall be read as "Bina Refinery & Petrochemical Complex of BPCL" as the context so requires.
41.	Annexure-X To SCC	TERMS OF PAYMENT	Following note has been added to Clause No. **1.1** of **Annexure-X** to SCC: *"The value of advance Bank Guarantee towards supplies against Clause No. 1.1 above will be allowed to be reduced on the written request of the CONTRACTOR in not more than 04 (four) occasions during the execution of the Contract and on recommendation and certification of E-I-C for receipt and acceptance of materials in good condition at Site and on adjustment of advance by Owner."*

ANNEXURE - I
TO
SPECIAL CONDITIONS OF CONTRACT

[TIME SCHEDULE]

TIME SCHEDULE

NAME OF WORK	CONTRACT DURATION/ TIME OF COMPLETION
Name of Work: STEAM GENERATION PACKAGE FOR BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL) **Bidding Document No.:** JP/B957-000-EB-T-0020/1004	1. **Mechanical Completion** of STEAM GENERATION PACKAGE to be achieved within **22 (Twenty-Two) Months** from the date of Award/ Letter of Acceptance (LOA). 2. **Pre-commissioning and Commissioning** to be achieved within **2 (Two) Months** from the date of Mechanical Completion of STEAM GENERATION PACKAGE. 3. **Performance Guarantee Test Run (PGTR)** of STEAM GENERATION PACKAGE to be achieved within **6 (Six) Months** from the date of Commissioning. In case PGTR not conducted by BPCL within the stipulated time, payable amount against PGTR shall be released to the contractor against equal amount of Bank Guarantee.

Note:

1. The time for completion shall be reckoned from the date of issue of LOA/Mechanical Completion, as applicable.
2. The time indicated is for completing all the works in all respects as per scope of work, specifications, codes, drawings and instructions of Engineer-in-Charge.
3. It should be noted that the period of completion of all works given above includes time required for mobilisation at site, carrying out the works as per the requirements Contract Document, demobilisation, preparation of all reports in requisite quantities as mentioned in the Bidding document, rectifications, if any, rework etc. complete in all respects to the entire satisfaction of Engineer-in-Charge.
4. Fronts [i.e., Physical front (Corresponding to drawing)] shall be released to the contractor as per enclosed sheets.

(SIGNATURE OF BIDDER)

FRONT AVAILABILITY

JOB SPECIFIC INFORMATION ON MAJOR FRONTS AND THEIR PROPOSED AVAILABILITY TO SUCCESSFUL BIDDER

Details	Physical front	Remarks
At time of Award	100%	100% Physical Front shall be made available to Contractor at time of Award of Work

ANNEXURE - II
TO
SPECIAL CONDITIONS OF CONTRACT

[LOADING AND GUARANTEES]

PERFORMANCE GUARANTEE
AND
LOADING & PENALTY CRITERIA
FOR
STEAM GENERATION SYSTEM PACKAGE

PROJECT:	**MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)**
UNIT:	**STEAM GENERATION PACKAGE**
OWNER:	**BHARAT PETROLEUM CORPORATION LIMITED (BPCL)**
PMC:	**ENGINEERS INDIA LTD.**
JOB NO.:	**B957**

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ABBREVIATIONS

D_F- Discounting factor
EIL-Engineers India Ltd.
GCV- Gross Calorific value
HMBD- Heat and Mass Balance diagram
HP-High pressure
LCV- Lower Calorific value
LP-Low pressure
LPC- Loading & Penalty Criteria
MCR-Maximum continuous rating
MP-Medium pressure
MSSV-Main steam stop valve
NOx -Oxides of Nitrogen
NPV - Net Present Value
PGTR- Performance Guarantee Test Run
PM- Particulate Matter
PMC- Project Management Consultant
PTC – Performance test code
SO2- Sulphur Dioxide
TPH-Ton per hour

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1.0 SCOPE:

This specification describes the requirement of performance guarantee, liability, loading, reduction in price & penalty and criteria applicable to Steam Generation package.

The penalty / price reduction criteria defined in this document shall be independent of any other penalty / price reduction specified elsewhere in the bid / enquiry.

The Contractor's (Bidder) responsibilities are obligated towards meeting the quality and performance-linked guarantees outlined below and also extensively described elsewhere in the tender document. Guarantee requirements as spelt out in this document are to be demonstrated by the EPC Contractor during Performance Guarantee Test Run (PGTR) for acceptance of the various facilities of the package.

2.0 BASIS FOR PERFORMANCE GUARANTEES:

Loading, Reduction in Price and Penalty criteria for Steam Generation package shall be based on parameters as specified in this document.

2.1 General:

2.1.1 Prior to conducting PGTR, EPC Contractor shall demonstrate the operability and performance of the individual equipment & associated auxiliaries as per requirements specified in tender.

2.1.2 The guarantee parameters shall be adjusted suitably in the event of variation in the design ambient conditions, export & import steam parameters at B/L, fuel properties as specified in the bid document, to the prevailing site conditions, as required. In such a case, EPC Contractor shall establish the adjusted parameters with necessary supporting documentations, calculations & technical justification.

2.1.3 All necessary tools, tackles, nozzles, flanges / blinds, tubing, instruments, accessories etc. shall be arranged by EPC Contractor without any additional cost & time implication during PGTR. Performance Guarantee shall be exclusive of instrument tolerances/uncertainties.

2.1.4 Prior to conducting PGTR, the EPC Contractor shall perform reliability test for 14 days of continuous operation of Utility Boiler (UB) and associate systems / auxiliaries. Total outage of 36 hours within the limit of 14 days is permitted and one continuous outage should not exceed 6 hours during reliability test.

2.1.5 EPC Contractor shall be responsible for performance guarantees (i.e. w.r.t process, thermal & hydraulic design, mechanical design parameters) & workmanship of complete package including Utility Boiler, associated auxiliary, accessories, bought outs, associate systems / sub systems & other facilities as per the tender.

2.1.6 EPC Contractor's guarantee shall also include sub-ordered, sub contracted & bought out items forming part of the total supplies.

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2.1.7 The EPC Contractor shall modify / replace any part of equipment/component/sub system/system / auxiliary/ accessories free of cost and without any time implication if: -

i) Faulty design offered by the EPC contractor,
ii) There is defect in material or workmanship/manufacturing process and/or it does not comply with technical & fabrication requirements or there is inappropriate selection of material for the service condition
iii) If fails to achieve the capacity, requisite operating parameters, performance and efficiency requirements,
iv) If not comply with various technical requirements specified in the bid package,
v) The material supplied is damaged during transit or during execution of the work or pre-commissioning/commissioning or during start-up
vi) The reliability and/or PGTR is not successful.

Alternatively, if the Owner / PMC is not satisfied with corrective measures being taken by the EPC contractor, Owner / PMC shall reserve the right to replace such defective parts / components / sub system / system/ auxiliaries / accessories after intimating the EPC Contractor and shall be entitled to recover the costs of such replacements from the EPC Contractor. However, this shall no way absolve the EPC contractor from his responsibilities.

2.1.8 Owner's / PMC inspection or review of EPC contractor's/vendor's designs / drawings / documents or agreed deviations shall not absolve the Contractor from his responsibility towards guarantee and workmanship.

2.2 Minimum requirement for Performance Guarantee Test Run:

PGTR shall be performed after the demonstration of satisfactory reliability test of complete steam generation package along with all associate auxiliary & accessories, component / equipment, system/sub system,

2.2.1 All instruments used for the performance testing shall be calibrated against standard instruments at a reputed laboratory (to be approved by PMC / Owner). Necessary calibration certificates shall be obtained by the EPC Contractor / Sub contractor / OEM before conducting PGTR.

2.2.2 For PGTR for Steam Generation package at site, EPC Contractor shall submit the detailed PGTR procedure for the approval of the OWNER / PMC during detail engineering phase, prior to conducting PGTR.

2.2.3 PGTR shall be conducted only after steady state operation is established for individual system / equipment of Steam generation Package. The PGTR shall be carried out as per time schedule as indicated in commercial section of tender.

2.2.4 Applicable Performance testing code for Utility Boiler is ASME PTC 4.0

2.2.5 PGTR shall be conducted for "Normal Guaranteed Operation" at least for 72 hours for Utility boiler along with associate systems / auxiliaries. However, 2 hours observation period for recording of various parameters and data during PGTR shall be considered for comparing with guaranteed figure.

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2.3 Guarantee operation

Fuel consumption measurement in UB shall be done indirectly based on heat loss method. However, direct method also shall be adopted for fuel consumption measurement for reference & record only. **Parameters and conditions as defined below for "Guarantee Operation"** shall be used for Loading and Penalty.

During "**Guarantee Operation"** net export of steam & BFW at "Steam Generation System Package" battery limit shall be met as defined below. For Guarantee parameters, refer clause 2.4.

2.3.1 **Definition of "Guarantee Operation" of Steam Generation Package:**

a) Utility Boiler shall be operating at required capacity to meet internal steam consumption and export of 219.3 TPH VHP steam at 108.7 kg/cm2(g) and 510 deg. C at package battery limit.
b) Fuel for Utility boiler shall be Natural Gas (RLNG) as per Annexure-2.
c) Following steam turbine drives/steam consumers shall be in operation:
   i. 1 No. BFW Pump for Utility Boiler.
   ii. 1 Nos. FD fan for Utility Boiler
   iii. 1 No. DM water pump
d) Internal steam consumption as required for deaerator etc shall be met through exhaust of turbo drives (refer cl. 2.3.1 (c)) and balance through PRS / PRDS.
e) Except export of 219.3 TPH VHP steam (refer cl. 2.3.1 (a)), no other steam export at any other level is required at battery limit. However, excess steam (if any after meeting internal consumption) at any other level within package shall be terminated at B/L at LP steam level only. LP steam parameter at Steam generation package B/L shall be 6 kg/cm2(g) pressure and 200°C temperature. Any credit of LP steam export shall not be applicable.
f) Electrical heaters shall not be permitted for heating of any utility / media / fuel applicable to boiler & auxiliaries' system.
g) Net export of 38.5 TPH VHP Boiler feed water (BFW) at 125 kg/cm2(g) and 110 deg.C shall be from battery limit.
h) No continuous blowdown from utility boiler shall be considered during observation period.
i) Condensation of steam from any level for any purpose is not to be considered.
j) The generated steam shall meet the quality parameters as per SGP Design Basis (Doc No. B957-420-80-44-DB-3201).
k) The UB shall also be meeting all the environmental regulations in line with the bidding document.
l) All other design consideration shall be as per design basis (B957-420-80-44-DB-3201).

2.3.2 The conditions to be followed during "**Guarantee Operation**":

a) Ambient temperature 30 deg. C and 54% RH shall be considered
b) Natural gas (RLNG) shall be made available at ambient (30 deg.C) and pressure of 45 kg/cm2g.
c) Gross Heating value (GHV) of Natural gas shall be 13003 kcal/kg.

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d) DM water at temperature 40 deg.C and 5 kg/cm2(g) shall be available at Battery Limit.
e) Polished Condensate import at battery limit shall be zero during PG test.
f) Flue gas temperature at stack inlet of Utility boiler shall be mandatorily 120 deg C.
g) Boiler feed water temperature at economizer inlet of Utility boiler shall be mandatorily 110 deg.C
h) For any variation in input parameters (sl. No. a, b, c & d of clause 2.3.2) at battery limit of package during PGTR at site, Contractor shall use enthalpy correction factor as agreed mutually prior to the test or correction curves submitted during bid.
i) Steam enthalpy values shall be as per IAWPS-IF97 ASME industrial formulation.

2.3.3 Bidder shall develop detailed 'Heat and Mass Balance diagram' (HMBD) - for the **Guarantee Operation (without guaranteed fuel consumption value)** and submit along with technical bid**. However, fuel consumption guaranteed value is to be submitted in sealed price bid only.**

HMBD shall include following minimum details i.e. Steam parameters (pressure & temperature) from Utility boiler at Main steam stop valve (MSSV) outlet , VHP & LP steam parameters (pressure, temperature & flow) at B/L, Boiler feed water pressure and temperature at economizer inlet in Utility boiler, VHP export BFW parameters (pressure, temperature & flow) at B/L, DM water parameters (pressure & temperature) at B/L, Fuel temperature and pressure at burner inlet, Deaerator outlet temperature, flue gas outlet temperature at stack inlet from utility boiler, excess oxygen (dry volume basis) in flue gas of utility boiler. Bidder to also submit all these above details in Annexure-3. The battery limit conditions and parameters given in the tender cannot be altered & not permitted.

Net export of steam & BFW at rated parameters, as stated above, shall be without any negative tolerance.

Total fuel consumption quoted by bidder, shall be without any positive tolerance.

2.4 Guarantee Parameters

2.4.1 Parameters for guarantees shall be furnished by the bidders:

Natural Gas (RLNG) consumption for ***Guarantee Operation***	Kg/Hr	Bidder to report & guarantee
Turndown of UB *Required Turndown: ≤ 20% MCR on gaseous fuels delivering* VHP steam at 108.7 kg/cm2(g) and 510 deg. C at package battery limit.	%MCR	Bidder to report & guarantee

2.4.2 Separately, the following equipment guarantees & specification guarantees for all applicable main & alternate fuels shall be provided by Contractor:

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Utility Boiler Steam Generation Capacity- MCR Minimum Required MCR is 265 MT/Hr	MT/Hr	≥ 265 MT/Hr Bidder to report & guarantee
Turndown of UB on superheater temp. control and auto-combustion control	%MCR	≤ 20% to ≤ 30% of MCR for Gaseous fuels ≤ 30% of MCR for Liquid fuels
Ramp up time of Boiler (*From quoted Turndown value by bidder to 100% MCR while running on Gaseous Fuel*)	Minutes	≤ 10 minutes Bidder to comply minimum Ramp - up time and report actual Ramp-up time in minutes & guarantee the same.
Steam purity as specified (*At the outlet of Utility Boiler*)		As per Design Basis (B957-420-80-44-DB-3201)
Stack Pollution/Emission Rates from Utility Boiler for all operating range from MCR to Turndown in line with B957-420-80-44-DB-3201 a) Sulphur Dioxide (SO2) - Gaseous fuels /liquid fuel b) Oxides of Nitrogen (NOx)-Gaseous fuels/liquid fuel c) Particulate Matter (PM) - Gaseous fuels /liquid fuel d) Carbon Monoxide (CO) - Gaseous fuels/liquid fuel e) Nickel & Vanadium (Ni+V) - liquid fuel		a) ≤ 50 mg/NM3 / 850 mg/NM3 b) ≤ 250 mg/NM3 / 350 mg/Nm3 c) ≤ 5 mg/NM3 / 50 mg/Nm3 d) ≤ 100 mg/NM3 / 150 mg/Nm3 e) ≤ 5 mg/Nm3
Deaerator performance for its rated capacity and turndown, however performance shall be demonstrated for ***Guarantee Operation***		O_2 at Deaerator outlet: - The oxygen content of the deaerated water shall be limited to 7 ppb (wt) without any chemical dosing when

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		tested by accepted Schwartz-Gurney modification of Winkler test of the referee method Ä' or non-referee method 'D' as described in ASTM-D888 CO_2 at Deaerator outlet: - NIL i.e. free Carbon dioxide content should not be detectable when tested by precise evaluation method 'D' as described in ASTM-D513

Guarantees shall be for all applicable fuels while PG test shall be conducted for RLNG.

2.4.2.1 **Utility Boiler Steam Generation Capacity (MCR):** Steam Generation capacity (i.e.; MCR) at rated steam parameters (i.e. pressure & temperature) and at prevailing ambient temperature (from the range of minimum ambient to maximum ambient) as quoted by bidder in technical offer shall be guaranteed and demonstrated during PGTR. No negative tolerances are acceptable on the MCR & steam parameters.

2.5 The Steam Generation Package shall also be meeting all the environmental regulations as specified elsewhere in the tender document.

3.0 LOADING CRITERIA:

Cost of loading due to differential guaranteed figures shall be worked out for "**Guarantee Operation**" as defined in this document and according to the same loading criteria is specified below:

3.1 For the purpose of the loading, following Parameters shall be followed:

a) Fuel Consumption in Utility Boiler

Datum value for fuel (RLNG) consumption shall be as **15700 kg/hr** for evaluation purpose.

In case bidder quotes higher fuel consumption than the datum value, loading shall be applicable as per LOADING FORMULA as given below. However, no credit shall be given for quoting lower than the datum value and negative loading shall not be applicable for evaluation.

b) Boiler turndown (> 20% to ≤ 30%)

Turndown datum value of Utility Boiler is **20% MCR** capacity with gaseous fuel and steam parameters of 108.7 kg/cm2(g) and 510 deg.C at package battery limit.

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In case, Bidder quotes higher turndown than the datum value (20% of MCR), Loading shall be applicable as per LOADING FORMULA as given below. However, no credit shall be given for quoting lower than the turn down datum value and negative loading shall not be applicable for evaluation.

3.2 Loading shall be considered for the period of 10 years @ 8000 hours per year with following applicable rates and formula while evaluating the bid.

3.3 Differential Operating Cost

Differential operating cost is defined as under:

Loading (C) on account of parameters as defined above in 3.1 shall be calculated using the following formulas:

C (In Rupees) = C_{Fuel} + C_{TD}

a) **Wherein C_{Fuel}**

C_{Fuel} **=** Cost of differential total fuel consumption as identified in this section for which bidders are required to quote against the datum consumption value defined.

Following formula shall be used for calculation of loading on Fuel consumption

C_{Fuel} = (EC_{IFQ}- EC_{IFR}) **x C**F **x 8000 x** DF **/ 1000**

EC_{IFQ}= Fuel (RLNG) Consumption offered by bidder for Utility Boiler (Kg/Hr).

EC_{IFR}= Datum value of Fuel (RLNG) consumption as mentioned above.

Where,

CF= Cost of fuel (RLNG) is Rs. 51622 /- per MT.

8000 = Number of operating hours per year.

DF= Discounting factor to arrive at Net Present Value (NPV) based on number of operating years as defined under clause 3.4

b) **Wherein C_{TD}**

C_{TD} **=** Cost of differential Turndown (%) against the datum turndown value defined.

Following formula shall be used for calculation of loading on Turndown

C_{TD} = (TD_{TDQ} - TD_{TDR}) x CD x 8000 x DF

TD_{TDQ} = Turndown quoted by bidder (in %MCR)

TD_{TDR}= 20% MCR (Datum value of Turndown)

Where,

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CD= Cost of 1% differential in turn down= Rs. 4892

8000 = Number of operating hours per year.

DF= Discounting factor to arrive at Net Present Value (NPV) based on number of operating years as defined under clause 3.4

3.4 Discounting factor (DF) is defined as under:

$$DF = \sum_{n=4}^{n=k+3} [1 / \{1+ (X/100)\}^n]$$

Where:

k = Number of operating years for which loading is to be done as specified i.e. 10 years.

X = Percentage rate of interest **12%**

DF = 4.02

[The above formula considers 3 years' time for start-up of operation.]

3.5 The maximum loading to be applied as $C_{Fuel} + C_{TD}$. However, same shall not exceed 10% of the total Lump sum Price of complete package as quoted by bidder in SP-0.

3.6 The bidder is required to furnish the guarantee values only in the price schedule format SP-10 in a closed envelop in bid.

3.7 This loading calculated using above shall be loaded on the evaluated price based on the other loading defined elsewhere in the tender.

4.0 PENALTY CRITERIA

4.1 Penalty for not meeting the guaranteed parameters

If bidder fails to meet the quoted guaranteed values, penalty shall be leviable based on the established parameters during as per the Performance Guarantee test run for the following:

a) Penalty for Excess Fuel Consumption

In case the fuel (RLNG) consumption value established during PGTR is found to be higher than the quoted guaranteed fuel value, penalty shall be levied on the EPC contractor.

Following shall be used for calculation of Penalty

$$\mathbf{P_{Fuel} = (EC_{IFA} - EC_{IFQ}) \ X \ CF \ x \ 8000 \ x} \ DF \ \mathbf{/ \ 1000}$$

EC_{IFA}= Actual Fuel (RLNG) Consumption (Kg/Hr) during PGTR.

EC_{IFQ}= Quoted Fuel (RLNG) consumption by bidder.

Where,

CF = Cost of Fuel (RLNG) is Rs. 51622 /- per MT.

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8000 = Number of operating hours per year.

DF= Discounting factor to arrive at Net Present Value (NPV) based on number of operating years as defined under clause 4.2

b) Penalty for Higher Turndown

In case the quoted guaranteed turndown as per clause 2.4 above is not established during PGTR and is found to be higher than the quoted guaranteed turndown value, penalty shall be levied on the EPC contractor.

Following shall be used for calculation of Penalty

$\mathbf{P_{TD} = (TD_{TDA} - TD_{TDQ}) \times C_{TD} \times 8000 \times}$ DF

TD_{TDA} = Actual Turndown during PGTR in % MCR

TD_{TDQ} = Quoted Turndown by bidder in %MCR.

Where,

$\mathbf{C_{TD}}$ = Cost of 1% differential in Turn down = Rs. 4892

8000 = Number of operating hours per year.

DF= Discounting factor to arrive at Net Present Value (NPV) based on number of operating years as defined under clause 4.2

4.2 Discounting factor (DF) is defined as under:

$$DF = \sum_{n=4}^{n=k+3} [1 / \{1+ (X/100)\}^n]$$

Where:

k = Number of operating years for which loading is to be done as specified i.e. 10 Years.

X= Percentage rate of interest **12%**

D_F = 4.02

[The above formula considers 3-year time for start-up of operation.]

4.3 Total penalty for the Steam Generation package = $P_{fuel} + P_{TD}$

5.0 REDUCTION IN PRICE: -

Maximum continuous rating (MCR) of Utility Boiler is a guaranteed value and same needs to be established during PGTR.

If boiler system underperform, reduction in price shall be applicable as specified below for MCR capacity shortfall:

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5.1 Steam Generator -Utility Boiler (UB):

During PGTR, UB shall be operated to its MCR capacity as quoted by Bidder. Bidder shall restrict the furnace absorption heat flux to its limiting value as per guidelines followed by the OEM for maintaining effective boiling region and used by OEM for designing utility boiler system in any of earlier successful operated installation with similar pressure & temperature steam requirements.

If the boiler system continues to underperform, reduction in price shall be applicable as specified below for shortfall in MCR capacity, in addition to penalty as per Clause No. 4.0, if applicable.

5.1.1 Shortfall in MCR for UB shall be measured and in case shortfall in steam generation is less than or equal to 1% of MCR capacity of UB,

Reduction in price (Rs) = Shortfall in VHP steam in MT/Hr x 8000 x CS x DF

Where,

CS = Cost of VHP steam to be considered is Rs. 4224 per MT

8000 = No. of operating hours for one year.

DF = Discounting factor for loading,

Where,

Discounting factor (DF) is defined as under:

$$DF = \sum_{n=4}^{n=k+3} [1 / \{1+ (X/100)\}^{n}]$$

Where,

k = Number of operating years for which loading is to be done, i.e.10 years

X = Interest rate i.e.12%

The above formula considers 3-years' time for start-up of operation applicable for Steam Generation System package and further operation up to10 years after start-up.

5.1.2 However, if shortfall is more than 1% of MCR in UB, reduction in price shall be evaluated as per above formulae given in cl. 5.1.1 with change in discounting factor i.e. DF=5.32 calculated with k (operating years) as 20 years. Owner reserves the right to accept / reject equipment in such a situation.

5.2 No credit shall be given for achieving higher than MCR capacity.

6.0 The total reduction in price as calculated in clause no. 5.0 above + total penalty as calculated in clause no. 4.0 above will not exceed 10% of total Lump sum Price as quoted by bidder in SP-0.

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7.0 No benefit shall be passed on to the Contractor in case the guaranteed fuel consumption, demonstrated by Contractor during PGTR is lesser than the quoted guaranteed values.

8.0 No credit shall be considered for excess air in Utility boiler during performance guarantee run.

9.0 Regarding the payment terms and bank guarantee requirements, commercial part of the bid package shall be applicable.

10.0 If EPC contractor fails to achieve some of the parameters while demonstrating the guaranteed parameters (as defined in cl. 2.0 above) during PGTR, contractor shall immediately start the necessary rectification / modification / replacement work at his own cost and through his own arrangement / agency to improve the supplied components / equipment / system / sub-system to prove guaranteed parameters in the final performance guarantee test in the shortest possible time and same should not exceed three months from the start of PGTR.

If the guarantee parameters are not met even after the rectification efforts by EPC Contractor, Client / Owner shall have their discretion:

a) Reject the component / equipment /sub system/ system and recover the total cost from the Contractor.

Or / and

b) Accept the component / equipment / sub system / system after imposing reduction in price (calculated as per clause 5.0) and penalty (calculated as per clause 4.0 above).

Boiler turn down (≤ 30% MCR), Boiler ramp up time, stack emissions, steam purity, Deaerator performance as specified in clause no. 2.4.2 above, shall be checked categorically during PGTR and to be necessarily met by EPC Contractor without any condition. Not meeting the required performance may lead to rejection of the equipment. Owner decision on this account shall be final.

The Contractor shall not be entitled to any extension of time for any remedy / replacement/rectification as specified above.

11.0 Operating parameter & capacity achieved to establish MCR capacity of UB during the PGTR (final values after rectification, if any) shall be used in calculations of price reduction and for penalty on various parameters.

12.0 Bidder / Contractor shall furnish the detailed calculations, supporting documents, basis and references as and when required to establish the guarantee parameters for boiler at Guaranteed Operation.

Bidder shall also submit the past references of the offered efficiency for Utility Boiler as and when required.

The bidder shall furnish following correction curves (if applicable) along with the bid to correct fuel consumption / efficiency for guaranteed operation.

a) For fuel (as applicable) from Boiler -OEM (Original Equipment Manufacturer): -

i. Variation in Moisture content in fuel.

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ii. Variation in GCV/LCV of fuel.
iii. Any other if applicable.

b) For any other parameter if applicable e.g. variation w.r.to ambient temperature etc.

Only submitted correction curves along with bid shall be used to calculate guaranteed parameters indicated by the Bidder in his bid and to convert test results to site conditions.

Changes in these curves (if applicable) by the contractor thereafter on his own shall not be permitted during PGTR stage for demonstration of guarantees. Bidder shall also furnish a set of sample calculations for conversion of test data to site conditions as and when required.

In case of Non availability of Natural gas during PGTR, other gaseous fuels as defined in Design basis of SGP shall be applicable with necessary correction factors. Applicable Correction factors for PGTR gas shall be decided and agreed upon mutually between Client/PMC and Contractor at the time PGTR.

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ANNEXURE-1

PROFORMA FOR GUARANTEED FIGURES FROM BIDDERS

Table A- To Be submitted by Bidder along with **Technical Offer**

Utility Boiler Steam Generation Capacity (MCR) *Minimum 265 MT/Hr or as quoted by Bidder in technical offer*	MT/Hr	Bidder to report & guarantee
Turndown of UB on superheater temp. control and auto-combustion control	%MCR	≤ 20% to ≤ 30% of MCR for Gaseous fuels ≤ 30% of MCR for Liquid fuels
Ramp up time of Boiler (*From quoted Turndown value by bidder to 100% MCR while running on Gaseous Fuel*)	Minutes	≤ 10 minutes Bidder to comply minimum Ramp - up time and report actual Ramp-up time in minutes & guarantee
Steam purity as specified *(At the outlet of Utility Boiler)*		As per Design Basis (B957-420-80-44-DB-3201)
Stack Pollution/Emission Rates from Utility Boiler for all operating range from MCR to Turndown in line with B957-420-80-44-DB-3201 a) Sulphur Dioxide (SO2) - Gaseous fuels / liquid fuel b) Oxides of Nitrogen (NOx) - Gaseous fuels / liquid fuel c) Particulate Matter (PM) - Gaseous fuels / liquid fuel d) Carbon Monoxide (CO) - Gaseous fuels / liquid fuel e) Nickel & Vanadium (Ni+V) - liquid fuel		a) ≤ 50 mg/NM3 / 850 mg/NM3 b) ≤ 250 mg/NM3 / 350 mg/Nm3 c) ≤ 5 mg/NM3 / 50 mg/Nm3 d) ≤ 100 mg/NM3 / 150 mg/Nm3 e) ≤ 5 mg/Nm3

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Deaerator performance for its rated capacity and turndown, however performance shall be demonstrated for ***Guarantee Operation***		O_2 at Deaerator outlet: - The oxygen content of the deaerated water shall be limited to 7 ppb (wt) without any chemical dosing when tested by accepted Schwartz-Gurney modification of Winkler test of the referee method Ä' or non-referee method 'D' as described in ASTM-D888 CO_2 at Deaerator outlet: - NIL i.e. free Carbon dioxide content should not be detectable when tested by precise evaluation method 'D' as described in ASTM-D513

Table B- To Be submitted by Bidder **along with Priced Offer**

Natural Gas (RLNG) consumption for Guarantee Operation	Kg/Hr	Bidder to Report & Guarantee
Turndown of UB *Required Turndown: ≤ 20% MCR on gaseous fuels delivering* VHP steam at 108.7 kg/cm2(g) and 510 deg. C at package battery limit.	%MCR	Bidder to Report & Guarantee

Notes:

1. Offer shall not be evaluated if this sheet is not completed.
2. Duly filled and signed/stamped format of Table A shall be furnished with technical offer. **Un-filled** and duly signed format of Table B shall be furnished with technical offer.
3. **Duly filled** and signed/stamped format of Table B shall be furnished with priced offer in sealed envelope.
4. Bidder to ensure that the values submitted in Table B in the priced offer (SP-10) are technically feasible and commensurate with the actual expected consumption during guaranteed operation. Documentary evidence and technical justification will need to be submitted by the bidder in support of the quoted values as and when required.

BIDDER'S NAME:

BIDDER'S SIGNATURE
AND SEAL/STAMP
DATE:

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ANNEXURE-2

Fuel Specification for Performance Guarantee Test Run

Component	Vol %
Methane	90.20
Ethane	5.92
Propane	2.26
i-Butane	0.70
n-Butane	0.64
i-Pentane	0.03
n-Pentane	0.00
n-Hexane	0.00
Nitrogen	0.25
GHV, BTU/Kg	51602
Impurities:	
CO2	<100 (ppmv)
O2	<50 (ppmv)
H2S	<5 (ppmw)
Total Sulphur	<10 (ppmw)

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ANNEXURE-3

Parameters to be provided in HMBD for the Guaranteed Operation

S. No.	Parameters	
1.	Steam parameters (pressure & temperature) from Utility boiler at Main steam stop valve (MSSV) outlet	Bidder to indicate and consider
2.	Feed water pressure (Kg/cm2g) & temperature (Deg C) at economizer inlet in Utility boiler	Bidder to indicate and consider
3.	VHP / LP steam parameters (pressure (Kg/cm2g), temperature (Deg C) & flow (TPH)) at “steam generation system” package B/L	Bidder to indicate and consider
4.	VHP BFW parameters (pressure (Kg/cm2g), temperature (Deg C) & flow (tph) at “steam generation system” B/L	Bidder to indicate and consider
5.	Deaerator outlet temperature	Bidder to indicate and consider
6.	Flue gas outlet temperature at stack inlet from utility boiler	Bidder to indicate and consider
7.	Excess oxygen (dry volume basis) in flue gas of utility boiler	Bidder to indicate and consider
8.	DM water parameters (pressure) (Kg/cm2g) & temperature (Deg C) at “Steam Generation System” B/L	Bidder to indicate and consider

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ANNEXURE - III
TO
SPECIAL CONDITIONS OF CONTRACT

[CONSTRUCTION SUB-CONTRACTOR'S APPROVAL]

APPROVAL OF CONSTRUCTION SUB-CONTRACTOR

1.	NAME OF MAIN CONTRACTOR	:	
2.	NAME OF WORK, LOCATION	:	
3.	NAME OF PROPOSED SUB-CONTRACTOR	:	
4.	SCOPE OF WORK PROPOSED TO BE SUB-CONTRACTED (BRIEF)	:	
5.	**ESTIMATED VALUE OF THE PROPOSED WORK TO BE SUB-CONTRACTED (INR):**	:	
6.	***QUALIFYING CRITERIA FOR SUB-CONTRACTOR:***	:	**------**
6.1	**Similar Work experience :**	:	
i)	**1 (One) Contract of 80% or 2 (two) contracts of 50% or 3 (Three) contracts of 40% each of estimated value of proposed work to be sub-contracted :**	:	
ii)	**Annual Turnover** average annual turnover not less than **30% of estimated value of proposed work to be sub-contracted** during the immediately preceding 3 (Three) financial years	:	
iii)	**Networth shall be positive as per the immediate preceding year's Audited financial results as per latest annual balance sheet/ Profit & loss account:**	:	
7.	EXPERIENCE AND FINANCIAL DETAILS OF PROPOSED SUB-CONTRACTOR	:	
i)	Contract Value of similar work executed (as evidenced by work Order & Completion Certificate) During the last 7 years	:	

ii)	Average Annual Turnover during last 3(three) years (as evidenced by Balance Sheets)	:	
iii)	Networth as per latest annual balance sheet/ Profit & loss account	:	
8	CRITERIA FOR QUALIFICATION OF SUB-CONTRACTOR	:	
i)	Sl.No. 7(i) >6 (i)	:	YES / NO
ii)	Sl.No. 7 (ii) >6 (ii)	:	YES / NO
iii)	Sl.No. 7 (iii) > 6.1 (iii)	:	YES / NO
9	Based on above information, we M/s_____(Name of Main Contractor) propose M/s._____(Name of proposed sub-contractor) as our sub-contractor for the above mentioned works. We understand that notwithstanding above approval, we shall remain fully responsible for the performance of the said sub-contractor and any failure of the sub-contractor shall not absolve/relieve us of our responsibility to complete the works as per the terms and conditions of the Contract.		

NOTE: Contractor to fill all the details in the above proforma. Further Contractor shall also fill-in the details at Sl.No.5 above based on the estimated value of the proposed work to be subcontracted.

(STAMP & SIGNATURE OF CONTRACTOR)

ANNEXURE - IV
TO
SPECIAL CONDITIONS OF CONTRACT

[QUALIFICATION & EXPERIENCE REQUIREMENT OF KEY CONSTRUCTION PERSONNEL AND PENALTY FORTHEIR NON-MOBILIZATION]

प्रमुख निर्माण कार्मिकों के लिए अपेक्षित योग्यता एवं अनुभव और तैनाती न करने पर जुर्माना

QUALIFICATION & EXPERIENCE REQUIREMENT OF KEY CONSTRUCTION PERSONNEL AND PENALTY FOR THEIR NON-MOBILIZATION

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					Approved by	
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Abbreviations:

CV	:	Curriculum Vitae
EPC	:	Engineering, Procurement & Construction
EPCC	:	Engineering, Procurement, Construction & Commissioning
ISO	:	International Organization for Standardization
NDT	:	Non Destructive Testing
QA/QC	:	Quality Assurance /Quality Control
RT	:	Radiography Testing
UT	:	Ultrasonic Testing

Construction Standards Committee

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Qualification & Experience (Post Qualification)

CATEGORY	QUALIFICATION & EXPERIENCE (POST QUALIFICATION) REQUIRED			
Resident Construction Manager/ Resident Engineer/Site-In-Charge	Degree or Diploma in Engineering with minimum following relevant experience in construction:			
	Awarded value (Rs) →	< 10 Cr. Works	10 - 50 Cr. Works	> 50 Cr. Works
	Degree holders	5 yrs	10 yrs	15 yrs
	Diploma holders	8 yrs	13 yrs	20 yrs
Lead Discipline Engineer (Mechanical, Civil, Electrical, Instrumentation)	Degree or Diploma in relevant Engineering discipline with following minimum experience in Construction:			
	Awarded value (Rs) →	≤ 10 Cr Works	10-50 Cr. Works	> 50 Cr. Works
	Degree holders	3 yrs	5 yrs	10 yrs
	Diploma holders	5 yrs	8 yrs	13 yrs
Lead Welding / NDT Engineer	Degree or Diploma in Mechanical Engineering/ Metallurgy with the minimum following experience in Welding & NDT (Non Destructive Testing) and possessing valid Level-II certificate in the relevant NDT methodology (RT/UT)			
	Awarded value (Rs) →	≤ 10 Cr. Works	10-50 Cr. Works	> 50 Cr. Works
	Degree holders	3 yrs	5 yrs	10 yrs
	Diploma holders	5 yrs	8 yrs	13 yrs
Lead QA/QC Engineer	Degree or Diploma in Engineering with following experience (refer Note 1 also) :			
	Awarded value (Rs) →	≤ 10 Cr. Works	10-50 Cr. Works	> 50 Cr. Works
	Degree holders	3 yrs of construction experience of which minimum 1 years in QA/QC	5 yrs of construction experience of which minimum 2 years in QA/QC	10 yrs of construction experience of which minimum 3 years in QA/QC
	Diploma holders	5 yrs of construction experience of which minimum 3 years in QA/QC	8 yrs of construction experience of which minimum 5 years in QA/QC	13 yrs of construction experience of which minimum 6 years in QA/QC
Lead Planning Engineer	Degree or Diploma in Engineering with following experience in Planning & Scheduling			
	Awarded value (Rs) →	≤ 10 Cr. Works	10-50 Cr. Works	> 50 Cr. Works
	Degree holders	3 yrs	5 yrs	8 yrs
	Diploma holders	5 yrs	8 yrs	13 yrs
Safety Officer / Supervisor	As per HSE Specification enclosed elsewhere in the bidding document.			

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Warehouse- In- Charge/ Materials Manager	Diploma in Engineering or Diploma in Materials Management or Graduate in any stream with min. following experience in Warehousing/ Stores Management:			
	Awarded value (Rs) →	≤ 10 Cr. Works	10-50 Cr. Works	> 50 Cr. Works
	Experience	3 years	5 yrs.	10 yrs.
Quantity Surveyor	Degree or Diploma in Engineering with minimum following experience in quantity estimation, field measurement, bill preparation etc. in Construction field:			
	Awarded value (Rs) →	≤ 10 Cr. Works	10-50 Cr. Works	> 50 Cr. Works
	Degree holders	2 yrs	3 yrs	5 yrs
	Diploma holders	4 yrs	6 yrs	8 yrs
Discipline Engineer	Degree in relevant Engineering Discipline with minimum 2 years of relevant experience in construction or Diploma in relevant Engineering Discipline with minimum 4 years of relevant experience in Construction. Welding / NDT engineer shall possess valid Level-II certificate in the relevant NDT methodology (RT/UT).			

NOTES : (For Table)

1. For Mechanical, Composite, EPC or EPCC Contracts of value more than Rupees 50 crores, the Lead QA/QC Engineer shall be a qualified internal auditor for ISO 9001.
2. CVs of key construction personnel proposed to be deployed shall be submitted to Owner/Engineer-in-Charge prior to their mobilization at site. The mobilization of key personnel shall be done at site subject to prior approval of their CVs by Owner/Engineer-in-Charge.

PENALTY FOR NON - MOBILIZATION OF KEY CONSTRUCTION PERSONNEL

Penalty for non-mobilization per day per person after the contractual mobilization period / mobilization schedule agreed during Kick off meeting / jointly agreed between contractor and PMC / Owner based on front availability etc.

- Rs. 7000/- for Resident Construction Manager/ Resident Engineer/ Site-in-Charge.
- Rs. 4000/- for Lead QA/QC Engineer, Lead Planning Engineer, Warehouse In-charge, Lead Discipline Engineers, Lead Welding / NDT Engineer and the Quantity surveyor.
- Safety Officer (As per HSE Specification).

NOTES : (For Penalty Clauses)

a) All intervening off days (Sundays etc.) and holidays will be counted for levy of penalty.

b) Mobilized personnel shall not be demobilized till contractual completion or based on consent of Engineer-in-Charge, else penalties as above shall be applied.

c) Total of above penalties shall not exceed 2% of the awarded contract value

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ANNEXURE - V
TO
SPECIAL CONDITIONS OF CONTRACT

[PROJECT EXECUTION PLAN]

PROJECT EXECUTION PHILOSOPHY FOR BPREP STEAM GENERATION PACKAGE

1. Bidders will ***visit site to assess the site conditions*** and familiarize themselves of ***site specific requirements***. During the visit bidder will also familiarize themselves of ***locally available resources*** that may be required for carrying out site works.
2. Bidder is advised to get maximum fabrication carried out in work shop however for inimitable activities; Bidder will set up ***well equipped, gated, covered and secured pre-fabrication facilities*** and ***site*** offices near the vicinity of site works. Watch and ward of these facilities will bidders responsibility during the entire duration of the works under the scope of this package.

   - **MONSOON COMBAT / Extreme Weather Condition**

3. During the Monsoon season, the bidders shall be ***responsible for making their own arrangements to combat monsoon*** to ensure uninterrupted site works. Bidder will make all necessary ***arrangements for keeping the prefabrication yard, working area free of water logging*** and make necessary approach to work site as required.
4. The execution of the work shall entail working in all seasons including extreme winter/summer and monsoons. In so far as necessary, the bidder shall maintain at job site at all times such material, labor, pumps, equipment and machinery as may be required for the performance of the work during all weather condition including monsoon or other rains and shall plan well in advance for the collection of material and equipment and the erection of such tarpaulins, sheds, wind breakers and/or other protection as shall or may be necessary for the work during all weather conditions including during the monsoon or other rains so that the rains or monsoon ***shall not hamper working***. Bidder shall also arrange and bring to job site such special equipment and machinery as may be necessary to enable work during the monsoon, and shall, at his own cost and initiative, arrange at all times for dewatering the job sites so as to keep the construction site and areas to be worked upon, free of water.

   Bidder to note that ***at least 2 monsoon stretches*** of rainfall is envisaged in the construction duration allocated for the works. ***Detailed plan*** for monsoon combat for ***uninterrupted construction activities during the monsoon period is to be provided.***
5. Bidders shall provide scheme for suitable ***coverage of the work area*** in addition to other covered prefabrication yards proposed by them for continuity of works during extreme summer/winter and monsoon and shall implement the schemes for effective mitigation of effects of monsoons at no extra cost to the Owner.
6. ***Adequate covered fabrication, blasting, painting and storage facilities*** shall be developed by the contractor in allotted fabrication yard (if available and provided by owner as per scope) for facilitating uninterrupted piping fabrication works during rainy season.
7. ***Testing of material (e.g. consumables)*** procured by bidder may be required in authorized laboratories during the course of execution of works and this will be bidder's responsibility without any time and cost implication to the owner.
8. Bidder shall ensure Comprehensive Piping Spools management for AG system / program during the entire execution of site work.

   Bidder shall use system/program for material and inventory management, weld mapping, revision management, activity level stage wise control with documentation at all level of fabrication and erection and related commercial billing. Advance technique like Bar code system must be used for identification of materials to ensure automation as per specification.

All piping spools 2" dia & above are to supplied in prefab condition. Also, bidder to ensure that all prefab work shall be carried out in shop not at site or in fabrication yard near to site.

➢ STATUTORY APPROVALS

9. Bidder will ensure ***all local approvals*** for smooth and uninterrupted execution of site work.
10. Bidder has to work in the existing running process units/premises. He has to comply with all the safety rules and regulations as per the guideline of BPCL.
11. Bidder has to comply the BPCL requirements like medical examinations, police verifications etc. for obtaining Gate passes for his officers/workers to work in the refinery complex.

➢ SITE COORDINATION & MANAGEMENT

12. The QA plans for execution shall be developed by the Contractor and submitted for Owner/EIL's approval well before start of the work.
13. ***Multiple agencies*** are expected to work concurrently at site; bidder will ensure ***necessary coordination*** with these agencies and ensure smooth construction/ site activities.
14. ***Competent sub-agencies may be engaged by the bidder*** with prior approval of owner/EIL for carrying out site works. Augmentation of manpower as required will be bidder's responsibility.
15. ***Skilled manpower required for carrying out site activities*** will be identified by the bidder and a ***deployment plan will be submitted*** to the owner. Bidder will ensure that the skilled manpower meets all qualification criteria required for performing site works. All required qualifications tests etc. will be at bidders cost.
16. ***Latest construction techniques*** will be ***utilized in performing site activities*** with an ***overall objective to maximize production in minimum time*** without compromising on quality. This shall be bidder's exclusive responsibility without any time and cost implication to the owner.

➢ PROGRESS REVIEWS

17. ***Weekly / monthly review meeting*** will be held with successful bidders and in case any ***lag behind in progress of work,*** Owner/EIL reserves the right to engage other agencies to augment site manpower for ensuring smooth and uninterrupted site work at bidders risk and cost. Bidder will ***ensure strong and competent planning and scheduling personnel*** as part of his site management team.

➢ ERECTION OF HEAVY LIFT / TALL EQUIPMENTS/ STRUCTURE

18. Mobilization of required capacity Crane for handling / installation of Equipment/ structure for Steam Generation Package.
19. The prime responsibility with respect to erection scheme & arrangements and complete erection lies with the bidder who would have substantial presence at site and shall be in a position to manage all aspects of the erection.
20. Bidder shall be responsible for preparation of Erection Scheme after incorporating the site, schedule and situation specific requirements & shall furnish the same to Owner/EIL along with offer and same shall be subject to review/approval by owner/ EIL as per the direction of EIC.

21. Bidder shall be responsible for ***sequencing the erection*** activities with respect to modular structures/ skid/piping and other works, cordoning-off the areas under risk prior to erection.
22. Bidder shall also be responsible for Making the foundation/Structure for erection including chipping/ hacking concrete surfaces of foundation, arranging shims, packing plates, etc., arranging all tools & tackles for aligning the equipment including Auto levels, Theodolites, laser plumbs, hydraulic jacks, stools etc., arranging manual/ power wrenches, torque tensioners etc. as required.
23. Bidder shall be responsible for arranging and erecting scaffolding, ladders, walkways, planks/boards for working platforms, safety nets, hand railing etc. as required for ensuring smooth and safe equipment erection operation.
24. Bidder shall be responsible for following activities during erection:
    - Providing skilled & un-skilled manpower.
    - Ensuring equipment orientation during erection.
    - Bolting/tightening and securing the equipment / skid during and upon placement on the foundation including inserting extra shims/pack-plates/jacks etc. if required.
    - Bringing the equipment to correct alignment with respect to all three-axis including blue matching if required.
    - Grouting the equipment base with foundation.
    - Preparation of relevant reports and obtaining endorsements as required by Owner/EIL.
25. Bidder to note that all fabrication of structure steels wherever possible shall be done outside the premises of the plant to minimize site fabrication work.
26. Bidder to note that no fabrication area inside the refinery premises is available. Inside the refinery premises, only area within Steam Generation Package battery limit shall be available.
27. Movable/Biodegraded toilets in adequate number (in a ratio of minimum 01 no for 25 Nos. workers) shall have to installed at site for workers.
28. Pre award/ tie up has to be necessarily made for immediate sub ordering of all identified items.
29. Bidder may also set up ***well equipped, gated, covered and secured pre-fabrication facilities*** and site offices near or in the vicinity of the 8-10 kms of site works. Watch and ward of these facilities will bidders responsibility during the entire duration of the works under the scope of this package. Power, Water & other construction related facilities has to be developed by bidder in fabrication yard.
30. Bidder shall endeavour to bring all critical supplies as per Critical Item list to avoid the Intermediate PRS as per Annexure - XIX of the SCC.
31. Vendor to carry out maximum prefab at shop and minimize site work.
32. Bidder to maximize use of tower cranes. It is envisaged that approx. 3 to 4 numbers tower crane may have to be mobilized and installed for this project. Site installation of these cranes shall be done at initial stage of work commencement to maximize productivity at site.

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ANNEXURE - VI
TO
SPECIAL CONDITIONS OF CONTRACT

[LIST OF MAJOR TAGGED/CRITICAL EQUIPMENTS]

Critical equipment list for Steam Generation Package of BPCL, Bina:

1) Complete Boiler package comprising of Steam Drum, Superheater, Boiler bank, Economiser, SCAPH & AIR PREHEATER (As applicable), CBD tank, IBD tank, Stack
2) Deaerator & storage tank
3) Burner assembly
4) BFW Pumps
5) Gas Conditioning System & KOD
6) Liquid fuel (Fuel oil) storage tank, heater & pumps
7) DM tank & transfer pumps
8) FD fan
9) Bought out items i.e. Expansion Bellows, Chemical Dosing system etc.

Job: B957, List of Critical Documents for Payment Milestone

I. Basic design stage documents

1. Overall Plant Layout
2. HMBD/PFD
3. P&IDs
   - Battery Limit
   - Steam and water
   - Air and flue gas
   - Fuel handling and forwarding system
   - Fuel firing system
   - Deaerator and Boiler feed water system
   - Blowdown system
   - Utility distribution system (IA, PA, CW, N2, SW)
4. Boiler DS
5. Boiler GAD

II. Detailed engineering stage documents

1. Sizing criteria document for Boiler feed pump, stack, Dosing system, Deaerator, Blowdown exchanger and pumps
2. Utility consumption (Instrument air, Plant air, Nitrogen, Service water, cooling water, Power)
3. Deaerator DS, BFP DS, Stack DS
4. P&ID of dosing system
5. Complete Pressure Parts Assembly
6. GAD of stack
7. Stack design calc. (STAAD Pro Input/output file)
8. IBR Design & stress calculations and analysis for complete pressure parts
9. OPC table
10. Filled in MTO format (B957-420-80-44-MTO) to be submitted
11. Foundation load data along with base plate/anchor bolts details, hard stand requirements
12. Commissioning and PGTR documents
13. Operation and maintenance manual
14. Mandatory spare list
15. CFD analysis

III. Procurement engineering stage documents

1. Purchase Specification for major bought out as given below
   - Burner
   - Expansion joints.
2. Burner DS
3. GAD of Burner system

ANNEXURE - VII
TO
SPECIAL CONDITIONS OF CONTRACT

[FREE ISSUE MATERIAL]

Not Applicable

ANNEXURE - VIII
TO
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[MECHANICAL COMPLETION, PRE-COMMISSIONING & COMMISSIONING]

Mechanical Completion

Mechanical completion shall mean as the stage when the construction of the Steam Generation package has been completed, other than activities which are minor in nature and do not affect **Pre-commissioning & Commissioning**, all civil & structural works are complete, all equipment and machinery are installed and aligned, all piping and instrumentation works are complete, all electrical works are complete, all hydrostatic/pneumatic testing done, safety valves & pressure relief valves set and checked, speed and direction of rotation of all prime movers checked, completion of all punch list items as provided by OWNER/PMC and/or Process Licensor and/or Statutory bodies like OISD, PESO, PNGRB, Factory Inspector, Pollution Control Authorities etc, but excluding punch list items which, in the sole opinion of Engineer-in-Charge, do not affect **Pre-commissioning & Commissioning**.

The Contractor shall notify BPCL/EIL in writing that the Plant is **mechanically completed** and ready for **Pre-commissioning & Commissioning** activities. It is expected that the items as per the check list of BPCL/EIL/Licensor/ Statutory bodies have been attended to fully or partially as agreed.

Notwithstanding any exclusion as aforesaid in the definition of Mechanical Completion, Mechanical completion shall not deemed to have achieved for the purpose of any payment milestone(s) subsequent to Mechanical Completion unless the excluded items are completed.

Mechanical Completion:

The Stage of Mechanical Completion is considered to be achieved after completion of following sequence of activities:

I. Steam Generation Package will be divided into system/ subsystem as per process/ pre commissioning requirement.

II. Steam Generation Package Contractor shall issue **Format-I** for each system for checking by BPCL/EIL for completeness of construction as per process requirement.

III. Except for any deviation/ modification agreed upon between BPCL/EIL/Licenser & Contractor, check list **(Format -II)** shall be liquidated by Contractor. Contractor shall then issue **Format III** with agreed deviation (if any) to be attended later and proceed with Pre-Commissioning activities. When Format-III of all system /subsystem are issued & certified by BPCL/EIL, the Plant/Unit/Facility is considered to be mechanically completed.

Pre Commissioning & Commissioning:

I. Pre commissioning activities shall include flushing, Card board blasting, Chemical cleaning, passivation of the system for the purpose of thorough cleaning of loop/system, Degreasing, Alkali boil out, Adsorbent loading (if any), Catalyst loading (if any as per pre-commissioning sequence and scope mentioned in the bidding document elsewhere.

II. Pre commissioning activities shall include Opening & box-up of piping, valves, instruments, spool pieces etc. as per pre- commissioning procedure. Opening & Boxing-up of piping / equipment flanges & blinding of Flanges joints. Carry-out integrated leak test & maintain records. Attending leaks by tightening to the required torque/replacement of faulty gaskets where necessary.

III. The unit shall be considered `Ready for Commissioning' **(FORMAT – IV)** when all the facilities have been completed along with their auxiliaries and support facilities in every respect including charging of lubes, chemicals, preparation of solution, last minute modifications, if any, as recommended by BPCL/EIL. All temporary structures, scaffolding etc. used for carrying out pre-commissioning activities are removed, all the blinds shall be placed into position as per P&IDs/ BPCL/EIL/Licensor.

IV. All safety devices like pressure safety valves (PSV), emergency shutdown valves are tested, witnessed and certified by representative of Contractor /BPCL/EIL. These certificates are to be handed over to BPCL/EIL prior to start-up of the UNIT.

V. **Commissioning** of the Unit means taking the feed in, passing it through the normal route; establishing the process control parameters as per the Bidding Document.

Steam Generation package Contractor to refer detailed specification of pre-commissioning and commissioning activities and formats as mentioned below enclosed in technical section elsewhere.

Format-I: Intimation regarding system completion,

Format-II: Check lists,

Format-III: Ready for pre-commissioning certificate,

Format-IV: Ready for commissioning certificate,

Format-V: Successful completion of commissioning certificate

The Contractor shall notify BPCL in writing that the Plant and Facilities are Mechanically Complete and ready for pre-commissioning & commissioning; within five (5) days of such notification, the BPCL/EIL shall notify the Contractor whether it accepts that the Plant and Facilities are Mechanically Complete and ready for pre-commissioning. If the BPCL/EIL does not accept that the Plant and Facilities are Mechanically Complete and ready for pre -commissioning & Commissioning then the BPCL/EIL shall give reasons to the Contractor and the Contractor shall use best endeavours to ensure that the Works relating to the Plant and Facilities achieve Mechanical Completion and are ready for pre -commissioning & Commissioning as soon as possible. If the BPCL/EIL notifies the Contractor that it accepts that the Plant and Facilities are Mechanically Complete and ready for pre -commissioning & Commissioning then the BPCL/EIL shall issue forthwith to the Contractor a Certificate of Mechanical Completion. The date of the Certificate of Mechanical Completion shall be the date of Mechanical Completion of the Plant and Facilities. It is acknowledged by Parties that staged mechanical completions pre-commissioning & Commissioning of Units / Systems may take place at the BPCL/EIL's discretion as might be available and appropriate in accordance with the Time Schedule. Mechanical Completion may therefore follow the logical sequence of pre-commissioning & Commissioning for Plant & Facilities.

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ANNEXURE - IX
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WORK DURING SUMMER/MONSOON

1. Contractor must take due cognizance of the presence of rainy/ summer season / days in his scheduled completion period and accordingly, shall take all necessary actions to protect, reorganize and progress the work, uninterruptedly during the monsoon period.

2. Contractor to collect all meteorological data from the local authority and collect necessary information about the intensity, frequency and period of rainy/ summer season.

3. No extension of time due to interruption /suspension of work, water logging, reduced /slowing down of progress, non-availability of manpower etc., whatsoever may be the reason, shall be tenable on account of monsoon/ summer and further no claim for stand-by of manpower and equipment, other resources etc. shall be paid for.

4. The successful bidder shall be required to submit within 15 days of Letter of Acceptance of offer / award of work, to the PMC/OWNER his contingency plan for work during monsoon/ summer, clearly stating their methodology / strategy to progress uninterruptedly during monsoon/ summer mentioning the deployment of resources viz, numbers, capacity, category of equipment and manpower on a weekly basis for approval. The contingency plan shall include all provisions for constructing and maintaining temporary infrastructure like temporary sheds, rain coats, approach road, temporary drains in and around work area, dewatering whether natural or forced to keep the work area free from water logging so as to maintain the same always in a state worthy of vehicular, human and equipment movement. The work area shall be so isolated as to restrict run-off from the adjacent areas in the work area / site.

5. Contractor shall put up temporary sheds for fabrication of formwork and reinforcement. For fabrication of steelwork / piping proper rainproof shed with concretized floor of adequate area shall be made.

6. Additionally, localized (structure wise) monsoon/ heat protection shall be provided in order to facilitate work.

7. The contractor must indicate the structures / areas that he would like to progress (as per the project schedule and priority) particularly during the monsoon clearly indicating the sub-phases of construction like foundation / sub structure, superstructure etc.

8. Contractor shall procure and stock sufficient quantities of materials (if required, outside the plant premises, the land for which is to be arranged by the contractor at his cost and expenses) viz. coarse and fine aggregates, bricks etc. adequate for the planned volume of the work during the monsoon, well in advance of the onset of same so that progress of work is not affected on this account. PMC/OWNER shall be free to inspect such storing arrangement (particularly at places outside of the pant areas), at any appropriate time as deemed fit by them.

9. All electrical installations, equipment shall be placed on plinths above ground under proper rain shed to avoid any inundation, short circuit and hazards of electrocution.

10. Contractor shall organize his work particularly for the underground activities in foundation, excavation in a way that instead of opening up fronts everywhere and in scattered locations (provided there is no priority concern) only those many structures and /or areas should be worked where concerted and continuous effort and resources could be engaged to bring the work up to the desired level expeditiously to minimize any rework resulting from water accumulation / rain.

11. To maintain the standard welding quality and progress, localized welding booth in sufficient numbers as per instruction of PMC shall be installed for protection against wind and rain.

12. The contractor must indicate plan for early mobilization of manpower, break during day-time and late relieving of manpower, providing suitable minerals to workmen to protect from heat of summer season etc.

13. Contractor's lumpsum rates shall be including all costs and expenses including supply of materials required for monsoon/ summer protection like tarpaulins, rain coats, shed, structural, GI sheet, drinking minerals etc. for the above provisions and no separate payment shall be made on this account.

ANNEXURE - X
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[TERMS OF PAYMENT]

TERMS OF PAYMENT

1. ON ACCOUNT PAYMENTS

These payment terms shall be utilized only for the purpose of making progressive payments to the contractor. Progress Payments shall be released to the Contractor against monthly running account bills duly certified by Engineer-in-charge after affecting the necessary deductions/recovery if any including interest charges accrued thereon. The basis for payment against various items shall be below:

TERMS OF PAYMENT

The basis and terms of payment for various items of Schedule of Lump sum prices, without prejudice to any other mode of recovery available to OWNER, shall be as follows: -

The CONTRACTOR shall submit further breakup for various activities of WORK for the purpose of billing for each discipline such as civil and structural, Mechanical, Piping, Electrical, Instrumentation, Insulation, Painting etc including breakup for Basic Design, Engineering, Detailed Engineering & procurement/supply which will be reviewed and approved by Engineer-in-charge on submission of complete document in this regard by CONTRACTOR. The CONTRACTOR shall be paid monthly running account bills at stages of completion of individual item/work, based on the value assessment by Engineer-in-charge in the following manner after deductions of necessary dues payable by CONTRACTOR to the OWNER in accordance with various provisions made elsewhere in this document.

1.1 FOR SUPPLIES

Subject to the other provisions of Contract documents, on account payments for the supplies will be made as follows:

i. 10% (Ten percent) of total supply value as per SP-2 of Price Part of the tender (**excluding cost of Mandatory Spares and cost of construction materials like Cement, Reinforcement Steel etc**.) on placement of **Purchase Order for major critical tagged items** (as per list of **major tagged equipment** attached to this SCC) on pro-rata basis. This payment shall be released after submission of Bank Guarantee for equivalent value. This bank guarantee shall be valid up to the Contractual Date of Completion plus three months. However, this Bank Guarantee shall be released after receipt of all materials at Site and issue of certificate of verification and good condition.

For payment of 10% of Total Supply value as per form SP-2 against BG, same Exchange rate (if applicable) shall be considered for the Price evaluation of the bids. Any fluctuations in the currency shall be adjusted later on after obtaining proof of payment by contractor to supplier by considering the exchange rate of the date of payment as per submitted proof of payment.

ii. 5% (Five percent) of total supply value as per SP-2 of Price Part of the tender (excluding cost of Mandatory Spares and cost of construction materials like Cement, Reinforcement

Steel etc.) **on pro-rata basis on approval of identified drawings of major tagged items at least in Code-2 and manufacturing clearance**. This payment shall be released after submission of Bank Guarantee for equivalent value. This bank guarantee shall be valid up to the Contractual Date of Completion plus three months. However, this Bank Guarantee shall be released after receipt of all materials at Site and issue of certificate of verification and good condition

iii. 5% (Five percent) of total supply value as per SP-2 of Price Part of the tender (excluding cost of Mandatory Spares and cost of construction materials like Cement, Reinforcement Steel etc.) **on pro-rata basis on against identification of raw materials of major tagged equipment (finalised in Billing break up)** at Supplier's works, This payment shall be released after submission of Bank Guarantee for equivalent value. This bank guarantee shall be valid up to the Contractual Date of Completion plus three months. However, this Bank Guarantee shall be released after receipt of all materials at Site and issue of certificate of verification and good condition.

iv. AGAINST PROOF OF SHIPMENT / DESPATCH OF MATERIALS

50% (Fifty percent) of the DDP price excluding GST of imported materials / indigenous materials as indicated in the Bill of Materials. Stage payment against "Proof of dispatch of Materials" shall be released (on pro-rata basis) on submission of the following documents with Contractor's Invoice.

A) IMPORTED MATERIALS

a) Signed invoice(s).

b) A full set of certified copies of clean onboard bills of lading / airway duly certified.

c) Certificate of country of origin issued by a competent authority.

d) Packing list / Delivery Challan (as applicable)

e) Inspection Release Note by Inspection agency clearly indicating that material has been inspected and accepted as per QAP approved by BPCL/EIL or their representatives

Note:

Where the sale of materials to the OWNER is deemed to take place in the course of international trade through endorsement / transfer of shipping documents during transit in high seas, the above documents shall be endorsed in favour of the OWNER.

B) INDIGENOUS MATERIALS

a) Signed invoice(s).

b) Packing list / Delivery Challan (as applicable)

c) Inspection Release Note by Inspection Agency.

d) Railway Receipt / LR.

Note: Where the sale to the OWNER is deemed to take place by endorsement / transfer of Railway Receipt or Truck / Lorry or any receipt during transit, the above documents shall be endorsed in favour of the OWNER.

v. On Issue of Certificate of Verification and Good Condition at Site, against Contractor's Certified Running Account Bill(s): **20% (Twenty percent**) of DDP price excluding GST of imported / indigenous materials as indicated in the Bill of Materials on submission of:

a) Verification of Third-Party Inspection certificate as per QAP approved by BPCL/EIL or their representatives along with Test Certificate;

b) Documents as per GST law to avail ITC by Owner;

c) Certificate of Verification and Good Condition in respect of relevant materials issued in accordance with the General Conditions of Contract after receipt of materials at Site

vi. 5% (Five percent) of DDP price excluding GST of imported material / indigenous materials as indicated in the Bill of Materials and on issue of Mechanical Completion Certificate against CONTRACTOR’s certified running Accounts Bill(s).

vii. 2% (Two percent) of the DDP price excluding GST of imported materials / indigenous material as indicated in the Bill of Materials on successful commissioning of the plant / works against the CONTRACTOR’s certified Running Account Bill(s)

viii. 1% (One percent) of the DDP price excluding GST of the imported materials / indigenous materials as indicated in the Bill of Materials on issue of Commissioning Certificate against the CONTRACTOR’s certified Running Account Bill(s)

ix. 2% (Two percent) of the DDP price excluding GST of the imported materials / indigenous materials as indicated in the Bill of Materials on completion of all jobs against the CONTRACTOR’s certified Final Bill

Note: DDP as per Incoterms 2020 is - “Delivered Duty Paid” means that the seller delivers the goods when the goods are placed at the disposal of the buyer, cleared for import on the arriving means of transport ready for unloading at the named place of destination. The seller bears all the costs and risks involved in bringing the goods to the place of destination and has an obligation to clear the goods not only for export but also for import, to pay any duty for both export and import and to carry out all customs formalities.

1.2 FOR MANDATORY SPARES

i) 60% (Sixty percent) of DDP price excluding GST of imported / indigenous material as indicated in the Bill of Materials against CONTRACTOR’s certified running Accounts Bill(s) against dispatch

Stage payment against "Proof of dispatch of Materials" shall be released on pro-rata basis on submission of the following documents with the CONTRACTOR’s invoice:

A) IMPORTED MATERIALS

a) Signed invoice(s)

b) A full set of certified copies of clean onboard bills of lading / airway duly certified

c) Certificate of country of origin issued by a competent authority.

d) Packing list / Delivery Challan (as applicable)

e) Manufacturer’s Test Certificate

f) Inspection Release Note by inspection agency clearly indicating that material has been inspected and accepted as per QAP approved by BPCL/EIL or their representatives

Note: Where the sale of materials to the OWNER is deemed to take place in the course of international trade through endorsement / transfer of shipping documents during transit in high seas, the above documents shall be endorsed in favour of the OWNER

B) INDIGENOUS MATERIALS

a) Signed Invoice(s)

b) Packing list / Delivery Challan (as applicable).

c) Manufacturer’s Test Certificate

d) Inspection Release Note by Inspection Agency.

e) Railway Receipt / LR. Note: Where the sale to the OWNER is deemed to take place by endorsement /

Note: Where the sale to the OWNER is deemed to take place by endorsement /transfer of Railway Receipt or Truck / Lorry or any receipt during transit, the above documents shall be endorsed in favour of the OWNER.

ii) 30% (Thirty percent) of DDP price excluding GST of imported / indigenous material as indicated in the Bill of Materials on receipt of material at Site and acceptance thereof, against Contractor's Certified Running Account Bill(s)

iii) 5% (Five percent) of DDP price excluding GST of imported / indigenous materials as indicated in the Bill(s) of Materials on providing Gate Passes and after carrying out all activities to facilitate capitalization of Mandatory Spares through entering its receipt in OWNER’s ERP System, against Contractor's Certified Running Account Bill(s)

iv) 3% (Three percent) of the DDP price excluding GST of the imported materials / indigenous materials as indicated in the Bill(s) of Materials on issue of Commissioning Certificate against the CONTRACTOR’s certified running Accounts Bill(s)

v) 2% (Two percent) of the DDP price excluding GST of the imported materials / indigenous materials as indicated in the Bill of Materials on completion of all jobs against the CONTRACTOR's certified Final Bill

1.3 FOR SUPPLIES OF MATERIALS LIKE CEMENT, REINFORCEMENT STEEL, INSULATION, PAINTING ETC.

i. 90% (Ninety percent) of the supply value of indigenous material as indicated in the Bill(s) of Materials against receipt of material at Site and acceptance thereof against CONTRACTOR's certified Running Account Bill(s).
ii. 5% (Five percent) of the supply value of indigenous material as indicated in the Bill(s) of Materials on issue of Mechanical Completion Certificate against CONTRACTOR's certified Running Account Bill(s).
iii. 2% (Two percent) of the supply value of indigenous material as indicated in the Bill(s) of Materials on successful Commissioning of the plant / works against CONTRACTOR's certified Running Account Bill(s)
iv. 1% (One percent) of the supply value of indigenous material as indicated in the Bill(s) of Materials on issue of Commissioning and Performance Test Certificate against CONTRACTOR's certified Running Account Bill(s)
v. 2% (Two percent) of the supply value of indigenous material as indicated in the Bill(s) of Materials on completion of all jobs against CONTRACTOR's Final Bill.

vi. Wherever percentage payment (as per Clause, “ON ACCOUNT PAYMENTS” above) is applicable against the receipt of Materials/Items (Imported or Indigenous) at Site, payment shall be made as per the payment terms mentioned above on receipt of Materials/Items within Owner’s premises and acceptance thereof. However, in case of those Materials/Items (Imported/Indigenous) which are stored/kept at Contractor’s Stores/Lay-down area/Fabrication Yard which is outside the Owner’s premises, percentage payment against receipt of such materials/items shall be made to the Contractor on submission of Bank Guarantee (in the Format to be approved by the Owner and from a Bank acceptable to Owner) of equivalent amount. This Bank Guarantee shall be over and above any other Bank Guarantee(s) specified in “ON ACCOUNT PAYMENTS” above. Such Bank Guarantee(s) shall be released only on receipt of the concerned Materials/Items within Owner’s premises and acceptance thereof by the Engineer-in- Charge. Also, other stipulations/provisions of the “ON ACCOUNT PAYMENTS” above shall be fulfilled by the Contractor in this regard. The maximum outstanding amount at any time under these provisions is limited to 10% of Contract Value.

1.4 FOR SERVICES

1.4.1 DESIGN & ENGINEERING SERVICES

i. 35% (Thirty Five percent) after completion of 30% 3D Model review, on pro-rata basis on submission of approved for construction drawings, P&IDs, other deliverable as per approved DCI and their approval under **Code-2** (Proceed with manufacturing/ fabrication as per Commented document/comments as noted) against the Contractor's certified Running Account Bill(s).

"Note: For the purpose of release of above payment towards civil / piling (if required) drawings, same shall be approved under Code - 1 (No comments. Proceed with construction/manufacturing/Fabrication as per the document) or under Code-R (Document is retained for Records / Information. Proceed with construction/manufacture / fabrication).

ii. 40% (Forty percent) after completion of 60% 3D Model review, on pro-rata basis on submission of all approved for construction drawings, P&IDs, Other deliverable as per approved DCI and their approval under **Code 1/R** (approved with no comments – Final, **R-Retained for records**) against the Contractor's certified Running Account Bill(s).

iii. 10% (Ten percent) on completion of 90% 3D Model review.

iv. 05% (Five percent) on submission of the followings on pro-rata basis:

a) All certificates and documents pertaining to the equipment/package comprised in Plant/ Works/package;

b) Electronic files for all documents;

c) Finalized 3-D model along with its native files (in a format specified in technical section) the against the Contractor's certified Running Account Bill(s).

v. 05% (Five percent) on submission of As-Built drawings for the Plant / Unit along with its electronic/native (as applicable) files against the CONTRACTOR's certified Running Account Bill(s).

vi. 02% (Two percent) on successful Commissioning of the Plant / works against the CONTRACTOR's certified Running Account Bill(s).

vii. 01% (One percent) on issue of Commissioning Certificate against the CONTRACTOR's certified Running Account Bill(s).

viii. 02% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill.

1.4.2 INSTALLATION AND COMMISSIONING SERVICES ETC.

(A) FOR CIVIL WORKS

i. 20% (Twenty percent) on completion of Civil/Piling works on pro-rata basis as per the approved Schedule of Activities against the CONTRACTOR's certified Running Account Bill(s).

ii. 70% (Seventy percent) on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s) on completion of individual item of work as per approved Schedule of Activities, provided that in case piling is not involved then payment percentage shall be 90% (Ninety percent) on pro- rata basis on completion of individual item(s) of Work as per Schedule of Activities.

iii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iv. 2% (Two percent) on successful Commissioning of the Plant / works against the CONTRACTOR's certified Running Account Bill(s).

v. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill.

(B) FOR STRUCTURAL WORK

i. 10% (Ten percent) on finalization of quantity, plan and submission of fabrication drawings on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

ii. 15% (Fifteen percent) against supply of identified structural steel at contractor's or sub-contractor's fabrication yard on pro-rata basis. This payment shall be released after submission of Bank Guarantee for equivalent value. This bank guarantee shall be valid up to the Contractual Date of Completion plus three months. However, this Bank Guarantee shall be released after receipt of all materials at Site and issue of certificate of verification and good condition.

iii. 35% (Thirty Five percent) against receipt of fabricated identified structural steel material at site or owner's premises on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

iv. 30% (Thirty percent) on erection, alignment, grouting and painting etc. on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

v. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on successful Commissioning of the Plant against the CONTRACTOR's certified Running Account Bill(s).

vii. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

viii. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill

(C) FOR MECHANICAL WORK

C.1 PIPING

i. 5% (Ten percent) on finalization of quantity, plan and submission of fabrication drawings on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s)

ii. 10% (Fifteen percent) against supply of identified piping materials at contractor's or sub-contractor's fabrication yard on pro-rata basis. This payment shall be released after submission of Bank Guarantee for equivalent value. This bank guarantee shall be valid up to the Contractual Date of Completion plus three months. However, this Bank Guarantee shall be released after receipt of all materials at Site and issue of certificate of verification and good condition.

iii. 25% (Forty percent) on receipt of pre-fabricated piping material including NDT as applicable at site or owner's premises on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

iv. 40% (Forty percent) on completion of erection and welding including NDT as applicable, on pro- rata basis against the CONTRACTOR's certified Running Account Bill(s).

v. 10% (Ten percent) on completion of hydro-testing, on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s)

vi. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

vii. 2% (Two percent) on successful Commissioning of the Plant / works against the CONTRACTOR's certified Running Account Bill(s).

viii. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

ix. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill

C.2 INSULATION

i. 70% (Seventy percent) on installation of insulation works, on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

ii. 20% (Twenty percent) on inspection after installation, it's acceptance and removal of scaffolding if any on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

iii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iv. 2% (Two percent) on successful Commissioning of the Plant / works against the CONTRACTOR's certified Running Account Bill(s).

v. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill.

C.3 PAINTING

i. 25% (Twenty Five percent) on pro-rata basis on surface preparation & primer application against the CONTRACTOR's certified Running Account Bill(s).

ii. 65% (Sixty Five percent) on pro-rata basis on Final Painting against the CONTRACTOR's certified Running Account Bill(s).

iii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iv. 2% (Two percent) on successful Commissioning of the Plant / works against the CONTRACTOR's certified Running Account Bill(s).

v. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill

C.4 REFRACTORY WORKS

i. 75% (Seventy Five percent) on pro-rata basis on installation against the CONTRACTOR's certified Running Account Bill(s).

ii. 15% (Fifteen percent) on pro-rata basis on initial dry out and acceptance against the CONTRACTOR's certified Running Account Bill(s).

iii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iv. 2% (Two percent) on successful Commissioning of the Plant / works against the CONTRACTOR's certified Running Account Bill(s).

v. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill

C.5 EQUIPMENT

i. 50% (Fifty percent) on completion of erection, on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

ii. 40% (Forty percent) on completion of alignment & grouting, on pro- rata basis against the CONTRACTOR's certified Running Account Bill(s).

iii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iv. 2% (Two percent) on successful Commissioning of the Plant / works against the CONTRACTOR's certified Running Account Bill(s).

v. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill.

(D) ELECTRICAL & PLANT COMMUNICATION WORKS

i. 50% (Fifty percent) on erection / installation etc. on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

ii. 40% (Forty percent) on testing loops and system on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

iii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iv. 2% (Two percent) on successful Commissioning of the Plant / Works against the CONTRACTOR's certified Running Account Bill(s).

v. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill.

Note: For the purpose of payment of second milestone of 40%, "testing loops and system" shall mean "continuity & erection protocol" in respect of electrical cables, earthing strips and cable trays.

(E) INSTRUMENTATION

i. 50% (Fifty percent) on erection / installation etc. on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

ii. 40% (Forty percent) on testing loops and system on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

iii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iv. 2% (Two percent) on successful Commissioning of the Plant / Works against the CONTRACTOR's certified Running Account Bill(s).

v. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

vi. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill.

Note: For the purpose of payment of second milestone of 40%, "testing loops and system" shall mean "continuity & erection protocol" in respect of Field Instruments.

(F) ALL OTHER WORKS

i. 90% (Ninety percent) on completion of work on pro-rata basis against the CONTRACTOR's certified Running Account Bill(s).

ii. 5% (Five percent) on issue of Mechanical Completion Certificate against the CONTRACTOR's certified Running Account Bill(s).

iii. 2% (Two percent) on successful Commissioning of the Plant / Works against the CONTRACTOR's certified Running Account Bill(s).

iv. 1% (One percent) on issue of Commissioning and Performance Test Certificate against the CONTRACTOR's certified Running Account Bill(s).

v. 2% (Two percent) on completion of all jobs against the CONTRACTOR's certified Final Bill

(G) COMMISSIONING

i. 95% on commissioning & acceptance of plant/unit and submission of all documents.

ii. 05% on completion of all works in all respects and issuance of completion certificate.

(H) POST WARRANTY COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT (PWCAMC)

100% (Hundred percent) Payment shall be released on pro-rata basis in quarterly installment at the end of each quarter against bills duly certified by OWNER for satisfactory performance.

GENERAL NOTES:

1. The above progressive payments are subject to deductions towards income tax and other deductions as applicable as per terms of the Contract. Tax at the prevailing rate shall be deducted as per the Indian Income Tax Act. Tax Deduction Certificate shall be issued by the Owner. Withholding Tax at the prevailing rate shall be deducted as per the Indian Income Tax Act. TDS certificate shall be issued by the Owner.

2. Completion certificate is the certificate issued after attending the defects prior to taking over as specified in the Special Conditions of Contract (SCC)/General Conditions of Contract (GCC).

3. Conditional Part completion certificate whenever essential (offloading case etc.) shall be issued with due concurrence from competent authorities to facilitate release of Final payment.

4. Wherever milestone payment has been recommended on receipt and acceptance of material, the same shall be released against “Incoming Material Inspection Report” issued by EIL/BPCL. Such release of the progressive payment towards supply in such a way ensuring that the total quantity against which the payment is released towards supply shall not exceed the final installed quantity of the item.

5. The above payment terms commensurate with the work executed.

6. Final payment for each item shall be linked with submission and acceptance of As built drawing/ documentation.

ANNEXURE - XI
TO
SPECIAL CONDITIONS OF CONTRACT

[HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT]

Bharat Petroleum

Quality, Environmental, Occupational Health and Safety (QEHS) Policy

We at Bharat Petroleum Corporation Limited, Bina Refinery (BPCL-BR) are committed to achieve Customer satisfaction by providing Quality products & services while demonstrating continual improvement in our QEHS performance to meet our stakeholder's expectations. Prevention of harm to human beings, environment and property are intrinsic to our Business philosophy.

To achieve the above objectives, we shall:

- **Proactively** anticipate & assess risks and opportunities, address them through short and long-term objectives and implement mitigation plans.
- **Inculcate** process-based thinking as a core responsibility in all functions to enhance individual ownership, accountability and performance.
- **Comply** with all applicable legislation and other requirements.
- **Focus** on protection of the environment, waste reduction and prevention of injuries and ill-health.
- **Emphasize** on QEHS aspects, technology upgradations, asset integrity, process improvements & cost reduction at planning & operational levels.
- **Ensure** effective Management of Energy and other Resources.
- **Institutionalize** EHS hazard & risk assessment methodologies, safe work practices & behaviors by benchmarking with international practices.
- **Develop** an effective response plan for quick implementation for foreseeable potential emergency situations.
- **Strengthen** awareness, skills, competence of our employees & business associates to continually improve performance standards through consultation and participation.
- **Periodically** review the suitability, adequacy and effectiveness of our Integrated Management Systems.

We shall communicate this Policy to all employees and service providers working in the organization and make it available to the public and other interested parties.

Date : 01st July 2023
Place : Bina

Chacko M Jose
Executive Director - BR

Bharat Petroleum

energising lives

PERSONAL PROTECTIVE EQUIPMENT (PPE) POLICY

We at **Bina Refinery(BR), Bharat Petroleum Corporation Ltd (BPCL)** are committed to achieve safe work environment by providing quality **Personal Protective Equipment (PPE)** as per the identified Hazards. Refinery operation is inherently hazardous in nature due to the processes involved and the large inventories of hydrocarbon stored in the premises. Petroleum Refinery poses great risk of fire, explosion and release of toxic materials due to the characteristics of its raw materials, intermediates and final products and the high operating temperature / pressure involved in the plant operations.

The purpose of the **Personal Protective Equipment Policy** is to protect the employees and service providers of BPCL BR from exposure to workplace hazards and the risk of injury.

To achieve the above objective, everyone shall adhere to the followings:

- ✓ **5–Mandatory PPEs** (Boiler suit / Duster Coat, Safety Shoes, Safety Helmet, Safety Goggle and Safety hand gloves) shall be used by all employees as well as Service Providers / Visitors while entering the operation area which is beyond the car parking area.
- ✓ **Mandatory PPEs** shall be used in **Workshop and Warehouse** storage areas also.
- ✓ **Flame Resistance Clothing** with inherently flame resistance fabrics shall be used for the Boiler suit / Duster Coat for the employees.
- ✓ For Service Providers working inside refinery operation areas like, Maintenance / Electrical / Instrumentation / other O&M service providers should preferably use minimum **Chemically treated flame resistance** boiler suits.
- ✓ Encourage use of **Cotton / Flame resistance Winter wear** by all employees and service providers. Winter wears using woollen / synthetic fabrics to be avoided.
- ✓ Employees in the rank of Chief Manager and above shall wear Duster Coats, while Sr. Manager and below shall wear Boiler suits. Duster Coats shall not be allowed to Service providers.
- ✓ In addition to above, **Job Specific PPEs** shall be used as per Hazard Identification and Risk Assessment. **Job specific PPE matrix** shall be followed as indicated in Common Procedure Manual for PPE.

Date: 08th Sept' 2023
Place: Bina

Chacko M Jose
Executive Director-BR

Chapter 3: Contractor's HSE Guidelines:

1	**PURPOSE:**	The purpose is to outline BPCL's Safety Guidelines for Contractors. These guidelines are not to be considered as a substitute for the applicable government regulations.
2	**SCOPE OF APPLICATON:**	This procedure shall be applicable to all BPCL Facilities. These includes, but not limited to: a) Refinery Complex b) Bina Dispatch Terminal (BDT) c) Crude Oil Terminal (COT Vadinar)
3	**CROSS REFERENCES:**	ISO 45001:2018, Factories Act 1948 & Madhya Pradesh State Factory Rules, 1962
4	**PROCEDURE:**	

PART "A": BPCL OBLIGATIONS

1.0 HSE Consideration in Selection of Contractors:

1.1 The user plant sends request to Commercial about the requirement of the contractor for any work/job. Commercial/User will locate the vendors/ contractors and suitable contractors are short-listed after technical scrutiny/ recommendation as per the prevailing procedures. Commercial will award the work order for the job as per existing SOP.

1.2 Contractor's past HSE record (minimum 2 years) shall be given due consideration, together with the technical competence. Following stages are considered while selecting & registration of new contracting agencies and awarding contract to any job.

1.2.1 Pre-selection stage:

i. During pre-selection stage, contractor's suitability for a specific type of work is assessed in a preliminary way. HSE should be one of the prime considerations in such assessment.

ii. Pre-selection involves establishing a list of approved contractors (the approved list). The contractors who are included in this list can be invited to submit an offer for a contract. HOD User Department / Engineer In Charge or his/her representative shall ensure that the contractor fulfills requirements pertaining to HSE before including his name in approved list.

1.2.2 Tendering and contract award stage:

i. In the tendering process, the contractor will have to include in its cost estimation, all items necessary for complying with health, safety and

environmental aspects. It is therefore essential that while inviting a contractor to submit an offer, he ensures understanding of the scope of work completely including general and specific HSE requirements, so as to enforce the required level of HSE performance during execution stage.

ii. Since all contractors, who have submitted offers, are screened in the pre-qualification stage, they are assumed to be capable of meeting the HSE requirements of the company. However, the aim should always be to achieve a high level of HSE performance in the execution of the contract, and hence the HSE aspects of each of the contractors should weigh equally amongst the other key items like cost, quality and time for making the ultimate choice.

2.0 BPCL Responsibilities

2.1 Responsibilities of BPCL Management:

2.1.1 To provide specific information to contractors and make workers aware of the hazards associated with job assigned.

2.1.2 To provide information about risk mitigation measures available at the workplace.

2.1.3 To provide the contractor with information on BPCL safety procedures, confined space entry, work permit system, Emergency Response & Disaster Management Plan etc.

2.1.4 To ensure training of the contractor workforce, medical examination, and proper usage of safety equipment.

2.1.5 To arrange for a multi-disciplinary safety audit team to conduct regular safety audits and monitor the implementation of the recommendations.

2.2 Responsibilities of Procurement Department:

2.2.1 Procurement will receive the request mentioning all the job details including special HSE requirement, if any from the concerned plant/ Dept. HOD and locate the suitable contractor.

2.2.2 Shall consider the performance of the contractor on compliance of HSE procedures as per the feedback given by the concerned Plant/Department/F&S for floating tender enquiry.

2.2.3 Shall advice / warn and if required terminate and de-list the contractor for violation of HSE procedures on recommendation of the EIC / User.

2.3 Responsibilities of Plant/Dept. HOD:

Although the contractual obligation for HSE of contractor's activity rests with the contractor, the HOD of concerned Plant/ Dept. shall also oversee that the contractor's supervision is in line with the HSE requirements applicable to the work and the hazards associated with that work.

2.4 Responsibilities of F & S Dept.:

2.4.1 Conduct safety induction, mandatory/ special fire & safety training for the contractor's supervisors and workers.

2.4.2 Ensure Investigation of all the incidents.

2.4.3 Conduct audits/inspections and suggest Contractor for improving the HSE standards of Contract employees.

2.4.4 Advises procurement department to warn / terminate the contractor if HSE procedures are violated.

2.5 Responsibilities of Engineer Incharge:

2.5.1 It is the responsibility of engineer incharge to ensure that BPCL HSE requirements are fulfilled by contractors/ sub-contractors.

2.5.2 The engineer in charge must see the past HSE record of all contractors/ subcontractors before awarding the work order.

2.5.3 The engineer in charge must ensure that the contractor employees have undergone safety induction, mandatory/ special F&S trainings.

2.5.4 The engineer in charge shall ensure that contractor's employees must wear mandatory/ job specific personal protective equipment.

2.5.5 The engineer in charge should ensure that incidents are reported/ entered in IRIS portal.

PART "B": CONTRACTOR'S HSE GUIDELINES

1.0 Introduction:

BPCL believes that all the manufacturing and related activities should be conducted in a safe way to ensure the safety of people working in its premises.

It is to be ensured that contractors, who work for BPCL, comply with HSE standards as per the company's policy and observe safe practices & procedures at work to protect health and safety of their employees and others.

Safety of the contract personnel needs enhanced focus due to constant change of persons leading to lack of awareness. Statistics and experience show that an additional benefit from improved HSE performance leads to overall effectiveness in the execution of contract work.

In particular, the contractor has an independent responsibility for his own HSE performance. BPCL is responsible for clearly communicating its HSE requirement to the contractor and for monitoring the contractor's performance with respect to HSE. HSE standards of the contract employees should be in line with the BPCL employees and any violation observed will be dealt with strictly (including termination of the contract).

These guidelines are applicable to all contracting agencies, O&M operators, other service providers, etc. who work for Bharat Petroleum Refineries Limited.

1.1 Definitions:

Owner / Company shall mean Bharat Petroleum Refineries Limited.

Agreement shall mean the contract agreement between owner and contractor for activities assigned to the contractors.

Contractor shall mean the person/persons, firm or company whose tender has been accepted by the Competent Officer of BPCL or contractor's legal Representative/ his successors and permitted assignee/sometimes engaged in job on verbal instructions, due to exigency/emergency etc.

Engineer – in – charge shall mean the person authorized by the Competent Officer of BPCL to whom contractor or his/her employees report to for work instruction.

Contract shall mean the totality of the agreement between the parties as derived from the contract documents.

2.0 HSE Aspects of the Contract:

In addition to the usual features of a contact there shall be a separate clause dealing with the contractor's compliance with Health, Safety and Environmental requirements. The sub-contractors if engaged shall follow all the HSE requirements of BPCL applicable to main contractor.

2.1 HEALTH: OCCUPATIONAL HEALTH REQUIREMENTS

2.1.1 MEDICAL FITNESS

i. Before planning the posting of the worker to BPCL, the concerned supervisor shall have a general overview that the person is not physically or mentally incapacitated for the planned job.

ii. The contractor shall arrange the medical examination of the workers as per the BPCL policy.

iii. The contractor shall produce the certificate of medical fitness of the worker at the time of gate pass application on the format as required by BPCL.

iv. The contractor shall ensure the compliance to the completion of the various specific medical examinations (SME) as per the BPCL policy. At present the SME is required for the following jobs

- Confined space entry (Specify if inert space entry)
- Work at Height
- Work in SRU
- Work in CPP
- Work in High Noise Area
- Canteen work
- Operation of a crane, locomotive or fork-lift truck, or to give signals to them
- Driving (other than specified in clause1.4.7)
- Work at White oil gantry or Railway Gantry of BDT

v. The contractor shall ensure compliance to the Form-32 medical examination for

- Confined space entry ,

- Work at Height (>30 Meters)
- Any specific job as suggested by Fire &Safety dept.

vi. The contractor shall ensure that the posting of the workers in the jobs requiring SME or Form-32 shall be in accordance with the fitness status in the medical examination.

vii. The contractor shall follow-up with the workers for the medical recommendation as suggested on the medical fitness certificate / Form 32.

viii. The contractor shall ensure timely renewal of the medical certificate, that is within one year for:

- Periodic Medical Examination for all the workers (if not specified)
- Confined space entry (Specify if inert space entry)
- Work at Height
- Canteen work
- Operation of a crane, locomotive or fork-lift truck, or to give signals to them (age < 45 years)
- Driving (other than specified in clause 1.4.7)
- Work at White Oil Gantry or Railway Gantry of BDT
- Six months for:
- Work in SRU
- Work in CPP
- Work in High Noise Area
- Operation of a crane, locomotive or fork-lift truck, or to give signals to them (age > 45 years)

ix. The cost of all these medical examinations (if any) should not be directly or indirectly recovered from the workers & shall be borne by the contractor company.

x. In case of any medical related dispute BPCL will be the final authority to arrive at a decision.

2.1.2 WORKPLACE INJURIES / EXPOSURES

i. The contractor shall periodically educate, train, motivate & supervise the workers at the opportunities of tool box talk or during the job on the possible health hazards, risks involved in the job & the good safety practices for prevention of such workplace injuries / exposures.

ii. The contractor shall ensure that in case of any such incident, the person is sent to Occupational Health Centre (OHC) along with his/her supervisor for the treatment & the documentation.

iii. The contractor shall cooperate, arrange & ensure that:

iv. The injured gets the complete treatment as advised,

v. The injured gets the medical attention on the recommended frequency at the govt. approved hospitals / clinics.

vi. The person is brought to the OHC for fitness certificate in all (except the First Aid cases), for the medical examination & fitness, before resuming the duties.

vii. The injured gets all required rehabilitative care.

2.1.3 HEALTH PROMOTION ACTIVITIES

The contractor shall ensure that the workers actively participate in all the health promotional activities as & when organized / supported by BPCL.

2.1.4 Disclosure

The contractor shall disclose any such important medical information he has, to the medical facility at BPCL in writing, if any of his workers has any potential or recognized significant health hazard to the health of the worker / his colleagues.

2.1.5 IMPROVEMENTS

The contractor shall periodically update his supervisors & the workers about the prevailing medical related requirements at BPCL.

2.2 Safety Guidelines for Contractors/ Sub-Contractors:

2.2.1 Responsibilities

i. The contractor shall be fully responsible for supervision of its personnel to ensure that they strictly adhere to all applicable Safety requirements.
ii. The contractor shall appoint one of its personnel on the work site as a Safety Representative.
iii. The contractor's Site Manager on site shall be responsible for coordinating the contractor's safety activities.

2.2.2 Alcohol and Drugs

The contractor shall ensure that any time during the performance of the work his personnel are not under the influence of any alcoholic liquor, drug or other intoxicating substances.

2.2.3 Conduct of Contractor's Personnel

The contractor shall instruct his personnel to comply with the following:

i. No one shall enter any part of the complex, including the work site except for undertaking the work assigned.
ii. Smoking is strictly prohibited. Anybody found smoking would be immediately removed from the complex. Such a person shall be barred from working for any other contractor employed by BPCL.
iii. No fire or naked light, matches, cigarette lighters or any apparatus that can cause ignition, shall be allowed in the complex.
iv. Personal Protective equipment shall be used and worn in accordance with the safety procedure.
v. It is essential that good housekeeping is maintained throughout the period of any work, both at work site and around any temporary building. The working area shall be kept tidy at all times, escape and other access ways shall be kept clear of objects.

vi. Safety equipment shall be kept in an accessible place. Scrap/surplus material shall be removed daily, cleaning up only at the end of the job is not considered sufficient.

vii. Spillage of oil or chemical shall be cleared up immediately in view of the fire hazard, slippery surfaces, toxic substances etc. Appropriate safety precaution shall be taken during the cleaning up. While returning permit, acceptor will certify housekeeping and issuer will check the same before signing the permit.

2.2.4 Equipment supplied by Contractor

The contractor shall provide and operate his equipment in compliance with the BPCL Procedures. Maintenance and use of equipment should be as per the standard practice and it should not create any hazard during the use. Contractor should deploy skilled workmen for operating the machine.

Contractors to inspect tools/tackles at quarterly interval and necessary records are to be maintained as per company format. Engineer In-charge will carry out random audits to ensure system compliance.

2.2.5 Personal Protective Equipment

i. The contractor/ sub-contractor shall supply following mandatory personal protective equipment to its all employees & supervisors:

S No.	PPE Type	Specification	Quantity	Frequency
1.	Safety Helmet	EN:397, IS:2925	1	Yearly
2.	Safety Goggles	EN:166, ANSI: Z 87.1	1	Quarterly
3.	Safety Hand Gloves	Polka Dotted	2 Pairs	Weekly
4.	Boiler Suit	Cotton	3 Sets	Yearly
5.	Safety Shoes	EN-345, IS:15298	1 Pair	Yearly
**Note: No Contractor shall use red colour boiler suits and helmets inside the premises other than the firefighting crew. ***Note: The service provider shall obtain approval from F&S department before selecting colour of coverall and helmets.				

ii. The contractor/ sub-contractor shall also provide following PPEs as per job requirements such as but not limited to:

SN	PPE Type	IS/EN/EU	Quantity	Frequency
1.	Ear Plug (Ear Muff on need base)	EN 352-2, ANSI: Z3.19, EN-352-1	1	Monthly
2.	Dust Mask	IS:9473,EN-149	2	Weekly
3.	Full Body Harness with double lifeline	IS: 3521	Job Specific	Need Base
4.	Face Shield	EN:166.1.B.3.9	Job Specific	Need Base
5.	PVC/Nitrile/Rubber gloves (For Chemical/Civil Jobs)	EN-374-(JKL) AND EN-388-CE, EN-374-CE	1 Pair	Weekly
6.	Gum Boots (Civil Jobs)	EN-345	1 Pair	Half Yearly
7.	Leather Gloves for Welders	CE-0493	1 Pair	Monthly
8.	Leather Apron	EN-398, EN-407	Job Specific	Need Base
9.	Helmet mounted welder's shield	IS:2925 ,EN-166	1	Yearly
10.	Chemical Splash Goggles (need base)	ANSI: Z 87.1	1	Quarterly
11.	Over Spectacles Goggles (need base)	EN-166, EN-170, EN-172	1	Quarterly

iii. The contractor/ sub-contractor shall ensure that the quality of PPE's is maintained as per BPCL guidelines. Contractor/ sub-contractor is responsible for providing personal protective equipment to their employees as per above specifications, quantity & frequency.

iv. The contractor/ sub-contractor shall ensure that personal protective equipment is maintained in good condition and shall be worn as per the requirement.

v. All the PPE should be available while working and proper supply to be ensured by the contractor for routine wear and tear/loss.

vi. Use of PPE is mandatory and any violation of the same shall be penalized.

vii. Contractor shall provide contractor's employees with the mandatory personal protective equipment and the personal protective / safety equipment as specified in the work permits. The contractor shall also provide additional PPE, if instructed for safe execution of the job.

viii. Contractor’s PPE and other safety equipment shall conform to BPCL specifications and sample shall be approved by BPCL safety representative before procurement. Sufficient stock of mandatory PPEs shall be kept and maintained at site.

ix. Contractor employees and employees of Subcontractors shall wear safety helmet and coverall of the same color with logo/emblem of the main contractor.

x. Contractor employees should be trained in proper use and maintenance of PPE.

xi. The damaged PPE shall be periodically replaced with new ones.

2.3 ENVIRONMENT:

2.3.1 The contractor shall perform their jobs in an eco-friendly manner and in consonance with the objective of BPCL Environment Management System. The contractor shall inculcate environmental awareness among their workmen/personnel and strive for enhancement of systems and skills for minimizing the environmental impact out of their activities/services.

2.3.2 The contractor shall avoid wastage of water, compressed air, electric power, steam, etc. supplied to them from owner's source of supply for execution of the job.

2.3.3 The contractor shall ensure that while carrying out Modification/Repair/Replacement jobs of any equipment or pipeline, the spillage of Hydrocarbon, Oily Sludge etc. are cleaned and routed to nearby OWS, at regular interval as well as after completion of jobs.

2.3.4 Before attending any blinding/de-blinding jobs, during pipeline transfer operation all tools, tackles &spares shall be kept ready at site in order to minimize Hydrocarbon spillage.

2.3.5 Should there be a discharge or escape of appreciable quantity of pollutants or contaminants during performance of its obligations under this Contract which occurs as a result of activities of Contractor or its sub-Contractor, the Contractor shall immediately take all action necessary to contain, control, recover or disperse the substance and to eliminate the safety and environmental risks and correct the damage resulting there from.

2.3.6 The contractor shall clear and level the work site and remove all metallic and nonmetallic surplus materials, scrap, debris and other waste materials generated out of his job, from time to time as well as after completion of job. The contractors shall not throw away cut gaskets, used electrode pieces, hand gloves, cotton bags, polythene bags, etc., into open channel drains or pipelines system. They are to be collected and to be deposited in bins/waste collectors earmarked for the purpose or disposed off in the areas as per the direction of Engineer-in-Charge. The contractor is responsible for keeping his place neat and clean. Also all temporary office shall be maintained in a healthy and hygienic condition.

2.3.7 Contractor shall return all surplus materials & scrap to the owner's stores.

2.3.8 Contractor's vehicles, trucks, tractor, cranes and other portable equipment e.g. Air Compressor, DG Set, Dewatering Pumps etc. used inside refinery premises (where Hydrocarbon is used as fuel) for execution of the job must be mechanically sound and have an exhaust complying pollution norms. The contractor shall ensure to avoid idle running of vehicles and equipment used for execution of the job.

2.3.9 Contractor shall comply all the applicable rules and regulations as per MoEF guidelines while working/ handling equipment inside refinery premises.

2.3.10 Special precautions and personal protection shall be taken as per refinery HSE procedures during the following jobs:

i. Handling of Hazardous Chemicals, Gases & Materials etc. (e.g. Spent Catalyst/Clay/Carbon/Resins, Acids, Chlorine, Ammonia, Pyrophoric Iron, etc.).

ii. Working in presence of Suspended Solids (e.g. Catalyst, Refractory, Sand, Dust, etc.)

iii. Cleaning/handling of Oily Sludge.

2.3.11 BPCL, Bina is having **"QUALITY, ENVIRONMENT, OCCUPATIONAL HEALTH AND SAFETY (QEHS) POLICY." Please refer Annexure I.** Contractor/ Sub-contractor will educate their personnel working inside the refinery w.r.t. QEHS Policy of the refinery and all out efforts shall be made for compliance to the above policy.

2.3.12 For contracts related to construction related activities, the contractor to use only fly-ash based products for building materials and road embankment, such as cement or concrete, fly-ash bricks/blocks/tiles, clay fly-ash bricks/blocks/tiles or cement fly-ash bricks/blocks/tiles or similar products in combination or in aggregate of them in every project in line with MoEF gazette notification.

2.3.13 For contracts related to solid material handling such as fly ash, pet-coke, coal, limestone, sulfur, etc., the contractor is required to take all necessary precautions so as avoid the dusts getting air borne or spillages on roads & drains, etc. during transportation and handling of the same. Precaution during transportation may include use of enclosed vehicles, proper covering of the consignment with tarpaulin, water sprinkling, etc. as suitably directed by Engineer-in-charge.

2.3.14 For activities related to generation & handling of E-Waste, spent lead acid batteries & contaminated chemical drums the contractor is required to ensure the handling of the same is carried out in line with related refinery Environment dept. guidelines.

3.0 ADMISSION TO BPCL PREMISES

3.1 ENTRY IN REFINERY PREMISES

CONTRACTOR shall allow only its employees, Subcontractors, and suppliers directly connected with the work, to enter BPCL premises only after attending necessary safety induction training endorsed by F&S.

3.2 VEHICLES AND PARKING

3.2.1 Contractor shall furnish transportation for all of Contractor’s employees from the designated entry gate to the job site and return. The BPCL Representative will designate the routes and parking areas to be used by Contractor's vehicles in BPCL premises. Contractor shall observe all of the BPCL’s traffic regulations at all times while in the refinery and other BPCL premises.

3.2.2 All Contractors owned, rented, or leased vehicles or equipment (i.e. air compressors, generators, welding equipment, forklifts, cranes, etc.) entering the Refinery and other BPCL premises shall be properly identified and has a valid Safety Certificate and Gate Pass. Only vehicles required for execution of work are allowed in the Refinery and other BPCL restricted premises; all other vehicles shall be parked outside the Refinery or BPCL restricted premises.

3.2.3 A safety clearance from F&S dept. is required to all the vehicles entering in BPCL operational area. The timings of vehicle inspection is from 09:00 AM to 11:00 AM.

3.2.4 The contractor shall comply with all points of checklist given in **Annexure II** of safety inspection of vehicles before coming for inspection.

3.3 TRAFFIC REGULATIONS

All traffic signs, signals, and road markings must be obeyed. Unless otherwise posted, the speed limit in BPCL facilities is 30 KMPH. In all cases, the low posted speed limit shall govern.

4.0 SAFETY RULES AND PROCEDURES

4.1 SMOKING AND CARRYING OF MATCHES / LIGHTERS

Smoking is prohibited in all BPCL Areas. Carrying of matches and lighters into Refinery premises is prohibited. Violators will be refused entry into the restricted area and shall be dealt administratively as violation. Contractor shall be responsible for strict adherence to these regulations by contractor's employees or the employees of contractor's sub-contractors.

4.2 BATTERY OPERATED AND ELECTRICAL ITEMS

Non-intrinsically safe battery operated items e.g. flashlights, mobile phone, pagers, personal monitors, etc. are not permitted inside the operational area. Electrically operated tools & equipment should be suitable for use as per the area classification and should be certified by BPCL electrical dept.

4.3 FIRE FIGHTING EQUIPMENT

Contractors shall furnish all portable fire extinguishers and safety equipment required at construction sites during construction. The fire extinguishers shall be certified by BPCL Fire & Safety dept. and proper tag / sticker shall be provided by the contractor. The firefighting equipment shall be regularly inspected & maintained.

Contractors shall not use, alter, or move BPCL firefighting equipment. Firefighting equipment shall be accessible at all times.

4.4 SCAFFOLDING AND LADDERS

4.4.1 All scaffolds shall be erected by competent and qualified personnel and shall conform to requirements of BPCL guidelines and safe work practices for scaffolds and ladders. These requirements include the mandatory inspection, tagging, approval, and certification of erected scaffold before use.

4.4.2 Contractor's scaffold material samples shall be approved by BPCL prior to procurement. Scaffolding should be regularly inspected by competent person & provided with inspection tag.

4.5 USE OF RADIOACTIVE MATERIAL

4.5.1 Only authorized personnel holding valid 'Radiation Work Permit License' issued by BARC shall handle radioactive material.

4.5.2 Contractor shall comply with all safety precautions and requirements as specified in relevant clauses of BPCL procedures and guidelines.

4.5.3 Contractor shall ensure that the following basic rules are strictly enforced:

i. The ionizing radiation source shall not be left unattended.
ii. Radiation film badge dose meter shall be used.
iii. The exposure area shall be clearly identified, barricaded by rope or other effective means and radiation warning signs posted.
iv. Contractor shall coordinate with BPCL Inspection\ Instrumentation Representative to ensure that, the Dose Rate at the barricade does not exceed 0.25 milirems per hour.
v. Contractor shall ensure availability of radiation meter at work site of radiography
vi. Contractor shall give 12 hours' prior notice to Engineer incharge Inspection \ Instrumentation before starting any radiography work inside refinery.

4.6 COMPRESSED GAS CYLINDERS

4.6.1 Contractor shall comply with the BPCL requirements for storing, handling and using of compressed gas cylinders.

4.6.2 Cylinders which are approved by PESO should only be allowed to use in refinery complex.

4.7 ROAD CLOSURES

4.7.1 No roads shall be barricaded or blocked in any way without written approval from the BPCL's representative & F&S dept. Use of a flag man is required to direct traffic around congested areas. Road workers and workers on roadsides shall wear reflective coverall or jacket.

4.7.2 Barricades, temporary walkways, signs, etc. should be provided for the safety of pedestrians and roadside facilities. Barriers shall be equipped with reflectors or lights so that it is readily visible at night.

4.8 VEHICLE / EQUIPMENT SAFETY CERTIFICATE

4.8.1 All vehicles and engine driven equipment entering BPCL premises require a 'Safety Certificate' as such, contractor should meet the following general requirements:

4.8.2 CONTRACTOR'S Vehicle or mobile equipment shall be in good condition and meet the requirements of 'Vehicle and Equipment Safety'. The number of vehicles/ mobile equipment shall be kept to the minimum essential for the site personnel and work requirements.

4.8.3 Contractor's vehicle or equipment shall be provided with the appropriate type and size of fire extinguisher certified by BPCL Fire & Safety dept.

4.8.4 An approved type of spark arrestor shall be fixed to the exhaust of equipment and vehicles entering hazardous area. Pool cars or buses shall not be allowed to enter hazardous area. Mobile equipment, lifting appliances and vehicles to load or unload material shall only be allowed with work permit and prior authorization.

4.8.5 In addition, contractor's lifting equipment shall have a valid load test certificate from a BPCL approved third party. Safety valves on mobile equipment shall also be third party certified.

4.9 WELDING AND CUTTING

4.9.1 Contractor should obtain a Hot Work Permit prior to any welding works in BPCL premises and all requirements pertaining to hot work shall be strictly enforced. Only a BPCL approved type of Welding Blanket shall be used.

4.9.2 When welding work is carried out in a workshop or any similar location classified as a permit free area, which is approved by CGM (Mfg.), a work permit is not required but the work shall be adequately supervised. The work area shall at all times be kept clean of combustible and flammable material.

4.10 WORK PERMITS

4.10.1 As a general principle, no work in the BPCL premises can be carried out unless authorized by appropriate work permit, except those specified in the BPCL Guidelines and Procedures for Work Permit System. The nature of work may also require additional permission, such as permission for radiography & Excavation.

4.10.2 Contractor shall obtain appropriate written work permit (and additional permission if required) through its BPCL representative before starting any work and an approved copy of the permit must be available at the job site.

5.0 CONTRACTOR'S EQUIPMENT / MATERIALS

i. Contractor's engine driven equipment shall be equipped with BPCL approved type of spark arrestor and should be in good operating condition before it can enter the Refinery and other BPCL premises.

ii. All battery boxes shall be covered and all gasoline lines and carburetors free from leakages.

iii. A current and valid BPCL Safety Certificate shall be attached to all engine driven equipment entering the Refinery.

iv. Operation of engine driven equipment must comply with BPCL Rules and Regulations.

5.1 THIRD PARTY 'TEST CERTIFICATE'

5.1.1 Contractor shall secure BPCL approved Third Party 'Test Certificate' (before using any) of the following contractor's equipment / equipment accessories:

i. Lifting appliances (crane, boom truck, truck, jig lift, forklift, pulley, D shackle etc.)

ii. Safety valves on mobile equipment, e.g. air compressor, hydro test machine, vacuum truck etc.

iii. Cargo tank of tank vehicles, e.g. fuel tanker, vacuum tank or pressurized tank, etc.

iv. All pressure vessels, e.g. compressor's air receiver, SMPV, etc.

5.1.2 And also produces test certificate once in year for all lifting appliance, valve vacuum tank, pressure vessel, & once in six month for lifts, hoist, man basket etc.

5.2 FORKLIFTS, INDUSTRIAL TRUCKS AND CRANES

Only persons holding appropriate Driving License may operate forklifts, industrial trucks and cranes. Personnel are not permitted to ride/travel on forklifts, industrial trucks and cranes.

5.3 STORING FUEL AND REFUELING ON BPCL PREMISES

5.3.1 Contractor should not store fuel for refueling (vehicles & equipment) inside BPCL premises without BPCL Representative approval.

5.3.2 Contractor should not transport fuel on vehicles or containers not approved for that purpose.

6.0 On-the job Control:

Following tools are useful to ensure the safe practices on the job.

6.1 Safety Supervision:

6.1.1 It is the duty of the contractor to supervise his workmen during the job. The concerned plant personnel shall oversee the supervision of safety, health and environmental matters.

6.1.2 It is mandatory that contractor's supervisor is present within the plant premises till the job continues. The contractor's supervisor will be in the close contact with BPCL Engineer in charge.

6.2 Safety Inspections and Safety Audits:

6.2.1 Safety inspection and auditing are important means for monitoring contractor safety. Contractor's Supervisor must discourage unsafe practices by contractor employees through regular inspection at the work site. The compliance with work permit system, mandatory PPE's of personnel, the operational condition of safety equipment and the reliability, use of tools appropriate for the job**,** serviceability
and maintenance of work tools and equipment should be established by spot checks. Concerned contractor's safety supervisors shall carry out audit of their facilities and equipment. It is the responsibility of Contractors to ensure that necessary action is taken to rectify in a time bound manner.

6.2.2 Contractor should participate in half yearly HSE audit conducted by F&S department of BPCL. The result of these audits should be used for setting goals for future improvements and winners should be awarded accordingly. A written Inspection report shall be prepared and distributed to top management of the same. The checklist for half yearly audit is as per **Annexure III.**

6.3 Non Compliance/ Safety Violation:

6.3.1 Whenever the contractor is found to be working unsafe, he shall be advised accordingly by the concerned plant management and F&S person to take corrective

action. If needed work shall be stopped until the situation is rectified. Delay in work as a result of such stoppages shall be regarded as a breach of contractual obligations.

6.3.2 Non-compliance / violation of safety standards by the contractor shall be viewed seriously by the HOD of concerned plant/ Dept. / HOD F&S.

7.0 Contract Employees Safety Training:

It is the policy of BPCL to provide systematic safety training and education to Company's contractors and transporters personnel for observing safe work practices.

7.1 Safety Induction, Mandatory and Job Specific Fire & Safety Training:

As a minimum requirement, all the contractor's personnel working at refinery Complex are required to be trained in HSE aspects as detailed below:

7.1.1 Every person will be provided safety induction prior to deployment on work.

7.1.2 Permanent contractor has to fulfill the requirements of *mandatory* fire & safety trainings.

7.1.3 Contractor employees will also attend job specific training on need basis.

7.1.4 Further, Contractor nominated safety representative also to train their workmen and keep a systematic records of training as per details given below:

i. Date and time of training given

ii. Name and Signature of Safety Representative

iii. Name and Signature of individual taken the training

iv. Periodically contractor workmen training activities will be audited by record checking and validation at random by Fire & Safety Dept.

7.2 Toolbox talks:

The toolbox talks as a part of continuous training for effective use of safety tips on the job planned for that day. The Supervisor-in-charge of the Contractor should give a ten to fifteen minutes talk to the Contract employees. This is the most effective channel of communication as it takes less time, it is at the work place and it is covering the immediate job they are handling so they can precisely correlate the training while working. Toolbox talk is the right tool to boost the safety awareness and to improve the Contract employees' participation as it involves a small group where direct contact is established to make the safety message more effective. Records are to be maintained by Contractor Supervisor of Tool Box talks. This should also reflect in monthly HSE report.

8.0 EMERGENCY RESPONSE AND INCIDENT REPORTING

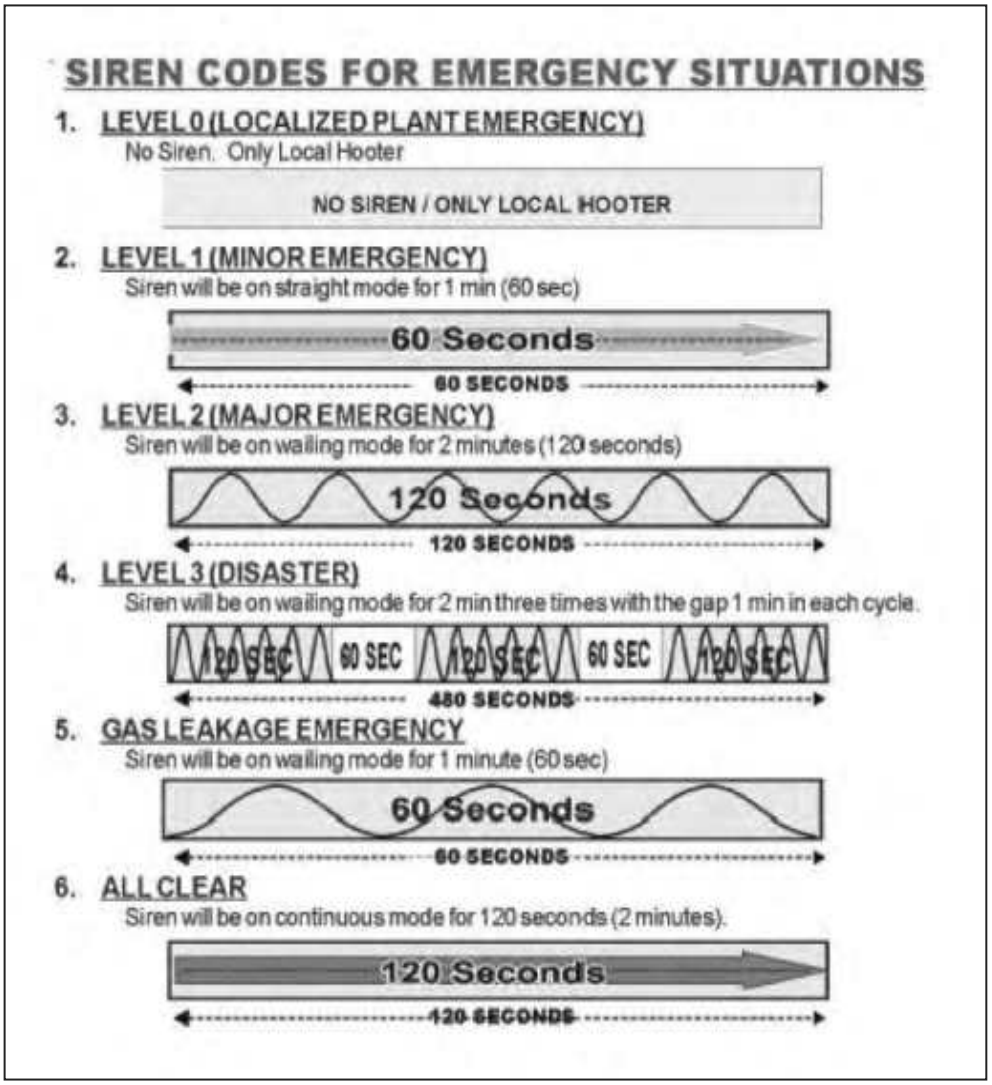
8.1 EMERGENCY RESPONSE

8.1.1 Contractor shall ensure that contractor employees clearly understand their responsibility for an appropriate emergency response as per the BPCL Emergency Response & Disaster Management Plan through awareness / refresher training and Safety Talks.

8.1.2 In the event of a major fire/ evacuation, contractor shall move contractor's employees away from the vicinity of the fire and out of the way of firefighting activities in an orderly manner.

8.2 EMERGENCY SIRENS

There are various sirens to indicate emergency situation in the refinery, as tabulated below. Proceed upwind, or crosswind if gas release is upwind of your location, as indicated by wind socks/steam plumes. Proceed to the appropriate emergency assembly area by the evacuation route as indicated/ communicated.



8.3 Incidents Reporting:

8.3.1 All incidents, property damage and near miss cases pertaining to contractor activities shall be reported by Contractor to the engineer in charge and Fire & Safety department.

8.3.2 Contractor employee, in case of any injury shall report to the plant personnel and if nobody is available, should rush to the Occupational Health Centre for the treatment. If further treatment is required outside company, contractor will arrange for the further treatment. In case of lost time injury or fatality, contractor is responsible for the treatment and compensation of the affected workmen. The contractor will not only give information during the investigation of the Incident to the investigation team but also arrange the witness of the same.

9.0 Responsibilities:

9.1 Responsibilities of Contractor:

9.1.1 To ensure that all tools and equipment used by his working crews are maintained in good working condition and have been tested by the competent authority.

9.1.2 Contractor is required to make safety documents and records available to BPCL Representative upon request. These include, but are not limited to work procedures, training records, performance records, environmental records, licenses, permits, registrations and compliance plans.

9.1.3 To employ adequately qualified, trained, skilled and experienced persons for specified activities.

9.1.4 To appoint adequate number of supervisors, who will be responsible for implementing their HSE program.

9.1.5 To take immediate action to correct any violation of safety rules observed or reported.

9.1.6 To ensure that appropriate warning signboards or tags are displayed on site.

9.1.7 To comply with safety norms lay down from time to time as per requirement of job.

9.1.8 To keep a constant liaison with Engg-in-charge /BPCL representative on safety issues.

9.1.9 Photography is prohibited in all BPCL controlled areas unless authorized. Contractor shall not take photographs without approval of the BPCL representative. Contractor shall obtain permission from BPCL representative. Appropriate Work Permit shall be obtained.

9.1.10 To ensure that his personnel are provided with mandatory personal protective equipment. Also, contractor should ensure that job specific personal protective equipment is available to his personnel.

9.1.11 The contractor has to give an undertaking before start of contract on HSE related aspects as per annexure IV.

9.2 Responsibilities of Contractor Supervisor / Site In-charge of Contractor:

9.2.1 Contractor supervisor is the key person to comply with the HSE standards at work site. He is responsible for overall coordination of the HSE procedures prescribed herein:

i. To facilitate AE/SIC, Fire & safety representative or any other person from BPCL to carry out safety inspections of his site.

ii. To comply with recommendations given by concerned BPCL Officer. All Contractor's Safety Personnel, including designated Safety Representatives, should make daily inspection of the work area. The inspection should be routine, planned, and designed to include communications with specific people in the work place, and not just a visual site visit.

iii. To get information from the concerned BPCL personnel on hazards associated with a particular job and to ensure that necessary precautions are taken during the execution of that job accordingly.

iv. Contractor's job supervisors also should make daily inspection of their work areas for the specific purpose of correcting unsafe acts or hazardous conditions.

v. To take action in consultation with concerned BPCL personnel to rectify the unsafe conditions at work site prior to start of the work.

vi. When work is in restricted area, to select personnel adaptable to the work at hand and will ensure that all safety requirements are being adhered to.

vii. To ensure the use of mandatory PPEs by working crew under his control.

viii. To review the work area for unsafe practices and conditions and initiate corrective actions as required.

ix. To maintain a constant awareness of fire hazards in their area of work responsibility and to take action to eliminate the fire hazards if possible. Matters beyond his ability to handle shall be reported to the concerned engineer in charge.

x. To know the plant emergency procedures. This will broaden the leadership base, which may be required to scope up with serious incidents, personal injuries, fires or evacuation.

xi. To provide all relevant information to incident investigation team for any incident resulting in personal injury, property/ environmental damage.

10.0 HEALTH, SAFETY AND ENVIRONMENTAL PROGRAM

Besides meeting BPCL and other regulatory safety provisions, contractors must have a written safety Program and shall be approved by Fire & Safety department. The actual program that shall be developed will depend on variables such as size of the firm, size of the project, nature of activities and the location & number of contract employees.
The Contractor Management shall commit resources and all necessary support to ensure the program is implemented to the satisfaction of the BPCL. Contractor shall ensure adherence to all laws, rules, regulation, and notification of various government departments pertaining to health, safety and environment.

10.1 SITE SAFETY ORGANIZATION AND RESPONSIBILITIES

10.1.1 The contractor's safety program should establish responsibilities for managers, engineers, supervisors, safety representatives, and the employees.

The contractor's safety program should also include site safety organization with respect to the overall site organogram. The contractor's employee in-charge of safety should be among the top in the organogram and should have authority over other activities. There should be at least one dedicated, qualified and experienced contractor's safety Engineer or Supervisor exclusively responsible for safety implementation / co-ordination. He shall be free from any other responsibility and no compensation will be made by the BPCL for the deputation of contractor's safety staff. The details of the safety officer/supervisor shall be submitted to BPCL F&S dept. in a format given in **annexure V**.
Contractors must provide a nominated manager, supervisor or foreman with authority to give and receive safety instructions at project location as mentioned below. Depending upon the nature and size of the job, minimum strength of the contractor's safety personnel shall be as indicated in the table below.

Employee Strength (including sub-contractor)	Minimum Strength of Safety Staff
Max. No. of employees 30	One no of dedicated supervisor who shall be designated as a safety steward/supervisor.
No. of employees: 30 – 100	For every 30 persons or more, contractors shall appoint one qualified safety steward/Supervisor (diploma in industrial safety from recognized government institute). For more than one safety steward, one of them shall be appointed as Chief safety steward. In addition to the above, the contractor shall also appoint one safety officer (Engineer) if he employs more than 100 workers. A safety officer (Engineer) shall have a Diploma in Industrial Safety or any equivalent qualification from the Government Recognized Institute and minimum 2 years of experience. For more than one safety officer, one of them shall be appointed as Chief safety steward
No. of employees: 101 – 250	
No. of employees: 251 – 500	
No. of employees: > 500	

NOTE : BPCL/EIL shall reserve the right to prescribe the number and qualification of contractor's safety personnel depending on the criticality and surge of activities and safety performance of the contractor during execution.

10.1.2 The number of employees mentioned above represents the maximum number of contractor employees estimated to be engaged at the site on any day by the contractor and their subcontractor. In case of block shutdown or turnaround when the contractor is required to bring in additional manpower, the number of contractor safety personnel shall be increased as per above table.

10.1.3 Contractor's safety personnel shall possess the requisite qualification and experience as given below:

10.2 Safety Engineer /Officer

Shall be a graduate engineer (Mechanical / Chemical / Electrical/ Civil/ IP/ CTM/ Safety) having a minimum of Two (2) years working experience in the field of Safety. He should possess a recognized degree or diploma in industrial safety. He must be able to speak, read and write English very well.

10.3 Safety Supervisor/Steward

10.3.1 He shall be a diploma holder in engineering or science graduate having five (5) years' experience in handling construction or maintenance projects in process Plant. He should possess a recognized degree or diploma in industrial safety. He must be able to speak, read and write English well.

10.3.2 Curriculum Vitae of contractor's safety personnel along with copies of all certificates shall be submitted for BPCL's review and approval before posting at BPCL site. The BPCL reserves the right to evaluate the candidate based on review of CV and verification of original certificates and/or personal interview.

Annexure VIII provides description of Contractor's Roles and Responsibilities.

Annexure IX provides tentative list of facilities /equipment for the contractor's safety function

10.4 SAFETY ORIENTATION

10.4.1 New contractor's key personnel (i.e. supervisors, engineers and managers) along with the workforce shall receive safety induction training from BPCL F&S department, as per applicable safety training procedure. In turn, these trained Contractor's key personnel shall conduct orientation to their respective employees prior to job site mobilization / beginning work in form of tool box talks on regular basis and generate record for the same. Such orientation should include provisions of the written safety program and procedures applicable to the contractor's scope of work, and also should include the following:

i. Clarification of the HSE responsibilities for contractor, subcontractor, employee and all construction/project site personnel.

ii. Clarification of HSE expectations of the contractor employees.

iii. HSE rules& regulations within BPCL.

iv. The procedure / responsibilities on Incident reporting for personal injuries, occupational illnesses, fire incidents, property damage incidents, environmental incidents, traffic incidents and near-miss incidents.

v. Toolbox meeting schedule, agenda and attendance mandatory requirement.

vi. The mandatory use of personal protective equipment on various specific activities

vii. Prompt reporting of unsafe acts or conditions.

viii. Overview of BPCL's emergency response plans and the contractor employees action in case of an emergency/drill

ix. Waste Handling and Disposal.

10.5 CONTRACTOR'S HSE MEETINGS AND TRAINING

Contractor site in charge along with the safety officer/ supervisor shall attend monthly HSE meeting conducted on every second Tuesday of the month by BPCL. The meeting agenda should include HSE records and activities, statistics, incidents, personal protective equipment and other employees' concern on HSE at work. Minutes of meeting shall be prepared by F&S dept. and circulated to top management and participants. The format of the monthly report is given in **annexure VI.**

10.6 SAFETY COMMUNICATION AND COORDINATION

For all practical purposes, it should be the responsibility of the contractor to have all its employees & sub-contractors etc. informed and involved in various safety communication and coordination activities.

10.7 RECORDKEEPING AND DOCUMENTATION

10.7.1 Records are required to support activities of contractor safety programs for both control and audit purposes. Records that shall be maintained and retained within the contract duration at the job site should include the following:

i. Log of all injury cases reported and treated, showing date, name of injured, job nature of injury and type of treatment given.

ii. All incident investigation report (i.e. injury, illness, traffic, property damage, environmental incident and as well as Near Miss Incidents).

iii. Safety meetings or toolbox meeting records or minutes showing date of meeting, who attended, the subjects discussed and who conducted the meeting.

iv. Job site inspection / audit reports and status of the action plans.

v. Records to show dates, name of participants and subject of training programs.

vi. Lifting Tackles and crane or equipment inspection records, 3rd party certificate.

vii. PPE's stock & distribution records shall be maintained

11.0 SAFETY REPORTS & RECORD REQUIREMENTS.

The Contractor shall prepare and submit the monthly safety reports in prescribe format given as Annexure II (through BPCL representative) to Fire & Safety department within the first five working days of the month.

12.0 COMPLIANCE WITH STATUTORY REQUIREMENT

Consultants, contractors/ sub-contractors or other third parties working in the field shall abide by:

i. The safety procedures for working in areas of the work as defined in scope of work.
ii. All requirements under The Factories Act 1948 and the rules framed there-under in the M P Factories Rules& Gujarat Factory Rules, as applicable.
iii. Applicable Environment Regulations in force and also the systems and procedures in M.P/Gujarat state of work.
iv. Contractor shall follow complete HSE (Health, Safety and Environmental Policy) guidelines of BPCL.

13.0 SAFETY INFRINGEMENT AND PENALTY SCHEME

All contractors/ sub-contractors and their employees working in BPCL premises shall comply with the BPCL safety procedures, guidelines and safe work practices. Violation of these BPCL procedures / guidelines / safe work practices shall be dealt according to penalty system as follows:

13.1 PENALTY STAGES

VIOLATION	FIRST	SECOND	THIRD	FOURTH
MINOR	**Caution Notice**	**Penalty Rs. 500/-**	**Penalty Rs. 1000/- ***	**Multiplied**
MAJOR	**Penalty Rs. 1000/-***	**Penalty Rs. 2000/- ***	**Penalty Rs. 5000/- ***	**Multiplied**

* The BPCL reserves the right to impose more severe penalty, i.e. suspend/terminate the employee, his supervisor or the site manager.
Note: - The penalties may be revised from time to time by BPCL management.

BPCL employee is authorized to charge the infringement note to contractor for any violation observed at site in prescribe format (Annexure- II) with the copy to safety dept. In case of any disagreement, BPCL SAFETY representative shall be the final authority to decide whether an infringement is minor or major for violations which are not listed in the penalty system. Fire & Safety Department is authorized to issue infringement report to the BPCL representative. The format of the penalty is as per **annexure VII**. The Engineer in Charge of the Contract shall take necessary action and provide feedback to Fire & Safety Department with copy of receipt from bank.

13.2 Minor Violation (Examples but not limited to)

i. Not wearing personal protective equipment (PPE) at work site.

ii. Minor traffic violation (wrong parking)

iii. Blocking of emergency equipment or exits.

iv. Using unapproved scaffolding.

v. Not keeping proper housekeeping

vi. Not providing shoring for the excavations.

vii. Over speeding

13.3 Major Violation (Examples but not limited to)

i. Smoking, carrying matches or lighter.

ii. Working without valid work permit.

iii. Non-compliance to work permits condition.

iv. Repeating minor violations more than twice.

v. Major traffic violation.

vi. Found guilty of negligent driving resulting in a vehicle incident.

Annexure II

VEHICLE / EQUIPMENT SAFETY CHECKLIST

Vehicle/Equipment type : _____ Vehicle Reg./Serial No.:_____ **☐ BPCL ☐ Contractor Company Name: _____ Re-validation: Six Month**			**Date** _____
Sr. No	**ITEM**	**REQUIREMENT**	**Y / N / NA**
1.	Fire Extinguisher	Approved type and size, properly mounted, easily retrievable	
2.	Exhaust System	Should not leak	
3.	Spark Arrestor	Fitted with approved spark arrestor	
4.	All Lights	Operable and covered with standard lens (includes reverse, brake, hazard lamps & turn indicators), not cracked or broken	
5.	Reverse Beeper/ Horn	Available in vehicles where driver cannot see the rear, horn loud enough, activated by gear lever	
6.	Seat Belt	Seat Belt with seat belt assembly in proper working condition	
7.	Tyres	Good condition	
8.	Battery	Secured by clamp, terminals covered	
9.	Fuel/Hydraulic System	Good condition and not leaking	
10.	Engine/Rotating part guards	Guards in place where applicable	
11.	Wind Shield	Good condition having proper visibility, no cracks	
		Wipers/Washers	
12.	Brakes/Parking Brake	Foot Brake Operable and efficient	
		Hand Brake Operable and efficient	
13.	Rear View Mirrors	Both Side / Rear View in driver cab available and adjustable, no cracks	
14.	Body/canopy/booms	Good condition	
15.	First Aid Kit	Available & maintained	
Additional Checks For Cranes			
16.	Safe Load Indicator	Working condition & tripping system not bypassed.	
		Anti-two Block Alarm/Cut - out	
		Load Indicator	
		Over Hoist Alarm	
		Over Boom Cut – Out/Alarm	
17.	Limit Switches	For crawler & hydraulic cranes	
18.	Glass enclosure for Forklift	Good condition having proper visibility, no cracks	
19.	ELCB Available	Applicable for welding machine or powered devices above 24V	
20.	Third Party Certificate	Valid certificate from approved third party for lifting appliances, PSV of equipment. & tank/vessel/cylinders of tankers	

21.	Safety latches	Available in hooks & in good condition.	
		Wire Ropes Condition/anchorages	
		Hook with Latch in good condition	
22.	Slings	Slings with load test and marking.	
	Operator	Operator's certificate of competency	
	Operator/Helper: Identity	Availability of Yellow Colour Jackets	

Driver's Name & Sign: Validity up to:

Checked by Safety Steward
(Name & Sign with seal)

Approved by: F&S Officer; BPCL

Fire & safety department is responsible for the safety clearance at the time of inspection. Responsibility of the vehicle before & after the inspection lies with the user department/Engineer in charge.

F/003/SFT/003 Rev No: 02 Format Rev Date:25.09.2017

Contractor's Safety Performance Checklist

F/03/CPM/FSG/03

Date:		**Time: Hrs**		
Location / Area of audit :				
Name of contractor company:				
Name of auditees during audit:				
Type of work involved:				
Name of auditors:				
Reporting department:		**Name of Engineer Incharge:**		
SN	**Check Points**	**Max. Marks**	**Marks Obtained**	**Remarks**
Compliance to Contractor Safety Guidelines				
1	Does the Contractor have adequate number of Supervisors for the jobs?	2		
2	Are the Supervisors competent to ensure that the work force adhere to all applicable safety requirements? (As per the scope of safety guidelines)	4		
3	Is there any incident/Accident/LTI occurred, (If 2 FAC - 0 , 1 FAC - half marked)	10		
4	Detail Report available, Remedial measure taken , Briefing about the incident done.	4		
5	Does the contractor know the accident / incident including Nearmiss reporting system of BPCL? Interview any Two Persons (supervisor & site incharge).	2		
6	Whether all the tools / equipment Including PPE used are meeting the standards of Contractor Safety Guidelines? (any certification CE, ISI Marked)	3		
Personal Protective Equipment				
7	Whether PPE are being used and in good condition? (Available with Workers at field)	10		
	• Full sleeve (Cotton overall)/ Boiler Suit			
	• Safety Shoes			
	• Safety Helmet			
	• Safety Goggles			
	• Hang gloves while working			
	• Ear Plug/Muff in high noise area			
	• Any specific PPE such as safety harness, respiratory protectors / mask, welder's screen, gum boot etc.			
Fire & Safety Protection System				
8	Does the workmen know about the nearest location of:	10		
	• MCP (with full form)			
	• Fire extinguishers (Act to operate)			
	• Safety Shower,			
	• Assembly Point, Wind socks, Siren Codes			
	• First Aid Box,			
	• Wind sock cloth?			
Compliance of Work Permit System				
9	Are contractor's personnel aware of the various types of permits for different kinds of jobs?	5		
10	Are the specified conditions of the permit complied?	5		

Chemical/ Material Safety				
11	Workplace maintained clean and orderly during / after the job?	5		
12	Chemicals / materials handled properly?	2		
Healthiness of Tools & Tackles				
13	Is the following equipment used by the contractors maintained in good condition? (check for the different legal requirement & BPCL requirement like list, internal inspection)	8		
	• Tools , Tackles			
	• Electrical / Welding Generators/ Cutting Set with Flash back Arresters.			
	• Scaffolds			
	• Cranes			
Maintaining Safety Records				
14	Whether the contractor workmen/supervisor familiar with safety sign, BPCL Area classification, etc.?	4		
15	Whether workmen undergone Safety training and records kept? (compulsory training all were attended seek record)	5		
16	All employee were taken basic fire & safety induction (record & interview any two persons)	5		
17	Whether toolbox talk conducted regularly and records kept properly? Record checked	4		
18	Asked the information from any of worker about tool box talk subject	2		
19	Does the contractor attend safety committee meetings regularly?	2		
Familiarization with Emergency Actions				
20	Does the contractor personnel know about the hazard associated with their job/ chemicals / material handled and precautions to be taken? (Brief discussion at field)	3		
21	Are the contractor's personnel familiar with emergency actions?	5		
	• Emergency telephone numbers			
	• What to do in case of fire?			
	• What to do in case of toxic release?			
Housekeeping & Safety Promotional Activities				
22	Site condition & equipment preparation & housekeeping.	10		
23	Safety promotion activities	10		
Process Safety Management				
24	Does the PSM Awareness among workers, PSM Poster/Beacon Displayed at site?	10		
25	Does the Contractor have a safety policy as per PSM Contractor Safety Management / OISD-207?	10		
26	Is Safety Statistics of Last 3 years Total Injury Frequency Rate (LWC+MTC) record maintained by contractor as per prequalification questionnaire of PSM Contractor Safety Management work process. **Calculation =[(No. of Injury cases)x(200,000)hrs/(Total hrs worked)]**	10		
	Total	150		
	Overall Rating			

Ref. of Rating: **0-50%**- Below Avg,**51-60%** - Average, **60-75%** - Satisfactory, **76-85%** - Good, **86-95%** -V Good,**96-100%** - Excellent

Name & Signature Auditor(BPCL) Auditee (Contractor/Owner)

Annexure IV

UNDERTAKING

We, M/s _____ have been awarded contract work order no. _____ dtd. __.__._____ by M/s Bharat Petroleum Refineries Ltd. We hereby undertake as follows:

1. That we have understood the details of the work to be executed with reference to the aforesaid work order and the requirements of manpower, equipment, tools/tackles, safety equipment and other resources necessary to execute the work thereof.
2. That we have got competent supervisors and workers with required qualification, relevant experience / skills and trained for safe execution of the work. Our supervisors are well aware of the work hazards and have got adequate knowledge and familiarity about the safe work practices / safe work methods, necessary safety measures and precautions to be taken to avoid accidents during execution of the work.
3. That we have read and understood the General and Special Conditions of the contract work order under reference and agree to abide by the same.
4. That we have familiarized ourselves with the working conditions, understood all necessary requirements for safe execution of the work, including HSE policy and procedures of BPCL and obtained all clarifications regarding the job.
5. That we undertake to ensure and strictly comply with safety procedures and safe practices / methods relevant to the work for safety of our employees and property of the company BPCL and provide required personal protective equipment to all our employees, as necessary for safety & to prevent probable injuries to our workers and as per the safety requirements of the Company (BPCL). We further undertake to carry out the work in accordance with the HSE policy and procedures of BPCL
6. That we shall also comply with all applicable regulations with respect to environmental protection.
7. That we undertake to deploy competent and trained personnel for the job identified who will possess requisite skill, certificate / license.
8. That we shall ensure use of right type of tools, tackles & equipment, maintained in good working condition, suitable to the nature of the job under execution.
9. That we shall be responsible for safety of our employees and other persons at site / property of the company and accountable for any accident due to negligence / fault of our employees or our company and shall be ready to accept the responsibilities for any legal consequences.

Signed, Sealed & Delivered by –

(Signature of the proprietor of the Company / Authorized person)

Name :

Date :

Name of Company :

Company Seal :

Witnesses:

1. Signature : _____ 2. Signature : _____

Name : _____ Name : _____

Date : _____ Date : _____

Address : _____ Address : _____

_____ _____

Annexure V

Safety Engineer / Supervisor appointment

Contractor's Name: - .....
Nos. of Work force at site:-.....
Details of Safety officer / Supervisor
Full Name: - .....
Date of Birth: - .....Designation: - .....
Contact No :- ..... Email ID: - .....
Appointment date: - .....
Educational Qualification: -
1).....
2).....
3).....
Professional Experience (In Chronological Order)

S.N.	Name of Organization	Period of Service		Designation	Area of Responsibility
		From	To		

Stamp and Signature of Contractor's Owner / Site Incharge
Date:-_____

Annexure VI: **F/03/CPM/FSG/04**

Contractor's Monthly Safety Performance Report

BHARAT PETROLEUM CORPORATION LIMITED
BINA REFINERY
CONTRACTOR'S MONTHLY SAFETY PERFORMANCE REPORT

REPORT FOR THE MONTH	
CONTRACT NO	
CONTRACTOR NAME	
CONTRACT TITLE	
CONTROLLING DEPT./TEAM	
SITE INCHARGE NAME - Mr.	SIGNATURE
THROUGH - ENGINEER INCHARGE NAME -	SIGNATURE
TO, FIRE & SAFETY DEPT NAME - Mr.	SIGNATURE

Following data to be furnish

Sr./No.	DESCRIPTION	THIS MONTH	YEARLY FY (22-23)	CUMMULATIVE	REMARK
	ManHours worked				
	Average No. of Employees Monthly				
	No of Employees				
	Leading Indicators				
1	Near-Miss (NM) Reporting				
2	Toolbox Talk Meeting (No.)				
3	Safety Awareness Training conducted (No.)				
4	BOSOP (No.)				
5	Safety Suggestion (No.)				
6	Safety Audits				
7	Fire & Safety Training (No. of Employee)				
8	Safety Promotion Activities				
9	Unsafe Act Reporting				
10	Unsafe Condition Reporting				
	Lagging Indicators				
1	First Aid cases (FAC)				
2	Medical Treatment cases (MTC)				
3	Restricted work Cases (RWC)				
4	Lost Time Injury (LTI)				
5	Lost Work - Days				
6	Accident/Incident				
7	Dangerous Occurrences (DO)				
8	Fatality				
9	Violation				

What is Safety Activity Rate (SAR) -

The safety activity rate is the overall safety promotional & awareness activity which including safety training & safety inspection conducted in a year with respect to total employees present & man hours worked in a month.

$$SAR = \frac{\text{Total No. of Safety Activities - Lagging Indicators (Excluding LTI)} \times 5 \times 10}{\text{Man Hours Worked} \times \text{No. of employees Present in a Month} \times 30} \times \text{SAR Benchmark}$$

Safety Activities Rate (SAR) % =	A	B	SAR %

Note : (1) Lagging Indicator includes Violation Notifications/Penalty Note/Warning/FAC/MTC/RWC/Lost Work -Days / Accident/Incident/DO.
(2) In case of any LTI the Safety Performance (SAR) of the company will be considered is zero.

Detail of Accidents/ Near miss/ Dangerous Occurrence

Date &time	Emp Name, ID,& Desig.	Brief Description	Recommendation

Detail of ToolBox Talk & Training

Date &Time	No of participants	Topic

Detail of safety Audits (copy of Report should be attached with report)

Date &Time	Audit done by		Auditee

Detail of Safety Violations by contractors (Report attached if any)

Date &Time	Breif Description of violation	Action taken / Remark

Annexure VII

F/03/CPM/FSG/05

Bharat Petroleum

energising lives

NOTIFICATION FOR CONTRACTORS SAFETY VIOLATIONS

From : Date : .....

To : Engineer in Charge, BPCL

Given below are violation detail of Safety Regulation / Site Instructions committed by a contractor working for your division.

Name of contractor's Employee / Workmen :
Emp. No. :

Contractor's Name/Agency EIC Name

Location of Violation : PO No.:

Date : Time :

Details of Violation : .....

.....

Immediate action taken : .....

.....

This Violation is : ☐ Minor ☐ Major

Action recommended : ☐ Written warning ☐ Penalty Rs. _____

☐ Suspension ☐ Dismissal ☐ Other _____

BPCL shall have right to recover increased amount of penalty from the contractor as per BPCL's sole discretion based on gravity of violation. In addition the contractor shall suspende/terminate his concerned employee, supervisor or the site manager etc. as the case may be due to said violations.

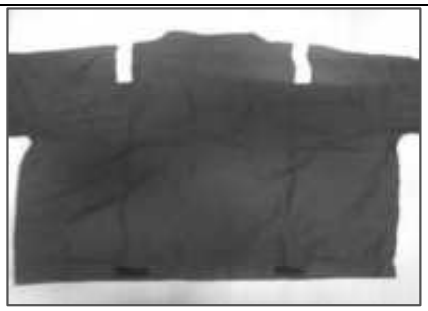
Sign of Person/Supervisor Violation Safety Norms

Name & Sign of Safety Officer/EIC

CC,
Head, Fire & Safety Department, BPCL

Annexure – I

Colour Code Matrix for Service Provider's Boiler Suits working at Bina Refinery

Sr. No.	Category / Service	Boiler Suit Colour	Sample / Picture
1	BR Employees	Royal Blue Colour	
2	Fire Fighting Services	Red Colour	
3	Mechanical Services / Tank M&I Services	Coffee Colour	
4	Electrical Services	Orange Colour	
5	Instrumentation Services	Olive Green Colour	

6	Operation Services (BDT/Offsite/ Refinery)	Navy Blue Colour	
7	Power Plant	Khaki Colour	
8	Utility / Canteen / Civil Services	Grey Colour	
9	Grass cutting / Housekeeping services / Gardening / Green belt Services	Green Colour	
10	Project Services	Dark Blue Colour	

Note: -

1. For other services which are not mentioned above, respective Engineer In-charges shall ensure different colour boiler suits than above colours for contractors.
2. Company Logo, Safety message and design of boiler suits is as per individual service provider's company policy.

Annexure VIII : Contractors Roles & Responsibilities : HSE Guidelines

Contractor's Project Manager

The contractor's Manager has overall responsibility for the development and implementation of appropriate Location Managing and Health and Safety Standards of BPCL. He shall also keep all team members of their responsibilities, current, new and amended statutory requirements.

The contractor's representative shall inform the name of Location Manager to BPCL at least 3 weeks prior to commencement of work. He shall work closely with BPCL Project manager and BPCL Location Safety officer.

Contractor's Managers/ Supervisors

All managers / supervisors employed by the contractor shall conform to the following requirements:

i. The understanding and acceptance of their responsibilities under the BPCL health and Safety Policies and current Indian Health and Safety Legislation.

ii. Make themselves fully conversant with the contents of this document copy and operate within all legal and BPCL requirements applicable to the project location. This requires the continual and regular checking of these requirements in actual practice and taking any necessary corrective action.

iii. Ensuring that all newly engaged or transferred personnel under their control are made fully aware of any known hazards or processes within the project location and the preventative measures to be taken or provided to reduce the risk to personnel.

iv. Ensuring that all employees, including Supervisors, are properly trained for the specific tasks allotted to them. That all newly engaged and transferred employees receive the Health and Safety induction training prior to commencing work at the project location, and that they receive on the job training in health and Safety matters.

v. Ensuring that all personnel under their control are made fully aware of the emergency and evacuation procedures and that the locations of firefighting equipment, alarms, emergency doors and exit routes and assembly areas are pointed out to them.

vi. Making sure that all plant, tools and equipment at the location are maintained in a condition that is safe to use, that all the necessary Safety equipment is readily available, issued, used and maintained and that there is a safe means of access and egress to and from the work location at all times.

vii. Ensuring that the entire relevant safe operating procedures and systems of work instructions are generated, made known to all respective personnel and strictly adhered to. This includes the continual review of these procedures and instructions in practice and discussions with the employees concerned to ensure that they are workable and understood.

viii. Ensuring that all personnel under their control are adequately trained and capable of carrying out their duties correctly and safely, and that no newly engaged or transferred employees are required to undertake any task without the appropriate training, instruction and supervision.

ix. Knowing and thoroughly implementing the accident and incident reporting investigation procedure and taking prompt remedial action to prevent recurrences.

x. Assisting BPCL on investigations, complying with instructions given by him, and co-operating on areas recommended for improvement.

xi. Demonstrating a personal interest in the health, Safety and welfare of personnel, applying a good standard of housekeeping within the work location and encouraging a positive response from other personnel by showing a high standard of self-discipline in respect of health and Safety. xii.

Maintaining a high standard of health and Safety at project location by the day to day Safety training, no matter how small the requirement, by individual instructions, as necessary.

xiii. Assisting the BPCL Representative on work location inspections and taking action any recommendations made, provided they are able to do so. Ensuring that in the event that any matter raised be unresolved, even with the facilities available to them, they refer the issue to the location Incharge/ Head.

xiv. Where new plant, equipment, process or changes are to be implemented within the work area, they are to make BPCL Representative(s) aware of the details and the potential effect such plant / equipment / practices are likely to have on the health and Safety of personnel in the work area.

xv. Seek the advice of the Location Incharge on matters of health and Safety, protective equipment, clothing, systems of work and procedures wherever any doubt exists.

xvi. Determine the requirements for protective equipment or clothing for operations and processes and requisition the same from stores and issue same to those requiring use of such equipment. xvii. Notify their immediate superior of any defective, damaged or missing guards on machinery or plant and request that the matter be dealt with immediately prior to permitting the use of any such plant or machinery, etc.

xviii. Notifying the Location Incharge of all personnel whom they intend to employ on operations involving contact with hazardous process.

xix. The contractor's managers/ supervisors have an overall responsibility to ensure that all machinery, plant and equipment under their direct control are safe and without risk to employees.

xx. In the event of the contractor's managers/ supervisors not being able to resolve a health and Safety problem, especially ones reported to him by employees, he shall refer the matter to the BPCL project manager.

xxi. The contractor shall maintain Portable First Aid Boxes in fully equipped state at various places. The contractor shall ensure that at least one employee on every working shift, is a trained First Aider, capable of administering First Aid competently until the arrival of professional help, in an accident situation.

Contractor's Safety Officer

The contractor's Safety officer is primarily responsible for writing and the upkeep of his Safety Plan, and any other identified required procedures as the project progresses. Other responsibilities include, but are not limited to, advising the SM and any members of the project team on Safety matters, assuring compliance with BPCL Safety Manual and any other relevant Safety related documents, ensuring audits and inspections are conducted on a regular basis as required, ensure that personnel, at all levels within their scope receive appropriate Safety training through organized induction and refresher courses and activity toolbox talks , provide assistance to assure they fully comply with their responsibilities for Safety, chairing Safety committee meetings and constant liaison with the BPCL Safety Engineer. PSE shall be appointed and notified to the Employer in due course.

ANNEXURE IX : Facilities /Equipment for the Contractor's Safety Function

The following minimum facilities shall be provided:

S.No	Safety monitoring and Audio-Visual equipment details	Quantity
1	Portable hand held Digital Sound Level Meter (SLM)	
2	Portable hand held Digital Lux Meter	
3	Laptop computer with standard configuration including multimedia facilities.	
4	Colour Printer	
5	Computer Projector with Screen	
6	Overhead Projector	
7	35mm Camera	
8	Digital Camera with flash (4 Mega pixel minimum) with video facility	
9	Digital still Camera with flash (4 Mega pixel minimum)	
10	Portable loud speaker (for tool box talk and emergency purpose)	
11	Communication facilities like mobile phones and Walky talky	
12	Accident Investigation kit	

निर्माण स्थल पर स्वास्थ्य, सुरक्षा एवं पर्यावरण प्रबंधन हेतु मानक विनिर्देश

STANDARD SPECIFICATION FOR HEALTH, SAFETY & ENVIRONMENTAL MANAGEMENT AT CONSTRUCTION SITES

Rev. No.	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
2	18/04/2023	REVISED & UPDATED	BT	RK	JPV	SM
1	07/06/2022	REVISED & UPDATED	BT	RK	JPV	SM
0	23/12/2020	REVISED & UPDATED	BT	RK	AKK	S Mazumdar

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Abbreviations:

AERB	:	Atomic Energy Regulatory Board
ANSI	:	American National Standards Institute
BARC	:	Bhabha Atomic Research Centre
BS	:	British Standard
BOCW	:	Building and other construction workers
BOO/BOOT	:	Build, Own, Operate/Build, Own, Operate, Transfer
EIL	:	Engineers India Limited
EIC	:	Engineer In charge
ELCB	:	Earth Leakage Circuit Breaker
EPC	:	Engineering, Procurement and Construction
EPCC	:	Engineering, Procurement, Construction and Commissioning
ESI	:	Employee State Insurance
GCC	:	General Conditions of Contract
GM	:	General Manager
GTAW	:	Gas Tungsten Arc Welding
HOD	:	Head of Department
HSE	:	Health, Safety & Environment
HIRAC	:	Hazard, Identification Risk Assessment & Control
HMV	:	Heavy Motor Vehicle
HV	:	High Voltage
IS	:	Indian Standard
ISO	:	International Organization for Standardization
IE	:	Indian Electricity
LTI	:	Lost Time Injuries
LMV	:	Light Motor Vehicle
LOTO	:	Lock Out & Tag Out
LPG	:	Liquefied Petroleum Gas
LSTK	:	Lump Sum Turn Key
MV	:	Medium Voltage
OH&S	:	Occupational Health and Safety
OISD	:	Oil Industry Safety Directorate
PPE	:	Personal Protective Equipment
PUC	:	Pollution Under Control
RC	:	Registration Certificate
RCCB	:	Residual Current Circuit Breaker
RCM	:	Resident Construction Manager or Site-in-Charge, as applicable
SCC	:	Special Conditions of Contract
SLI	:	Safe Load Indicator
SWL	:	Safe Working Load
TPI	:	Third Party Inspection
TBT	:	Tool Box Talks

Construction Standards Committee

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Members: Sh.Janak Kishore, ED (Projects)
Sh.Biswajit Mandal, CGM (SCM)
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1.0 SCOPE

This specification establishes the Health, Safety and Environment (HSE) management requirement to be complied by Contractors/Vendors including their sub-contractors/sub vendors during construction.

This specification is not intended to replace the necessary professional judgment needed to design & implement an effective HSE system for construction activities and the contractor is expected to fulfill HSE requirements in this specification as a minimum. It is expected that contractor shall implement best HSE practices beyond whatever are mentioned in this specification.

Requirements stipulated in this specification shall supplement the requirements of HSE Management given in relevant Act(s)/ Legislations, General Conditions of Contract (GCC), Special Conditions of Contract (SCC) and Job (Technical) Specifications. Where different documents stipulate different requirements, the most stringent shall apply.

2.0 REFERENCES

The document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Building and other construction workers Act, (Refer Appendix-D)
- Indian Factories Act,(Refer Appendix-D)
- Job (Technical) specifications
- Relevant International/ National Codes (refer Appendix-A for standards/codes on HSE)
- Relevant State & National Statutory requirements.
- Operating Manuals Recommendation of Manufacturer of various construction Machineries
- Occupation Health and Safety Management System (OHSAS 18001:2007/ISO 45001) and Environmental Management System (ISO 14001:2015)

3.0 REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENTAL (HSE) MANAGEMENT SYSTEM TO BE COMPLIED BY BIDDERS

3.1 Management Responsibility

3.1.1 HSE Policy & Objectives

The Contractor should have a documented and duly approved HSE policy &objectives to demonstrate commitment of their organization to ensure health, safety and environmental aspects in their line of operations.
The Contractor's senior management shall provide strong visible leadership and continuously demonstrate commitment to develop, operate and maintain, review and continually improve a HSE culture at site which empowers individuals to take responsibility for their safety and embrace and accept nothing but responsible HSE behaviour.
Contractor shall refer in clause No. 3.3.23 for Key Performance Indicator (KPI).

3.1.2 Management System

The HSE management system of the Contractor shall cover the HSE requirements & commitments to fulfill them, including but not limited to what have been specified under clauses 1.0 and 2.0 above. The Contractor shall obtain the approval of its site specific HSE Plan from EIL/ Owner prior to commencement of any site works. Corporate as well as Site management of the Contractor shall ensure compliance of their HSE Plan at work sites in its entirety in true spirit.

3.1.3 Indemnification

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Contractor shall indemnify & hold harmless, Owner/EIL & their representatives, free from any and all liabilities arising out of non-fulfillment of HSE requirements or its consequences.

3.1.4 **Deployment &Qualifications of Safety Personnel**

The Contractor shall designate/deploy various categories of HSE personnel at site as indicated below insufficient number. In no case, deployment of safety Supervisor / Safety Steward shall substitute deployment of Safety Officer / Safety Engineer what is indicated in relevant statute of BOCW Act i.e. deployment of safety officer/Safety Engineer is compulsory at project site. The Safety supervisors, Safety stewards/Observer etc. would facilitate the HSE tasks at grass root level for construction sites and shall assist Safety Officer /Engineers.

Contractor shall appoint safety personnel as given below for every work shift:

(i) Safety Observer/Steward: Contractor shall depute one Safety Observer/Steward for every 100 workers or part thereof

(ii) Safety Supervisor: In addition to above(i), contractor shall depute one Safety Supervisor for every 250 workers or part thereof

(iii) Safety Engineer: In addition to above (i&ii), one safety engineer/ officer for every 1000 workers or part thereof.

Contractor shall intimate/obtain prior permission from EIC before demobilizing any safety personnel. The Contractor shall mobilize suitable safety personnel as replacement.

a) Safety Steward/Observer

As a minimum, he shall possess class XII pass certificate and trained in fire-fighting as well as in safety/occupational health related subjects, with minimum two year of practical experience in construction work environment and should have adequate knowledge of the local language spoken by majority of the workers at the construction site.

b) Safety Supervisor

As a minimum, he shall possess a recognized graduation Degree in Science (with Physics & Chemistry) or a Diploma in Engg. Or Tech. with minimum Two years of practical experience in construction work environment and should possess requisite skills to deal with construction safety & fire related day-to-day issues.

c) Safety Officer / Safety Engineer

Safety Officer/Engineer should possess following qualification & experience:

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(i) Recognized degree in any branch of Engg. or Tech. or Architecture with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than two years, **or** possessing recognized diploma in any branch of Engg. or Tech with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than five years.

(ii) Recognized degree or one year diploma in Industrial safety(from any Indian Institutes recognized by AICTE or State Council of Tech. Education of any Indian State/Union territory) with at least one paper in construction safety (as an elective subject).

(iii) Preferably have adequate knowledge of the language spoken by majority of the workers at the construction site.

Alternately

(i) Person possessing Graduation Degree in Science with Physics **or** Chemistry and degree or one year diploma in Industrial Safety (from any Indian institutes recognized by AICTE or State Council of Tech. Education of any Indian State/ Union Territory) with practical experience of working in a building, plant or other construction works (as Safety Officer, in line with Indian Factories Act, 1948) for a period of not less than five years, may be considered as Safety Officer.

d) HSE In-Charge

In case there is more than one Safety Officer at any project construction site, one of them, who is senior most by experience (in HSE discipline), may be designated as HSE In-Charge. Duties & responsibilities of such person shall be commensurate with that of relevant statute and primarily to coordinate with top management of EIL/Client and contractors.

In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the Building and Other Construction Workers' Regulation of Employment and Conditions of Service- Act,1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above clarifications, the same shall be followed.

Contractors shall ensure physical availability of safety personnel at the place of specific work location, where Hot Work Permit is required/granted. No work shall be started at any of the project sites until above safety personnel & concerned Site Engineer of Contractor are physically deployed at site. The Contractor shall submit a HSE Organogram clearly indicating the lines of responsibility and reporting system and elaborate the responsibilities of safety personnel in their HSE Plan.

Upon fulfilling the basic requirement of qualification and relevant experiences, the performance of contractor HSE personnel's is to be monitored.

The good performing contractor's HSE personnel at site shall be rewarded upon assessment of performance by EIL/Owner. The non-performing HSE personnel shall be counselled by EIL/Owner & suitable action may be taken for suspension from site for 3-6 days. Contractor shall arrange training for non performing HSE personnel.

HSE In –Charge of the contractor shall be given the status at par with the other heads of department and shall report to Head of Project.

The Contractor shall verify & authenticate credentials of such safety personnel and furnish Bio-Data/Resume/Curriculum Vitae of the safety personnel as above for EIL/Owner's approval, at least 1 month before the mobilization. The Contractor, whenever required, shall arrange submission of original testimonials/certificates of their Safety personnel, to EIL/Owner (for verification/scrutiny, etc.)

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Imposition/ Realization of penalty shall not absolve the Contractor from his/her responsibility of deploying competent safety officer at site.

Adequate planning and deployment of safety personnel shall be ensured by the Contractor so that field activities do not get affected because of non-deployment of competent & qualified safety personnel in appropriate numbers.

3.1.5 **Implementation, Inspection/Monitoring**

a) The Contractor shall be fully responsible for planning, reporting, implementing and monitoring all HSE requirements and compliance of all laws & statutory requirements.

b) The Contractor shall also ensure that the HSE requirements are clearly understood & implemented conscientiously by their site personnel at all levels at site.

c) The Contractor shall ensure physical presence of their field engineers / supervisors, during the continuation of their contract works / site activities including all material transportation activities. Physical absence of experienced field engineers / supervisors of Contractor at critical work spot during the course of work may invite halting / stoppage of work.

d) The Contractor shall regularly review inspection report internally and implement all practical steps / actions for improving the status continuously.

e) Contractor skilled workmen like riggers, scaffold erectors, welders, crane operators etc. should have sufficient past experience and skill on the relevant job.

f) The Contractor shall ensure important safety checks right from beginning of works at every work site locations and to this effect format No. HSE-10 "Daily Safety Check List" shall be prepared by field engineer & duly checked by safety personnel for conformance.

g) The Contractor shall carry out inspection to identify various unsafe conditions of work sites/machinery/equipment's as well as unsafe acts on the part of workmen/supervisor/engineer while carrying out different project related works.

h) Adequate records for all inspections shall be maintained by the Contractor and the same shall be furnished to EIL/Owner, whenever sought.

i) To demonstrate involvement/commitment of site management of Contractor, at least one Monthly Safety Walk through in a month shall be carried out by Contractor's head of site (along with his area manager/field engineers)and a report shall be furnished to EIL/Owner as per format No: HSE-1" Safety walk through report" followed by compliance for unsatisfactory remarks.

j) As a general practice lifting tools/tackles, machinery, accessories etc. shall be inspected, tested and examined by competent person(approved by concerned State authorities) before being used at site and also at periodical interval (e.g. during replacement, extension, modification, elongation/reduction of machine/parts, etc.) as per relevant statutes. Hydraulic Mobile Crane, cranes, lifting machinery, mobile equipment's/ machinery/ vehicles, etc. shall be inspected regularly by only competent / experienced personnel at site and requisite records for such inspections shall be maintained by contractor. Contractor shall also maintain records of maintenance of all other site machinery (e.g. generators, rectifiers, compressors, cutters, etc.) & portable tools/equipment's being used at project related works (e.g. drills, abrasive wheels, punches, chisels, spanners, etc.).The Contractor shall not make use of arbitrarily fabricated 'derricks' at project site for lifting/ lowering of construction materials.

k) Site facilities /temporary, installations, e.g. batching plant, cement godown, DG-room, temporary electrical panels/distribution boards, shot-blasting booth, fabrication yards, etc. and site welfare facilities, like labour colonies, canteen/pantry, rest-shelters, motor cycle/bicycle-shed, First-aid centers, urinals/toilets, etc. should be periodically inspected by Contractor (preferably utilizing HR/Admin. personnel to inspect site welfare facilities) and records to be maintained.

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3.1.6 **Behaviour Based Safety**

a) The contractor shall develop a system to implement Behavior-Based Safety (BBS) through which work groups can identify, measure and change the behaviors of employees and workers towards construction safety aspects.

b) The BBS process shall include the following:
- Identify the behaviors critical to achieve required safety performance.
- Communicate the behaviors and how they are performed correctly byall
- Observe the work force and record safe/at risk behaviors. Intervene with workers to give positive reinforcement when unsafe behaviors are observed. Provide coaching/correction when at risk behaviors are observed
- Collect and record observation data
- Summarize and analyze observation data
- Communicate observation data and analysis results to all employees
- Provide recognition or celebrate when safe behavior improvements occur
- Change behaviors to be observed or change activators or change consequences as appropriate.
- Communicate any changes to workforce

c) Contractor through its own HSE committee shall implement the above process.

d) The necessary procedures and Monthly reporting formats shall be developed by the contractor for approval by EIL/Owner.

e) The HSE committee of contractor shall observe individual's behavior for safe practices adapted for utilization/execution of work for followings a minimum:-
- PPE
- Tools & equipment's
- Hazard Identification & control
- House keeping
- Confined space entry
- Hot works
- Excavation
- Loading & unloading
- Work at height
- Stacking & storage
- Ergonomics

f) EIL/Owner and Contractor's site staff at all levels shall monitor the behavior of contractor employees that create and/or contribute to the unsafe situations at work place.

g) Contractor shall arrange Behavior Based safety (BBS) training of their employees at site on yearly basis.

3.1.7 **Awareness and Motivation**

a) The Contractor shall promote and develop awareness on Health, Safety and Environmental protection among all personnel working for the Contractor.

b) The contractor shall display safety statistics board at all prominent location .Also shall provide dedicated notice board for displaying of safety alerts or any other safety related notices for awareness site workforces.

c) Regular awareness programs and fabrication shop/work site meetings at least on monthly basis shall be arranged on HSE activities to cover hazards/risks involved in various operations during construction.

d) Contractor's workmen & supervisory staff shall participate in common Tool Box Meeting as & when organized/required at site to avoid any incident/accident or occupational disease arising out of multidisciplinary jobs/activities being performed by various contracting agencies in the same location at different elevation.

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e) Contractor to motivate & encourage the workmen & supervisory staff by issuing/ awarding them with tokens/ gifts/ mementos/ monetary incentives/ certificates etc. The motivational program shall be organized on regular basis.

f) Contractor shall assess & recognize the behavioral change of its site engineers / supervisors periodically and constantly motivate / encourage them to implement HSE practices at project works

g) Life Saving Rules (refer Appendix-I for details) are to be displayed at prominent location of site.

3.1.8 **Fire Prevention & First-Aid**

The Contractor shall deploy First aider & suitable First-aid measures such as First Aid Box (Refer Appendix-B for details), stand-by Emergency Vehicle. Additionally separate ambulance with trained personnel/male or female nurse to administer First Aid shall be provided by the Contractor beyond deployment of 500 workmen during day/night working hours.

a) The Contractor shall arrange installation of fire protection measures such as adequate number of steel buckets with sand & water and adequate number of appropriate portable fire extinguishers (Refer Appendix-C for details) to the satisfaction of EIL/Owner.

b) The Contractor shall arrange EMERGENCY MOCK DRILL like fire, bomb threat, gas leakage, earth quake, etc. at each site at least once in three months, involving site workmen and site supervisory personnel & engineers. The Contractor shall maintain record of such mock drills at project site.

c) The contractor shall require to tie-up with the hospitals located in the neighborhood for attending medical emergency.

3.1.9 **Documentation**

The Contractor shall evolve a comprehensive, planned and documented system covering the following as a minimum for implementation and monitoring of the HSE requirements and the same shall be submitted for approval by owner/EIL.

- HSE Organogram
- Site specific HSE Plan
- Safety Procedures, forms and Checklist. Indicative list of HSE procedures is attached as Appendix :H
- Inspections and Test Plan
- Risk Assessment & HIRAC for critical works.
- HIRAC Register as per Format no: HSE-19 to identify, assess, analyze & mitigate the construction hazards& incorporate relevant control measures before actually executing site works.
- Environmental Aspect Impact Register as per Format no: HSE-18 (identify, assess, analyze & mitigate the environmental impact & incorporate relevant control measures).
- Legal Register to identify and comply to all applicable HSE related legal requirements.

The monitoring for implementation shall be done by regular inspections and compliance of the observations thereof. The Contractor shall get similar HSE requirements implemented at his sub-contractor(s) work site/office, if applicable. However, compliance of HSE requirements shall be the responsibility of the Contractor. Any review/approval by EIL/Owner shall not absolve contractor of his responsibility/liability in relation to fulfilling all HSE requirements.

3.1.10 **Audit**

Safety Audit shall be conducted at initial stage by EIL/Owner to understand the readiness to start the job after mobilization of contractor's RCM at site& Suitable action shall be taken by contractor to comply the audit observation(s).

The Contractor shall submit an Audit Plan to EIL/Owner indicating the type of audits covering following as minimum:

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a) Internal HSE audits regularly on six monthly basis by engaging internal qualified auditors (viz. safety officers/Construction personnel having 5years experience in construction safety and Lead Auditor Course: OHSAS 18001/ISO 45001 certification).However, minimum two internal HSE audit will have to be conducted irrespective of time period of the contract.

b) External HSE audits regularly on yearly basis by engaging authorized auditing agencies (viz. National Safety Council etc.)or qualified external auditors (viz safety officers/Construction personnel having 10years experience in construction safety and Lead Auditor Course: OHSAS 18001/ISO 45001certification). However, minimum one external HSE audit will have to be conducted irrespective of time period of the contract.

c) EIL/Owner may participate in Opening and closing meeting of external audits and provide inputs to the external auditor. Outcome of external audit shall be discussed during HSE Meeting with EIL/Owner.

All HSE shortfalls/ non-conformances on HSE matters brought out during review/audit, shall be resolved forthwith(generally within a week) by Contractor& compliance report shall be submitted to EIL/Owner.

In addition to above audits by contractor, the contractor's work shall be subjected to HSE audit by EIL/Owner at any point of time during the pendency of contract. The Contractor shall take all actions required to comply with the findings of the Audit Report and issue regular Compliance Reports for the same to OWNER/ EIL till all the findings of the Audit Report are fully complied.

Failure to carry-out HSE Audits& its compliance (internal & external) by Contractor, shall invite penalization.

3.1.11 **Meetings**

i. The Contractor shall ensure participation of his top most executive at site (viz. Resident Construction Manager / Resident Engineer/ Project Manager / Site-in-Charge) along with safety officer in Safety Committee/HSE Committee meetings arranged by EIL/Owner usually on monthly basis or as and when called for. In case Contractor's top most executive at site is not in a position to attend such meeting, he shall inform EIL/Owner in writing before the commencement of such meeting indicating reasons of his absence and nominate his representative – failure to do so may invite very stringent penalization against the specific Contractor, as deemed fit as per Contract. The obligation of compliance of any observations during the meeting shall be always time bound. The Contractor shall always assist EIL/Owner to achieve the targets set by them on HSE management during the project implementation.

ii. In addition, the Contractor shall also arrange internal HSE meetings chaired by his top most executive at site on fortnightly basis and maintain records. Such internal HSE meetings shall essentially be attended by field engineers / supervisors including safety personnel of the Contractor and its associates. Records of such internal HSE meetings shall be maintained by the Contractor for review by EIL/Owner or for any HSE Audits.

iii. Agenda of internal HSE meeting should broadly cover: -

a) Confirmation of record notes /minutes of previous meeting
b) Discussion on outstanding subjects of previous points / subjects, if any
c) Incidents / Accidents (of all types) at project site, if any
d) Current topics related to site activities / subjects of discussion
e) House keeping
f) Behavioral Safety
g) Information / views / deliberations of members / site sub-contractors
h) Report from Owner / Client
i) Status of Safety awareness, Induction programs & Training programs

The time frame for such HSE meeting shall be religiously maintained by one and all.

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3.1.12 Intoxicating drinks & drugs and smoking

a) The Contractor shall ensure that his staff members & workers (permanent as well casual) shall not be in a state of intoxication during working hours and shall abide by any law relating to consumption & possession of intoxicating drinks or drugs in force.

b) The Contractor shall not allow any workman to commence any work at any locations of project activity who is/are influenced / effected with the intake of alcohol, drugs or any other intoxicating items being consumed prior to start of work or working day.

c) Awareness about local laws on this issue shall form part of the Induction Training and compulsory work-site discipline.

d) The Contractor shall ensure that all personnel working for him comply with "No-Smoking" requirements of the Owner as notified from time to time. Cigarettes, lighters, auto ignition tools or appliances as well as intoxicating drugs, dry tobacco powder, etc. shall not be allowed inside the project / plant complex.

e) Smoking shall be permitted only inside smoking booths, if any, exclusively designated & authorized by the Owner/EIL.

3.1.13 Penalty

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliances and also for repeated failure in implementation of any of the HSE provisions, EIL/Owner may impose stoppage of work without any cost & time implication to the Owner and/or impose a suitable penalty.

The amount of penalty to be levied against defaulted Contractor shall be up to a cumulative limit of

2.0% (Two percent) of the contract value for Item Rate or Composite contracts with an overall ceiling of 1,00,00,000(Rupees One Crore).

0.5% (Zero decimal five percent) of the contract value for LSTK, OBE, EPC,BOO/BOOT, EPCC or Package contracts with an overall ceiling of 10,00,00,000(Rupees Ten Crores.)

This penalty shall be in addition to all other penalties specified elsewhere in the contract. The decision of imposing stop-work-instruction and imposition of penalty shall rest with EIL/Owner. The same shall be binding on the Contractor. Imposition of penalty does not make the Contractor eligible to continue the work in unsafe manner.
The amount of penalty applicable for the Contractor on different types of HSE violations is specified below:

Sl. No.	Violation of HSE Norms	Penalty Amount
1.	For not using personal protective equipment like Helmet, Safety Shoes, and other safety gadgets as applicable as per nature of work.	Rs.500/- per day/Item / Person
2.	Working without Work Permit/Clearance	Rs.20,000/- per occasion
3	Execution of work without deployment of requisite field engineer / supervisor at work spot	Rs.5,000/- per violation per day
4.	Unsafe electrical practices (not installing ELCB, using poor joints of cables, using naked wire without top plug into socket, laying wire/cables on the roads, electrical jobs by incompetent person, etc.)	Rs.10,000/- per item per day

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Sl. No.	Violation of HSE Norms	Penalty Amount
5.	Working at height without full body harness, using non-standard/ rejected scaffolding and not arranging fall protection arrangement as required, like hand-rails, life-lines, Safety Nets etc.	Rs.10,000/- per case per day
6.	Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, and not keeping cylinders vertical during storage/handling, not using safety cap of cylinder).	Rs.1,000/- per item per day
7.	Use of domestic LPG for cutting purpose / not using flash back arresters on both the hoses/tubes on both ends.	Rs.5,000/-per occasion
8.	No fencing/barricading of excavated areas / trenches.	Rs.5,000/- per occasion
9.	Not providing shoring/strutting/proper slope and not keeping the excavated earth at least 1.5M away from excavated area.	Rs.5,000/-per occasion
10.	Non display of scaffold tags, caution boards on erected scaffolds.	Rs.1,000/- per occasion per day
11.	Traffic rules violations like over speeding of vehicles, rash driving, talking on mobile phones during vehicle driving, wrong parking, not using seat belts, vehicles not fitted with reverse horn / warning alarms / flicker lamps during foggy weather.	Rs.3,000/-per occasion per day
12.	Absence of Contractor's RCM/SIC or his nominated representative (prior approval must be taken for each meeting for nomination) from site HSE meetings whenever called by EIL/Owner& failure to nominate his immediate deputy for such HSE meetings.	Rs.10,000/- per meeting
13.	Failure to maintain HSE records by Contractor Safety personnel, in line with approved HSE Plan/Procedures/Contract specifications.	Rs.10,000/- per month
14.	Failure to conduct daily site safety inspection (by Contractor's Site Engineer &safety officer), internal HSE meeting, internal HSE Awareness/Motivation Program and Site HSE Training at predefined frequencies (as approved in HSE Plan).	Rs.10,000/- per occasion
15.	Failure to fill online/submit the monthly HSE report by 5th of subsequent month to Engineer-in-Charge/ Owner	Rs10,000/-per occasion and Rs.1,000/-per day of further delay
16.	Poor House Keeping	Rs.5,000 /- per occasion per subject
17.	Failure to report &follow-up accident (including Near Miss) reporting system within specific time-frame.	Rs.20,000/- per occasion
18.	Degradation of environment (not confining toxic spills, spilling oil/lubricants onto ground)	Rs.10,000/- per occasion

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Sl. No.	Violation of HSE Norms	Penalty Amount
19.	Not medically examining the workers before allowing them to work at height / to work in confined space / to work in shot-blasting / to work for painting / to work in bitumen or asphalt works, not providing ear muffs while allowing them to work in noise polluted areas, made them to work in air polluted areas without respiratory protective devices, etc.	Rs.5,000/- per occasion per worker
20.	Violation of any other safety condition as per job HSE plan / work permit and HSE conditions of contract (e.g.using crowbar on cable trenches, improper welding booth, not keeping fire extinguisher ready at hot work site, unsafe rigging practices, non-availability of First-Aid box at site, not providing dead man handle switch for blasting, whiplash arrestor for the compressor line, not using hood with respiratory devices by blaster for shot//grit blasting, etc.)	Rs.5,000/- per occasion
21.	Penalty for non-deployment of ambulance in case of man-power more than 500 or not providing dedicated emergency vehicle in case of man-power less than 500.	Rs.3,000 per day
22.	Failure to carry-out Safety audit in time (internal & external),close-out of identified shortfalls of Observations of Safety Aspects(OSA),etc.	Rs.20,000/- per occasion (for internal audit &OSA). Rs.30,000/-per occasion for external audit
23.	Carrying out sand blasting instead of grit/shot blasting	Rs.50,000/- per day
24.	Failure to deploy adequately qualified and competent Safety Officer	Rs.10,000/- per day per Officer
25.	Utilization of Hydraulic Mobile Crane /back-hoe loader for material shifting or any other unauthorized /unsafe lifting works	Rs.25,000/- per occasion
26.	Any Fatal Accident	Rs.10,00,000/-per fatality
27.	Any violation not covered above	To be decided by EIL/Owner.

Note: Penalty amount deducted from the contractor shall be utilized by owner/EIC for the promotion of the safety during the currency of the project.

The Contractor shall make his field engineers/supervisors fully aware of the fact that they keep track with the site workmen for their behavior and compliance of various HSE requirements. Safety lapses / defects of project construction site shall be attributable to the concerned job supervisor / engineer of the Contractor, (who remains directly responsible for safely executing field works). For repeated HSE violations, concerned job supervisor / engineer shall be reprimanded or appropriate action, as deemed fit, shall be initiated (with information to EIL & Owner) by the concerned Contractor.

Contractor shall initiate verbal warning shall be given to the worker/employee during his first HSE violation. A written warning shall be issued on second violation and specific training shall be arranged / provided by the Contractor to enhance HSE awareness/skill including feedback on the mistakes/ flaws. Any further violation of HSE stipulations by the erring individuals shall call

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for his forthright debar from the specific construction site. A record of warnings for each worker/employee shall be maintained by the Contractor, like by punching their cards / Gate passes or by displaying their names at the Project entry gate. Warnings, penalizations, appreciations etc. shall be discussed in HSE Committee meetings by site Head of the Contractor.

3.1.14 **Accident/ Incident investigation**

All accidents/incidents shall be informed to EIL/Owner at least telephonically by Contractor immediately and in writing within 24 hours on Format No. HSE-2 as applicable, by Contractor. Thereafter, a Supplementary Accident/Incident investigation Report on Format No. HSE-3 shall be submitted to EIL/Owner within 72 hours. Near Miss incident(s), Dangerous accidents/incident shall also be reported on Format No. HSE-4 within24 hours. The accident/ incident shall be investigated by a team of Contractor's senior Site personnel (involving Site-in-Charge or at least by his deputy) for establishing root-cause and recommending corrective & preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to EIL/Owner. Owner/EIL shall have the liberty to independently investigate such occurrences and the Contractor shall extend all necessary help and cooperation in this regard. EIL/Owner shall have the right to share the content of this report with the outside world.

3.2 House Keeping

The Contractor shall ensure that a high degree of housekeeping is maintained and shall ensure inter-alia; the followings:

a) All surplus earth and debris are removed/disposed-off from the working areas to designated location(s).

b) Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas are removed to identify location(s).

c) All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).

d) Roads shall be kept clear and materials like pipes, steel, sand, boulders, concrete, chips and bricks etc. shall not be allowed on the roads to obstruct free movement of men & machineries.

e) Fabricated steel structural, pipes & piping materials shall be stacked properly.

f) Water logging on roads shall not be allowed.

g) No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement.

h) Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.

i) Protective measures to be ensured with projected rebar by suitable means.

j) Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the plant area/ or these materials shall be transported with top surface wet.

k) The contractor shall ensure that the atmosphere in plant area and on roads is free from particulate matter like dust, sand, etc. by keeping the top surface wet for ease in breathing.

l) At least two exits for any unit area shall be assured at all times – same arrangement is preferable for digging pits/ trench excavation/ elevated work platforms/ confined spaces etc.

m) Welding cables and the power cable must be segregated and properly stored and used. The same shall be laid away from the area of movement and shall be free from obstruction.

n) Upkeep/cleaning of site to be carried out on regular basis by the contractor. Contractor shall earmark the area for waste/scrap disposal and ensure that all waste/scrap arising out of the day's work is properly disposed to the earmarked area.

o) Hazardous waste shall be segregated and shall be kept separately at designated place.

p) Contractor shall present the status of housekeeping in HSE meeting.

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The Contractor shall carry-out regular checks (minimum one per fortnight) as per format No. HSE-11 for maintaining high standard of housekeeping and maintain records for the same. The Contractor shall provide supervisor for housekeeping exclusively for management of day-to-day housekeeping activities.

3.3 HSE Measures

3.3.1 Construction Hazards

The Contractor shall ensure identification of all Occupational Health, Safety & Environmental hazards in the type of work he is going to undertake and enlist mitigation measures. Contractor shall carry out HIRAC specifically for high risk jobs/critical jobs like

a) Working at height (+2.0 Mts height) for cold (incl. colour washing, painting, insulation etc.) & hot works.
b) Work in confined space,
c) Deep excavations &trench cutting (depth > 2.0 mts.)
d) Operation & Maintenance of Batching Plant.
e) Shuttering / concreting (in single or multiple pour) for columns, parapets & roofs.
f) Erection & maintenance of Tower Crane.
g) Erection of structural steel members / roof-trusses / pipes at height more than 2.0 Mts. with or without crane.
h) Erection of pipes (full length or fabricated) at height more than 2.0 Mts. height with Crane of 100T capacity.
i) All lifts using 100T Crane plus mechanical pulling.
j) All lifts using two cranes in unison (Tandem Lifting).
k) Any lift exceeding 80% capacity of the lifting equipment's (Hydraulic Mobile Crane, crane etc.).
l) Laying of pipes (isolated or fabricated) in deep narrow trenches – manually or mechanically.
m) Maintenance of crane / extension or reduction of crane-boom on roads or in yards.
n) Erection of any item at >2.0 Mts. height using 100T crane or of higher capacity
o) Hydrostatic test of pipes, vessels & columns and water-flushing.
p) Radiography jobs (in-plant & open field)
q) Work in Live Electrical installations / circuits
r) Handling of explosives &Blasting operations
s) Demolishing/ dismantling activities
t) Welding/ gas cutting jobs at height (+2.0 Mts.)
u) Lifting/placing roof-girders at height(+2.0 Mts.)
v) Lifting & laying of metallic / non-metallic sheet over roof/structures.
w) Lifting of pipes, gratings, equipment's/vessels at heights (+2.0 Mts.) with & without using cranes
x) Calibration of equipment, instruments and functional tests at yards / work-sites.
y) Operability test of Pump, Motors (after coupling) & Compressors.
z) Cold or Hot works inside Confined Space.
aa) Transportation & shifting of ODC consignments into project areas.
bb) Working in "Charged/Live" elect. Panels
cc) Stress Relieving works (Electrically or by Gas-burners).
dd) Pneumatic Tests
ee) Card board blasting
ff) Grit Blasting activity
gg) Catalyst loading/unloading
hh) Erection/dismantling of scaffolding
ii) Chemical cleaning

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The necessary HSE measures devised shall be put in place, prior to start of an activity &also shall be maintained during the course of works, by the Contractor. Copies of such HIRAC shall be kept available at work sites by the Contractor to enable all concerned carrying out checks / verification.

A list of typical construction hazards along with their effects & preventive measures is given in **Appendix-E.**

3.3.2 Accessibility

h) The Contractor shall provide safe means of access(in sufficient numbers)& efficient exit to any working place including provisions of suitable and sufficient scaffolding at various stages during all operations of the work for the safety of his workmen and EIL/Owner.

i) The Contractor shall implement use of all measures including use of "life line", "fall-arresters", "retractable fall arresters", "safety nets" etc. during the course of using all safe accesses& exits, so that in no case any individual remains at risk of slip & fall during their travel.

j) A ladder or step- ladder must have a level and firm footing, in case of use of fixed ladders, sufficient foot hold and hand hold to be provided.

k) The access to operating plant / project complex shall be strictly regulated. Any person or vehicle entering such complex shall undergo identification check, as per the procedures in force / requirement of EIL/Owner.

l) Accessibility to 'confined space' shall be governed by specific system / regulation, as established at project site.

3.3.3 Personal Protective Equipment (PPEs)

a) The Contractor workmen shall be permitted entry inside the project premises only with proper PPEs.

b) The Contractor shall ensure that all their staff, workers and visitors including their sub-contractor(s) have been issued (records to be kept) & wear appropriate PPEs like nape strap type safety helmets preferably with head &sweat band with ¼" cotton chin strap (made of industrial HDPE), High ankle safety shoes with steel toe cap and antiskid sole, Coverall, full body harness (CE marked and conforming to EN361), protective goggles, gloves, ear muffs, respiratory protective devices, etc. All these gadgets shall conform to applicable IS Specifications/CE or other applicable international standards. The Contractor shall implement a regular regime of inspecting physical conditions of the PPEs being issued / used by the workmen of their own & also its sub-agencies and the damaged / unserviceable PPEs shall be replaced forthwith.

c) Owner/EIL may issue a comprehensive color scheme for helmets to be used by various agencies. The Contractor shall follow the scheme issued by the owner/EIL and shall choose colour other than white (for Owner) or blue (for EIL). All HSE personnel shall preferably wear dark green band on their helmet or green color safety helmet so that workmen can approach them for guidance during emergencies.HSE personnel shall preferably wear such dresses with fluorescent stripes, which are noticeable during night, when light falls on them.

d) Florescent jackets with respective company logo to be worn by the contractor workmen with different color coding for categories like supervisor and workmen.

e) Workers required using or handling alkalies, acid or other similar corrosive substance at site shall be provided with appropriate protective equipment, in accordance with MSDS.

f) For shot blasting, the usage of protective face shield and helmets, gauntlet and protective clothing is mandatory. Such protective clothing should conform relevant IS Specification.

g) For off-shore jobs/contracts, contractor shall provide PPEs (new) of all types to EIL & Owner's personnel, at his (contractor's) cost. All personnel shall wear life jacket at all time.

h) An indicative list of HSE standards/codes is given under **Appendix-A**.

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i) Contractor shall ensure procurement & usage of following safety equipment's/ accessories (conforming to applicable IS mark / CE standard) by their staff, workmen & visitors including their subcontractors all through the span of project construction / pre-commissioning/ Commissioning:-

i. PPEs (Helmet with company name/logo, Safety Goggles, Coverall, Ear-muff, Face Shield, Hand Gloves, High Ankle Safety Shoes, Gum Boot etc.)
ii. Barricading tape / warning signs
iii. Rechargeable Safety torch (flame-proof)
iv. Safety nets (with tie-chords)
v. Fall arresters
vi. Emergency Man-basket/rescue kit for height works
vii. Portable ladders (varying lengths)
viii. Life-lines (steel wire-rope, dia. not less than 8.0 mm)
ix. Full body double lanyard Safety harness with Rebar/ladder hook or scaffolding hook.
x. Lanyard
xi. Karabiner
xii. Retractable fall arresters (various length)
xiii. Portable fire extinguishers (DCP type) – 5 kg&10 kg capacity
xiv. Portable Multi Gas detector
xv. Sound level meter
xvi. Digital lux meter
xvii. Fire hoses & flow nozzles
xviii. Fire blankets/ Fire retardant cloth (with eyelets)
xix. Flame retardant/Flame resistant coverall-based on hazard identification & risk assessment, if required.

3.3.4 **Working at height**

a) The Contractor shall issue permit for working (PFW) at height after verifying and certifying the checkpoints as specified in the attached permit (Format No. HSE-6). He shall also undertake to ensure compliance to the conditions of the permit during the currency of the permit including adherence of personal protective equipment's. Contractor's Safety Officer shall verify compliance status of the items of permit document after implementation of action is completed by Contractor's execution / field engineers at work site. HIRAC for specific works at height duly commented by EIL/Owner, shall be kept attached with particular Permit for Work (PFW) at site for ready reference & follow-up.

b) Such PFW shall be initially issued for one single shift or expected duration of normal work and extended further for balance duration, if required. EIL/Owner can devise block-permit system at any specific area, in consultation with project specific HSE Committee to specify the time-period of validity of such PFW or its renewal. This permit shall be applicable in areas where specific clearance from Owner's operation Deptt./Safety Deptt. is not required. EIL / Owner's field Engineers/Safety Officers/Area Coordinators may verify and counter sign this permit (as an evidence of verification) during the execution of the job.

c) All personnel shall be medically examined & certified by registered doctor, confirming their 'medical fitness(Vertigo or epilepsy must be covered under test report)for working at height. Contractor shall develop the model for conducting vertigo test. The fitness examination shall be done once in six months. Sticker for "PASS FOR HEIGHT WORK" shall be pasted on the safety helmet of the site personnel.

d) In case work is undertaken without taking sufficient precautions as given in the permit, EIL/Owner Engineers may exercise their authority to cancel such permit and stop the work till satisfactory compliance/rectification is arranged made. Contractors are expected to maintain a register for issuance of permit and extensions thereof including preserving the

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used permits for verification during audits etc.

e) The Contractor shall arrange (at his cost) and ensure use of Fall Arrester Systems by his workers. Fall arresters are to be used while climbing/descending tall structures or vessels / columns etc. These arresters should lock automatically against the anchorage line, restricting free fall of the user. The device is to be provided with a double security opening system to ensure safe attachment or release of the user at any point of rope. In order to avoid shock, the system should be capable of keeping the person in vertical position in case of a fall. All the fall arrest systems should be cleaned after use and stored in a clean &dry area. Defective Safety Harness, lanyards & life line must be discarded from workplace and record to be maintained.

f) The Contractor shall ensure that Full body harnesses with double lanyards conforming EN361 and having authorized CE marking is used by all personnel while working at height. The lanyards and life lines should have enough tensile strength to take the load of the worker in case of a fall. One end of the lanyard shall be firmly tied with the harnesses and the other end with life line. The harness should be capable of keeping the workman vertical in case of a fall, enabling him to rescue himself.

g) The Contractor shall provide Roof Top Walk Ladders for carrying out activities on sloping roofs in order to reduce the chances of slippages and falls.

h) The Contractor shall ensure that a proper Safety Net System is used wherever the hazard of fall from height is present. The safety net, preferably a knotted one with mesh ropes conforming to IS 5175/ ISO 1140 shall have a border rope & tie cord of minimum 12mm dia. The Safety Net shall be located not more than 6.0 meters below the working surface extending on either side upto. sufficient margin to arrest fall of persons working at different heights.

i) In case of accidental fall of person on such Safety Net, the bottom most portion of Safety Net should not touch any structure, object or ground.

j) Grade separators shall be provided in Pipe-rack/Tech-structures to arrest falling objects like welding spatters, welding rods, nuts, bolts, tools etc. and to facilitate U/G and A/G works simultaneously.

k) Beam Clamps may be used for construction of localized temporary working platforms sheds for welding booths etc. at height in all types of steel structure due to faster installation and requirement of less scaffolding materials.

l) Hanging Platform, manufactured by Standard HSE equipment vendors must be encouraged for painting of Buildings etc.

m) All the tools used at height (like spanner, screw driver etc.) shall be provided with securing arrangement like back-pack/waist pouch to prevent accidental slippage from worker hand.

n) The Contractor shall install temporary lightening arrester in tall structures during construction to save human life and to avoid damage to equipment's& machineries. During the possibility of a thunderstorm, all the work at height where a person can be exposed to lightning shall be stopped.

o) To the extent possible use Roller arrangement to shift overhead pipes from one end to other in Pipe Racks Area.

p) Providing of steel scaffold stair tower system with landings at regular intervals as and when required for height work.

q) The Contractor shall ensure positive isolation while working at different levels like in the pipe rack areas. The working platforms with toe boards & hand rails shall be sufficiently strong & shall have sufficient space to hold the workmen and tools& tackles including the equipment's required for executing the job. Such working platforms shall have mid-rails, to enable people work safely in sitting posture.

3.3.5 Scaffoldings& Barricading

a) Suitable steel scaffoldings only shall be provided to workmen for all works that cannot be safely done from the ground or from solid construction except such short period work that

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can be safely done using ladders or certified (by 3rd party competent person) man-basket. When a ladder is used, an extra workman shall always be engaged for holding the ladder. The ladder shall be inspected before use for cracked or split stiles, missing, broken, loose or damaged rungs & splinters. The ladder shall be of adequate length to enable it to extend to at least 1.0m above the landing place or working point. Metallic ladders shall be only used as access.

b) The Contractor shall ensure that the scaffolds used during construction activities shall be strong enough to take the designed load. Main Contractor shall always furnish duly approved construction-design details of scaffold &SWL (from competent designers) free of charge, before they are being installed/ constructed at site. Owner/EIL reserves the right to ask the Contractor to submit certification and or design calculations from his Head Office/ Design/Engineering expert regarding load carrying capacity of the scaffoldings. All steel tubing, couplers and fittings used for scaffolding shall conform to IS 3696 or an acceptable equivalent. Only metallic scaffold boards shall be allowed to use. Steel tubes shall be free from cracks, splits. Surface flaws & other defects. All couplers & fittings shall be properly oiled and maintained. Nuts shall have a free running fit on their bolts. Bolts with worn or damaged thread shall be replaced.

c) All scaffolds shall be inspected by a competent Scaffolding Inspector (person with scaffolding related experience in construction field and having a training of scaffolding supervisor from a institute/agency like National Safety Council etc.). He shall paste a GREEN tag (duly signed by competent Scaffolding Inspector) on each scaffold found safe and a RED tag (duly signed by competent Scaffolding Inspector) on each scaffold found unsafe. Scaffolds with GREEN tag only shall be permitted to be used and Scaffolds with RED ones shall immediately be made inaccessible. Work being found continuing on scaffolds with RED tag shall be considered unauthorized work by Contractor and may invite penalization from EIL/Owner. For every 120-125 m^2 /m^3 area / volume or its parts thereof minimum one TAG shall be provided.

d) The Contractor shall ensure positive barricading (indicative as well as protective) of the excavated, radiography, heavy lift, high pressure hydrostatic & pneumatic testing and other such areas. Sufficient warning signs shall be displayed along the barricading areas.

e) Scaffolding shall be constructed using foot seals or base plates only. Base plates shall be used below each standard on surface .Sole plate of timber shall be used beneath the base plate to achieve greater load distribution.

3.3.6 **Electrical installations**

a) All electrical installations/ connections shall be carried out as per the provisions of latest revision of following codes/standards, in addition to the requirements of Statutory Authorities and IE/applicable international rules& regulations:

- OISD STD 173 : Fire prevention & protection system for electrical installations
- SP 30 (BIS) : National Electric Code

b) All electrical installations shall be approved by the concerned statutory authorities.

c) All temporary electrical installations / facilities shall be regularly checked by the licensed/competent electricians of the Contractor and appropriate records shall be maintained in format no: HSE-12" Inspection of temporary electrical booth/installation at project construction site". Such inspection records are to be made available to EIL/Owner, whenever asked for.

3.3.6.1 The Contractor shall meet the following requirements:

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a. Shall make Single Line Diagram (SLD) for providing connection to each equipment's & machinery and the same (duly approved by EIL/Owner) shall be pasted on the front face of DBs (distribution boards) or JBs (Junction boxes) at every site.(A typical Switch Board Sketch is attached as Appendix -G)

b. Ensure that electrical systems and equipment including tools & tackles used during construction phase are properly selected, installed, used and maintained as per provisions of the latest revision of the Indian Electrical/ applicable international regulations.

c. Shall deploy qualified & licensed electricians for proper & safe installation and for regular inspection of construction power distribution system/points including their earthing. A copy of the license shall be submitted to EIL / Owner for records. Availability of at least one competent (ITI qualified) / licensed electrician (by State Elec. authorities) shall be ensured at site round the clock to attend to the normal/emergency jobs.

d. All switchboards / welding machines shall be kept in well-ventilated & covered shed/ with rain shed protection. The shed shall be elevated from the existing ground level to avoid water logging inside the shed. Installation of electrical switch board must be done taking care of the prevention of shock and safety of machine.

e. No flammable materials shall be used for constructing the shed. Also flammable materials shall not be stored in and around electrical equipment / switchboard. Adequate clearances and operational space shall be provided around the equipment.

f. Fire extinguishers and insulating mats shall be provided in all power distribution centers.

g. Temporary electrical equipment shall not be employed in hazardous area without obtaining safety permit.

h. Proper housekeeping shall be done around the electrical installations.

i. All temporary installations shall be tested before energizing, to ensure proper earthing, bonding, suitability of protection system, adequacy of feeders/cables etc.

j. All welders shall use hand gloves irrespective of holder voltage.

k. Multilingual (Hindi, English and local language) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name & telephone No. of contact person in emergency shall be provided in substations and near all distribution boards / local panels.

l. ELCB tester /test meter shall be used for testing the ELCBs operation. ELCBs testing shall be carried out by using ELCB tester on monthly basis but in specific cases like heavy rain as decided by owner/EIC. Record of the testing shall be maintained.

m. Regular inspection of all installations at least once in a month. (**Ref. Format HSE-12**).

3.3.6.2 The following features shall also be ensured for all electrical installations during construction phase by the contractor:

a. Each installation shall have a main switch with a protective device, installed in an enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5 M. The main switch shall be connected to the point of supply by means of armoured cable.

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b. The outgoing feeders shall be double or triple pole switches with fuses / MCBs. Loads in a three phase circuit shall be balanced as far as possible and load on neutral should not exceed 20% of load in the phase.

c. The installation shall be adequately protected against overload, short circuit and earth leakage by the use of suitable protective devices. Fuses wherever used shall be HRC type. Use of rewirable fuses shall be strictly prohibited. ELCB/RCCB (Residual Current Circuit Breaker) must be fitted with all Electrical installation. The earth leakage devices shall have an operating current not exceeding 30 mA.

d. All connections to the hand tools / welding receptacles shall be taken through proper switches, sockets and plugs.

e. All single phase sockets shall be minimum 3 pin type only. All unused sockets shall be provided with socket caps.

f. Only 3 core (P+N+E) overall sheathed flexible cables with minimum conductor size of 1.5 mm^2 copper shall be used for all single phase hand tools.

g. Only metallic distribution boxes with double earthing shall be used at site. No wooden boxes shall be used.

h. All power cables shall be terminated with compression type cable glands. Tinned copper lugs shall be used for multi-strand wires / cables.

i. Cables shall be free from any insulation damage.

j. Minimum depth of cable trench shall be 750 mm for MV & control cables and 900 mm for HV cables. These cables shall be laid over a sand layer and covered with sand, brick & soil for ensuring mechanical protection. Cables shall not be laid in waterlogged area as far as practicable. Cable route markers shall be provided at every 25 M of buried trench route.

When laid above ground, cables shall be properly cleated or supported on rigid poles of atleast 2.1 M high. Minimum head clearance of 6 meters shall be provided at road crossings.

k. Underground road crossings for cables shall be avoided to the extent feasible. In any case no underground power cable shall be allowed to cross the roads without pipe sleeve.

l. All cable joints shall be done with proper jointing kit. No taped/temporary joints shall be used.

m. An independent earthing facility should preferably be established within the temporary installation premises. All appliances and equipment shall be adequately earthed. In case of armored cables, the armour shall be bonded to the earthing system. IS: 3043 Code for earthing practices shall be followed at project site.

n. All cables(green colour) and wire rope used for earth connections shall be terminated through tinned copper lugs.

o. In case of local earthing, earth electrodes shall be buried near the supply point and earth continuity wire shall be connected to local earth plate for further distribution to various appliances. All insulated wires for earth connection shall have insulation of green colour. Periodical check tests of all electrodes should be carried out and record shall be maintained of such checks.

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p. Separate core shall be provided for neutral. Earth / Structures shall not be used as a neutral in any case.

q. ON/OFF position of all switches shall be clearly designated / painted for easy isolation in emergency.

3.3.7 Welding/ Grinding/Gas cutting

a) Contractor shall ensure that flash back arrestors conforming to BS:6158 or equivalent are installed on all gas cylinders as well as at the torch end of the gas hose, while in use.

b) All cylinders shall be mounted on trolleys and provided with a closing key. Empty & filled-up gas cylinders shall be stored separately with TAG, protecting them from direct sun or rain. Minimum 2 nos. of Portable DCP type fire extinguishers (10 kg) shall be maintained at the gas cylinder stores. Stacking & storing of compressed gas cylinders shall be arranged away from DG set, hot works, Elect. Panels / Elec. boards, etc.

c) The burner and the hose placed downstream of pressure reducer shall be equipped with Flash Back Arrester/Non Return Valve device.

d) The hoses for acetylene and oxygen cylinders must be of different colours. Their connections to cylinders and burners shall be made with a safety collar.

e) At end of work, the cylinders in use shall be closed and hoses depressurized.

f) Cutting of metals using gases, other than oxygen &acetylene, shall require written concurrence from Owner.

g) Grinding activity shall not be carried out in confined spaces without a valid work permit.

h) All grinding/cutting machines shall be guarded and fitted with Dead-Man switch and this shall not be bypassed any time.

i) All welding/grinding machines shall have effective earthing at least at distinctly isolated two points.

j) In order to help maintain good housekeeping, and to reduce fire hazard, live electrode bits shall be contained safely and shall not be thrown directly on the ground.

k) The hoses of Acetylene and Oxygen shall be kept free from entanglement & away from common pathways / walkways and preferably be hanged overhead in such a manner which can avoid contact with cranes, Hydraulic Mobile Crane or other mobile construction machinery.

l) Hot spatters shall be contained / restricted appropriately (by making use of effective fire-retardant cloth/fabric) and their flying-off as well as chance of contact with near-by flammable materials shall be stopped. The Fire retardant blanket shall be woven from ceramic yarn with eyelets.

m) The Contractor shall arrange adequate systems & practices for accumulation / collection of metal & other scraps and remnant electrodes and their safe disposal at regular interval so as to maintain the fabrication and other areas satisfactorily clean & tidy.

n) All gas cylinders must have a cylinder cap on at all times when not in use.

3.3.8 Ergonomics and tools & tackles

a) The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health. Competency of the crane operator to be thoroughly checked prior to engaging in crane operation.

b) All lifting tools, tackles, equipment, trailers, trucks/dumpers, accessories including cranes shall be tested periodically by statutory/competent authority for their condition and load carrying capacity. Valid test & fitness certificates from the applicable authority shall be submitted to Owner/EIL for their review/acceptance before the lifting tools, tackles,

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equipment, trailers, trucks/dumpers, accessories and cranes are used. Third party inspection certificate is mandatory for all lifting tools & tackles before put into use.

c) Load testing of Cranes by competent person must be made mandatory after each modification/alteration of crane configuration/change in boom length. All heavy equipment's including cranes must be maintained in good condition &record of such maintenance shall be maintained. Routine preventive maintenance of the crane to be carried out& record to be maintained for such preventive maintenance. Healthiness of the crane to be checked by Crane Expert on regular basis as per manufacturer guidelines.

d) HIRAC/JSA for assembly/dismantling activity of the crane to be submitted for approval of EIC.

e) No one should stand/work below the mast & boom of the crane. Mast of the crane should not be used for unintended lifts.

f) Mast of the crane to be kept in right position during dismantling activity of the crane.

g) Log book of all crane to be maintained.

h) Only authorized person shall be allowed to give signal to the operator.

i) Lifting/Loading/Unloading activities shall be carried out by the trained riggers under supervision of rigging Foreman.

j) Prior to marching/movement of the crane, obstructions free access/route to be ensured.

k) Skilled Technician to be engaged for AC gas checking and refilling of refrigerant and should follow the safe operating procedure for cranes.

l) Manufacturer's instructions to be followed without any deviation.

m) The contractor shall not be allowed to use defective equipment or tools not adhering to safety norms.

n) Adequate capacity of Chain pulley blocks with valid TPI certificate to be used for lifting/lowering/dragging/erection of piping material .

o) Colour coding system for lifting tools & tackles shall be followed on quarterly basis for a particular colour as mentioned below:

Period	Colour Code
January, February, March	Blue
April,May, June	Yellow
July, August, September	Green
October, November, December	Orange
For Quarantine (Unsafe Tools & Tackles)	Red

Contractor shall arrange non-sparking tools for project construction works in operating plant areas / hydrocarbon prone areas.

i. Wherever required the Contractor shall make use of Elevated Work Platforms (EWP) or Aerial Work Platforms (mobile or stationary) to avoid ergonomical risks and workmen shall be debarred to board such elevated platform during the course of their shifting / transportation.

ii. Contractor shall ensure installation of Safe Load Indicator (SLI) on all cranes (while in use) to minimize overloading risk. SLI shall have capability to continuously monitor and display the load on the hook, and automatically compare it with the rated crane capacity at the operating condition of the crane. The system shall also provide visual and audible warnings at set capacity levels to alert the operator in case of violations.

iii. The contractor shall be responsible for safe operations of different equipments mobilized and used by him at the workplace like transport vehicles, Tower Crane, engines, cranes, mobile ladders, scaffoldings, work tools, etc. Strictly avoid standing close to Hydraulic Mobile Crane/vehicles tyres during operation.

iv. The contractor shall deploy cranes in good working condition of maximum allowable years of service from the year of manufacture as specified below: -

20 years for cranes of 50 MT & below capacity,25 years for 51 MT to 100 MT,30 years for cranes above 101 MT.

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v. In general Man basket shall not be lifted by Hydraulic Mobile Crane. Generally Crane shall be used for lifting the man basket.

vi. Tower Crane, Crane, Hydraulic Mobile Crane or equivalent, Hydraulic Rig &Boom Lift shall be inspected on fortnightly basis as per Format No. HSE-20, HSE-21, HSE-22, HSE-23 & HSE-24.

vii. The Contractor shall arrange periodical training for the operators of Hydraulic Mobile Crane, crane, excavator, mobile machinery, Tower Crane, etc. at site by utilizing services from renowned manufacturers.

viii. Hydraulic Mobile Crane or equivalent having steering control mechanism shall be permitted at construction site only for the purpose of loading/unloading. However, continuous rigger availability during marching of hydraulic crane at site shall be ensured by contractor.

3.3.9 Occupational Health

a) The contractor shall identify all operations that can adversely affect the health of its workers and issue & implement mitigation measures.

b) For surface cleaning operations, sand blasting shall not be permitted even if not explicitly stated elsewhere in the contract.

c) To eliminate radiation hazard, Tungsten electrodes used for Gas Tungsten Arc Welding shall not contain Thorium.

d) Appropriate respiratory protective devices(hood with respiratory devices) shall be used to protect workmen from inhalation of air borne contaminants like silica, asbestos, gases, fumes, etc.

e) Workmen shall be made aware of correct methods for lifting, carrying, pushing & pulling of heavy loads. Wherever possible, manual handling shall be replaced by mechanical lifting equipment's.

f) Fuelling of construction equipments/Diesel Generator set shall be carried out by hand operated pump.

g) In view of the congested working environment and associated hazards, deployment of manpower/machineries shall be in staggered manner keeping adequate safe distance between two adjacent work spot.

h) For jobs like drilling/demolishing/dismantling/steam blowing/cardboard blasting etc. where noise pollution exceeds the specified limit of 85decibels, ear muffs shall be provided to the workers. The Noise level monitoring record shall be maintained.

i) To avoid work related upper limb disorders (WRULD) and backaches, Display Screen Equipments' workplace stations shall be carefully designed & used with proper sitting postures. Power driven hand-held tools shall be maintained in good working condition to minimize their vibrating effects and personnel using these tools shall be taught how to operate them safely & how to maintain good blood circulation in hands.

j) The Contractor shall arrange health check-up(by registered medical practitioner) for all the workers at the time of induction. Health check may have to be repeated if the nature of duty assigned to him is changed necessitating health check or doubt arises about his wellness. EIL/Owner reserves the right to ask the contractor to submit medical test reports. Regular health check-ups are mandatory for the workers assigned with Welding, Radiography, Blasting, Painting, Heavy Lift and Height (>2m) jobs. All the health check-ups shall be conducted by registered Medical practitioner and records are to be maintained by the Contractor.

k) The Contractor shall arrange Medical Camps at regular intervals at work sites and labor colonies to assess health condition of workers.

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l) The Contractor shall ensure vaccination of all the workers including their families, during the course of entire project span.

3.3.10 Hazardous substances

a) Hazardous, inflammable and/or toxic materials such as solvent coating, thinners, anti-termite solutions, water proofing materials shall be stored in appropriate containers preferably with lids having spillage catchment trays and shall be stored in a good ventilated area. These containers shall be labeled with the name of the materials highlighting the hazards associated with its use and necessary precautions to be taken. Respective MSDS (Material Safety Data Sheet) shall be made available at site &may be referred whenever problem arises.

b) Where contact or exposure of hazardous materials are likely to exceed the specified limit or otherwise have harmful effects, appropriate personal protective Equipment's such as gloves, goggles/face-shields, aprons, chemical resistant clothing, respirator, etc. shall be used.

c) The work place shall be checked prior to start of activities to identify the location, type and condition of any asbestos materials which could be disturbed during the work. In case asbestos material is detected, usage of appropriate PPEs by all personnel shall be ensured and the matter shall be reported immediately to EIL/ Owner.

3.3.11 Slips, trips & falls

a) The contractor shall establish a regular cleaning and basic housekeeping programme that covers all aspects of the workplace to help minimize the risk of slips, trips & falls. The contractor shall take positive measures like keeping the work area tidy, storing waste in suitable containers & harmful items separately, keeping passages, stairways, entrances & exits especially emergency ones clear, cleaning up spillages immediately and replacing damaged carpet/ floor tiles, mats & rugs at once to avoid slips, trips & falls.

b) Grating removal permit system should be implemented during construction phase. So that after permanent gratings are installed on platforms and tech structure floors; removal of any gratings for whatever purpose (including for lifting piping material etc.) is required to be sanctioned by signed permit by HSE officers of both contractor and Engineer-in-charge. The spot where gratings are removed shall be hard-barricaded during course of work. The removed gratings shall be re-installed immediately after completion of work or at the time of cessation of work every day whichever is earlier and the permit shall be closed on daily basis. A register shall be maintained for recording all the grating removal permits and their closure shall be monitored on daily basis.

3.3.12 Radiation exposure

a) All personnel exposed to physical agents such as ionizing &non-ionizing radiation, including ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.

b) For Open Field Radiography works, requirements of Bhabha Atomic Research Centre (BARC)/ Atomic Energy Regulatory Board (AERB) shall be followed.

c) The Contractor shall implement an effective system of control (as described in the AERB regulations) at site for handling radiography-sources & for avoiding its misuse & theft.

d) The contractor shall generate the Format No: HSE-8 "Permit for radiation work" before start of work.

e) In case the radiography work has to be carried out at day time, suitable methodology to be used so that other works, people are not affected.

3.3.13 Explosives/Blasting operations

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a) Blasting operations shall be carried out as per latest Explosive Rules (Indian/ International) with prior permission. The Contractor shall obtain license from Chief Controller of Explosives (CCoE) for collection, transportation, storage of explosives as well as for carrying out blasting operations.

b) The Contractor shall prepare exclusive method statement (in cognizance with statutory requirements)for rock blasting works &diffusing unfired explosives, if any, at project site before carrying out actual task. Nowhere blasting shall be carried out by the Contractor or its agency without the involvement of competent supervisor and licensed blaster.

3.3.14 Demolition/ Dismantling

a) The contractor shall adhere to safe demolishing/ dismantling practices at all stages of work to guard against unsafe working practices.

b) The contractor shall disconnect service lines (power, gas supply, water, etc.)/ make alternate arrangements prior to start of work and restore them, ifrequired as directed by EIL/ Owner at no extra cost.

c) Before carrying out any demolition/dismantling work, the contractor shall take prior approval of EIL/Owner and generate the Format No.HSE-9. For revamp jobs in operating plants where location of underground utilities is not known with certainty, the contractor shall depute an experienced engineer for supervision and shall make adequate arrangements for Fire-fighting& First-Aid during the execution of these activities.

d) The Contractor shall arrange approved HIRAC/ Method Statement for the specific demolition / dismantling task and corresponding action plan commensurate with hazards / risks associated therein. In no case any activity related to demolition / dismantling shall be carried out by the Contractor without engaging own supervision / field engineer.

3.3.15 Road Safety

a) The Contractor shall ensure adequately planned road transport safety management system.

b) The vehicles shall be fitted with reverse warning alarms & flashing lights / fog-lights and usage of seat belts shall be ensured.

c) The Contractor shall also ensure a separate pedestrian route for safety of the workers and comply with all traffic rules & regulations, including maintaining speed limit of 20 KMPH or indicated by owner for all types of vehicles / mobile machinery. The maximum allowable speed shall be adhered to.

d) In case of an alert or emergency, the Contractor must arrange clearance of all the routes, roads, access. The Contractor shall deploy sufficient number of traffic controllers at project site routes / roads/ accesses, to alert reversing movement of vehicles & machinery as well as pedestrians. Experienced drivers/operators with valid driving license (LMV/HMV)shall be allowed to drive/operate the vehicles/equipment's. The Contractor shall maintain copy of PUC,RC and Insurance etc. for all the vehicles/equipment's.

e) Dumpers, Tippers, etc. shall not be allowed to carry workers within the plant area and also to & from the labour colony to & from project sites.

f) Hydraulic Mobile Crane or equivalent)shall only be allowed for handling(loading/unloading) the materials at fabrication/ storage yards and in no case shall be allowed to transport the materials over project / plant roads.

g) The Contractor shall not deploy any such mobile machinery / Equipment's, which do not have competent operator and / or experienced banks-man/signal-man. Such machinery/equipment's shall have effective limit-switches, reverse-alarm, front& rear-end lights etc. and shall be maintained in good working order.

h) The Contractor shall not carry-out maintenance of vehicles / mobile machinery occupying space on project / plant roads and shall always arrange close supervision for such works.

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i) For pipeline jobs, the contractor shall submit a comprehensive plan covering transportation, loading / unloading of pipes, movement of side booms, movement of vehicles on the ROW, etc.

j) Height barrier/Restriction to be provided on both side of the HT lines, if required.

k) Contractor's shall arrange /install visible road signs, diversion boards, caution boards, etc. on project roads for safe movement of men and machinery.

3.3.16 Welfare measures

Contractor shall, at the minimum, ensure the following facilities at work sites:

a) A crèche at site where 10 or more female workers are having children below the age of 6 years.

b) Adequately ventilated / illuminated rooms at labour camps & its hygienic up-keeping.

c) Reasonable canteen facilities at site and in labour camps at appropriate location depending upon site conditions. Contractor shall make use of "industrial" variety of LPG cylinder & satisfactory illumination at the canteens. Necessary arrangement for efficient disposal of wastes from canteens & urinals /toilets shall also be made and regular review shall be made to maintain the ambience satisfactorily hygienic &shall also comply with all applicable statutory requirements.

d) Adequately lighted & ventilated Rest rooms at site (separate for male workers and female workers).

e) Provision for suitable mobile toilets to be made available by Contractor for remote/scattered job locations.

f) Urinals, Toilets, drinking water, washing facilities, adequate lighting at site and labour camps, commensurate with applicable Laws/ Legislation.

g) The contractor shall ensure the test report of drinking water.

h) The contractor at periodic interval shall arrange to prevent mosquito breeding by fumigation/spraying of insecticides at workplace/fabrication yard.

3.3.17 Environment Protection

Contractor shall ensure proper storage and utilization methodology of materials that are detrimental to the environment. Where required, Contractor shall ensure that only the environment friendly materials are selected and emphasize on recycling of waste materials, such as metals, plastics, glass, paper, oil & solvents. The waste that cannot be minimized, reused or recovered shall be stored and disposed of safely. In no way, toxic spills shall be allowed to percolate into the ground. The contractor shall not use the empty areas for dumping the wastes.

The contractor shall ensure availability of stack emission test report of DG set. Monitoring of air quality emission of DG stack shall be carried out on yearly basis. However, air quality emission shall be monitored first time on commissioning of DG Set.

Contractor to submit Environmental Aspect Impact Register detailing the list of activities in his scope, the respective environmental impact and the actions taken to minimize the impact. Environmental Aspect Impact Register to be prepared as per Format HSE-18 and to be updated and maintained till job completion. Environmental Aspect Impact Register of the contractor shall be reviewed by EIL/Owner on half-yearly basis.

The contractor shall strive to conserve energy and water wherever feasible.

The contractor shall ensure dust free environment at workplace by sprinkling water on the ground at frequent intervals. The air quality parameters for dust, poisonous gases, toxic releases,

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harmful radiations, etc. shall be checked by the contractor on daily basis and whenever need arises.

The contractor shall not be allowed to discharge chemicals, oil, silt, sewage, sullage and other waste materials directly into the controlled waters like surface drains, streams, rivers, ponds. A discharge plan suggesting the methods of treating the waste before discharging shall be submitted to EIL/Owner for approval.

For pipeline jobs, top soil shall be stacked separately while making ROW through fields. This fertile soil shall be placed back on top after backfilling.

For offshore construction barges, arrangements shall be made for safe disposal of human, food & other wastes and applicable laws in this regard shall be followed.

3.3.18 Rules & Regulations

All persons deployed at site shall be knowledgeable of and comply with the environmental laws, rules & regulations relating to the hazardous materials, substances and wastes. Contractor shall not dump, release or otherwise discharge or disposes off any such materials without the express authorization of EIL/Owner. An indicative list of Statutory Acts & Rules relating to HSE is given under Appendix-D.

3.3.19 Weather Protection

Contractor shall take appropriate measures to protect workers from severe storms, rain, solar radiations, poisonous gases, dust, etc. by ensuring proper usage of PPEs like Sun glasses, Sun screen lotions, respirators, dust masks, etc. and rearranging/ planning he construction activities to suit the weather conditions. Effective arrangement (without creating inconvenience to project facilities & permanent installations) for protecting workmen from hailstorm, drizzle in the form of temporary shelter shall be made at site.

3.3.20 Communication

All persons deployed at the work site shall have access to effective means of communication so that any untoward incident can be reported immediately and assistance sought by them.

All health & safety information shall be communicated in a simple & clear language easily understood by the local workforce.

For information to all, typical subjects that should be communicated are: -

Inside the company (Top to down)

a. Quality Policy
b. HSE Policy contents
c. Environment Policy
d. HSE Objectives
e. Safety Cardinal Rules
f. HSE Target – reached or missed
g. Praises & Warnings to personnel for HSE Management
h. Safety Walk Through Reports and safety defects / shortfalls (by management)
i. HSE Audit results
j. Revised Statutory Health & Safety provisions, if any
k. H & S publicity
l. Suggestions

Inside the Company (Bottom to up)

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a. Complaints
b. Compliances on safety defects / shortfalls
c. Suggestions
d. Proposals for changes & improvements
e. HSE Reports (including near-miss reports)

3.3.21 Confined Space Entry

The contractor shall generate a work permit (Format No. HSE -7) before entering a confined space. People, who are permitted to enter into confined space, must be medically examined & certified by registered doctor, confirming their 'medical fitness for working in confined space'. All necessary precautions mentioned therein shall be adhered to. An attendant shall be positioned outside a confined space for extending help during an emergency. Effective communication shall be maintained between personnel in confined space and outside by combination of visual/voice or portable radio. Compressed gas cylinders shall not be taken into confine space. Entry Register for confined space to be maintained with the name and time of entry/exit. All appropriate PPEs and air quality parameters shall be checked before entering a confined space. It shall be ensured that the piping of the equipment which has to be opened is pressure- free by checking that blinds are in place, vents are open and volume is drained. Inside confined space works, only electrical facilities / installations of 24V shall be permitted. Contractor shall ensure usage of safe & suitable arrangement of oxygen supply for individual workmen (during the course of work in confined space), if oxygen concentration is found to be less than 19.5% (v/v) there. All persons must be made aware of the risk associated with Nitrogen &all precautionary measures shall be taken when vessel/sphere/pipelines etc. are being purged with nitrogen.
Rescue arrangement must be readily available at workplace to fulfill requirement of the emergency situation.

3.3.22 Heavy Lifts

a) The contractor shall submit detailed rigging study/ plan for EIL/ Owner approval prior to lifting equipment requiring a crane of approx. 100 MT capacity or more due to constraints of its dimensions, location of foundation height, approach & weight.
b) Contractor shall generate the format no. HSE-15 "Permit for heavy lift/critical erection"
c) The Safe Working Load (SWL) and manufacturer's serial numbers shall be clearly marked on the slings and the lifting gears, either by tagging, stamping, engraving or embossing.
d) Prior to actual lifting activities, contractor shall check the validity of the crane inspection certificate issued by statutory/ competent authority. This requirement shall also apply to all rigging equipment's utilized for the job.
e) The contractor shall, at all times, be responsible for all rigging activities.
f) The Contractor shall ensure medical fitness of all workmen who are engaged / involved in erection of equipment's, vessels etc. and such fitness checks shall be carried-out every six months interval with the help of a registered medical practitioner & record shall be maintained
g) Adequate safety measures such as positive barricading, usage of appropriate PPEs, permit to work, etc. shall be taken during all heavy or critical lifts.
h) Ground condition should be suitable to sustain the Ground Bearing Load of the Crane with full load condition.
i) For lifting any material (irrespective of shape, size or volume), at any height, it is always advisable to prepare a Plan of Erection (PoE) taking into consideration hazards & risks associated therein – this can enable people to put their own experiences of various natures & side-by-side establish a practical method for risk-free erection / lifts. The contractor shall

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prepare PoE & shall document the same, when risks are identified as "medium" or "high" and the same shall be approved by its competent / qualified engineer.

3.3.23 Key Performance Indicators

The contractor shall measure an activity in both leading & trailing indicators for statistical and performance measurement. The activities pertaining to key performance indicators are covered in Monthly HSE Report (Format No. HSE-5). The contractor shall try to achieve a statistically fair record and strive for its continual improvement.

Leading Indicators viz:-:

- Number of Safety Inductions carried-out at site (for workmen & staff members)
- Number of HSE inspections carried out
- Number of "Safety Walk Through" carried-out by site-head.
- Number of HSE shortfalls / lapses identified per contractor& closed-out in time.
- Number of Safety Meetings conducted (in-house / with contractors)
- Number of HSE Audits made (internal & external) vis-à-vis non conformances raised
- Number of HSE Awareness / Motivational program conducted by contractors
- Number of HSE Trainings conducted at site for supervisors & workmen
- Study of Near miss case reported
- Encouragements / Awards / Recognitions to workmen, job supervisors & field engineers.
- Suggestions for improvement

Trailing Indicators viz:-:

- Calculation of HSE statistics viz frequency rate, severity rate, LTA free man hours etc.
- Analysis of incidents / accidents (nature, severity, types etc.)
- Study of Incident / Accident with respect to :-
    - Variety
    - Period of the year / project span
    - Timings of the incident / accident
    - Age profile of victims
    - Body parts involved
    - Penalty levied for causing incident / accident

3.3.24 Unsuitable Land Conditions

Contractor shall take appropriate measures and necessary work permits/clearances if work is to be done in or around marshy areas, river crossings, mountains, monuments, etc. The Contractor shall make right assessment and take all necessary action for developing work areas to make them safe & suitable for crane operations or other vehicular movement before carrying out any project related activity / operation. Contractor shall take all necessary actions to make the surroundings of its site establishments (site office, stores, lay-down area etc.) work-worthy safe and secure.

3.3.25 Under Water Inspection

Contractor shall ensure that boats and other means used for transportation, surveying & investigation works shall be certified seaworthy by a recognized classification society. It shall be equipped with all life saving devices like life jackets, adequate fire protection arrangement sand shall possess communication facilities like cellular phones, wireless, walkie-talkie. All divers used for seabed surveys, underwater inspections shall have required authorized license, suitable life-saving kit. Number of hours of work by divers shall be limited as per regulations. EIL/ Owner shall have the right to inspect the boat and scrutinize documents in this regard.

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3.3.26 Excavation

The Contractor shall obtain permission from competent authorities prior to excavation wherever required.

The Contractor shall locate the position of buried utilities (water line, cable route, etc.) by referring to project / plant drawing / in consultation with EIL/Owner. The Contractor shall start digging manually to locate the exact position of buried utilities & thereafter use mechanical means.

In case of non-availability of sufficient data/drawings, underground services i.e. underground cable/ pipe shall be checked by cable detector/pipe locator by the contractor.

The Contractor shall keep soil heaps at least 1.5 M away from edge or a distance equal to depth of pit (whichever is more)

All excavated pits greater than 10 Sq.M plan area and depth more than 1.5M shall have at least two access routes for ingress and egress. Also, additional access routes shall be provided such that distance between any two access routes shall not be more than 20M.

The Contractor shall maintain sufficient "angle of repose" during excavation – shall also provide slope or suitable bench as decided by EIL / Owner.

The Contractor shall arrange "battering" or "benching" wherever required for preventing collapse of edge of excavations.

Avoid vertical wall of less than 2mtrs between two adjacent deep excavated pit/area. Further deep excavation should not be kept open for a longer duration.

The Contractor shall identify & arrange de-watering pump or well-point system to prevent earth collapse due to heavy rain / influx of underground water.

The Contractor shall arrange protective fencing/hard barricading with warning signal around excavated pits, trenches, etc. along with minimum 2 (two) entries, exits / escape ladders.

The Contractor must avoid "underpinning" / under-cutting to prevent collapse of chunk of earth during excavation.

The Contractor shall use "stoppers" to prevent over-run of vehicle wheels at the edge of excavated pits / trenches. Vehicles movement should be restricted to minimum three meters away from the excavated pit.

The Contractor shall arrange strengthening of "shoring" & "strutting" proactively to avoid collapse of earth / edges due to vehicular movement in close proximity of excavated areas / pits/ trenches, etc.

3.4 Tool Box Talks (TBT)

Contractor shall conduct daily TBT with workers prior to start of work and shall maintain proper record of the meeting. A suggested format is given below. The Job specific TBT is to be conducted by the immediate supervisor of the workers.

The Contractor shall conduct TBT before start of every morning or evening shift or night shift activities, for alerting the workers on specific hazards and their appropriate dos & don'ts. The Contractor shall provide sufficient rests to the site workmen and their foremen to avert fatigue & thereby endangering their lives during the course of site works.

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TOOLBOX TALK RECORDING SHEET		
Date & Time		
Work Location		
Subject (Nature of work)		
Presenter		
Hazards involved		
Precautions to be taken		
Worker's Name	Signature	Section
Remarks, in any		

The topics during TBT shall include

- Hazards related to work assigned on that day and precautions to be taken.
- Any forthcoming HSE hazards/events/instruction/orders, etc.

The above record can be kept in local language, which workers can read. These records shall be made available to EIL/ Owner whenever demanded.

3.5 Training & Induction Programme

a) Initial induction of workers into Construction oriented activities and appraising them about the methodology of works and how to carry-out safely and the same should not be inter mixed with Tool Box Talks or HSE Training. In this regard careful action should be made& maintained for imparting HSE induction to every individual, irrespective of his task/designation/level of employment, whereas, HSE Training should be imparted to specific person/group of people who are to carry-out that specific task more than once – for example, Riggers must be trained for working at heights, welders must be trained for work in confined space, fitters/carpenters, mesons must be trained for work at heights, etc.
Contractor shall arrange suitable facilities (e.g training room/place, audio visual facilities etc.) for organizing such training on HSE.

b) Contractor shall conduct Safety induction programme on HSE for all his workers and maintain records. Sticker for "Safety Induction" shall be pasted on the safety helmet of the site personnel. The Gate Pass shall be issued only to those workers who successfully qualify the Safety induction programme. Contractor to conduct effective safety induction program at work site by making efforts to arrange Video film/Virtual Reality (VR) technology pertaining to the escape routes, assembly points, risks involved in the event of an emergency etc while imparting safety induction.

c) The Contractor brief the visitors about the HSE precautions which are required to be taken before their proceeding to site and make necessary arrangements to issue appropriate PPEs like Aprons, hard hats, ear-plugs, goggles & safety shoes etc., to his visitors. The Contractor shall always maintain relevant acknowledgement from visitor on providing him brief information on HSE actions.

d) Contractor shall submit job specific training schedule for approval of EIL/Owner &ensure that all his personnel possess appropriate training to carry out the assigned job safely. The training should be imparted in a language understood by them and should specifically be trained about

- Potential hazards to which they may be exposed at their workplace

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- Measures available for prevention and elimination of these hazards

The topics during training shall cover, at the minimum: -

- Why safety should be considered during work - explanation
- Education about hazards and precautions required
- Employees' duties & responsibilities
- Emergency and evacuation plan
- HSE requirements during project activities
- Fire fighting and First-Aid
- Use of PPEs
- Occupational health issues – dos & don'ts
- Local laws on intoxicating drinks, drugs, smoking in force
- Common environmental subjects – lighting, ventilation, vibration, smoke/fumes etc.

e) Records of the training shall be kept and submitted to EIL/ Owner.

f) The Contractor shall make regular program for conducting Safety Training on various topics related to various activities & their safe-guarding utilizing experienced persons / outside agency / faculty. A program for Safety Training (indicative list as per Appendix –F) shall be furnished by the Contractor in its HSE Plan.

g) For offshore and jetty jobs, contractor shall ensure that all personnel deployed have undergone a structured sea survival training including use of lifeboats, basket landing, use of radio communication etc. from an agency acceptable to Owner/EIL.

3.6 ADDITIONAL SAFETY REQUIREMENTS FOR WORKING INSIDE A RUNNING PLANT

As a minimum, the contractor shall ensure adherence to following safety requirements while working in or in the close vicinity of an operating plant:

a) Contractor shall obtain permits for Hot work, Cold work, Excavation and Confined Space from Owner in the prescribed format.

b) The contractor shall monitor record and compile list of his workers entering the operational plant/unit each day and ensure & record their return after completing the job.

c) Contractor's workers and staff members shall use designated entrances and proceed by designated routes to work areas only assigned to them. The workers shall not be allowed to enter units' area, tanks area, pump rooms, etc. without work authorization permit.

d) Work activities shall be planned in such a way so as to minimize the disruption of other activities being carried out in an operational plant/unit and activities of other contractors.

e) The contractor shall submit a list of all chemicals/toxic substances that are intended to be used at site and shall take prior approval of the Owner.

f) Specific training on working in a hydrocarbon plant shall be imparted to the work force and mock drills shall be carried out for Rescue operations/First-Aid measures.

g) Proper barricading/cordoning of the operational units/plants shall be done before starting the construction activities. No unauthorized person shall be allowed to trespass. The height and overall design of the barricading structure shall be finalized in consultation with the Owner and shall be got approved from the Owner.

h) Care shall be taken to prevent hitting underground facilities such as electrical cables, hydrocarbon piping during execution of work.

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i) Barricading with water curtain shall be arranged in specific/critical areas where hydrocarbon vapors are likely to be present such as near horton spheres or tanks. Positioning of fire tenders (from owner) shall also be ensured during execution of critical activities.

j) Emergency evacuation plan shall be worked out and all workmen shall be apprised about evacuation routes. Mock drill operations may also be conducted.

k) Flammable gas test shall be conducted prior to any hot work using appropriate measuring instruments. Sewers, drains, vents or any other gas escaping points shall be covered with flame retardant tarpaulin.

l) Respiratory devices shall be kept handy while working in confined zones where there is a danger of inhalation of poisonous gases. Constant monitoring of presence of Gas/Hydrocarbon shall be done.

m) Clearance shall be obtained from all parties before starting hot tapping, patchwork on live lines and work on corroded tank roof.

n) Positive isolation of line/equipment by blinding for welding/cutting/grinding shall be done. Closing of valve will not be considered sufficient for isolation.

o) Welding spatters shall be contained properly by using fire retardant blanket and in no case shall be allowed to fall on the ground containing oil. Similar care shall be taken during cutting operations. Fire watcher to be deployed to ensure the same.

p) The vehicles, cranes, engines, etc. shall be fitted with spark arresters on the exhaust pipe and got it approved from Safety Department of the Owner.

q) Plant air should not be used to clean any part of the body or clothing or use to blow off dirt on the floor.

r) Gas detectors should be installed in gas leakage prone areas as per requirement of Owner's plant operation personnel.

s) Flame proof electrical distribution board, plug and socket shall be used for electrical appliances.

t) Experienced full time safety personnel shall be exclusively deployed to monitor safety aspects in running plants.

3.7 Self-Assessment and Enhancement

The contractor shall develop a method of check & balance through self-assessment& enhancement techniques and shall explore the opportunities for continual improvement in the HSE system.

3.8 HSE Promotion

The contractor shall encourage his workforce to promote HSE efforts at workplace by way of organizing workshops/seminars/training programs, celebrating HSE awareness weeks &National Safety Day, conducting quizzes & essay competitions, distributing pamphlets, posters & material on HSE, providing incentives for maintaining good HSE practices and granting incentives/ bonus for completing the job without any lost time accident.

3.9 Lock Out and Tag Out(LOTO) for Isolation of Energy Source

a) Contractor shall follow the LOTO/Isolation procedure of owner for all energy source isolations installed/under purview by /of owner i.e. "Brown field"

b) For all the other energy source (not under purview of client/owner)i.e. "Green field" Contractor shall develop a system to ensure the isolation of equipments, pipelines, Vessel, electrical panels from the energy source covering following as minimum:-

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- Identification of all energy source viz electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational, radiation and other forms of stored or kinetic energy.
- Establishing the energy isolation devices viz manually operated electrical circuit breakers, disconnection switches, blind flanges, etc.
- Installation of Lock Out devices for preventing the inadvertent release of stored energy and Tag Out devices ("Danger", "Do Not operate" or Do not Remove"tags) to indicate that testing, maintenance or servicing is underway and the device cannot be operated until the tag out device is removed.
- Lock Out and Tag out log book
- Permit for isolation and de-isolation of energy source as per format No.: HSE-16
- Availability of competent persons like experienced operators at substations, pump house, units etc. supervisors etc.

c) Contractor shall ensure that all the sources are locked out and tagged properly before giving clearance to start the job.

d) After the completion of job, contractor shall ensure all tools and tackles are removed and nobody is present in the working area and signing on LOTO log book.

e) Only on confirmation of above the contractor will remove their lock and tag from the isolation points and give instructions for energizing the same. Only the person carrying out the task shall himself carry the key for the lock in /Lock out.

4.0 DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR

4.1 On Award of Contract

The Contractor shall submit a comprehensive Health, Safety and Environmental Plan or programme for approval by EIL/Owner prior to start of work. The Contractor shall participate in the pre-start meeting with EIL/Owner to finalize HSE Plans which shall including the following:

- HSE policy & Objectives
- Job procedure to be followed by the Contractor for construction activities including handling of equipment's, scaffolding, electric installations, etc. describing the risks involved, actions to be taken and methodology for monitoring each activity. Indicative list of procedures is enclosed as Annexure-H
- EIL/Owner review/audit requirement.
- Organization structure along with responsibility and authority, on HSE activities.
- Administrative & disciplinary steps involving implementation of HSE requirements
- Emergency evacuation plan/ procedures for site and labour camps
- Procedures for reporting & investigation of accidents and near misses.
- HSE Inspection
- HSE Training programme at project site
- HSE Awareness program eat project site
- Reference to Rules, Regulations and statutory requirements.
- HIRAC
- Environment Aspect Impact Register
- Legal Register
- HSE documentation viz reporting, analysis & record keeping.

4.2 During Job Execution

Contractor shall implement approved Health, Safety and Environment management plan or programme including but not limited to as brought out under para 3.0. Contractor shall also ensure:

a) to arrange workmen compensation insurance, registration under ESI Act, third party liability insurance, registration under BOCW Act etc., as applicable.

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b) to arrange all HSE permits before start of activities (as applicable), like permits for hot work, working at heights (Refer Format No. HSE-6), confined space (Refer Format No. HSE-7), Radiation Work Permit (Refer Format No. HSE-8), Demolishing/ Dismantling Work Permit (Refer Format No. HSE-9),Permit for erection/modification & dismantling of scaffolding(Refer Format No:HSE-14),Permit for heavy lift/critical erection (Refer Format No:HSE-15) ,Permit for energy Isolation & De-isolation" (HSE-16) ,storage of chemical/explosive materials & its use and implement all precautions mentioned therein. In this regard, requirements of *Oil industry Safety Directorate Standard No.* Std -105 "Work Permit Systems" shall be complied with while working in existing Oil or Gas processing plants. List of the persons involved shall be maintained as annexure to the work permit issued for a particular activity.

c) to submit, timely, the completed checklist on HSE activities in Format No.HSE-1, Monthly HSE report in Format No.HSE-5 (use of web based package (www.eil.co.in/conthse) is compulsory wherever the facility is available else a hard copy is to be submitted), accident/ incident reports, investigation reports etc. as per EIL/Owner requirements. Compliance of instructions on HSE shall be done by Contractor and informed urgently to EIL/Owner.

d) that his top most executive at site attends all the Safety Committee/HSE meetings arranged by EIL/Owner and carries out safety walk regularly. Only in case of his absence from site that a second senior most person shall be nominated by him, in advance, and communicated to EIL/Owner for performing the above tasks.

e) display at site office and at prominent locations HSE Policy, caution boards, list of hospitals, emergency services available, safety signs like Men at work, Speed Limits, Hazardous Area, various do's & don'ts, etc.

f) provide posters, banners for safe working to promote safety consciousness.

g) identify, assess, analyze & mitigate the construction hazards& incorporate relevant control measures before actually executing site works. (HIRAC = Hazard Identification, Risk Analysis and Control).

h) identify, assess, analyze & mitigate the environmental impact & incorporate relevant control measures through Environmental Aspect Impact Register

i) Identify and comply to all applicable HSE related legal requirements by preparing and maintaining a Legal register.

j) To maintain & monitor the level of legal compliance at site, a committee shall be formed comprising of contractor's RCM as Head and lead representatives as member(s)from HR/Legal, HSE and discipline engineer(s) (Civil, Mechanical, Electrical, Instrumentation) as applicable. Committee shall review the applicable legal requirements during periodical meetings and monitor the compliance status.

k) arrange testing, examination, inspection of own as well as borrowed construction equipment's/ machinery (stationary &mobile) before being used at site and also at periodical interval, through own resources and also by 3rd party competent agencies (as deemed fit in statutes). Records of such test, examination etc. shall be maintained & shall be submitted to EIL/Owner as & when asked for.

l) carryout audits/inspection (internal & external) at his works as well as sub-contractor works as per approved HSE plan/procedure/programme & submit the compliance reports of identified shortfalls for EIL/Owner review.

m) Arranging HSE training for site workmen (of his own &subcontractors) through internal or external faculty at periodical intervals.

n) Assistance& cooperate during HSE audits by EIL/Owner or any other 3rd party and submit compliance report.

o) Generate & submit of HSE records/report as per this specification.

p) Contractor shall arrange minimum 100 lux. illumination level at construction site for night works& record shall be maintained.

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q) Mobile phones shall not be permitted in operational area of the Project Site. However, intrinsically safe mobile phone can be permitted on approval from EIL/Owner. Alternatively, telephone booth(s) may be set up by the contractor after obtaining approval from EIL/Owner. Use of mobile phone shall also be restricted during construction activities such as height work, erection of material, confined space and Pre-commissioning & Commissioning activities at all project sites.

r) The contractor shall assign responsible person as in charge for night works and it shall be informed to owner/EIL.

s) Appraise EIL/Owner on HSE activities at site regularly.

t) Carry-out all dismantling activities safely, with prior approval of EIL/Owner representative.

u) The Contractor shall ensure that "Hot works" and painting works do not continue at the same place/ location at project site for which chance or probability of "fire" incident exists.

4.3 During Short Listing of the Sub-Contractors

The contractor shall review the HSE management system of the sub-contractors in line with the requirements given in this specification. The contractor shall be held responsible for the shortcomings observed in the HSE management system of the sub-contractor(s) during execution of the job.

5.0 RECORDS

At the minimum, the contractor shall maintain/ submit HSE records in the following reporting formats:

Safety Walk Through Report	HSE-1
Accident/ Incident Report	HSE-2
Supplementary Accident/ Incident Investigation report	HSE-3
Near Miss Incident Report	HSE-4
Monthly HSE Report	HSE-5
Permit for working at height	HSE-5
Permit for working in confined space	HSE-7
Permit for radiation work	HSE-8
Permit for demolishing/ dismantling	HSE-9
Daily Safety checklist	HSE-10
Housekeeping Assessment & compliance	HSE-11
Inspection of temporary electrical booth/installation	HSE-12
Inspection for scaffolding	HSE-13
Permit for erection/modification &dismantling of scaffolding	HSE-14
Permit for heavy lift/critical erection.	HSE-15
Permit for Energy isolation and de-isolation.	HSE-16
Permit for Excavation	HSE-17
Environmental Aspect Impact Register	HSE-18
HIRAC Register	HSE-19
Checklist for Tower Crane	HSE-20
Crane Inspection Checklist	HSE-21
Hydraulic Mobile Crane Inspection Checklist	HSE-22
Hydraulic Rig Inspection Checklist	HSE-23

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Boom Lift Inspection Checklist	HSE-24
Inspection reports of Equipment/tools/tackles	*
Report of Toolbox Talks	As indicated in specification
PPE issue report/register	*
Site inspection reports	*
Training records	*

(*) The formats shall be developed by contractor in consultation with EIL/Owner.

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APPENDIX-A
(Sheet 1 of 2)

A.	IS CODES ON HSE
SP: 53	Safety code for the use, Care and protection of hand operated tools.
IS: 838	Code of practice for safety & health requirements in electric and gas welding and cutting operations
IS: 1179	Eye & Face precautions during welding, equipment etc.
IS: 1860	Safety requirements for use, care and protection of abrasive grinding wheels.
IS: 1989 (Pt -II)	Leather safety boots and shoes
IS: 2925	Industrial Safety Helmets
IS: 3016	Code of practice for fire safety precautions in welding & cutting operation.
IS: 3043	Code of practice for earthing
IS: 3764	Code of safety for excavation work
IS: 3786	Methods for computation of frequency and severity rates for industrial injuries and classification of industrial accidents
IS: 3696	Safety Code of scaffolds and ladders
IS: 4083	Recommendations on stacking and storage of construction materials and components at site
IS: 4770	Rubber gloves for electrical purposes
IS: 5121	Safety code for piling and other deep foundations
IS: 5216 (Pt-I)	Recommendations on Safety procedures and practices in electrical works
IS: 5557	Industrial and Safety rubber lined boots
IS: 5983	Eye protectors
IS: 6519	Selection, care and repair of Safety footwear
IS: 6994 (Pt-I)	Industrial Safety Gloves (Leather & Cotton Gloves)
IS: 7293	Safety Code for working with construction Machinery
IS: 8519	Guide for selection of industrial safety equipment for body protection
IS: 9167	Ear protectors
IS: 11006	Flash back arrestor (Flame arrestor)
IS: 11016	General and safety requirements for machine tools and their operation
IS: 11057	Specification for Industrial safety nets
IS: 11226	Leather safety footwear having direct moulded rubber sole
IS: 11972	Code of practice for safety precaution to be taken when entering a sewerage system
IS: 13367	Code of practice-safe use of cranes
IS: 13416	Recommendations for preventive measures against hazards at working place

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APPENDIX-A
(Sheet 2 of 2)

B. INTERNATIONAL STANDARDS ON HSE

Safety Glasses	:	ANSI Z 87.1, ANSI ZZ 87.1, AS 1337, BS 2092, BS 1542, BS 679, DIN 4646/ 58311
Safety Shoes	:	ANSI Z 41.1, AS 2210, EN 345
Hand Gloves	:	BS 1651
Ear Muffs	:	BS 6344, ANSI S 31.9
Hard Hat	:	ANSI Z 89.1/89.2, AS 1808, BS 5240, DIN 4840
Goggles	:	ANSI Z 87.1
Face Shield	:	ANSI Z 89.1
Breathing Apparatus	:	BS 4667, NIOSH
Welding & Cutting	:	ANSI Z49.1
Safe handling of compressed:P-1		(Compressed Gas Association Gases in cylinders 1235 Jefferson Davis Highway, Arlington VA 22202 - USA)
Full body harness	:	EN-361
Lanyard	:	EN-354
Karabiner	:	EN-362 and EN-12275

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APPENDIX-B

DETAILS OF FIRST AID BOX

SL. NO.	DESCRIPTION		QUANTITY
1.	Small size Roller Bandages, 1 Inch Wide	(Finger Dressing small)	6 Pcs.
2.	Medium size Roller Bandages, 2 Inches Wide	(Hand & Foot Dressing)	6 Pcs.
3.	Large size Roller Bandages, 4 Inches Wide	(Body Dressing Large)	6 Pcs.
4.	Large size Burn Dressing	(Burn Dressing Large)	4 Pkts.
5.	Cotton Wool	(20 gms packing)	4 Pkts.
6.	Antiseptic Solution Dettol (100 ml.) or Savlon		1 Bottle
7.	Mercurochrome Solution (100 ml.) 2% in water		1 Bottle
8.	Ammonia Solution (20 ml.)		1 Bottle
9.	A Pair of Scissors		1 Piece
10.	Adhesive Plaster (1.25 cm X 5 m)		1 Spool
11.	Eye pads in Separate Sealed Pkt.		4 pcs.
12.	Tourniqut		1 No.
13.	Safety Pins		1 Dozen
14.	Tinc. Iodine/ Betadine (100 ml.)		1 Bottle
15.	Polythene Wash cup for washing eyes		1 No.
16.	Potassium Permanganate (20 gms.)		1 Pkt.
17.	Tinc. Benzoine (100 ml.)		1 Bottle
18.	Triangular Bandages		2 Nos.
19.	Band Aid Dressing		5 Pcs.
20.	Iodex/Moov(25 gms.)		1 Bottle
21.	Tongue Depressor		1 No.
22.	Boric Acid Powder (20 gms.)		2 Pkt.
23.	Sodium Bicarbonate (20 gms.)		1 Pkt.
24.	Dressing Powder (Nebasulf) (10 gms.)		1 Bottle
25.	Medicinal Glass		1 No.
26.	Duster		1 No.
27.	Booklet (English& Local Language)		1 No. each
28.	Soap		1 No.
29.	Toothache Solution		1 No.
30.	Vicks (22 gms.)		1 Bottle
31.	Forceps		1 No.
32.	Snake –Bite Lancet		1No.
33.	Note Book		1 No.
34.	Splints		4 Nos.
35.	Lock		1 Piece
36.	Life Saving/Emergency/Over-the counter Drugs		As decided at site

Box size: Suitable size first aid box to be used for first aid items

Note : The medicines prescribed above are only indicative. Equivalent medicines can also be used. A prescription, in this regard, shall be required from a qualified Physician.

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APPENDIX-C

TYPE OF FIRES VIS-À-VIS FIRE EXTINGUISHERS

Fire Extinguisher → / Fire ↓	Water	Foam	CO_2	Dry Powder	Multi purpose (ABC)
Originated from paper, clothes, wood	✔	✔	can control minor surface fires	can control minor surface fires	✔
Inflammable liquids like alcohol, diesel, petrol, edible oils, bitumen	×	✔	✔	✔	✔
Originated from gases like LPG, CNG, H_2	×	×	✔	✔	✔
Electrical fires	×	×	✔	✔	✔

LEGEND : ✔ : CAN BE USED

× : NOT TO BE USED

Note: Fire extinguishing equipment must be checked atleast once a year and after every use by an authorized person. The equipment must have an inspection label on which the next inspection date is given. Type of extinguisher shall clearly be marked on it.

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APPENDIX-D

List of Statutory Acts & Rules Relating to HSE

- The Indian Explosives Act and Rules
- The Motor Vehicle Act and Central Motor Vehicle Rules
- The Factories Act and concerned Factory Rules
- The Petroleum Act and Petroleum Rules
- The Workmen Compensation Act
- The Gas Cylinder Rules and the Static & Mobile Pressure Vessels Rules
- The Indian Electricity Act and Rules
- The Indian Boiler Act and Regulations
- The Water (Prevention & Control & Pollution) Act
- The Water (Prevention & Control of Pollution) Cess Act
- The Mines & Minerals (Regulation & Development) Act
- The Air (Prevention & Control of Pollution) Act
- The Atomic Energy Act
- The Radiation Protection Rules
- The Indian Fisheries Act
- The Indian Forest Act
- The Wild Life (Protection) Act
- The Environment (Protection) Act and Rules
- The Hazardous Wastes (Management & Handling) Rules
- The Manufacturing, Storage & import of Hazardous Chemicals Rules
- The Public Liability Act
- The Building and Other Construction Workers (Regulation of Employment and Condition of Service) Act
- Other statutory acts Like EPF, ESIS, Minimum Wages Act.

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APPENDIX-E(Sheet 1 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(A) EXCAVATION Pit Excavation upto 3.0m	Falling into pit	Personal injury	Provide guard rails/ barricade with warning signal Provide atleast two entries/ exits. Provide escape ladders.
	Earth Collapse	Suffocation/ Breathlessness Buried	Provide suitable size of shoring and strutting, if required. Keep soil heaps away from the edge equivalent to 1.5m or depth of pit whichever is more. Don't allow vehicles to operate too close to excavated areas. Maintain atleast 2m distance from edge of cut. Maintain sufficient angle of repose. Provide slope not less than 1:1 and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock. Battering/benching the sides.
	Contact with buried electric cables Gas/ Oil Pipelines	Electrocution Explosion	Obtain permission from competent authorities, prior to excavation, if required. Locate the position of buried utilities by referring to plant drawings. Start digging manually to locate the exact position of buried utilities and thereafter use mechanical means.
Pit Excavation beyond 3.0m	Same as above plus Flooding due to excessive rain/ underground water	Can cause drowning situation	Prevent ingress of water Provide ring buoys Identify and provide suitable size dewatering pump or well point system
	Digging in the vicinity of existing Building/ Structure	Building/Structure may collapse Loss of health & wealth	Obtain prior approval of excavation method from local authorities. Use under-pining method Construct retaining wall side by side.
	Movement of vehicles/ Equipments close to the edge of cut.	May cause cave-in or slides. Persons may get buried.	Barricade the excavated area with proper lighting arrangements Maintain at least 2m distance from edge of cut and use stop blocks to prevent over-run Strengthen shoring and strutting

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APPENDIX-E: (Sheet 2 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
Narrow deep excavations for pipelines, etc.	Same as above plus Frequent cave-in or slides	May cause severe injuries or prove fatal	Battering/benching of sides Provide escape ladders
	Flooding due to Hydro- static testing	May arise drowning situation	Same as above plus Bail out accumulated water Maintain adequate ventilation.
Rock by excavation blasting	Improper handling of explosives	May prove fatal	Ensure proper storage, handling & carrying of explosives by trained personnel. Comply with the applicable explosive acts & rules.
	Uncontrolled explosion	May cause severe injuries or prove fatal	Allow only authorized persons to perform blasting operations. Smoking and open flames are to be strictly prohibited
	Scattering of stone pieces in atmosphere	Can hurt people	Use PPE like goggles, face mask, helmets etc.
Rock excavation by blasting (Contd)	Entrapping of persons/ animals.	May cause severe injuries or prove fatal	Barricade the area with red flags and blow siren before blasting.
	Misfire	May explode suddenly	Do not return to site for atleast 20 minutes or unless announced safe by designated person.
Piling Work	Failure of pile-driving equipment	Can hurt people	Inspect Piling rigs and pulley blocks before the beginning of each shift.
	Noise pollution	Can cause deafness and psychological imbalance.	Use personal protective equipment's like ear plugs, muffs, etc.
	Extruding rods/casing	Can hurt people	Barricade the area and install sign boards Provide first-aid
	Working in the vicinity of 'Live-Electricity'	Can cause electrocution/ Asphyxiation	Keep sufficient distance from Live-Electricity as per IS code. Shut off the supply, if possible Provide artificial/rescue breathing to the injured
(B) CONCRETING	Air pollution by cement	May affect Respiratory System	Wear respirators or cover mouth and nose with wet cloth.
	Handling of ingredients	Hands may get injured	Use gloves & other PPE.
	Protruding reinforcement rods.	Feet may get injured	Provide platform above reinforcement for movement of workers or provide end caps for protection on reinforcement bars.

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APPENDIX-E :(Sheet 3 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Earthing of electrical mixers, vibrators, etc. not done.	Can cause electrocution/ asphyxiation	Ensure earthing of equipments and proper functioning of electrical circuit before commencement of work.
	Falling of materials from height	Persons may get injured	Use hard hats Remove surplus material immediately from work place. Ensure lighting arrangements during night hours
	Continuous pouring by same gang	Cause tiredness of workers and may lead to accident.	Insist on shift pattern Provide adequate rest to workers between subsequent pours.
	Revolving of concrete mixer/ vibrators	Parts of body or clothes may get entrapped.	Allow only mixers with hopper Provide safety cages around moving motors Ensure proper mechanical locking of vibrator.
Super-structure	Same as above plus Deflection in props or shuttering material	Shuttering/props may collapse and prove fatal	Avoid excessive stacking on shuttering material Check the design and strength of shuttering material before commencement of work Rectify immediately the deflection noted during concreting.
	Passage to work place	Improperly tied and designed props/planks may collapse	Ensure the stability and strength of passage before commencement of work. Do not overload and stand under the passage.
(C) REINFOR-CEMENT	Curtailment and binding of rods	Persons may get injured	Use PPE like gloves, shoes, helmets, etc. Avoid usage of shift tools
	Carrying of rods for short distances/at heights	Workers may get injured their hands and shoulders.	Provide suitable pads on shoulders and use safety gloves. Tie up rods in easily liftable bundles Ensure proper staging.
	Checking of clear distance/ cover with hands	Rods may cut or injure the fingers	Use measuring devices like tape, measuring rods, etc.
	Hitting projected rods and standing on cantilever rods.	Persons may get injured and fell down	Use safety shoes and avoid standing unnecessarily on cantilever rods Avoid wearing of loose clothes

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APPENDIX-E:(Sheet 4 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Falling of material from height	May prove fatal	Use helmets Provide safety nets
	Transportation of rods by trucks/ trailers	Protruded rods may hit the persons	Use red flags/lights at the ends Do not protrude the rods in front of or by the side of driver's cabin. Do not extend the rods 1/3rd of deck length or 1.5m whichever is less
(D)WELDING AND GAS CUTTING	Welding radiates invisible ultraviolet and infra-red rays	Radiation can damage eyes and skin.	Use specified shielding devices and other PPE of correct specifications. Avoid thoriated tungsten electrodes for GTAW
	Improper placement of oxygen and acetylene cylinders	Explosion may occur	Move out any leaking cylinder Keep cylinders in vertical position Use trolley for transportation of cylinders and chain them Use flashback arrestors
	Leakage/ cuts in hoses	May cause fire	Purge regulators immediately and then turn off Never use grease or oil on oxygen line connections and copper fittings on acetylene lines Inspect regularly gas carrying hoses Always use red hose for acetylene & other fuel gases and black for oxygen
	Opening-up of cylinder	Cylinder may burst	Always stand back from the regulator while opening the cylinder Turn valve slowly to avoid bursting Cover the lug terminals to prevent short circuiting
	Welding of tanks, container or pipes storing flammable liquids	Explosion may occur	Empty & purge them before welding Never attach the ground cable to tanks, container or pipe storing flammable liquids Never use LPG for gas cutting

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APPENDIX-E:(Sheet 5 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES ...(Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(E) RADIOGRAPHY	Ionizing radiation	Radiations may react with the skin and can cause cancer, skin irritation, dermatitis, etc.	Ensure Safety regulations as per BARC/AERB before commencement of job. Cordon off the area and install Radiation warning symbols Restrict the entry of unauthorized persons Wear appropriate PPE and film badges issued by BARC/AERB
	Transportation and Storage of Radiography source	Same as above	Never touch or handle radiography source with hands Store radiography source inside a pit in an exclusive isolated storage room with lock and key arrangement. The pit should be approved by BARC/AERB. Radiography source should never be carried either in passenger bus or in a passenger compartment of trains. BARC/AERB has to be informed before source movement. Permission from Director General of Civil Aviation is required for booking radio isotopes with airlines.
	Loss of Radio isotope	Same as above	Try to locate with the help of Survey Meter. Inform BARC/AERB (*)
(F) ELECTRICAL INSTALLATION ANDUSAGE	Short circuiting	Can cause Electrocution or Fire	Use rubberized hand gloves and other PPE Don't lay wires under carpets, mats or door ways. Allow only licensed electricians to perform on electrical facilities Use one socket for one appliance Ensure usage of only fully insulated wires or cables Don't place bare wire ends in a socket Ensure earthing of machineries and equipment's Do not use damaged cords and avoid temporary connections Use spark-proof/flame proof type field distribution boxes.

(*) Atomic Energy Regulatory Board (AERB),
Bhabha Atomic Research Centre (BARC)
Anushakti Nagar, Mumbai – 400 094

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APPENDIX-E:(Sheet 6 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			Do not allow open/bare connections Provide all connections through 30mAELCB Protect electrical cables/equipments from water and naked flames Check all connections before energizing
	Overloading of Electrical System	Bursting of system can occur which leads to fire	Display voltage and current ratings prominently with 'Danger' signs. Ensure approved cable size, voltage grade and type Switch off the electrical utilities when not in use Do not allow unauthorized connections. Ensure proper grid wise distribution of Power
	Improper laying of overhead and underground transmission lines/cables	Can cause electrocution and prove fatal	Do not Jay un armoured cable directly on ground, wall, roof of trees Maintain atleast 3m distance from HT cables All temporary cables should be laid atleast 750 mm below ground on 100 mm fine sand overlying by brick soling Provide proper sleeves at crossings/ inter-sections Provide cable route markers indicating the type and depth of cables at intervals not exceeding 30m and at the diversions/termination
(G) FIRE PREVENTION AND PROTECTION	Small fires can become big ones and may spread to the surrounding areas	Cause burn injuries and may prove fatal	In case a fire breaks out, press fire alarm system and shout "Fire, Fire". Keep buckets full of sand & water/ fire extinguishing equipment near hazardous locations. Confine smoking to 'Smoking Zones' only. Train people for using specific type of fire fighting equipments under different classes of fire. Keep fire doors/shutters, passages and exit doors unobstructed. Maintain good housekeeping and first-aid boxes (for details refer Appendix-B). Don't obstruct assess to Fire extinguishers. Do not use elevators for evacuation during fire. Maintain lightening arrestors for elevated structures. Stop all electrical motors with internal combustion.

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APPENDIX-E :(Sheet 7 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			Move the vehicles from dangerous locations. Remove the load hanging from the crane booms Remain out of the danger areas.
	Improper selection of Fire extinguisher	It may not extinguish the fire	Ensure usage of correct fire extinguisher meant for the specified fire (for details refer Appendix-C). Do not attempt to extinguish Oil and electric fires with water. Use foam cylinders/CO_2/sand or earth.
	Improper storage of highly inflammable substances	Same as above	Maintain safe distance of flammable substances from source of ignition. Restrict the distribution of flammable materials to only min. necessary amount. Construct specifically designed fuel storage facilities. Keep chemicals in cool and dry place away from heat. Ensure adequate ventilation. Before welding operation, remove or shield the flammable material properly. Store flammable materials in stable racks, correctly labeled preferably with catchment trays. Wipe off the spills immediately
	Short circuiting of electrical system	Same as above Can cause Electrocution	Don't lay wires under carpets, mats or door ways Use one socket for one appliance. Use only fully insulated wires or cables. Do not allow open/bare connections. Provide all connections through 30mAELCB. Ensure earthing of machineries and equipments.
(H) VEHICULAR MOVEMENT	Crossing the Speed Limits (Rash driving)	Personal injury	Obey speed limits and traffic rules strictly. Always expect the unexpected and be a defensive driver. Use seat belts/helmets. Blow horn at intersections and during overtaking operations. Maintain the vehicle in good condition. Do not overtake on curves, bridges and slopes.
	Adverse weather condition	Same as Above	Read the road ahead and ride to the left. Keep the wind screen and lights clean. Do not turn at speed. Recognize the hazard, understand the defense and act correctly in time.

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APPENDIX-E :(Sheet 8 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Consuming alcohol before and during the driving operation	Same as above	Alcohol and driving do not mix well. Either choose alcohol or driving. If you have a choice between hitting a fixed object or an on-coming vehicle, hit the fixed object Quit the steering at once and become a passenger. Otherwise take sufficient rest and then drive. Do not force the driver to drive fast and round the clock. Do not day dream while driving
	Falling objects/ Mechanical failure	May prove fatal	Ensure effective braking system, adequate visibility for the drives, reverse warning alarm. Proper maintenance of the vehicle as per manufacturer instructions
(I) PROOF TESTING (HYDROSTATIC/ PNEUMATIC TESTING)	Bursting of piping Collapse of tanks Tanks flying off	May cause injury and prove fatal	Prepare test procedure & obtain EIL/owner's approval. Provide separate gauge for pressurizing pump and piping/equipment. Check the calibration status of all pressure gauges, dead weight testers and temperature recorders. Take dial readings at suitable defined intervals and ensure most of them fall between 40-60% of the gauge scale range. Provide safety relief valve (set at pressure slightly higher than test pressure) while testing with air/ nitrogen. Ensure necessary precautions, stepwise increase in pressure, tightening of bolts/nuts, grouting, etc. before and during testing. Keep the vents open before opening any valve while draining out of water used for hydro-testing of tanks. Pneumatic testing involves the hazard of released energy stored in compressed gas. Specific care must therefore be taken to minimize the chance of brittle failure during a pneumatic leak test. Test temperature is important in this regard and must be considered when the designer chooses the material of construction.

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APPENDIX-E :(Sheet 9 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			A pressure relief device shall be provided, having a set pressure not higher than the test pressure plus the lesser of 345 KPa (50 psi) or 10% of the test pressure. The gas used as test fluid, if not air, shall be nonflammable and nontoxic.
(J) WORKING AT HEIGHTS	Person can fall down	May sustain severe injuries or prove fatal	Provide guard rails/barricade at the work place Use PPE like full body harness, life line, helmets, safety shoes, etc. Obtain a permit before starting the work at height above 2 meters Fall arrest and safety nets, etc. must be installed Provide adequate working space(min. 0.6 m) Tie/weld working platform with fixed support Use roof top walk ladder while working on a slopping roofs Avoid movement on beams
		May hit the scrap/material stacked at the ground or in between	Keep the work place neat and clean Remove the scrap immediately
	Material can fall down	May hit the workers working at lower levels and prove fatal	Same as above plus Do not throw or drop materials or equipment from height, i.e. do not *bomb* materials All tools to be carried in a tool-kit Bag or on working uniform Remove scrap from the planks Ensure wearing of helmet by the workers working at lower levels. Multiple activities at same location to be avoided.
(K) CONFINED SPACES	Suffocation/ drowning	Unconsciousness, death	Use respiratory devices, if reqd. Avoid overcrowding inside a confined space Provide Exhaust fans for ventilation Do not wear loose clothes, neck ties, etc. Fulfill conditions of the permit

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APPENDIX-E:(Sheet 10 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			Check for presence of hydrocarbons, O_2 level Obtain work permit before entering a confined space Ensure that the connected piping of the equipment which is to be opened is pressure free, fluid has been drained, vents are open and piping is positively isolated by a blind flange
	Presence of foul smell and toxic substances	Inhalation can pose threat to life	Same as above plus Check for hydrocarbon and Aromatic compounds before entering a confined space Depute one person outside the confined space for continuous monitoring and for extending help in case of an emergency
	Ignition/ flame can cause fire	Person may sustain burn injuries or explosion may occur	Keep fire extinguishers at a hand distance Remove surplus material and scrap immediately Do not smoke inside a confined space Do not allow gas cylinders inside a confined space Use low voltage (24V) lamps for lighting Use tools with air motors or electric tools with max. voltage of 24V Remove all equipment's at the end of the day
(L) HANDLING AND LIFTING EQUIPMENTS	Failure of load lifting and moving equipment's	Can cause accident and prove fatal	Avoid standing under the lifted load and within the operating radius of cranes. Check periodically oil, brakes, gears, horns and tyre pressure of all moving machinery. Check quality, size and condition of all chain pulley blocks, slings, U-clamps, D-shackles, wire ropes, etc. Allow crane to move only on hard, firm and leveled ground. Allow lifting slings as short as possible and check gunny packings at the friction points. Do not allow crane to tilt its boom while moving Install Safe Load Indicator. Ensure certification by applicable authority.

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APPENDIX-E :(Sheet 11 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Overloading of lifting equipments	Same as above	Safe lifting capacity of derricks and winches written on them shall be got verified The max. safe working load shall be marked on all lifting equipments Check the weight of columns and other heavy items painted on them and accordingly decide about the crane capacity, boom and angle of erection Allow only trained operators and riggers during crane operation.
	Overhead electrical wires	Can cause electrocution and fire	Do not allow boom or other parts of crane to come within 3m reach of overhead HT cables Hook and load being lifted shall preferably remain in full visibility of crane operators.
(M) SCAFFOLDING, FORMWORK AND LADDERS	Person can fall down	Person May sustain severe injuries and prove fatal	Provide guard rails for working at height. Face ladder while climbing and use both hands. Ladders shall extend about 1m above landing for easy access and tying up purpose. Do not place ladders against movable objects and maintain base at 1/4 unit of the working length of the ladder. Suspended scaffolds shall not be less than 500 mm wide and tied properly with ropes. No loose planks shall be allowed. Use PPE, like helmets, safety shoes etc.
	Failure of scaffolding material	Same as above	Inspect visually all scaffolding materials for stability and anchoring with permanent structures. Design scaffolding for max. load carrying capacity. Scaffolding planks shall not be less than 50X250 mm full thickness lumber or equivalent. These shall be cleated or secured and must extend over the end supports by at least 150mm and not more than 300mm. Don't overload the scaffolds. Do not splice short ladders to make a longer one. Vertical ladders shall not exceed 6m.
	Material can fall down	Persons working at lower level gets injured	Remove excess material and scrap immediately. Carry the tools in a tool-kit bag only. Provide safety nets.

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APPENDIX-E:(Sheet 12 of 12)

CONSTRUCTION HAZARDS, THEIR EFFECTS &PREVENTIVE MEASURES (...Contd.)

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(N) STRUC-TURAL WORKS	Personal negligence and danger of fall	Can cause injury or casualty	Do not take rest inside rooms built for welding machines or electrical distribution system. Avoid walking on beams at height. Wear helmet with chin strap and full body harness while working at height. Use hand gloves and goggles during grinding operations. Cover or mark the sharp and projected edges. Do not stand within the operating radius of cranes.
	Lifting/ slipping of material	Same as above	Do not stand under the lifted load. Stack properly all the materials. Avoid slippage during handling. Control longer pieces lifted up by cranes from both ends. Remove loose materials from height. Ensure tightening of all nuts & bolts.
(O)PIPELIN E WORKS	Erection/ lowering failure	Can cause injury	Do not stand under the lifted load. Do not allow any person to come within the radii of the side boom handling pipes. Check the load carrying capacity of the lifting tools & tackles. Use safe Load Indicators (SLI). Use appropriate PPEs.
	Other	Same as above	Wear gum boots in marshy areas. Allow only one person to perform signaling operations while lowering of pipes. Wedges to be provided below the pipe to prevent spool/pipe roll out. Provide night caps on pipes. Provide end covers on pipes for stoppage of pigs while testing/ cleaning operations.
(P) GRIT BLASTING	Pollution in neighboring area, hit by grit sand high pressure air	Can cause personal injury	Ensure the blasting is done in enclosed shed. Keep safe distance while blasting operations. Wear positive pressure blast hood or helmet with view-window, ear-muff/plug, gloves, overall or leather coat /apron, rubber shoes.

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APPENDIX-F

TRAINING SUBJECTS / TOPICS

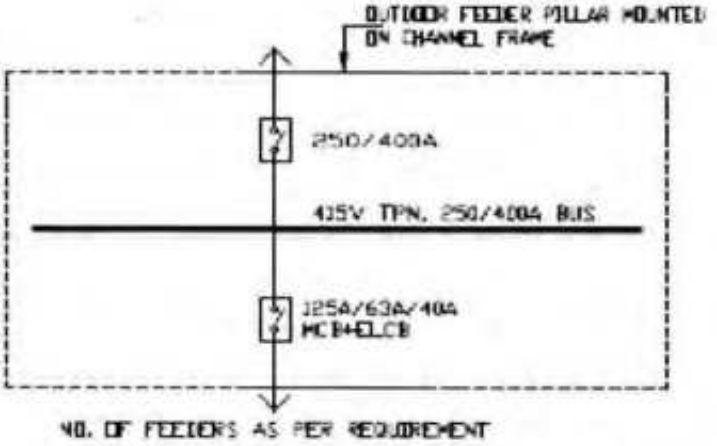
(For contractors' personnel)

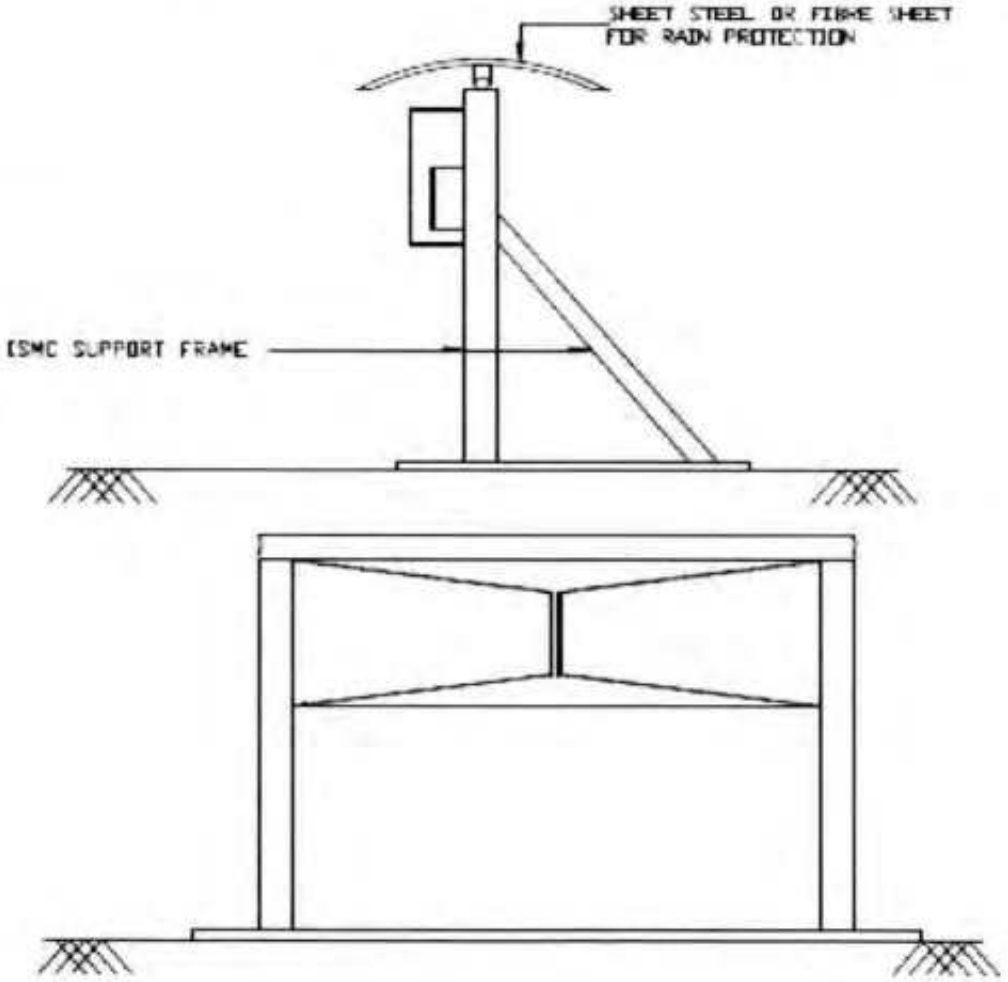
1. The Law & Safety – Statutory Requirement / Applicable statutes / Duties of employer / employee.
2. Policy & Administration – Why HSE? / Duties & Responsibilities of Safety Personnel at project site / Effect of incentive on accident prevention.
3. HSE & Supervision – Duties of Supervisor / HSE integrated supervision / Who should be held responsible for site accidents?
4. Safety Budget / Cost of Accidents – Direct costs / Indirect costs.
5. Hazard Identification / Type of hazards / HIRAC.
6. Behavioral Safety & Motivation.
7. Housekeeping – Storage / Stacking / Handling of materials / Hydraulic Mobile Crane handling.
8. Occupational Health in Construction sector.
9. Personal Protective Equipment's – Respiratory & Non- respiratory.
10. Electricity & Safety – ELCB / Fuse / Powered tools / Project illumination.
11. Handling of Compressed Gas – Transportation / Storage / FBAs / Fire prevention.
12. Machine Safety – Machine guarding / Maintenance.
13. Transportation – Hazards & risks in transp. of materials / ODC consignments.
14. Cranes & Other Lifting machinery – Legal requirements vis-â-vis essential safety requirements.
15. Communication – HSE Induction / TBTs / Safety Committee / Safety meeting / Safety propaganda / Publicity.
16. Excavation – Risks & Dangers / Safety measures.
17. Working at Heights – Use of ladder / Work on roofs / Scaffolds / Double harness lanyards / Life-line / Fall arrester / Safety Nets / Floor openings.
18. Hazards in Welding & important safety precautions.
19. Gas Cutting – Hazards & safety measures.
20. Fire prevention & fire protection.

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APPENDIX - G

CONSTRUCTION POWER BOARD(typ)





NOTES:-
1. CONTRACTOR TO INSTALL TEMPORARY CONST. POWER BOARD AS SHOWN IN THE DRG. ITS LOCATION SHALL BE EASILY ACCESABALE.
2. POWER DISTRIBUTION BOARD SHALL BE EARTHED AT TWO POINTS BY MINIMUM 40X5MM GI STRIP FROM THE AVILABLE GRID OR DIRECTLY CONNECTED TO TWO DIRECTLY DRIVEN EARTH ELECTRODES.
3. DISTRIBUTION BOARD SHALL BE FABRICATED BY USING 14MM CRCA SHEET STEEL WITH HINGED DOORS AND ALL COMPONENT MOUNTED IN IT.
4. ALL INCOMING AND OUTGOING CABLES SHALL HAVE BOTTOM ENTRY.

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APPENDIX-H

LIST OF PROCEDURES (MINIMUM) TO BE FORMING PART OF HSE PLAN:-

A. HSE Management Procedures:

- HSE Risk Management (including HIRA)
- HSE Legal Compliance and Other Requirements
- HSE Objectives & Performance
- HSE Training and Competence (including Induction)
- HSE Motivation &Award Scheme
- HSE Audits
- HSE Sub Contractor Management
- HSE Emergency Management
- HSE Incidents Reporting and Management
- HSE procedure for Behaviour based Safety
- First Aid & Management
- Roles, Responsibility, accountabilities and Authorities

B. Job procedures/Safe Operating procedures

- Setting Up Site &Signages
- Working at Height
- Confined Space Entry
- Permit to Work (including hot works)
- Housekeeping
- Transportation of materials including Manual Handling
- Earthmoving Operations & excavation
- Scaffolding
- Fire Prevention/Protection
- Hazardous Substance handling & Storage
- Personal Protective Equipment

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APPENDIX-I

LIFE SAVING RULES

Bypassing Safety Controls

Obtain authorisation before overriding or disabling safety controls



- I understand & use safety-critical equipment and procedure which apply to my task
- I obtain authorization before:
  - disabling or overriding safety equipment
  - deviating from procedures
  - crossing a barrier

Confined Space

Obtain authorisation before entering a confined space



- I confirm energy sources are isolated
- I confirm the atmosphere has been tested and is monitored
- I check and use my breathing apparatus when required
- I confirm there is an attendant standing by
- I confirm rescue plan is in place
- I obtain authorization to enter

Driving

Follow safe driving rules



- I always wear a seatbelt
- I do not exceed the speed limit, and reduce my speed for road conditions
- I do not use phones or operate devices while driving
- I am fit, rested and fully alert while driving
- I follow journey management requirements

Energy Isolation

Verify isolation and zero energy before work begins



- I have identified all energy sources
- I confirm that hazardous energy sources have been isolated, locked and tagged
- I have checked there is zero energy and tested for residual or stored energy

Hot Work

Controls flammables and ignition sources



- I identify and control ignition sources
- Before starting any hot work:
  - I confirm flammable material has been removed or isolated
  - I obtain authorization
- Before starting hot work in a hazardous are I confirm:
  - a gas test has been completed
  - gas will be monitored continually

Line of Fire

Keep yourself and others out of the line of fire



- I position myself to avoid:
  - moving objects
  - vehicles
  - pressure releases
  - dropped objects
- I establish and obey barriers and exclusion zones
- I take action to secure loose objects and report potentialdropped objects

Safe Mechanical Lifting

Plan lifting operations and control the area



- I confirm that the equipment and load have been inspected and are fit for purpose
- I only operate equipment that I am qualified to use
- I establish and obey barriers and exclusion zones
- I never walk under a suspended load

Work Authorization

Work with a valid permit when required



- I am authorised to perform the work
- I understand the permit
- I have confirmed that hazards are controlled and it is safe to start
- I stop and reassess if conditions change

Work at Height

Protect yourself against a fall when working at height



- I inspect my fall protection equipment before use
- I secure tools and work materials to prevent dropped objects
- I tie off 100% to approved anchor points while outside a protected area

Excavation

Follow safe excavation procedure



- Before starting any excavation:
  - I confirm availability of underground utilities
  - I obtain authorization
  - I take adequate precautions to prevent collapse of soil

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FORMAT NO. : HSE-1 REV 1

(Sheet 1 of 6)

SAFETY WALK-THROUGH REPORT

(Name & signature of walk through performer to be inserted at the bottom of each page)

Project : _____ Report no. : _____

Date : _____ Ccontractor : _____

Inspection by : _____ Owner : _____

Frequency : Monthly Job no. : _____

Note : Write 'NA' wherever the item is not applicable

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
1.	HOUSEKEEPING				
a)	Waste containers provided and used				
b)	Sanitary facilities adequate and Clean				
c)	Passageways and Walkways Clear				
d)	General neatness of working areas				
e)	Other				
2.	PERSONNEL PROTECTIVE EQUIPMENT				
a)	Goggles; Shields				
b)	Face protection				
c)	Hearing protection				
d)	Foot protection				
e)	Hand protection				
f)	Respiratory Masks etc.				
g)	Full body harness conforming to CE, EN 361				
h)	Hard hat (HDPE)				
i)	Other				
3.	EXCAVATIONS/OPENINGS				
a)	Openings properly covered or barricaded				
b)	Excavations shored				
c)	Excavations barricaded				
d)	Overnight lighting provided				
e)	Other				

Safety walk-through performer (Name & Signature).....

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FORMAT NO. : HSE-1 REV 1

(Sheet 2 of 6)

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
4.	WELDING & GAS CUTTING				
a)	Gas cylinders chained upright				
b)	Cables and hoses not obstructing				
c)	Screens or shields used				
d)	Flammable materials protected				
e)	Live electrode bits contained properly				
f)	Fire extinguisher (s) accessible				
g)	Other				
5.	SCAFFOLDING & BARRICADING				
a)	Fully decked platforms				
b)	Guard and intermediate rails in place				
c)	Toe boards in place				
d)	Adequate shoring				
e)	Adequate access				
f)	Positive barricading for critical activities				
g)	Installation of warning signs				
h)	Other				
6.	LADDERS				
a)	Extension side rails 1 m above				
b)	Top of landing				
c)	Properly secured				
d)	Angle + 70^0 from horizontal				
e)	Other				

Safety walk-through performer (Name &Signature).....

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FORMAT NO. : HSE-1 REV 1

(Sheet 3 of 6)

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
7.	HOISTS, CRANES AND DERRICKS				
a)	Condition of cables and sheaves OK				
b)	Condition of slings, chains, hooks and eyes O.K.				
c)	Inspection and maintenance log-books maintained				
d)	Outriggers used				
e)	Reverse horn installed / active / coupled with gear				
f)	Signs/barricades provided				
g)	Signals observed and understood				
h)	Qualified operators				
i)	Other				
8.	MACHINERY, TOOLS AND EQUIPMENT				
a)	Proper instruction				
b)	Safety devices				
c)	Proper cords				
d)	Inspection and maintenance				
e)	Other				
9.	VEHICLE AND TRAFFIC				
a)	Rules and regulations observed				
b)	Inspection and maintenance				
c)	Licensed drivers				
d)	Other				

Safety walk-through performer (Name &Signature).....

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FORMAT NO. : HSE-1 REV 1

(Sheet 4 of 6)

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
10.	TEMPORARY FACILITIES				
a)	Emergency instructions posted				
b)	Fire extinguishers provided				
c)	Fire-aid equipment available				
d)	Secured against storm damage				
e)	General neatness				
f)	In accordance with electrical requirements				
g)	Other				
11.	FIRE PREVENTION				
a)	Personnel trained& instructed to make use of facility				
b)	Fire extinguishers checked periodically & record maintained				
c)	No smoking in Prohibited areas.				
d)	Fire Hydrants not obstructed				
e)	Regular fire drill conducted				
12.	ELECTRICAL				
a)	Use of 3-core armored cables everywhere				
b)	Usage of 'All insulated' or 'double-insulated' electrical tools				
c)	All electrical connection are routed through ELCB				
d)	Natural Earthing at the source of power (Main DB)				
e)	Continuity and tightness of earth conductor				
f)	Effective covering of junction boxes, panels and other energized wiring places				
g)	Ground fault circuit interrupters provided				
h)	Prevention of tripping hazards maintained				
f)	DCP extinguishers arranged & licensed electrician engaged at site				

Safety walk-through performer (Name &Signature).....

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FORMAT NO. : HSE-1 REV 1

(Sheet 5 of 6)

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
13.	HANDLING AND STORAGE OF MATERIALS				
a)	Safely stored or stacked				
b)	Passageways clear / free from obstructions				
c)	Fire fighting facility in place				
14.	FLAMMABLE GASES AND LIQUIDS				
a)	Containers clearly identified / protected from fire				
b)	Safe storage & transportation arrangement made				
c)	Fire extinguishers positioned nearby				
d)	Facilities kept away from electric spark, hot spatters & ignition source.				
15.	WORKING AT HEIGHT				
a)	Approved Erection plan and work permit in place				
b)	Safe access, Safe work platform & Safety nets provided				
c)	Life lines, Fall arrester, Full body harness with double lanyards used;				
d)	Health Check record available for workers going up?				
e)	Protective handrails arranged around floor openings				
16.	CONFINED SPACE				
a)	Work Permit obtained from requisite authority				
b)	Test for toxic gas and sufficient availability of oxygen conducted & status				
c)	Supervisor present at site & at least one person outside the confined space for monitoring deputed				
d)	Availability of safe means of entry, exit and ventilation (register for entry & exit maintained)				
e)	Fire extinguisher and first-aid facility ensured				
f)	Lighting provision made by using 24V Lamp				
g)	Proper usage of PPEs ensured				
17.	RADIOGRAPHY				
a)	Proper storage and handling of source as per BARC/ AERB guidelines (authorized radiographer available)				
b)	Work permit obtained				

Safety walk-through performer (Name &Signature).....

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FORMAT NO. : HSE-1 REV 1

(Sheet 6 of 6)

SL. NO.	ITEM	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
c)	Cordoning of the area done				
d)	Use of appropriate PPE's ensured				
e)	HSE training to workers/supervisors imparted during the fortnight (indicate topic)				
f)	Minimum occupancy of workplace ensured				
18.	HEALTH CHECKS				
a)	All Workers medically examined and found be fit for working at heights (slinging, rigging, painting etc.) in confined space in excavation / trenching in shot blasting				
b)	Availability of First Aid box with contents				
c)	Proper sanitation at site, office and labour camps				
d)	Arrangement of medical facilities.				
e)	Measures for dealing with illness at site & labour camps.				
f)	Availability of Potable drinking water for workmen & staff.				
g)	Provision of crèches for children.				
h)	Stand by vehicle / ambulance available for evacuation of injured				
i)	Adherence to Govt. Guidelines/procedures during epidemic and pandemic (as applicable).				
19.	ENVIRONMENT				
a)	Chemical and Other Effluents properly disposed				
b)	Cleaning liquid of pipes disposed off properly				
c)	Seawater used for hydro-testing disposed off as per agreed procedure				
d)	Lubricant Waste/Engine oils properly disposed				
e)	Waste from Canteen, offices, sanitation etc. disposed properly				
f)	Disposal of surplus earth, stripping materials, Oily rags and combustible materials done properly				
g)	Green belt protection				

Safety walk-through performer (Name &Signature).....

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FORMAT NO. : HSE-2 REV 0

(Sheet 1 of 3)

ACCIDENT REPORT

(To be submitted by Contractor after every Accident within 24 hours to EIL/ Owner)

Report No.: _____ **Date:** _____

Project site: _____ **Name of work:** _____

Contractor's name: _____ Contractor's Job Engineer (name) _____

Non-disabling injury (Non-LTI)	Hospitalized but resumed duty before end of 48 hrsof accident	
Disabling injury (other LTI)	Hospitalized & failed to resume duty within next 48 hrs	
Fatal (LTI):	Death / Expiry	
First Aid case	Resume duty after first aid	

Name of the injured:_____ Father's name of victim: _____

Sub Contractor's Name: .....

Gate Pass No.:.....Age: _____Yrs. Victim's medical fitness exam. (Pre-empl.) date: - _____

Date & time of Accident / Incident: _____

Names of Witnesses: (1_____ (2)_____ (3) _____

Profession of victim:

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c.operator	
Engineer		Manager		Other/specify	

Qualification

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

Job Experience

NIL		Less than 2 yrs		2-5 yrs	
5-10 yrs		11-15 yrs		15 years and above	

Location where the incident happened: _____

_____

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FORMAT NO. : HSE-2 REV 0

(Sheet 2 of 3)

Activity / Works that were continuing during incident / accident: -

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

What exactly the victim was doing just before the incident / accident? .....

.....

.....

Nature of injury:

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

Parts of body involved in incident / accident

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Truck (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

Accident type:

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./ extremes)		Contact with chemicals oroils		Vehicle accident	
Other/specify					

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FORMAT NO. : HSE-2 REV 0

(Sheet 3 of 3)

Medical Aid provided:-(indicate specific aids / treatment etc.)-

.....

.....

.....

Actions taken to prevent recurrence of similar incident / accident:.....

.....

.....

.....

.....

.....

.....

Intimation to local authorities (Dist. Collector / Local Police Station / ESI authority): Yes / No / NA.

If yes, to whom .....

Safety Officer
(Signature and Name)
Stamp of Contractor

Site Head / Resident Construction Manager
(Signature and Name)

To : Owner
: RCM/Site-in-charge EIL (3 copies)
- Nodal Officer HO through RCM (In case of major accident)
- Divisional Head (Constn) through RCM
- Project Manager, EIL, through RCM

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FORMAT NO. : HSE-3 REV 0

(Sheet 1 of 5)

SUPPLEMENTARY ACCIDENT INVESTIGATION REPORT

TICK THE APPROPRIATE ONEAS APPLICABLE (furnish within 72 hours)

Supplementary to Incident / Accident Report No: _____ (Copy enclosed)

Report No.: _____ **Date:** _____

Project site: _____ **Name of work:** _____

Contractor's name: _____ Contractor's Job Engineer (name) _____

Non-disabling injury (Non-LTI)	Hospitalized but resumed duty before end of 48 hrs of accident.	
Disabling injury (other LTI)	Hospitalized & failed to resume duty within next 48 hrs.	
Fatal (LTI)	Death / Expiry	
First Aid case	Resume duty after first aid	

Name of the injured: _____ Father's name of victim: _____

Sub Contractor's Name: .....

Gate Pass No.:..... Age: _____Yrs. Victim's medical fitness exam. (Pre-empl.) date: - _____

Date & time of Accident / Incident: _____

Names of Witnesses: (1_____ (2)_____ (3) _____

Profession of victim:

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c. operator	
Engineer		Manager		Other/specify	

Qualification

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

Job Experience

NIL		Less than 2 yrs.		2-5 yrs.	
5-10 yrs.		11-15 yrs.		15 years and above	

Location where the incident happened: _____

_____

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FORMAT NO. : HSE-3 REV 0

(Sheet 2 of 5)

Activity / Works that were continuing during incident / accident: -

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

What exactly the victim was doing just before the incident / accident? .....

.....

.....

Particular of tools & tackles being used and condition of the same after incident/accident:

.....

.....

Description of Incident/Accident (How the incident was caused) : .....

.....

.....

.....

Nature of injury:

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

Parts of body involved in incident / accident

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Truck (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

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FORMAT NO. : HSE-3 REV 0

(Sheet 3 of 5)

Accident type:

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./ extremes)		Contact with chemicals or oils		Vehicle accident	
Other/specify					

Name & Designation of person who provided First-Aid to the victim: _____

Name & Telephone number of Hospital where the victim was treated _____

Mode of transport used for transporting victim – Ambulance / Private car / Tempo / Truck / Others

How much time taken to shift the injured person to Hospital_____

In case of FATAL incident, indicate clearly the BOCW Registration No. of the victim/Company.....
...

Comments of Medical Practitioner, who treated / attended the victim/injured (attached / described here)_____

What actions are taken for investigation of the incident, please indicate clearly – (Video film / Photography / Measurements taken etc. .....)

Immediate cause (Please tick the right applicable) –

Hazardous methods or procedures inadequately guarded		Poor housekeeping		Inadequate or improper PPE	
Environmental hazards (excess noise/ space constraint/ inadequate ventilation		improper illumination/Moving on oval surface		Working on dangerous equipment	

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FORMAT NO.: HSE-3 REV 0

(Sheet 4 of 5)

Failure to secure		Horse-play		Failure to use PPE	
Inattention to surroundings		Improper use of hands & body-parts		By-passing safety devices	
Unsafe mixing or placement of tools & tackles		Bypassing standard procedures		Failure in communication	
Operating without authority		Improper use of equipment or tools & tackles		drug or alcoholic influence	
excessive haste		Others(specify)			

Basic cause

Over confidence		Impulsiveness		over-exertion	
Faulty judgement or poor understanding		Failing to keep attention constantly		Nervousness & Fear	
Fatigue		Defective vision		Ill health or sickness	
Slow reaction		Others(specify)			

Root cause

Inadequate Engg.		Improper Design		Inadequate Planning & organization	
Inadequate knowledge		Inadequate skill		Inadequate training	
Inadequate supervision		Improper work procedure		Inadequate compliance with standard	
Substandard performance		Inadequate maintenance		Improper inspection	
Others(specify)					

Loss of man days and impact on site works, (if any) –

Remarks from Contractor's Safety Officer/ Engineer –

Was the victim performing relevant tasks for which he was engaged /employed? Yes / No
Was the Supervisor present on work-site during the incident? Yes / No
Have the causes of incident rightly identified? Yes / No
Cause of Accident was _____

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FORMAT NO. : HSE-3 REV 0

(Sheet 5 of 5)

Remedial measures recommended by **Safety Officer of Contractor** for avoiding similar incident in future

: .....

.....

.....

.....

.....

.....

.....

Intimation to local authorities (Dist. Collector / Local Police Station / ESI authority): Yes / No / NA.

If yes, to whom .....

Safety Officer
(Signature and Name)

Site Head / Resident Construction Manager
(Signature and Name)
Stamp of Contractor

To : Owner
: RCM/ Site-in-charge of EIL (3 copies)
Nodal Officer HO through RCM (In case of major accident)
Divisional Head (Constn.) through RCM
Project Manager EIL, through RCM

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FORMAT NO. : HSE-4 REV 0

NEAR MISS INCIDENT/ DANGEROUS OCCURRENCE REPORTPROFORMA

(to be submitted within 24 hours)

Report No.: _____

Name of Site: _____ Date: _____

Name of work: _____ Contractor: _____

Incident reported by :

Date & Time of Incident :

Location :

Brief description of incident

Probable cause of incident

Suggested corrective action

Steps taken to avoid recurrence Yes ☐ No ☐

Safety Officer
(Signature and Name)

Site Head / Resident Construction Manager
(Signature and Name)

Stamp of Contractor

Note:

- **Near Miss:** Human injury escaped & no damage to property, equipmentor interruption to work.
- **Dangerous Occurrence**: Occurrences as mentioned below shall be considered as "Dangerous occurrences"

a. collapse or failure of lifting appliances or hoist or conveyors or other similar equipment for handling building or construction material or breakage or failure of rope, chain or loose gears; overturning of cranes used in building or other construction work; falling of objects from height;
b. collapse or subsidence of soil, any wall, floor, gallery, roof or any other part of any structure, platform, staging, scaffolding or any means of access including formwork;
c. collapse of transmission tower;
d. fire and explosion causing damage to property at Construction site.
e. spillage or leakage of hazardous substances and damage to their container;
f. Collapse, capsizing, toppling or collision of transport equipment;
g. Leakage or release of harmful toxic gases at the construction site.

To :Owner
:RCM/Site-in-charge EIL (3 copies)

Divisional Head (Const.) through RCM
Project Manager EIL, through RCM
} (Applicable for Dangerous Occurrence only)

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FORMAT NO. : HSE-5 REV 0

MONTHLY HEALTH, SAFETY &ENVIRONMENTAL (HSE) REPORT

(To be submitted by each Contractor)

Actual work start Date: _____ For the Month of: _____

Project: _____ Report No: _____

Name of the Contractor: _____ Status as on: _____

Name of Work: _____ Job No : _____

(Contractor in consultation with EIL shall generate the reports through web basedpackage (www3.eil.co.in/eilhse)only.

ITEM		UPTO PREVIOUS MONTH	THIS MONTH	CUMULATIVE
1) Average number of Staff & Workmen (average daily headcount, not man days)				
2)Total Man-hours worked				
3) Number of site personnel undergone HSE Induction				
4) Number of HSE meetings organized at site				
5) Number of HSE awareness programmes conducted at site				
6) Number of Tool Box Talks conducted				
7) Number of Loss Time Injuries (LTI)	Fatalities			
	Other LTI			
8) Number of Non disabling injury (Non-LTI)				
9) Number of First Aid Cases				
10) Number of Near Miss Incidents				
11) Number of Dangerous Occurrences				
12) No. of unsafe acts/ practices detected				
13) No. of disciplinary actions taken against staff/ workmen				
14) Man-days lost due to injury				
15) LTI Free man-hours i.e. LTI free man-hours counted from the Last LTI (enter date: .....)				
16) Frequency Rate (No. of reportable LTI per 10lacs man-hours worked)				
17) Severity Rate (No. of man days lost due to LTI per 10lacs man-hours worked)				
18) No. of activities for which HIRAC Completed				
19) No. of incentives/ awards given				
20) No. of occasions on which penalty imposed by EIL/ Owner				
21) No. of Audits conducted				
22) No. of pending NCs in above Audits				
23) Compensation cases raised with Insurance				
24) Compensation cases resolved and paid to workmen				
25) No of Vehicular Accident cases				
26) No of fire/Explosion cases				

27) Whether workmen compensation policy taken			Yes		No
28) Whether workmen compensation policy is valid			Yes		No
29) Whether workmen registered under ESI Act, as applicable			Yes		No
30) Whether HIRAC Register prepared and updated			Yes		No
31)Whether Environment Aspect Impact Register prepared and updated			Yes		No
32) Whether Legal Register prepared and updated			Yes		No

Remarks, if any

Date:

Prepared by Safety Officer Approved by Site Head / Resident Construction Manager

(Signature and Name)(Signature and Name)

To: -

- RCM EIL

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FORMAT NO. : HSE-6 REV 1

PERMIT FOR WORKING AT HEIGHTS (ABOVE 2.0 METER)

(In duplicate to be issued daily for site and for office)

Permit No..... Name of Main Contractor.....
Name of work executing agency / sub agency / vendor:.....
Date..... Exact Location of work.....
Nature of work .....Duration of work (from) ..... (to) .....
Number of workers covered within this permit.....
(*List enclosed with name & gate pass numbers.*)

Sl. No.	Items / Subjects	Status of compliance (Yes / No)	
1	Work areas / Equipment's inspected		
2	Work area cordoned off		
3	Adequate lighting is provided		
4	Precautions against public traffic taken		
5	Concerned persons in & around have been alerted & cautioned		
6	Hazards / risks involved in routine / non-routine task assessed and control measures have been implemented at specific task		
7	ELCB provided for electrical connection & found working		
8	Ladder safely attached / fixed		
9	Scaffoldings are checked and TAGs are found used correctly		
10	Working platforms are provided and are found sound /safe for use		
11	Safe access & egress arrangements (e.g. ladders, fall arresters, life-lines etc.) are satisfactorily incorporated		
12	a. Openings on platform / floors are effectively cordoned / covered		
	b. Safety Nets are provided wherever required		
13	Use of following safety gadgets by people working at area under this permit, is checked and found satisfactory - Safety helmet Safety harness (full body) with double lanyard Safety Shoes Safety gloves Safety goggles		
14	Housekeeping of work area found satisfactorily tidy / clean & clear		
15	Adequate measures have been taken for works being continued at the ground level, when simultaneous works are permitted overhead at that very location.		
16	Materials are not thrown from heights on to ground		
17	Medical examination of workers are made & found satisfactory		
18	Responsible job engineer / supervisor found physically present at work spot for overall administration of work as well as safety of people.		

Above items have been checked & compliance has been found in place. Hence work is permitted to start / continue at the above-mentioned location. Work shall not start till identified lapses are rectified.

Additional Precautions, if any .....
.....

Work Permit Receiver — Verification By — Work Permit issuer
Contractor Job Supervisor — Contractor Safety Officer — Contractor Engineer/RCM

AT THE END OF THE DAY/WORK:
All works at height are completed & workmen have returned safely from work location at (time)....., (date).....

(Sig. Contractor Engineer)

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FORMAT NO. : HSE-7 REV 1

CONFINED SPACE ENTRY PERMIT

Project site _____ Sr. No. _____
Name of the work _____ Date _____
Name of Contractor _____ Nature of work _____
Exact location of work _____

Safety Requirements POSITIVE ISOLATION OF THE VESSEL IS MANDATORY

(A) Has the equipment been ?

Y	NR		Y	NR		Y	NR	
☐	☐	Isolated from power/steam/air	☐	☐	water flushed &/or steamed	☐	☐	radiation sources removed
☐	☐	isolated from liquid or gases	☐	☐	Man ways open & ventilated	☐	☐	proper lighting provided
☐	☐	depressurized &/or drained	☐	☐	cont. inert gas flow arranged	☐	☐	
☐	☐	blanked/ blinded/ disconnected	☐	☐	adequately cooled	☐	☐	

(B) Expected Residual Hazards

☐☐	lack of O_2	☐☐	combustible gas/ liquid	☐☐	H_2S / toxic gases
☐☐	corrosive chemicals	☐☐	pyrophoric iron / scales	☐☐	electricity / static
☐☐	heat/ steam / frost	☐☐	high humidity	☐☐	ionizing radiation
☐☐		☐☐		☐☐	

(C) Protection Measures

☐☐	gloves	☐☐	ear plug / muff	☐☐	goggles / face shield
☐☐	protective clothing	☐☐	dust / gas / air line mask	☐☐	personal gas alarm
☐☐	grounded air duct/blower /AC	☐☐	attendant with SCBA/air mask	☐☐	rescue equipment/team
☐☐	Fire fighting arrangements	☐☐	safety harness & lifeline	☐☐	communication equipment
☐☐		☐☐		☐☐	

Authorization / Renewal (It is safe to enter the confined space)

	No. of persons allowed	Name of persons allowed	Signature			Time		Signature
			Work Permit Receiver(Contractor Supervisor)	Verification by Contractor Safety officer	Work permit issuer Contractor Engineer/RCM	From	To	Workman

Permit Closure :

(A) Entry ☐ was closed ☐ stopped ☐ will continue on ...

(B)☐ Site left in a safe condition ☐ Housekeeping done

(C) Multi lock☐ removed ☐ key transferred

☐ Ensured all men have come out ☐ Man-ways barricaded

Remarks, if any:

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FORMAT NO. : HSE-8 REV 0

RADIATION WORK PERMIT

Project :
Name of the work :
Name of site contractor :

Sr. No. :
Date :
Job No.:

Location of work :

Source strength :

Cordoned distance (m) :

Name of Radiography agency :

Approved by Owner/EIL ☐

No. of workers engaged :
(List enclosed with name & gate pass numbers.)

The following items have been checked &compliance shall be ensured during currency of the permit:

S. No.	Item description	Done
	Safety regulations as per BARC/AERB ensured while source in use/in transit & during storage	☐
	Area cordoned off / safe working platform provided	☐
	Lighting arrangements for working during nights ensured	☐
	Warning signs/ flash lights installed	☐
	Cold work permit taken (if applicable)	☐
	PPEs like film badges, dosimeters used	☐

Additional precautions, if any _____

(Radiography Agency's BARC/AERB authorized Supervisor)

Permission is granted.

Permit is valid from _____ AM/PM _____ Date to _____ AM/PM _____ Date

(Signature of permit issuing authority-RCM of contractor)
Name : Designation: Date:

Permit renewal:

Permit extended up to		Additional precautions required, if any	Sign of issuing authority with date (of site contractor)	
Date	Time			

Work completed/ stopped/ area cleared at _____ Hrs of Date _____
(Sign. of permit issuing authority)
Name& Signature of site contractor:

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FORMAT NO. : HSE-9 REV 1

DEMOLISHING/DISMANTLING WORK PERMIT

Project :
Name of the work :
Name of contractor :
Sr.No. :
Date :
Job No. :

Name of sub-contractor :

No. of workers to be engaged:
(List enclosed with name & gate pass numbers.)

Line No./ Equipment No./ Structure to be dismantled :

Location details of dismantling/ demolition with sketch : (clearly indicate the area)

The following items have been checked &compliance shall be ensured during currency of the permit:

S. No.	Item description	Done	Not Applicable
	Services like power, gas supply, water, etc. disconnected	☐	☐
	Dismantling/ Demolishing method reviewed & approved	☐	☐
	Usage of appropriate PPEs ensured	☐	☐
	Precautions taken for neighboring structures	☐	☐
	First-Aid arrangements made	☐	☐
	Fire fighting arrangements ensured	☐	☐
	Precautions taken for blasting	☐	☐

Work Permit Receiver
(Contractor's Supervisor/Engineer)

Verification by Contractor
(Contractor's Safety Officer)

Permission is granted.

(Work Permit issuer-Client)

Name :
Date :

Completion report:

Dismantling/ Demolishing is completed on _____ Date at _____ Hrs.

Materials/ debris transported to identified location ☐ Tagging completed (as applicable) ☐

Services like power, gas supply, water, etc. restored ☐

(Permit issuing authority-Client)

CONTRACTOR's NAME

FORMAT NO. : HSE-10 REV 0

DAILY SAFETY CHECKLIST

(To make use of before start of day's work)

Project :
Name of the work :
Name of contractor :

Sr.No. :
Date :
Job No. :

Description of Job decided to perform : -

- **Use of PPE / Safety Gadgets**

Sl. No	PPEs	Compliance (Yes / No)	Sl. No	PPEs	Compliance (Yes / No)
1	Safety Helmets		6	Face Shield	
2	Safety Shoes		7	Full body harness	
3	Hand Gloves		8	Fall Arrest System	
4	Dust Musk		9	Safety net	
5	Safety Goggles		10	Horizontal life-line made of steel wire, (dia not less than 8.0 mm.)	

(Serial No. 1 & 2 are compulsory for everyone. Specify & ensure use of other safety gadgets as required for the job)

- **Identify following important unsafe conditions: -**

Sl. No	Conditions	Yes / No
1	Access to work site / emergency escape clear	
2	Soil / Loose earth kept away from excavated pit / slope / ladder provided	
3	Electrical wire / welding lead lying entangled on ground / welding m/c. booth accessible	
4	Elevated work platform / open ends are protected	
5	Ground area cordoned off before lifting works or erection at height / ground area checked & cordoned-off before start of height works	
6	Structural members / erected pipes / wooden boards/pieces etc. are safely anchored at heights and are not likely to fall down on people when working beneath	
7	Ladders tied-up on tall steel structures, long before are removed to get rid of their use	
8	Any Other	

- **Indicate actions taken, if status of any of the above items is found "No"**
  .....
  .....
- **Specific Safety guidelines / precautions, if any** (communicated thro' TBT)
  .....
  .....
- **Above conditions and PPE compliances are checked by undersigned and correct status are indicated after verification**

Prepared by
Contractor Site Engineer

Verification By
Contractor Safety Officer

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FORMAT NO. : HSE-11 REV 0

(Sheet 1 of 2)

HOUSEKEEPING ASSESSMENT& COMPLIANCE

Project :
Name of the work :
Name of contractor :
Name of contractor : Fortnightly

Sr.No. :
Date :
Job No. :

Sl. No.	Subjects of Review	Satisfactory/ Yes	Non satisfactory/No	Remarks	Action
1.	Cleanliness at the Main entry / access of site				
2.	Ground condition / floor areas free from water-logging / oil spillage				
3.	Ground & elevated floors free from rubbish / wastes / accumulated debris / scraps.				
4.	Manholes / openings are covered / fenced				
5.	Trenches are barricaded / walkways are in place				
6.	Drains are cleaned / not choked / not occupied by dumped materials				
7.	Sufficient CAUTION boards / instructions displayed				
8.	Construction machinery are maintained & parked in orderly manner.				
9.	Movement of site people are not obstructed because of dumping / storing of construction materials				
10.	Access / egress to Electrical Distribution Boards / Panels clear from wires / cables / earth-strips etc.				
11.	Electrical panel rooms / sheds / MCC / Control rooms / Substations etc. are clean & tidy and not used for storing dress / clothes, tiffin-box or bicycles.				
12.	Passage behind Elec. panels are free for access				
13.	Fire extinguishers / fire-buckets are accessible without any difficulty.				
14.	Stair-steps, platforms & landings are clear & tidy				
15.	Sheds / rooms & work areas have got sufficient illumination as well as ventilation				
16.	Cables / Wires / welding leads are routed / hanged appropriately & are not creating unsafe condition.				
17.	Stacking / storing of insulation materials or their packing.				
18.	Removal or cleanliness of left-over sand, concrete, brick-bats, insulation-materials, excess earth, wastes etc.				
19.	Storing / stacking of sand, metal chips, re-bars, steel pipes, valves, fittings etc.				
20.	One escape route at ground & minimum two escape routes at elevation available,				

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FORMAT NO. : HSE-11 REV 0

(Sheet 2 of 2)

Sl. No.	Subjects of Review	Satisfactory/ Yes	Non satisfactory/No	Remarks	Action
21.	Captions / Posters / Slogans on various safety instructions are displayed legibly in local language				
22.	Cable trenches are water-free or regular arrangement for taking out accumulated water exists.				
23.	Windows of rooms / offices are regularly cleaned				
24.	Facilities for cycle sheds, drinking water, washing, rest-rooms etc. are maintained in tidy manner.				
25.	Toilet, Urinals, Canteen / kitchen / pantry etc. are maintained & free from obnoxious smell.				
26.	Construction tools / tackles are stored systematically - the items are tagged / tested / certified by competent third party.				
27.	Sufficient numbers of Dust-bins / Waste-bins found at site and are regularly emptied.				

Additional remarks, if any -

.....

.....

.....

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

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FORMAT NO. : HSE-12 REV 0

INSPECTION OF TEMPORARY ELECTRICAL BOOTH / INSTALLATION

Project :
Name of the work :
Name of contractor :
Sub Station No:/Booth No

Sr.No. :
Date :
Job No. :
Location:

SL NO	SUBJECTS	OBSERVATION (YES /NO)	ACTION TAKEN
1	Switchboards installed properly are in order and protected from rain & water-logging.		
2	Adequate illumination provided for switchboard operation during night hours & the lamps are protected from direct human contact.		
3	Voltage ratings, DANGER signs, Shock-Treatment-Chart displayed in the installation / booth		
4	Fire extinguisher (DCP or CO_2) & Sand Bucket kept in close vicinity of Switchboards		
5	Valid License & Competent Electrician / Wireman available & name/ license no. displayed at booth / installation.		
6	General housekeeping in & around booth / installation found in order.		
7	Cable-route-markers for U/G cables provided.		
8	Monthly inspection report of Electrical hand tools available in booth / installation.		
9	Electrical Panel door to be in closed condition and Insulated Mat to be provided in front of panel.		
10	Rubber hand gloves available/ used by Electricians		
11	Availability of CAUTION boards for shutdown & / or repairing works.		
12	All incoming & outgoing feeders have proper MCCB / HRC fuses / Switches.		
13	Switchboards "earthed" at two distinctly isolated locations.		
14	Switchboards have adequate operating space at the front face & at the rear face too.		
15	All connections provided through 30mA ELCB.		
16	Testing records of all ELCBs available at site		
17	Only industrial type plugs & sockets are used.		
18	Temporary connections are 3-core double insulated & free from cuts & joints and 3rd core is earthed at both ends		
19	Socket boards are properly mounted on stand & protected from water ingress.		
20	Electrical equipments operating above 250V have two earthing / double earthing		
21	All incoming / outgoing cables are properly glanded& terminated with "lugs".		
22	Switch-boards are of industrial variety / type.		
23	Sketch for installation / connection (SLD) made & pasted& other safety labels/display boards		
24	Labeling of incoming / outgoing feeders made.		
25	All hand lamps are protected from direct contact.		
26	All electrical cable / joints are in safe condition		

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

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FORMAT NO. : HSE-13 REV 0

(Sheet 1 of 2)

INSPECTION FOR SCAFFOLDING

Project :
Name of the work :
Name of contractor :

Sr.No. :
Date :
Job No. :

Sl. No	Description	Yes	No	N.A.	Actions taken
1	Whether work permit is obtained to take up work at height above 1.5 Mts?				
2	Whether atmospheric condition is "stormy" or "raining" and works at heights have been permitted?				
3	Whether steel pipes scaffoldings are used for units /off-site areas?				
4	Whether scaffolding has been erected on rigid/firm/leveled surfaces / ground? Whether "foot-seals" or "base-plates" are used beneath the up-rights (vertical steel pipes)				
5	Whether scaffold construction is as per IS specification with toe-board and hand-rails (top-rail as well as mid-rail)?				
6	Whether distance between two successive up-rights are less than 2.5 Mts (height of scaffold & load carrying capacity governs the distance between two uprights)				
7	Whether all uprights are extended at least 900 mm above the top most working platform (to enable fitting of handrails)?				
8	Whether vertical distance of two successive ledgers is satisfactory? *(varying between 1.3 Mts. To 2.1 Mts)*				
9	Whether the peripheral areas of working at height are cordoned-off? (for avoiding accident to people arising out of dropped / deflected materials)				
10	Whether platform is provided? Is it safely approachable?				
11	Whether end of scaffold platform / board are extended beyond transoms? (125mm to 150 mm)				
12	Whether CE / IS approved quality and worthy conditioned full-body safety harness (with double lanyard & karabiners) are used while working at heights?				
13	Whether life-line of safety harness is anchored to an independent secured support capable of withstanding load of a falling person?				
14	Whether the area around the scaffold is cordoned off to prohibit the entry of unauthorized person / vehicle?				
15	Whether clamps used are of good condition, of adequate strength and free from defects?				
16	Whether ladder is placed at secured and leveled surface?				
17	Whether water-pass and oil-spills are avoided around the scaffold structure?				
18	Whether ladder is extended 1.5mts. above the landing point at height?				
19	Whether more than one access/egress provided to the scaffold?				
20	Whether ladder used are of adequate length and overlapping of short ladders avoided?				
21	Whether metallic ladders are placed much away from near-by electrical transmission line?				
22	Whether rungs of ladder are inspected and found in good order?				
23	Whether fall-arresters provided on both the access/egress routes?				
24	Whether diagonal (cross) bracings are provided at regular interval on the scaffold?				
25	Whether working platform on the scaffold has been made free from "jolt" or "gap"?				
26	Whether tools or materials are removed after completion of the day's job at heights?				
27	Whether a valid Permit for Work (PFW) is obtained before taking up work over asbestos or fragile roof?				
28	Whether sufficient precaution is taken while working on fragile roof?				

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FORMAT NO. : HSE-13 REV 0

(Sheet 2 of 2)

Sl. No	Description	Yes	No	N. A	Actions taken
29	Whether provision is made to arrange duck ladder, crawling board for working on fragile roof?				
30	Whether scaffold has been inspected by qualified civil engineers prior to their use?				
31	Whether the scaffolding has been designed for the load to be borne by the same?				
32	Whether the erection and dismantling of the scaffolding is being done by trained persons and under adequate supervision?				
33	Whether safety net with proper working arrangement and life-line has been provided?				
34	Whether TAGS (Green for acceptable and Red for incomplete/unsafe scaffolds) are used on scaffolds?				
35	Whether sufficient illumination is provided in and around the scaffold and access?				
36	Whether emergency rescue / response arrangements are made in place				

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

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FORMAT NO. : HSE-14 REV 1

(sheet 1 of 2)

PERMIT FOR ERECTION / MODIFICATION & DISMANTLING OFSCAFFOLDING

Project :
Name of the work :
Name of contractor :
Nature of activities :

Sr.No. :
Date :
Job No. :
Duration: From.....To.....

SL. No.	SUBJECTS / ITEMS	DONE	NOT DONE	REMARKS
1	Specific task of Erection / Modification / Dismantling of scaffolds, identified & TAGGED accordingly (before as well as after carrying-out jobs).			
2	People engaged in doing the job are identified & are certified by Job Engineer of Main Contractor as experienced / trained.			Names to be noted
3	Concerned persons are alerted by the Job Engineer of Main Contractor in connection with possible hazards & what the workmen MUST do / MUST not do.			
4	Verification by Job Engineer of Main Contractor made for confirming that all persons permitted to carry-out the jobs are making use of Helmet, Safety Shoes, Goggles, Gloves & Double lanyard safety harness and other relevant PPEs.			
5	Area of work is effectively cordoned-off / barricaded / illuminated.			
6	For taking-up / lowering down Scaffolding members / clamps / couplings etc. appropriate ropes / pulleys/ chains etc. have been arranged for use (not to throw any item) & the same have been verified as "fit for purpose".			
7	Items / members of scaffold, being lowered are removed from the area & stacked correctly.			
8	Ropes, chains, pulley blocks etc. being used for lifting or lowering scaffold items, are inspected by the Job Engineer & their certifications as well as physical conditions have been found O.K. before signing this PERMIT.			
9	Safety Net / Life-line / Fall Arresters etc. are arranged in position and Job Engineer has found working conditions favorable for activities to start.			
10	Scaffold erection or dismantling tasks are being supervised by Experienced Engineer / Competent person.			
11	Only competent & experienced people have been selected / engaged in Scaffolding erection, modification or dismantling tasks.			
12	Adequate & effective actions for traffic and movement of people around the cordoned-off area taken to avoid inadvertent incident			
13	Working platforms are protected with handrails & toe-boards.			
14	Access & Exit (for reach & escape) are safe for use by people.			
15	Tools, tackles to be used for above jobs are verified by job Engineers of Main contractor as genuinely good and tied-up at height (to prevent their fall).			
16	Site important Telephone Nos. are made known to everyone			
17	SOP (Safe Operating Procedure) for the specific task is made & followed too.			
18	Emergency vehicle has been arranged at work locations.			

- This permit for work shall be available at specific work location all the time.
- After completion of work, permit shall be returned to safety cell of main contractor, without fail.
- This Permit shall be issued maximum upto (Monday to Sunday).
- Additional Precautions, if any

  .....

- **ACCORD OF PERMISSION** (to be ticked) - **YES** ( )/ NO ( )

  Work Permit Receiver Verification By Work Permit issuer Contractor Job Supervisor

  Contractor Safety Officer Contractor Engineer/RCM

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FORMAT NO. : HSE-14 REV 1

(sheet 2of 2)

Everyday Site working conditions & performance of workmen shall be assessed / checked by Contractor Site Engr. and Safety Officer shall verify the same.

	Name / Sign.	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Site Engr.								
Safety Off.								

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FORMAT NO. : HSE-15 REV 1

PERMIT FOR HEAVY LIFT/CRITICAL ERECTION

Project :
Name of the work :
Name of contractor :
Nature of activities :
Location of work :
Equipment/Structure to be erected:

Sr. No. :
Date :
Job No. :
Duration: From.....To.....
Name /Type of crane :
Wt. of equipment/ structure to be erected

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1)	Is the crane type suitable for lift or as per erection procedure?				
2)	Is the crane have the correct number of counterweights fitted?				
3)	Availability of Load Certification of crane from authorized agency.				
4)	Is the load chart of crane available in carne cabin/or with Crane operator?				
5)	Is the device to check the Wind speed in crane is working? Is the safety features in crane are working?				
6)	Availability of Load certification of slings and other accessories from authorized agency				
7)	Availability of Licensee/certificate for crane operator from authorized agency.				
8)	Availability of approved HIRAC for the subject activities.				
9)	Availability of approved erection/rigging procedures.				
10)	Availability of temporary gratings/ platforms for critical lifting(as applicable)				
11)	Tool Box conducted before erection?				
12)	Has the area been cordoned off?				
13)	Are the authorized persons during erection are identified?				
14)	Does each person identified for erection understand their roles and responsibilities?				
15)	Is the ground on which crane will rest or outrigger support are correct?				
16)	Is hard stand requirement (if any) complied?				
17)	Is the communication system (viz walkie-talkies, etc. are working properly?				
18)	If more than one crane is lifting the load, is an Intermediate rigger will supervise the lift?				
19)	If there is other obstruction within the operating radius of the crane, have correct precautions been taken to prevent collision?				
20)	All the persons are wearing the requisite PPE?				

Work Permit Receiver Verification By Work Permit issuer Contractor Job Supervisor
Contractor Safety Officer Contractor Engineer/RCM

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FORMAT NO. : HSE-16 REV 1

PERMIT FOR ENERGY ISOLATION & DE-ISOLATION

Project :
Name of the work :
Name of contractor :
Sr.No. :
Date :
Job No. :

ENERGY ISOLATION PERMIT

- Clearance required from:.....Hrs .....Date To .....Hrs ....Date
- Name of equipment/ energy source etc. .....
- Nature of job to be done: .....
- Area.....Location:.....

PERMIT VALIDATION	PERFORMING AUTHORITY
I hereby authorize the .....personnel(performer) to isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for maintenance/repair. Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name:	The work and precautions will be carried out under my overall responsibility.(Testing/execution engineer) Signature: Date: Name:

SAFETY PRECAUTIONS FOR CLEARANCE	NORMALISING AFTER CLEARANCE
1. Notify workers of intent to de- energize ☐ 2. Obtain lock, tag or locking/tagging devices ☐ 3. Shut down, de-energize, dissipate any residual energies. ☐ 4. Apply lock ,tag and locking and/or tagging devices ☐ 5. *Any other job specific precautions ☐ 6. Verify effectiveness of lockout by attempting to restart. ☐ 7. Proper PPE is ensured ☐ I certify that the energy source mentioned above is isolated from all sources and is safe to start the work. Tag No:..... Lock No:..... Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name: **(*to be included by contractor in consultation with issuing authority)**	1. Notify workers of intent to re- energize ☐ 2. Conduct visual inspection to confirm that the danger zone is clear of workers ☐ 3. Conduct visual inspection to confirm that tools ,equipment's danger zone is clear of workers ☐ 4. Reposition the safety devices(interlocks, valves, guards, covers ,sensors, as applicable, etc.) ☐ 5. *Any other job specific normalizing details ☐ 6. Remove lock, tag and locking and/or tagging devices. ☐ 7. Re-energize. ☐ 8. Confirm system is operating properly& safely I certify that the energy source mentioned above is isolated from all sources and is safe to start the work. Tag No:..... Lock No:..... Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name: **(*to be included by contractor in consultation with issuing authority)**

ENERGY DE-ISOLATION PERMIT

PERMIT VALIDATION	PERFORMING AUTHORITY
I hereby authorize the .....personnel(performer) to de- isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for normal operation.. Issuing authority Client/Contractor RCM (as applicable) Signature: Date: Name:	I hereby certify that the equipment/energy source mentioned above has been de-isolated and is ready for normal operation.(Testing/execution engineer) Signature: Date: Name: Countersigned by Issuing authority

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FORMAT NO. : HSE-17 REV 1

PERMIT FOR EXCAVATION (depth 2m and above)

(Sheet 1of 2)

Project :
Name of the work :
Name of contractor :
Job Description :
Size of excavation :

Sr.No. :
Date :
Job No. :
Location:

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1)	Suitable and sufficient risk assessments and method statements has been carried to ensure that the work shall be undertaken in accordance with specification and standard.				
2)	Are plans/details of underground services available and the same has been reviewed?				
3)	Has survey done to locate the services/obstacles etc.				
4)	Has the live services (electrical, water line, air line, telephone line, etc)has been disabled for carrying out the job.				
5)	Is adequate barriers/fences to protect the excavation are in place?				
6)	Is Adequate warning signs are in place?				
7)	Is Assessment of ground conditions done and remedial action(if any) taken?				
8)	Safe access / egress (e.g. ramp / steps / ladders etc.) provided for site workmen & supervisors.				
9)	Is the excavation work being undertaken in proximity of structure, etc. ?If Yes, it's effect is considered?				
10)	Availability of competent person for supervising the excavation work?				
11)	Adequate safe arrangement to prevent collapse of edges (e.g. shoring / strutting / benching / sloping etc.) made at site.				
12)	Hard barricades (at least 1.0M away from edge & for excavation near site access roads) with warning signs/caution boards are provided				
13)	Accumulation / passage-ways of water at periphery of excavation / trench stopped/ restricted.				
14)	Is the equipment being used for excavation has been checked for adequacy and is in good working condition having all the safety features?				
15)	Age & fitness of workmen ensured by medical test before engagement in job ?				
16)	Arrangement of Monitoring of possible oxygen deficiency or obnoxious gases done & action taken?				

PERMIT GRANTED - Yes / No

(List enclosed with name & gate pass numbers.)

Name & Signature of Site Engr. Name & Signature of Area – In charge/RCM of Contractor (Receiver) Contractor (Issuer)

Verification by Contractor Safety Officer

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FORMAT NO. : HSE-17 REV 1

PERMIT FOR EXCAVATION

(Sheet 2of 2)

NOTES: -

1. Slopes or benches for excavation beyond 2.0M depth shall be designed & approved by Contractor's site head.
2. Excavated earth to be kept at least 1.5M away from edges
3. Safety helmets, Safety shoes or gum-boots, gloves, goggles, Face shield, Safety Harness shall be essential PPEs.
4. Permit shall be made in **duplicate** and original shall be available at site of work.
5. Permit shall be issued for maximum **one week** only (Monday to Sunday)
6. After completion of works, permit shall be closed & preserved for record purpose

GRANT OF PERMIT AND EXTENSIONS

Sl. No.	Validity period From ____To ____	Working Time From _____To _____	Receiver (site Engr. of Main Contractor)	Issuer(Area In charge/RCM of Main Contractor)	Review by EIL / Owner (Remarks with date
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Additional safety instructions if any: -

1.

2.

3.

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FORMAT NO. : HSE-18 REV 0 **(Sheet 1of 2)**

IDENTIFICATION OF ENVIRONMENTAL ASPECTS, IMPACT ASSESSMENT AND CONTROL MEASURES

S.No	Activity	Environmental Aspect	N/A/E	Environment Impact	Control Measures	Consequences						Risk Level	Significant	Gaps/ Recommendations
						A	B	C	D	E	F	G	Yes/No	

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(Sheet 2 of 2)

INITIAL ENVIRONMENT REVIEW TECHNIQUE

Environmental Impacts	AP = Air Pollution	WP = Water Pollution	LC = Land Contamination	DNR = Depletion of Natural Resources	NP = Noise Pollution

Scale	**Quantity (A)**	**Occurrence (B)**	**Severity of Impact (C)**	**Detection (D)**	**Control (E)**	**Legal and other requirements (F)**
1	Negligible	Very Rare	Negligible visual impact	Immediately	Available & effective at place	In compliance or not applicable
2	Low	Once a month or less	Causes Discomfort or Nuisance	Within 1 hour	Has in-built Secondary control	
3	Moderate	Once a day	Resource Depletion	Within 8 hours	Needs human Intervention	
4	High	Several times a Day	Affects Aquatic Life, flora, fauna or global issue	Within 24 hours	Mechanism in place but not reliable	
5	Excessive	Continuous	Human health effect	More than 24 hours	Absent or no effective control	Not in compliance

Risk Level - G : A x B x C x D x Ex F

Aspects with score of **100 and above** are considered as significant.
Also, Irrespective of the score, all legal noncompliance's to be considered as significant

Condition	
N	NORMAL
A	ABNORMAL
E	EMERGENCY

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FORMAT NO. : HSE-19 REV 0 HIRAC

Risk Identification						Desired Controls & Existing Gaps, If Any		Risk Assessment				Recommended Control Actions To Reduce The Risk Level	Action By	Remarks
SN	Activity	Activity Type (R/NR)	Hazards	Condition(N/AN/E)	Associated Risk	Desired Control Measures	Gaps If Any	Probability(P)	Impact (I)	Risk R= P*I	Risk Classification			

Likelihood – Possibility of occurrence of risks based on present gaps (technological / operational / competence / measurement and monitoring);

UL: Unlikely, **L:** Likely, **VL:** Very Likely, **FR:** Frequent, **C**: Continuous

Impact –

SI: Slight Injury, **MI:** Minor Injury, **MJ:** Major Injury, **SF:** Single Fatality, **MF:** Multiple Fatalities

Level of consequence – Refer Guidance criteria for this i.e. possible degree of damage;

Condition- N: Normal, **AN**: Abnormal, **E**-Emergency

Activity Type: R- Routine, NR- Non Routine

RISK –

L: Low Risk, **M:** Moderate Risk, **H:** High Risk

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FORMAT NO.: **HSE-20 REV 0**

Inspection of Tower Crane

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Serial number plate &SWL marking		
2	Valid TPI Certificate		
3	Valid Insurance		
4	Safe access and egress are provided to the crane operator.		
5	Front glass of Operator cabin		
6	Operator crane cabin is provided with a locking mechanism so as to prevent unauthorised entry.		
7	A safety bar is fitted across the operator's cabin window where there is likelihood of the operator falling through it.		
8	Manufacturer Operating Manual and Maintenance Manual are made available.		
9	An updated Operation and Maintenance log book is available in the operator cabin.		
10	All mounting bolts are in good condition.		
11	Load chart provided		
12	SLI available		
13	Crane hooks have got smooth surface and no dent		
14	Hook-latch / Dog-clamp in hook is effective		
15	Over hoist limit switch		
16	Double body earthing of Tower Crane		
17	Jib angle indicator is provided (For Luffing Jib Tower Crane).		
18	Emergency stop button, which will terminate the operation of the crane engine, is installed in the operator cabin and correctly identified.		
19	Effective braking mechanisms for Hoisting, Derricking, Slewing, Trolley Travelling maintained:		
20	Trolley Travelling limiter to prevent over-travelling of trolley is functional.		
21	Limit switches to prevent over-derricking and over-lowering of jib (For Luffing Jib Tower Crane) is functional.		
22	Slewing limiter to restrict slewing of crane is functional.		
23	Over load Limiter to prevent overloading of crane is functional.		
24	Load Moment Limiter to prevent over-turning moment is functional.		
25	Anti-collision devices are tested to stop the tower crane's operation such that the crane-to-crane interference must be maintained at not less than 3 m.		
26	Condition of boom		
27	Counter weight placement and pins		
28	Winches, pulleys and wire ropes are in good working condition.		
29	Colour coding		
30	Leakage in hydraulic cylinder		

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31	Fire Extinguisher		
32	Tower crane is adequately grounded or protected against lightning.		
33	Wind anemometer is installed and is in good working condition.		
34	Aviation lamp is functional (Reqd. for 30mt and above)		
35	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
36	Safety Induction for Operator		
37	Others		

Signature & Name of Operator:

Signature and name of Job Engineer

Signature & Name of Contractor's Safety Officer

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FORMAT NO. : HSE-21 REV 0

Crane Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Crane hooks have got smooth surface and no dent		
2	Hook-latch / Dog-clamp in hook is effective		
3	Over hoist limit switch		
4	Over Load Indicator		
5	Over Boom limit switch		
6	Boom angle indicator		
7	Colour coding		
8	Condition of boom		
9	Condition of wire rope		
10	Rope drum / sheaves are in good working condition		
11	Swing break & lock		
12	Swing Alarm		
13	Over hoist break & lock		
14	Boom break & lock (For Telescopic Boom)		
15	Leakage in hydraulic cylinder		
16	Condition of Outrigger (For Tyre Mounted Crane)		
17	Outrigger fully extended Marking (For Tyre Mounted Crane)		
18	Condition of Tyre (For Tyre Mounted Crane)		
19	Wheel chokes are present and are used whenever required (For Tyre mounted)		
20	Battery & lamps		
21	Moving & rotating parts guarded		
22	Load chart provided		
23	Reverse horn (For Tyre Mounted Crane)		
24	Body Condition of crane		
25	Front glass of Operator cabin		
26	Both side Mirror		
27	Number Plate (For Tyre Mounted Crane)		
28	Fire Extinguisher		
29	Horn		
30	Windshield and wipers		
31	Working of light & Indicator		
32	SLI		
33	Spark Arrestor(For Running Refinery/ Petrochemical/Chemical Plant)		

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34	Foot-steps and hand-holds are in good working condition for exit /enter in to cabin		
35	TPI Certificate		
36	RC Document (For Tyre Mounted Crane)		
37	Fitness Certificate of Vehicle by authority		
38	Insurance		
39	PUC		
40	HMV License for Operator		
41	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
42	Safety Induction for Operator		
43	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

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FORMAT NO. : HSE-22 REV 0

Hydraulic Mobile Crane- Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Identification number of Hydraulic Mobile crane boldly scribed in front and rear end of machine		
2	Operator has got adequate document in support of his competency (i.e. HMV driving license, knowledge & training)		
3	Marking of SWL on hook position is clearly visible		
4	Test & examination of Hydraulic Mobile crane by statutory / competent authority is carried out & document is valid		
5	Colour Coding		
6	RC Document		
7	Fitness Certificate of Vehicle by authority		
8	Valid Insurance		
9	Valid PUC		
10	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
11	Safety Induction for Operator		
12	Crane hooks have got smooth surface and no dent		
13	Hook-latch / Dog-clamp in hook is effective		
14	Over hoist limit switch		
15	Over Load Indicator		
16	SLI		
17	Condition of boom		
18	Condition of wire rope		
19	Rope drum / sheaves are in good working condition		
20	Leakage in hydraulic cylinder		
21	Tyre condition		

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22	Battery		
23	Moving & rotating parts guarded		
24	Break		
25	Parking Break		
26	Front horn		
27	Reverse horn		
28	Hydraulic Mobile Crane cabin body and frame of machine is in good order		
29	Both side Mirror		
30	Fire Extinguisher		
31	Front glass pane of the Hydraulic Mobile operator's cabin is clean & clear (i.e. not cracked / damaged / broken)		
32	Windshield and wipers condition		
33	Working of front & back lights, turn Indicators, parking lights & fog lamps		
34	Spark Arrestor(For Running Refinery/ Petrochemical/Chemical Plant)		
35	Wheel chokes are present and are used whenever required		
36	Foot-steps and hand-holds are in good working condition for exit /enter in to cabin		
37	Others		

Signature & Name of Operator

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

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FORMAT NO. : HSE-23 REV 0

Hydraulic Rig Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
2	All switch & mechanical guards are in good condition and properly installed		
3	All Safety Indicator lights work		
4	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
5	Motion alarms are functional		
6	Safety decals are in place and readable		
7	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
8	Braking devices are operating properly		
9	Winches, pulleys and wire ropes are in good working condition.		
10	Function of interlocks and limit switch		
11	The manufacturer's operations manual (in all languages of the operators)		
12	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		
13	Battery Charge		
14	Outriggers in place or functioning. Associated alarms working		
15	Moving & rotating parts guarded		

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16	Load chart provided		
17	Fire Extinguisher		
18	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
19	Serial number plate		
20	SLI		
21	TPI Certificate		
22	Colour Coding		
23	Insurance		
24	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
25	Safety Induction for Operator		
26	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

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FORMAT NO. : HSE-24 REV 0

Boom Lift Inspection Checklist

Name of Contractor: **Project:**

Name of Work: **Job No:**

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Operating and emergency controls are in proper working condition, EMO button or Emergency Stop Device		
2	Functional upper drive control interlock (i.e. foot pedal, spring lock, or two hand controls)		
3	Emergency Lowering function operates properly		
4	Lower operating controls successfully override the upper controls		
5	Both upper and lower controls are adequately protected from inadvertent operation.		
6	Control panel is clean & all buttons/switches are clearly visible (no paint over spray, etc.)		
7	All switch & mechanical guards are in good condition and properly installed		
8	All Safety Indicator lights work		
9	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
10	Motion alarms are functional		
11	Safety decals are in place and readable		
12	Guardrails and anchor points are in place, and in good condition		
13	Work platform & extension slides are clean, dry, & clear of debris		
14	Work platform extension slides in and out freely with safety locking pins in place to lock setting on models with extension platforms.		
15	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
16	Braking devices are operating properly		
17	The manufacturer's operations manual is stored on AWP (in all languages of the operators)		
18	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		

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19	Battery Charge		
20	Outriggers in place or functioning. Associated alarms working		
21	Tyres and wheels are in good condition, with adequate air pressure if pneumatic		
22	Wheel chokes are present and are used whenever required		
23	Moving & rotating parts guarded		
24	Load chart provided		
25	Fire Extinguisher		
26	Spark Arrestor, if operated by using fuel(For Running Refinery/ Petrochemical/Chemical Plant)		
27	Serial number plate with Load capacity		
28	TPI Certificate		
29	Colour Coding		
30	Insurance		
31	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
32	Safety Induction for Operator		
33	Others		

Signature & Name of Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

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OISD - GDN - 192
July, 2000

FOR RESTRICTED CIRCULATION

SAFETY PRACTICES DURING CONSTRUCTION

OISD-GDN-192

Oil Industry Safety Directorate

Government of India
Ministry of Petroleum & Natural Gas
8th Floor, OIDB Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)

Website: www.oisd.gov.in

Tele: 0120-2593800, Fax: 0120-2593802

OISD - GDN - 192
July, 2000

FOR RESTRICTED CIRCULATION

SAFETY PRACTICES DURING CONSTRUCTION

Prepared by

COMMITTEE ON
SAFETY PRACTICES DURING CONSTRUCTION

Oil Industry Safety Directorate

Government of India
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Preamble

Indian petroleum industry is the energy lifeline of the nation and its continuous performance is essential for sovereignty and prosperity of the country. As the industry essentially deals with inherently inflammable substances throughout its value chain – upstream, midstream and downstream – Safety is of paramount importance to this industry as only safe performance at all times can ensure optimum ROI of these national assets and resources including sustainability.

While statutory organizations were in place all along to oversee safety aspects of Indian petroleum industry, Oil Industry Safety Directorate (OISD) was set up in 1986 Ministry of Petroleum and Natural Gas, Government of India as a knowledge centre for formulation of constantly updated world-scale standards for design, layout and operation of various equipment, facility and activities involved in this industry. Moreover, OISD was also given responsibility of monitoring implementation status of these standards through safety audits.

In more than 25 years of its existence, OISD has developed a rigorous, multi-layer, iterative and participative process of development of standards – starting with research by in-house experts and iterating through seeking & validating inputs from all stake-holders – operators, designers, national level knowledge authorities and public at large – with a feedback loop of constant updation based on ground level experience obtained through audits, incident analysis and environment scanning.

The participative process followed in standard formulation has resulted in excellent level of compliance by the industry culminating in a safer environment in the industry. OISD – except in the Upstream Petroleum Sector – is still a regulatory (and not a statutory) body but that has not affected implementation of the OISD standards. It also goes to prove the old adage that self-regulation is the best regulation. The quality and relevance of OISD standards had been further endorsed by their adoption in various statutory rules of the land.

Petroleum industry in India is significantly globalized at present in terms of technology content requiring its operation to keep pace with the relevant world scale standards & practices. This matches the OISD philosophy of continuous improvement keeping pace with the global developments in its target environment. To this end, OISD keeps track of changes through participation as member in large number of International and national level Knowledge Organizations – both in the field of standard development and implementation & monitoring in addition to updation of internal knowledge base through continuous research and application surveillance, thereby ensuring that this OISD Standard, along with all other extant ones, remains relevant, updated and effective on a real time basis in the applicable areas.

Together we strive to achieve NIL incidents in the entire Hydrocarbon Value Chain. This, besides other issues, calls for total engagement from all levels of the stake holder organizations, which we, at OISD, fervently look forward to.

Jai Hind!!!

Executive Director
Oil Industry Safety Directorate

FOREWORD

The Oil Industry in India is nearly 100 years old. Due to various collaboration agreements a variety of international codes, standards and practices are in vogue. Standardisation in design philosophies, operating and maintenance practices at a national level was hardly in existence. This lack of uniformity coupled with feedback from some serious accidents that occurred in the recent past in India and abroad, emphasised the need for the industry to review the existing state of art in designing, operating and maintaining oil and gas installations.

With this in view, the Ministry of Petroleum and Natural Gas in 1986 constituted a Safety Council assisted by the Oil Industry Safety Directorate (OISD) staffed from within the industry in formulating and implementing a series of self-regulatory measures aimed at removing obsolescence, standardising and upgrading the existing standards to ensure safer operations. Accordingly OISD constituted a number of functional committees comprising of experts nominated from the industry to draw up standards and guidelines on various subjects.

The present document on “Safety Practices during Construction” was prepared by the Functional Committee on “Safety Practices during Construction”. This document is based on the accumulated knowledge and experience of industry members and the various national and international codes and practices.

It is hoped that provisions of this document if implemented objectively, may go a long way to improve the safety to reduce accidents in Oil and Gas Industry. Users are cautioned that no document can be substitute for the judgment of responsible and experienced engineer.

Suggestions are invited from the users after it is put into practice to improve the document further. Suggestions for amendments, if any, to this standard should be addressed to:

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These documents are intended to supplement rather than replace the prevailing statutory requirements.

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SAFETY PRACTICES DURING CONSTRUCTION

1.0 INTRODUCTION

Safety in Construction Management deserves utmost attention especially in the hydrocarbon industry, such as Exploration, Refineries, Pipelines and Marketing installations, Gas Processing units etc. Construction is widely recognised as one of the accident prone activities. Most of the accidents are caused by inadequate planning, failure during the construction process and/or because of design deficiencies. Besides property loss, accidents also result in injuries and fatalities to the personnel; same needs to be prevented.

The reasons for accidents during construction activities are related to unique nature of the industry, human behaviour, difficult work-site conditions, extended odd duty hours, lack of training & awareness and inadequate safety management. Unsafe working methods, equipment failure and improper housekeeping also tend to increase the accident rate in construction.

Ensuring good quality of materials, equipment and competent supervision along with compliance of standard engineering practices shall go a long way to in built safety into the system.

The objective of this standard is to provide practical guidance on technical and educational framework for safety and health in construction with a view to:

(a) prevent accidents and harmful effects on the health of workers arising from employment in construction;
(b) ensure appropriate safety during implementation of construction;
(c) provide safety practice guidelines for appropriate measures of planning, control and enforcement.

2.0 SCOPE

This document specifies broad guidelines on safe practices to be adhered to during construction activities in oil industry. However, before commencing any job, specific hazards and its effects should be assessed and necessary corrective/preventive actions should be taken by all concerned. The document is intended only to supplement and not to replace or supersede the prevailing statutory requirements, which shall also be followed as applicable. For Personal Protective Equipment, OISD-STD-155 (Part I&II) shall be referred to. The scope of this document does not include the design aspects and quality checks during construction.

3.0 DEFINITIONS

Definitions of various terminology are given below:

- *Adequate, appropriate or suitable* are used to describe qualitatively or quantitatively the means or method used to protect the worker.

- *Brace:* A structural member that holds one point in a fixed position with respect to another point; bracing is a system of structural members designed to prevent distortion of a structure.

- *By hand:* The work is done without the help of a mechanised tool.

- *Competent Authority:* A stautory agency having the power to issue regulations, orders or other instructions having the force of law.

- *Competent person:* A person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. The competent authorities may define appropriate criteria for the designation of such persons and may determine the duties to be assigned to them.

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- *Execution agency:*

  Any physical or legal person, having contractual obligation with the owner, and who employs one or more workers on a construction site

- *Owner:*

  Any physical or legal person for whom construction job is carried out.

  It shall also include owner's designated representative/consultant/nominee/agent, authorised from time to time to act for and on its behalf, for supervising/ coordinating the activities of the execution agency.

- *Hazard:* Danger or potential danger.

- *Guard-rail:* An adequately secured rail erected along an exposed edge to prevent persons from falling.

- *Hoist:* A machine, which lifts materials or persons by means of a platform, which runs on guides.

- *Lifting gear:* Any gear or tackle by means of which a load can be attached to a lifting appliance but which does not form an integral part of the appliance or load.

- *Lifting appliance:* Any stationary or mobile appliance used for raising or lowering persons or loads.

- *Means of access or egress:* Passageways, corridors, stairs, platforms, ladders and any other means for entering or leaving the workplace or for escaping in case of danger.

- *Scaffold:* Any fixed, suspended or mobile temporary structure supporting workers and material or to gain access to any such structure and which is not a lifting appliance as defined above.

- *Toe-board:* A barrier placed along the edge of a scaffold platform, runway, etc., and secured there to guard against the slipping of persons or the falling of material.

- *Worker:* Any person engaged in construction activity.

- *Workplace:* All places where workers need to be or to go by reason of their work.

4.0 GENERAL DUTIES

4.1 GENERAL DUTIES OF EXECUTION AGENCIES

4.1.1 Execution agency should:

i) provide means and organisation to comply with the safety and health measures required at the workplace.

ii) provide and maintain workplaces, plant, equipment, tools and machinery and organise construction work so that, there is no risk of accident or injury to health of workers. In particular, construction work should be planned, prepared and undertaken so that:

(a) dangers, liable to arise at the workplace, are prevented;
(b) excessively or unnecessarily strenuous work positions and movements are avoided;
(c) organisation of work takes into account the safety and health of workers;
(d) materials and products used are suitable from a safety and health point of view;
(e) working methods are adopted to safeguard workers against the harmful effects of chemical, physical and biological agents.

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iii) establish committees with representatives of workers and management or make other arrangement for the participation of workers in ensuring safe working conditions.

iv) arrange for periodic safety inspections by competent persons of all buildings, plant, equipment, tools, machinery, workplaces and review of systems of work, regulations, standards or codes of practice. The competent person should examine and ascertain the safety of construction machinery and equipment.

v) provide such supervision to ensure that workers perform their work with due regard to safety and health of theirs as well as that of others.

vi) Employ only those workers who are qualified, trained and suited by their age, physique, state of health and skill.

vii) satisfy themselves that all workers are informed and instructed in the hazards connected with their work and environment and trained in the precautions necessary to avoid accidents and injury to health.

viii) Ensure that buildings, plant, equipment, tools, machinery or workplaces in which a dangerous defect has been found should not be used until the defect has been rectified.

ix) Organise for and remain always prepared to take immediate steps to stop the operation and evacuate workers as appropriate, where there is an imminent danger to the safety of workers.

x) establish a checking system by which it can be ascertained that all the members of a shift, including operators of mobile equipment, have returned to the camp or base at the close of work on dispersed sites and where small groups of workers operate in isolation.

xi) provide appropriate first aid, training and welfare facilities to workers as per various statutes like the Factories Act, 1948 etc. and, whenever collective measures are not feasible or are insufficient, provide and maintain personal protective equipment and clothing in line with the requirement as per OISD-STD-155 (Vol. I& II) on Personnel Protective Equipment. They should also provide access to workers to occupational health services.

xii) Educate workers about their right and the duty at any workplace to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on working procedures adopted as may affect safety and health.

xiii) Ensure that except in an emergency, workers, unless duly authorised, should not interfere with, remove, alter or displace any safety device or other appliance furnished for their protection or the protection of others, or interfere with any method or process adopted with a view to avoiding accidents and injury to health.

xiv) Ensure that workers do not operate or interfere with plant and equipment that they have not been duly authorised to operate, maintain or use.

xv) Ensure that workers do not sleep, rest or cook etc in dangerous places such as scaffolds, railway tracks, garages, confined spaces or in the vicinity of fires, dangerous or toxic substances, running machines or vehicles and heavy equipment etc.

xvii) Obtain the necessary clearance/permits as required and specified by owner

xviii) As per the Govt. circular as amended from time to time all contractors who employ more than 50 workers or where the contract value exceeds Rs. 50 crores, the following facilities are to be provided by contractor at site :

- Arrangement for drinking water
- Toilet facilities
- A creche where 10 or more women workers are having children below the age of 6 years
- Transport arrangement for attending to emergencies

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xix) should deploy a safety officer at site

4.2 GENERAL DUTIES OF OWNERS

4.2.1 Owners should:

i) co-ordinate or nominate a competent person to co-ordinate all activities relating to safety and health on their construction projects;
ii) inform all contractors on the project of special risks to health and safety;
iii) Ensure that executing agency is aware of the owner's requirements and the executing agency's responsibilities with respect to safetry practices before starting the job.

5.0 SAFETY PRACTICES AT WORK PLACES

5.1. GENERAL PROVISIONS

5.1.1 All openings and other areas likely to pose danger to workers should be clearly indicated.

5.1.2 Workers & Supervisors should use the safety helmet and other requisite Personal Protective Equipment according to job & site requirement. They should be trained to use personal protective equipment.

5.1.3 Never use solvents, alkalis and other oils to clean the skin.

5.1.4 Lift the load with back straight and knees bent as far as possible. Seek the help in case of heavy load.

5.1.5 Ensure the usage of correct and tested tools and tackles. Don't allow the make shift tools and tackles.

5.1.6 No loose clothing should be allowed while working near rotating equipment or working at heights.

5.2 MEANS OF ACCESS AND EGRESS

Adequate and safe means of access (atleast two, differently located) to and egress from all workplaces should be provided. Same should be displayed and maintained.

5.3 HOUSEKEEPING

5.3.1 Ensure:

i) proper storage of materials and equipment;
ii) removal of scrap, inflammable material, waste and debris at appropriate intervals.

5.3.2 Removal of loose materials, which are not required for use, to be ensured. Accumulation of these at the site can obstruct means of access to and egress from workplaces and passageways.

5.3.3 Workplaces and passageways, that are slippery owing to oil, grease or other causes, should be cleaned up or strewn with sand, sawdust, ash etc.

5.4 PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES

5.4.1 Precautions should be taken such as the provision of fencing, look-out men or barriers to protect any person against injury by the fall of materials, or tools or equipment being raised or lowered.

5.4.2 Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.

5.4.3 All openings through which workers are liable to fall should be kept effectively covered or fenced and displayed prominently.

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5.4.4 As far as practicable, guardrails and toe-boards should be provided to protect workers from falling from elevated workplaces.

5.5 PREVENTION OF UNAUTHORISED ENTRY

5.5.1 Construction sites located in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of unauthorised persons.

5.5.2 Visitors should not be allowed access to construction sites unless accompanied by or authorised by a competent person and provided with the appropriate protective equipment.

5.6 FIRE PREVENTION AND FIRE FIGHTING

5.6.1 All necessary measures should be taken by the executing agency and owner to:

i) avoid the risk of fire;
ii) control quickly and efficiently any outbreak of fire;
iii) bring out a quick and safe evacuation of persons.
iv) Inform unit/fire station control room, where construction work is carried out within existing operating area.

5.6.2 Combustible materials such us packing materials, sawdust, greasy/oily waste and scrap wood or plastics should not be allowed to accumulate in workplaces but should be kept in closed metal containers in a safe place.

5.6.3 Places where workers are employed should, if necessary to prevent the danger of fire, be provided with:

i) suitable and sufficient fire-extinguishing equipment, which should be easily visible and accessible;
ii) an adequate water supply at sufficient pressure meeting the requirements of various OISD standards.

5.6.4 To guard against danger at places having combustible material, workers should be trained in the action to be taken in the event of fire, including the use of means of escape.

5.6.5 At sites having combustible material, suitable visual signs should be provided to indicate clearly the direction of escape in case of fire.

5.6.6 Means of escape should be kept clear at all times. Escape routes should be frequently inspected particularly in high structures and where access is restricted.

5.7 LIGHTING

5.7.1 Where natural lighting is not adequate, working light fittings or portable hand-lamps should be provided at workplace on the construction site where a worker will do a job.

5.7.2 Emergency lighting should be provided for personnel safety during night time to facilitate standby lighting source, if normal system fails.

5.7.2 Artificial lighting should not produce glare or disturbing shadows.

5.7.3 Lamps should be protected by guards against accidental breakage.

5.7.4 The cables of portable electrical lighting equipment should be of adequate size & characteristics for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.

5.8 PLANT, MACHINERY, EQUIPMENT AND HAND TOOLS

5.8.1 General Provisions

i) Plant, machinery and equipment including hand tools, both manual and power driven, should:

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a) be of proper design and construction, taking into account health, Safety and ergonomic principles.
b) be maintained in good working order;
c) be used only for work for which they have been designed.
d) be operated only by workers who have been authorised and given appropriate training.
e) be provided with protective guards, shields or other devices as required.

ii) Adequate instructions for safe use should be provided.

iii) Safe operating procedures should be established and used for all plant, machinery and equipment.

iv) Operators of plant, machinery and equipment should not be distracted while work is in progress.

v) Plant, machinery and equipment should be switched off when not in use and isolated before any adjustment, clearing or maintenance is done.

vi) Where trailing cables or hose pipes are used they should be kept as short as practicable and not allowed to create a hazard.

vii) All moving parts of machinery and equipment should be enclosed or adequately guarded.

viii) Every power-driven machine and equipment should be provided with adequate means, immediately accessible and readily identifiable to the operator, of stopping it quickly and preventing it from being started again inadvertently.

ix) Operators of plant, machinery, equipment and tools should be provided with PPEs, including where necessary, suitable ear protection.

5.8.2 Hand tools

i) Hand tools should be repaired by competent persons.

ii) Heads of hammers and other shock tools should be dressed or ground to a suitable radius on the edge as soon as they begin to mushroom or crack.

iii) When not in use and while being carried or transported sharp tools should be kept in sheaths, shields, chests or other suitable containers.

iv) Only insulated or nonconducting tools should be used on or near live electrical installations.

v) Only non-sparking tools should be used near or in the presence of flammable or explosive dusts or vapours.

5.8.3 Pneumatic Tools

i) Operating triggers on portable pneumatic tools should be:
a) so placed as to minimise the risk of accidental starting of the machine.
b) so arranged as to close the air inlet valve automatically when the pressure of the operator's hand is removed.

ii) Hose and hose connections for compressed air supply to portable pneumatic tools should be:

a) designed and tested for the pressure and service for which they are intended;
b) fastened securely on the pipe outlet and equipped with the safety chain, as appropriate.

iii) Pneumatic shock tools should be equipped with safety clips or retainers to prevent dies and tools from being accidentally expelled from the barrel.

iv) Pneumatic tools should be disconnected from power and the pressure in hose lines released before any adjustment or repair is made.

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5.8.4 Electrical Tools

i) Low voltage portable electrical tools should generally be used.
ii) All electrical tools should be earthed, unless they are "all insulated" or "double insulated" tools which do not require earthing.
iii) All electrical tools should get inspected and maintained on a regular basis by a competent electrician and complete records kept.

5.8.5 Engines

i) Engines should:

a) be installed so that they can be started safely and the maximum safe speed cannot be exceeded.
b) have controls for limiting speed.
c) have devices to stop them from a safe place in an emergency.

ii) IC engines should not be run in confined spaces unless adequate exhaust ventilation is provided.

iii) When IC engines are being fuelled:

a) the engine should be shut off.
b) care should be taken to avoid spilling fuel;
c) no person should smoke or have an naked light in the vicinity.
d) a fire extinguisher should be kept readily available.

iv) Secondary fuel reservoir should be placed outside the engine room.

6.0 CONSTRUCTION ACTIVITIES

The various common activities in construction are as under:

- Excavation
- Scaffolding, Platforms & Ladders
- Structural Work, Laying of Reinforcement & Concreting
- Road Work (Laying of roads)
- Cutting /Welding
- Working in Confined Space
- Proof/Pressure Testing
- Working at Heights
- Handling & Lifting Equipments
- Vehicle Movement
- Electrical
- Offshore
- Demolition
- Radiography
- Sand/shot blasting/ spray painting
- Work above water

The safe practices to be followed during the implementation of above construction activities are given below:

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6.1 EXCAVATION

6.1.1 All excavation work should be planned and the method of excavation and the type of support work required should be decided considering the following:

i) the stability of the ground;
ii) the excavation will not affect adjoining buildings, structures or roadways;
iii) to prevent hazard, the gas, water, electrical and other public utilities should be shut off or disconnected, if necessary;
iv) presence of underground pipes, cable conductors, etc.,
v) the position of culvert/bridges, temporary roads and spoil heaps should be determined;

6.1.2 Before digging begins on site, all excavation work should be planned and the method of excavation and the type of support work required decided.

6.1.3 All excavation work should be supervised.

6.1.4 Sites of excavations should be thoroughly inspected:

i) daily, prior to each shift and after interruption in work of more than one day;
ii) after every blasting operation;
iii) after an unexpected fall of ground;
iv) after substantial damage to supports;
v) after a heavy rain, frost or snow;
vi) when boulder formations are encountered.

6.1.5 Safe angle of repose while excavating trenches exceeding 1.5m depth upto 3.0m should be maintained. Based on site conditions, provide proper slope, usually 45^0,and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock or provide proper shoring and strutting to prevent cave-in or slides.

6.1.6 As far as possible, excavated earth should not be placed within one meter of the edge of the trench or depth of trench whichever is greater.

6.1.7 Don't allow vehicles to operate too close to excavated area. Maintain atleast 2m distance from edge of excavation. No load, plant or equipment should be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.

6.1.8 Adequately anchored stop blocks and barriers should be provided to prevent vehicles being driven into the excavation. Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.

6.1.9 If an excavation is likely to affect the security of a structure on which persons are working, precautions should be taken to protect the structure from collapse.

6.1.10 Barricade at 1m height (with red & white band/self glowing caution board) should be provided for excavations beyond 1.5m depth. Provide two entries/exits for such excavation.

6.1.11 Necessary precautions should be taken for underground utility lines like cables, sewers etc. and necessary approvals/clearances from the concerned authorities shall be obtained before commencement of the excavation job.

6.1.12 Water shall be pumped/bailed out, if any accumulates in the trench. Necessary precautions should be taken to prevent entry of surface water in trenches.

6.1.13 During rains, the soil becomes loose. Take additional precaution against collapse of side wall.

6.1.14 In hazardous areas, air should be tested to ascertain its quality. No one should be allowed entry till it is suitable for breathing.

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6.1.15 In case of mechanised excavation, precaution shall be taken to not to allow anybody to come within one meter of extreme reach of the mechanical shovel. The mechanised excavator shall be operated by a well-trained experienced operator. When not in operation, the machine shall be kept on firm leveled ground with mechanical shovel resting on ground. Wheel or belt shall be suitably jammed to prevent any accidental movement of the machine. Suitable precautions as per manufacturer guidelines should be taken for dozers, graders and other heavy machines.

6.1.16 In case of blasting, follow strictly IS:4081-1986 & Indian Explosive Act and rules for storage, handling and carrying of explosive materials and execution of blasting operation.

6.2 SCAFFOLDING, PLATFORMS & LADDERS

6.2.1 Metal as material of construction

i) A scaffold should be provided and maintained or other equally safe and suitable provision should be made where work cannot safely be done on or from the ground or from part of a building or other permanent structure.

ii) Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.

iii) Every scaffold should be constructed, erected and maintained so as to prevent collapse or accidental displacement when in use.

iv) Every scaffold and part thereof should be constructed :

(a) in such a way so as not to cause hazards for workers during erection and dismantling;
(b) in such a way so as guard rails and other protective devices, platforms, ladders, stairs or ramps can be easily put together;
(c) with sound material and of requisite size and strength for the purpose for which it is to be used and maintained in a proper condition.

v) Boards and planks used for scaffolds should be protected against splitting.

vi) Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.

vii) Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.

viii) Tubes should be free from cracks, splits and excessive corrosion and be straight to the eye, and tube ends cut cleanly square with the tube axis.

ix) Scaffolds should be designed for their maximum load as per relevant code.

x) Scaffolds should be adequately braced.

xi) Scaffolds which are not designed to be independent should be rigidly connected to the building at designated vertical and horizontal places.

xii) A scaffold should never extend above the highest anchorage to an extent which might endanger its stability and strength.

xiii) Loose bricks, drainpipes, chimney-pots or other unsuitable material should not be used for the construction or support of any part of a scaffold.

xiv) Scaffolds should be inspected and certified:

(a) before being taken into use;
(b) at periodic intervals thereafter as prescribed for different types of scaffolds;
(c) after any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.

xv) Inspection should more particularly ascertain that:

(a) the scaffold is of suitable type and adequate for the job;

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(b) materials used in its construction are sound and of sufficient strength;
(c) it is of sound construction and stable;
(d) that the required safeguards are in position.

xvi) A scaffold should not be erected, substantially altered or dismantled except by or under the supervision.

xvii) Every scaffold should be maintained in good and proper condition, and every part should be kept fixed or secured so that no part can be displaced in consequence of normal use.

xviii) If out-rigger scaffolding is to be used, it should be specifically designed and inspected before putting in use.

6.2.2 Lifting appliances on scaffolds

i) When a lifting appliance is to be used on a scaffold:

(a) the parts of the scaffold should be carefully inspected to determine the additional strengthening and other safety measures required;
(b) any movement of the scaffold members should be prevented;
(c) if practicable, the uprights should be rigidly connected to a solid part of the building at the place where the lifting appliance is erected.

6.2.3 Prefabricated scaffolds

i) In the case of prefabricated scaffold systems, the instructions provided by the manufacturers or suppliers should be strictly adhered to. Prefabricated scaffolds should have adequate arrangements for fixing bracing.

ii) Frames of different types should not be intermingled in a single scaffold.

iii) Scaffolding shall be erected on firm and level ground.

iv) All members of metal scaffolding shall be checked periodically to screen out defective / rusted members. All joints should be properly lubricated for easy tightening.

v) Entry to scaffolding should be restricted.

vi) Erection, alteration and removal shall be done under supervision of experienced personnel.

vii) Use of barrels, boxes, loose bricks etc., for supporting platform shall not be permitted.

viii) Each supporting member of platform shall be securely fastened and braced

ix) Where planks are butt-joined, two parallel putlogs shall be used, not more than 100mm apart, to give support to each plank.

x) Platform plank shall not project beyond its end support to a distance exceeding 4 times the thickness of plank, unless it is effectively secured to prevent tipping. Cantilever planks should be avoided.

xi) The platform edges shall be provided with 150mm high toe board to eliminate hazards of tools or other objects falling from platform.

xii) Erect ladders in the “four up-one out position”

xiii) Lash ladder securely with the structure.

xiv) Using non-slip devices, such as, rubber shoes or pointed steel ferules at the ladder foot, rubber wheels at ladder top, fixing wooden battens, cleats etc.

xv) When ladder is used for climbing over a platform, the ladder must be of sufficient length, to extend at least one meter above the platform, when erected against the platform in “four up-one out position.”

xvi) Portable ladders shall be used for heights not more than 4mt. Above 4mt flights, fixed ladders shall be provided with at least 600 mm landings at every 6mt or less.

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xvii) The width of ladder shall not be less than 300mm and rungs shall be spaced not more than 300mm.

xviii) Every platform and means of access shall be kept free from obstruction.

xix) If grease, mud, gravel, mortar etc., fall on platform or scaffolds, these shall be removed immediately to avoid slippage.

xx) Workers shall not be allowed to work on scaffolds during storms or high wind. After heavy rain or storms, scaffolds shall be inspected before reuse.

xxi) Don't overload the scaffolding. Remove excess material and scrap immediately.

xxii) Dismantling of scaffolds shall be done in a pre-planned sequential manner.

6.2.4 Suspended scaffolds/boatwain's chair

i) In addition to the requirements for scaffolds in general as regards soundness, stability and protection against the risk of falls, suspended scaffolds should meet the following specific requirements.

(a) platforms should be designed and built with dimensions that are compatible with the stability of the structure as a whole, especially the length;
(b) the number or anchorage should be compatible with the dimensions of the platform;
(c) the safety of workers should be safeguarded by an extra rope having a point of attachment independent of the anchorage arrangements of the scaffold;
(d) the anchorage and other elements of support of the scaffold should be designed and built in such a way as to ensure sufficient strength;
(e) the ropes, winches, pulleys or pulley blocks should be designed, assembled, used and maintained according to the requirements established for lifting gear adapted to the lifting of persons according to national laws and regulations;
(f) Before use, the whole structure should be checked by a competent person.

6.2.5 Bamboo Scaffolding

i) In general, it should be avoided as far as possible. It should not be used in the unit/off-site areas and where hot work is to be done.

ii) For construction and maintenance of residential and office buildings, situated outside explosive licensed area, bamboo scaffold, if used, should conform to provisions given in IS-3696 (Part 1)-1987.

6.3 STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING

6.3.1 General provisions

i) The erection or dismantling of buildings, structures, civil engineering works, formwork, falsework and shoring should be carried out by trained workers only under the supervision of a competent person.

ii) Precautions should be taken to guard against danger to workers arising from any temporary state of weakness or instability of a structure.

iii) Formwork, falsework and shoring should be so designed, constructed and maintained that it will safely support all loads that may be imposed on it.

iv) Formwork should be so designed and erected that working platforms, means of access, bracing and means of handling and stabilising are easily fixed to the formwork structure.

6.3.2. Erection and dismantling of steel and prefabricated structures

i) The safety of workers employed on the erection and dismantling of steel and prefabricated structures should be ensured by appropriate means, such as provision and use of:

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(a) ladders, gangways or fixed platforms;
(b) platforms, buckets, boatswain's chairs or other appropriate means suspended from lifting appliances;
(c) safety harnesses and lifelines, catch nets or catch platforms;
(d) Power-operated mobile working platforms.

ii) Steel and prefabricated structures should be so designed and made that they can be safely transported and erected.

iii) In addition to the need for the stability of the part when erected, the design should explicitly take following into account:

(a) the conditions and methods of attachment in the operations of transport, storing and temporary support during erection or dismantling as applicable;
(b) Methods for the provision of safeguards such as railings and working platforms, and, when necessary, for mounting them easily on the structural steel or prefabricated parts.

iv) The hooks and other devices built in or provided on the structural steel or prefabricated parts that are required for lifting and transporting them should be so shaped, dimensioned and positioned as:

(a) to withstand with a sufficient margin the stresses to which they are subjected;
(b) Not to set up stresses in the part that could cause failures, or stresses in the structure itself not provided for in the plans, and be designed to permit easy release from the lifting appliance. Lifting points for floor and staircase units should be located (recessed if necessary) so that they do not protrude above the surface;
(c) To avoid imbalance or distortion of the lifted load.

v) Storeplaces should be so constructed that:

(a) there is no risk of structural steel or prefabricated parts falling or overturning;
(b) storage conditions generally ensure stability and avoid damage having regard to the method of storage and atmospheric conditions;
(c) racks are set on firm ground and designed so that units cannot move accidentally.

vi) While they are being stored, transported, raised or set down, structural steel or prefabricated parts should not be subjected to stresses prejudicial to their stability.

vii) Every lifting appliance should:

(a) be suitable for the operations and not be capable of accidental disconnection;
(b) be approved or tested as per statutory requirement.

viii) Lifting hooks should be of the self-closing type or of a safety type and should have the maximum permissible load marked on them.

ix) Tongs, clamps and other appliances for lifting structural steel and prefabricated parts should:

(a) be of such shape and dimensions as to ensure a secure grip without damaging the part;
(b) be marked with the maximum permissible load in the most unfavourable lifting conditions.

x) Structural steel or prefabricated parts should be lifted by methods or appliances that prevent them from spinning accidentally.

xi) When necessary to prevent danger, before they are raised from the ground, structural steel or prefabricated parts should be provided with safety devices such as railings and working platforms to prevent falls of persons.

xii) While structural steel or prefabricated parts are being erected, the workers should be provided with appliances for guiding them as they are being lifted and set down, so as to avoid crushing of hands and to facilitate the operations. Use of such appliances should be ensured.

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xiii) A raised structural steel or prefabricated part should be so secured and wall units so propped that their stability cannot be imperiled, even by external agencies such as wind and passing loads before its release from the lifting appliance.

xiv) At work places, instruction should be given to the workers on the methods, arrangements and means required for the storage, transport, lifting and erection of structural steel or prefabricated parts, and, before erection starts, a meeting of all those responsible should be held to discuss and confirm the requirements for safe erection.

xv) During transportation within the construction area, attachments such as slings and stirrups mounted on structural steel or prefabricated parts should be securely fastened to the parts.

xvi) Structural steel or prefabricated parts should be so transported that the conditions do not affect the stability of the parts or the means of transport result in jolting, vibration or stresses due to blows, or loads of material or persons.

xvii) When the method of erection does not permit the provision of other means of protection against fall of persons, the workplaces should be protected by guardrails, and if appropriate by toe-boards.

xviii) When adverse weather conditions such as snow, ice and wind or reduced visibility entail risks of accidents, the work should be carried on with particular care, or, if necessary, interrupted.

xix) Structures should not be worked on during violent storms or high winds, or when they are covered with ice or snow, or are slippery from other causes.

xx) If necessary, to prevent danger, structural steel parts should be equipped with attachments for suspended scaffolds, lifelines or safety harnesses and other means of protection.

xxi) The risks of falling, to which workers moving on high or sloping girders are exposed, should be limited by all means of adequate collective protection or, where this is impossible, by the use of a safety harness that is well secured to a strong support.

xxii) Structural steel parts that are to be erected at a great height should as far as practicable be assembled on the ground.

xxiii) When structural steel or prefabricated parts are being erected, a sufficiently extended area underneath the workplace should be barricaded or guarded

xxiv) Steel trusses that are being erected should be adequately shored, braced or guyed until they are permanently secured in position.

xxv) Load-bearing structural member should not be dangerously weakened by cutting, holing or other means.

xxvi) Structural members should not be forced into place by the hoisting machine while any worker is in such a position that he could be injured by the operation.

xxvii) Open-web steel joists that are hoisted singly should be directly placed in position and secured against dislodgment.

6.3.3 Reinforcement

i) Ensure that workers use Personnel Protective equipment like safety helmet, safety shoes, gloves etc.

ii) Don't place the hand below the rods for checking clear distance. Use measuring devices.

iii) Don't wear loose clothes while checking the rods.

iv) Don't stand unnecessarily on cantilever rods.

v) To carry out welding/cutting of rods, safety procedures/precautions as mentioned in Item No. 6.5 to be followed.

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vi) For supplying of rods at heights, proper staging and/or bundling to be provided.

vii) Ensure barricading and staging for supplying and fixing of rods at height.

viii) For short distance carrying of materials on shoulders, suitable pads to be provided.

ix) While transporting material by trucks/trailers, the rods shall not protrude in front of or by the sides of driver's cabin. In case such protrusion cannot be avoided behind the deck, then it should not extend 1/3rd of deck length or 1.5M which ever is less and tied with red flags/lights.

6.3.4 Concreting

i) Ensure stability of shuttering work before allowing concreting.

ii) Barricade the concreting area while pouring at height/depths.

iii) Keep vibrator hoses, pumping concrete accessories in healthy conditions and mechanically locked.

iv) Pipelines in concrete pumping system shall not be attached to temporary structures such as scaffolds and formwork support as the forces and movements may effect their integrity.

v) Check safety cages & guards around moving motors/parts etc. provided in concreting mixers.

vi) Use Personal Protective Equipment like gloves, safety shoes etc. while dealing with concrete and wear respirators for dealing with cement.

vii) Earthing of electrical mixers, vibrators, etc. should be done and verified.

viii) Cleaning of rotating drums of concrete mixers shall be done from outside. Lockout devices shall be provided where workers need to enter.

ix) Where concrete mixers are driven by internal combustion engine, exhaust points shall be located away from the worker's workstation so as to eliminate their exposure to obnoxious fumes.

x) Don't allow unauthorised person to stand under the concreting area.

xi) Ensure adequate lighting arrangements for carrying out concrete work during night.

xii) Don't allow the same workers to pour concrete round the clock. Insist on shift pattern.

xiii) During pouring, shuttering and its supports should be continuously watched for defects.

6.4 ROAD WORK

6.4.1 Site shall be barricaded and provided with warning signs, including night warning lamps at appropriate locations for traffic diversion.

6.4.2 Filled and empty bitumen drums shall be stacked separately at designated places.

6.4.3 Mixing aggregate with bitumen shall preferably be done with the help of bitumen batch mixing plant, unless operationally non-feasible.

6.4.4 Road rollers, Bitumen sprayers, Pavement finishers shall be driven by experienced drivers with valid driving license.

6.4.5 Workers handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate, shall be provided with PVC hand gloves and rubber shoes with legging up to knee joints.

6.4.6 At the end of day's work, surplus hot bitumen in tar boiler shall be properly covered by a metal sheet, to prevent anything falling in it,

6.4.7 If bitumen accidentally falls on ground, it shall be immediately covered by sprinkling sand, to prevent anybody stepping on it. Then it shall be removed with the help of spade.

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6.4.8 For cement concrete roads, besides site barricading and installation of warning signs for traffic diversion, safe practices mentioned in the chapter on "Concreting", shall also be applicable.

6.5 CUTTING/WELDING

6.5.1 Common hazards involved in welding/cutting are sparks, molten metal, flying particles, harmful light rays, electric shocks etc. Following precautions should be taken: -

i) A dry chemical type fire extinguisher shall be made available in the work area.

ii) Adequate ventilation shall be ensured by opening manholes and fixing a shield or forced circulation of air etc, while doing a job in confined space.

iii) Ensure that only approved and well-maintained apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used.

iv) All covers and panels shall be kept in place, when operating an electric Arc welding machine.

v) The work piece should be connected directly to Power supply, and not indirectly through pipelines/structures/equipments etc.

vi) The welding receptacles shall be rated for 63 A suitable for 415V, 3-Phase system with a scraping earth. Receptacles shall have necessary mechanical interlocks and earthing facilities.

vii) All cables, including welding and ground cables, shall be checked for any worn out or cracked insulation before starting the job. Ground cable should be separate without any loose joints.

viii) Cable coiling shall be maintained at minimum level, if not avoidable.

ix) An energised electrode shall not be left unattended.

x) The power source shall be turned off at the end of job.

xi) All gas cylinders shall be properly secured in upright position.

xii) Acetylene cylinder shall be turned and kept in such a way that the valve outlet points away from oxygen cylinder.

xiii) Acetylene cylinder key for opening valve shall be kept on valve stem, while cylinder is in use, so that the acetylene cylinder could be quickly turned off in case of emergency. Use flash back arrestors to prevent back-fire in acetylene/oxygen cylinder.

xiv) When not in use, valves of all cylinders shall be kept closed.

xv) All types of cylinders, whether full or empty, shall be stored at cool, dry place under shed.

xvi) Forced opening of any cylinder valve should not be attempted.

xvii) Lighted gas torch shall never be left unattended.

xviii) Store acetylene and oxygen cylinders separately.

xix) Store full and empty cylinders separately.

xx) Avoid cylinders coming into contact with heat.

xxi) Cylinders that are heavy or difficult to carry by hand may be rolled on their bottom edge but never dragged.

xxii) If cylinders have to be moved, be sure that the cylinder valves are shut off.

xxiii) Before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose.

xxiv) Do not use matches to light torches, use a friction lighter.

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xxv) Move out any leaking cylinder immediately.

xxvi) Use trolleys for oxygen & acetylene cylinder and chain them.

xxvii) Always use Red hose for acetylene and other fuel gases and Black for oxygen, and ensure that both are in equal length.

xxviii) Ensure that hoses are free from burns, cuts and cracks and properly clamped.

xxix) Avoid dragging hoses over sharp edges and objects

xxx) Do not wrap hoses around cylinders when in use or stored.

xxxi) Protect hoses from flying sparks, hot slag, and other hot objects.

xxxii) Lubricants shall not be used on Ox-fuel gas equipment.

xxxiii) During cutting/welding, use proper type goggles/face shields.

6.6 WORKING IN CONFINED SPACES

6.6.1 Following safety practices for working in confined space like towers, columns, tanks and other vessels should be followed in addition to the safety guidelines for specific jobs like scaffolding, cutting/welding etc.

i) Shut down, isolate, depressurise and purge the vessel as per laid down procedures.

ii) Entry inside the vessel and to carry out any job should be done after issuance of valid permit only in line with the requirement of OISD-STD-105.

iii) Ensure proper and accessible means of exit before entry inside a confined space.

iv) The number of persons allowed inside the vessel should be limited to avoid overcrowding.

v) When the work is going on in the confined space, there should always be one man standby at the nearby manway.

vi) Before entering inside the vessels underground or located at lower elevation, probability of dense vapours accumulating nearby should also be considered in addition to inside the vessel.

vii) Ensure requisite O_2 level before entry in the confined space and monitor level periodically or other wise use respiratory devices.

viii) Check for no Hydrocarbon or toxic substances before entry and monitor level periodically or use requisite Personal Protective Equipment.

ix) Ensure adequate ventilation or use respiratory devices.

x) Depending upon need, necessary respirator system, gas masks and suit shall be worn by everyone entering confined space. In case of sewer, OWS or in the confined area where there is a possibility of toxic or inert gas, gas masks shall be used by everyone while entering.

xi) Barricade the confined spaces during hoisting, radiography, blasting, pressure testing etc.

xii) Use 24V flameproof lamp fittings only for illumination.

xiii) Use tools with air motors or electric tools with maximum voltage of 24V.

xiv) House keeping shall be well maintained.

xv) Safety helmet, safety shoes and safety belt shall be worn by everyone entering the confined space.

xvi) Don't wear loose clothing while working in a confined space.

xvii) In case of the vessels which are likely to contain pyropheric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be

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made to remove the pyropheric substances. Otherwise, these should be always kept wet by suitable means.

xviii) The cutting torches should also be kept outside the vessel immediately after the cutting.

xix) The gas cylinders used for cutting/welding shall be kept outside.

xx) All cables, hoses, welding equipment etc., shall be removed from confined space at end of each work day, even if the work is to be resumed in the same space the next day.

xxi) To the extent possible sludge shall be cleared and removed from outside before entering.

xxii) No naked light or flame or hot work such as welding, cutting and soldering should be permitted inside a confined space or area unless it has been made completely free of the flammable atmosphere, tested and found safe by a competent person. Only non-sparking tools and flameproof hand lamps protected with guard and safety torches should be used inside such confined space or area for initial inspection, cleaning or other work required to be done for making the area safe.

xxiii) Communication should be always maintained between the worker and the attendant.

6.7 PROOF/PRESSURE TESTING

6.7.1 Review test procedure before allowing testing with water or air or any other fluid.

6.7.2 Provide relief valves of adequate size while testing with air or other gases.

6.7.3 Ensure compliance of necessary precautions, step wise loading, tightening of fasteners, grouting etc. before and during testing.

6.7.4 Inform all concerned in advance of the testing.

6.7.5 Keep the vents open before opening any valve for filling/draining of liquid used for hydrotesting. The filling/draining should not exceed the designed rate for pressure testing.

6.7.6 Provide separate gauges of suitable range for pressurising pump and the equipment to be tested.

6.7.7 Provide gauges at designated locations for monitoring of pressures.

6.7.8 Check the calibration of all pressurising equipment and accessories and maintain records.

6.7.9 Take readings at pre-defined intervals.

6.8 WORKING AT HEIGHTS

6.8.1 General Provision

i) While working at a height of more than 3 meters, ISI approved safety belt shall be used.

ii) While working at a height of more than 3 meters, permit should be issued by competent person before commencement of the job.

iii) Worker should be well trained on usage of safety belt including its proper usage at the time of ascending/descending.

iv) All tools should be carried in tool kits to avoid their falling.

v) If the job is on fragile/sloping roof, roof walk ladders shall be used.

vi) Provide lifeline wherever required.

vii) Additional safety measures like providing Fall Arrestor type Safety belt, safety net should be provided depending upon site conditions, job requirements.

viii) Keep working area neat and clean. Remove scrap material immediately.

ix) Don't throw or drop material/equipment from height.

x) Avoid jumping from one member to another. Use proper passageway.

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xi) Keep both hands free while climbing. Don't try to bypass the steps of the ladder.

xii) Try to maintain calm at height. Avoid over exertion.

xiii) Avoid movements on beam.

xiv) Elevated workplaces including roofs should be provided with safe means of access and egress such as stairs, ramps or ladders.

6.8.2 Roof Work

i) All roof-work operations should be pre-planned and properly supervised.

ii) Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.

iii) Work on roofs shouldn't be carried on in weather conditions that threaten the safety of workers.

iv) Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.

v) Roofing brackets should fit the slope of the roof and be securely supported.

vi) Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.

vii) On a large roof where work have to be carried out at or near the edge, a simple barrier consisting of crossed scaffold tubes supporting a tubing guardrail may be provided.

viii) All covers for openings in roofs should be of substantial construction and be secured in position.

ix) Roofs with a pitch of more than 10 should be treated as sloping.

x) When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured in position.

xi) During extensive work on the roof, strong barriers or guardrails and toe-boards should be provided to stop a person from falling off the roof.

xii) Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and when spanning across the supports for the roof covering to support those workers.

xiii) A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.

6.8.3 Work on tall chimneys

i) For the erection and repair of tall chimneys, scaffolding should be provided. A safety net should be maintained at a suitable distance below the scaffold.

ii) The scaffold floor should always be at least 65 cm below the top of the chimney.

iii) Under the working floor of the scaffolding the next lower floor should be left in position as a catch platform.

iv) The distance between the inside edge of the scaffold and the wall of the chimney should not exceed 20 cm at any point.

v) Catch platforms should be erected over:

(a) the entrance to the chimney;
(b) Passageways and working places where workers could be endangered by falling objects.

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vi) For climbing tall chimneys, access should be provided by:

(a) stairs or ladders;
(b) a column of iron rungs securely embedded in the chimney wall;
(c) Other appropriate means.

vii) When workers use the outside rungs to climb the chimney, a securely fastened steel core rope looped at the free end and hanging down at least 3 m should be provided at the top to help the workers to climb on to the chimney.

viii) While work is being done on independent chimneys the area surrounding the chimney should be enclosed by fencing at a safe distance.

ix) Workers employed on the construction, alteration, maintenance or repair of tall chimneys should not:

a) work on the outside without a safety harness attached by a lifeline to a rung, ring or other secure anchorage;
b) put tools between the safety harness and the body or in pockets not intended for the purpose;
c) haul heavy materials or equipment up and down by hand to or from the workplace on the chimney;
d) fasten pulleys or scaffolding to reinforcing rings without first verifying their stability;
e) work alone;
f) climb a chimney that is not provided with securely anchored ladders or rungs;
g) Work on chimneys in use unless the necessary precautions to avoid danger from smoke and gases have been taken.

x) Work on independent chimneys should not be carried on in high winds, icy conditions, fog or during electrical storms.

6.9 HANDLING AND LIFTING EQUIPMENT:

6.9.1 General Provisions

Following are the general guidelines to be followed with regard to all types of handling and lifting equipment in addition to the guidelines for specific type of equipments dealt later on.

i) There should be a well-planned safety programme to ensure that all the lifting appliances and lifting gear are selected, installed, examined, tested, maintained, operated and dismantled with a view to preventing the occurrence of any accident;

ii) All lifting appliances shall be examined by competent persons at frequencies as specified in "The Factories act".

iii) Check thoroughly quality, size and condition of all lifting tools like chain pulley blocks, slings, U-clamps, D-shackles etc. before putting them in use.

iv) Safe lifting capacity of all lifting & handling equipment, tools and shackles should be got verified and certificates obtained from competent authorities before its use. The safe working load shall be marked on them.

v) Check periodically the oil, brakes, gears, horns and tyre pressure of all moving equipments like cranes, forklifts, trailers etc as per manufacturer's recommendations.

vi) Check the weights to be lifted and accordingly decide about the crane capacity, boom length and angle of erection.

vii) Allow lifting slings as short as possible and check packing at the friction points.

viii) While lifting/placing of the load, no unauthorised person shall remain within the radius of the boom and underneath the load.

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ix) While loading, unloading and stacking of pipes, proper wedges shall be placed to prevent rolling down of the pipes.

x) Control longer jobs being lifted up from both ends.

xi) Only trained operators and riggers should carry out the job. While the crane is moving or lifting the load, the trained rigger should be there for keeping a vigil against hitting any other object.

xii) During high wind conditions and nights, lifting of heavy equipments should be avoided. If unavoidable to do erection in night, operator and rigger should be fully trained for night signaling. Also proper illumination should be there.

xiii) Allow crane to move on hard, firm and leveled ground.

xiv) When crane is in idle condition for long periods or unattended, crane boom should either be lowered or locked as per manufacturer's guidelines.

xv) Hook and load being lifted shall remain in full visibility of crane operators, while lifting, to the extent possible.

xvi) Don't allow booms or other parts of crane to come within 3 meters reach of overhead electrical cables.

xvii) No structural alterations or repairs should be made to any part of a lifting appliance, which may affect the safety of the appliance without the permission and supervision of the competent person.

6.9.2 Hoists

i) Hoist shafts should be enclosed with rigid panels or other adequate fencing at:

(a) ground level on all sides;
(b) all other levels at all points at which access is provided;
(c) all points at which persons are liable to be struck by any moving part.

ii) The enclosure of hoist shafts, except at approaches should extend where practicable at least 2mt above the floor, platform or other place to which access is provided except where a lesser height is sufficient to prevent any person falling down the hoistway and there is no risk of any person coming into contact with any moving part of the hoist, but in no case should the enclosure be less than 1mt in height.

iii) The guides of hoist platforms should offer sufficient resistance to bending and, in the case of jamming by a safety catch, to buckling.

iv) Where necessary to prevent danger, adequate covering should be provided above the top of hoist shafts to prevent material falling down them.

v) Outdoor hoist towers should be erected on firm foundations, and securely braced, guyed and anchored.

vi) A ladderway should extend from the bottom to the top of outdoor hoist towers, if no other ladderway exists within easy reach.

vii) Hoisting engines should be of ample capacity to control the heaviest load that they will have to move.

viii) Hoists should be provided with devices that stop the hoisting engine as soon as the platform reaches its highest stopping place.

ix) Winches should be so constructed that the brake is applied when the control handle is not held in the operating position.

x) It should not be possible to set in motion from the platform a hoist, which is not designed for the conveyance of persons.

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xi) Winches should not be fitted with pawl and ratchet gears on which the pawl must be disengaged before the platform is lowered.

xii) Hoist platforms should be capable of supporting the maximum load that they will have to carry with a safety factor.

xiii) Hoist platforms should be equipped with safety gear that will hold the platform with the maximum load if the hoisting rope breaks.

xiv) If workers have to enter the cage or go on the platform at landings there should be a locking arrangement preventing the cage or platform from moving while any worker is in or on it.

xv) On sides not used for loading and unloading, hoist platforms should be provided with toe-boards and enclosures of wire mesh or other suitable material to prevent the fall of parts of loads.

xvi) Where necessary to prevent danger from falling objects, hoist platforms should be provided with adequate covering.

xvii) Counterweights consisting of an assemblage of several parts should be made of specially constructed parts rigidly connected together.

xviii) Counterweights should run in guides.

xix) Platforms should be provided at all landings used by workers.

xx) Following notices should be posted up conspicuously and in very legible characters:

(a) on all hoists:

- on the platform: the carrying capacity in kilograms or other appropriate standard unit of weight;
- on the hoisting engine: the lifting capacity in kilograms or other appropriate standard unit of weight;

(b) on hoists authorised or certified for the conveyance of persons:

- on the platform or cage: the maximum number of persons to be carried at one time;

(c) *on* hoists for goods only:

- on every approach to the hoist and on the platform: prohibition of use by persons.

xxi) Hoists intended for the carriage of persons should be provided with a cage so constructed as to prevent any person from falling out or being trapped between the cage and any fixed part of the structure when the cage gate is shut, or from being struck by the counterbalance weight or by articles or materials tailing down the hoistway.

xxii) On each side in which access is provided, the cage should have a gate fitted with devices which ensure that the gate cannot be opened except when the cage is at a landing and that the gate must be closed before the cage can move away from the landing.

xxiii) Every gate in the enclosure of the hoist shaft which gives access from a landing place to the cage should be fitted with devices to ensure that the gate cannot be opened except when the cage is at that landing place, and that the cage cannot be moved away from that landing place until the gate is closed.

6.9.3 Derricks

Stiff-leg derricks

i) Derricks should be erected on a firm base capable of taking the combined weight of the crane structure and maximum rated load.

ii) Devices should be used to prevent masts from lifting out of their seating.

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iii) Electrically operated derricks should be effectively earthed from the sole plate or framework.

iv) Counterweights should be so arranged that they do not subject the backstays, sleepers or pivots to excessive strain.

v) When derricks are mounted on wheels:

a) a rigid member should be used to maintain the correct distance between the wheels;
b) they should be equipped with struts to prevent them from dropping if a wheel breaks or the derrick is derailed.

vi) The length of a derrick jib should not be altered without consulting the manufacturer.

vii) The jib of a scotch derrick crane should not be erected within the backstays of the crane.

Guy derricks

i) The restraint of the guy ropes should be ensured by fitting stirrups or anchor plates in concrete foundations.

ii) The mast of guy derricks should be supported by six top guys spaced approximately equally.

iii) The spread of the guys of a guy derrick crane from the mast should not be more than 45^0 from the horizontal.

iv) Guy ropes of derricks should be equipped with a stretching screw or turnbuckle or other device to regulate the tension.

v) Gudgeon pins, sheave pins and fool bearings should be lubricated frequently.

vi) When a derrick is not in use, the boom should be anchored to prevent it from swinging.

6.9.4 Gin poles

i) Gin poles should:

(a) be straight;
(b) consist of steel or other suitable metal;
(c) be adequately guyed and anchored;
(d) be vertical or raked slightly towards the load;
(e) be of adequate strength for the loads that they will be required to lift/move.

ii) Gin poles should not be spliced and if a gin pole is composed of different elements, they should be assembled in conformity with their intrinsic material strength.

iii) Gin poles should be fastened at their feet to prevent displacement in operation.

iv) Gin poles, which are moved from place to place and re-erected, should not be taken into use again before the pole, lifting ropes, guys, blocks and other parts have been inspected, and the whole appliance has been tested under load.

v) When platforms or skips are hoisted by gin poles, precautions should be taken to prevent them from spinning and to provide for proper landing.

6.9.5 Tower cranes

i) Where tower cranes have cabs at high level, persons, capable and trained to work at heights, should only be employed as crane operators.

ii) The characteristics of the various machines available should be considered against the operating requirements and the surroundings in which the crane will operate before a particular type of crane is selected.

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iii) Care should be taken in the assessment of wind loads both during operations and out of service. Account should also be taken of the effects of high structures on wind forces in the vicinity of the crane.

iv) The ground on which the tower crane stands should have the requisite bearing capacity. Account should be taken of seasonal variations in ground conditions.

v) Bases for tower cranes and tracks for rail-mounted tower cranes should be firm and level. Tower cranes should only operate on gradients within limits specified by the manufacturer. Tower cranes should only be erected at a safe distance from excavations and ditches.

vi) Tower cranes should be sited where there is clear space available for erection, operation and dismantling. As far as possible, cranes should be sited so that loads do not have to be handled over occupied premises, over public thoroughfares, other construction works and railways or near power cables.

vii) Where two or more tower cranes are sited in positions where their jibs could touch any part of the other crane, there should be direct means of communication between them and a distinct warning system operated from the cab so that one driver may alert the other of impending danger.

viii) The manufacturers' instructions on the methods and sequence of erection and dismantling should be followed. The crane should be tested before being taken into use.

ix) The climbing operation of climbing tower cranes should be carried out in accordance with manufacturers' instructions. The free-standing height of the tower crane should not extend beyond what is safe and permissible in the manufacturers' instructions.

x) When the tower crane is left unattended, loads should be removed from the hook, the hook raised, the power switched off and the boom brought to the horizontal. For longer periods or at times when adverse weather conditions are expected, out of service procedures should be followed. The main jib should be slewed to the side of the tower away from the wind, put into free slew and the crane immobilised.

xi) A windspeed measuring device should be provided at an elevated position on the tower crane with the indicator fitted in the drivers' cab.

xii) Devices should be provided to prevent loads being moved to a point where the corresponding safe working load of the crane would be exceeded. Name boards or other items liable to catch the wind should not be mounted on a tower crane other than in accordance with the manufacturers' instructions.

xiii) Tower cranes should not be used for magnet, or demolition ball service, piling operations or other duties, which could impose excessive loading on the crane structure.

6.9.6 Lifting ropes

i) Only ropes with a known safe working capacity should be used as lifting ropes.

ii) Lifting ropes should be installed, maintained and inspected in accordance with manufacturers' instructions.

iii) Repaired steel ropes should not be used on hoists.

iv) Where multiple independent ropes are used, for the purpose of stability, to lift a work platform, each rope should be capable of carrying the load independently.

6.10 VEHICLE MOVEMENT

6.10.1 Park vehicles only at designated places. Don't block roads to create hindrance for other vehicles.

6.10.2 Don't overload the vehicle.

6.10.3 Obey speed limits and traffic rules.

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6.10.4 Always expect the unexpected and be a defensive driver.

6.10.5 Drive carefully during adverse weather and road conditions.

6.10.6 Read the road ahead and ride to the left.

6.10.7 Be extra cautious at nights. Keep wind screens clean and lights in working condition.

6.10.8 All vehicles used for carrying workers and construction materials must undergo predictive/preventive maintenance and daily checks

6.10.9 Driver with proper valid driving license shall only be allowed to drive the vehicle

6.10.10 Routes shall be leveled, marked and planned in such a way so as to avoid potential hazards such as overhead power lines and sloping ground etc.

6.10.11 While reversing the vehicles, help of another worker should be ensured at all times

6.10.12 An unattended vehicle should have the engine switched off

6.10.13 Wherever possible one-way system shall be followed

6.10.14 Barriers/fixed stops should be provided for excavation/openings to prevent fall of vehicle

6.10.15 Load should be properly secured

6.10.16 The body of the tipper lorry should always be lowered before driving the vehicle off.

6.10.17 Signs/signals/caution boards etc. should be provided on routes .

6.11 ELECTRICAL

6.11.1 General Provisions

i) Only persons having valid licenses should be allowed to work on electrical facilities.

ii) No person should be allowed to work on live circuit. The same, if unavoidable, special care and authorisation need to be taken.

iii) Treat all circuits as "LIVE" unless ensured otherwise.

iv) Electrical "Tag Out" procedure "MUST" be followed for carrying out maintenance jobs.

v) Display voltage ratings prominently with "Danger" signs.

vi) Put caution/notice signs before starting the repair works.

vii) All electrical equipment operating above 250V shall have separate and distinct connections to earth grid.

viii) Proper grounding to be ensured for all switch boards and equipment including Portable ones prior to taking into service.

ix) Make sure that electrical switch boards, portable tools, equipments (like grinding machine etc.) don't get wet during their usage. If it happens, stop the main supply, make the tools dry and then only use them. Check proper earthing.

All temporary switch boards/ KIOSKS put up at work site should be suitably protected from rain and the level of same should be high enough to avoid contact with water due to water logging.

x) Don't work wet on electrical system.

xi) Don't overload the electrical system.

xii) Use only proper rated HRC fuses.

xiii) Industrial type extension boards and Plug sockets are only to be used.

xiv) ELCB for all temporary connections must be provided. Use insulated 3-pin plug tops.

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xv) All power supply cables should be laid properly and neatly so that they don't cause hindrance to persons working and no physical damage also takes place to the cables during various construction activities.

xvi) All Power cables to be properly terminated using glands and lugs of proper size and adequately crimped.

xvii) Use spark-proof/flame proof type electrical fittings in Fire Hazard zones as per area classification under OISD-STD-113.

xviii) Check installations of steel plates/pipes to protect underground cables at crossings.

xix) Don't lay unarmored cable directly on ground, wall, roof or trees. All temporary cables should be laid at least 750 mm below ground and cable markers should be provided. Proper sleeves should be provided at road crossings. In case temporary cables are to be laid on wooden poles/steel poles, the minimum cable heights should be 4.5 M.

xx) Maintain safe overhead distance of HT cables as per Indian Electricity Rules and relevant acts.

xxi) Don't connect any earthing wire to the pipelines/structures.

xxii) Don't make any unsafe temporary connections, naked joints/wiring etc.

xxiii) Ensure that temporary cables are free from cuts, damaged insulation, kinks or improper insulated joints.

xxiv) Check at periodic intervals that pins of sockets and joints are not loose.

xxv) Protect electrical wires/equipments from water and naked flames.

xxvi) Illuminate suitably all the work areas.

xxvii) All switchboards should be of MS structure only and incoming source should be marked.

xxviii) Hand lamps should not be of more than 24V rating.

xxix) Fire extinguishers (DCP/CO_2/Sand buckets) should be kept near temporary switch boards being used for construction purposes. Don't use water for fighting electrical fires.

xxx) Insulating mats shall be provided in the front and back end of switch boards.

xxxi) All parts of electrical installations should be so constructed, installed and maintained as to prevent danger of electric shock, fire and external explosion.

Periodic checking/certification of electrical safety appliances such as gloves, insulating mats, hoods etc. to be done/witnessed along with maintaining a register at site signed by competent authority.

xxxii) A notice displaying following, should be kept exhibited at suitable places:

a) prohibiting unauthorised persons from entering electrical equipment rooms or from handling or interfering with electrical apparatus;
b) containing directions as to procedures in case of fire, rescue of persons in contact with live conductors and the restoration of persons suffering from electric shock;
c) specifying the person to be notified in case of electrical accident or dangerous occurrence, and indicating how to communicate with him.

xxxiii) No other cables/pipes to be laid in trench used for electrical cables.

xxxiv) Utmost care should be taken while excavating Earth from cable trench to avoid damage or any accident.

xxxv) Sub-station floor cut-outs meant for switch board installations to be covered wherever installation is incomplete.

NOTE: A Residual Current Operated Circuit Breaker (RCCB) or Earth Leakage Circuit Breaker (ELCB), when installed, protects a human being to the widest extent. RCCB or ELCB should be provided as per Indian Electricity Rules.

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6.11.2 Inspection and maintenance

i) All electrical equipment should be inspected before taking into use to ensure suitability for its proposed use.

ii) At the beginning of every shift, the person using the electrical equipment should make a careful external examination of the equipment and conductors, especially the flexible cables.

iii) Apart from some exceptional cases, work on or near live parts of electrical equipment should be forbidden.

iv) Before any work is begun on conductors or equipment that do not have to remain live:

a) the current should be switched off by a responsible authorised person;
b) precautions should be taken to prevent the current from being switched on again;
c) the conductors or the equipment should be tested to ascertain that they are dead;
d) the conductors and equipment should be earthed and short-circuited;
e) neighbouring live parts should be adequately protected against accidental contact.

v) After work has been done on conductors and equipment, the current should only be switched on again on the orders of a competent person after the earthing and short-circuiting have been removed and the workplace reported safe.

vi) Electricians should be provided with approved and tested tools, and personal protective equipment such as rubber gloves, mats etc.

vii) All conductors and equipment should be considered to be live unless there is a proof of the contrary.

viii) When work has to be done in dangerous proximity to live parts the current should be cut off. If for operational reasons this is not possible, the live parts should be fenced off or enclosed by qualified staff from the sub-station concerned.

6.11.3. Testing

i) Electrical installations should be inspected and tested and the results recorded.

ii) Periodic testing of the efficiency of the earth leakage protective devices should be carried out.

iii) Particular attention should be paid to the earthing of apparatus, the continuity of protective conductors, polarity and insulation resistance, protection against mechanical damage and condition of connections at points of entry.

6.12 OFFSHORE

6.12.1 General

The isolated nature of offshore installations are hazardous. They call for greater need for safety and survival at offshore. Safety at offshore is safety of installations and safety of personnel. Safety problems and accidents at offshore have high risks due to limited space, helicopter operation, sea transport etc. Following are the general safety guidelines to be followed in addition to the safety guidelines stipulated for specific jobs dealt later on:

i) Workers should be well trained to do their job independently with high degree of self-control and self-discipline.

ii) On arrival at offshore, everyone should be briefed about the safety rules to be followed at offshore, evacuation system etc. All personnel should wear overall (dangri), helmet and shoes for personnel protection.

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iii) In case of emergency, workers should follow instruction of Field Production Superintendent (F.P.S.) In certain cases instructions may be given to abandon the offshore installation and evacuate the persons to safe location.

iv) To overcome above problems, offshore personnel must receive training for using life saving appliances and other personal survival techniques.

v) Any person working at offshore should have one person as standby for any eventuality.

6.12.2 Drilling Rigs

i) Location of jack up rigs should not be less than 5 Kms from shipping route. Orientation of the rig, wind direction etc are required for safe landing of helicopter. Information w.r.t. sea currents, wind speed, Hi-lo tide etc are required for mooring of supply vessels.

ii) Sea bed condition at every location should be ensured for safety of rig.

iii) Radio and other communication facilities should be such to maintain contact with base all times.

iv) During toeing of rig, the rig deck should be clear of load, toeing lines should be in good condition and tensions in various toeing lines should be constantly monitored.

v) Few steps during toeing are:

a) crane booms should be secured to their vesta,
b) all hatches and water tight doors should be closed,
c) number of personnel on board should be restricted,
d) evacuate in case of emergency and operation should be completed preferably in day light.

6.12.3 Drilling

i) In view of CO_2 and H_2S gas cut from well, effective ventilation should be provided where drilling is in progress.

ii) Safety alarm shall be checked in advance in view of failure of ventilation system.

iii) Suitable sensors for H_2S and Methane should be function tested time to time and suitable colour code should be given.

iv) Working areas of the crane should be illuminated during night to avoid accident.

v) Clear space should be available for despatch and receipt of load and, in particular, basket transfer of passengers. Persons engaged in loading/unloading of materials should be protected from falling into the sea.

vi) Signal light should be fitted at the top of the jib.

vii) Crane hook should be fitted with safety latches.

viii) Experienced person should be engaged in operation of specific equipment like winches, cranes etc.

ix) At least three cable turns shall always be there on the winch drum.

x) Adequate communication like walkie talkie, round robin phone should be available between the crane operator, supervisor and helper.

xi) Crane operation should be completely stopped during helicopter landing/taking off.

xii) Except for helicopter landing deck, all decks, platforms, bridges, ladders should have rigid and fixed guard rails atleast one meter high and should have one intermediate rail midway between the handrail and 100 mm toe board.

xiii) Wooden ladders shall not be used at offshore.

xiv) Flow sensor in the flow line should be ensured for safe working and to avoid blow out.

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xv) Hydrogen sulphuide gas In offshore is of great risk and at 10 ppm (0.001%) concentration in air, a person should not be exposed for more than 8 hours, If concentration is more, then breathing apparatus should be used. Corrosion of equipment is also caused by H_2S.

xvi) Portable H_2S gas detector should be continously used.

6.12.4 Production Platforms

i) In case hydrocarbon Is released due to overpressure, leak, overflow, gas blow etc., shut down process to stop flow *of* hydrocarbon. Prevent ignition of released hydrocarbon and in case of fire shut in the process complex and follow emergency contigency plan.

ii) Sub surface safetv valve (SSSV)) below the well head should be actuated during uncontrolled well -flow and they should be regularly checked.

iii) Surface safety valve or SDV should be checked for no gas leakage from bleed port / flange etc., in the well head area. It should not be in "mechanical override" or bypassed from panel.

iv) High pressure gas lift lines - blowdown system should be O.K.

v) Auto actuation of SDVs in the inlet of pressure vessels should be O.K. and in "normal position" from shutdown panels. A record of status of switches normal/bypassed in auto-con* panels (PSH, PSL, LSL, ILSL) should be maintained.

* Shut Down Panels

vi) Welders rectifier set and electrical connections to it should be checked and approved by electrical-in- charge for proper electrical safely.

vii) “SCADA" telementry system if available should be operational for remote opening and closing of wells at unmanned platforms (through RPMC).

viii) Local ESD/FSD (near the work site) should be provided for jobs of very critical nature, so that the persons working can access it immediately in emergency for safety. Safety officer should judge the requirement & inform FPS for the same.

ix) Railings and Gratings etc. in and around work area should be O.K. and inspected to avoid slippage of man into sea.

x) Emergency shut down (ESD) system is initiated when an abnormal condition is detected. ESD should be checked once in six months.

xi) Platform should be manned round the clock.

xii) Welding and cutting work should be regulated by hot work permit.

xiii) All detectors should be calibrated as per recommendation of the manufacturer.

xiv) No system should be by-passed which affects the system of platform.

xv) In H_2S field platforms, due care shall be taken as per recommendations.

xvi) Follow the instructions of F.P.S. during stay at platform

6.12.5 Fire Prevention And Control

i) Provision be made for safe handling and storage of dirty rags, trash, and waste oil. Flammable liquids and chemicals applied on platform should be immediately cleaned.

ii) Paint containers and hydrocarbon samples, gas cylinders for welding and cutting should be stored properly. Cylinders should be transported in hand-cart.

iii) Smoking should be restricted and no smoking area should be identified.

iv) Special attention should be given to crude oil pump seals, diesel and gas engines which are potential source of ignition in the event of failure.

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v) Fire and smoke detectors i.e. ultraviolet heat, thermal and smoke detector should be function tested once in three months.

vi) Fire is controlled in offshore by water spraying, Halon, CO_2 flooding, DCP and sprinkler system.

vii) Foaming agent is applied for controlling fire in liquid hydrocarbon. The system is not effective in gas fire.

viii) Light weight breathing system should be used.

ix) The fire control plan at offshore should reveal control station, fire alarms and fire detectors, deluge valves and sprinkler, fire extinguishing appliances, fireman outfit and ventilation system.

x) Fire fighting equipment should be maintained in ready to use condition.

6.12.6 Life Saving Appliances

i) Life boats with a speed of 6 knots and carrying capacity upto 50 persons are used in offshore.

ii) No. of life boats on one installation should have a capacity to accommodate twice the number of persons onboard installation.

iii) Launching appliances and life boat equipment should be checked every week.

iv) Boat landing areas should be adequately illuminated.

v) Life raft has no power and they rely on drift.

vi) Life jacket lifts the wearer after entering water.

vii) Life buoys are used to rescue persons if any person accidentally falls in the sea.

viii) All life saving appliances should be inspected by the MMD surveyor /sr. officials once a year.

ix) Every life boat shall be inspected once a week.

x) Every life boat and life raft should be serviced once a year by a competent authority,

6.12.7 Safety Precautions during Helicopter Transportation

i) Passenger briefing regarding safety rules while travelling in helicopter should be carried out before boarding the helicopter.

ii) Emergency procedure should be briefed to all the passenger In case helicopter is to ditch into the sea.

iii) Heli-pad should have a non-skid surface. Nylon rope net should be stretched on the deck.

iv) Proper drainage should be available on helideck.

v) There should be no obstruction on the helideck itself and within 3 meters of its parameter. Closest super structure above the helideck should have red obstruction light.

vi) While landing fire crew of two persons should be standby adjacent to helideck.

vii) Heli-deck should be properly illuminated for night landing.

viii) During switching off helicopter, persons should not be allowed to go out/ towards helicopter

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6.13 DEMOLITION

6.13.1. General provisions

i) When the demolition of any building or structure might present danger to workers or to the public:

(a) necessary precautions, methods and procedures should be adopted, including those for the disposal of waste or residues;
(b) the work should be planned and undertaken only under the supervision of a competent person.

ii) Before demolition operations begin:

(a) structural details and builders' drawings should be obtained wherever possible;
(b) details of the previous use should be obtained to identify any possible contamination and hazards from chemicals, flammables, etc.;
(c) an initial survey should be carried out to identify any structural problems and risks associated with flammable substances and substances hazardous to health. The survey should note the type of ground on which the structure is erected, the condition of the roof trusses, the type of framing used in framed structures and the load-bearing walls;
(d) a method of demolition should be formulated after the survey and recorded in a method statement having taken all the various considerations into account and identifying the problems and their solutions;

iii) All electric, gas, water and steam service lines should be shut off and, as necessary, capped or otherwise controlled at or outside the construction site before work commences.

iv) If it is necessary to maintain any electric power, water or other services during demolition operations, they should be adequately protected against damage.

v) As far as practicable, the danger zone round the building should be adequately fenced off and sign posted. To protect the public a fence 2m high should be erected enclosing the demolition operations and the access gates should be secured outside working hours.

vi) The fabric of buildings contaminated with substances hazardous to health should be decontaminated. Protective clothing and respiratory devices should be provided and worn.

vii) Where plant has contained flammable materials, special precautions should be taken to avoid fire and explosion.

viii) The plant to be demolished should be isolated from all other plant that may contain flammable materials. Any residual flammable material in the plant should be rendered safe by cleaning, purging or the application of an inert atmosphere as appropriate.

ix) Care should be taken not to demolish any parts, which would destroy the stability of other parts.

x) Demolition activities should not be continued under adverse climatic conditions such as high winds, which could cause the collapse of already weakened structures.

xi) To prevent hazards parts of structures should be adequately shored, braced or otherwise supported.

xii) Structures should not be left in a condition in which they could be brought down by wind pressure or vibration.

xiii) Where a deliberate controlled collapse technique is to be used, expert engineering advice should be obtained, and:

(a) it should only be used where the whole structure is to come down because it relies on the removal of key structural members to effect a total collapse;

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(b) it should only be used on sites that are fairly level and where there is enough surrounding space for all operatives and equipment to be withdrawn to a safe distance.

xiv) When equipment such as power shovels and bulldozers are used for demolition, due consideration should be given to the nature of the building or structure, its dimensions, as well as to the power of the equipment being used.

xv) If a swinging weight is used for demolition, a safety zone having a width of at least one-and-a-half times the height of the building or structure should be maintained around the points of impact.

6.13.2. Demolition of structural steelwork

i) All precautions should be taken to prevent danger from any sudden twist, spring or collapse of steelwork, ironwork or reinforced concrete when it is cut or released.

ii) Steel construction should be demolished tier by tier.

iii) Structural steel parts should be lowered and not dropped from a height.

6.14 RADIOGRAPHY

6.14.1 All radiography jobs shall be carried out as per BARC Safety Regulations

6.14.2 During field radiography, nearby area around the radiation source should be cordoned off.

6.14.3 If the field radiography is to be done at the same location repeatedly, it is advisable to provide either a wire fencing around or a temporary brick enclosure.

6.14.4 Special permission/permit should be taken for radiography from area-in-charge.

6.14.5 As far as possible, field radiography should be done only during night time when there is little or no occupancy there.

6.14.6 Radiation warning signals should be pasted all along the cordoned off area.

6.14.7 Entry into the restricted area by unauthorised persons should be strictly prohibited during exposure.

6.14.8 The radiation level alongwith the cordon should be monitored by a suitable and well-calibrated radiation survey meter.

6.14.9 All personnel working with radiography sources should wear appropriate protective equipment and film badges issued by BARC.

6.14.10 Protection facilities such as manipulator rod, remote handling tongs, lead pots, radiation hazard placards and means of cordon off shall be available at each site.

6.14.11 The radiography source shall never be touched or handled directly with hands.

6.14.12 The package containing radiography cameras and sources should never be carried by public transport like bus, train etc.

6.14.13 Radiography sources and cameras, when not in use, should be stored inside a source pit with lock and key arrangement as approved by BARC. The storage room should preferably be located in an isolated area of minimum occupancy and radiation level outside the storage room should not exceed 0.25 mR/hr as per BARC Regulations.

6.14.14 In case of an accident (due to loss or of damage to radiography source), action should be taken in line with BARC Safety Rules/Guidelines.

6.15 SAND/SHOT BLASTING/ SPRAY PAINTING

6.15.1 Sand blasting should be used only after approval from competent person.

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6.15.2 Air Compressor used for sand/shot blasting/painting should have guard and positioned away from the work place.

6.15.3 Exhaust of the prime mover, if IC engine is used, should be directed away from the work place.

6.15.4 In case of motor driven compressor, the body of the motor as well as the compressor to be properly earthed.

6.15.5 The hoses used for compressed air should be of proper quality, and health of the same to be ensured through regular check/ test.

6.15.6 The operator of sand/shot blasting/painting should wear suitable PPE's including mask.

6.15.7 Adequate measures to be taken to suppress dust/spray particle.

6.15.8 Sand used for sand blasting should be suitably covered & protected from to rain/moisture.

6.15.9 When these activities are done in confined places, adequate measure to be taken for proper ventilation.

6.16 WORK ABOVE WATER

6.16.1 General Provisions

i) Where work is done over or in close proximity to water & where possibility of drowning exists, provision should be made for:
   a) Preventing workers from falling into water;
   b) The rescue of workers in danger of drowning;
   c) Safe and sufficient transport.

ii) Provisions for the safe performance of work over or in close proximity to water should include, where appropriate, the provision and use of suitable and adequate:

   a) fencing, safety nets and safety harnesses;
   b) lifebuoys, life jackets and manned boats;
   c) protection against such hazards as reptiles and other animals.

iii) Gangways, pontoons, bridges, footbridges and other walkways or work places over water should:
   a) possess adequate strength and stability;
   b) be sufficiently wide to allow safe movement of workers;
   c) have level surfaces free from tripping hazards;
   d) be adequately lit when natural light is insufficient;
   e) where practicable and necessary, to prevent danger, be provided with toe-boards, guard rails, hand ropes etc.
   f) be secured to prevent dislodgment by rising water or high winds;
   g) if necessary, be equipped with ladders which should be sound, of sufficient strength and length and be securely lashed to prevent slipping.

iv) All deck openings including those for buckets should be fenced.

6.16.2 Rescue & Emergency procedures

i) Persons who work over water should be provided with some form of buoyancy aid. Life jackets should provided sufficient freedom of movement, have sufficient buoyancy to bring persons to the surface and keep them afloat face upwards, be easily secured to the body, be readily visible by way of self luminous paint/strip.

ii) Nobody should work alone on or above water.

iii) Each worker should be trained in the procedure to be followed in the event of an emergency.

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7.0 ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS

In addition to general safety precautions as outlined above for the activities in Clause 6.0, following additional safety precautions need to be taken for the sites within the operating area or nearby, where presence of Hydrocarbons cannot be ruled out.

i) No job shall be carried out without a valid permit. Permit should be in line with OISD-STD-105 "Work Permit System".

ii) Smoking should be prohibited in all places containing readily combustible or flammable materials and "No Smoking" notices be prominently displayed.

iii) In confined spaces and other places where flammable gases, vapours or dusts can cause danger, following measures should be taken:

(a) only approved type electrical installations and equipment, including portable lamps, should be used;
(b) there should be no naked flames or source of ignition;
(c) oily rags, waste and clothes or other substances liable to spontaneous ignition should be removed without delay to a safe place;
(d) ventilation should be provided.

iv) Regular inspections should be made of places where there are fire risks. These include the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations.

v) Welding, flame cutting and other hot work should only be done after issuance of work permit in line with the requirement of OISD-STD-105 after appropriate precautions, as required, are taken to reduce the risk of fire. For carrying out other jobs also, OISD-STD-105 should be followed strictly.

vi) Fire-extinguishing equipment should be well maintained and inspected at suitable intervals by a competent person. Access to fire-extinguishing equipment such as hydrants, portable extinguishers and connections for hoses should be kept clear at all times.

vii) All supervisors and a sufficient number of workers should be trained in the use of fire-extinguishing equipment, so that adequate trained personnel are readily available during all working periods.

viii) Audio means to give warning in case of fire should be provided where this is necessary to prevent danger. Such warning should be clearly audible in all parts of the site where persons are liable to work. There should be an effective evacuation plan so that all persons are evacuated speedily without panic and accounted for and all plant and processes shut down.

ix) Notices should be posted at conspicuous places indicating:

(a) the nearest fire alarm;
(b) the telephone number and address of the nearest emergency services.

x) The work site shall be cleared of all combustible materials, as Sparks and molten metal coming from the welding job can easily ignite combustible materials near or below the welding site. If the combustible materials cannot be removed from the area, the same shall be properly shielded.

xi) A dry chemical type fire extinguisher shall be made available in the work area. Also fire protection facilities like running hoses etc. as per permit should be complied with.

xii) Wherever required, welding screens shall be put up to protect other equipment in adjoining areas against flying sparks. Material used should be metal/asbestos/water curtain.

xiii) Welding or cutting of vessels/ equipments used in Hydrocarbon/ hazardous chemicals shall be done after proper gas freeing and verifying the same with the explosive-meter.

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xiv) The confined space/equipment shall be gas freed and cleaned.

xv) Absence of any toxic gas and any flammable gas above explosion limit shall be ensured with the help of gas detection instrument and explosive meter respectively.

xvi) Used and hot electrode stubs shall be discarded in a metal bucket.

xvii) Use approved and certified flame arrestors for vehicles.

xviii) Work permit to be obtained, if construction work is carried out within existing operating area.

8.0 FIRST AID

First aid facilities should be provided in line with various statutory regulations like factory act etc. However following care should be taken:

i) First aid, including the provision of trained personnel should be ensured at work sites. Arrangement should be made for ensuring the medical attention of the injured workers. First aid box should be as per the Factory rules.

ii) Suitable rescue equipment, like stretchers should be kept readily available at the construction site.

iii) First-aid kits or boxes, as appropriate and as per statutory requirements, should be provided at workplaces and be protected against contamination by dust, moisture etc.

iv) First-aid kit or boxes should not keep anything besides material for first aid in emergencies.

v) First-aid kits and boxes should contain simple and clear instructions to be followed, be kept under the charge of a responsible person qualified to render the first aid and be regularly inspected and stocked.

vi) Where the work involves risk of drowning, asphyxiation or electric shock, first-aid personnel should be proficient in the use of resuscitation and other life saving techniques and in rescue procedures.

vii) Emergency telephone numbers of nearby Hospitals, Police, Fire Station and Administration should be prominently displayed.

9.0 DOCUMENTATION

The intention of keeping documentation of all types of accident(s) is to prevent recurrence of similar accident(s). All accidents should be reported as per OISD Guidelines (OISD-GDN-107) and Factories act, 1948.

All accidents (major, minor or near miss) should be investigated, analysed and recommendations should be documented along with implementation status.

All related data should be well-documented and further analysis highlighting the major cause(s) of accidents be done. This will help in identifying thrust areas and training needs for prevention of accidents.

10.0 SAFETY AWARENESS & TRAINING

Safety awareness to all section of personnel ranging from site-in-charge to workmen helps not only preventing the risk but also build up the confidence. Time and expenditures also get saved as a result.

Safety awareness basically seeks to persuade/inform people on safety besides supplementing skill also. Awareness programme may include followings:

i) **Poster:** Posters with safety slogan in humorous, gruesome demonstrating manner may be used to discourage bad habits attributable to accidents by appealing to the workers'

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pride, self-love, affection curiosity or human aspects. These should be displayed in prominent location(s).

ii) **Safety Sign Boards**: Different type of message of cautioning, attention, notice etc. should be displayed at the appropriate places for learning/ awareness of the workmen while working at site.

iii) **Films & Slides:** Film(s) narrating the accident including the causes and possible remedial ways of preventing the recurrence of a similar accident should be displayed at regular intervals. Slides consisting main points of the film show may also be shown to workers.

iv) **Talks, lectures & conferences:** The success of these events would depend much on audience's understandings of the speaker (s). The speakers are to be knowledgeable and good presenter. Speakers should know to hold the attention and to influence the audiences.

v) **Competitions:** Organise competition(s) between the different deptts/categories of workers. The sense of reward/recognition also will improve safety awareness and result in enhancing safety levels.

vi) **Exhibitions:** Exhibitions also make the workers acquainted with hazards and means of preventive measures.

vii) **Safety Publication:** Safety publications including pocket books dealing with ways of investigation and prevention in the field of safety and so on, may be distributed to workers to promote the safety awareness.

viii) **Safety Drives:** From time to time, an intensive safety drive by organising a safety day or a safety week etc. should be launched.

ix) **Training:** Training for covering the hazards for different trade should be imparted. Training should also include the specific hazards related to a job in addition to the general safety training as has been dealt in various chapters and should include all workers. Reference may be drawn from OISD-STD-154.

11.0 REFERRENCES

i) *Factory Act, 1948*

ii) *Indian Electricity Rules*

iii) *Safety & Health in Construction by ILO*

iv) *The Building & Other Construction Workers (Regulation, Employment and Conditions of Service) Act 1996*

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ANNEXURE I

LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS

Sr.no	Code No.	Title
01.	IS : 818	Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations – First Revision.
02.	IS : 875	Code of practice for Structural safety of buildings: Masonry walls
03.	IS : 933	Specification for Portable Chemical Fire Extinguisher, Foam Type – Second Revision.
04.	IS : 1179	Specification for Equipment for Eye and Face Protection during Welding – First Revision.
05.	IS : 1904	Code of practice for Structural safety of buildings: Shallow foundations
06.	IS : 1905	Code of practice for Structural safety of buildings: Masonry walls
07.	IS : 2171	Specification for Portable Fire Extinguishers, Dry Powder Type – Second Revision.
08.	IS : 2361	Specification for Building Grips – First Revision.
09.	IS : 2750	Specification for Steel Scaffoldings.
10.	IS : 2925	Specification for Industrial Safety Helmets – First Revision.
11.	IS : 3016	Code of Practice for Fires Precautions in Welding and Cutting Operations – First Revision.
12.	IS : 3521	Industrial safety belts and harnesses
13.	IS : 3696 – Part I	Safety Code for Scaffolds and Ladders : Part I – Scaffolds.
14.	IS : 3696 – Part II	Safety Code for Scaffolds and Ladders : Part II – Ladders.
15.	IS : 3764	Safety Code for Excavation Work.
16.	IS : 4014 -Part I & II	Code of practice for Steel tubular scaffolding
17.	IS : 4081	Safety Code for Blasting and Related Drilling Operations.
18.	IS : 4082	Recommendations on staking and storage of construction materials at site
19.	IS : 4130	Safety Code for Demolition of Buildings – First Revision.
20.	IS : 4138	Safety Code Working in Compressed Air-First Revision
21.	IS : 4756	Safety code for Tunneling works
22.	IS : 4912	Safety requirements for Floor and Wall Openings, Railings and toe Boards –First Revision.
23.	IS : 5121	Safety Code for Piling and other Deep Foundations.
24.	IS : 5916	Safety Code for Construction involving use of Hot Bituminous Materials.
25.	IS : 5983	Specification for Eye Protectors – First Revision.
26.	IS : 6922	Structures subject to underground blasts, criteria for safety and design of

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27.	IS : 7155	Code of recommended practices for conveyor safety
28.	IS : 7205	Safety Code for Erection on Structural Steel Works.

Sr.no	Code No.	Title
29.	IS : 7069	Safety Code for Handling and Storage of Building Materials.
30.	IS : 7293	Safety Code for Working with Construction Machinery.
31.	IS : 7323	Guidelines for operation of Reservoirs
32.	IS : 7969	Safety code for handling and storage of building material
33.	IS : 8758	Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals.
34.	IS : 8989	Safety Code for Erection of Concrete Framed Structures.
35.	IS : 9706	Code of Practices for construction of Arial ropeways for transportation of material
36.	IS : 9759	Guidelines for de-watering during construction
37.	IS : 9944	Recommendations on safe working load for natural and man-made fibre roap slings
38.	IS : 10291	Safety code for dress divers in civil engineering works
39.	IS :10386 – Part I	Safety Code for Construction, Operation and Maintenance for River Valley Projects.
40.	IS :10386 – Part II	Safety Code for Construction, Operation and Maintenance of River Valley Projects.
41.	IS : 11057	Code of practice for Industrial safety nets
42.	IS : 13415	Code of Practice on safety for Protective barriers in and around building
43.	IS : 13416	Recommendations for preventive measures against hazards at working places

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OISD – GDN – 207

FOR RESTRICTED CIRCULATION ONLY

OCTOBER 2002

CONTRACTOR SAFETY

OISD – GUIDELINES – 207

Oil Industry Safety Directorate
Government of India
Ministry of Petroleum & Natural Gas

CONTRACTOR SAFETY

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CONTRACTOR SAFETY

1.0 INTRODUCTION

Oil and Gas operations like Drilling, Production, Refining, Transportation and Distribution are inherently hazardous. A large number of contractor workforce is deployed to carry out construction, maintenance and other jobs. The analysis of the incidents in the Petroleum Sector indicates that a large number of incidents involved contractor workforce and have resulted in either casualty or injury besides leading to property damage and operational interruptions and environmental degradation.

In order to improve the safety levels of oil installations, the contractor safety is of utmost importance and there is a need to institute a good contractor safety system.

2.0 SCOPE

This standard covers broadly the guidelines on the management system for enhancing the safety levels of the contractor workforce deployed in construction, maintenance and operation activities in the hydrocarbon industry.

The safety precautions to be taken while carrying out different activities during construction / maintenance have separately been covered in OISD-GDN-192 on "Safety Practices during Construction".

3.0 DEFINITIONS

Work station/Work site

A place/unit where the job is carried out by contractor/executing agency in specified manner with safety, during construction phase or in operation phase.

Owner

Any physical or legal person/entity for whom prescribed job is carried out.

It shall also include owner's designated representative / consultant /nominee / agent, authorised from time to time to act for and on its behalf, for supervising / co-ordinating the activities of the contractor/execution agency.

Contractor / Executing Agency

A physical or legal person/entity having contractual obligation with the owner, and who deploys one or more worker on the site.

Contractor Worker

It covers all workmen who are either self-employed or employed through contractor, the casual workers and includes contractor's supervisor, working at a location / site employed directly by Owner or through their contractor.

Incident

An incident is an unplanned, uncontrolled, unintended or unforeseen event, caused by unsafe acts and / or unsafe conditions, resulting in or having the potential to result in personal injury and/or property damage.

Consultant

Consultant is a physical or legal person/entity engaged by owner to provide the consultancy services to owner for management of the contract on their behalf or as specified.

Designer

Designer is a physical or legal person / entity engaged by owner to provide design services of a work site.

Owner's Representative / Engineer In Charge

The Owner's representative/Engineer-in-charge is the one, who has been designated by the owner to manage the contract.

Owner's Safety Officer

A properly trained person designated by owner who ensures safety at work site.

4.0 DUTIES/ RESPONSIBILITIES

4.1 OWNER

4.1.1 Owner's Management

The commitment to safety has to be emphasised by the owner by practice by its own management and employees at all levels. The duties and responsibilities of owner should include:

i) To institute a mechanism for identification and compliance of all applicable statutory rules & regulations (Refer Annexure I for a list of few important Bureau of Indian Standards & statutory regulations).

ii) To provide specific information to contractors and make workers aware on the hazards associated with job assigned.

iii) To provide information about Risk Mitigation measures available at the place of work.

iv) To provide the contractor with information on Owners Safety Plan & Regulations, Emergency Management Plan, lockout/ tag out procedure, confined space entry, work permit system, excavation/trench permit system etc.

v) To specify rules (e.g. for security including access arrangements) and safety rules such as fire protection, first aid arrangements, Work Permit systems etc.

vi) To provide comprehensive list of statutory regulations / standards and specification, to be complied with during execution of contract, in the tender document itself.

vii) To ensure training of the contractor workforce, medical examination, and proper usage of safety equipment.

viii) To specify the requirements of Health, Safety and Environment (HSE) (commensurate with the nature of job) in Pre- Qualification criteria.

ix) To designate Engineer-in-charge and safety officer.

x) To arrange for a multi-disciplinary safety audit team to conduct surprise / regular safety audits and monitor the implementation of the recommendations.

xi) To introduce suitable schemes for motivation of the contractor worker to adhere to safety guidelines.

xii) To review safety practices & their implementation through periodic surprise visit of the work sites and monthly review meeting.

xiii) To develop the HSE plans and incorporate the same in the tender document.

xiv) To liaise with external agencies like press, public etc and with law enforcement, regulatory, statutory agencies etc.

xv) To report to statutory agencies on safety compliance and accidents, if any.

4.1.2 Owner's Representative/Engineer-in-charge

The duties & responsibilities of engineer-in-charge should include:

i) To ensure that all Contract requirements including Health, Safety, Environment & Security are complied with.

ii) To ensure that contractor workforce deployed is adequately qualified, trained and in state of health to commensurate with the requirements of the job.

iii) To ensure that the Tools / Tackles and Machinery being used are properly

tested and are in sound working conditions and necessary resources proposed for providing safe place of work and necessary PPE are being used.

iv) To take the required necessary corrective action immediately upon noticing or receipt of a report on noncompliance or any such condition which poses a threat to health, safety or environment. If during the course of execution of the contract, any situation of non-compliance with the contractor's safety and health plan are noticed / reported, the same will be taken up with the contractor for correction. In the event of repeated non compliance, suitable action to be initiated as per the contract.

v) To ensure that the incidents are reported to all concerned within stipulated timeframe.

vi) To ensure submission of a plan for safe working (Method Statement) from contractor and approval of the same by competent person / department.

vii) To ensure that Work Permit System in line with OISD-STD-105 is adhered to.

viii) To ensure availability of all the documentation needed for the execution of contract.

ix) To ensure that the quality controls have been maintained during fabrication/erection and all jobs required for safe commissioning have been carried out.

x) To ensure safe dismantling of all temporary facilities/connections put up by the contractor, after completion of work.

xi) To compile a report on the safety performance (at the conclusion of each contract or periodically such as annually for renewable and long-term contracts), which is to be considered in future when selecting contractors.

xii) To ensure that the Consultant, contractor and sub-contractor employ / designate qualified & trained Safety Engineer / Officer commensurate with requirement of the job.

4.1.3 Owner's Safety Officer

The duties & responsibilities of the Owner's Safety Officer should include:

i) To assess the hazards associated with jobs in consultation with all concerned and establish safe working procedure including identification of the escape routes.

ii) To establish a written record of factors which can cause injuries and illnesses.

iii) To undertake routine/surprise inspections of all work sites and identify unsafe conditions & practices, if any. Check for compliance of the safety practices being followed with approved HSE Plan.

iv) To investigate promptly the incidents (including near-miss) in order to advise corrective and/or preventive action.

v) To maintain statistical information for use in analyzing all phases of incidents and events involving contract personnel.

vi) To provide the means for complying with the reporting requirements for occupational injuries and illnesses.

vii) To check whether the proposed working arrangements are safe and satisfactory, particularly at the interface between the contractor's planned work and owner’s existing facilities.

viii) To communicate to the Contractor the imposed restrictions which may affect the work/personnel such as the temporary closure of a corridor or electrical isolation of equipment.

ix) To review and monitor the contractor's adherence to approved HSE plan and all applicable environmental, health, and safety requirements.

x) To ensure that Consultant, Contractor's Managers, Supervisors and workmen at all levels (who will plan, monitor, oversee and carry out the work) undergo Health, Safety and Environmental training in their respective responsibilities with respect to conducting work safely and with due regard for the protection of the environment.

xi) To identify areas of operations where specialized training is required to deal with potential dangers.

xii) To document and to bring to the attention of the Owner's Supervisor and Contractor any non-compliance/violation of the safety norms against approved safety and health plan or safety and health requirements and also raise these issues in the Safety Committee Meetings.

xiii) To take part in Tool Box Meetings at random and to ensure maintenance of records.

4.2 CONTRACTOR

4.2.1 Contractor's Management

Duties & responsibilities of the contractor should include the following:

i) To implement safe methods and practices, deploy appropriate machinery, tools & tackles, experienced supervisory personnel and skilled work force etc. required for execution.

ii) To prepare a comprehensive and documented plan for implementation, monitoring and reporting of Health, Safety and Environment (HSE) and implement the same after its approval.

iii) To nominate qualified & trained Safety Engineers / Officers reporting to the Site in charge, for supervision, co-ordination and, liaison for the implementation of the safety plan.

Similar HSE Plan should be implemented at the sub- contractor's or supplier's site /office. However the compliance with the HSE Plan is to be the sole responsibility of the Contractor.

iv) To arrange suitable facilities in liaison with the owner for drinking water, toilets, lighting, canteen, crèche etc as applicable as per Laws/ Legislation at site and also arrange for workmen compensation insurance, third party liability insurance, registration under ESI / PF act etc as applicable.

v) To arrange for fire protection equipment as per the advice of owner.

vi) To ensure that its employees have completed appropriate health and safety training as required by the statute / regulation and also as per requirements of the Owner / Consultant. The documentation of such training imparted to all its employees should be maintained and produced for verification as required.

vii) To comply with all the security arrangements of owner.

viii) To ensure that the plant and equipment used on-site by him / his employees is correctly registered, controlled and maintained in sound working condition.

ix) To ensure availability of First Aid boxes and First Aid trained attendant.

x) To ensure that all incidents including near misses are reported to all concerned immediately.

In construction projects where sub-contractors are engaged, the contractor should set out the responsibilities, duties and safety measures that are expected of

the sub-contractor's workforce. These measures should include the provision and use of specific safety equipment, methods of carrying out specific tasks on safety and the inspection and appropriate use of tools.

The responsibilities indicated separately under contractor's Supervisor, Safety Officer and contract worker are contractually that of the Contractor and legally binding on the Contractor only. However the specific detailing as above has been given separately for guidance and operational convenience.

The selection of sub contractors, if employed, should be approved by the owner. Sub-contractor should comply fully with all safety rules and conditions applicable to the main contractor.

4.2.2 Contractor's Supervisor / Safety Officer

Duties & responsibilities of the Contractor's supervisor/Safety Officer should include the following:

i) To ensure strict compliance with work permit system by carrying out work only with appropriate work permits and after ensuring that all safety precautions / conditions in the permit are complied with and closing the same after job completion.

ii) To ensure that required guards and protective equipment are provided, used, and properly maintained.

iii) To ensure that tools and equipment are properly maintained and tested.

iv) To plan the workload and assign workers to jobs in commensuration with their qualification, experience and state of health.

v) To ensure that the workers understand the work to be done, the hazards that may be encountered, and the proper precautions/procedure for carrying out the work safely.

vi) To take immediate action to correct any violation of safety rules observed or reported.

vii) To ensure that the workers likely to be exposed to hazardous chemicals/materials have access to appropriate Material Safety Data Sheets (MSDS), wherever applicable, and provide necessary mitigation measures.

viii) To ensure inspection and certification of all tools (hand operated as well as mechanically operated) being used. Defective tools shall be immediately removed.

ix) To ensure that appropriate warning signboards or tags are displayed.

x) To ensure that workers have proper training for their job assignments, including use of appropriate PPE and first aid fire fighting equipment.

xi) To comply with all applicable safety and health standards, rules, regulations and orders issued by competent authority pertaining to the assigned activities.

xii) To ensure that sick and/or injured workers receive appropriate first aid and/or medical attention.

xiii) To report each incident and/or injury in accordance with established procedures and assist in investigation.

xiv) To take necessary action for correction of any unsafe act / condition at the workplace. However, in case the same is outside the limits of authority, it should be reported to Owner's Engineer-in-charge immediately.

xv) To conduct daily inspections to ensure compliance with safety standards, codes, regulations, rules and orders applicable to the work concerned.

xvi) To ensure that workers under their supervision are aware of their responsibilities.

xvii) To arrange daily tool box meeting and regular site safety meetings and maintain records in the required formats. (Refer Clause 5.9.1)

xviii) To arrange stand-by supervisor/ worker where situations so demand.

xix) To develop methods and display banners/posters to inculcate safety consciousness.

xx) To attend training and ensure participation of his workers for training as per schedule arranged by the Owner / Consultant and keeps himself updated.

xxi) To keep records of number of persons working at the site.

xxii) To keep a constant liaison with Engg-in-charge / owners' representative on safety issues.

xxiii) To maintain accident & nearmiss record in a register.

xxiv) To ensure that only PPE of the approved type by owner is used at site.

A separate Safety Officer should be assigned, where more than 100 workers are employed at site. For smaller jobs, the supervisor should assume the role of the safety officer also.

4.2.3 Contract workers

The duties & responsibilities of the contractor worker should include the following:

i) To perform work safely as per the job requirement and instructions.

ii) To inform all concerned regarding unsafe conditions/acts.

iii) To wear PPE as stipulated and necessary for the job.

iv) To inform promptly to their supervisor regarding all work related incidents resulting in personal injury, illness and/or property damage.

v) To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

4.3 CONSULTANT

The activities and responsibilities covered under the scope of the Owner may be delegated to the consultant in those cases as applicable, based on the respective contract conditions. The primary responsibility of Consultant is to ensure compliance with agreed HSE plan for the contract by the Contractor. However those responsibilities conferred on Owner as Principal employer cannot be delegated to consultant.

Where the consultant's scope involves Engineering and Design, those factors under **Designer** should also be applicable.

In all cases, the Consultant's scope should include submission of latest HSE plans for work under his and Contractor's purview and implementing the same till job completion. It should conform to owner's overall HSE plan. This should include Guidelines and Implementation and Reporting Methodology to be followed with required report formats.

Adequate number of Safety Officers shall be provided by the Consultant with necessary skills required for the work to be performed.

The Consultant shall review the documents submitted by the contractor and advise owner on acceptance as well as advise suitability and number of Contractor's safety officers / supervisors.

4.4 DESIGNER

The Process Designer should identify all hazards and risks likely to be encountered during fabrication, erection including

dismantling, Pre-commissioning, commissioning and Performance run to meet the Guarantees and advise the risk mitigation measures.

All the hazards and safety measures to be adopted while handling Dangerous chemicals and Catalysts should be detailed by the Process Licensor and the same should be again included in the scope of the suppliers. Specific write ups/MSDS should be obtained from Patented single source suppliers also.

Designs should recognize, include and apply safe practice during preparation, construction and subsequent operational use and maintenance after completion of the Project.

All documents including drawings and calculations are to be originated, checked and approved in accordance with latest international codes, standards, specifications and design basis philosophy.

Preferred use of low risk materials, policy on hazardous substances, preferred use of low noise and dust-suppressed equipment etc. should be encouraged.

5.0 SAFETY MANAGEMENT

5.1 JOB SAFETY ANALYSIS (JSA)

Job safety analysis (JSA) provides a mechanism by which the contractor, safety officer or supervisor take a detailed look at how an individual task is performed and its inherent hazards and preventive measures. This procedure helps in integrating accepted safety and health principles and practices into a particular operation. In a JSA, each step of the job is examined to identify potential hazards and to determine the safest way to do the job.

A job safety analysis includes five steps as below:

- Select a job
- Break the job down into a sequence of steps
- Identify the hazards against each of these steps (based on knowledge of accident, causes of injuries and personal experience) and determine the preventive measures to overcome these hazards
- Apply the controls to the hazards
- Evaluate the controls

5.2 CRITERIA OF SELECTION OF A CONTRACTOR

“Contractor Safety” can be ensured to a large extent if competent agency for execution of assignment or job, based on HSE system agreed upon by owner, is selected. It is necessary to assess his capabilities and competencies to perform work safely.

A databank should be developed for all the contractors for their past performance on HSE aspects. An attempt should also be made to get similar data from other similar industries.

The data required will depend upon complexity involved in the job and type / size of resources required. Format needs to be suitably developed depending upon size, nature of the job & hazard associated therein. The format designed should also take care of the skill required to carry out the job.

Performance review is essential for all type of contractors. It helps in recording actual performance/experience with contractors while the contract is in progress. It is essential that resources agreed as per the contract are reviewed at mobilization stage for ensuring compliance from the day one and thorough effective supervision / monitoring system are at place.

This activity also helps in taking timely action in case of unsatisfactory performance to correct the situation and ensure safe work during execution period and deciding about suitability of the contractor for future jobs.

The periodicity of such performance review will depend upon size/type/complexity of contract. However, the performance should be reviewed at least at mobilisation stage and at the end of the contract.

5.3 SITE PLANNING AND LAYOUT

Before starting the construction/maintenance job at existing workplace in operation or green field locations, following should be ensured: -

i) Details regarding location of workshop/ fabrication yard, site office, stores, laboratory, electrical installations, placement of construction machinery, medical and welfare facilities, lighting underground and above ground piping route, cable route etc. should be decided prior to commencement of the work in consultation with owner / Consultants and implementation should be ensured. Layout should be displayed at strategic locations.

ii) The resources required to meet any emergency situations like fire fighting, first aid etc. should be planned and mobilized as per the job requirement.

iii) The sequence or order in which work to be done and any hazardous operations or processes should be identified.

iv) Free access to site shall be provided with clear roads, passage, gangways, staircases etc. Access to construction site should be leveled, open and free from any obstructions like construction material or scrap/waste, exposure to hazards such as falling materials, material handling equipment and vehicles. Any pit or ditch shall be covered or barricaded.

v) Arrangements should be made to maintain good housekeeping at site. Scrap and debris generated out of construction work should be removed/disposed off at a regular interval as directed. Emergency exit should be provided in case of blockade of primary exit.

vi) Suitable warning notices and also the routes to and from welfare facilities should be displayed prominently.

vii) Pedestrian pathways and routes for vehicular traffic (light/heavy vehicles including material handling equipment) should be earmarked.

viii) Artificial lighting to be provided at places where work continues or workers pass by after sunset or in case natural light is insufficient like confined spaces.

ix) Keep all equipment /machines under cover to prevent them from dust, rain/flood water, heat etc. and follow storage instructions as applicable for each of them.

5.4 GATE ENTRY PROCEDURE

Gate entry at any site / workplace / unit is to be restricted to ensure entry of only authorised persons / vehicles.

5.4.1 Entry procedure for all contractor worker should be as follows:

A. Issuance of Pass

i) The passes are to be issued after the owner's representative/engineer-in-charge forwards the application of the contractor providing complete details of the workers being engaged. The contractor may be asked to submit Character & Antecedents (C&A) verification of individual worker from concerned authorities.

ii) With regard to issuance of passes for all vehicles including material handling equipment, owner's representative / engineer-in-charge should forward the application only after ensuring that all documents pertaining to the fitness of the vehicle/equipment and valid driving license of the driver etc. are available.

iii) The passes should be serially numbered with address, contractor name, identification mark, signature of the worker etc.

iv) Special colour code for passes should be used for persons entering different

areas like Administrative Block, Unit area, Project Area (wherever applicable).

v) Contractor workers engaged on routine basis for long periods should be provided with monthly photo pass.

vi) Special permit is required separately for working beyond normal working hours and holidays.

B. Gate Entry

i) Entry of the contractor's employees should be permitted with valid gate passes only.

ii) Entry of contractor's workers should be allowed in presence of authorized representative of contractor.

iii) Records of persons at the time of entry/exit should be maintained.

iv) At the entry gate of the location, a physical checking for non-carrying of lighter, matchboxes, explosives etc. should be carried out.

v) Gate passes/Identity Cards should be displayed on persons at all the times.

vi) For Mega-projects at existing / operating installations, it is preferable to have a separate gate for entry of contractor workers and also the project areas should be segregated fencing from operational area by fencing / other physical means.

vii) No vehicle should be allowed to enter in an operational area without proper flame arrestor.

viii) Awareness on Safety through training / posters etc. highlighting Do's and Don'ts should be spread within entire contractor workforce. Video/Audio tapes on Safety Topics should be played preferably.

ix) For occasionally engaged labourers such as for material handling etc., spot photograph may be preferably taken with two copies (one for preparing the pass and other for attachment with gate register). Specific advice and recommendation of User Department may be given due cognizance. Relevant details are to be written. The pass should be collected back at the gate after day's work.

5.4.2 Tank Truck Loading (TTL) Operation :

At the loading / unloading location, a large no. of Tank Trucks of petroleum products enter the installation. Crew members are generally not regular entrants. The procedure should be as follows:

i) The gate pass should be issued to the individual crew members on written request of the transporter mentioning TT registration nos., License and certificate of training as per MV rule 9.

ii) Character & Antecedent (C & A) verification of the TTL crew through local police is to be done preferably and record maintained.

iii) For loading/unloading purpose, register entry at security gate is made before allowing entry into the premises with recording of names of crew members, time of entry, pass Sr. No., TT no. etc.

iv) For loading/unloading, crew is allowed entry alongwith TT only, after checking of TT from explosive/security point of view.

v) Out time, invoice no., Destination etc., are recorded while TTs go out of the security gate.

5.5 TRAINING

Training is to educate contractor workforce on various hazards associated with the job/workplace and on the respective preventive / mitigation measures to avoid untoward incidents.

i) Workers should be adequately and suitably:

(a) informed of potential safety and health hazards to which they may be exposed to at their workplace;

(b) instructed and trained in the measures available for the prevention, control and protection against those hazards.

ii) No person should be employed in any work at a workplace unless that person has received the necessary information, instruction and training so as to be able to do the work competently and safely. The competent authority should, in collaboration with employers, promote training programs to enable all the workers to read and understand the information / instructions related to safety and health matters.

iii) The information, instruction and training should be given in a language understood by the worker and written, Oral, visual and participative approaches should be used to ensure that the worker has assimilated the information.

iv) Every worker should receive instruction and training regarding the general safety and health measures common to the workplace. This should include:

(a) general rights and duties of workers at the workplace;

(b) means of access and egress both during normal working and in an emergency;

(c) measures for good housekeeping;

(d) location and proper use of welfare amenities and first aid facilities provided;

(e) proper use and care of the items of personnel protective equipment and protective clothing provided to the worker;

(f) general measures for personal hygiene and health protection;

(g) fire precautions to be taken;

(h) action to be taken in case of an emergency;

(i) requirements of relevant safety and health rules and regulations.

Copies of the relevant safety and health rules, regulations and procedures should be available to workers upon the commencement of and upon any change of employment.

5.5.1 Training Techniques

a) Lectures

This technique should be applied when it is required to transfer information in local language to a large contractor workforce with controlled content and time.

b) Case Study

This is an effective technique based on the presentation of case of real events by Trainer to highlight probable causes like Human Error, ignorance about the job etc.

c) Videos

Videos, an effective technique of communication, should be used to display the right techniques of performing a task in a safe manner and hazards associated with a job.

d) Demonstration at site

Right way to do a job should invariably be demonstrated to workers at the site itself. The right way is also a safe way. Hazards due to wrong procedures, short cuts and their adverse effects etc. should also be highlighted.

5.5.2 Training/Awareness Module and Frequency

A. General Safety Training to all categories of contractor employees should be imparted before induction and annually thereafter. No person should be allowed to enter the installation without undergoing this training. This training program may cover:

i) Mandatory uses of PPE like Cotton clothes, Helmet, Safety Shoes, Safety Belts etc.

ii) Probable Hazards

iii) Important Telephone No / Escape route

iv) First Aid

v) Use of Fire extinguisher

The contractor workers, if engaged in operation of the plants/facilities, should be trained in line with Clause No. 4.6 of OISD-GDN-206 on "Safety Management System". For other categories of contractor workers, training modules for different category employees are as follows:

B. Contractor Supervisor

Contractor Supervisor should be trained in accordance with the provision of clause no. 5.1.1.2, 5.2.7, 5.3.10, 5.6.12 and 5.7.8 of OISD-STD-154 on 'Safety Aspects in Functional Training'

C. Contractor Worker

Yearly training programme should be carried out for contractor worker and the records should be maintained. The training programme should cover at least the following:

i) Worker responsibility for safety of himself and work area.

ii) Associated hazards with the job and job area including electrical shock hazards.

iii) Importance of First Aid fire fighting equipment, their use & operations

iv) Communication system at the installation

v) Fire / Accident Reporting procedure

vi) General Safety rules

vii) Safety Measures during execution of job such as:

- Welding / Cutting / Grinding
- Working at height
- Confined space entry
- X ray / radiation
- Erection / Dismantling of scaffolding
- Tank construction and repairs
- Handling of chemicals etc.

viii) Importance & use of PPE

ix) Emergency Routes

x) Assembly Points

xi) Job Specific Training

D. Consultant / Contractor

Awareness program should be carried out for Consultant / Contractor at the time of induction. This program should cover at least the following:

i) Responsibility of contractor for safety of their personnel and work area

ii) Hazardous property of Petroleum products and chemical used

iii) Communication system

iv) Fire / Accident Reporting procedure

v) Medical facility available

vi) Statutory requirements

vii) Importance of First Aid equipment and required at the site

viii) Work Permit system

ix) Direct/ Indirect losses due to accident

x) Safety Measures while executing the jobs such as:

- Welding / Cutting / Grinding
- Working at height
- Confined space entry
- X ray / radiation
- Erection / Dismantling of scaffolding
- Tank construction and repairs
- Handling of chemicals etc.
- electrical jobs

xi) Safety training needs of their supervisors and workers

xii) Importance & Use of PPE at the site

xiii) General Safety rules at the installation

E Security Personnel

Training program should be carried out for Security personnel at the time of induction and annually thereafter and the records should be maintained. The training program should cover at least the following:

i) Layout of Plant and Facilities
ii) Vulnerable locations
iii) Safety regulations (Statutory and in company)
iv) Fire Protection Facilities and Locations
v) Role in case of Fire / Disaster
vi) Emergency Procedure and Drills
vii) Industrial First Aid
viii) Use of Personnel Protective Equipment
ix) Disaster Management Plan

5.6 INSPECTION / AUDIT

Inspection / Audit is a tool to evaluate compliance of all safety requirements. Most of the information could be gathered through site inspection using ready-made check lists to ensure that contractors / agencies abide by the safety rules and norms while working at operating / construction sites.

A checklist, while carrying out different type of jobs, should be developed based on hazards associated with the job being performed and requirements as per OISD-GDN-192 on "Safety Practices during Construction". Typical format is enclosed at Annexure II, which should be modified to suit the requirement of the site / job to be done.

Before starting the work and at regular intervals thereafter, Contractor's Supervisor/safety Officer and Owner's representative / Engineer-in charge/safety Officer should inspect as per the checklist so prepared to ensure that contractor has prepared to start the work with all safety precaution required for safe execution of job.

5.7 PENALTIES FOR NON-COMPLIANCE

Financial or other type of penalties like seizure of gate passes, stoppage of work for a limited period etc. may be levied on the contractors or their workers for non-compliance of safety rules. A provision of suitable accident severity based penalty clause for contractor may be incorporated to ensure adherence of systems and procedures. A few of the usual non-compliance are as follows:

-- Non-usage of PPEs like Safety helmet / Safety shoes / Safety goggles / Respiratory protection etc. by the contractor personnel

-- Non-usage of the safety belt and life line by the workers while working at height

-- Non-provision of basic safety requirement such as 24 V lamp for working in confined space, uncertified / non standard lifting tools, earth leakage protection & earthing connections for electrical appliances as per Indian Electricity Rules, emergency isolation switches etc.

-- Violation of Safety Permit conditions like Fire fighting equipment

-- Non-barricading of area while rigging, digging etc.

-- Working without valid work permit

-- Unauthorised road closure/blockage

5.8 INCIDENT REPORTING AND INVESTIGATION SYSTEM

All the incidents including near-miss should be reported immediately by contractor's Supervisor to Contractor and owner's Supervisor/Engineer-in-charge, who should inform to Owner's Safety Officer and owner's Management. Owner's Safety Department will be required for onward reporting as per OISD, Statutory requirements.

All accidents regardless of the extent of injury or damage should be investigated in order to find probable causes, lessons learnt thereof and remedial measures required to prevent its recurrence.

The incident investigation should be done as per provision of clause no. 4.12 of OISD-GDN-206 on 'Safety Management System' . All the recommendations of investigation / Enquiry Report need to be monitored closely for its implementation. A proper record needs to be maintained to ensure implementation of all the recommendations and same should be reviewed from time to time.

5.9 SAFETY COMMITTEE MEETINGS

Following three type of safety committee meetings should be held aiming at raising the level of safety consciousness at the site:

5.9.1 Toolbox meeting

To maintain awareness, update training and convey important safety and health information, contractor supervisors should conduct tool box meetings at least weekly and also prior to start of any work. All the contractor workers should attend this meeting. The owner's supervisor/Engineer-in-charge and safety officers should also attend these meetings on random basis. Tool box meeting should be conducted more frequently depending upon circumstances. Record of the same can be maintained in the following typical format.

TOOLBOX MEETING FORM

SUBJECT :
PRESENTER :
DATE :
TIME : From….. To…..
CONTENT IN BRIEF :

Participant's Name	Signature
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5.9.2 Site Safety Committee Meeting

Primary purpose of this safety committee is to enable owner, contractor and workers to work together to monitor the site safety and health plan so as to prevent accidents and improve working condition on site. Its size and membership will depend on the size and nature of job.

The safety committee should include representatives of owner, consultant, contractor identified as safety officer/supervisor. It should be headed by Engineer-in-charge.

The safety committee should have regular and frequent meetings, atleast fortnightly, to discuss the safety and health program on site and to make suggestions for improvement. The meetings should be documented with a time bound action plan. The functions carried out by safety committee should include:

i) Review compliance of pending items of last Safety meetings.

ii) Consideration of the reports of safety personnel.

iii) Discussion of accident/near-miss and illness reports in order to make appropriate recommendation for prevention.

iv) Examination/evaluation of suggestions made by workers.

v) Dissemination of acquired knowledge through training programs and information sharing sessions.

vi) Discussion & review of Fire Prevention & Disaster Management Plan.

vii) To send recommendation to Apex Body for consideration/approvals.

5.9.3 Safety Review Meeting by Location Head

This meeting should be headed by the Location head and attended by Owner's Supervisor/Engineer-in-charge, owner's safety Officer and all concerned department heads. Prime purpose of this review is to ensure that all the recommendations of various committees are being complied with and to take decisions on critical points raised. This meeting should take place at least once in every quarter. All the investigation reports/ audit findings with status of implementation of recommendations should be discussed.

5.10 SAFETY EQUIPMENT / PERSONNEL PROTECTIVE EQUIPMENT

The type of safety equipment to be used is decided based on the job requirement. Selection should be made based on OISD-GDN-192, OISD-STD-155 (Part I & II) and the job requirement. Safety equipment / Personnel Protective Equipment (PPE) shall be of approved make. Contractor shall provide necessary training to each employee regarding proper usage and upkeep of PPE including its limitation.

A register showing stock and issue of PPE should be maintained by the contractor at site and must be available for inspection.

6.0 REFERENCES

1) OISD-GDN-206 on "Safety Management System"

2) OISD-GDN-192 on "Safety During Construction"

3) OISD-STD-155 Part(I&II) on "Personnel Protective Equipment"

4) Building & Other Construction workers (Regulation of Employment & Condition of Service) Act 1996

ANNEXURE I

LIST OF SAFETY CODES FOR CIVIL WORKS PUBLISHED BY BUREAU OF INDIAN STANDARDS

Sl.no.	Code No.	Title
1	IS: 818	Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations – First Revision.
2	IS: 875	Code of practice for Structural safety of buildings: Masonry walls
3	IS: 933	Specification for Portable Chemical Fire Extinguisher, Foam Type – Second Revision.
4	IS: 1179	Specification for Equipment for Eye and Face Protection during Welding – First Revision
5	IS: 1904	Code of practice for Structural safety of buildings: Shallow foundations
6	IS: 1905	Code of practice for Structural safety of buildings: Masonry walls
7	IS: 1989 – Part II	Leather Safety Boots and shoes for heavy metal industry
8	IS: 2171	Specification for Portable Fire Extinguishers, Dry Powder Type – Second Revision
9	IS: 2361	Specification of Building Grips – First Revision
10	IS: 2750	Specification for Steel Scaffoldings
11	IS: 2925	Specification for Industrial Safety Helmets – First Revision
12	IS: 3016	Code of Practice for Fires Precautions in Welding and Cutting Operations – First Revision
13	IS: 3521	Industrial Safety Belts and harnesses
14	IS: 3696 – Part I	Safety Code for Scaffolds and Ladders: Part I – Scaffolds
15	IS: 3696 – Part II	Safety Code for Scaffolds and Ladders: Part II – Ladders
16	IS: 3764	Safety Code for Excavation Work
17	IS: 4014 – Part I & II	Code of Practice for Steel Tubular Scaffolding
18	IS: 4081	Safety Code for Blasting and Related Drilling Operations
19	IS: 4082	Recommendations on stacking and storage of construction materials at site
20	IS: 4130	Safety Code for Demolition of Buildings – First Revision
21	IS: 4138	Safety Code for working in compressed air – First Revision

22	IS: 4756	Safety Code for Tunneling works
23	IS: 4912	Safety requirements for Floor and Wall openings, Railings and toe boards – First Revision
24	IS: 5216 – Part I & II	Recommendations on safety procedures and practices in electrical work
25	IS: 5121	Safety code for piling and other deep foundations
26	IS: 5916	Safety Code for Construction involving use of Hot Bituminous materials
27	IS: 6994 – Part I	Specifications for safety gloves: Part I – Leather and Cotton gloves
28	IS: 5983	Specification for Eye Protectors – First Revision
29	IS: 6922	Criteria for safety and design of structures subject to underground blasts
30	IS: 7155	Code of recommended practices for conveyor safety
31	IS: 7205	Safety Code for Erection on Structural Steel Works
32	IS: 7069	Safety Code for Handling and Storage of Building Materials
33	IS: 7293	Safety Code for Working with Construction Machinery
34	IS: 7323	Guidelines for operation of Reservoirs
35	IS: 7969	Safety Code for handling and storage of building materials
36	IS: 8758	Recommendation for Fire Precautionary Measures in construction of Temporary Structures and Pandals
37	IS: 8989	Safety Code for Erection of Concrete Framed Structures
38	IS: 9706	Code of Practices for construction of Arial ropeways for transportation of material
39	IS: 9759	Guidelines for de-watering during construction
40	IS: 9944	Recommendations on safe working load for natural and manmade fibre rope slings
41	IS: 10667	Guide for selection of industrial safety equipment for protection foot and leg
42	IS: 10291	Safety Code for dress divers in civil engineering works
43	IS: 10386 – Part I	Safety Code for Construction, Operation and Maintenance for River Valley Projects
44	IS: 10386 – Part II	Safety Code for Construction, Operation and Maintenance for

		River Valley Projects
45	IS: 11057	Code of Practice for Industrial Safety Nets
46	IS: 13415	Code of Practice on safety for Protective barriers in and around building
47	IS: 13416	Recommendations for preventive measures against hazards at working places

Statutory Regulations

Latest Statutory Acts and Rules, as given below, may be referred:-

1. The Petroleum Acts 1934 and Petroleum Rules 2002
2. The Factory Act, 1948 (As amended by Factory Amendment Act 1987) and concerned Factory Rules
3. The Water (Prevention and Control of Pollution) Act 1974 & Rules 1975
4. The Environment (Protection) Act 1986
5. The Manufacturing, Storage and Import of Hazardous Rules 1989
6. The Hazardous Wastes Management (Management & Handling) Rules 1989
7. The Indian Electricity Act 1901 and Rules 1956
8. The Indian Explosive Acts, 1884 & The Indian Explosive Rules 1983
9. The Gas Cylinder Rules 1981and the static & Mobile Pressure Vessels (Unfired) Rules 1981
10. The Indian Boiler Act 1923 and Regulations 1950
11. The Public Liability Act 1991 as amended in 1992
12. The Motor Vehicle act 1988 and Central Motor Vehicle rules 1989
13. Building & Other Construction workers (Regulation of Employment & Condition of Service) Act 1996

In addition to above, various other statutory acts like EPF, ESIS, Minimum wage act and other local statutory requirements shall also be complied with.

ANNEXURE II

CHECK LIST FOR SAFETY INSPECTION / AUDIT

Job _____ Location _____ Date of Audit_____Frequency _____

Inspected by _____ Contractor (s) _____

Sl.no.	ITEM	YES	NO	NA	REMARKS / ACTION
1.0	**PERSONNEL PROTECTIVE EQUIPMENT (PPE):** Are following PPEs being used as per the job requirements?				
1.1	Safety Helmets				
1.2	Safety Shoes				
1.3	Gum Boots				
1.4	Safety Belts with life line				
1.5	Gloves				
1.6	Ear Plug				
1.7	Goggles				
1.8	Shield Glass				
1.9	Face Protection				
1.10	Breathing Apparatus				
1.11	Canister Mask				
1.12	Hand wash / Eye wash/ Respirating filter / cloth				
1.13	Boiler Suit				
1.14	Others				
2.0	**HOUSE KEEPING**				
2.1	Whether Waste Bins are provided / used				
2.2	Are Passageways / Walkways clear?				
2.3	Is General neatness O.K.?				
2.4	Is the Ground free from oil, grease etc. and is not found to be slippery?				
2.5	Others				

3.0	**EXCAVATION**				
3.1	Whether soil stability is checked?				
3.2	Whether proper shoring for the excavation is provided to prevent cave-in for side of slope >45 Degree?				
3.3	Whether proper precautions have been taken if the excavation is adjoining to heavy structure like building, street and roadways?				
3.4	While excavating whether proper slope usually 45^0 & suitable benches of 0.5 m width at each 1.5 m depth are provided?				
3.5	Whether barricading of 1m height with glowing caution board is provided for excavation beyond 1.5m depth?				
3.6	Whether excavating earth is placed beyond 1m of the edge of the trench?				
3.7	Whether heavy vehicle movement is restricted to come too close to the excavating area?				
3.8	Whether necessary precaution is taken for underground pipes, sewers, cables by contractors?				
3.9	Whether excavation hot work permit is taken?				
3.10	Whether extra precaution is taken for bailing out water properly while excavating?				
3.11	During rains whether the excavation is done with extra precaution to prevent caving in?				
3.12	Whether two separate entry/ exit points with necessary ladders / steps, as per requirement, have been provided?				
3.13	Whether one person is available at all the time to communicate any hazards noticed with workers working in deep trenches or excavation?				
3.14	Whether necessary precautions like				

	regular gas testing are being taken in areas having hydrocarbons and LPG so that no gas accumulation takes place in the trenches.				
3.15	Whether IS: 4081-1986 & Indian Explosive act & rules for storage, handling & carrying of explosive material and execution of blasting operation is followed?				
3.16	Whether in case of mechanised excavation, caution board is provided for do's and don'ts like 'Nobody to enter' within one meter of the extreme reach?				
3.17	Whether the following are inspected during excavation work :- a) Boulder formation encountered b) Collapsing / development of cracks of sides c) Marked damage to support d) Unexpected fall of ground e) Inspection of site after each blast.				
3.18	Others				
4.0	**PERMITS**				
4.1	Whether valid work permit is issued to start any work?				
4.2	Whether all conditions of the permit are fulfilled before starting the job?				
4.3	As noted in the permit, whether compliance of all the recommendations are ensured?				
4.4	Whether permits are available at work site all the times?				
4.5	Whether hot work permit registered in fire station?				
4.6	Whether permits are being closed after the completion of job?				
4.7	Others				
5.0	**SAFETY IN CUTTING / WELDING/GRINDING**				
5.1	Whether LPG / Oxygen / Acetylene/ Gas				

	cylinders are kept outside only while working in confined space?				
5.2	Are Acetylene /LPG cylinders kept in upright position and secured at designated places under shed – wet gunny bags wrapped around it if the same is under sun at designated place?				
5.3	Check cylinder and cylinder valves for any kind of damage?				
5.4	Whether protective valves are kept on cylinder while not in use?				
5.5	Whether proper means and method for transportation of cylinders to avoid dropping and rolling are being adopted / followed?				
5.6	Whether gas cylinders, regulators are kept away/free from oil and grease?				
5.7	Whether all hoses were found to be free of any damage or crack?				
5.8	Whether oxygen and acetylene cylinders are stored separately?				
5.9	Whether color coding is being used for easy identification of different type of cylinders and hoses?				
5.10	Whether cylinder keys are available near the cylinder?				
5.11	Whether gas torches with NRV with flash back arrestor of approved make are only being used?				
5.12	Whether pressure gauges are in working condition and checked from time to time?				
5.13	Whether welding shields are used while welding?				
5.14	Whether proper earthing for welding machines are provided?				
5.15	Whether power is taken from approved sources (welding receptacles)?				
5.16	Whether welding receptacles are properly grounded?				

5.17	Whether welding cables are maintained in good condition and without any joints/ cuts?				
5.18	Whether to avoid short circuit, welding machines are protected against rain?				
5.19	Whether earth connectors are securely connected to the job and not to the adjoining pipeline or structure?				
5.20	Whether flame arrestor of DG set is of approved make and quality?				
5.21	Others				
6.0	**SAND / SHOT BLASTING**				
6.1	Whether sand blasting is used only after getting approval from competent authority?				
6.2	Whether air compressor used for sand / shot blasting are positioned away from work place?				
6.3	Whether exhaust of the prime mover is directed away from the work place?				
6.4	Whether in case of motor driven compressor, the body of the motor as well as the compressor is properly earthed?				
6.5	Whether line operator of sand/shot blasting wear suitable PPEs including mask?				
6.6	Whether adequate measures are adopted to confine dust/spray particles?				
6.7	Whether adequate measures are taken for proper ventilation while the work is done in confined space?				
6.8	Others				
7.0	**SAFETY WHILE WORKING AT HEIGHTS / SCAFFOLDING / LADDERS**				
7.1	Whether work permit is obtained to take up work at height above 3 mts?				
7.2	Whether steel pipes scaffoldings are used in unit/off site areas?				

7.3	Whether provision for suitable platform with all scaffoldings are made? Whether its construction is as per specification with toe board and railing?				
7.4	Whether the area below working at height is cordoned?				
7.5	Whether suitable platform is provided?				
7.6	Whether ISI approved quality and good condition safety belts are used while working at heights?				
7.7	Whether life line of safety belt is Anchored to an independent secured support capable of withstanding load of a falling person?				
7.8	Whether the area around the scaffold is cordoned off to prohibit the entry of unauthorized person?				
7.9	Whether ropes used are of good condition and adequate strength free of defects?				
7.10	Whether ladder is placed at secured and leveled surface?				
7.11	Whether it is extended 1.5 Mts. Above the landing point?				
7.12	Whether ladder used are of adequate length and tying short ladder is avoided?				
7.13	Whether metallic ladders are placed away from electrical system?				
7.14	Whether tools or materials are removed after completion of the day's job at heights?				
7.15	Whether a valid permit is obtained before taking up work on asbestos or fragile roof?				
7.16	Whether sufficient precaution is taken while working on fragile roof?				
7.17	Whether provision is made to arrange duck ladder, crawling board for working at fragile roof?				
7.18	Whether scaffolding has been erected on rigid / firm / levelled surfaces only?				

7.19	Whether scaffold has been inspected by competent person prior to being put in use?				
7.20	Whether the scaffolding has been designed for the load to be borne?				
7.21	Whether the erection and dismantling of the scaffolding is being done only by trained persons and under supervision?				
7.22	Whether safety net with proper working arrangement and life line has been provided?				
7.23	Others				
8.0	**SAFETY IN CONFINED SPACE**				
8.1	Whether a permit is obtained to enter a confined space?				
8.2	Whether gas test for hydrocarbon, toxic gas, oxygen level is obtained before entering any confined space?				
8.3	Whether adequate oxygen level is ensured in confined space before entering? If not, whether all precaution like using of Breathing Apparatus set is ensured?				
8.4	Whether, in case of chance of ingress of hydrocarbon gases / toxic gases, Personnel Monitoring System (PMS) is used or not?				
8.5	Whether only in presence of a supervisor, worker enters in confined space?				
8.6	Whether provision of sufficient means of entry and exit is available?				
8.7	Whether provision of ventilation to remove welding fumes, dust, exhaust gases are made?				
8.8	Whether provision of 24V (Hand lamps with cage as per OISD-STD-155) light for working inside space is made?				

8.9	Is it strictly ensured that a stand-by trained person is standing outside before a person enters a confined space and communication is being maintained all the time with workers working inside?				
8.10	Whether life belt with one end under control of stand-by person outside is kept while working in confined space?				
8.11	Whether Personnel protective Equipment are in good condition as specified in the permit?				
8.12	Whether absence of Hydrogen Sulfide, CO or other toxic gas is ensured before entering into a confined space? If yes, whether proper required PPE like BA, Gas Mask are used.				
8.13	Whether boxing up is being done only as per the approved procedures and by competent persons?				
8.14	Whether all the safety precautions listed in OISD-GDN-192 are taken while working in sewers, OWS etc.?				
8.15	Whether proper house keeping is being maintained inside the confined space?				
8.16	Whether training has been provided to workers working in the confined space and the workers only of sound health are being asked to work in the confined space?				
8.17	Others				
9.0	**SAFETY IN MATERIAL HANDLING**				
9.1	Whether all lifting tools, tackles, machines, chains, ropes etc. are of sound construction, made of sound material and maintained in good condition?				
9.2	Whether safe working load, date of testing visibly marked/painted on the equipment?				
9.3	Whether lifting tools, tackles are of adequate strength for the load to be handled?				
9.4	Whether all parts including the working gears fixed or movable of every lifting machine, chain, rope, tackles specify the				

	following condition: a) Thoroughly examined by competent person at least once a year or such interval as required by statutory authority. b) Document of such examination are maintained and produced to owner supervisor before use of particular equipment?				
9.5	Whether chain blocks and cables are inspected before each use to assure their sound condition?				
9.6	Whether hoist and lift if used are: a) Properly maintained and thoroughly examined by competent authority at least once in every year. b) A register to be maintained to record particulars of such examination in prescribed forms and shall be produced to the owner supervisor before use.				
9.7	Whether area below the movement of boom of crane is cleared to avoid injury from falling objects?				
9.8	Whether it is ensured that crew of truck leave the truck in crane handling area before starting loading / unloading, if not involved in rigging operation?				
9.9	Whether transporting material from one place to another is done by suitable means?				
9.10	Whether carrier with sufficient capacity without projecting parts is used for transporting materials?				
9.11	Whether riggers engaged are well trained and conversant with signaling procedures including night signalling if required?				
9.12	Whether permission of authorized person is obtained before working on or near an overhead crane?				
9.13	Whether trained riggers are available all the time along with crane?				

9.14	Whether barricading has been done to ensure no unauthorised person enters in the working area of the crane?				
9.15	Whether lifting plan has been prepared and approved before start of the work?				
9.16	Whether route of crane movement has been planned before the crane moves out of the garage?				
9.17	Whether it has been ensured that no electrical cable come within 3 metres or safe distance from the boom of the crane?				
9.18	Whether boom is being kept in the horizontal position or locked while idling?				
9.19	Whether material is being stacked / destacked in trucks with the help of wedges to ensure no slippage while loading / unloading takes place?				
9.20	Whether the forklift / crane is being operated only by trained person?				
9.21	Others				
10.0	**ELECTRICAL SAFETY**				
10.1	Has the Electrical Line Clearance procedure been followed involving electrical and other concerned Dept. and filling of formats?				
10.2	Have Danger Signs with Voltage rating/ Men at work signboards been displayed at both Sub Station as well as the work site?				
10.3	Has the contractor worker understood the electrical circuit on which he is going to work with probable electrical hazards and mitigation measures to be adopted?				
10.4	Whether contractor has engaged electrician (s) having valid electrical licence in line with provisions in Indian Electricity Rules?				

10.5	Have all checks prior to switching operation been carried out and authorisation of owner/ user section obtained subsequently?				
10.6	Have all earthing links on electrical conductors removed before charging the line/ apparatus?				
10.7	Have PPE as prescribed under Indian Electricity Rules been in place, kept healthy and used?				
10.8	Are earthing and bonding arrangement of non-current carrying metallic parts in line with provisions of Indian Electricity Rules – 1956 amended time to time as IS: 3043?				
10.9	Have electrical part of OISD-GDN-192 and Clause No. 9.0 for Temporary installations in OISD-173 been understood and followed wherever applicable?				
10.10	Are flexible wires having voltage of 240 volts above earth potential taken through PVC conduits?				
10.11	Whether portable hand lamps with a voltage rating of not more than 24 volts used with flameproof enclosures in confined spaces within columns, vessels etc?				
10.12	Have the Switches, MCBs, fuses etc. been inspected for proper ratings?				
10.13	Has Earth Leakage Circuit Breaker (ELCB) been used on the incoming side to protect against leakage of current? Is the device tested every time the work is started?				
10.14	Whether all portable appliances are provided with insulated Three pin Plugs and socket arrangement?				
10.15	Whether industrial type extension boards and plug sockets are used?				
10.16	Has the electrical equipment brought to site by contractor been inspected by owner's supervisor/ safety officer for damage/cuts/abrasion etc? Is record of				

	Insulation Resistance, wherever required , being kept?				
10.17	Have standard practices for termination of conductors/ cables been followed (e.g. use of proper lugs, crimping tool, cable glands etc)? Is cable armour in continuity from feeding point to load?				
10.18	Are the Contractor supervisor and workmen well acquainted with first aid for electrical shock?				
10.19	Are the wires/ cables identifiable along their route towards the load by using colour coding and/or markers?				
10.20	Others				
11.0	**ROAD WORK**				
11.1	Whether site is barricaded and provided with warning signs including night warning lamps/ self glowing markers at appropriate location for diversion of traffic?				
11.2	Whether mixing aggregates with bitumen is done with the help of batch mixing plants? If no, whether adequate precautions have been taken?				
11.3	Whether road rollers, bitumen sprayers, pavement finishers are driven by experienced drivers with valid driving licenses?				
11.4	Whether the worker handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate are provided with PVC hand gloves rubber shoes with pegging upto knee joints?				
11.5	Others				
12.0	**FORM WORK, REINFORCEMENT**				
12.1	Whether form work, shuttering, shoring etc. are adequately designed and provided to erect the structure and to support the expected load?				

12.2	Whether staging (support) for shuttering is designed for loads like worker movement, impact load and other incidental loads during construction?				
12.3	Whether workers use PPEs at work site?				
12.4	Whether all safety procedures are adopted while cutting rod?				
12.5	Whether proper staging and bundling is provided for supplying rods at height?				
12.6	Whether sufficient cross bracings are provided for high staging works at vulnerable points?				
12.7	Others				
13.0	**CONCRETING**				
13.1	Whether the concreting area is barricaded?				
13.2	Whether vibrator hoses, pumping concrete accessories are in healthy condition and mechanically strong?				
13.3	Whether it is ensured that no pipe line in concrete pumping system is attached to any temporary strut such as scaffolds etc.?				
13.4	Whether it is checked that safety guards around moving parts are provided in concrete mixer/ machines?				
13.5	Whether earthing of electrical mixers, vibrator etc. are checked?				
13.6	Whether entry of unauthorised person in the concreting area is restricted?				
13.7	Whether adequate lighting arrangement is made in the concreting area if working during night?				
13.8	Whether PPEs like gum boots, gloves and dust masks etc. are being used?				
13.9	For overhead or underground work, whether form work and shuttering have been checked so that the same do not collapse during concreting?				

13.10	Others				
14.0	**DEMOLISHING (DEMOLISHING BY BLAST NOT CONSIDERED)**				
14.1	Has the stability of structure been examined by competent person and found OK?				
14.2	Are non-sparking tools being used, if required?				
14.3	Is intermittent clearing operation being done to keep the area reasonably tidy and clean?				
14.4	Whether effective barricading has been provided?				
14.5	Whether Electrical and other facilities like water, oil, gas pipelines have been isolated/protected?				
14.6	Whether the plan of demolition (including sequence of activities) has been prepared and approved prior to start of the work?				
14.7	Others				
15.0	**RADIOGRAPHY**				
15.1	Are safety precautions for handling of source as per guidelines of BARC being followed?				
15.2	Is the potency of the source being used within acceptable limits as per the BARC regulations?				
15.3	Is the area being cordoned with proper signs during radiography?				
15.4	Does proper place exist as per BARC regulations for storage of source / Personnel safety equipment?				
15.5	Does the radiographer has valid certificate of radiography from competent authority (BARC)?				
15.6	Is radiographer using Exposure Meter / Dosi Meter?				
15.7	Whether minimum occupancy of the				

	premises / workplace is being ensured while radiography is in progress?				
15.8	Is permit system being followed?				
15.9	Others				
16.0	**ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS**				
16.1	Are jobs being carried out with a valid work permit only as per OISD-STD-105 "Work Permit System".				
16.2	Is smoking prohibited in all places containing combustible or flammable materials and "No Smoking" notices prominently displayed.				
16.3	Are only approved type electrical installations and equipment, including portable lamps, being used?				
16.4	Are oily rags, waste, wooden materials and clothes or other substances liable to spontaneous ignition being removed?				
16.5	Are the combustible materials properly shielded in case same cannot be removed from the area?				
16.6	Has welding screens (like metal/asbestos/ water curtain) been put up to protect other equipment / facilities/ OWS/ drains in adjoining areas against flying sparks, as may be required?				
16.7	Is Gas-testing being done with the means of a calibrated Gas detection Meter prior to start of Hot work and being done subsequently at regular intervals as per the requirement?				
16.8	Are regular inspections being done of places where there are fire risks like in the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations?				
16.9	Are fire-extinguishing equipment being placed at strategic locations and are kept well maintained and inspected at suitable intervals by a competent person.				
16.10	Are access to fire-extinguishing equipment such as hydrants, portable				

	extinguishers and connections for hoses kept clear at all times?				
16.11	Are all supervisors and a sufficient number of workers trained in the use of fire-extinguishing equipment?				
16.12	Are audio means, to give warning in case of fire provided, audible in all parts of the site where persons are liable to work?				
16.13	Is there an effective evacuation plan in place so that all persons are evacuated speedily without panic?				
16.14	Others				
17.0	**EMERGENCY PROCEDURES**				
17.1	Is signaling / siren system effective?				
17.2	Is arrangement for rescuing affected person adequate?				
17.3	Are signs showing emergency exit route installed?				
17.4	Is emergency exit route clear of obstacles?				
17.5	Is communication system adequate?				
17.6	Whether emergency vehicle with driver has been provided to meet any emergency situation?				
17.7	Does any tie-up with hospitals or local doctors exist?				
17.8	Has the assembly point for workers in case of emergency been identified and earmarked?				
17.9	Has training been provided to a few workers for First Aid?				
17.10	Others				
18.0	**WELFARE FACILITIES**				
18.1	Is hygienic conditions prevailing at labour camps?				
18.2	Are First Aid facilities available?				

18.3	Does proper sanitation exist at site office and labour camps?				
18.4	Does any arrangement of medical facilities like tie ups with nearby hospital exist?				
18.5	Is proper drinking water facility available for workmen & staff?				
18.6	Are crèches provided for children (if applicable)?				
18.7	Is any proper place/canteen/restroom provided for eating food and taking rest?				
18.8	Is any place earmarked for storing / keeping clothing?				
18.9	Is Adequate washing facility available?				
18.10	Does proper ventilation at working place exist?				
18.11	Others				
19.0	**GENERAL**				
19.1	Are illumination levels at workplace and passages adequate?				
19.2	Is communication system adequate?				
19.3	Are display and caution boards provided at strategic locations?				
19.4	Are road barriers being used for blocking any roads/passage?				
19.5	Has the structure been adequately secured against storm/high winds during construction/ erection?				
19.6	Are the equipment properly earthed?				
19.7	Are vehicles being checked like brakes, oil, lights etc. on regular basis?				
19.8	Is compressed air being used only for its intended purpose and not for any other purpose?				
19.9	Are only proper clothes and not loose clothes being used while working around				

	machinery?				
19.10	Are nails or other sharp objects being removed or bent?				
19.11	Are machine guards over moving parts of machinery such as coupling, pulley, wheel etc. installed?				
19.12	Whether after maintenance of machinery the guards are securely fitted before putting into operation?				
19.13	Are working platforms / gangways provided with hand rails & toe guards?				
19.14	Are swing platforms provided with chains & secured adequately when not in use?				
19.15	Are the approaches to work sites being maintained & kept clear of obstacles?				
19.16	Whether engines of equipment entering into the operating area have exhaust and muffler system with approved spark arrestor?				
19.17	Whether vehicles/engine driven equipment, electrical equipment and tools used are certified?				
19.18	Whether contractors inform his workers about hazards and safe procedures?				
19.19	Whether sufficient care is taken so that spark do not go outside working enclosure & falls below?				
19.20	Whether contractor's qualified / trained supervisor is present?				
19.21	Whether all exhausts of engines are provided with approved type of flame arrestors and exhaust is not facing toward the place where the workers are working?				
19.22	Others				

Signature of the Auditor

CONSTRUCTION SAFETY AUDIT CHECK-LIST FOR REFINERIES & PETROCHEMICAL PLANTS

Oil Industry Safety Directorate

Government of India

Ministry of Petroleum & Natural Gas

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Section 1: Introduction

The safety Checklist is a tool to help identify the tasks, hazards, and controls, based upon contractor's scope of work, and to properly align them with Oil Industry Safety Directorate's applicable standard, guidelines, and recommended practises.

The safety checklist is intended to be filled out by internal auditors of owner and later verified by OISD auditor. Filling out the Safety Checklist helps determine if owner, main contractor, and its subcontractor(s) is considering expected hazards and controls based upon the scope of work.

This checklist will be applicable to auditing the construction areas of petroleum refineries, petrochemical plants, and oil /gas processing plants.

1.1 Audit Facility details

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
1.1.1.	Name of the Project:	
1.1.2.	Plant Location:	
1.1.3.	Name of PMC/EPCM/LSTK Contractor (Unit wise):	
1.1.4.	Licensed/Design Capacity: unitwise (Annual & Hourly):	
1.1.5.	Type of Feed/ feed mix	
1.1.6.	Provide brief description of the unit/facility	
1.1.7.	Land area- L x B (In meters):	
1.1.8.	Max. No. of Persons deployed on any particular day	
1.1.9.	Present overall progress of work completion in percentage	

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1.2 Contractors Competent & Qualified Person(s):

Provide the name(s) of those persons onsite who by possession of a recognized degree, certification, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems relating to the subject matter, the work, or the project. The contractor shall confirm that each qualified and competent person listed has been trained in the following areas as applicable:

1.2.1	Overall site In-charge of contractor for the facility	
1.2.2	Site supervisor of contractor	
1.2.3	Crane Competent Person of Contractor:	
1.2.4	Confined Space Entry Supervisor of Contractor:	
1.2.5	Electrical Qualified Person(s) of Contractor:	
1.2.6	Excavation & Trenching Competent Person of Contractor:	
1.2.7	Scaffold Competent Person of Contractor:	

Section 2: Leadership and Commitment by Owners for contractor safety

As we embark on this critical evaluation of contractor safety practices, we begin by focusing on the pivotal role that owners play in fostering a safe work environment. In this section, we examine the leadership and commitment demonstrated by owners towards the safety of all personnel involved in their projects. The extent to which owners embrace safety as a core value and actively support contractors in their pursuit of a hazard-free workplace is fundamental to the success of any safety program. This section will audit into the actions, policies, and culture established by owners to confirm that safety is paramount in every aspect of their operations.

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Sl. No.	Description	Observations by the team
2.1	In the HSE policy, what are the components relevant to construction sites?	
2.2	Are HSE related issues reviewed by company management, during project reviews? Provide MoM of last project review meeting.	
2.3	What is the system for safety aud t of construction sites in line with OISD-GDN-192 and checklist of OISD-GDN-207? Who reviews the construction safety audit report? When was the last audit conducted?	
2.4	Is there a company nominated HSE executive for each construction site? To whom does the HSE executive report? Are the role, responsibility, accountability and authority of the HSE executive defined and communicated?	
2.5	What is the qualification & experience of contractor HSE officer? How many contractor HSE officers are there in the site and what is basis for this number?	
2.6	Are HSE personnel deployed by contractor in ratio as specified in contract condition?	
2.7	What is the system for review & approval of CVs of HSE personnel of PMC & executing agencies before their deployment at site?	
2.8	Are the HSE officer aware of related OISD standards like OISD-STD-105, OISD-STD-155, OISD-GDN-206, OISD-GDN-192, OISD-GDN-207 etc.	
2.9	What is the system for giving induction safety training to all workmen? What is the periodicity of training imparted to workmen? Who reviews and approves the contents & matter of induction safety training?	
2.10	What is the system for rewarding the workmen performing excellently in the field of HSE?	
2.11	What system is there to confirm competency of contract workmen (specialized job like welder, electrical technician, instrument technician, scaffolders, crane operator etc)?	

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2.12	Who imparts toolbox talk to contract workmen, before start of job? Is record available for same? Are applicable recommendations of OISD safety alerts/case studies being discussed during TBT?	
2.13	What is the system and frequency for regular health check-up of working personnel?	
2.14	Is Doctor or Paramedic available at site?	
2.15	Does "Basic Life Support Ambulance" is available at site?	
2.16	Does the system exist for tie-up with nearby hospital for attending to emergency cases on round the clock basis?	
2.17	Does the system exist to Confirm that children & unhealthy adults are not engaged for the job.	
2.18	Has Asset Integrity Management (AIM) been considered during design stage i.e. inherent safety, built in reliability.	
2.19	Is there any procedure to Confirm safety aspects such as safe access, approach, escape etc., operability and maintenance aspects such as ergonomics etc. w.r.t. equipment?	
2.20	What is the procedure to Confirm Calibration/ standardization of equipment and instrumentation used for construction/ fabrication/ erection/ inspection etc?	
2.21	What system is followed to Confirm proper inspection of materials at various stage of procurement at vendor shop? What is the role of owner in this inspection process?	
2.22	Is the installation procedure available for all type of equipment?	
2.23	What system exist to confirm use of appropriate gaskets, packing, bolts, valves, lubricants and welding rods etc? Is it documented?	
2.24	(a) What is the frequency of safety review meeting by contractor/ PMC/ Owner? (b) Produce the agenda, MOM and compliance status of these meetings for verification.	

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Section 3: Pre-Project Safety Planning and Statutory Approval

Pre-project safety planning and obtaining statutory approvals are critical aspects of ensuring safety and compliance, especially in construction and hazardous operations. Here's a combined checklist that addresses both pre-project safety planning and the necessary statutory approvals:

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
3.1	Are the conditions stipulated in the PESO (CCOE) approval for construction of facilities complied? Provide Ref no and Date of approval of PESO approval along with plot plan, equipment layout and Hazardous area classification.	
3.2	OISD standard	
3.3	Is storage license for hydrocarbon and gas cylinder available?	
3.4	Are the conditions stipulated in the MOEF Clearance (EC) is compiled?	
3.5	Is the Change of Land Use (CLU) approval being applicable and available?	
3.6	Are the conditions stipulated in the consent to establish from State Pollution control Board complied? Issue date? List pending issues if any.	
3.7	Are the Consent to Establish under Factories Act taken.	
3.8	Are Registration of establishment from Central / State Govt. Labour Commissioner under Contract Labour (Regulation and Abolition) Act 1970 available?	
3.9	Whether water supply/ Electricity supply agreement is available?	
3.10	Whether construction approval for IBR equipment and piping is available from IBR authority?	
3.11	Whether PNGRB consent/ approval for pipe line is applicable and taken?	
3.12	Whether fire NOC is available?	

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3.13	Confirm the existence of a comprehensive project-specific safety plan. Confirm that the safety plan addresses potential hazards and risks associated with the project.	
3.14	Whether Risk Analysis (QRA/ RRA) has been carried out and recommendations implemented?	
3.15	Provide the list of risk reduction measures implemented.	
3.16	Whether Environment impact assessment has been carried out and recommendations implemented?	
3.17	Whether consent under hazardous waste/ construction waste or plastic waste management taken?	
3.18	Whether HAZOP study has been carried out and its recommendations addresses and updated in as-built P&ID? Specify total recommendations.	
3.19	Any other approval like ground water, forest clearance CRZ etc.	

Section 4: Site Assessment and Preparation

Meticulous evaluation and readiness Confirm the safety and effectiveness of contractor safety in the oil and gas industry. This section focuses on key considerations for identifying hazards, implementing safeguards, and setting the foundation for a secure project site.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
4.1	Confirm that the site is properly cleared of any debris, vegetation, or potential obstructions.	
4.2	Confirm the establishment of safe access routes and pathways for personnel and equipment.	
4.3	Confirm that safety barriers are installed to prevent unauthorized access to hazardous areas, construction area evacuated area.	

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4.4	Check for the presence of safety barriers, warning signage, and access control. Confirm that warning signs are clearly visible and appropriately placed to alert personnel to potential dangers.	
4.5	Confirm that fully equippec first-aid stations are strategically located throughout the site. Confirm that personnel are aware of the location of first-aid facilities and how to access them in case of emergencies.	
4.6	Confirm that essential safety equipment, such as fire extinguishers and safety showers are readily accessible and well-maintained. Confirm that personnel are trained in the proper use of safety equipment.	
4.7	Confirm that access points, walkways, stairs, and platforms are in good condition and free from tripping hazards.	
4.8	Confirm that adequate lighting is available for safe movement, especially in areas with 24/7 operations.	

Section 5: Incident Reporting and Investigation

This Section focuses on ensuring that incidents are promptly reported, thoroughly investigated, and corrective actions are implemented.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
5.1	Existence of a clear and documented incident reporting process at the construction site. Confirm that all personnel including contractors, are aware of the reporting process.	
5.2	Confirm that incidents are reported promptly, including unsafe act, unsafe condition, near misses and minor injuries.	
5.3	Confirm that incident reports contain essential information, including date, time, location, individuals involved, and a detailed description of the incident.	
5.4	Confirm that all incidents, regardless of severity, are reported and documented, and that there are no instances of unreported incidents.	
5.5	Whether consumption of first aid items are being evaluated to analysed the type of incident.	

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Section 6: Safety Equipment and PPE

This comprehensive evaluation Confirms that personnel, including contractors, are adequately equipped to mitigate refinery-specific hazards and adhere to safety protocols, ultimately fostering a secure working environment. The checklist encompasses various aspects, including PPE selection, proper usage, maintenance, and compliance with industry safety standards.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
6.1	What is the PPE policy and the system to confirm the use of mandatory PPEs at all the construction sites? What are the mandatory PPEs used?	
6.2	What is the system for selecting and ensuring the quality of PPEs & safety gadgets? Please give details of system.	
6.3	Confirm that personnel, including contractors and sub-contractors are trained on the proper use, care, and maintenance of PPE.	
6.4	Evaluate the availability and condition of essential PPE items, including: - • Hard he met • Safety glasses or face shields • Hearing protection (e.g., earplugs or earmuffs) • Gloves (variety of types for different tasks • Safety footwear with slip-resistant soles • High-visibility vests or clothing (if required)	
6.5	Confirm the availability and functionality of emergency safety equipment, including: - • Eyewash stations and safety showers • Fire extinguishers • Emergency escape respirators (if needed) • First-aid kits and medical supplies	

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Section 7: Emergency Response and Evacuation

Audit checklist is a vital tool to assess the contractor's preparedness and capability to respond swiftly and effectively to various potential emergencies, including fires, chemical spills, and other critical incidents. This comprehensive evaluation Confirms that emergency plans, equipment, personnel training, and evacuation procedures are meticulously reviewed, promoting the safety of all individuals.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
7.1	Existence of a comprehensive emergency response plan specific to project site.	
7.2	Confirm that the plan is well-documented, up-to-date, and accessible to all personnel, including sub-contractors	
7.3	Confirm that the emergency response plan addresses a wide range of potential construction incidents, including fire, Slip, Trip, and Fall, Electrical Accident, Trench and Excavation Hazard, Caught-in or Caught-between Accidents, Confined space Incidents, explosions, releases of hazardous materials, natural calamity and handling heavy equipment.	
7.4	Confirm the clarity and specificity of roles and responsibilities assigned to personnel, including emergency response teams and sub-contractors.	
7.5	Confirm that emergency contact information is prominently displayed throughout the project site, including: Phone numbers for local emergency services (fire, medical, police). Contacts for management and designated emergency responders.	
7.6	Confirm the availability and functionality of emergency response equipment, including: • Fire extinguishers, hoses, and suppression systems • Gas detectors and alarms. • Spill control kits and containment materials.	
7.7	Confirm that all personnel, including contractors, receive emergency response training: • Confirm that training includes procedures for evacuations, fire response, spill containment, and first aid. • Confirm that personnel are trained in the proper use of emergency equipment.	

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7.7.1	Review training records to confirm compliance with training requirements.	
7.8	Is arrangement for rescuing affected person adequate?	
7.9	Are signs showing emergency exit route installed?	
7.10	Is emergency exit route clear of obstacles?	
7.11	Is communication system adequate?	
7.12	Whether emergency vehicle with driver has been provided to meet any emergency situation?	
7.13	Does any tie-up with hospitals or local doctors exist?	
7.14	Has the assembly point for workers in case of emergency been identified and earmarked?	
7.15	Has training been provided to a few workers for First Aid?	
7.16	Emergency procedure and telephone numbers are known to all and same are prominently displayed at site? (Sample compliance check)	
7.17	Whether emergency mock drills are being regularly done?	
7.18	Specify frequency, coverage and effectiveness of mock drill	

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Section 8: Safety while working at Height/ Scaffolding /ladders.

Safety while working at height, particularly on scaffolding and ladders, is paramount in preventing falls and injuries. It involves thorough risk assessments, proper training, and the use of fall protection equipment to Confirm workers' safety. Adherence to safety protocols and equipment maintenance is vital to minimize risks in elevated work environments.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
8.1	Confirm for issuance of "Height Work Permit" before start of for any work at height (> 1.8 Mtrs).	
8.2	Confirm that a comprehensive Job safety assessment has been conducted for all tasks involving working at height at project site taking into account specific work areas, types of tasks. and potential hazards associated with working at height. Confirm that control measures are in place to mitigate identified hazards.	
	Scaffolding	
8.3	Confirm that scaffolding is erected, inspected, and maintained by competent personnel.	
8.4	Confirm that scaffold structures are designed to support the intended loads and are stable and secure.	
8.5	Confirm that guardrails, toe boards, and access points are installed correctly.	
8.6	Check that scaffolding platforms are fully planked and free from defects.	
8.7	Confirm that only authorized personnel are allowed to erect, modify, or dismantle scaffolding.	
	Fall Protection	
8.8	Confirm that fall protection measures are in place when working at height:	
8.9	Confirm the use of personal fall protection equipment (harnesses, lanyards, lifelines, fall arrestor) where necessary.	

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8.10	Confirm the presence of anchorage points or anchor systems for connecting fall protection equipment.	
8.11	Confirm that workers are trained in the proper use of fall protection equipment.	
	Training and Competency	
8.12	Confirm the training and competency of contractors and sub-contractors involved in working at height tasks.	
8.13	Confirm that personnel are trained in identifying fall hazards and using fall protection equipment.	
8.14	Confirm that workers are competent in scaffold erection, ladder use, and fall prevention measures.	
8.15	Whether vertigo test is mandatory for the workers working at height.	
8.16	Review training records to Confirm compliance with training requirements.	
	Inspection	
8.17	Confirm the system exist for certification of scaffolds (and green tagging), by competent person. What is the frequency of inspection/ recertification	
8.18	Does the system exist for periodic visit to all height locations by a competent person, and identification of dangerous openings, for necessary corrective actions. Are the records available. Furnish list of deviations observed.	
	Supervision and Monitoring	
8.19	Confirm that competent supervisors oversee activities	
8.20	Confirm that regular inspections and audits are conducted to monitor compliance with safety measures.	
8.21	Confirm that hazard communication includes proper signage and barricades to warn of working at height activities.	

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Section 9: Safety while excavation and trenching

Excavation and trenching activities are paramount for various maintenance, construction, and projects. These processes involve digging into the earth's surface to create cavities or trenches for purposes such as installing pipelines, repairing underground structures, or conducting maintenance on critical infrastructure. Safety is of utmost concern in these operations due to the risk of trench collapses, utility strikes, and exposure to hazardous gases. Stringent safety protocols, including comprehensive excavation plans, proper protective systems, and continuous training, are imperative to mitigate risks and Confirm the well-being of workers, the integrity of the refinery's infrastructure, and the prevention of environmental incidents.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
9.1	Confirm that a comprehensive excavation and trenching plan is in place and approved by competent authority.	
9.2	Verify that a thorough site inspection of excavation and trenching activities as per clause 6.1.4 of OISD-GDN-192 is followed.	
	Protective Systems:	
9.3	Inspect the use of appropriate protective systems such as trench boxes, shoring, or sloping based on soil conditions and depth	
9.4	Is it Confirmed that excavated earth is not dumped by the side of excavated pit.	
9.5	Are the escape stairs/ ladders available in every excavated pit (of more than 1.2 mts depth)	
9.6	Whether barricading of 1 Mtr. Height with glowing caution boards provided for excavations beyond 1.5 mtr. Depth.	
9.7	Whether one person is available outside at all times to communicate any hazards noticed with workers working in deep trenched or excavations.	

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Section 10: Safety while reinforcement/ shuttering & concreting

A comprehensive safety checklist for these activities includes Confirming the structural integrity of formwork and shuttering, ensuring proper bracing and support systems are in place to prevent collapses, and confirming the correct placement of reinforcement materials. Additionally, rigorous checks for the availability and use of personal protective equipment, fall protection measures, and adequate ventilation are essential to safeguard workers from potential hazards associated with concrete work in this high-risk environment.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
	Pre-Work Planning:	
10.1	Confirm the presence of detailed reinforcement and concreting plans and designs. Confirm that plans are reviewed and approved by qualified structural engineers and complied with national building codes.	
	Structural Stability	
10.2	Inspect formwork, shuttering, and bracing systems to Confirm they are structurally sound and properly installed.	
10.3	Confirm that adequate supports are in place to prevent collapses during concreting.	
	Safety:	
10.4	The safety of workers on erection and dismantling of steel and prefab structure should be Confirmed by provision mentioned in OISD-GDN-192 clause no 6.3.2	
10.5	All lifting appliances should be suitable for the operations and approved and tested as per statutory requirement.,	
10.6	Inspect the proper storage and handling of reinforcement bars, concrete, and related materials to prevent accidents and material degradation.	

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Section 11: safety while working in confined space area.

Safety is paramount when working in confined spaces. These spaces can pose numerous hazards, including toxic atmospheres, limited entry and exit points, and the potential for engulfment or entrapment. To Confirm worker safety, strict adherence to confined space entry procedures, including proper ventilation, continuous atmospheric monitoring, and the use of appropriate personal protective equipment, is essential. Comprehensive training, frequent drills, and clear communication among the team are vital elements in mitigating risks and responding effectively to emergencies within confined spaces, ultimately safeguarding the lives of refinery personnel.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
	General	
11.1	Whether entry inside the vessel to carry out any job shall be done after issuance of valid permit only in line with the requirement of OISD-STD-105?	
11.2	Shut down, pos tively isolate, depressurise and purge the confined area as per laid down procedures.	
	Entry Procedures	
11.3	Confirm proper and accessible means of exit before entry inside a confined space.	
11.4	Whether systems exist for registering the number of workmen entering & leaving the confined space.	
11.5	What type of ladder/ safety harness are in use for working in confined space?	
	Atmospheric Testing	
11.6	Whether system exists for gas test of confined spaces in order to Confirm adequate oxygen level & absence of Hydrocarbon, H2S, CO or other toxic gases before entry of workmen into the confined spaces.	
11.7	Confirm that gas detectors are calibrated and functioning correctly.	
	Communication	

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11.8	When the work is going on in the confined space, there should always be two men standby at the nearby manway / manhole equipped with communication arrangement to contact seniors and to evacuate the worker inside confined space in case of emergency.	
	Lighting and Equipment	
11.9	Use 24V flameproof lamp fittings only for illumination.	
11.10	Use tools with air motors or electric tools with maximum voltage of 24V.	
11.11	The cutting torches should also be kept outside the vessel immediately after the cutting and the gas cylinders used for cutting/welding shall be kept outside.	
	Emergency Response	
11.12	Confirm the availability and condition of rescue equipment, such as hoists, tripods, and self-contained breathing apparatus (SCBA).Also Confirm that a well-documented rescue plan s in place, and rescue personnel are trained and ready to respond.	

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Section 12: Safety during material handling and lifting equipment safety.

Ensuring safety while handling and lifting equipment is of paramount importance in the industrial setting of an oil refinery. It involves meticulous equipment inspection, rigorous operator training, and strict adherence to safety procedures to prevent accidents, protect personnel, and safeguard critical infrastructure.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
12.1	Does the system exist for load testing & certification of all lifting tools and tackles like wire ropes slings, chain blocks etc. at regular intervals as per the provisions of factories act. Is register maintained to record particulars of such tests. Please mention the periodicity of such tests. Furnish list of deviations/ failures of such tests.	
12.2	Does the systems exist for load test & certification of equipment (Cranes, Hoists, Hydra etc.) by competent persons before deployment at site and thereafter at regular intervals.	
12.3	Whether all parts including the working gears fixed or movable of every lifting machine, chain, rope, tackles specify the following condition: a) Thoroughly examined by competent person at least once a year or such interval as required by statutory authority. b) Document of such examination are maintained and produced to owner supervisor before use of particular equipment? c) Whether safe working load, date of testing & next test due date visibly marked/ painted on all equipment.	
12.4	Whether chain blocks and cables are inspected before each use to assure their sound condition?	
12.5	Whether area below the movement of boom of crane is cleared to avoid injury from falling objects?	
12.6	In crane handling area whether it is confirmed that crew of truck, leave the truck before starting loading / unloading?	
12.7	Whether transporting material from one place to another is done by suitable means?	
12.8	Whether carrier with sufficient capacity without projecting parts is used for transporting materials?	

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12.9	Whether riggers engaged are well trained and conversant with signalling procedures including night signalling if required?	
12.10	Whether permission of authorized person is obtained before working on or near an overhead crane?	
12.11	Whether trained riggers are available all the time along with crane?	
12.12	Whether barricading has been done to confirm no unauthorised person enters in the working area of the crane?	
12.13	Whether lifting (rigging) plan has been prepared and approved before start of the work?	
12.14	Whether route of crane movement has been planned before the crane moves out of the garage?	
12.15	Whether it has been confirmed that no electrical cable comes within 3 meters or safe distance from the boom of the crane?	
12.16	Whether boom is be ng kept in the horizontal position or locked while idling?	
12.17	Whether material is being stacked / de-stacked in trucks with the help of wedges to Confirm no slippage whi e loading / unloading takes place?	
12.18	Whether the for-lift / crane is being operated only by trained / authorized person?	
12.19	Whether permission of authorized person is obtained before working on or near an overhead crane?	
12.20	Whether trainec riggers are available all the time along with crane?	
12.21	Whether barricading has been done to Confirm no unauthorised person enters in the working area of the crane?	
12.22	Whether lifting (rigging) plan has been prepared and approved before start of the work?	
12.23	What system is available to Confirm that all Heavy equipment operators are experienced for operating the relevant equipment.	
12.24	Does the system exist for general check-up of cranes, hydra etc. like tyre pressure, reverse horn etc. on daily basis.	
12.25	Does the system exist for approval of erection scheme of heavy lifts & critical lifts. Who is the approving authority?	
12.26	Does the system exist for keeping record of equipment, tools & tackles and manpower involved in heavy lifts & critical lifts.	

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12.27	Does the system exist to restrict the boom loaded hydras for movement/ transshipment of loads?	
12.28	Does the system exist to Confirm adequate hard stand before deployment of crane?	

Section 13: Safety while gas cutting, grinding & welding.

Safety during gas cutting, grinding, and welding is paramount in industrial operations, particularly in environments like an oil refinery. These processes involve high temperatures, flammable materials, and potentially hazardous fumes, making strict adherence to safety protocols, proper training, and the use of appropriate personal protective equipment critical to prevent accidents, fires, and exposure to harmful substances.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
13.1	Whether LPG / Oxygen / Acetylene/ Gas cylinders are kept outside only while working in confined space	
13.2	Are Acetylene/ O2 / LPG cylinders kept in upright position with required valve cap and secured at designated places under shed – wet fire retardant clothes gunny bags wrapped around it if the same is under sun at designated place?	
13.3	Check cylinder and cylinder valves for approved quality & any kind of damage?	
13.4	Whether protective valves caps are kept on cylinders while not in use?	
13.5	Whether proper means and method for transportation of cylinders to avoid dropping and rolling are being adopted / followed?	
13.6	Whether gas cylinders, regulators are kept away from combustible materials and / free from oil and grease?	
13.7	Check cylinder and cylinder valves for approved quality & any kind of damage?	
13.8	Are the electric connection cables & welding cables, cutting hoses laid in non-haphazard manner.	
13.9	Whether all hoses are of approved quality and found to be free of any damage or crack?	
13.10	Whether oxygen and acetylene cylinders are stored separately at a distance of at least 5 feet from each other and kept under shade as per Gas Cylinder rules 2016?	
13.11	Whether gas cylinders are kept at safe location particularly in case job is being done at different elevations while in use?	

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13.12	Whether color coding is being used for easy identification of different type of cylinders and hoses?	
13.13	Whether cylinder keys are available near the cylinder?	
13.14	Whether gas torches with flash back arrestors of approved make are only being used?	
13.15	Whether pressure gauges are in working condition and checked from time to time?	
13.16	Whether welding shields are used while welding?	
13.17	Whether proper earthing for welding machines are provided?	
13.18	Whether power is taken from approved sources (welding receptacles)?	
13.19	Whether welding receptacles are properly grounded?	
13.20	Whether welding cables are maintained in good condition and without any joints/ cuts?	
13.21	Whether to avoid short circuit, welding machines are protected against rain?	
13.22	Whether earth connectors are securely connected to the job and not to the adjoining pipeline or structure?	

Section 14: Safety in electrical jobs.

Safety during gas cutting, grinding, and welding is paramount in industrial operations, particularly in environments like an oil refinery. These processes involve high temperatures, flammable materials, and potentially hazardous fumes, making strict adherence to safety protocols, proper training, and the use of appropriate personal protective equipment critical to prevent accidents, fires, and exposure to harmful substances.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
14.1	Whether the provisions for temporary installations as per clause 09 of OISD-STD-173, fully complied.	
14.2	Does the contractor engage electrician(s) having valid electrical license in line with provisions of Central Electricity Authority (CEA).	
14.3	Has the Electrical Line Clearance procedure been followed involving electrical and other concerned Dept. and filling of formats?	
14.4	Have Danger Signs with Voltage rating/ Men at work signboards been displayed at both Sub Station as well as the work site?	

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14.5	Does the system exist for inspection & approval of electrical equipment (DG sets, Panels etc.) by the competent person/ authority before being put to use.	
14.6	Whether the cables from switchgear panels to portable equipment/ lighting transformers/ field distribution board are running in orderly manner with no insulation damage/ no joints.	
14.7	Are the cables/ wires identifiable along their route towards the load by using colour coding and or markers.	
14.8	Is the standard practice for termination of cables (i.e. proper lugs, crimping, cable glands etc.) being followed. Is cable armour in continuity from feeding point to load point.	
14.9	Are the ELCB used on the incoming side to protect against the current leakage. Is the device tested every time before start of work.	
14.10	Are all the portable appliances provided with insulated three pin plug & socket arrangement.	
14.11	Whether only industrial type extension boards & plug sockets used at all sites.	
14.12	Whether electrical PPEs (hand gloves, insulating mats, fuse pullers etc.) are available and maintained in good condition.	
14.13	Whether CO2 fire extinguishers to control electrical fires are available and periodically tested?	
14.14	Visual inspection of electrical equipment for damaged cables. loose connections, improper earthing and exposed live parts.	
14.15	Whether all portable lights and tools are flame proof or intrinsically safe when working in a confined space where there is a potential flammable or explosive atmosphere.	

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Section 15: Safety in abrasive blasting and painting jobs.

Ensuring safety during abrasive blasting and painting jobs in an oil refinery is essential to protect workers, prevent environmental damage, and maintain the integrity of equipment and structures. These tasks involve various hazards, including exposure to hazardous materials, respiratory risks, confined space work, and the potential for falls. This contractor safety audit checklist is designed to help refinery operators and contractors systematically assess and enhance safety measures during abrasive blasting and painting activities, promoting a secure work environment and regulatory compliance.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
15.1	**General**	
15.1.1	Confirm that abrasive blasting is used only after getting approval from competent authority / work permit?	
15.1.2	Confirm that air compressor used for abrasive blasting are positioned away from workplace.	
15.2	**Respiratory Protection**	
15.2.1	Confirm that workers are provided with the correct type of respirators for the tasks, and they are fit-tested and trained in their use.	
15.2.2	Check that respirators are maintained, cleaned, and stored properly.	
15.3	**Ventilation and Dust Control**	
15.3.1	Inspect the availability and effectiveness of local exhaust ventilation systems to control dust anc fumes.	
15.3.2	Confirm that dust collection systems are properly maintained and functioning.	
15.4	**Equipment Inspection**	
15.4.1	Check that abrasive blasting equipment, including blast pots, hoses, nozzles, and paint spraying equipment, is in good working condition.	
15.4.2	Confirm regular equipment inspections, maintenance, and safety checks are documented.	
15.5	**Paints and Coatings**	
15.5.1	Confirm that workers are trained in the safe handling and disposal of paints, coatings, and solvents.	

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15.5.2	Confirm that hazardous materials are stored and labeled properly.	

Section 16: Safety in Radiography.

Safety in radiography within an oil refinery is crucial to protect personnel from radiation hazards and Confirm compliance with regulatory requirements. This specialized safety audit checklist focuses on Confirming the qualifications of radiography technicians, inspecting radiation equipment, ensuring proper shielding, monitoring individual exposure levels, and confirming adherence to safety protocols. Additionally, it assesses emergency response plans and the availability of radiation detection equipment. By conducting regular safety audits using this checklist, oil refineries can maintain a secure environment during radiography activities, mitigating the risk of radiation exposure and ensuring regulatory compliance.

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
16.1	**General**	
16.1.1	Are safety precautions for handling of source as per guidelines of AERB being followed?	
16.1.2	Is the potency of the source being used within acceptable limits as per the AERB regulations?	
16.1.3	Whether Radiation Safety Officer is available at site?	
16.2	**Qualified Personnel**	
16.2.1	Does the radiographer have valid certificate of radiography from competent authority (AERB)?	
16.3	**Equipment Inspection**	
16.3.1	Is the area being cordoned with proper signs during radiography as per guidelines of AERB?	
16.3.2	Confirm that radiographic equipment, including X-ray machines or gamma-ray sources, is in good working condition and has up-to-date inspection and calibration records.	
16.4	**Radiation Safety and Exposure Control**	
16.4.1	Is radiographer using Exposure Meter / Dosi Meter?	
16.4.2	Whether minimum occupancy of the premises / workplace is being monitored?	

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Section17-21: Safety check list in various jobs as tabulated:

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
17.0	**SAFETY WHILE WORKING NEAR OR ABOVE THE WATER BODIES**	
17.1	Are the provisions as per clause 6.16 of OISD-GDN-192, being complied with.	
17.2	Are the sufficient provisions like safety nets, life buoys, life jackets, boats etc. available?	
17.3	Are rescue & emergency procedure in place for any eventuality?	
18.0	**NOISE POLLUTION RELATED SAFETY**	
18.1	Are there construction sites where continuous noise level exceeds 85 Decibels	
18.2	Is the noise level monitored? Explain the mitigation measures for high noise level equipment/ areas.	
18.3	Are the high noise areas, (i.e., the areas where verbal communication is difficult), been identified.	
18.4	Are approved hearing protection devices used by workers/ employees working in high noise areas (>85Db).	
18.5	Are the employees exposed to continuous noise level above 85 Db, tested periodically for audiometric test.	
19.0	**TRANSPORTATION, LOADING AND UNLOADING**	
19.1	Is any written down procedure available for material movement inside the premises? How to Confirm implementation of procedure?	
19.2	Is any written down procedure available for material loading unloading?	
20.0	**STORAGE AND PRESERVATION**	

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20.1	Whether material like pipes, tubes, fittings etc. are stored with proper manner (stacking, tagging, capping)?	
21.0	**Safety in Road work**	
21.1	Whether site is barricaded and provided with warning signs including night warning lamps/ self glowing markers at appropriate location for diversion of traffic?	
21.2	Whether mixing aggregates with bitumen is done with the help of batch mixing plants? If no, whether adequate precautions have been taken?	
21.3	Whether road rollers, bitumen sprayers, pavement finishers are driven by experienced drivers with valid driving licenses?	
21.4	Whether the worker handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate are provided with PVC hood, hand gloves rubber shoes (gum boot) with pegging upto knee joints?	

Section22: Documentation and Quality assurance plan

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
22.1	Whether procedure is available for handover of as built/ final drawing, documents, datasheets, 3D model, Isometrics etc. to owner for future reference.	
22.2	Whether guidelines for quality control and assurance procedures and specifications for asset are available and implemented to Confirm that material, construction, and procedure (fabrication and inspection) during the fabrication stage are in accordance with the design specifications?	
22.3	What is the procedure of positive material identification (PMI) to identify metallurgy mismatch? What are the stages of PMI?	

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Section23: Welfare facility

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
23.1	Are the welfare related facilities as per factories act provided, not limited to following: -Canteen (Neat & Hygienic) -Drinking water facilities - Shelters for rest room - Toilet facilities(ladies/gents) -First Aid Boxes	
23.2	Does the system exist for review of basic amenities on the labour camps viz.: -Drinking -Washing facilities -Adequate carpet area for family members. -Protection from mosquitoes menace. -Clean to lets	
23.3	Are the first aid & rescue facilities available at each site like: -First aid boxes -Qualified first aider -Ambulance (s) -Visiting doctor	

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Section24: General

SR. NO.	DESCRIPTION	OBSERVATIONS BY AUDIT TEAM
24.1	Does the system exist to encourage reporting of near miss, unsafe act & unsafe condition.	
24.2	Does the system exist for encouraging the house keeping at site?	
24.3	Whether any system is available for construction waste management?	
24.4	Are there adequate safety promotion displays at the site (i.e. posters, Banners, Signages, Slogans etc.)?	
24.5	Whether waste bins are provided at each site for collection & regular disposal of wastes.	
24.6	Is communication system adequate?	
24.7	Are road barriers being used for blocking any roads/passage?	
24.8	Has the structure been adequately secured against storm/high winds during construction/ erection?	
24.9	Are only proper clothes and not loose clothes being used while working around machinery?	
24.10	Is the speed limit for vehicles inside the plant duly notified & followed. Please mention speed limit.	
24.11	Does the system exist for checking of vehicles before their deployment at site and regular checking thereafter.	
24.12	Does the system exist for penalty in case of violation of safety norms.	
24.13	Whether all moving parts of equipment provided with safety guards	
24.14	Are the floor openings, service pits etc. always covered or protected by guard rails or equivalent system.	
24.15	Whether adequate covered area is provided at each site to Confirm smooth & safe working during unfavourable weather conditions. Please mention the ratio of total area Vs covered area.	

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24.16	Whether separate area is earmarked for warehousing the combustible materials (i.e., diesel, lube oils etc.), with adequate fire extinguishing equipment. Are the statutory provisions complied?	
24.17	Whether Boundary wall / Barrication constructed surrounding the project area?	
24.18	Is access system available for contract workmen and employees?	
24.19	Whether motorable access road is available for all the sites?	
24.20	Whether fire and rescue tender is available?	
24.21	What type of security system available i.e., CCTV, security guards, Drone vigilance?	

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WRITE A BRIEF ABOUT HSE PRACTICES OF YOUR SITE

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Bharat Petroleum

energising lives

BPCL CORPORATE SAFETY MANAGEMENT SYSTEM

Technical Standard on Project Safety Management

(BPCL /CSMS/TS/05)



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1.0 Purpose

BPCL has developed Corporate Safety Management System (CSMS) which defines specific requirements for managing OHS risks across its operations in accordance to its HSE policy and stakeholders expectations. The **Element 5 of Corporate Safety Management System : Planning, Standards and Procedures** requires that BUs establish project safety management plans and procedures to ensure safety during construction and commissioning of new installations or modernization/ expansion projects.

This Technical Standard outlines project safety management requirements,which should be integrated in all new (i.e. green field projects) as well as modernization or expansion projects (i.e. projects within or adjacent to existing locations/plants).

2.0 Applicability

This Techniacl Standard applies to Project Functions of respective Business Units and their project locations. **The scope of Tehnical Standard covers both i.e. new projects at greenfield locations and modernization/expansion projects within or adjacent to existing BPCL plant/location .** The project contracts includes here combination of all activities such as Construction, Erection, Modifications, Expansions, Maintenance, Demolishing, etc to be done within specific budget and time frame. These are typically managed by project function and can be a very large projects at times. The TS shall apply to all contractors/sub-contractors hat provide services solely to the Project.

The plan is to be implemented by the Contractors/ project management consultant, if applicable and its application will be monitored/ audited by BPCL.

3.0 References

BPCL HSE Policy
BPCL Corporate Safety Management System
BPCL Technical standard on Risk Assessment and Management
BPCL Technical standard on Contractors Safety Management (TS/01)
The Building and Other Construction Workers (Regulations of Employment and Conditions of Services) Act and State Rules as applicable to BPCL Project Site

4.0 Responsibilities

Corporate HSSE shall be responsible for training , communicating and monitoring of this technical standard in BU and their project locations.

BU- HSSE/ Location- HSSE shall be responsible for implementation of this technical standard at their project locations.

BPCL Project Leader responsibility shall include(but not limited to)

- Ensuring legal compliances related to project activities;
- Ensuring that tenders/bids for contracts contain sufficient information to enable an evaluation of the safety risk and control measures associated with the work activity;
- Ensuring a contractor pre-prequalification process is applied that evaluates the safety systems, capability and performance of companies prior to work commencing;
- Provide information relating to the hazards associated with project activities and the risk control measures designed to prevent injury and/or loss;
- Review , monitoring and enforcement of a documented project safety plan of EPC contractor;
- Establish a system for daily job safety planning, risk assessments, training, performance monitoring, auditing and inspection of contractor activities at the project location;

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- Ensuring that workers get adequate instruction, information, training and supervision;
- Sharing good practices to promote continuous improvement in contractor and BPCL safety performance;
- Effective motivation and disciplinary policy.

Project Leader shall define the project management organizational structure , roles, responsibilities and accountabilities for all personnel who play a role implementing the Project Safety Management , including:

- Project Management Consultant, if applicable
- Area In-charges;
- BPCL HSSE Professionals;
- Human Resource
- Any other department under project
- Supervisors;
- Safety staffing of contractors

Refer **Appendix 1** for Guidance on Responsibilities.

5.0 Existing Applicable Laws

BU/ Locations shall ensure that their operations comply with all relevant Indian Environmental, Health and Safety laws and regulations and obtain statutory permissions/approvals prior to start of the work.

6.0 Project Safety Management

a. Contractors' safety Management is vital to prevent any accidents and incidents that have harmful impact on employees, the community, assets and the environment. This can be achieved by:

- Clear communication of BPCL's safety management system(SMS) requirements to Contractor(s)
- Verifying the gap(s) between the Contractor's SMS and BPCL's Requirements and
- Establishing and implementing Mechanism for monitoring and ensuring compliance of BPCL SMS requirements

b. Key areas for project safety management include but not limited to:

- Project team leadership and commitment
- Prequalification and selection of competent project contractor
- Communication of project specific safety requirements in contract documents
- Comprehensive project safety plan preparation by contractor or project management consultant and approval by BPCL project owner / owner's representative
- Pre-job meetings / Tool box talks
- Induction and specialized training
- Daily job plan
- supervisory safety responsibility
- Monitoring/supervision of critical tasks
- Daily equipment and work area inspections
- Active project safety committee
- Joint safety walks
- Method statement
- Safe equipment and tools
- Effective control and monitoring on alcohol and drug abuse policy
- Execution of the work &performance Monitoring
- Post contract evaluation
- Effective motivation and disciplinary policy

6.1. Management Commitment & Accountability

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BPCL project team at all levels, is dedicated to assuring that its employees and others are provided a safe and healthy place to work on each of its projects and ensuring that the Zero Harm philosophy is executed. The management should take the lead and demonstrate commitment throughout the project by:

Treating safety management as a core value of the project and demonstrating leadership throughout the project.

Developing shared objectives and promoting team building between BPCL Project Management Team and Contractors organization's / Project Management Consultant.

- Providing adequate resources and competent safety professionals
- Visibly promoting safety in regular meetings and by doing regular safety walks /**Location** visits with their counterparts.
- Setting safety objectives and targets and by measuring and reviewing performance.

6.2. Pre-Qualifications & Selection of Project Contractors

a. BU/ Locations shall develop and maintain a process for pre-qualification and selection of project contractors relevant to their needs and demonstrate continual improvement of the same.

b. While selecting / pre-qualifying the contractors, consideration shall at least be given to:

A. Contractor's Past Safety Performance

a. Worker's Compensation Payout (last 3 years)
b. Number of Fatal Incidents (last 3 years)
c. Reportable Lost Time Injury Frequency Rates (last 3 years)
d. Pending court cases, if any

B. Safety Capabilities Assessment

a. Contractor's Company Safety Policy
b. Contractor's Company Safety Organization
c. Safety Management System Manual of the contractor
d. Hazard Identification & Risk Management Program
e. Accreditation (ISO 9001/ ISO 14001/ OHSAS 18001) / Performance Awards
f. 3rd Party / Client Audits Report of similar previous jobs undertaken by them

c. Contractors safety pre-qualification evaluations shall be performed by a team of designated officials from Contract Owners / Owners Representative; Procurement, HSSE, Finance etc. considering the other risks such as commercial etc.
d. Procurement / Owner department shall ensure the completion of any requirement, further highlighted by HSSE Staff before qualifying the contractor.
e. Once the contractor is qualified, his name shall be maintained in contract department's database of competent project contractors and their safety pre-qualifications information.

6.3. Communicating Project Specific Safety Requirements in Contract Documents

a. Locations shall determine project specific work specific safety requirements. These Project Specific Safety Requirements shall be communicated to all pre-qualified contractors in bid documents by contracting department.

The project specific work specific safety requirements, which may be included are (but not limited to):

- Valid Registration Letter issued by BPCL
- Contractor's Safety Organization specific to project

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- Hazard Identification and Risk Management Procedures
- Applicable Risk Assessment Studies like HAZOP, HAZID etc.
- Project Safety Management Plan
- Method Statement(s)/(safe work procedure) for all hazardous or potentially jobs as defined by owner department.
- Any additional document/procedure/study as identified by BU/location.

Contracting department shall ensure that contractor submit all the applicable safety requirements as listed above. HSSE department shall be consulted if needed.

6.4. Project Safety Management Plan

Contractor shall submit a detailed Project Safety Management Plan in BU prescribed template. This shall be a comprehensive document defining safety management system for the project and shall be reviwed/approved by BPCL project owner/ representative, prior to start of the work (Refer **Appendix 2** for a sample Template for a Project Safety Management Plan) .

Note : BU/Location may not require a detailed Project Safety Management Plan as per Appendix 2 for a small or short term project. However, a shorter version of plan shall always be necessary to show that that the hazards are recognized and understood is likely to be adequate.

6.5. Project Safety Organization

The project safety organization shall vary according to size and complexity of projects. A typical project, however should include :

A. Chief Project HSSE Manager- HQ

B. Senior Project HSSE Managers- Region

C. Project Engineers

D Fire and Electrical Officer (as may be applicable)

E. Contractor's Safety Officers

F. Contractor's Safety Supervisors

6.6. Contractor's Safety Organization

Contractors must provide a nominated manager, supervisor or foreman with authority to give and receive safety instructions at project location as mentioned below.

- If a contractor is employing less than 30 employees, he shall designate one dedicated supervisors as a safey steward.
- For every 30 persons or more contractor shall appoint one qualified safety steward (diploma in industrial safety from recognized government institute). For more than one safety steward, one of them shall be appointed as Chief safety steward.
- In addition to above contractor shall also appoint one safety officer, if he employs more than 100 workers. Safety officer shall have Diploma in Industrial Safety or any equivalent qualification from Government Recognized Institute and minimum 2 years of experience. For more than one safety officer, one of them shall be appointed as Chief safety steward.

NOTE: BPCL shall reserve the right to prescribe the number and qualification of contractor's safety personnel.

Appendix 3 provides description of Contractor's Roles and Responsibilities. **Appendix 4** provides list of facilities /equipment for the contractor's safety function.

6.7. Inadequate Safety Personnel

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In case if the contractor fails to provide the minimum required manpower or fail to fill up vacancies created within 30 days, the same shall be provided by BPCL at contractor's cost. Any administrative expenses involved providing the same like paper advertisement or manpower consultant charges, etc shall also be at the cost of contractor.

6.8. Approval of Safety Personnel from BPCL

The name of the nominated person(s) must be given to the BPCL Representative before work commences along with their educational qualification and training certificates. The Contractor shall be fully responsible for supervision of Contractor personnel to ensure that they strictly adhere to all applicable safety requirements. The Contractor shall provide, and fix in place, all caution and hazard notices required for the project location in accordance with the applicable laws in force and industry practice.

6.9. Subcontractors Control

The Contractor shall provide the BPCL Representative with the names of the Sub-Contractors and obtain approval to this Code of Practice prior to their engagement. Contractor shall ensure that the sub contractors shall also be governed by the requirements as applicable to them. The contractor shall ensure that the Sub-Contractors receive safety induction briefings. The Contractor shall regularly check the Sub-Contractors' compliance with safety requirements and be held accountable for their safety performance including requirement to use Personal Protective Equipment (PPE).

6.10. Kickoff Meeting

The contractor shall facilitate a formal safety kickoff meeting prior to commencement of Location works along with subcontractors and BPCL representative. The contractor shall inform the BPCL a minimum of seven (07) days in advance of these formal kickoff meetings and the BPCL.

6.11. Project Safety Committee

A project safety management committee shall be constituted with representation from senior management representation from the contractors, subcontractors (if permitted in contract).The meeting shall be held at least once per month and record maintained. The meeting shall be chaired by BPCL project manager and convened by Location HSSE Manager.

The large contractors/ sub-contractors may also be asked to constitute their own safety committees. will provide the BPCL the minutes of the same.

The outcome of pre job meeting shall be documented and record maintained.

6.12. Hazard Identification and Risk Assessment

The contractor shall ensure that a specific hazards are identified, which have the potential to cause harm in terms of human injury, ill health, damage to property or the environment, or a combination of these and risk is properly assessed, control measures are identified prior to start of work. The record shall be maintained at Location office.

6.13. Safety Instruction & Training

Project Leader shall establish safety training plan & procedures (example given below).

Training Profile Discipline: Scaffolder	Initial Training
Safety Orientation & BPCL HSE Policy, Life Saving Rules, Roles & Responsibilities, Incident Reporting, Emergency management, Project description, hazards & risks, Project Safety Management Plan etc.	Prior to starting work- All BPCL and Contractors Employee

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Scaffolder Practical Assessment	Prior to starting work
New Start Orientation	Prior to starting work
Correct use of PPE	Prior to starting work
Safe use of Safety Harness and 100% Tie-Off	Prior to starting work
Working at Height & Dropped Object Controls	Prior to starting work
Toolbox Talk	Prior to starting work
Hazard Identification and Safety Intervention	Prior to starting work
JSP and Work Permit System	Prior to starting work
First Aid	As required
Worker Welfare Program	Prior to starting work
Environmental Awareness Program	Prior to starting work
Transport Safety Awareness	Prior to starting work
Safe Commissioning and Start up to concerned personnel	Prior to Commissioning and Start up

The contractor shall ensure that all personnel attend the Safety Induction Training / Instruction, Tool Box talks before they start to work on the project. The contractor's workman shall attend Refresher Training Periodically and shall take advantage of the various Safety training courses provided by BPCL.

A record of the Safety training undertaken by staff shall be maintained and available to Employers Representative on demand.

6.14. Daily Job Safety Plan

The Contractor Job Representative shall prepare daily job safety plan to identify specific tasks, their hazards and risks and control measures. This is a joint formal review of all tasks and to be documented. This shall be reviewed and approved by owner or his authorized representatives.

6.15. Safety Communication

The Table 1 below outline the indicative methods and schedule for Contractor Specific Health and Safety communication for processes identified for all employees.

Table 1 : Indicative Communication Workplace Schedule:

Communication Process	Schedule	Participants	Facilitator
Toolbox Meeting	Daily	Contractors and its subcontractors	Respective Contractors Supervisors in charge of work activities
Safety Meetings	As scheduled	Contractors	BPCL HSSE Manager
Project kick Off Meeting	Prior to project commencement or first day on-Location	BPCL Construction Team, Contractors and its subcontractors	BPCL HSSE Manager/ Contractors Safety Officers/ Stewards

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Mass Tool Box Meeting	Weekly	BPCL Construction Team, Contractors and its subcontractors	BPCL Project Manager Contractor Front Line Supervision and Contractor safety stewards
Safety "Stand Down"	As and when required	Specific task group	Contractor project Manager / Contractor Construction Manager
Emergency drill exercise	Monthly	As per emergency response plan	Contractor Project Manager / Contractor Construction Manager

6.16. Toolbox Meetings and Mass Tool Box Meeting

Daily toolbox meetings shall be conducted prior to commencement of operations to raise the safety awareness of all project personnel- Meetings shall be carried out at the workface. Toolbox meetings shall comprise information of discussions concerning any inherent hazards associated with planned works as well as precautions that will be initiated. Topics for toolbox meetings shall include risk assessments conducted for work activities. Toolbox meetings shall be conducted at the common resting shed and designated Contractor personnel will provide assistance to Contractor Supervisors in the preparation and delivery of safety talks and other relevant matters. Refer **Appendix 5** for Guidance on Tool Box Talk.

Mass Tool Box Meetings will be conducted by BPCL Project Manager /Contractors to address workforce common issues, communicate corporative messages, and discuss Lesson Learns and / or safety programs new initiatives.

6.17. Monthly Location Walk Through

Contractors shall conduct Monthly Location Walk Troughs comprising Contractors Location Management and Safety Coordinators. BPCL project management and HSSE role holders will join these inspections on regular basis.

6.18. Safety Audits

Internal Project Safety Audits will be undertaken in accordance with the Project Safety Management Plan. Regional Project Head shall decide about the external safety audit from Indepdent third party agencies or BPCL auditors (other than Project) as may be required on case to case basis.

6.19. Safety Statistics

Contractors' safety statistics shall be gathered on a monthly basis and reported to the BPCL HSSE Manager. Contractors and its subcontractors shall provide details regarding their monthly statistics to BPCL for collation by the 5 th calendar day of every month. Monthly Statistics shall be communicated at a prominent place. Refer Appendix 6 for indicative safety statistics to be maintained at each BPCL project Location as minimum.

6.20. Project Safety Management Basic Rules

Refer **Appendix 7** for Project Safety Basic Rules.

6.21. Equipment and Machinery Safety

All plant and equipment intended to be used at the project contractors and its subcontractors shall conform to the manufacturer's specifications shall have a proof of adequate maintenance regime. In

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addition to these requirements, Contractor shall comply with all regulatory authority standards for machinery guarding and warning devices shall be adhered to prior to the operation of the plant and or equipment on the project.

Contractor shall keep records of all inspections; third party certifications (when applicable) and maintenance activities inclusive of breakdowns shall be recorded using the logbook provided for the relevant item of plant.

All plant items shall be provided with a logbook that contains:

- Current copy of registration/certificate or licence, where applicable,
- Records of service,
- Operation manual,
- Daily pre-start inspection checklists (as applicable),Maintenance records for prior history and provision for future entries, and
- Mobilization inspection checklist completed by en appropriately qualified or competent person.
- Authorized operators record

Vehicle and Plant maintenance will be carried out to manufacturer's specifications and maintenance schedule.

Colour-coding and frequency of maintenance are to be indicated clearly in the maintenance regime of all equipment and machinery.

Unless all the required licenses required to operate any equipment are held by the operating employee and have obtained the necessary work permit approval, then that equipment will not be operated.

BPCL and Third parties will audit the inspection protocols and inspection records.

6.22. Pre-Start Inspections

Supervisors and operators shall ensure equipment and vehicles are inspected prior to operation each shift. The operator shall enter details of the inspection into the logbook or daily checklist of the person delegated to complete the inspection. All safety devices shall be operative and at all times used. All required certificates should be available, current and valid

6.23. Equipment and Machinery Inspection Register

Contractor construction team shall maintain a Plant and Equipment Register to systematically record each item of plant brought to the project location, which will determine inspection levels, registration details and logbook requirements. All safety devices shall be operative and at all times used as well as all required certificates, all required certificates should be available current and valid

BPCL Team and Third parties will audit the inspection protocols and inspection records

6.24. Lifting Machines (Cranes, Rigging, Lifting and Mobile platform)

The use of lifting machines in the project location shall abide by the following conditions:

- Current applicable regulation shall be complied with at all times.
- Lifting machines (i.e. cranes, piling machines) shall possess a valid Inspection Certificate and such certificate must be displayed on the machines.
- Contractor Project engineer and lifting supervisor shall inspect the lifting machines upon arrival at project location before being permitted to be used.
- A statutory competent person shall examine the lifting machines at least once in every 12 months. All required certificates should be available, current and valid.
- The Load Capacity Chart (manufacturer or certified by Authorized Examiner) shall be displayed on the lifting machines and understood by the operators.

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- Lifting machines shall be marked with its safe working load (maximum and minimum radius)
- Lifting machines shall be used in accordance with manufacturer's operating instruction and/or the Authorized Examiner's instructions
- Lifting machines shall be provided with.

  -An adequate braking mechanism
  -A swing lock or swing brake capable of prevention of rotation;
  -A brake or other device adequate to bring the crane to a stop from any travel for which it is designed, together with a means of locking the crane so as to hold its stationary
  - a load and/or radius indicator with warning alarm
  -a load/radius table to be available in the crane cab of every variable radius jib crane
  -an automatic safe load indicator (Load Moment Indicator)
  -anti two blocking devices
  -crane hook with a safety catch to prevent displacement of the sling or load from the hook
  -an anemometer or a wind speed meter (for new cranes) for measuring wind force and velocity
- Lifting machines shall be examined by an Authorized Examiner after any major repair or any repair done on the hoisting or operating mechanism, boom jib and after over loading incident
- Excavators shall not be used for lifting operations.
- No lifting machine shall be operated unless all measures are taken to prevent toppling or overturning or contact with overhead obstruction (such as structure, power lines)
- When moving lifting machines, the boom shall be lowered and traffic controller/guide shall be required to guide the lifting machine operator.
- When lifting machines are reversing, an additional person shall be required to ensure that the path of travel is clear.
- Lifting machines cabin shall be locked when it is not attended by the operator. Unauthorized person(s) shall not be permitted to enter in the cabin or operate the crane.
- Fire extinguisher shall be provided in the lifting machines. Operator shall be trained to use fire extinguishers.
- Good housekeeping of the lifting machine shall be exercised and maintained.
- Safe access (with proper foot and hand holds/supports) to the cabin and deck of the lifting machines shall be provided and identified.
- Lifting machines shall be maintained to ensure that all components of the lifting and operating mechanism are in good, safe and sound functioning condition.
- A maintenance program shall be required and implemented effectively for the lifting machines and the maintenance records shall be kept in the cabin.
- The operator shall carry out daily inspection of the crane and testing of the safety devices In accordance to manufacturer's recommendations.
- The maintenance section of respective supplier shall inspect the lifting machines at least once every month.

6.25. Lifting Operations

- BPCL requires that all lifting to be executed as a minimum, under compliance with applicable regulations and approved code of practices.
- Contractors shall appoint trained and competent Lifting Supervisors Riggers, Signalman and Crane Operators In accordance to statutory requirements.
- Contractors shall also appoint a Responsible Person to coordinate lifting activities.
- Method statements, risk assessments and Work Permit System shall be implemented for all lifting operations.
- A Lifting Plan shall be established and implemented for all routine and non-routine operations.

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- The Lifting Plan shall be submitted together with the Lifting Checklist prior to commencing lifting operations. Designated lifting points and the lifting path shall be drawn in the Lifting Plan .o The Lifting Plan shall also indicate the followings:
  - Location of lifting operation;
  - Description of lifting operation;
  - Weight of load;
  - Description of lifting equipment to be used;
  - Personnel involved in the lifting operation
- Appointed lifting supervisor shall also check and ensure that all safety provision are in place before the lifting operation is commenced with checklist(s) provided.
- The lifting operation area and other areas with potential hazard / danger must be cordoned off to prevent access for all unauthorized personnel. Only authorized persons and personnel involved in the lifting are allowed in the lifting operation area.
- The load shall be controlled by means of tag lines to prevent the load from turning, swaying or swinging.
- The crane operator/lifting machine operator shall be medically and physically fit for the job and possess the following qualifications.
  - valid crane operator license issued by Government department; and
  - certificate of competency for the type class/capacity of the crane.
- Contractors shall submit the respective documents and certificates on the above for verification to BPCL

6.26. Safe Work Procedures

The contractor shall develop and implement a safe system of work and procedure/ method statement at each Location. A copy of procedures shall be submitted to BPCL Representative prior to commencement of the work.

This shall include but not be limited to:

- BPCL 12 Life Saving Rules
- Safety Signage
- Hazard Identification and Risk Assessment Procedure
- General Safe System of Work
- Lay out, Housekeeping and Traffic
- Working at heights, ladders, Scaffold and Working Platform
- Use of electrical plant and hand tools
- Material Handling
- Heavy earth moving equipment
- Digging and Excavation
- Hot work
- Dust & Fumes
- Control of hazardous Substances
- Electrical hazards, especially in the connection of equipment supplied by BPCL, or their Subcontractors, to power sources provided by others
- Confined spaces (as applicable)
- Noise, Lighting, Heat Stress, Extreme whether
- Store & waste management
- Portable tools & equipment
- Induction Checklist Drugs and Alcohol
- Safe Lifting & Rigging Procedures
- Material Handling Equipment Operations Ladder Safety

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- Portable Hand Tool / Power Tools Safety
- Personal Protective Equipment (Selection, Use & Maintenance)
- Waste Storage, segregation & disposal procedures
- Competency Criteria for High Risk Activities (Qualification / Experience / Training / Skills)

6.27. Scaffolding and Work Platforms

Erection, alteration and dismantling of any scaffold shall be carried out by a person holding the appropriate certificate of competency and under the direct supervision of a qualified scaffold supervisor. The use of scaffolds shall be governed by the IS codes.

6.28. Personal Protective Equipment (PPE)

PPE that shall be required for all personnel including visitors whilst they enter project Location. Areas where personal protective equipment is required to be worn shall be prominently displayed with signs. Instruction on the correct use and maintenance of personal protective equipment shall form part of the nominated training and toolbox sessions and reiterated through the pre-start meeting process. Contractors shall establish and implement a PPE maintenance programme.

The Contractor shall remove from the location any worker who consistently refuses to wear the appropriate personal protective equipment. The PPEs and safety appliances provided by the contractor shall be of the standard as prescribed by Bureau of Indian Standards (BIS) or equivalent standard.

All construction workers should be provided with high visibility Jackets with reflective tapes confirming to the requirement specified under BS EN 471: 1994. The contractor shall at all time maintain a minimum of 10% spare PPEs and safety appliances and maintain proper record. The standard PPE may include:

- High visibility Vests
- Fire Retardant Clothing (particular activities and designated areas)
- Portable gas detector (particular activities and designated areas)
- Toe Protection and steel capped safety footwear with ankle support
- Hearing protection (particular activities and designated areas)
- Respiratory protection (particular activities and designated areas)
- Hand Protection (particular activities and designated areas)
- Safety helmet with chinstrap
- Safety Goggles.
- Eye protection for grinding, welding and cutting, compressed air use and chemical interaction
- Full body harnesses attached to a shock absorbing device and with double lanyard ("Y" type)
- Life Jackets (designated area)

Safety Induction shall be used as a forum to advice on the general personal protective equipment.

6.29. Location Familiarization

Location familiarization is an essential part of the Location Safety arrangements. The contractor shall provide its employees a familiarization tour to their work area for their personnel prior to commencement of the work. This shall include:

- Boundary of work location.
- Authorized safe access / egress routes.
- Authorized walking Routes.
- Storage areas for various materials in particular where dangerous materials or substances are concerned.

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- Location of key Personnel, e.g. BPCL Project Manager, HSSE office etc.
- Arrangements for sanitary conveniences and washing facilities.
- Location security arrangements.
- Identification of physical hazards associated with BPCL operational or other work activities.
- Assembly points during emergency.

6.30. Certificates of Competency

BPCL requires the Contractors to maintain a register with all statutory certificates of competence as their qualified personnel. These records shall be kept on Location for auditing purposes.

Where BPCL requires personnel to have certificates of competency to perform designated tasks, a record of the certificates will be taken at the time of employment or induction prior to employees being able to perform those tasks. The records shall be maintained in a register for Auditing purposes

Competency certificates shall be maintained for:

- Issuing work permits
- Conducting Electrical Work
- Scaffold work
- Lifting Operations / Safe Slinging & Rigging
- Crane / forklift operators
- Fire Fighting

6.31. Location Access Control and Traffic Management

Contractors shall manage the security at BPCL project premises. Security guards, traffic patrols, traffic wardens, heavy equipment escorting, vehicle access, warehouses, access and exit gates will be managed by Contractors under procedures and regulations agreed with BPCL Project Team Management.

Only authorized employees with a current and valid driver's license will be allowed to operate vehicles on the project. Contractors shall train all their drivers in defensive driving principles.

6.32. No Smoking Policy

BPCL follows No Smoking Policy at the work Location and same shall be practised at all its project locations. The cigarettes / bidis, lighters, match boxes etc. shall not be permitted to the project Location.

6.33. Drugs and Alcohol

The use, possession, distribution or sale of illegal drugs and controlled substances by any BPCL employee, visitors, contractors or sub-contractors and their employees while on BPCL premises or while performing services on the BPCL project Location is strictly prohibited. Breath analyzer test shall be conducted at the Location regularly.

6.34. Notices and Signs

Contractors shall display prominently relevant safety notices and signs in such a manner as to ensure personnel in the vicinity are made obviously aware of the potential hazard. Posters shall be utilized within amenities as a general reminder and changed on a regular basis to reduce familiarity. Signs shall be generated following Indian regulations.

6.35. Barricading and Shuttering

Barricades are designed to restrict access into work areas where hazardous conditions are prevalent. Shutters and roof supports are designed to protect access to trenches, tunnels, drains, sewers etc.

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Contractors shall identify and adequately highlight potentially hazardous areas or processes and particular risky activities by displaying appropriate tag, warning sign and where deemed necessary, bunted off with fixed rail barricades. Contractor shall erect fixed temporary guardrails at entry points to areas requiring the removal of permanent guard railing or other means of fall protection, Other situations include:

Overhead Work.

- Confined Space Entry;
- Scaffold erection and protection;
- Chemical and product spills;
- Traffic and pedestrian control;
- Blasting and charging situations;
- Excavation
- Hot work
- Painting
- Electrical equipment

6.36. Working at Heights

Working at heights may cause serious injuries or fatalities. It is therefore essential to ensure the following measures are taken by Contractors prior to commencing any work at height:

- Permit to work system shall be implemented for working at height
- Where work is performed/or lifted to heights greater than 2 metres above the ground, the potential drop zones must be cordoned off
- Pipe work and structures that could deflect falling objects will be considered when assessing the potential drop zone
- All work areas, walkways, platforms etc. elevated 2 meter or more, must be encompassed by an approved guard rail or rope
- All barriers such as guardrails, opening covers are adequately provided with warning signage must be to protect all workers and public from injury
- Tools and materials will be raised and lowered in secured containers
- When work is carried out at elevated levels, the area below must be cordoned off and warning signs must be posted up
- All openings in floors must be covered temporarily or securely fenced.
- Appropriate Personal Protective Equipment (PPEs) for fall arrest such as full body harnesses attached to a shock absorbing device and with double lanyard ("Y" type) shall be used for work at heights. It is to be used at height of 2 meters and above.

6.37. Housekeeping

Housekeeping shall be considered an extension of every activity on the project. Contractors shall ensure maintaining a high standard of housekeeping in the Project at all times. Contractors' supervisors shall be responsible for ensuring housekeeping inspections are conducted on a daily basis and corrective actions are taken accordingly. The areas within their control are to be maintained

in a tidy, safe condition, materials and equipment not in use are neatly stacked away from the work areas and clear of access ways and emergency exits.

Housekeeping shall be constantly monitored to ensure a safe and productive work environment. The following shall be complied at all times:

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- Emergency exits, stairway, roadways, walkways and fire points must be identified and kept free of obstruction
- Place of work shall be kept free from any obstruction and from any substance likely to cause a person to slip, trip or fall
- Equipment for use or installation placed on Location and work area shall not cause any obstruction unless otherwise approved
- Wires, cables, and gas hoses shall not be laid across floors, steps, stairs, passages, gangways and means of access.
- Construction materials shall be stored or placed at demarcated areas, and stacked in a safe, stable and orderly manner
- Cleaning of offices canteens, and sanitary facilities shall be carried out daily on e routine basis
- All waste shall be categorized and disposed to designated containers, bins, or designated places only.
- Construction and engineering waste and scraps shall be collected and place into designated bins at the end of the work day
- Surplus waste civil material such as soil, stone etc. must be dumped at the designated dumping areas or remove from Location
- Mass housekeeping exercise shall be carried out once every week, and as and when
- Contractors Project Managers or HSSE personnel deemed necessary
- Chemicals shall be stored in a designated area and locked to prevent unauthorized usage

6.38. Hazardous Substances

Any material or substances that are or may be considered hazardous to Personnel or the environment shall be handled, stored, transported, used or applied according to:

- Manufacturer's Recommendations
- Statutory Requirements
- Contractor shall keep a register of all chemicals used in the Project. Contractor HSE Manager shall approve all chemicals to be used in the Project before they brought into Project premises. It is advisable for the Contractor to generate an Internal Chemical Approval and Control Procedure

6.39. Portable Electrical Power Tools and Equipment

- Earth Leakage Circuit Breakers (ELCB) ere standard devices to be used on project locations. Contractors shall use ELCBs when using portable tools and/or equipment. This ensures the maximum safety and protection for all personnel.
- All their tools shall be tagged and tested.
- Double adaptors and piggy-back plugs shall not be used.
- Electrical extension leads and cables shall be, where practical, kept off the floors or ground and be secured at a height by insulated hangers that does not interfere with or hinder the work area.
- Electrical cords, as much as possible, shall not be coiled when in use, they shall be inspected daily before they are used
- Electrical extension leads across pedestrian access ways / floors shall be adequately protected from damage and to reduce trip hazards.
- All equipment shall be visually inspected by the operator prior to use and by a licensed electrician on a three-monthly basis with details of the inspection being recorded in the "Electrical Inspection Register" and on the appropriate colour coded tag for the period.

Common types of power tools used are:

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- Drills Rivet
- Grinders
- Guns
- Circular saws

6.40. Electrical work

- For all works that require the identification and control of electrical energy, an approved Log Out - Tag Out (LOTO) Procedure shall be utilized. Contractor shall ensure to generate and utilize a LOTO procedure to manage the intervention on electrical equipment. As minimum, this procedure shall include:
  - Selection and appointment of competent personnel
  - Roles and responsibilities
  - Training requirements
  - Approved tools
  - Safety devices and mechanisms
  - Communication protocols
  - Authorization protocols
  - Administration and physical controls
  - Precautionary measures
  - Maintenance and testing protocols
  - Consideration on simultaneous operations
- All pertinent personnel shall be trained, If energized equipment, installation, or electrical system must be intervened it shall be de energized and/or isolated prior to commencement of work on them by using the Log out Tag Out Procedure
- All practicable measures shall be taken to protect any person against the risk of electric shock arising from or in connection with the use of any electrical installation or equipment.
- Underground or concealed electrical power lines must be identified and marked prior to any work to be carried out onto the ground or wall.
- In work areas where the exact location of underground electric power lines is unknown, person using hand tools which may contact a line must be provided with insulated protective gloves and insulated protective footwear.
- All dangerous occurrences and electrical incidents shall be reported to the Contractors Project Manager and HSSE personnel immediately and followed by submission with an appropriate written report.
- Electrical installation and equipment shall be of good construction, sound material and free from defect.
- Electrical installation shall be performed, tested and checked by a Licensed Electrical person.
- Testing, inspection and maintenance on electrical installations shall be done by a licensed electrician.
- All temporary electrical in building and work location shall be provided with earth leakage circuit breakers (ELCB).
- All wiring shall be made of weatherproof types, properly insulated and provided with adequate mechanical protection.
- No bare wires or other unprotected conductors shall be located within 4 meters of any surface where employees may work or pass, unless completely guarded by a fence or other barrier.
- No person shall work in such proximity to any part of an electric power circuit that he may be in contact with in the course of his work unless he is protected against electric shock.
- Person shall be advised of the location of such lines, the hazards involved and the protective measures to be taken. No extension to the electrical wiring system shall be made without the Contractor Project Manager and HSE Manager approval.

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- Underground and/or concealed cables shall be identified on Location layout drawings and other related drawings, and shall also be Identified with markers on location.
- All electrical , testing or alterations to any electrical equipment shall only be undertaken by a suitably licensed electrician.
- All electrical equipment including cables, leads or extension cords are to be examined and tested at regular intervals. The findings of these inspections are to be recorded and action taken for the repair, replacement or destruction of the damaged equipment after suitable approval has been granted.
- Switchboards shall be kept locked at all times. The key shall be secured in a safe place to prevent unauthorized access.
- Mobile portable lighting shall be inspected daily for broken switches, exposed or damaged wiring, blown bulbs and damage to trailer and trailer frame. Portable items which are damaged are to be tagged and the details of the damage recorded and then action taken for the repair, replacement or destruction of the damaged equipment after suitable approval has been granted.
- Conductors, switchgear and electrical apparatus is always regarded as being alive until it is proved to be dead by means of approved test lamps, suitable indication devices or voltmeters.
- All electrical equipment and tools are to be inspected by a Licensed Electrician on a monthly basis.

6.41. Working on or near Exposed Live Circuits and Equipment

When working on exposed Live Low Voltage Mains and Apparatus adequate precautions must be taken, otherwise may result in injury or death,

- Insulating mats and hose are to be used by Construction staff when working on or adjacent to exposed Live Low Voltage Mains and Apparatus. When insulating mats and hose are used to cover conductors or earthed metal, the mats and/or hose must be securely fixed to prevent displacement. Conductors and apparatus taken out of service must be proven" dead h by testing
- Precautions must be taken to ensure that the supply remains de-energized by Locking Out the main control switch and any other control points which are capable of restoring supply.
- "Danger" Notices are to be securely attached to the operating lever or push buttons so there is no risk of them becoming dislodged, or of an operator being able to restore power or operate the equipment whilst being unaware of the danger by doing so

6.42. Isolations

Electrical Isolations shall be co-ordinated via Local Electrical Authority, appointed Responsible Competent Person, HSSE appointed personnel and respective Supervisor.

Contractors will adopt its internal Isolation and Lockout procedure.

6.43. Lock-out & Tag-out of Equipment

A lock-out and tag-out procedure shall be in place for machinery or equipment at the Location for the purpose of inspection, maintenance, routine servicing, or repair. During this period, if the machinery or equipment is inadvertently activated or energized leading to a start-up, it is liable to cause bodily injury to any person who may be working on the machinery, by the sudden release of energy.

The lock-out & tag-out procedure is a set of procedures established for the following purposes:

- To ensure that all energy sources to the relevant part of the machinery / equipment, shall be isolated or disconnected.
- To prevent any interconnected part of the machinery / equipment from being inadvertently activated or energized.
- To implement for the inspection, cleaning, repair or maintenance of any plant, machinery or equipment

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Note: The Contractor Log Out and Tag Out Procedure shall integrate all pertinent piping, mechanical, pre-commissioning, commissioning activities as well as communication and joint activities at battery limit form multiple contractors/service providers

6.44. Work Permit System

The intention of the permit to system is to control construction activities having the potential to result in personnel injury, property damage or environment impact.

Locations shall implement a Work Permit System to be applied during construction stage and communicate to contractors. The work permit system shall cover;

- Entry into confined spaces
- Work at Height
- Excavation
- Use of explosive devices
- Hot work
- Electrical work
- Radiography
- Piling work
- Demolition
- Lifting operations involving lifting machines and appliances
- Tunneling work
- Working at height where a person could fall more than 2 meters
- Any other high risk activities, as identified by risk assessment shall also be included It may extend into cold commissioning activities, which may require a Clearance Certificate.

6.45. Hot Work

"Hot Work" is any work activity which requires or involves open flames or any other sources of heat that could ignite flammable or com**bu**stible materials in the work area. Such work shall include but not be limited to, welding, burning, grinding, soldering etc. The following requirements shall be in place prior to commencing any hot work activity.

- A work permit system shell be implemented for hot work activities o An adequate number of dry powder fire extinguishers shall be located within close proximity to hot work areas
- A trained fire watchman shall be assigned to be positioned at the area where hot work is being carried out
- All Slags and sparks shall be contained within the work area. Fire blankets shall be used to contain the sparks, if required.

No hot work close to operating plant and in commissioning areas shall be done by Contractors without BPCL permission.

6.46. Welding

- Welding works shall comply with Indian Standard requirements. Only competent and authorized workers use welding and cutting equipment. Welders and fire watchers shall be competent in the operation of fire extinguishers, fire hoses and any other fighting equipment.
- No Welding and gas cutting close to operating plant and in commissioning areas shall be done by contractors without BPCL permission.
- Fumes and gases evolved shall be identified and exposure controlled. Welders and other persons in the vicinity shall be protected against exposure to ultra violet light and infra-red radiation emitted from the welding operation.
- Welding sets shall be in good condition, properly maintained and earthed.

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- Terminals and live components shall be adequately protected.
- Cables shall be inspected to ensure the insulation is intact.
- Damaged cables or electrical holders shall be properly repaired or replaced
- Welders shall wear face mask, appropriate face shields and welder gauntlets during welding activities
- Only competent and authorized workers shall use welding equipment.
- Precautions shall be taken against exposure for welder and other personnel to ultraviolet radiation, fire, explosion, asphyxiation, or exposure to toxic gases, fumes or dust during welding activity.
- Adequate ventilation shall be furnished when working with welding equipment.
- Fire extinguisher/charged hoses/firefighting equipment must be provided at the welding work locations.
- Welders and fire watch personnel shall be competent in using the fire extinguisher/fire hoses/fire fighting equipment.
- Welding shields must be used to protect the eyes of nearby workers and visitors from ultraviolet exposure.
- Welders shall not wear metal rings, bracelets or necklaces during work as these might be heated by induced currents from the welding equipment.
- The welding equipment shall be checked for defects by the welder prior to usage:
- Damaged insulation on welding leads electrode holders and connections;
  - Faulty earth clamps and earth leads,
  - Torn insulation mats/cradles;
  - Worn or damaged hoses;
- Welding equipment shall be installed in such a manner that it can be continuously seen by the welder during welding activities.
- The welding equipment shall be placed at ground level only. The welding equipment shall not be placed in the path of falling sparks or in elevated structures.
- Diesel welding machines, generators and transformers must be protected by suitable covers for general protection.
- Such equipment must be turned off when not in use.
- Welding machines shall be inspected by a licensed electrician on a monthly basis
- Metal frames and casings of mains powered welding rectifiers, transformers and voltage regulators shall be earthed.
- Welding leads and return leads shall be well protected against mechanical damage.
- The earthing cable shall be attached to the work area as close as possible.
- The earthing cable shall not be attached to an existing installation or apparatus.
- Welding of the earthing cable is prohibited. No concrete reinforcing steel bar shall be used as earth point.
- The work piece shall be positively earthed, using a well-protected earthing wire connected at both ends by bolted lugs or secured by screwed clamps.
- Grounding to plant equipment pieces is prohibited.

6.47. Gas cutting

- Gas cutting shall comply with Indian Standard requirements.
- Gas cylinders shall be in good condition and free from corrosion
- Gas cylinders shall be properly colour-coded and individually identified
- Hoses shall be properly colour-coded to the internationally recognized standard for the gas being used, in good condition and fitted with hose connectors attached with permanent clips. Jubilee clips shall not be used

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- A suitable non-return valve or any other similar device which prevents the backflow of gas shall be fitted in accordance with the manufacturer's instructions between each gas torch inlet and gas hose of every oxygen-fuel gas equipment.
- A flashback arrestor which stops flashbacks shall be fitted in accordance with the manufacturer's instructions at the pressure regulator outlet of each gas cylinder
- Gas cutting equipment must be inspected on a daily basis for leaks, damaged hoses, regulators and pressure gauges, etc, Defects must be reported.
- Suspected leaks may be confirmed with a soap solution. Equipment must be replaced if leak cannot be repaired
- There shall be a designated area for proper storage of cylinders. Cylinders shall not be left lying around, They must not be stored or used in a horizontal position, but must be secured in an upright position, Cylinders must not be taken into confined spaces for use or storage, and shall not be placed on scaffolds
- Cylinder storage area shall be well ventilated and away from heat source or direct sunlight, "No Naked Flame", II NO Smoking" and "Flammable" sign boards shall be displayed
- Cylinders must be handled with care and must not be misused. They must be properly shut off when not in use and safety cap must be fitted when being moved
- Cylinders must be placed in a cylinder cage or frame prior to lifting by crane. Manual lifting of cylinder should be minimized. Cylinders shall not be subjected to drop, knocks, and roll during handling
- Cylinders must be placed in trolleys. A bottle key shall be kept with cylinders in use. Cylinders not in use shall be fitted with a safety cap.
- Oxygen and fuel gas cylinders shall be kept separate with a minimum distance of 5m. Empty cylinders must be separated with full cylinders, and shall be marked "Empty" or 'Full"
- Gas cutting equipment, including hoses shall not cause obstruction. Hoses not in use must be coiled up and put in a safe place. Hoses should be supported off the ground
- Gas cutting equipment, including hoses must be removed from confined spaces and excavations during any break or at the end of the day

6.48. Hazardous Areas

- Hot work shall not be carried out in a hazardous area unless a hot work permit is issued.
- Before hot work in a hazardous area is performed, the Contractor and person(s) performing the hot work shall:
    - Provide suitable locations for equipment including emergency fire fighting equipment.
    - Consider any possible changes in circumstances during the hot work, which may render the area unsafe..
    - Ensure fire watchman and fire fighting equipment are available.
    - If required, fire blankets will be used to protect areas that could com**bu**st due to sparks
    - Issue hot work permit.
    - Ensure that when hot work is performed, welders will not work alone and shall be provided with assistance as considered necessary. One of the duties performed by the assistance shall be of trained fire watcher.
    - Ensure that on completion of the hot work, the permit has been signed off by the issuing officer.

6.49. Confined Spaces

All conditions, precautions, etc. as outlined in the Regulations and relevant code of practice shall be adhered to. In addition, the requirements as defined in Additional requirements are as follows:

- A competent Confined Space Assessor shall be engaged to closely monitor and supervise the safe work operations in the confined space. He shall be the assessor of the confined space where works are intended to be carried out
- The Confined Space Assessor shall test the atmosphere of a confined space prior to entry by any person into the confined space. The results, indicating the levels of oxygen content, flammable and toxic gases shall be recorded and attached to the work permit system.
- A copy of the approved work permit system shall be displayed at the entrance of the confined space.
- Atmospheric testing of the confined space shall be carried out prior to start of confined space works and subsequently at 6-hourly intervals if the work is continuous. The work permit system will be revoked if independent testing shows the confined space to be an unsafe hazardous environment Re-entry into the confined space shall only be allowed with the issuance of a new PTW
- Confined Space workers (entrants) shall have passed the BPCL approved Safety Orientation
- Confined space attendant(s) who have to communicate regularly with the entrants shall be trained in the same areas as the entrants He shall also be trained in rescue efforts so that he can coordinate rescue efforts in times of emergency. The attendant shall not leave his position at the outside entrance of the confined space at any time.
- Forced ventilation shall be provided at all times to a confined space when work activity is being carried out. The ventilation system would consist of a blower connected to flexible ducting. Only explosion proof blower shall be used for combustible atmospheres. The requirement and determination of equipment to be used and its set up while obey a Contractor Confined Space Assessor ventilation plan.
- Appropriate respiratory, breathing apparatus and proper PPE shall be provided to protect the entrants from inhaling contaminants in the confined space
- A retrieval system consisting of a retrieval line, body harness and a lifting device, or other suitable means shall be used by entrants who are authorized to enter into a confined space and tended at all times by the attendant.
- Illumination of not less than 50 lux shall be provided for access and passage into the confined space.
- All portable hand-held lightings provided in confined space shall be operated at an AC voltage not exceeding 55 volts between the conductor and earth or DC voltage not exceeding 1 10 volts
- Warning signs shall be displayed at or near every access point to warn persons of the existence of a confined space.
- A confined space entrant shall always wear a safety harness with a retractable lifeline, abrasion resistant gloves, protective non-slip footwear and safety helmets.
- A tripod or crane should be used to lower workers where possible.
- Breathable air cylinders to be used shall be properly certified and tested before each use
- If Air compressor will be used to supply breathable air, the compressor shall be for that purpose only and it should be provided with CO, moisture, temperature and oil in line monitor and deficiency alarms.

6.50. Excavation

Contractor shall authorize all excavation work by means of an excavation permit; it includes on-shore pile driving and soil testing. Proper checks, e.g. by hand excavated test holes, shell be made for the presence of underground cables or services before machine excavation work is authorized. Drawing checks are insufficient. On project locations within or adjacent to operating plants , all machine excavation shall be done with a dedicated and properly trained banksmen observing the actual soil cutting and removal. The following conditions shall be in place for excavation works:

- Excavations shall be barricaded with signs and shall have warning lights at night

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- Excavations with a depth of more than 1.5 meters must be shored, sheet piled or sloped. Excavation more than 1.5 meters depth must have a barrier constructed from the edge of the excavation
- Materials shall be placed more than 1.5 meters away to prevent collapse. Vehicles shall not be parked near excavation areas • Exposed cables or services shall be supported
- Exits points shall be provided
- Excavations shall be inspected by the supervisor daily before work start. Any shoring for excavation depth exceeding 4 metres shall be designed by a professional engineer
- Excavations and trenches more than 1.2 meters depth shall be considered as a confined space and subject to work permit control, both on existing operating and green field project locations
- A designated person who has completed adequate training in safety and health shall supervise the excavation works. He shall also carry out daily inspection of the excavated area before commencement of work, and after every rainstorm or other hazard occurrence
- Access ladders must be provided for excavation depth exceeding 1.2 meters and at least every 25 meters around the perimeter of all excavations
- Ground water must be pumped and kept out from the bottom of all excavations
- Gas cylinders must not permitted in any excavation
- Edge line of excavation, ropes, chains and other tripping hazards must be marked in order to be clearly visible during day or night
- Starter bars or other protruding objects must be covered or removed
- Personnel removing shoring after completion of work must not be at the bottom of the excavation
- Only a trained and competent excavator operator is allowed to operate the excavator. The excavator operator shall have completed a training course on the operation of excavators
- Excavation machinery must be positioned and operated in a manner that will not endanger any person involved in the excavation works
- No person shall be permitted to work or to be at vicinity where he may be struck or endangered by excavation machinery or by material dislodged by it or falling from it. A safe distance must be maintained between the excavator machine and any person(s) working near to that machine. Person(s) must be prevented from entering the safe operational envelope of the machine; if no-one is there than no-one can get injured.
- visible barrier shall be erected around the excavator to prevent person(s) from walking close to its operating envelope
- Excavations must be gas checked before any personnel enter if evidence of gaseous elements is suspected
- Excavators shall not be used for lifting purposes at any time
- Excavation machinery shall be subjected to daily inspection and regular maintenance

6.51. Security

Contractor shall include the provision of full-time security personnel to manage Security measures at the Location. These personnel form part of the Emergency Response Team (ERT) and assist in emergency evacuation of personnel. The security department shall take the following measures daily.

- Attendance record for all Location personnel including sub-contractors and visitors
- Issuing of visitor pass as per location procedure
- Vehicle movement record for all vehicles entering and leaving the Location
- Records for all incoming and outgoing machineries such as cranes, excavators, piling rigs, etc,
- Stop and conduct checks on all persons, their identities, and any items in their possessions, custody or control
- Declaration form by persons carrying personal phones, pagers, walkie-talkies
- Control and management of unauthorized parking at Location premises

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- Location patrol
- Support the Contractor Drug & Alcohol Monitoring and testing Procedure
- Support Contractor Management in handling cases of workers involved in misconduct /violations at the project location.

6.52. Location traffic & Transport of Material

Contractors shall ensure the following conditions are in place for transportation of materials:

- All vehicles must be roadworthy and conform to local legal requirements.
- Inspection and maintenance of all vehicles and construction equipment before mobilization on Location. Periodic maintenance to be conducted after mobilization on-Location. All vehicles must be wellmaintained, and exhaust emissions must be clean, with no visible black smoke. All safety features/devices shall be fully operative at all times.
- Risk assessment on the 'transport of materials to include as a minimum: loading, securing, unloading of materials, escorting heavy loads, escorting loads in complicated/congested routes, use of banksmen and spotters as needed, peak hour mobilizations, pre-checks of heavy loads routes and areas impacted by inclement weather.
- Training and authorization of drivers of all classes of vehicles and construction equipment. Contractors must ensure that only licensed and authorised personnel are allowed to drive
- Designating Location personnel to act as traffic controllers. Traffic controllers to be briefed on roles and responsibilities.
- Demarcation of areas on-Location where traffic is allowed to be made known to all Location personnel and visitors. Contractors must erect barricades and install signs to separate pedestrians from vehicles. Particular attention must be paid at entrances to the Location.
- Reverse sensors to be fitted on all vehicles where practicable. In the event where fitting of the sensors are impractical, traffic controllers should be deployed.
- Seat belts are compulsory for the drivers and passengers of all classes of vehicles.
- Vehicles must be parked at a designated car park and shall not block access or emergency points
- Traffic management will be coordinated through the BPCL project manager.
- Only authorised routes must be used to and from the Location- Mobilization route drawings must be communicated and update accordingly.

6.53. Piling

Contractor shall carry out Piling operations shall be carried out, as a minimum, in accordance with the following requirements:

- Method statements risk assessments and emergency procedure for piling works
- Structure adequately supported by sheet piling or other means of shoring in accordance with the design of a professional engineer (PE)
- Contractors shall assign an area for pile preparation at a safe distance away from the piling zone
- To determine the piling machine's safe working area/access on Location during operation/movement based on type of machine operated and the ground load bearing capacity e Provision of suitable PPE to protect rig operators and workers from falling objects, noise, etc, Inspection of the piling machine daily prior to start work. Ensure all safety mechanism/devices are well known by involved personnel and are in good working condition
- Submit the Work Permit for piling prior to work commencement and proceed work subject to approval from the Project Manager
- Suitable footing such as steel plate and hard core to be provided if piling rig is to be driven on soft ground
- Only trained and competent persons to operate piling machines With valid LM certificates
- Bored holes to be properly barricaded and/or effectively covered.

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- The piling machine shall be subjected to regular inspection and maintenance regime programme. It shall have updated and valid certification.

6.54. Demolition

Contractor shall perform demolition work in accordance with the following requirements:

- Method statements and risk assessments for demolition work shall include exposure to hazardous chemicals such as dust and toxic chemicals
- De-energize all electrical supply prior to commencement of demolition works
- Protection of adjacent structures against premature collapse
- Disposal of all types of waste in accordance to local authority requirements
- Demarcation for no-entry zones to prevent unauthorized entry into the structure being demolished.
- Appropriate PPE requirements such as safety harnesses, anchoring points, respirators, etc.

6.55. Commissioning

It is vital to mobilize commissioning managers and other key persons early, and to maintain continuity of people, planning and work processes from construction through cold commissioning to hot commissioning to start-up. Cold commissioning involves cleaning and functional testing of utility and process systems without the introduction of nitrogen and hydrocarbons. Hot commissioning involves introduction of hydrocarbons or other process materials for testing purposes and the functional testing of all remaining utility and process systems. During commissioning, BPCL work permit system will be used.

6.56. Environmental Management

BPCL Project team should audit the implementation of adequate environmental protection plan, procedures, protocols and actions.

Environmental management shall include the following.

- Waste management
- Chemicals management
    - Fugitive dust controls
- Noise and vibration controls
- Traffic management ensuring "clean wheel policy"
- Reinstatement of land after temporary works
- Vector controls (e.g. by dewatering, water treatment, use of water-based spraying of mosquitoes instead of thermal fogging, others)
- Rodent and pest controls
  Hygiene controls of office f and warehouse facilities and canteens
- Waste and spoil management to include hazardous waste (e.g. keeping a list of hazardous substances used and SDS, keeping a list and utilizing approved waste collectors, implementing programs to minimize waste by programme for recycling, reusing and recovering, others)Reporting of environmental incidents
- Training on environmental principles end procedures
- Effluent discharge controls
- Pollution prevention training
- Complying with all Pollution Control Board requirements
- Taking timely and adequate actions to resolve any potential audit observation

6.57. Waste Management

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All Contractors shall take provision for proper disposal of general and industrial waste at the Location. Collection of garbage and industrial waste should be conducted on a regular basis. Waste should be segregated based on the different types such as metal, wood, food, hazardous and general waste. General guidelines on disposal of waste should include the following.

Hazardous waste to be disposed in separate containers and clearly labelled. Contractors should engage a licensed industrial waste collector to dispose all hazardous waste. Hazardous waste includes waste generated from clinics such as

- Signs are to be placed at designated areas for the storage of waste bins or containers
- Batteries should be segregated and subsequently disposed in a safe and controlled manner
- Only approved contractors should be engaged for the recycling of scrap metal.
- Chemical containers and drums should be reused if still in good condition
- Disposal of garbage shall meet local legislative requirements and public health standards. Solid waste management shall be managed by the collection of refuse by licensed general waste collectors
- There shall not be any overloading or spillage of construction wastes from skips
- Refuse bins shall be properly covered
- Organic food wastes and construction wastes must not be stored together and shall be removed daily
- Waste/used oil shall be properly collected and sent to a pollution control board licensed collector/agency.
- dressings, swabs, used syringes, needles, cartridges, medicines, tablet and other chemical waste used in OHS centre.

6.58. Air Pollution Control by Contractors

- Lorries and vehicles carrying construction materials must be properly and adequately covered
- There shall not be any emission of dark smoke from construction equipment and machinery
- Open burning of construction waste is strictly prohibited.
- Dust preventive measures such as water sprinklers/spray, shielding, netting, covers/hoarding for aggregate/sand stores shall be provided and maintained.

6.59. Noise Pollution Control by Contractors

- DG sets at Location shall be with acoustic enclosure.
- Regular maintenance shall be carried out for all equipment and machinery to prevent excessive noise emission
- Noise monitoring activities may be needed/required on particular cases.

6.60. Toilet & Washing facilities by Contractors

Sufficient toilet and washing facilities at the Location office shall include the following facilities:

- Wash basins and showers shall be provided with hot and cold water, with soap and paper towels, continuous roller type towels or hand dryers
- Continuous supply of water should be provided at all times
- Toilet and washing facilities shall be kept clean and in working order
- Floors, walls, ceilings and fittings in the facilities should be of a finish that can be cleaned easily
- Waste water should be connected to a disposal drain and discharged to a drain

6.61. Canteen& Food Hygiene

Contractors shall maintain a high level of food hygiene at the Location. The necessary steps are to be taken to prevent food contamination that may lead to case(s) of food poisoning:

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- Provision of a designated area for consumption of food away from the Location.
- All Location personnel are to be briefed on good hygiene habits prior to consumption of food.
- Consumption of food at any other area other than the designated area should be strictly prohibited.
- Only food catering operators that are licensed are allowed to deliver food to the Location.
- Food handlers shall wear gloves or use tongs or other suitable implements when handling ready-to-eat or cooked food

6.62. Drinking Water

Contractors shall ensure the availability of sufficient potable drinking water for all personnel at the Location. Drinking water standards should meet WHO quality standards. Provision of potable drinking water and water stations shall also meet the following requirements:

- The stations for the drinking water and potable water tanks are to be labeled "Drinking Water" to differentiate from water used for industrial purposes
- Drinking water stations are to be indicated on the general Location layout plan to inform all personnel.

6.63. Lighting

Contractors shall provide sufficient and suitable lighting at every part of the Location as well as in the office. The requirements shall conform to the requirements stated in National building Code/OISD codes.

- General lighting requirements shall be as follows:
- Minimum 50 lux — for passageways, corridors and stairways
- Minimum 100 lux — for store rooms, toilets and wash rooms
- Minimum 200 lux -- moderate discrimination of detail required (eg. rough bench and machine work)
- Minimum 300 lux - close discrimination of detail required (eg. medium bench and machine work)
- Emergency lighting shall also be provided in the event of a power failure affecting the general lighting.

6.64. Health Monitoring

Health surveillance will be provided for staff where there is a legislative requirement or for staff who have been identified as having exposure to hazardous substances and the exposure to the hazardous substance is such that it is likely that an adverse effect on the staff's health may occur under the particular conditions of the work.

6.65. Procedures, Records Storage

BPCL HSSE procedures will be used as reference for Contractors compliance during the Construction Stage. Stringent of the two shall be complied with. Contractors Procedures will be aligned with BPCL Procedures. BPCL HSSE procedures will be fully in use during the commissioning stage,

Contractors shall ensure that the following records are obtained and kept on file:

- Insurance details for each contractor including Workers Compensation and Public Liability;
- Licenses and Permits
- Drivers license (motor vehicle and plant);
- Electrical contractors license;
- Crane drivers, signalmen, riggers, etc;

Contractors shall ensure that as a minimum the following documentation is maintained on the project:

- Details of HSSE training (external & In-house) and induction records, attendance records;
- Hot Work Permits and Confined Space permits; •Records of all accidents and near misses;

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- Details of all inspections, hazard/risk assessments;
- Copies of all Health & Safety reports

6.66. Emergency Response Plan (ERP)

Location shall develop and implement a comprehensive Emergency Response Plan to be used during the construction and commissioning phase. Communication with external authorities and Emergency Response Organizations shall be clearly defined.

A copy of the up-to-date Emergency Preparedness and Response Plan for each Area shall be made available as guide of the Emergency Response Team (ERT).

Specific high risk activities that require potentially complex rescues e.g. Confined Space within confined space or confined space requiring ventilation entry into a vessel loaded with trays or activities conduct from particularly high structures, such as flares, will be requires to have "Stand By" rescue personnel.

Locations shall ensure that contractors properly communicate the Emergency Respond Plan to their all personnel. Contractors will be responsible to ensure safety of all their supplier and short term service personnel and escort them at all time on Location.

All visitors and personnel entering the work Location shall be provided with instructions in what action to take in the event of a potential emergency situation. Key subject areas will be.

- Locations of medical facilities
- Overview of emergency plan and procedures
- Potential emergency threats on project
- Action to take in the event of an emergency
- Emergency notification alarms and their location
- Location of " Assembly Area"
- Action to be taken at a " Assembly Area"
- Medical Emergency response requirements
- First aid requirements
- Emergency Telephone numbers

6.67. Emergency Alarm System

Locations shall evaluate the need to install alarm systems. This could consist of the following.

- Gas Detection Alarm Systems
- Office Building Alarm System

6.68. Medical Facilities

Location shall maintain an OHS centre, equipped ambulance and first aid boxes at project Location as per the Building and Construction Workers Rules as applicable . Any project location more than 500 workers shall have one fully equipped ambulance van.

6.69. Incidents and Near Misses Reporting and Investigation

All accidents and dangerous occurrences shall be reported/ recorded as per BPCL IRIS system, regardless of whether or not personnel injury occurs.

- Fatal accident
- Lost Time Injury accident
- Dangerous occurrence
- Any incident involving a member of the public
- Near Misses

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BPCL shall conduct in-depth investigations into all fatal accidents, Lost Time injury, accidents, incidents involving a member of the public, dangerous occurrences. Copies of these investigations shall be forwarded to the contractor Representative.

6.70. Dangerous occurrence Reporting

- Bursting of a revolving vessel, wheel, and grindstone or grinding wheel moved by mechanical power.
- Collapse or failure of a crane, derrick, winch or other appliance used in raising or lowering persons or goods or any part thereof (except the breakage of chain or rope slings), or the overturning of the crane;
- Explosion or fire causing damage to the structure of any room or place in which persons are employed, or to any machine or plant, resulting in the complete suspension of ordinary work.
- Electrical short circuit or failure of electrical machinery, plant or apparatus, attended by explosion or fire, causing structural damage involving its stoppage or disuse.
- Explosion of a receiver or container used for the storage at a pressure greater than atmospheric pressure of any gas or gases (including air) or any liquid or solid resulting from the compression of gas.
- Collapse in whole or part from any cause whatsoever of any roof, wall, floor, structure or foundation forming part of the construction Location in which persons are employed.
- Total or partial collapse of any overburden, face tip or embankment on the construction Location.
- The overturning of, or collision with any object by any bulldozer, dumper, excavator, grader, lorry or shovel loader, or any mobile machine used for the handling of any substance on the construction Location.

6.71. Reporting of Fires to BPCL

The contractor shall report to the BPCL Representative all fires which occur on Location including any fires that have been extinguished by the contractor, and the Employers Representative may send staff to investigate such fires. The following information shall be provided:

- Time of fire;
- Location of fire;
- Means of extinguishing fire;
- Injury to any person / damage to any property; and
- The probable cause of fire.

6.72. Monthly Safety Submittal to the BPCL

The contractor shall submit following monthly reports to BPCL (but not limited to)

- Monthly report of total number of workmen.
- Total Man hours worked
- Number of LTI incidents
- Minutes of Location safety committee Meeting.
- Safety Inspection report
- Electrical Inspection Report
- Scaffold Inspection Report
- Crane Inspection Report
- Any potential concern

6.73. Safety Record to be maintained by contractor

The contractor shall submit following monthly reports to BPCL (but not limited to)

- Accident / Incident / Dangerous Occurrence report form.

- Accident Statistic – Monthly report form.
- Contractors Monthly Safety report.
- Work permit records
- Risk Assessment worksheet.
- Safety Training Attendance record.
- Weekly Fire Fighting Equipment checklist.
- Electrical Inspection Report
- Scaffold Inspection Report
- Crane Inspection Report

6.74. Safety Inspections

Contractor shall establish following schedule of inspections as a minimum at each project Location and submit inspection checklist

Inspection Category	Inspection Type	Periodicity
Planned General Inspection	Contractor and subcontractor Location safety committee	Monthly
	Daily safety inspection by contractor Location safety Team	Daily
Routine Inspection	Inspection of equipment	Daily
Special inspection	As per equipment manufacturer's manual (scaffold, crane, HEMM, Electrical etc.)	----

6.75. Safety Recognition

Locations shall develop and implement recognition scheme to recognize outstanding safety performance of workers, supervisors and subcontractors. This recognition shall l be given out on a monthly basis.

BU/ Locations may award contractors who have performed well in best safety practices and achieved "Zero harm to People and Assets Incident" target.

7.0 Review

Corporate HSSE shall review this technical standard once in 2 years and need based in consultation with BU HSSE Role Holders.

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8.0 Definitions

Project	A project, by definition, is a temporary activity with a starting date, scope, specific goals and conditions, defined responsibilities, a budget, a planning, fixed end date, parties involved. It means here a EPC project related to construction and commissioning of a new installation at a new Location or expansion / modernization of existing installation at the existing Location. The project work activities may include but not limited to activities related to Construction, Erection, Modifications, Expansions, Maintenance, Demolishing, etc.
Project Safety Management Plan	A comprehensive document defining entire safety management system for the proposed activities. This shall be submitted by contractors in BU prescribed template and shall be approved by project owner/his representative prior to start of the work.
Project Locations	It includes A. New projects such as greenfield Locations as well as B. Projects within or adjacent to existing installation/plant (but separated by a fence with an independent access control. In case of project work , within or adjacent to existing installation/plan , prior work permit shall be required.

9.0 Abbreviations

API	American Petroleum Institute
ANSI	American National Standard Institute
ALARP	As Low As Reasonably Practicable
BPCL	Bharat Petroleum Corporation Limited
BU	Business Unit
EPC	Eraction, Procurement and Commissioning
FEED	Front-End Engineering Design
HSSE	Health, Safety, Security , Environment
HAZOP	Hazard and Operability Analysis
HIRA	Hazard Identification and Risk Assessment
IRIS	Incident Reporting and Investigation System
ISO	International Organization for Standardization
IS	Indian Standards
JSP	Job Safety Plan
OISD	Oil Industry Safety Directorate

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RLTIFR	Reportable Lost Time Injury Frequency Rate
OHSA	Occupational Health and Safety
P & ID	Piping & Instrument Diagram
PSP	Project Safety Plan
QRA	Quantitative Risk Assessment
SWP	Safe Work Procedure / Standard Operation Procedure
TS	Technical Standard
WPS	Work permit system

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Appendix 1 : Project Personnel Responsibilities

BPCL Project Leader : Specific Responsibilities may include:

- Ensure Project Safety Management Plan is developed and implemented for the project and actively promote safety via personal example and supervision.
- Ensure the allocation of adequate resources for implementation of the Project Safety Management Plan
- Promote the reporting of all incidents (including non-injury) by all employees
- Ensure an audit plan is in place to monitor the compliance and effectiveness of the Project Safety Management Plan
- Endorsement of the BPCL HSSE Policy

BPCL Project Engineers

Specific Responsibilities may include.

- Ensure the effective communication of the Project Safety Management Plan to all employees, Contractors and its subcontractors
- Ensure the Project Safety Management plan as documented is implemented and to actively promote via personal example and supervision
- Familiarization and compliance of legislation as applied to the project
- To ensure safety training and induction programme are formulated and exercised to all employees, Contractors and its subcontractors
- Promote a recognition Scheme for personnel and Contractors with outstanding safety performance
- Promote a safety accountability scheme to deal with personnel with under expectation safety performance
- Promote the reporting of all incidents (including non-injury) by all employees.
- Ensure that the Contractors and their subcontractors have undertaken their Health and Safety obligations
- Undergo necessary safety training and induction of each construction Location

BPCL Project HSSE Role Holders

- Daily job planning with contractors job representatives
- Audit / inspection the implementation of the BPCL Location Project Safety Management Plan as defined herein.
- Liaison with Contractors' safety personnel and line managers.
- Audit Contractor Line Management implementation of the Project Safety Management Plan
- Participate inspections of the work areas with Contractors Management
- Advise supervisory staff and employees in the implementation of strategies to identify and control potential hazards.
- Liaise with Contractor's Safety Role Holders to request to the Contractors action plans for safety performance improvement as needed
- Audit Contractors equipment and machinery inspection process
- Audit Contractors' Hazardous Materials storage and controls
- Conduct internal safety training

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- Participate in safety meetings, including the Project Safety Committee Meetings
- Incident recordings and investigations
- Safety discipline

Appendix 2: Sample Template for Project Safety Management Plan

Project Details:

CLIENT/COMPANY	
PROJECT	

Prepared by:

Reviwed by:

Approved by:

TABLE OF CONTENTS

Sr. No	Particulars	Page No
	Name of contractor organization submitting Safety Management Plan	
	Authorized Person Submitting safety Plan & Contact details	
0.	Purpose of the Plan	
1.	Project Highlights • Title • Principal Employer • Project Brief • Period • Lay out plan • Contact No. of Principal Employer	
2.	Scope of the Contract against which this safety Plan is submitted	
3.	Reference Documents	
4.	Abbreviations /Definitions	
5.	General Duties of project managers	
6.	General Duties of workmen	
7	Safety Leadership, Policy & Objectives	
7.1	Safety Policy & involvement of leadership in Safety Implementation	
7.2	Contractor's Alcohol & Drug Policy	
7.3	Safety Objectives & Targets	
8	Contractor's safety Organization • Safety Committee • Project Director • Location Manager • Supervisor	

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	• Location Safety Head • Location SAFETY Managers • Location SAFETY Representatives • SAFETY Stewarts • Labor Welfare officer • Medical Officer & staff • Sub-contractors • Fire / Safety Watch • Quality Assurance Staff	
9	Hazard Identification , Risk assessment & Risk mitigation Procedure	
10	Facility & Equipment provided to safety personnel	
12	Selection , Control & evaluation of Sub contractor	
13	Issuing I Card & Maintaining Register of workman	
14	Health Surveillance & Facilities (Occupational Health center , Ambulance & First aid facilities)	
15	Contractor's Safety committee meetings	
16	Safety Department & Contractors Safety stewards meetings	
17	Pre start up meeting	
18	List of Safe Work Procedure to be maintained at Location	
19	Hazard Reporting & Rectification Procedure	
20	Work Permit Systems	
21	Lockout & Tag out followed, if yes details	
22	Details of Persons Having "Certificate of Competency" on high risk activities including: • Work permit issuer • Electrical work • Operators- Crane, Hydra / Derrick • Drivers • Slinging & Rigging • Scaffold • Any other Note : Provide copies of certificates of competent persons	
23	a. Contractor's Safety Training , Promotion & Recognition b. Induction Training to project managers / officers/ supervisors (Prior to start the work) c. Induction Training to contractors (Prior to start the work) d. Training plan and agenda e. Competency assessment training f. Safety Internal auditor training g. Mandatory Safety Training to selected employees/	

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	workmen (Firefighting / First aid / Emergency drill) h. Safety Intranet i. Quarterly Safety Campaign j. Safety Signage k. List of Days to be celebrated l. Safety Rewards	
24	**Contractor's Safety Inspection System** a. Management Walk b. Daily Safety inspection by SAFETY Representative c. Daily Safety Inspection by contractor Safety Officer d. Scaffolding & Platform inspection (weekly) e. Lifting machines / tools inspection by Competent Authority –Annually f. Lifting appliances (Quarterly) – Inspection & color coding g. Electrical safety inspection – Monthly h. Heavy Earth moving machineries	
25	**Contractor's Safety Consultation & Communication Arrangements**	
26	Monthly Performance Reporting parameters to THDCL	
27	Monthly Reporting by Sub Contractors and designated person	
28	**Contractor's System of Safety Audit** • Internal Safety Audit • Corporate Safety Audit • Third Party Audit • Special Audit – Electrical, PTW, Fire Safety etc.	
29	Fire Protection Plan & Facilities	
30	Work Place Monitoring	
31	Incident / Accident Management • Reporting • Investigation • Control measures follow up • Statistics	
32	List of standard IS approved PPEs provided at location	
33	Road & Traffic Management	
34	Details of Labor Health & Welfare Camp & facilities to be provided	
35	Environmental Management • Disposal of construction waste • Hazardous / Inflammable chemicals management • Hazardous waste management	

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	• Dust Suppression • Emissions – DG Sets • Waste Water Management – Sewage • Drinking Water Management • Illumination Management • Noise Management • Vector Control Measures	
36	Visitors and Security Management	
37	Records Management	
38	Abbreviations & Definitions	

Appendix 3: Contractors Roles & Responsibilities

Contractor's Project Manager

The contractor's Manager has overall responsibility for the development and implementation of appropriate Location Managing and Health and Safety Standards of BPCL. He shall also keep all team members of their responsibilities, current, new and amended statutory requirements.

The contractor's representative shall inform the name of Location Manager to BPCL at least 3 weeks prior to commencement of work. He shall work closely with BPCL Project manager and BPCL Location Safety officer.

Contractor's Managers/ Supervisors

All managers / supervisors employed by the contractor shall conform to the following requirements:

i. The understanding and acceptance of their responsibilities under the BPCL health and Safety Policies and current Indian Health and Safety Legislation.

ii. Make themselves fully conversant with the contents of this document copy and operate within all legal and BPCL requirements applicable to the project location. This requires the continual and regular checking of these requirements in actual practice and taking any necessary corrective action.

iii. Ensuring that all newly engaged or transferred personnel under their control are made fully aware of any known hazards or processes within the project location and the preventative measures to be taken or provided to reduce the risk to personnel.

iv. Ensuring that all employees, including Supervisors, are properly trained for the specific tasks allotted to them. That all newly engaged and transferred employees receive the Health and Safety induction training prior to commencing work at the project location, and that they receive on the job training in health and Safety matters.

v. Ensuring that all personnel under their control are made fully aware of the emergency and evacuation procedures and that the locations of firefighting equipment, alarms, emergency doors and exit routes and assembly areas are pointed out to them.

vi. Making sure that all plant, tools and equipment at the location are maintained in a condition that is safe to use, that all the necessary Safety equipment is readily available, issued, used and maintained and that there is a safe means of access and egress to and from the work location at all times.

vii. Ensuring that the entire relevant safe operating procedures and systems of work instructions are generated, made known to all respective personnel and strictly adhered to. This includes the continual review of these procedures and instructions in practice and discussions with the employees concerned to ensure that they are workable and understood.

viii. Ensuring that all personnel under their control are adequately trained and capable of carrying out their duties correctly and safely, and that no newly engaged or transferred employees are required to undertake any task without the appropriate training, instruction and supervision.

ix. Knowing and thoroughly implementing the accident and incident reporting investigation procedure and taking prompt remedial action to prevent recurrences.

x. Assisting BPCL on investigations, complying with instructions given by him, and co-operating on areas recommended for improvement.

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xi. Demonstrating a personal interest in the health, Safety and welfare of personnel, applying a good standard of housekeeping within the work location and encouraging a positive response from other personnel by showing a high standard of self-discipline in respect of health and Safety.

xii. Maintaining a high standard of health and Safety at project location by the day to day Safety training, no matter how small the requirement, by individual instructions, as necessary.

xiii. Assisting the BPCL Representative on work location inspections and taking action any recommendations made, provided they are able to do so. Ensuring that in the event that any matter raised be unresolved, even with the facilities available to them, they refer the issue to the location Incharge/ Head.

xiv. Where new plant, equipment, process or changes are to be implemented within the work area, they are to make BPCL Representative(s) aware of the details and the potential effect such plant / equipment / practices are likely to have on the health and Safety of personnel in the work area.

xv. Seek the advice of the Location Incharge on matters of health and Safety, protective equipment, clothing, systems of work and procedures wherever any doubt exists.

xvi. Determine the requirements for protective equipment or clothing for operations and processes and requisition the same from stores and issue same to those requiring use of such equipment.

xvii. Notify their immediate superior of any defective, damaged or missing guards on machinery or plant and request that the matter be dealt with immediately prior to permitting the use of any such plant or machinery, etc.

xviii. Notifying the Location Incharge of all personnel whom they intend to employ on operations involving contact with hazardous process.

xix. The contractor's managers/ supervisors have an overall responsibility to ensure that all machinery, plant and equipment under their direct control are safe and without risk to employees.

xx. In the event of the contractor's managers/ supervisors not being able to resolve a health and Safety problem, especially ones reported to him by employees, he shall refer the matter to the BPCL project manager.

xxi. The contractor shall maintain Portable First Aid Boxes in fully equipped state at various places. The contractor shall ensure that at least one employee on every working shift, is a trained First Aider, capable of administering First Aid competently until the arrival of professional help, in an accident situation.

Contractor's Safety Officer

The contractor's Safety officer is primarily responsible for writing and the upkeep of his Safety Plan, and any other identified required procedures as the project progresses. Other responsibilities include, but are not limited to, advising the SM and any members of the project team on Safety matters, assuring compliance with BPCL Safety Manual and any other relevant Safety related documents, ensuring audits and inspections are conducted on a regular basis as required, ensure that personnel, at all levels within their scope receive appropriate Safety training through organized induction and refresher courses and activity toolbox talks , provide assistance to assure they fully comply with their responsibilities for Safety, chairing Safety committee meetings and constant liaison with the BPCL Safety Engineer. PSE shall be appointed and notified to the Employer in due course.

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Appendix 4 : Facilities /Equipment for the Contractor's Safety Function

The following minimum facilities shall be provided:

S.No	Safety monitoring and Audio-Visual equipment details	Quantity
1	Portable hand held Digital Sound Level Meter (SLM)	
2	Portable hand held Digital Lux Meter	
3	Laptop computer with standard configuration including multimedia facilities.	
4	Colour Printer	
5	Computer Projector with Screen	
6	Overhead Projector	
7	35mm Camera	
8	Digital Camera with flash (4 Mega pixel minimum) with video facility	
9	Digital still Camera with flash (4 Mega pixel minimum)	
10	Portable loud speaker (for tool box talk and emergency purpose)	
11	Communication facilities like mobile phones and Walky talky	
12	Accident Investigation kit	

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Appendix 5: Indicative Contractor Toolbox Meeting Structure

TOOLBOX MEETING STRUCTURE	
Coordinator	Contractor Supervisor
Attendees	Entire Work Crew for the workplace / work activity (Assemble workforce in groups of manageable size so the talk is effective)
Agenda	Supervisors shall consider the following when formulating the daily agenda: Work Permit Conditions PPE Requirements Area and Task risk analysis Emergency protocol, numbers and Assembly Areas Emergency Exit Routes (for new personnel) Equipment Condition and inspection Emergency Exit Routes (for new personnel) Dissemination of Safety Bulletins Significant Incidents / Near Misses / Preventive actions / Incident reports, safety trends & findings of incident investigations
Frequency	Daily/Weekly
Minutes	Toolbox meetings shall be considered a formal communication process and the recording of minutes with the standard Project Toolbox meeting record form shall be used

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Appendix 6: Indicative Project Safety Statistics

Name of Project :

A : General

Indicator	Total
Man-hours Current Reporting Period	
Accumulated Man-hours (Since start of project)	
Days without any Lost Time Injury	

B. Lead Safety Indicators

	Target	Actual
Total Number of hazards/ unsafe conditions/ unsafe act Reported	Numbers	
Near misses and findings closed on time	100 %	
Safety audit and inspection findings closed on time	100 %	
Number of Monthly Safety Walks (against plan)	Numbers	
Number of Monthly Safety Committee Meetings	Numbers	
Number of Monthly Mass Communication Meetings	Numbers	

C. Lag Safety Indicators

	Target	Actual
Fatality	Zero	
Lost Time Injury	Zero	
First Aid Case	Zero	
Dangerous Occurrences/ Near Misses	Zero	
Spills	Zero	
Fires	Zero	
Asset damage Incident	Zero	
Traffic Incidents	Zero	
Security Incident	Zero	
Penalty Notices / Discipline Action Taken	Zero	

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Total Lost Time Incident Rate (per 1,000,000 man-hours worked)	Zero	
Total Compensation Paid	Zero	

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Appendix 7 : Project Safety Basic Safety Rules

1. Contractor shall appoint adequate number of qualified and experienced safety staff at the BPCL Project Location.
2. All equipment, tools, crane, vehicle etc. brought by the contractor shall be inspected to ensure compliance with the applicable Safety requirements. Only those equipment, tools, crane, vehicle etc that meets the requirements and are approved by the BPCL shall be permitted for use.
3. Such inspections shall be carried out independently as well as jointly by contractor and BPCL HSSE staff. Inspections checklists shall be used for these inspections.
4. Contractor employees shall comply with the BPCL HSSE procedures & policies as applicable at the concerned project location.
5. Contractor shall follow project safety management plan duly reviewed and approved by BPCL.
6. Contractor employees shall follow Safety precautions and procedures concerning specific operations and jobs. Work or task shall be performed according to established procedures and with the designated tools & equipment.
7. Contractor employees shall not start work until authorized by the area owner or work supervisor from BPCL or his authorized agency.
8. Contractor employees shall only carryout the assigned task under a work permit issued by the BPCL or his authorized agency.
9. Contractor employees shall not bring Radios, Mobile phones, lighters, matches, or any other form of ignition sources within project locations.
10. Firearms, ammunitions, knifes etc. shall be strictly prohibited at project locations and workers camps within Industrial Sector.
11. Contractor employees shall not carryout photography or use video camera within the project locations without written approval of BPCL concerned department.
12. No Smoking Policy shall be strictly followed for all projects.
13. All temporary buildings of contractors within project locations shall be located in an area approved by the BPCL area owner and HSSE Department.
14. All temporary offices, office wiring including accessories installed therein shall be subjected to inspection & approval of BPCL. Any changes to approved wiring or installation of new electrical accessories shall be submitted to BPCL for review and approval prior to implementation.
15. Contractor shall ensure that construction areas, fabrication shop, corridors, offices material storage area, workshops etc. have adequate natural or artificial lighting.
16. Contractor shall furnish adequate clean supply of potable water, containers disposable cups to their employees for drinking water.
17. Contractor shall furnish adequate portable toilet facilities for his employees. All portable toilets shall be kept clean and located in an easily accessible area. If they are to be used at night, the area shall have adequate illumination.
18. Contractor shall properly secure, transport, and use compressed gas cylinders. Cylinders not in use shall be capped and marked.
19. BPCL fire and emergency response equipment and systems shall not be used without authorization and/or for any non-emergency activity. Such equipment shall not be impaired (restricted access) by contractor work activity.
20. Contractor shall comply with applicable rules and regulations for disposal of debris, waste material including hazardous, toxic chemicals.
21. Contractor shall provide required safety signs, posters, warning lights, night lights, barricades and other devices/equipment necessary for all situations or for temporary hazards created by the contractors work activity.
22. All excavations made by the contractor shall be adequately protected to prevent sloughing of earth, by shoring or sloping and shall be protected against personnel slipping or falling into the excavation.
23. Contractor shall guard or place appropriate barricades around temporary openings in floor, temporary impairments to handrails, stairways, or walkways. Existing machinery or equipment guards shall not be modified or altered.
24. Work on live electrical systems shall be conducted in accordance with tag-out, lockout, and permit procedures.

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25. Contractor shall follow State Pollution Control Board regulations for safe handling, storage & disposal of materials from the work .
26. When it is necessary for a contractor to operate cranes or lifting operations within 4 meters of the vicinity of energized electrical lines, the contractor shall review the hazards and precautions with the Tenant concerned area supervisor / end user to determine whether the lines can be de-energized. If the lines are to remain energized, the contractor is responsible to install suitable guards to prevent an electrical arc or accidental circuit condition. For such situations contractor shall submit a method statement along with a checklist for verifying all requirements.
27. Contractor shall ensure identification of underground services /pipelines etc in consultation with end user / facility owner prior to execution of job.
28. Contractor shall ensure compliance to compatibility requirements for hazardous material and cylinders storage.
29. Contractor supervisory personnel shall develop method/system and implement it to ensure that all safety procedures are understood and followed. Contractor supervisory personnel shall, at all times, set a good safety example.
30. Contractors shall be accountable for their employees' compliance with the Tenant safety rules.
31. Where it is apparent that contractor employees are not following prescribed Tenant safety regulations, policies, or procedures, the person observing such situations should notify the Tenant Supervising Department, who will take the necessary action to ensure that safe work conditions are maintained.
32. Horseplay, fighting, gambling, possessions of firearms or explosives, use of regulated drugs or alcohol, being under the influence of drugs or alcohol, theft, vandalism, sabotage, and distribution of unauthorized literature shall not be permitted. Those involved in such activities shall be removed from the project location and shall be liable for punishment by applicable law.
33. **For Project Locations, within existing installations/plants,** Contractor shall not perform any of the following jobs without the specific permission of the area supervisor / end user:

    a. Make repairs or changes to existing equipment
    b. Operate any valve, switch, or instrument control device.
    c. Operate any utility services such as electricity, water, air, nitrogen, etc.
    d. Connect into existing pipelines
    e. Connect into existing sewers
    f. Connect into existing electrical system or electrically operated equipment
    g. Operate electrical equipment or electrical switches
    h. Enter any closed vessel, tank, container, pit, excavations, or other confined space
    i. Perform work involving radiography (X-ray etc.)
    j. Use entity's pipelines, electrical conduits, handrails, or structures as supports for loads, ladders, or scaffolds
    k. Use entity's structure, pipe or other equipment for attaching blocks, lines, or other services which apply loads on the equipment
    l. Install guy lines across electrical lines
    m. Operate cranes or derricks near electrical lines
    n. Work on any machinery while it is in operation
    o. Dispose any material in unauthorized areas
    p. Make excavations without adequate protection to prevent sloughing and without fencing to prevent personnel from failing into them
    q. Operate electrical equipment without grounding or ground fault circuit interruption (GFCI) protection
    r. Move suspended loads without securing load to prevent swinging
    s. Operate any metal-wheeled equipment without adequate protection for the street paving.

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ANNEXURE - XII
TO
SPECIAL CONDITIONS OF CONTRACT

[LAND, POWER, WATER AND OTHER FACILITIES]

19.0 LAND, POWER, WATER AND OTHER FACILITIES:

Construction Water and Construction Power supply shall be as per the below modifications of Clause Nos. **2.3** of GCC stands modified to the following extent as detailed below:

19.1 Construction Water

The Client shall provide construction water as a free issue to the Contractor for use in the execution of works. A water connection will be provided at one point near the Battery Limit of the plot and at one point in the fabrication areas allocated by the Owner.

Construction water shall be available throughout the construction period. The CONTRACTOR shall at his own cost arrange for tapping, storage tank & distribution required for his work including supply, installation & calibration of water meters for temporary construction facility. The Contractor shall be responsible for the distribution of construction water from the point of supply to the specific areas of work within the project site and any other areas under their control. All necessary infrastructure, including but not limited to, piping, valve etc shall be arranged and installed by the Contractor at his own cost.

The Contractor shall ensure that the water supplied are used solely for the purpose of carrying out intended works as specified in the scope and within these areas. The Contractor shall use the construction water judiciously and without any wastage. Any failure to do so may result in penalties or discontinuation of the facility at the discretion of the Client.

Any construction water required for works carried out outside the project site, including any work in shops or fabrication areas not specifically allocated by the Owner, shall be the sole responsibility of the Contractor, and shall be provided at the Contractor's own cost.

In the event of non-availability of construction water, for any reason, it shall not entitle the Contractor to make any claims of whatsoever nature, whether for extension of time, cost recovery, or any other form of compensation from the Owner. Therefore, the CONTRACTOR shall, within the quoted price, make alternate arrangement for construction water meeting water quality requirements from external local suppliers to cope with such eventuality. Additional water, if required, to meet the contractual requirements, shall be arranged by the CONTRACTOR at his own cost.

19.2 Construction Power

The Client shall provide construction power as a free issue to the Contractor for use in the execution of works. A power connection will be provided at one point near the Battery Limit of the plot and at one point in the fabrication areas allocated by the Owner. Voltage rating will be 415 Volts.

Construction power shall be available throughout the construction period. The CONTRACTOR shall at his own cost arrange for laying of cable / distribution panel etc & distribution required for his work including supply, installation & calibration of energy meters for temporary construction facility. The Contractor shall be responsible for the distribution of construction power from the point of supply to the specific areas of work within the project site and any other areas under their control. All necessary infrastructure, including but not limited to, cables, distribution panels etc shall be arranged and installed by the Contractor at his own cost. The energy meter to be installed by the CONTRACTOR shall be tested and certified by State Electricity Board or any other agency approved by the Owner.

The Contractor shall ensure that the power supplied are used solely for the purpose of carrying out intended works as specified in the scope and within these areas. The Contractor shall use the construction power judiciously and without any wastage. Any failure to do so may result in penalties or discontinuation of the facility at the discretion of the Client.

Any construction power required for works carried out outside the project site, including any work in shops or fabrication areas not specifically allocated by the Owner, shall be the sole responsibility of the Contractor, and shall be provided at the Contractor's own cost.

Bidder to provide construction power requirement schedule (month-wise) during execution and accordingly power will be allotted to bidder.

The construction power shall be made available to the CONTRACTOR subject to grid distribution. In the event of non-availability of construction power, for any reason, it shall not entitle the Contractor to make any claims of whatsoever nature, whether for extension of time, cost recovery, or any other form of compensation from the Owner. Therefore, the CONTRACTOR shall, within the quoted price, make alternate arrangement to cope with such eventuality and may use DG sets to meet the construction power requirements. Additional power, if required, to meet the contractual requirements, shall be arranged by the CONTRACTOR at his own cost.

19.3 LAND FOR CONTRACTOR'S FIELD, GODOWN AND WORKSHOP

19.3.1 PROVISION OF LAND FOR FABRICATION YARD & STORAGE:

No separate space for fabrication yard, office and storage/warehouse shall be provided to the Contractor. However, Contractor shall make office and warehouse within the battery limit as indicated in the scope drawing of the Bidding Document. Contractor to ensure that there is no hinderance in execution of work due to their temporary office/warehouse. Space for Fabrication yard shall be arranged by the Contractor outside the Complex at their own cost. Any additional area required beyond the battery limit area shall be arranged by Package contractor outside the Refinery & Petrochemical Complex at Contractor's cost.

Contractor shall relocate their temporary construction facilities within refinery complex, if any, as and when required by BPCL.

Allocation of the graded land to Contractor for Construction & setting office/warehouse shall be as per Scope Drawing. The area required to be developed by the Contractor by their own and regular housekeeping to be maintained. In case contractor fails to do so the necessary housekeeping will be arranged by deploying other agencies at risk and cost of the contractor as well as vacating the area. Non availability of space inside refinery from BPCL should not be a case for extra claim or time extension. Therefore, the CONTRACTOR shall, within the quoted price, make alternate arrangement to cope with such eventuality.

The land for labour colony to be arranged by Contractor at their own cost.

Barricading, Site grading and development of the allocated area, if required, will be the responsibility of the contractor. The contractor shall remove all temporary buildings/ facilities etc. immediately after completion of works in all respects.

Additional space, if required, to meet the contractual requirements, shall be arranged by the CONTRACTOR outside refinery premises at his own cost. Contractor is required to vacate their entire temporary structure after carrying out all the housekeeping within **45 (forty five) days** from the date of overall completion of the job failing which applicable financial penalties, if applicable will be imposed by BPCL.

19.3.2 PROVISION OF PROPER WAREHOUSING

In line with requirements specified in GCC and specifications, materials shall be properly stored by CONTRACTOR in his warehouse to enable easy traceability, handling and preservation with all materials having proper identification marks, colour coding etc. Incase CONTRACTOR fails to follow the specified requirements, next payment due to him shall not be released till he complies with all the requirements to the satisfaction of E-I-C.

19.3.3 PROVISION OF LAND FOR LABOUR CAMP/ COLONY:

The land for labour colony to be arranged by Contractor at his own cost. Barricading, Site grading and development of the area, if required, will be the responsibility of the contractor. The contractor shall remove all temporary buildings/ facilities etc. immediately after completion of works in all respects.

19.4 Drinking Water

Owner will provide drinking water if available within 500 Metres of the plot for ETP Package. Further distribution from the location shall be by the CONTRACTOR at their own cost. Contractor to arrange filtration for consumption purpose. Based on the Factories act requirement, CONTRACTOR to provide adequate drinking water taps at their own cost along with water coolers etc.

ANNEXURE - XIII
TO
SPECIAL CONDITIONS OF CONTRACT

[QUALITY MANAGEMENT SYSTEM]

बोलीकर्ता से गुणवत्ता प्रबंधन प्रणाली अपेक्षाओं हेतु विनिर्देश

SPECIFICATION FOR QUALITY MANAGEMENT SYSTEM REQUIREMENTS FROM BIDDERS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convener	Standards Bureau Chairman
					Approved by	
2	12.06.20	General Revision	QMS Standards Committee	QMS Standards Committee	SKB	SKS
1	12.03.15	General Revision	QMS Standards Committee	QMS Standards Committee	MPJ	SC
0	04.06.09	Issued as Standard Specification	QMS Standards Committee	QMS Standards Committee	SCT	ND

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Abbreviations:

ISO	-	International Organization for Standardization
MR	-	Material Requisition
PO	-	Purchase Order
PR	-	Purchase Requisition
QMS	-	Quality Management System

QMS Standards Committee

Convener: Mr. S.K. Badlani

Members: Mr. Sanjay Mazumdar (Engg.)
Mr. R.K. Singh (SCM)
Mr. B. Biswas (SCM)
Mr. Ravindra Kumar (Const.)
Mr. Vinod Kumar (CQA)
Mr. Swapnil Vaishnav (Projects)

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5.0	QUALITY SYSTEM REQUIREMENTS	4
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1.0 SCOPE

This specification establishes the Quality Management System requirements to be met by BIDDER for following purpose:

- QMS requirements to be met by suppliers / contractors after award of work / during contract execution.

2.0 DEFINITIONS

2.1 Bidder

For the purpose of this specification, the word "BIDDER" means the person(s), firm, company or organization who is under the process of being contracted by EIL / Owner for delivery of some products (including service). The word is considered synonymous to supplier, contractor or vendor.

2.2 Project Quality Plan

Document tailored from Standard Quality Management System Manual of BIDDER, specifying how the quality requirements of the project will be met.

2.3 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

3.0 REFERENCE DOCUMENTS

6-78-0002	Specification for Documentation Requirements from Contractors
6-78-0003	Specification for Documentation Requirements from Suppliers

4.0 QUALITY MANAGEMENT SYSTEM – GENERAL

Unless otherwise agreed with EIL / Owner, the BIDDER proposed quality system shall fully satisfy all relevant requirements of ISO 9001 "Quality Management Systems – Requirements." Evidence of compliance shall be current certificate of quality system registration to ISO 9001 or a recent compliance audit recommending registration from a certification agency. The quality system shall provide the planned and systematic control of all quality related activities for execution of contract. Implementation of the system shall be in accordance with BIDDER'S Quality Manual and PROJECT specific Quality Plan.

5.0 QUALITY SYSTEM REQUIREMENTS

5.1 BIDDER shall prepare and submit for review / record, Project Quality Plan / Quality Assurance Plan for contracted scope / job. The BIDDER'S Quality Plan shall address all of the applicable elements of ISO 9001, identify responsible parties within BIDDER'S organization, for the implementation / control of each area, reference the applicable procedures used to control / assure each area, and verify the documents produced for each area. The Project Quality Plan shall necessarily define control or make reference to the relevant procedures, for design and engineering, purchase, documentation, record control, bid evaluation, inspection, production / manufacturing, preservation, packaging and storage, quality control at construction site, pre-commissioning, commissioning and handing over (as applicable) in line with contract requirement and scope of work.

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5.2 BIDDER shall identify all specified or implied statutory and regulatory requirements and communicate the same to all concerned in his organization and his sub contractor's organization for compliance.

5.3 BIDDER shall deploy competent and trained personnel for various activities for fulfillment of PO / contract. BIDDER shall arrange adequate infrastructure and work environment to ensure that the specification and quality of the deliverable are maintained.

5.4 BIDDER shall do the quality planning for all activities involved in delivery of order. The quality planning shall cover as minimum the following:

- Resources
- Product / deliverable characteristics to be controlled.
- Process characteristics to ensure the identified product characteristics are realized
- Identification of any measurement requirements, acceptance criteria
- Records to be generated
- Need for any documented procedure

The quality planning shall result into the quality assurance plan, inspection and test plans (ITPs) and job procedures for the project activities in the scope of bidder. These documents shall be submitted to EIL / Owner for review / approval, before commencement of work.

5.5 Requirements for sub-ordering of outsourced items / sub-contracting / purchasing of services specified in MR / contract / tender shall be adhered to. In general all outsourced items will be from approved vendors of EIL. Wherever requirements are not specified, or approved sub vendors do not exist, the sub-contractor shall establish and maintain a system for purchasing / sub-contracting to ensure that purchased product / service conforms to specified requirements in concurrence with EIL / Owner. Criteria for selection of sub-contractor, evaluation, re-evaluation, maintenance of purchasing data and verification of purchased product (sub-contractor services), constitute important components of this requirement.

5.6 BIDDER shall plan and carry production and service provision under controlled conditions. Controlled conditions shall include, as applicable

a) the availability of information that describes the characteristics of the product
b) the availability of work instructions
c) the use of suitable equipment
d) the availability and use of monitoring and measuring devices
e) the implementation of monitoring and measurement
f) the implementation of release, delivery and post-delivery activities

5.7 BIDDER shall validate any processes for production and service provision where resulting output cannot be verified by subsequent monitoring and measurement. This includes any process where deficiencies become apparent only after the product is in use or service has been delivered.

5.8 BIDDER shall establish a system for identification and traceability of product / deliverable throughout product realization. Product status with respect to inspection and testing requirements shall be identified.

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5.9 BIDDER shall identify, verify, protect and safeguard EIL / Owner property (material / document) provided for use or incorporation into the product. If any Owner / EIL property is lost, damaged or otherwise found to be unsuitable for use, this shall be reported to the EIL / Owner.

5.10 BIDDER shall ensure the conformity of product / deliverable during internal processing and delivery to the intended destination. Requirements mentioned in the MR/ tender shall be adhered to.

5.11 BIDDER shall establish system to ensure that inspection and testing activities are carried out in line with requirements. Where necessary, measuring equipment shall be calibrated at specified frequency, against national or international measurement standards; where no such standard exists, the basis used for calibration shall be recorded. The measuring equipment shall be protected from damage during handling, maintenance and storage.

5.12 BIDDER shall ensure effective monitoring, using suitable methods, of the processes involved in production and other related processes for delivery of the scope of contract.

5.13 BIDDER shall monitor and measure the characteristics of the product / deliverable to verify that product requirement has been met. The inspection (stage as well as final) by BIDDER and EIL / Owner personnel shall be carried out strictly as per the approved ITPs or ITPs forming part of the contract. Product release or service delivery shall not proceed until the planned arrangements have been satisfactorily completed, unless otherwise approved by relevant authority and where applicable by Owner / EIL.

5.14 BIDDER shall establish and maintain a documented procedure to ensure that the product which does not conform to requirements is identified and controlled to prevent its unintended use or delivery

5.15 All non-conformities (NCs) / deficiencies found by the BIDDER'S inspection / surveillance staff shall be duly recorded, including their disposal action shall be recorded and resolved suitably. Effective corrective actions shall be implemented by the BIDDER so that similar NCs including deficiencies do not recur. The BIDDER shall take appropriate actions to address the Risks and Opportunities in the project.

5.16 All deficiencies noticed and reported by EIL / Owner shall be analyzed by the BIDDER and appropriate corrective actions shall be implemented. BIDDER shall intimate EIL / Owner of all such corrective action implemented by him.

5.17 BIDDER should follow the standards, specifications and approved drawings. Concessions / Deviations shall be allowed only in case of unavoidable circumstances. In such situations Concession / deviation request must be made by the BIDDER through online system of EIL eDMS. URL of EIL eDMS is http://edocx.eil.co.in/vportal.

5.18 BIDDER shall have documented procedure for control of documents.

5.19 All project records shall be carefully kept, maintained and protected for any damage or loss until the project completion, then handed over to EIL / Owner as per contract requirement (Refer Specification Nos. 6-78-0002 - Specification for Documentation Requirements from Contractors and 6-78-0003 - Specification for Documentation Requirements from Suppliers), or disposed as per relevant project procedure.

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6.0 AUDITS

BIDDER shall plan and carry out the QMS audit for the job. Quality audit programme shall cover design, procurement, construction management and commissioning as applicable including activities carried out by sub-vendors and sub-contractors. This shall be additional to the certification body surveillance audits carried out under BIDDER'S own ISO 9001 certification scheme.

The audit programmes and audit reports shall be available with bidder for scrutiny by EIL / Owner. EIL or Owner's representative reserves the right to attend, as a witness, any audit conducted during the execution of the WORKS.

In addition to above, EIL, Owner and third party appointed by EIL / Owner may also perform Quality and Technical compliance audits. BIDDER shall provide assistance and access to their systems and sub-contractor / vendor systems as required for this purpose. Any deficiencies noted shall be immediately rectified by BIDDER.

7.0 DOCUMENTATION REQUIREMENTS

BIDDER shall submit following QMS documents immediately after award of work (Within one week) for record / review by EIL / Owner/ TPIA, as applicable.

- Organization chart (for complete organization structure and for the project)
- Project Quality Plan / Quality Assurance Plan
- Job specific Inspection Test Plans, if not attached with PR
- Job Procedures
- Inspection / Test Formats

In addition to above QMS documents, following documentation shall be maintained by the BIDDER for submission to EIL / Owner on demand at any point of time during execution of the project.

- Quality Manual
- Certificate of approval for compliance to ISO: 9001 standard
- Procedure for Control of Non-conforming Product
- Procedure for Control of Documents
- Sample audit report of the QMS internal and external audits conducted during last one year
- Customer satisfaction reports from at least 2 customers,
- Project QMS audit report
- Technical audit reports for the project
- Corrective action report on the audits

Documents as specified above are minimum requirements. BIDDER shall submit any other document / data required for completion of the job as per EIL / Owner instructions.

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ANNEXURE - XIV
TO
SPECIAL CONDITIONS OF CONTRACT

[ENERGY POLICY]

Bharat Petroleum

Energy Policy

We at Bharat Petroleum Corporation Limited, Bina Refinery (BPCL-BR) are committed to continual improvement in Energy performance and Energy Management System, which shall be demonstrated by:

- **Proactively** anticipate & assess risks and opportunities, address them through short and long-term objectives and implement mitigation plans.
- **Ensuring** effective Management of Energy, Information and Resources to achieve Objectives & Targets and Complying with all applicable legislation and other requirements.
- **Strengthening** purchase of energy efficient products & services by utilizing latest technology to improve our energy performance.
- **Monitoring** & Controlling energy consumption through well-structured reviews.
- **Attaining** participative culture of energy conservation by creating awareness through training.

Date : 1st July 2023

Place : Bina

Chacko M Jose

Executive Director - BR

ANNEXURE – XV
TO
SPECIAL CONDITIONS OF CONTRACT

[LABOUR COMPLIANCE & SPECIFICATIONS/GUIDELINES FOR LABOUR WELFARE FACILITIES AT CAMP AND AT PROJECT SITE]

LABOUR COMPLIANCE

1. On the award of a contract, the contractor shall contact BPCL HR department to understand the requirements for onward process/ procedure for BPCL HR related activities and submit details/ contact number(s)/ email id(s) of their point of contact and authorization letter (for signing any BPCL HR related compliance document) of the person named so.

2. The scope of obligations of the contractors underlined also includes those of its subcontractor(s) and the contractor shall have the sole ownership and accountability for the same.

3. **Adherence to Statutes, Regulations, Schemes, Rules, BPCL's rules and procedures**: The contractor shall undertake to ensure due and complete compliance with respect to all Statutes, Regulations, Schemes, Rules, BPCL's rules and procedures etc. (which may be amended from time to time) whether of Central Govt. or State Govt. or any other competent authority applicable to the contractor and or employees employed or whose services are otherwise availed of by contractor or sub-contractor appointed by such contractor. Such laws shall also include Minimum Wages Act, 1948, Contract Labour (Regulation and Abolition) Act,1970, Employees State Insurance Act, 1948. Employees' Compensation Act, 1923, Payment of Gratuity Act, 1972, Provident Fund & Miscellaneous Provisions Act, 1952, Payment of Bonus Act, 1965, Apprentices Act,1961 and all other applicable Act, laws, rules, regulations and orders as may be in force from time to time. The Contractor must ensure strict compliance with respect to all applicable Acts.

4. The Gate Passes for contractors' employees are processed through Contract Man Management System (CMMS) online portal. The contractor shall fill in details pertinent to the LOI/ LOA/ PO, Labour license (if applicable), accidental insurance (Employees State Insurance Act, 1948/ Employees Compensation Act, 1923 policy details) and personal details of contractors' employees in CMMS through its login credential. The contractor shall contact BPCL HR department to understand the requirements and process.

5. Documents related to the contractor's employees to be submitted to BPCL and or uploaded in CMMS:
   5.1. Character certificate (Police verification)
   5.2. Medical fitness certificate
   5.3. Insurance policy (Pehchan Card under ESIC/EC policy/Group Personal Accident (GPA) as applicable)
   5.4. Photo Id (preferably Aadhar)
   5.5. Education/ Experience certificate (as required)
   5.6. Bank account, mobile number and UAN details; if not available, after the first month of the running of the contract
   5.7. Any additional requirement will be communicated and shall be required to be complied

6. For Bina location, medical examination of the employees is to be done mandatorily at BPCL (VK BR) hospital, located in BPCL Township, Bina as per the applicable charges. The gate pass is issued only those who are declared medically fit. Medical fitness of employees

involved in the high-risk jobs like confined space entry, inert space entry, work at height etc. is reassessed for specific requirements (on form-32) at Occupational Health Centre.

7. BPCL has the sole proprietorship of the Gate Passes issued to the contractors' employees and the contractor is obligated to return all the gate passes issued to the contractor. In case of non-submission of the Gate passes / lost Gate passes / damaged Gate passes suitable amount per gate pass will be deducted by BPCL. Also, the case of non-submission of the Gate passes / lost Gate passes shall require the contractor to lodge complaint at the local Police Thana and submit a copy of the same to BPCL Security.

8. **Confirmation to BPCL HR department of Compliance under various Act applicable:** It shall be the responsibility of the Contractor to confirm to BPCL HR of conformance to statutory compliances under various Acts applicable and submit the required documents to BPCL HR in CMMS through its log in credentials, on monthly basis. The contractor is required to contact BPCL HR department to understand the requirements and process.

   8.1. Contractor shall ensure timely payment to employees, remittance of PF & Pension & ESIC contributions and maintain statutory documents & registers under various applicable Acts.
   8.2. The checklist of the documents and formats etc. to be maintained and submitted to BPCL can be obtained from the BPCL HR department after the award of contract.
   8.3. On submission of the aforementioned documents, BPCL HR will inspect and issue 'HR Clearance Certificate'. Clearance of invoices shall be subject to completion of all labour compliances and getting HR Clearance Certificate from BPCL HR.

9. **Inspections/ Audits:** The contractor shall maintain and keep a copy of statutory documents at site and shall present itself at the designated time and venue with the required documents as when demanded by the BPCL and or any statutory authorities.

Specifications for Labour Camp

1 Purpose

To establish a minimum standard for the provision and maintenance of living conditions for the wellbeing and welfare of the workforce in construction projects of BPREP. The document aim to cover the norms apart from the existing provisions incorporated in relevant tenders.

2 Scope

This standard covers minimum basic requirements of design, construction, installation, and maintenance of temporary workers' housing quarters (Labor Camp) on construction site.

The contractor shall provide, free of cost temporary accommodation as the regulatory requirement to all workers engaged in the Project.

This document aims to provide the Project Teams and Contractors with guidance on the planning, design, construction, operation and decommissioning of Construction Camps in a sustainable way:

- Create adequate, respectable living conditions for the Project construction workforce.
- Maximize value over the entire lifecycle of the construction camp (maintenance, cleaning, waste management, energy and water usage management) and minimize footprint.
- Consider ethnic, religious and cultural differences and managing those.
- Create a secure, safe, and hygienic environment, including the logistics.
- Minimize impact on the local communities.
- Lower disease incidence and/or food poisoning outbreaks.
- Promote Health & Wellness and create a facility and community that exudes care for people.
- Maximize opportunities for beneficial use of the site, infrastructure, or parts thereof after project execution.
- It is assumed in this document that the facilities will be intended for single or bachelor status occupancy only unless specified differently.

This document does not cover permanent residential areas, neither temporary nor permanent office units nor buildings located inside project area.

3 Responsibilities

Following are the responsibilities of contractor:

- Providing Labour camp as per the norms listed in the tender document.
- Deploying manpower/ stewards/ managers and training workers as per contract norms for inspection & ensuring compliance

Maintaining records of labor complaints and submitting owner for record of compliance.

4 General guidelines for location of labor camp:

(To be read in Conjunction with labor camp layout, Appendix I)

- CONTRACTOR shall arrange land for construction of labour camp outside the Refinery. CONTRACTOR shall ensure that all workers stay in the labour camp. The workers having permanent address within 10 kms radius of the refinery location can be exempted from camp accommodation. For subject exemption, CONTRACTOR shall maintain record of all the workers with their name, age, local address, and permanent address along with copy of Aadhar card.
- CONTRACTOR shall develop and maintain all necessary facilities in labour camp like power, water, hutments, sanitation facilities, medical facilities, drainage, transportation facilities, etc. as per the norms mentioned in the tender document.
- Land for labour camp will be arranged by contractor following all local authorities rules and regulations. Camp must be located on elevated ground which is less prone to floods.
- Ensure that the land is not marshy in nature. Locality of the camp should be so selected that that there is no rift between the habitats of the camp and nearby community. Land under dispute shall not be selected for labor camp. If possible, commuting for shopping or to work shall be minimized.
- If there is danger of intrusion of snakes, carbolic acid must be spread around the labor camp and an area up to five meters from the buildings shall be cleared of any kind of shrubs, holes etc. that can house snakes and insects and it shall be maintained by periodic removal of vegetation.
- Availability of underground public utility services like electricity cables, water pipelines, gas pipelines and telephone / other lines shall be assessed and proper approval shall be taken from the authorities before excavating the land.
- If passing of overhead high-tension electric line over the labor camp cannot be avoided then a safe distance (minimum 3-5 meters) from the wires shall be ensured.
- Structures in the labor camp should be designed, constructed accordingly and their structural stability certificate shall be obtained.
- Water shall not be allowed to stagnate, and water generated shall be collected, treated and recycled.
- A small grocery shop shall be developed inside the labor camp.

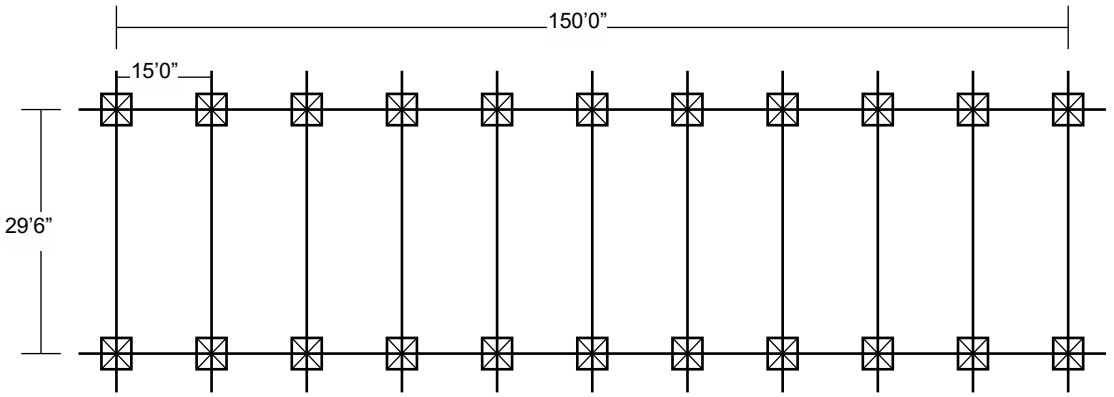
5 Norms for labor camp

5.1 Housing and Accommodation

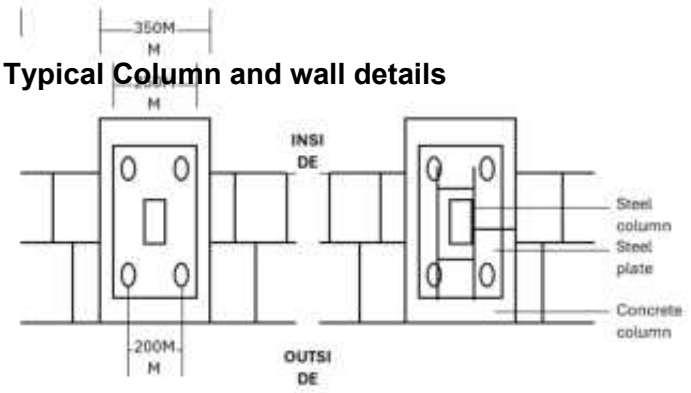
- The housing shall be in the form of weather protected, prefabricated houses or constructed with hollow blocks. Row type sheds constructed with Structural Steel structure and Prefabricated Aerocon Panels & GI sheet roofing with columns, trusses and purlins and thermocol false ceiling.

- The contractor shall be responsible for demolishing the camp, clear the area and hand over the land to the landowner post project completion.
- Contractor shall allocate everyone a minimum of 25 square feet of accommodation space.
- Accommodations should be structured to house four persons per unit, utilizing bunk beds to maximize the use of vertical space.
- Each room with bunk bed setup should be equipped with a fan and a window to ensure proper ventilation, and lockers should be provided for personal storage. There shall be provision of a meshed window, 3 feet x 2 feet in size, located 6-9" below the ceiling on the common wall for ventilation.
- The height of ceiling shall be a minimum of 10 feet. If bunker beds are provided, the ceiling shall be a minimum of 4 feet above the top bunker bed. In case of bunker beds, no ceiling fans are allowed, only wall mounted fans shall be permitted.
- Provision of hooks in rooms @ 5ft height from the floor for tying the mosquito nets shall be ensured.
- Additionally, each bed should be furnished with a suitable mattress to ensure comfort and support for the occupants.
- Contractor shall provide for family rooms of approximately 12*10 square feet area in the ratio of 20:80 bachelor accommodation. The family accommodation shall be provided in the same camp area, separated by a barricading.
- Maximum 3-4 camps with 5000-8000 workers per camp may be considered for better management of facilities.
- Proper signages shall be installed at all turns and junctures to facilitate easy movement of habitants.
- Safe electric fitting with sufficient switches and plugs shall be provided. Every room shall have one tube light or LED, one fan and minimum 3 plug points. If bunker beds are used, number of light, fan and charging points shall be increased accordingly. ELCB of proper rating shall be provided for Electrical safety.
- The rooms and ceiling should be painted in light (preferably white) color for better illumination.
- The flooring should be made of Plain Cement Concrete.
- Every room shall have a window with grill and door with lock and key.
- Accommodation for bachelors and families shall be separate.
- Plinth of the rooms shall be approximately 300mm above the ground surface.

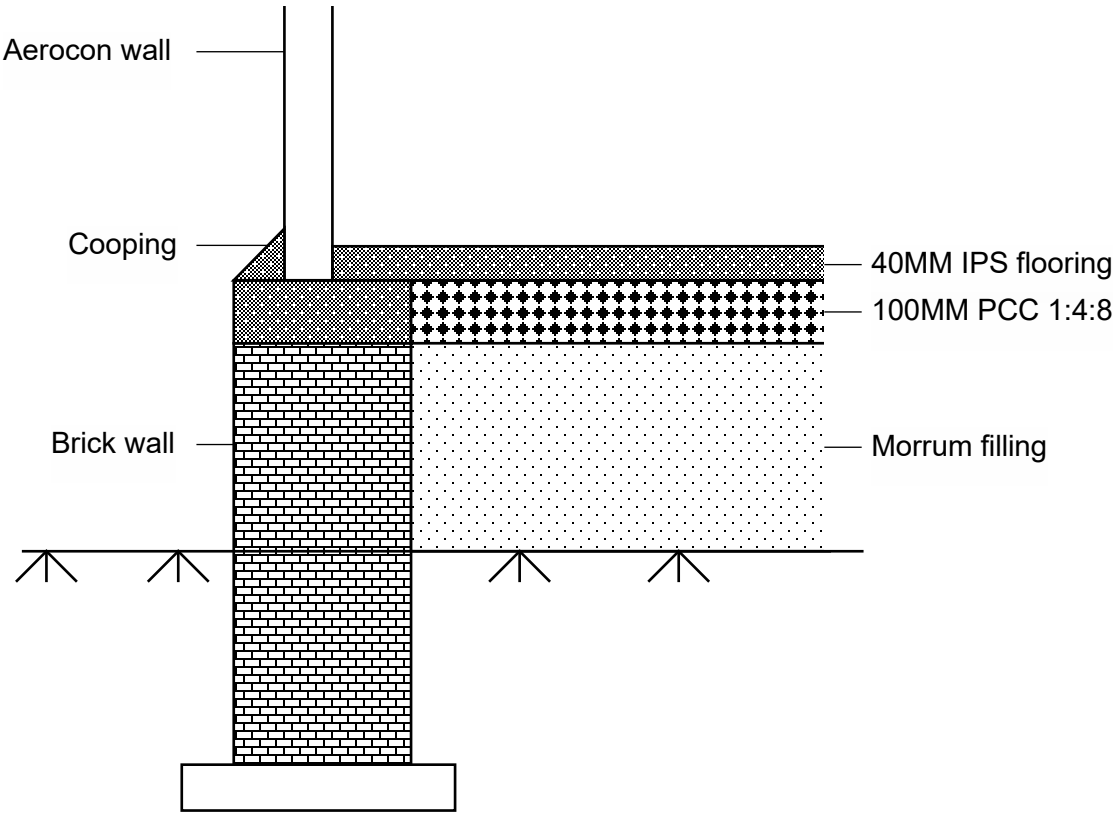
Labor quarters footing drawing



Typical Column and wall details



Typical Flooring details



Note: Details provided are typical in nature and for depiction only. Contractor shall design the structures as per standards and stability certification shall be provided.

5.2 Hygiene and Sanitation

Washrooms:

- Contractor shall ensure segregated water closets for men and women, adhering to below ratio: .
    - 1 for up to 20 persons
    - 2 for 21 to 45 persons
    - 3 for 46 to 70 persons
    - 4 for 71 to 100 persons
    - From 101 to 200 persons, add at the rate of 3 %. For over 200 persons, add at the rate of 2.5 %.
- Additionally, urinals shall also be installed following a ratio of 1:40.
- Washrooms with brick wall, tile flooring and standard sanitary fittings shall be provided for labour camps.
- Toilets are to be located within 100m of home location at camp
- Essential to maintaining cleanliness and hygiene, disposable bags and adequately covered dustbins must be provided in all toilet facilities.
- Furthermore, ensuring that every washroom is stocked with handwash, and soap will promote hygiene and prevent the spread of disease. These improvements are essential for providing a safe and dignified environment for all workers at the site.
- To further enhance the sanitation management, the installation of small-scale Sewage Treatment Plants (STPs) in all camps is required. There should not be any untreated discharge to the storm water.
- Proper levelling/ pavement of roads is to be ensured to avoid water logging.

Washing/Bathing Area:

- Contractor shall ensure segregated bathrooms/ washrooms for men and women, adhering to below ratio:
    - 1 for up to 20 persons
    - 2 for 21 to 45 persons
    - 3 for 46 to 70 persons
    - 4 for 71 to 100 persons
    - From 101 to 200 persons, add at the rate of 3 %. For over 200 persons, add at the rate of 2.5 %.
- The bathing area shall be constructed on P.C.C floor of area 24 feet x 24 feet with 5-bathroom block on each side and 2 feet gap on each side.
- The water shall be pumped to the portable tank lying on the structurally stable structure above the ground.
- The capacity of tank shall be suitable for 50 liters/person/day.
- The bathroom shall be completely covered with brick wall on 3 faces and gate on the 4th face.
- Size of each bathroom shall be 4ft x 4ft x 8 ft (height) fixed with a door.

- Labors shall be educated not to throw the shampoo pouches/soap cover in the bathrooms & proper screen shall be fixed to prevent all these solid wastes going into grey water treatment plant.

5.3 Water Supply

- To address drinking water issues, it is imperative to ensure a supply of 20-30 liters of water per person per day, specifically allocated for drinking and cooking purposes.
- Contractor shall ensure a daily water provision of 8-10 liters per person through water stations.
- Additionally, water coolers fitted with Reverse Osmosis (RO) systems shall be installed at all water stations to provide clean, safe drinking water at camp and site. The water used for cooking and drinking purpose shall be tested and potable as per IS 10500. Water tapes shall be push button type (as used in railways) in the drinking water area
- Recommended water supply for purposes other than drinking and cooking to be provided to ensure a minimum of 100 liters per person per day and a wastewater treatment plant of suitable capacity and design shall be established at each camp.

5.4 Grey Water and Sewage Treatment Plant

- Bathing and washing wastewater is termed as grey water and it is encouraged to treat the same in the grey water treatment plant, the treated water shall be reused for bathing and washing (by maintaining pH value), dust suppression/ green belt watering at the site.
- Grey water shall be treated in Grey water treatmentunit and sewage shall be treated in sewage treatment plant before any discharge. Grey water and sewage treatment plant shall be provided by contractor for his labor camps. Both the units shall be designed and implemented as per labor camp capacity following all environmental and statutory guidelines after taking necessary approval from BPCL/ EIL.

5.5 Fresh Water Tank

Sintex (3 layered) water tanks of required capacity shall be provided to store the fresh water, considering 2 days' storage. They should be located close to the main gate. An electric pump and necessary plumbing to pump the water to other areas shall be provided.

- A designated common kitchen shall be provided in every camp, ensuring that food preparation facilities are accessible to all residents. Cooking area with a minimum area of 600 sqft shall be setup and be separated from other facilities
- Openings for exhaust and cross ventilation shall be provided.
- The food preparation area shall be equipped with fire extinguisher for safety.
- Adequate storage with lock and key shall be provided to all the gangs for storage of grocery and vegetable.
- Pest control with anti-rodent arrangements shall be conducted regularly in the cooking area.

- If LPG is used as fuel, periodic checking of supply pipe/ regulator shall be done for leakage detection
- Fuel storage: The fuel storage area shall be close to the cooking area which should be equipped with fire extinguishers and necessary safety arrangements. People shall be trained to use fire-extinguishers. Minimum area of fuel storage shall be 100 sqft.
- No kitchen shall be allowed at Project site, food packets to be delivered to the workers by respective contractors. The food distribution by respective contractors needs to be pre-planned for additional delivery during early start and late finish months.
- Provision shall be made inside camps for workers to cook food as per choice. Cooking inside the accommodation rooms shall be strictly banned.
- Kitchen shall be provided in family rooms by using space of verandah.
- Dining area shall be near to the cooking area and shall be minimum 20X40 feet for 100 workers. Dining area capacity shall be 25% of the total wokers deployed by contractor.
- The dining area
- Fixed tables and sitting arrangements should be made preferably made of kadappa stone tables and benches.
- The area shall be sufficient for 80 to 100 labors at a time.
- Hand-wash area with drainage shall be provided.

  Covered Food-waste bins shall be kept near the dining area & waste shall be disposed on daily basis to avoid breeding of flies/mosquitoes.

5.6 Utensil Washing Area

- Utensil washing area shall be near to the cooking area and shall be minimum 20X20 feet.
- Utensil washing area shall be provided with 10 taps to wash the utensils.
- The wastewater stream from utensil washing area shall flow to gray water treatment plant after screening solids from the kitchen water.
- The screened solids shall be diverted to the waste disposal area, where food waste is disposed. Contractor should make proper arrangement for disposal of food waste/ other solid waste meeting all statutory and environmental compliance.

5.7 Weather conditions at camps

- Fans and proper ventilation shall be ensured in all camp accommodation by the respective contractors.
- Uninterrupted supply of cold water by sufficient industrial water coolers (stations) shall be ensured during the peak summer months.
- Provision of heaters/ blowers needs to be ensured at camp to cater to extreme cold.

5.8 Worker Transportation

- Comfortable seats in good condition shall be always maintained in the buses.
- Regular audits may be carried out by designated representative to ensure no overcrowding of buses.

- Site management shall ensure that parking at site is planned sufficiently to ensure no traffic because of buses at any time.
- Workflow shall be set-up by the respective contractors to ensure proper queuing of workers for getting in and getting out of the buses.

- **Provision of Transportation Services**

  The Contractor shall provide adequate transport facilities for all workmen employed at the construction site. Contractor shall provide proper mode of transport in form of passenger Bus service for transporting workmen from Labour camp to entry gate and from entry gate to worksite. The facilities shall ensure timely onboarding, transportation to the site, and return to the designated pick-up points within the stipulated timeframes. This is to ensure the timely, efficient, and safe transportation of workmen to and from the work site, thereby minimizing downtime, improving productivity, and maintaining steady job progress.

- **Capacity and Frequency of Transport**

  a. The transportation facilities shall be organized to ensure that each bus caters to minimum 50 workers per trip.
  b. The number of buses and trips required shall be determined by the total number of workmen and their work schedules to avoid overcrowding or delays.

- **Prohibition of Overcrowding**

  The Contractor shall ensure that all transport vehicles comply with applicable safety regulations and are not overcrowded. Adequate seating and standing arrangements shall be made, ensuring the comfort and safety of the workmen.

- **Compliance with Time Management**

  a. The transport schedule shall align with the work site's operational hours to guarantee that all workmen reach the site punctually.
  b. The downtime due to transportation delays shall be minimized, and any repeated failure to meet this standard may result in penalties or deductions, as specified in the contract.

- **Monitoring and Reporting**

  The Contractor shall maintain a log of transport schedules, vehicle capacity, and the number of workers transported. This record shall be subject to periodic inspection by the Owner or their representative.

- **Health and Safety Standards**

The Contractor shall ensure all transport vehicles are in good working condition and comply with health and safety regulations. Drivers shall be licensed and trained to handle workmen transportation professionally.

- **Non-Compliance:**
  Improper mode of transport (deploying small vehicles , pick up vans , construction material carrier etc) will be considered as unsafe act and suitable penalty for unsafe act will be imposed.

5.9 Cultural Amalgamation and Recreation

- Absence of recreational facilities on site can affect the morale and overall well-being of workers. Site management shall incorporate an open space measuring 100 X 150 meters in each camp specifically designated for sports and recreational activities.
- The decision regarding the specific facilities to be included in this space should be made by the contractor, based on the preferences and interests of the workforce.
- A recreation room of minimum 20*20 ft shall be provided for entertainment of labors
- The contractor needs to organize theme-based skits with professional agencies related to safety, unity, rights and duties, de-addiction, etc. once every two months.
- It shall be ensured that all the festivals are organized at camp and site to encourage bonding between workers.
- Training and awareness through slogans in different languages shall be ensured throughout the camp and site area.
- The camp management team shall comprise of representatives from different regions to ensure open communication with workers from different areas of the country.
- A TV (minimum 40 inch) with data cable connection shall be provided & be used for entertainment and showing informative videos on HSE/ general topics.
- Camp Head shall take care of the discipline in TV room and food, bidi, gutka shall not be allowed inside the TV room, also labors shall not be allowed to sleep inside the TV room
- Appropriate no of big floor mats of minimum 10ft*10ft shall be provided for watching the TV.

5.10 Medical Facilities

- Medical check-up report needs to be mandatorily submitted by the contractor for all the workers before issuance of ID card.
- Site management shall ensure primary medical facilities to all workers through OHCU.
- An ambulance through tie up with nearby hospitals should be available on site at a ratio of one per 2000 workers. If the workers are less than 2000, minimum one ambulance to be maintained. A first aid center with adequate paramedics should be present next to the camp administrator's office and the area of this room shall be minimum 100 sqft. In case of female workers, female first aiders shall be made available.

- Contractors shall equip each dining area (within HSSE hub) with a first aid box, maintaining a ratio of one box per 150 workers, to ensure first aid supplies in case of emergencies.
- Furthermore, organizing medical camps every two months and conducting an annual health check-up for all workers will help in early detection and management of potential health issues.
- Mandatory Emergency First Response training shall be imparted to supervisors once every year.
- De-addiction drives shall be organized every two months to provide education, support, and resources to help workers overcome their addictions.

5.11 Safety and security

- Security measures must include installation of a minimum of six closed-circuit television cameras in each camp, with capabilities to record continuously for 30 days to enhance safety and monitoring.
- Every labor camp shall have security cabin at the main gate to guard and to ensure safe passage of people, goods and belongings. The security cabin should typically be 6 feet x 6 feet.
- A security guard shall be deployed (24x7) at the main gate.

5.12 Waste Disposal Area

- The waste disposal area shall be cleaned daily, and authorized vendor shall be engaged to dispose the collected waste.
- Bio-gas plant and food-waste composting shall be encouraged for energy conservation and for food waste management in large labor camps (more than 1500 labors). For specific details on size please touch base with Corporate HSE department.

5.13 Emergency Assembly Area

- Emergency assembly area shall be clearly marked and should be easily accessible to everyone in the labor colony.
- Area: should be able to accommodate the full occupant load of the premises / area (as a thumb rule, not less than 2.25 square feet per person @ 1.5x1.5 feet)
- A notice board displaying the emergency contact numbers shall be provided in this area.
- Each occupant shall be briefed on the location of Emergency Assembly Area, first-aid room and their actions in case of an emergency

5.14 Grocery Shop

- Provision for a grocery shop of 10*10 Sq ft shall be made inside the labor camp, the shopkeeper must keep daily use items for labors like soap, washing powder, toothpaste,

Hair Oil, comb, shampoo etc. Kitchen items like cooking oil, rice, dal, wheat flour, spices etc shall be available with the shop.

- Shopkeeper may keep a provision for preparation of tea and ready to eat snacks, biscuits etc based on the requirement, but cooking shall not be permitted inside the grocery shop.

5.15 Creche

- In case of 50 or more female workers, a creche facility of minimum 20*10 Sqft shall be provided inside the labor camp.
- Children below 6 years shall be accommodated in creche and a trained caretaker shall be appointed to take care of children. Proper nutrition, healthcare, hygiene and primary education shall be ensured for the children by the caretaker.

5.16 Electric Room

- Preferably, labor camp electrification shall have solar energy as the source of electric energy and a small DG set as back-up for emergencies.
- Electric room shall preferably be of adequate size to accommodate the DG and panels etc. In general, it may be of 200 sqft size with brick work, concrete flooring and plaster. Earthing pits shall be a part of it. If required, cable trays shall be provided to align the cables.
- The roof, floor and walls shall be leak-proof to avoid any leakage / dampness.
- It shall be equipped with firefighting equipment and with lock & key.
- Earth resistance shall be checked on weekly basis and no. of earth pit shall be done
- In case of solar powered labor camp, room to store batteries of energy bank shall be provided.

5.17 Camp Head Room

- An office room for the camp administrator shall be provided near the entrance gate.
- This office room shall be minimum 100 sqft.
- Provision of electrical fittings & fixtures (lights & fan) as well as a table, 4 chairs and cupboard shall be provided.
- A notice board in lock & key shall be provided outside the camp boss room but displaying notices, information etc.

6 Guidelines on compliance of norms

6.1.1 Audit

- **Inspection Protocol:** A third-party audit appointed by EIL/BPCL will be conducted monthly. Any deficiencies identified must be corrected and reassessed as per Attached annexure-I for penalty matrix

- **Audits and Feedback:** Surprise visits will be conducted by the owner's human resources, legal, IR, or safety teams, or by the PMC, to gather feedback on labor accommodation.

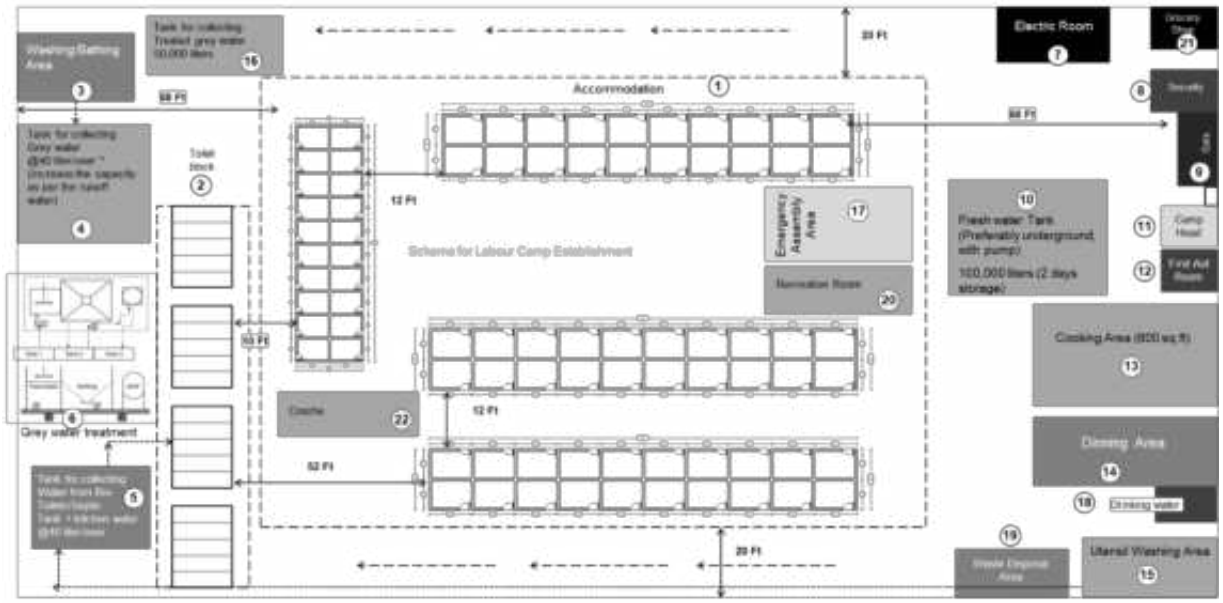
6.1.2 Reporting

- **Complaint Mechanism:** Each contractor's office must have a provision for laborers to submit complaints. The contractor is responsible for maintaining records of these complaints and resolving complaints in a timely manner.
- **Incident Reporting:** The PMC is tasked with verifying documents and informing the owner of any incidents. Human resources from the owner will report these incidents to the factory inspector, DISH, and PESO.

6.1.3 Pain - Gain

- **Non-Compliance Penalties:** The concerned authority from the owner/ PMC will impose penalties for each non-compliance issue, as per attached Annexure-I.
- **Appreciation and Rewards:** Appreciation letters will be awarded to the best contractor.
- **Recognitions** such as Safety/Quality person of the month, quarter, and year would be awarded to the contractors based on their performance in these domains.
- **Exclusive high tea sessions** with the leadership may be organized to motivate the manpower
- **Wall of fame** for outstanding laborers will be maintained and the names chosen by the auditing team.

Depiction for Scheme for Labor camp establishment


Accommodation
Electric Room
Toilet block
Scheme for Labour Camp Establishment
Grey water treatment
Cooking Area (800 sq ft)
Dining Area
Utensil Washing Area
Fresh water Tank (Preferably underground with pump)
100,000 liters (2 days storage)
Emergency Assembly Area
Canteen
33 Ft
88 Ft
12 Ft
52 Ft
20 Ft

Welfare facilities for Labour at Site

1. Toilet/ Urinal:

- Contractor shall ensure segregated water closets for men and women, adhering to a ratio of 1:20. Additionally, urinals shall also be installed following a ratio of 1:40.
- Washrooms with brick wall, tile flooring and standard sanitary fittings shall be provided in Process units (in ECU, PP/BU, etc. areas for longevity) , whereas portable washrooms may be provided in other areas at site (as mentioned in the plot plan shared in tender)
- Toilets are to be located within 200m of work zone at site (<5 mins walk).
- Essential to maintaining cleanliness and hygiene, disposable bags and adequately covered dustbins must be provided in all toilet facilities.
- Furthermore, ensuring that every washroom is stocked with handwash, and soap will promote hygiene and prevent the spread of disease. These improvements are essential for providing a safe and dignified environment for all workers at the site.
- To further enhance the sanitation management, the installation of small-scale Sewage Treatment Plants (STPs) in all camps or, alternatively, the use of septic tanks is recommended. There should not be any untreated discharge to the storm water.
- Proper levelling/ pavement of roads is to be ensured to avoid water logging.

2. Drinking Water:

- Contractor shall ensure a daily water provision of 8-10 liters per person through water stations.
- Additionally, water coolers fitted with Reverse Osmosis (RO) systems shall be installed at all water stations to provide clean, safe drinking water at camp and site. The water used for drinking purpose shall be tested and potable as per IS 10500. Water tapes shall be push button type (as used in railways) in the drinking water area

3. Food Shelters:

- Contractor shall establish dining halls (multiple small dining halls if needed) with capacity to accommodate 25% of total workforce at that hall.
- Everyone shall be allotted a space of 20 square feet to ensure comfort while dining.
- Additionally, the area shall be equipped with coolers and fans to maintain pleasant temperature, as well as fly killers to enhance sanitary conditions, ensure dignified and hygienic environment.
- The area including the dining hall may be designated as HSSE hub and shall include drinking water, hand wash facility, rest area, toilets and first aid facility.

- Covered Food-waste bins shall be kept near the dining area & waste shall be disposed on daily basis (at designated locations) to avoid breeding of flies/mosquitoes. Food waste shall be utilized for bio-gas generation and manure production

4. Weather conditions

- Adjustment of work schedule to include a 3–4-hour lunch break during the peak summer months, with an option for adjusting the same through an extended early start or finish, will help minimize exposure to peak temperature hours.
- It is recommended to provide a minimum of 20 square feet of shaded space per person, ideally located adjacent to the dining area. This can be achieved through the installation of tents made of fire retardant materials, which offer effective protection against the sun.
- Additionally, equipping these areas with fans that utilize atomized water or mist sprays will further help in reducing the temperature and providing comfort to the workers.
- Site management shall ensure properly laid out drawing in the tender documents, clearly showing the locations of shaded areas, water coolers, and washrooms.
- Provision of hydration supplements (ORS, Glucose) to mitigate dehydration during hot weather shall be ensured.
- Uninterrupted supply of cold water by sufficient industrial water coolers (stations) shall be ensured during the peak summer months.
- Towels need to be provided to workers on site to protect from harsh sun during summers.
- Provision of heaters/ blowers needs to be ensured at site to cater to extreme cold. Bonfires in site area shall be strictly prohibited to ensure safety and prevent hazard.

Note: Please refer Annexure-I for non-compliance Penalty

Non- compliance penalties against Labour facilities

Areas	Provisions/ sub areas (as per specifications in tender norms)	Timeline for compliance post inspection (days)	Penalty for each instance of non-compliance post timeline given at inspection (in INR)	Penalty applicability at Camp & Project Site	Maximum penalty per unit (Col E) per year for the specified area (in INR)
A	B	C	D	E	F
General	Upkeep of camp area- clearing bushes, etc.	7	1,000	Per 100 person camp/ Site	12,000
	Approach Roads	15	2,000	Per 100 person camp / Site	24,000
Housing/ accommodation	Accommodation space per person	15	200	Per room	2,400
	Fan	7	200	Per room	2,400
	Window	7	200	Per room	2,400
	Ceiling height	15	200	Per room	2,400
	Mattress	7	100	Per unit	1,200
	Signages	15	200	Per 100 person camp	2,400
	Provision of lighting/ socket in room	7	200	Per room	2,400
	Plinth height	15	1,000	Per 100 person camp	12,000
Washrooms	Area and specifications	15	500	Per washroom	6,000
	Nos of WC	15	500	Per washroom	6,000
	Dustbins and disposable bags	7	100	Per washroom	1,200
	Handwash and soap	7	100	Per washroom	1,200
	Daily cleaning as per specification	7	100	Per washroom	1,200
	Ventillation as per specification	7	100	Per washroom	1,200
Bathrooms	Area and specifications	15	500	Per bathroom	6,000
	No of bathrooms	15	500	Per bathroom	6,000
Drinking water	Capacity for drinking and cooking (fresh water tanks)	7	1,000	Per 100 person camp/ Site	12,000
	No of water stations/ coolers (all with RO)	7	1,000	Per 100 person camp/ Site	12,000
Water for washing and cleaning	Capacity (as per specifications)	7	1,000	Per 100 person camp/ Site	12,000
Water treatement	availability of grey water treatment unit	15	1,000	Per 100 person camp/ Site	12,000
	availability of Sewage treatment plant	15	2,000	Per 100 person camp/ Site	24,000
Dining hall	Capacity of dining hall	15	2,000	Per 100 person camp/ Site	24,000
	Seating capacity (tables/ chairs)	7	200	Per unit	2,400
	Air coolers	7	1,000	Per hall	12,000
	Fans	7	1,500	Per hall	18,000
	Insectecutor	7	500	Per hall	6,000
	Drinking water coolers	7	1,000	Per hall	12,000
	Hand wash basin	15	500	Per hall	6,000
	Hand wash/ soap	7	200	Per hall	2,400
	Covered food- waste bins	7	200	Per hall	2,400
Kitchen/ canteen	Area of cooking space	15	2,000	Per 100 person camp	24,000
	Exhaust fan	7	200	Per 100 person camp	2,400

Areas	Provisions/ sub areas (as per specifications in tender norms)	Timeline for compliance post inspection (days)	Penalty for each instance of non-compliance post timeline given at inspection (in INR)	Penalty applicability at Camp & Project Site	Maximum penalty per unit (Col E) per year for the specified area (in INR)
	Fire extinguisher	1	200	Per 100 person camp	2,400
	Storage with lock and key	7	100	Per 100 person camp	1,200
	Utensil washing area with hot water supply	15	500	Per 100 person camp	6,000
Steps for weather conditions	Minimum shaded space per person	15	2,000	Per 100 person	24,000
	Fans	15	200	Per 100 person	2,400
	Hydration supplements	7	50	Per person	600
	Heaters/ Blowers	7	200	Per 100 person	2,400
Transportation	No of buses/ trips	15	500	Per 100 person camp/ Site	6,000
Recreation facilities	Open space as per specification	15	2,000	Per 100 person camp	24,000
	Recreation room	30	500	Per 100 person camp	6,000
	TV	7	500	Per 100 person camp	6,000
	Floor mats/ chairs in TV room	7	200	Per 100 person camp	2,400
Medical facilities	Annual check up	15	100	Per person	1,200
	Ambulance	15	200	Per 100 person camp/ Site	2,400
	First aid (for each location)	7	100	Per 100 person camp/ Site	1,200
Waste disposal	Daily cleaning	7	500	Per 100 person camp/ Site	6,000
Emergency assembly area	Space as per specification	15	500	Per 100 person camp/ Site	6,000
	Notice board	7	200	Per 100 person camp/ Site	2,400
Creche	Provision as per specification	15	2,000	Per 100 person camp	24,000
Electric room	As per specification	15	2,000	Per 100 person camp	24,000
	DG set	7	1,000	Per 100 person camp	12,000

Note: In case of non- adhernace of the compliances mentioned in the contract or otherwise as applicable by the labour law, the principal employer will supply/ provide the facility and recover the cost of the same with penalty from respective contractors' running bill.
The maximum overall penalty per year for non compliance of norms for labour facilities as per the tender document would be capped at 1% of the overall contract value

ANNEXURE - XVI
TO
SPECIAL CONDITIONS OF CONTRACT

[SOCIAL MEDIA POLICY FOR BUSINESS PARTNER]



BHARAT PETROLEUM CORPORATION LIMITED
SOCIAL MEDIA POLICY FOR BUSINESS PARTNERS

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TERMS AND CONDITIONS FOR ACCEPTABLE USE OF SOCIAL MEDIA BY BUSINESS PARTNERS

1. OBJECTIVE

Social media has become part of everyday life and a means of communication and sharing information with others. Every organization recognises the benefits that social media tools can provide, and also reckons the challenges it brings.

These terms and conditions ("**Social Media T&Cs**") seek to provide clear guidance on acceptable standards of conduct and practices to be followed by the Business Partners (*as defined below*) of Bharat Petroleum Corporation Limited ("**Corporation**"), in the usage of social media tools during and post their association with the Corporation. These terms and conditions are intended to protect and safeguard *inter alia* the interests and reputation of the Corporation, in the access, use of or participation on Social Media (*as defined below*) platforms by such constituents.

It is important to maintain the highest degree of professional standard that is associated with the Corporation's name, brand and reputation. Constituents must constantly be aware of the risk of damaging the Corporation's name or reputation in public forums. These terms and conditions should be adhered to by each constituent at all times and should be read harmoniously and in conjunction with the terms of their engagement with the Corporation, as well as other applicable policies and directions issued by Corporation, from time to time, including the Relevant Documents (*as defined below*).

1.1. Social Media

Social Media includes any web or mobile based platform that enables an individual or agency to communicate interactively and enables exchange of user generated content. The term "**Social Media**" describes internet-based technologies and practices that people use to share opinions, insights, experiences and perspectives. It may be internal (housed within the Constituent's technology infrastructure and open for use only by the Constituents) or public (widely available to the population of internet users).

These terms and conditions are applicable equally to a wide range of websites and mobile phone / tablet applications, including the following:

(a) Social Networking sites, for example - Facebook, Twitter, and LinkedIn.
(b) Media Sharing sites, for example - Instagram, Snapchat, YouTube
(c) Discussion forums, for example - Reddit, Quora, Digg, Glassdoor
(d) Content Curation network, for example - Pinterest, Flipboard

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(e) Blogging and Publishing sites, for example - WordPress, Tumblr, Medium including blogs
(f) Interest-based network, for example - Goodreads, Houzz
(g) Information sharing sites, such as Wikipedia
(h) Opinion sites (e.g. Yahoo! Answers)
(i) Any other social media platform/s

1.2. Scope and Applicability

These Social Media T&Cs are applicable to all Business Partners (*as defined below*), including any prospective partners of the Corporation (the "**Constituents**").

The Social Media T&Cs provides a framework for the usage of Social Media by the Constituents and non-conformance with these Social Media T&Cs or any other applicable policy or directions issued by the Corporation as may be relevant to the Constituents, may result in penalties ranging from financial to legal liabilities, as set out under the respective contractual understanding between each Business Partner and the Corporation.

1.3. Relevant Documents

These Social Media T&Cs have been formulated in line with the Framework & Guidelines for Use of Social Media for Government Organizations, issued by the Department of Electronics and Information Technology, Ministry of Communications & Information Technology, Government of India.

In addition, these Social Media T&Cs must be read in conjunction with the underlying contract documents including the following documents (collectively, the "**Relevant Documents**"), as may be applicable to each Constituent:

(a) General Conditions of Contract for vendors (relevant clauses are placed at Annexure I);

(b) Transportation Contract Agreement Bulk LPG Transportation Contract By Road (relevant clauses are placed at Annexure II);

(c) PCVO, Retail and Lubes Transport guidelines.

2. CONTENT GUIDELINES

This section seeks to set out the guidelines for content management as well as administration rights of all official Business Partner Social Media accounts and ensure accountability of the authorised representatives of such Business Partner.

The following guidelines on content sharing ("**Content Guidelines**") must be followed, in relation to all content created, posted or shared on Social Media:

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(a) All post and other content shared via Social Media shall abide by applicable laws, including the Information Technology Act, 2000 and rules made thereunder, as amended.

(b) The content posted or shared though official Social Media accounts, shall be relevant, engaging and in line with the Corporation's brand and communication strategy, whether in the form of text, images, gifs, videos, etc.

(c) The Constituents shall be mindful of content and the tone associated with it. A negative tonality, sarcasm, dry humour, pun, memes, etc. should be avoided to steer clear from any controversy.

(d) The Constituents shall be careful and ensure that any content posted or shared through the official Social Media accounts does not bring disrepute to the Corporation. Opinion or comments on political observations, religious beliefs, gender biases, etc. must be avoided while operating official Social Media accounts. In the use of official Social Media accounts, the Constituents shall refrain from forwarding or sharing any videos or images or messages, which are considered inappropriate or any content that is considered offensive, obscene or derogatory in nature.

(e) The Constituents shall be cognizant of concerns regarding confidentiality and disclosure requirements, and must at all times, adhere to the Relevant Documents as well as these terms and conditions, to understand what shall be disclosed on a public platform. For instance any communication marked as "privileged" or "restricted" or "confidential" or "not for circulation" should not be shared on Social Media. The Constituents are absolutely prohibited from disclosing commercially sensitive, anticompetitive, private or confidential information. If unsure whether the information that is proposed to be shared falls within one of these categories, authorised representatives of the Constituent may discuss with the concerned official as designated by the Corporation.

(f) The Constituents shall ensure that any references to the Corporation or its employees, or other customers, partners and vendors do not contravene any non-disclosure agreements. The Constituents shall avoid disclosure of any information pertaining to any employee / vendor / customer or individual associated with the Corporation, without their prior consent.

(g) The Constituents shall be vigilant about tagging, mentions and conversations around the Corporation. If it notices any customer complaint, dealer/ distributor/ vendor grievances, media story etc., the same may be flagged to the official channels of the Corporation and will be responded to by authorized personnel within the Corporation.

(h) In the operation of official Social Media accounts, the Constituents shall be cognizant of maintaining professional etiquette for all interactions and shall not initiate or engage in discussions which may be characterised as showcasing a personal opinion such as political or religious beliefs. In

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addition, official Social Media accounts should not share any content or comment that may be viewed as colouring the relations between the Corporation and the Government of India or any Ministry / Department of the Central or State Governments.

(i) The Constituents, particularly in the use of official Social Media accounts, shall only post original content, which is free of any copyright infringement or plagiarism. To ensure the reputation and principles of the Corporation are safeguarded, all Constituents must avoid posting content that violates the law, infringes the intellectual property rights of the Corporation and its group companies or of any individual or organization. Any inadvertent posts, which violates these principles, must be removed / deleted immediately upon becoming aware of the implications as set out in these guidelines.

As responsible business partners of the Corporation, the following points must be strictly observed and followed by the Constituents:

(i) Text, photos, images, musical work in any form, video clips, movie clips, or any other content for which the Constituent does not own copyright, must not be used in any form, and in particular for official purposes to promote any activities related to the Corporation, without obtaining consent from the copyright owner. If the copyright owner for such work cannot be identified or if the consent for use of such work is not provided by the copyright owner, the work must not be used by the Constituent.

(ii) Capturing photographs and/or videos of the Corporation's offices, facilities, and other establishments (within or outside) or customer sites is strictly prohibited. Any such illegal images and/or videos of the Corporation's establishments, offices, facilities and factories or other sites and whether directly emailing or otherwise circulating such content via Social Media posts on the Internet, shall attract legal consequences. Official visual materials may be availed from the Corporation and can be requested through email, to the relevant State / Territory team.

(iii) Creation, sharing and/or distribution of videos which make use of unlicensed music is strictly prohibited.

(iv) Unauthorized videos of any events hosted by the Corporation, whether within or outside the Corporation's premises that may be captured by Constituents shall not be shared/distributed on Social Media.

(v) All Constituents must take due care to protect the Corporation's copyright and intellectual property within and outside the organization.

(j) The authorised personnel operating official Social Media accounts of respective Business Partner shall not post unverified news, or news from dubious 'sources', that may project the Corporation in a negative light.

(k) The admins operating official Social Media accounts shall clearly state the source and give due disclaimers while quoting any third-party content through such Social Media accounts.

(l) Additionally, content on official Business Partner Social Media Accounts shall be limited to the coverage of activities related to the business only. However, these accounts can re-share / retweet the posts of Corporation's official Social Media accounts, subject to the veracity of such accounts.

3. ACCEPTABLE USAGE OF SOCIAL MEDIA BY BUSINESS PARTNERS

The following guidelines are applicable to vendors, suppliers and other contractors of the Corporation ("**Business Partners**"), and these are intended to supplement, and do not to replace the terms and conditions or any other agreement or guidelines (including the applicable provisions set out under Annexure I or II of these Social Media T&Cs), which are currently in place to regulate the conduct of such Business Partners:

(a) Business Partners have the discretion to decide whether their Social Media accounts will be used for personal or professional purposes. However, in any event, whether such Social Media accounts are used for official purposes or personal purposes, to the extent that they declare their affiliation with the Corporation in any way, it is deemed that they will abide by these terms and conditions read with the applicable contractual provisions and the Framework & Guidelines for Use of Social Media for Government Organizations, issued by the Department of Electronics and Information Technology, Ministry of Communications & Information Technology, Government of India.

(b) Only official Business Partners accounts are eligible to declare their association with the Corporation or using any content owned by or belonging to the Corporation, including logo, product specifications, product pictures, product catalogues, etc. Such accounts may only post content that are official in nature and reasonably expected to promote the activities specific to its business. Such official Business Partner Social Media account shall be akin to a professional page to promote business interactions and shall not post any content which may showcase the account as expressing opinion on ancillary matters which are not in furtherance of the objective set out under the Relevant Documents, such as posts related to entertainment industry, or political views etc. However, such affiliation or use of Corporation's content, such as logo, product pictures etc. is only limited to use by official Social Media accounts of such Business Partner, and will not, at any time, be used by any authorised or other personnel of such Business Partner, in the operation of a personal Social Media account.

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(c) Every Business Partner's official or personal (individual) Social Media account is prohibited from posting / circulating any official communication / document or disclosing any business-related or other confidential information, pertaining to the Corporation, in accordance with the Relevant Documents.

(d) Each Business Partner Social Media account, particularly those accounts which have been permitted to acknowledge their association with the Corporation, has an obligation to exercise caution in the posting or sharing of content on Social Media, and shall undertake adequate diligence prior to posting any content. In particular, such accounts shall be fully cognizant of posting or providing traction to any 'fake news' and shall refrain from posting or sharing unlawful, controversial or unverified news, or news from dubious 'sources', particularly in relation to the Corporation and the Central / State Governments.

(e) The Business Partner Social Media account which are maintained for official purposes, shall refrain from engaging in unlawful or inappropriate posts or sharing any content that may be defamatory or may have the effect of downplaying the Corporation's business or competitors. In addition, such account should also not post or share content using derogatory language or is likely to demean sentiments of anyone with whom they engage in any public communication using Social Media.

(f) Business Partners using Social Media for official purposes and especially those accounts that have been approved by the Corporation, shall maintain professional and proper etiquette in online interaction via Social Media and shall not engage in inappropriate behaviour. Such inappropriate behaviour includes but may not be limited to posting, sharing or endorsing in any form, any content which may be considered as:

(i) Divisive, unethical or unlawful at the workplace;

(ii) False, or derogatory, or amounting to bullying, trolling, intimidating, or harassing including using offensive, defamatory, threatening, discriminating, obscene or insulting language;

(iii) A misrepresentation of the Corporation, such as creating any unofficial groups or networks (whether intentional or unintentional) using the Corporation's name, logo, or email address;

(iv) Compromising the confidentiality (of the Constituents and/or the Corporation's information), or creating a conflict of interest;

(v) Disclosing commercially sensitive, anticompetitive, or information which is marked as restricted for internal circulation within the Corporation;

(vi) Misleading and misrepresentative, such as creating or endorsing any video channel / account representing the Corporation or any specific Business Unit, or otherwise posting or sharing any content owned by the

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Corporation, unless such content has been posted on verifiable official Social Media accounts of the Corporation;

(vii) Amounting to pornographic material (that is, writing, pictures, films and video clips of a sexually explicit nature) or content that could be considered as offensive, obscene or criminal; or

(viii) Creating or likely to create any liability (whether criminal or civil, for the Corporation).

Where evidence of misuse or inappropriate behaviour is brought to the notice of the Corporation, the Corporation may undertake a more detailed investigation in accordance with its procedures, which may involve the examination and disclosure of records by those nominated to undertake the investigation and any witnesses involved in the investigation. If necessary, action may be taken against such Business Partner under the respective contractual agreement and in case required, such information may be handed to authorities in connection with the investigation.

(g) Any violation of these Social Media T&Cs shall be treated as violation of General Conditions of Contract of the Corporation and may invite action by the Corporation as deemed fit, based on the sole discretion of the Corporation.

(h) The Corporation has a zero-tolerance policy for any complaints that may be brought to its notice via Business Partner Social Media accounts. In the event the Business Partner or its associates *etc.* are dissatisfied with the Corporation, or have any unresolved query or grievance against the Corporation or any individual who is in the employment or association of the Corporation, the Business Partner or such person associated with it must reach out to the designated official and follow the hierarchy established within the Corporation. All such communication must follow the formal processes that are available as per contractual agreement with the Corporation. In the event the Business Partner, whether by itself or its employee or associate publishes any such information on Social Media or discloses details of any complaint or dispute with the Corporation on a public forum through Social Media, it will be in breach of the terms of these T&Cs and its agreement with the Corporation, and the Corporation will have the right to pursue such legal remedies as may be appropriate and available under law.

(i) Upon termination or expiry of the Relevant Document / underlying contractual agreement between the Corporation and the Business Partner, the Business Partner shall ensure that all references and posts which disclose any affiliation with the Corporation has been scrubbed from the Business Partner's Social Media account and a formal written declaration to this effect must be provided to the Corporation, within 7 days of such termination or expiry.

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4. ENFORCEABILITY AND COMPLIANCE

4.1. These Social Media T&Cs are construed to be a part of the Relevant Documents and form an integral part of the contractual understanding between the Corporation and the Business Partner.

4.2. Any violation of the Social Media T&Cs shall be treated as violation of respective contractual understanding between the Corporation and the Business Partner, and may invite appropriate action by the Corporation as deemed fit.

4.3. The Business Partner agrees and understands that all activities of the Business Partner's official Social Media Account is subject to monitoring and periodic audits by the Corporation, if required.

4.4. The Business Partner will provide its written acknowledgement to these Social Media T&Cs, in the form set out in Annexure III, failing which the Corporation may take such action as may be necessary to ensure compliance with these terms and conditions.

4.5. The concerned official of the Corporation shall be responsible for reviewing the compliance of these Social Media T&Cs as may be required to ensure that it meets legal requirements and reflects best practice.

ANNEXURE I

GENERAL CONDITIONS OF CONTRACT FOR VENDORS

Clause 34: Contractor's Subordinate Staff and Their Conducts:

34.2 If and whenever any of the Contractor's or sub-contractor's agents, sub-agents, assistants supervisor or other employees shall in the opinion of Engineer-in-Charge be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or that in the opinion of the owner or Engineer-in-Charge, it is undesirable for administrative or any other reason for such person or persons to be employed in the works, the contractor, if so directed by the Engineer-in- Charge, shall at once remove such person or persons from employment thereon. Any person or persons so removed from the works shall not again be employed in connection with the works without the written permission of the Engineer-in-Charge. Any person so removed from the works shall be immediately replaced at the expense of the contractor by a qualified and competent substitute. Should the contractor be requested to repatriate any person removed from the works he shall do so and shall bear all costs in connection herewith.

34.3 The contractor shall be responsible for the proper behaviour of all the staff, supervisor, workmen and others and shall exercise a proper degree of control over them and in particular, and without prejudice to the said generality, the contractor shall be bound to prohibit and prevent any employees from trespassing or acting in any way detrimental or prejudicial to the interest of the community or of the properties or occupiers of land and properties in the neighbourhood and in the event of such employee so trespassing, the contractor shall be responsible therefore and relieve the Owner of all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the Engineer-in-Charge upon any matter arising under this clause shall be final. Contractor shall ensure that none of their employees are ever engaged in any anti-national activities.

Clause 44: Liens

44.2 Contractor will not disclose details of the work to any person or persons except those engaged in its performance, and only to the extent required for the particular portion of the work being done. Contractor will not give any items concerning details of the work to the press or a news disseminating agency without prior written approval from Engineer-in-Charge. Contractor shall not take any pictures on site without written approval of Engineer-in-Charge.

ANNEXURE II

TRANSPORTATION CONTRACT AGREEMENT FOR BULK LPG TRANSPORTATION CONTRACT BY ROAD

Clause 28:

(a) The Transporter shall remain at all times liable to the Corporation for any loss or damage caused to any building, plant machinery or the property of the Corporation due to careless, negligent, inexperienced act or default of the Transporter, their agents, representative or employees. The Corporation shall be entitled to deduct from the amounts payable to the Transporter under this Agreement or otherwise the loss or damages so suffered.

(b) The Transporter will be liable for any loss and/or injury to Corporation's employee due to careless, negligent, wrongful act or default of the Transporter, his/their representatives or employees in carrying out the job under this contract.

Clause 38:

All terms & conditions stipulated in the Guidelines for Bidders, Tender Terms & Conditions, Declarations, Agreement, Industry Bulk LPG Transport Discipline Guidelines and other documents furnished with the Tender and related correspondence shall form part of the contract. The Corporations are entitled to frame and implement the Policy(ies) applicable to Transporters, and to modify and amend the same from time to time, and that the Policy(ies) as framed, amended and modified would be binding on the Transporters, immediately upon being communicated to them.

Clauses from Transportation Agreement of Retail and MAK Lubricants

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ANNEUXRE III

FORMAT OF ACKNOWLEDGEMENT

To,
[*insert details to whom such acknowledgement may be addressed***]**

[*in the case of an individual or sole proprietorship*] I am _____ , an inhabitant of _____ and carrying on business of _____

OR

We are [*insert names of all partners of firm*] carrying on business at _____ in partnership under the firm name and style of M/s. _____

OR

[*insert name of Limited Company or a Co-operative Society / Trust Co-operative*] incorporated under the laws of India and having its Registered Office at _____
_____

I / We have entered into a [insert name of agreement] dated [*insert date*] ("**Agreement**") for the [*insert purpose*], with Bharat Petroleum Corporation Limited ("**BPCL**").

In furtherance thereof, we have been provided with a copy of the Terms and Conditions for Acceptable Use of Social Media by Business Partners, issued by the Corporation.

I / We have read and understood BPCL's Terms and Conditions for Acceptable Use of Social Media by Business Partners and agree to abide by it.

I / We understand that any violation of the above conditions may result in disciplinary action, or termination or revocation of the Agreement.

In acknowledgement thereof, please see below our acceptance of the Terms and Conditions for Acceptable Use of Social Media by Business Partners, issued by the Corporation, duly signed and acknowledged by [*insert name*], in the capacity of our authorised representative.

A copy of such authorisation is also attached for your record.

_____
(Signature & seal)

Name:
Designation: Date:

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ANNEXURE - XVII
TO
SPECIAL CONDITIONS OF CONTRACT

[PRICE VARIATION OF STEEL FOR LSTK PACKAGE]

Not Applicable

ANNEXURE - XVIII
TO
SPECIAL CONDITIONS OF CONTRACT

[GUIDELINES ON CONTRACTOR'S PERFORMANCE EVALUATION]

1.0 GENERAL

A system for evaluation of Contractors' performance is a key process and important to support an effective contracting function of an organization.
Performance of all contractors needs to be closely monitored to ensure complete execution of project within scheduled completion period. For timely execution of project and achieving the desired goals of the organization, it is necessary to monitor the execution of project or contracts right from the award stage to completion stage and take corrective measures in time.

2.0 OBJECTIVE

The objective of contractor performance evaluation is to ascertain the performance of the contractor with respect to satisfactory execution of work while maintaining safety and quality standards and to develop reliable contractors so that they consistently meet or exceed expectations and requirements.
The purpose of this guideline is to put in place a system to monitor performance of contractors associated with BPCL Refineries Division so as to ensure timely completion of various projects.

3.0 MEASUREMENT OF PERFORMANCE

Standard Format attached as Annexure-1 shall be used for evaluating Contractors' Performance.

4.0 BASIC OF CONTRACTORS' PERFORMANCE EVALUATION

The contractors' actual performance till actual Mechanical Completion vis-à-vis the Overall Progress S-curve finalized in the base planning package document shall form the basis for the evaluation pf performance of contractor.

5.0 STAGES OF EVALUATION

Performance Evaluation of Contractor shall be done independently at following three stages
Of the project as per Overall Progress S-curve and at mechanical Completion:

i) First performance evaluation shall be done at initial stage i.e. at 30% schedule progress stage as per Overall progress S-curve.
ii) Second performance evaluation shall be done at mid/ peak stage i.e. at 80% schedule progress stage as per overall progress S- curve.
iii) Third performance evaluation shall be done at Schedule completion stage i.e. at 100% schedule progress stage as per overall progress S-curve.
iv) Fourth performance evaluation shall be done at actual completion stage i.e. at mechanical completion.

Note:

1) Performance evaluation by Engineer-in-charge (EIC) for stages against SN (i),(ii) & (iii) shall be carried out within a period of 01 (one) month after reaching at designated schedule progress stage.
2) Performance evaluation by Engineer-in-charge (EIC) for SN (iv) shall be carried out within a period of 06 (six) months after achieving Mechanical Completion.

6.0 PERFORMANCE RATING:

Depending upon the Total Marks obtained by the contractor as per Annexure-1, the performance rating of the contractor shall be finalized as per following:

No.	% age of marks obtained	Performance Rating
1	> 80%	Very Good
2	> 60 % but ≤ 80%	Good
3	> 40% but ≤ 60%	Fair
4	≤ 40%	Unsatisfactory

7.0 ACTION BASED ON PERFORMANCE RATING

7.1 Following actions shall be taken at different evaluation stages depending upon the performance rating:

Sl No	Evaluation stage	performance rating	Recommended Action
1	Initial Stage (30% Schedule Progress)	Very Good	No further action
		Good	Letter to the contractor for improving the performance in future
		Fair	Restrict Contractors' Pre-qualification in future jobs or Additional bank Guarantee in future jobs (note)
		Unsatisfactory	Banning for future jobs (Note)
2	Mid / Peak stage (80% Schedule Progress)	Very Good	No further action
		Good	Letter to the contractor for improving the performance in future
		Fair	Restrict Contractors' Pre-qualification in future jobs or Additional bank Guarantee in future jobs (note)
		Unsatisfactory	Banning for future jobs (Note)
3	Schedule Completion stage (100% Schedule Progress)	Very Good	No further action
		Good	Letter to the contractor for improving the performance in future
		Fair	Restrict Contractors' Pre-qualification in future jobs or Additional bank Guarantee in future jobs (note)
		Unsatisfactory	Banning for future jobs (Note)
4	Actual Completion stage (After Mechanical Completion)	Very Good	May be considered for Limited Tendering in future jobs
		Good	Letter to the contractor for improving the performance in future
		Fair	Restrict Contractors' Pre-qualification in future jobs (Note)
		Unsatisfactory	Banning for future jobs (Note) & Initiate action for Holiday- Listing (Note)

Note:

In case of Fair / unsatisfactory rating, indicated penal action shall be taken for future jobs for a maximum period of 1 year across all Division, with a provision of revoking such penal action in case of improvement in performance in the job under evaluation or any other concurrent job (having contract value of minimum 80% of the job under evaluation) at similar or higher stage of evaluation in the same division.

7.2 Restriction in Contractors' pre-qualification in future jobs

In future job, prequalify the contractor only for the work of estimated value up to X% of the original contract value for which "Fair performance "rating has been given.

"X" = marks obtained by the contractor

7.3 Additional Bank Guarantee

In future jobs submit additional Bank Guarantee of an amount equivalent to 10% (ten percent) of the contract value, over & above the other bank Guarantees specified in the tender, if Contractor' performance rating is Fair on the last date of submission of Bid. This additional bank guarantee shall be submitted before signing of the contract and shall be vaild up to completion of the work.

- Contractor shall have the option to choose between the above mentioned two options i.e. at sr. no,7.2 & 7.3 at the time of submission of bid for future jobs.

7.4 Banning Not to consider the contractor in future jobs.

Annexure-1

BHARAT PETROLEUM CORPORATION LIMITED
REFINERIES DIVISION

FORMAT FOR REFINERIES DIVISION

EVALUATION OF CONTRACTORS' PERFORMANCE FOR PROJECTS

1.0 Name of Contractor :

2.0 Work order No.& Date :

3.0 Name of Work :

4.0 Contract No..& Date :

5.0 Contract Value (Rs.) :

6.0 Contractual Completion Date :

7.0 Actual Completion date :
(Not Applicable for Initial/
Mid stage evaluation)

8.0 Geographical Region of work under evaluation (Please (√) mark)

1. North ☐
2. South ☐
3. East ☐
4.West ☐

9.0 Stage of Evaluation (Please (√) mark against respective stage):

1. Initial stage at 30% schedule Physical progress as per overall progress S-curve ☐

2. Mid / peak stage at 80% schedule Physical progress as per overall progress S-curve ☐

3. Schedules Completion stage at 100% schedule physical Progress as per overall progress S- curve ☐

4. Actual Completion stage at mechanical completion ☐

10.0 Allocation of marks: (To be filled up by EIC for calculation of marks)

10.1 Allocation of marks for Initial, mid / Peak & Schedule Completion stage:

Schedule ogress at uationstage	% schedule progress worked out after delay analysis	% actual Progress	Mark obtained by Contractor
	A%	B %	C = (B/A) × 100%

10.2 Allocation of marks for Actual Completion stage (i.e. Mechanical Completion):
10.2.1 In case there is NO DELAY solely attributable to contractor, marks obtained by the Contractor =100

10.2.2 In case there is DELAY solely attributable to contractor.

Maximum marks to be considered	Delay in week(s) or part thereof	For delay up to 20 weeks : Marks to be deducted @ 1 mark per week delay or part thereof	For delay more than 20 week: Additional marks to be deducted @ 2 marks per week or part thereof for delay beyond 20 weeks	Marks obtained by Contractor
A	B	C= B × 1	D = (B – 20) × 2	E = A –(C+D)
100				

11.0 Deduction of marks on account of following:

11.1 Cash Flow issues

SN	Description	Unit Marks to be deducted / Incident	No. of Incidents	Total no. of makers to be deducted
	A	B	C	D= B × C
1	Direct payment by BPCL to subcontractor	2	……	……
2	Direct Payment by BPCL to contractors labour	5	……	…….
	Total marks to be deducted			……..

Note:

1. The maximum deduction of marks on account of cash flow issues of contractor shall be limited to 15 marks.
2. Incident(S) occurred in billing Cycle shall be considered as one incident.

11.2 Part-Offloading

SN	Description	Unit Marks to be deducted / Incident	No. of Incidents	Total no. of makers to be deducted
	A	B	C	D= B × C
1	Off-loading of part work at contractors risk & cost	10	……	……
	Total Marks to be deducted			……..

Note: The maximum deduction of marks on account of part of-loading in any work shall be limited to 20 marks.

11.3 Safety Violation

For calculation of marks towards deduction on safety violation, the following formula shall be used:

$$AFR = \frac{[(10 \text{ X } D)+I]X10^6}{MH}$$

Where,

AFR - Accident Frequency Rate
D - Total Number of Fatalities and/ or Number of permanent disabilities
I - Number of loss time injury cases without permanent disability
MH - Man Hours worked

SN	D	I	MH	AFR = $\frac{[(10 \times D)+I] \times 10^6}{MH}$
1				

Deduction of marks based on ARF shall be as under.

SN	AFR	Calculation of marks for deduction	Total No. of marks to be deducted
1	> 0 but ≤ 0.5	0.5	0.5
2	>0.5	{(AFR-0.5) / 0.05} × 0.25	…….
	Total Marks to be deducted { SN 1 + SN 2}		……..

Note:

1. Figure arrived after using the formula '{(AFR – 0.5)/ 0.05}"at SN 2 above shall be rounded up tonext whole number
2. The maximum deduction of marks on account of safety violation in any work shall be limited to 25 marks.
3. Deductions on account of safety violation shall be applicable for the incidents occurred from start to evaluation stage.

11.4 Delay in lining up of sub- contractor

SN	Description	Unit marks to be deducted/ week/Incident	No .of / week/ Incidents	Total no. of marks to be Deducted
	A	B	C	D = B × C
1	Delay in lining up of sub-contractor with respect to agreed schedule	1	……	……
	Total Marks to be deducted			**……..**

Note:
The maximum deduction of marks on account of part offloading in any work shall be limited to 05 marks.

General Note:

The above mentioned deduction towards 11.1 & 11.2 shall be applicable for incident(s) occurred in between the successive evaluation stages only, but the deductions towards 11.3&11.4 shall be applicable for the incidents occurred from start of work to respective evaluation stage. For performance evaluation at 30% schedule progress stage, incident occurred between start of work & 30% schedule progress stage shall be considered.

11.5 Total Deduction of Marks as calculated at 11.1,11.2, 11.3, & 11.4 = ……

12.0 Total marks as allocated to contractor.

SN	Description		Marks
1	Marks as calculated at 10.0	A	
2	Deduction of marks as calculated at 11.5	B	
3	Net marks after considering Deduction	C = A- B	
4	Enhancement of net marks as obtained at C by 10% for work executed in Eastern Regions (BR, HR, PDR,GR, BGR, AOD) only (note: In other regions this shall not apply)	D = C × 1.10	
5	Total marks Obtained D for (Eastern Regions) or C for (other regions)		

13.0 Performance rating of Contractor:

Performance rating chart:

SN	% age of marks obtained	Performance rating
1	>80 %	Very Good
2	>60 % but ≤ 80 %	Good
3	>40 % but ≤ 60 %	Fair
4	≤ 40 %	Unsatisfactory

Depending upon the total marks as obtained by the contractor at 12.0 above, the performance Rating of the contractor, comes out to be……..

Signature of EIC: ……..……..

Name: ……

Designation: ……

Date: ……

ANNEXURE - XIX
TO
SPECIAL CONDITIONS OF CONTRACT

[PRICE REDUCTION FOR SLIPPAGE IN COMPLETION
&
PRICE REDUCTION FOR DELAY IN ACHIEVING INTERMEDIATE MAJOR MILESTONE]

ANNEXURE -XIX to SCC

PRICE REDUCTION FOR DELAY IN ACHIEVING INTERMEDIATE MAJOR MILESTONE FOR STEAM GENERATION PACKAGE

(BID DOCUMENT No. JP/B957-420-PG-T-7410/1009)

List of intermediate major milestone and its completion schedule is as under:

DESCRIPTION / INTERMEDIATE MILESTONE	Time Schedule, Month from award date	PRS in % per week (percent of total Contract price as per Schedule of Rates)
PO Placement of Critical items (As per Annexure-VI to SCC)	3	0.15
Approval of Engineering Design & Drawings of Critical Items (Minimum in Code 2 approval stage)	6	0.25
Delivery of all critical items at site	14	0.20
Readiness of Substation & SRR building for receipt of Electrical & Instrumentation Items	16	0.15

NOTES:

1. In the event of delay in achieving the above intermediate milestones, Price adjustment for delay in achieving each intermediate major milestones shall be a sum equivalent to the % as mentioned above of the Total Contract Price for every week of delay or part thereof, for each milestone, subject to a maximum of four weeks delay for each milestone, limited to a maximum of 3.0% of the Total Contract Price in respect of any or all the intermediate major milestones put together. However, the total adjustment on account of delay in achieving the intermediate major milestones as mentioned above and delay in Mechanical completion of work beyond the overall Time schedule as mentioned in Annexure-I of SCC shall be limited to 5% of Total Contract Price only.

2. Further in case CONTRACTOR defaults in completion of intermediate major milestones as mentioned above but completes the Mechanical Completion within the Time Schedule as per Annexure-I to SCC, the amount deducted against Price adjustment for delay in achieving intermediate major milestones shall be paid to the CONTRACTOR in the final bill

ANNEXURE - XX
TO
SPECIAL CONDITIONS OF CONTRACT

[LIST OF BANKS FOR SUBMITTING CPBG]

List of banks Meeting the stipulated criteria as on 09.05.2024

Sr No.	Name of Bank	Category of Banks
1	AU Small Finance Bank Ltd	Indian Bank
2	Axis Bank Ltd	Indian Bank
3	Bank of Baroda	Indian Bank
4	Bank of India	Indian Bank
5	Bank of Maharashtra	Indian Bank
6	Canara Bank	Indian Bank
7	Federal Bank Ltd	Indian Bank
8	HDFC Bank Ltd	Indian Bank
9	ICICI Bank Ltd	Indian Bank
10	IDFC First Bank Ltd	Indian Bank
11	Indian Bank	Indian Bank
12	IndusInd Bank Ltd	Indian Bank
13	Kotak Mahindra Bank Ltd	Indian Bank
14	Punjab National Bank	Indian Bank
15	State Bank of India	Indian Bank
16	Union Bank of India Ltd	Indian Bank
17	Abu Dhabi Commercial Bank PJSC	Foreign Bank
18	Bank of America NA	Foreign Bank
19	Bank of Nova Scotia/The	Foreign Bank
20	BNP Paribas SA	Foreign Bank
21	Shinhan Financial Group Co Ltd	Foreign Bank
22	Citibank NA	Foreign Bank
23	DBS Group Holdings Ltd	Foreign Bank
24	Hongkong & Shanghai Banking Co	Foreign Bank
25	Westpac Banking Corp	Foreign Bank
26	Industrial & Commercial Bank o	Foreign Bank
27	Credit Agricole SA	Foreign Bank
28	Cooperatieve Rabobank UA	Foreign Bank
29	Doha Bank QPSC	Foreign Bank
30	Qatar National Bank QPSC	Foreign Bank
31	United Overseas Bank Ltd	Foreign Bank
32	Hana Bank	Foreign Bank
33	Industrial Bank of Korea	Foreign Bank
34	First Abu Dhabi Bank PJSC	Foreign Bank
35	Emirates NBD Bank PJSC	Foreign Bank
36	NatWest Markets PLC	Foreign Bank
37	Bank of China Ltd	Foreign Bank
38	CTBC Bank Co Ltd	Foreign Bank

Note:

1. The above list of bank is based on the credit rating as on date (Source: Bloomberg)
2. In case of any discrepency/ subsequent upgrade in credit rating, user department can contact Treasury for clarification

ANNEXURE - XXI
TO
SPECIAL CONDITIONS OF CONTRACT

[ADVISORY ON ENVIRONMENTAL CRITERIA]

BPCL Supplier / Vendor Advisory on Environmental Criteria

Dear Suppliers / Vendors,
As you aware that environment is one of the most precious gifts given to us by Mother Nature. We must be conscious of our actions and act responsibly to preserve and conserve the environment. BPCL has always endeavoured to be a responsible & conscious corporate citizen. We would also want to engage you - our suppliers - in the efforts to reduce our impact on the environment.

Below are the advisory guidelines on environmental criteria, which we want our suppliers to follow:

1. Emission / Pollution Control (Air, Water, Soil, Noise etc.)

a. The organization and its all operations should follow all laws related to emission / pollution norms.
b. The organization should get all necessary approvals & certifications for emission / pollution control from relevant authorities for plants, equipment, vehicles etc.
c. Monitoring mechanism should be put in place for all emissions / pollution emitted from organization owned assets e.g. Equipment, vehicles etc.
d. Organization should conduct training and awareness programs for the staff on emission / pollution impacts & prevention.

2. Energy

a. Monitoring energy consumption by the organization from all sources should be done.
b. Organization should strive to reduce energy consumption by employing energy efficiency & conservation measures.
c. Use of alternate fuel sources & renewable energy should be promoted by the organization.

3. Water

a. Water consumption from all the sources should be monitored by the organization.
b. Reduction in water consumption should be aimed by treating waste water & alternative use of waste water.
c. Waste water should be treated to remove harmful elements before releasing it to the eco-system.

4. Reducing Resource Intensity

a. Optimization / re-use / recycle techniques should be used to reduce the use of resources.
b. Minimizing use of resources having major environmental impact should be done and substitutes should be found.
c. Proper handling should be done for hazardous resources (chemicals etc.) having impact on humans & eco system.

5. Waste Management

a. Waste segregation based on type of waste (solid, liquid, hazardous, etc.) generated by the organization should be done.
b. Opportunities for recycling & re-use of waste should be identified & promoted by the organization.
c. Hazardous waste should be handled by trained personnel & disposed to authorized agencies only.

6. Risk Mitigation

a. Environmental Risk Assessment should be carried out for all the organization's operations.
b. The severity / extent of damage due to the environmental risk should be estimated.
c. Staff / personnel involved in operations related to environmental risk should be trained and regular awareness programs should be conducted.

The guidelines are indicative of the direction that the suppliers should take to be more environmentally supportive. Suppliers should join hands with BPCL in making a value chain that is environmentally aware and responsible.

ANNEXURE - XXII
TO
SPECIAL CONDITIONS OF CONTRACT

[PROCEDURE FOR VENDOR INVOICE PROCESSING]

Business Process Excellence Centre

To Our Esteemed Suppliers/ Contractors,

BPCL has setup a Business Process Excellence Centre (BPEC) for Vendor Invoice processing.

BPEC will function as a payments factory to receive, digitize and process vendor invoices in a timely and accurate manner. In addition, the centre will receive and account for Bank Guarantees (BGs) & other allied activities like release of retention money/ security deposit etc.

➢ Bill Payments

Effective 1st May 2017, the following original documents will need to be sent to BPEC for release of payments:

i) Original Commercial / Tax invoice
ii) Any Supporting documents for payments e.g. Octroi certificate, freight bills, IRN, test certificate
iii) Copy of the Works Contract Tax (WCT) Exemption Certificate for lower/Nil deduction of WCT (Original must be submitted to Kochi Refinery procurement team for their records)

Please send these documents to the following address for payment processing*:

BUSINESS PROCESS EXCELLENCE CENTRE (BPEC)
4th FLOOR, BPCL OFFICE COMPLEX
PLOT NO. 6 SECTOR – 2
BEHIND CIDCO GARDEN, KHARGHAR
NAVI MUMBAI-410210

**Please note that this does not change the BPCL address that needs to be put on the invoice.*

The following documents should not be sent to BPEC:

- Excise invoice (Duplicate invoice For Transporter- DFT)
- User reference manuals
- Test booklets
- BG against Earnest Money Deposit (EMD) etc.

**These documents should be sent to the procurement location i.e Kochi Refinery*

How to Track Status of Bills sent to Business Process Excellence Centre (BPEC)?

1) For every valid bill received at BPEC, the vendor will be communicated with a unique DPID no. on their registered email ID & mobile no. as per BPCL records
2) Vendors can contact Toll Free No. 1800 224 221 during working days between 9.00 AM to 5.00 PM for any payment/ bill related queries
3) Vendors can write to z_vendorhelpdesk@bharatpetroleum.in for any queries
4) The payment status of your invoices can also be check in Vendor Portal (*https://efp.bpcl.in/*)
5) The payment status of your invoices can also be check in Mobile Application (https://ebiz.bpc.co.in/EbizPortal/)
6) For status of specific invoices, vendor can also use SMS application by sending SMS **"STAT (Space) <DPID>"** to 9223112222 from their registered mobile no.

General Guidelines for Invoices

All invoices should be legible and accompanied with supporting documents required for invoice processing as per the PO. Invoices should be compliant with government requirements on tax invoices and should have the following information:

- PO number, clearly mentioned (45XXXXXXXX)
- Vendor code (Available with your BPCL contract)
- Vendor name
- Vendor address, telephone number, email address and point of contact
- Tax registration number (VAT, Service Tax, Excise etc. as applicable)
- The invoice should be in name of Bharat Petroleum Corporation Limited (BPCL)
- Invoice number
- Invoice date
- Specification of goods and services delivered
- Total gross amount and breakup
- Taxes applicable, with individual tax rates matching with the purchase order
- BPCL Location name and address
- Kindly ensure multiple invoices are not bunched together (stapled) whilst sending the same to BPEC for processing.

**Please note that the above information should be present on the invoice, to ensure that the invoice is processed in a timely manner*.

➢ Release of Security Deposit/ Retention Money

Standard Template for Release of Retention Money & Security Deposit is duly attached herewith which should be used by all vendors/contractors while submitting their release of Retention/Security deposit requests to BPEC.

With respect to the said template vendors are required to note the following point:

1) Only single Purchase Order (45XXXXXXXX) / Contract (46XXXXXXXX) can be provided per request letter (separate requests letters for each Purchase Order/ Contract)
2) **Photo copies of old invoices/bills** to which the retention money pertains **should not be attached** with the request letter
3) Request letter must be duly signed by the vendor or their authorized representative
4) There is no requirement for BPCL officers to sign on the said request letter
5) Request letter must be sent to BPEC only after completion of job (for security deposit) or completion of defect liability period (for retention money)
6) Vendors can also send scan copy of the said letter duly signed to z_vendorhelpdesk@bharatpetroleum.in
7) Vendors will also be receiving emails for tracking of these requests on their registered email ID's

➢ Guidelines for Bank Guarantees and Performance Bank Guarantees

All PBGs and BGs should be accompanied with a cover letter stating one of the following (available with your BPCL contract)

- PO/ Contract number
- RFQ number

In addition, please clearly state the following:

- Vendor number
- Vendor Name, address, email address and phone number
- Vendor point of contact
- BPCL location and address

Further, currently on receipt of these BG's, letters are being sent to issuing Bank for BG Confirmation. On many occasions there are delays or no response from Banks with regards to confirmation of BG's which ultimately leads to delay in release of vendor payments.

Considering the above pain points, BPCL has tied up with SBI for implementation of SFMS (Structured Financial Messaging Service) Bank Guarantee Process and the salient features are as given below:

1) Vendors/ Contractors shall provide BPCL's Bank Account No. & IFSC Code (Details given below) to their existing Bank at the time of application for Bank Guarantee in favor of BPCL
2) Your Bank shall issue the Bank Guarantee & send SFMS message to BPCL Bank confirming the Bank Guarantee as genuine
3) **BPCL's Bank (SBI) shall in turn send the said SFMS message to BPCL's dedicated email ID basis which BPEC shall consider the said Bank Guarantee as verified by Bank**
4) Once the above process is completed, BPEC Team shall proceed with the release of payment to vendors which is due against the said Bank Guarantee.

Name of Bank: State Bank of India
Branch: CAG Branch, Mumbai
Account No: 11083980831
IFSC Code: SBIN0009995

REQUEST FOR RELEASE OF SECURITY DEPOSIT

Date: DD/MM/YYYY

To,

The Allied Process Team
BUSINESS PROCESS EXCELLENCE CENTRE
4th FLOOR, BPCL OFFICE COMPLEX
PLOT NO. 6 SECTOR – 2
BEHIND CIDCO GARDEN, KHARGHAR
NEW MUMBAI-410210

Dear Sir,

Sub: - **Request for Release of Security Deposit**

Request you to kindly release the Security Deposit money held by Bharat Petroleum Corp Ltd as per the details given below:

Purchase Order	**(45XXXXXXXX)**
Contract No (if applicable)	**(46XXXXXXXX)**
Vendor Code	
Vendor Name	
Description of Services / Job Carried	
Security Deposit Amount	

(Only one PO/Contract # per Request letter will be accepted)

Thanking you,

Yours faithfully
For M/s…….

_____

REQUEST FOR RELEASE OF RETENTION MONEY

Date: DD/MM/YYYY

To,

The Allied Process Team
BUSINESS PROCESS EXCELLENCE CENTRE
4th FLOOR, BPCL OFFICE COMPLEX
PLOT NO. 6 SECTOR – 2
BEHIND CIDCO GARDEN, KHARGHAR
NEW MUMBAI-410210

Dear Sir,

Sub: - **Request for Release of Retention Money**

Request you to kindly release the retention money held by Bharat Petroleum Corp Ltd as per details given below

The request to release is based on (Please tick whichever applicable)

- ☐ Retention money is due since defect liability period is complete
- ☐ Performance Bank Guarantee submitted against PO/Contract

Purchase Order	**(45XXXXXXXX)**
Contract No (if applicable)	**(46XXXXXXXX)**
Vendor Code	
Vendor Name	
Description of Services / Job Carried	

(Only one PO/Contract # per Request letter will be accepted)

S. No	Invoice Ref. No.	Invoice Date	Invoice Amount	Performance Bank Guarantee No. (if retention release against submission of PBG)	Retention Amount
1					
2					

Thanking you,

Yours faithfully
For M/s……

ANNEXURE - XXIII
TO
SPECIAL CONDITIONS OF CONTRACT

[ENDORSEMENT OF FEED]

Not Applicable

ANNEXURE - XXIV
TO
SPECIAL CONDITIONS OF CONTRACT

[TAXES AND DUTIES]

A. Price basis w.r.t inclusion/exclusion of taxes and duties

1. The quoted price(s) shall be inclusive of all the taxes and duties except GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively) and GST compensation cess, (if applicable) leviable on sale of finished goods/services.
2. In case of foreign bidders, bidders shall submit their prices on FOB international sea port of exit basis/CFR on destination port basis *Note-1 (INCOTERM *Note-2), unless otherwise stated in the bid document. FOB/CFR *Note-1 prices quoted shall be inclusive of all applicable taxes up to FOB international sea port of exit/CFR on destination port basis *Note-1.
3. Transportation charges (if applicable) up to respective project site shall be exclusive of GST.
4. Site work prices, if applicable shall be inclusive of all taxes and duties except GST. All necessary registrations, if required, for carrying out the site activities shall be done by the bidder and costs towards the same shall be included in quoted site work prices.
5. Prices of per diem supervision charges, training/AMC, HAZOP Study etc. (as applicable) shall be exclusive of GST. However, GST shall not be applicable on training provided at foreign bidder's work/training facilities in any territory other than India.

B. TAX CLAUSES

1. Goods and Services Tax

a. The supplier/contractor will be liable to register with the respective tax authorities and to submit self-attested copy of such registration certificates and the supplier/contractor will be responsible for procurement of goods/services in its own registration (GSTN).

b. Supplier/Contractor shall be required to issue tax invoice in the form and manner prescribed under GST Act read with Rules thereunder including E-Invoicing provisions so that input tax credit under GST can be availed by Owner. In the event that the supplier/contractor fails to provide the Tax Invoice/E-Invoice in the form and manner prescribed under the GST act read with GST invoicing rules thereunder, Owner shall not be liable to make any payment on account of GST against such invoice.

c. In case supplier/contractor is not subject to E-Invoicing provisions under the GST Laws as amended from time to time, then a declaration to this effect shall be furnished by the supplier/contractor along with the Invoice.

d. GST shall be paid to supplier/contractor against receipt of Tax Invoice/E-Invoice and on auto-population of input tax credit on GSTN portal. In case of non-receipt of Tax Invoice/E-Invoice and/or non-auto-population of input tax credit on GSTN portal, Owner shall with hold the payment of GST.

e. The supplier/contractor shall always comply with the requirements of applicable laws and provide necessary documents as prescribed under the rules and regulations, as applicable from time to time. In particular, if any tax credit, refund or any other benefit Is denied/delayed to Owner or any interest/penalty is charged to Owner due to any non-compliance/ delayed compliance by the supplier/contractor under the GST Law (including but not limited to failure to upload the details of the sale on GSTN portal, failure to pay GST to the government or due to non-furnishing or furnishing of incorrect or incomplete documents, non-filing of GST return by the

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supplier/contractor), the supplier/contractor shall be liable to reimburse Owner for all such losses and other consequences including but not limited to the tax loss, interest and penalty. Owner shall be entitled to recover such amount from the supplier/contractor by way of adjustment from the next invoice, encashment of BG or by way of any other means either of same project or any other project of the Owner.

f. In case of any Advance including Mobilization/Secured/Other Advance is granted to supplier/contractor as per the provisions of Contract, then the supplier/contractor shall issue a Receipt Voucher / GST Invoice in the form and manner prescribed under GST Act read with Rules thereunder including e-invoicing provisions.

g. In case of any Price Variation as per the provisions of Contract, the supplier/contractor shall issue an Invoice in the form and manner prescribed under the GST Act read with Rules thereunder including e-invoicing provisions.

h. GST payable under reverse charge for specified services/goods under GST Act read with Rules thereunder, if any, shall not be paid to the supplier/contractor but will be directly deposited by Owner to the appropriate Government Tax Authority. If the same has already been reimbursed / paid to the supplier/contractor for any reason whatsoever, then Owner shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by Owner to supplier/contractor.

i. Where Owner has the obligation to discharge GST liability under reverse charge mechanism and Owner has paid or is liable to pay GST to the government on which interest/penalty becomes payable as per GST law for any reason which is not attributable to Owner or Input Tax Credit w.r.t. such payment is not available to Owner for any reason which is not attributable to Owner, then Owner shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by Owner to contractor/supplier.

j. TDS under GST, if applicable shall be deducted from supplier/contractor bills at applicable rates and a certificate as per rules for tax so deducted shall be provided to supplier/contractor.

k. The supplier/contractor will be under obligation for charging correct rate of tax as prescribed under the respective tax laws. Further the supplier/contractor shall avail and pass on benefits of all exemptions/concessions available under applicable tax laws.

l. In case bidder is covered under composition scheme under GST law, then bidder shall quote the price inclusive of GST. Further, such bidder should mention “Covered under GST Composition Scheme” in column for GST of relevant price schedule(s). In case subsequently such bidder gets covered under regular GST regime, the prices including GST under regular GST regime shall not exceed the prices quoted by the bidder under composition scheme.

m. Owner prefers to deal with registered supplier/contractor of goods/services under GST. Therefore, bidders are requested to get themselves registered under GST, If not registered yet. However, in case any unregistered bidder is submitting bid, their prices will be loaded with applicable GST while evaluation of bid as per evaluation methodology of tender document. However, where Owner is entitled for input credit of GST, the same will be considered for evaluation of bid as per evaluation methodology of tender document.

n. In case of foreign bidders, for supervision/site-work/training, services provided by foreign bidder at project site, GST shall be paid by Owner directly to appropriate

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Government Tax Authorities, under Reverse Charge Mechanism, if applicable and prices of such services will be loaded with applicable GST while evaluation of bid as per clause E (Evaluation methodology).

o. Bidder will be required to quote applicable tax rate (along with applicable HSN/SAC Code) as per provisions of GST Laws for all the line items forming part of the enquiry. Any higher rate of tax actually invoiced in excess of quoted rate of tax (except in compliance with provisions of Statutory Variation clauses) shall be adjusted in basic price.

p. In case of delay in supply/execution of contract, supplier/contractor shall be liable to raise invoices for reduced value as per Price Reduction Schedule (PRS) provision of the bidding document. In case the supplier/contractor raises invoices for full value, then supplier/contractor shall issue Credit Note, in the form and manner prescribed under relevant GST Act read with Rules thereunder, towards applicable PRS amount with applicable GST thereon.

In case supplier/contractor fails to submit invoices with reduced value or does not issue Credit Note as mentioned above, Owner shall release payment to the supplier/contractor after giving effect to the PRS clause with corresponding reduction in taxes from invoice(s) of supplier/contractor.

In case any financial implication arises on Owner due to issuance of invoice without reduction in prices or non-issuance of Credit Note by supplier/contractor, the same shall be to the account of supplier/contractor. Owner shall be entitled to recover the amount of such financial implication paid or becoming payable by Owner together with penalty and interest thereon, if any.

q. E-way bills shall be issued directly by supplier/contractor in all cases except in cases of direct imports by Owner where E-way bill shall be issued by Owner.

r. In case of applicability of any recovery as per provisions of the contract, Owner shall raise Invoice on supplier/contractor after charging GST at applicable rates as per prevailing provisions of GST Laws.

2. IMPORT DUTIES

a. Direct supplies by foreign suppliers where, client becomes consignee:

i. Consignee shall be Owner, bill of entry shall be filed by Owner, all import duties, Social Welfare Surcharge, IGST and GST Compensation Cess etc. as applicable in India shall be paid by Owner.

b. Imported supplies by Indian/ Foreign suppliers/Contractors as built in import content where goods are cleared by filing into Bill of Entry in the name of Owner

i. High seas sale shall be effected between, supplier/contractor and Owner.

ii. Bill of entry shall be filed in the name of Owner by supplier/contractor, all import duties, Social Welfare Surcharge, IGST and GST Compensation Cess etc. as applicable in India shall be discharged by Owner.

iii. Custom duties, Social Welfare Surcharge, IGST, GST Compensation Cess, etc. as applicable in India on the imported materials shall not be included in the quoted prices by the bidder. All harbour dues/ pilotage fees, port fees, wharfage, unloading costs, demurrage charges etc. incurred in India in respect of any imported goods shall be to supplier's/contractor's account.

iv. Bidder to indicate CIF value of built-in import content and applicable merit rate,Social Welfare Surcharge on custom in the relevant price schedule.

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v. The supplier/contractor shall be responsible for and shall exercise due diligence in properly classifying the goods and materials, undertaking the payment of custom duties, and/or otherwise complying with all applicable laws w.r.t. import of the goods and materials

vi. If the total custom duties (BCD, SWS & IGST) paid or payable on the import of goods into India exceeds the total value thereof calculated as per the CIF value and rates indicated by supplier/contractor as above as increased or decreased for any increase or reduction in applicable rates or CIF valuation, the Supplier/contractor shall pay and bear and/or reimburse to the Owner such excess custom duties.

c. Imported supplies by Indian suppliers as built in import content where Suppliers/Contractors will become consignee of the goods by filling Bill of Entry for Home consumption

i. Custom duties, Social Welfare Surcharge, IGST, GST Compensation Cess, etc. as applicable in India on the imported materials shall be included in the quoted prices by the bidder (considering the input tax credit of IGST, GST Compensation Cess on imported material) and supplier/contractor shall be responsible for the timely payment of the custom duties to the relevant government authority. All harbor dues/ pilotage fees, port fees, wharfage, unloading costs, demurrage charges etc. incurred in India in respect of any imported goods shall be to supplier's/contractor's account.

ii. Bidder to indicate, in relevant price schedule, CIF value of built-in import content and applicable merit rate of basic custom duty, Social Welfare Surcharge on custom duty (considering the input tax credit of IGST, GST Compensation Cess on imported material) included in quoted price, in the price schedule.

iii. In case merit rate of custom duty is applicable and bids are invited on the basis of same, however at a later stage concessional rate of custom duty becomes applicable, concessional certificate shall be issued towards import of material against the advance request letter submitted by the domestic bidder and the differential custom duties between concessional rate and quoted merit rate of custom duty by supplier/contractor shall be passed on to the Owner or it shall be recovered by the Owner from the supplier/contractor's invoice.

iv. The supplier/contractor shall be responsible for and shall exercise due diligence in properly classifying the goods and materials, undertaking the payment of custom duties, and/or otherwise complying with all applicable laws w.r.t. import of the goods and materials.

v. If bidder does not furnish built in CIF value and rates of custom duty, in that case bidder shall not be entitled to claim any variation in the custom duties even if bidder has quoted their prices considering custom duties.

vi. If custom duty rate actually paid on import of materials and components is found to be lower than the quoted rate of custom duty, then benefit of the same shall be passed on to the Owner.

vii. If bidder has considered Import Duty other than Merit Rate of Import Duty then statutory variation on the Import Duty shall be payable extra on the Merit Rate of Import Duty or the rate of Import Duty considered by the bidder, whichever is lower.

viii. In case, no import is made for execution of the order, clauses related to Imports will not be applicable.

d. General points:

i. In case Owner is exposed to any penal action, interest /penalties by the custom authorities for incorrect declaration and / or valuation of the goods or material by the supplier/contractor, or otherwise on account of any breach of

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applicable laws in the course of the import of the goods and material by supplier/contractor, the supplier/contractor shall indemnify and hold harmless the Owner for any and all costs, expenses or losses suffered or incurred by Owner in this regard

ii. If bidder intends to source import of goods from a country with which India has Free Trade Agreement (FTA) or Comprehensive Economic Partnership Agreement (CEPA) or any such multi-lateral / bi-lateral Agreement or Treaty with India or under Generalized System of Preference (GSP); or under any other notification (allowing lower rate of custom duty), then the bidder is advised to ascertain and confirm its applicability along with supporting documents in the bid and ensure that conditions of such agreement/treaty etc. are strictly complied with.

iii. The bidder shall be liable to provide all documentation to ensure availment of the exemption/waiver. In case the bidder defaults on this due to any reason, whatsoever, he shall be liable to bear the incremental custom duty applicable if any

iv. Any additional custom duty applicability on account of any change in the notification (allowing lower rate of custom duty)/ CEPA/FTA/multi-lateral/bi-lateral trade agreement shall be to bidder's account.

v. Documentation to be furnished for availing the exemption/waiver of custom duty shall be specifically listed in the letter of credit also as a prerequisite for release of payment against shipping documents and this documentation shall necessarily form a part of shipping documents.

vi. Owner will not bear any liability towards payment of Safeguard Duty, Anti-Dumping Duty, Protective Duty and applicable IGST including GST Cess on same or Countervailing Duty on subsidized articles or any other such duties of Customs imposed by Government under Customs Tariff Act, 1975.

vii. In case custom duty rate as quoted by Foreign bidder is less than Actual rate applicable on due date of submission of last price bid and payment of custom duty is on Owner's Account, differential amount on account of above-mentioned rate variation will be recovered from Foreign bidder.

3. INCOME TAX

a. Foreign supervisors/suppliers/contractors

Prices of site work, contracts and other services of foreign supplier/contractor shall be gross of income tax i.e., inclusive of Indian income tax at the applicable prevailing rate as per Indian Income Tax Act and Rules there under.

Owner shall deduct withholding tax at source (TDS) as applicable while making payments against each invoice. Certificate for TDS shall be provided to the supplier/contractor.

In case foreign bidder quotes Prices of site work, contracts and other services "net of Income Tax" i.e., exclusive of Indian income tax, Owner shall deduct and deposit TDS as applicable after grossing up the sums due while making payments against each invoice at the applicable prevailing rate as per Indian Income Tax Act and Rules thereunder.

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Foreign bidder shall furnish the information required in line with the prevalent provisions of Income tax act read with rules thereunder including but not limited to Tax residency certificate, Form 10F, No permanent establishment declaration, No business connection certificate, PAN in India if available.

Failing to provide above documents/information, tax will be withheld at rates applicable as per the provisions of Income Tax Act, 1961 read with rules thereunder and the benefit of reduced rates will not be given.

If the non-resident is unable to obtain & submit Tax Residency Certificate to the Owner within a reasonable time, the bidder should furnish Form 10F along with an undertaking to the effect that the bidder is a tax resident of (the specified country) and that they shall obtain and provide the tax residency certificate (TRC) to the Owner before 30 days of submission of first Invoice by them or within 3 months from the date of entering into contract whichever is earlier.

In case of contracts with term exceeding one financial year, the relevant documents like TRC, Form 10 F, No PE / Business Connection Certificate etc. as applicable, as per Income Tax Act, 1961 must be submitted at the beginning of each financial year and the Owner will not bear additional tax liability (if any) arising from non-submission of documents.

The bidder shall be liable to intimate the subsequent changes (if any) to the information submitted against any of the above particulars, along with full details.

In addition to the above particulars, the bidder should also provide any other information as may be required at a later stage for determining the taxability of the amount to be remitted to the non-residents.

In case, any additional tax liability arises on the Owner due to any action of bidder like delay in submission / non-submission of information / documents required as above or change in residential status post submission of documents or change in any document (like TRC, Form 10F etc.) after its submission shall be recovered from the supplier/contractor.

b. Indian resident supervisors/ suppliers/contractors

Prices for supply and services of Indian suppliers/ contractors shall be inclusive of income tax.

Tax shall be deducted at source (TDS) by Owner on all sums due to supplier/contractor in accordance with the provisions of Indian Income Tax act read with rules thereunder as in force at the relevant point of time.

Owner shall issue a Tax Deduction Certificate to the supplier/contractor evidencing the tax deducted or withheld and deposited by Owner on payments made to the supplier/contractor to enable the supplier/contractor to claim the credit of Tax deducted by Owner.

c. <u>INCOME TAX (General Points)</u>:-

i. The supplier/contractor shall also be responsible for ensuring compliance with all applicable provisions of the Direct Tax Laws of India including, but not limited to, the filing of relevant Tax Returns and shall promptly provide all information required by the Owner for discharging any of its responsibilities/liabilities under such laws in relation to or arising out of the

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Contract. For the lapses/failure, if any, on the part of the supplier/contractor and consequential penal action taken by the Income Tax department, Owner shall not take any responsibility whether financial or otherwise and shall be indemnified by the supplier/contractor.

ii. The Indian Income Tax Act and Rules made thereunder contains provisions permitting deduction of tax at source (TDS) at lesser rate if the supplier/contractor is able to justify to the Income Tax Authorities such lesser rate of deduction. However, a deduction once made has to be deposited by the Owner with the Income Tax Authorities in India and will not be adjustable by the Owner. It is therefore in the interest of the supplier/contractor that prior to release of any payment due to the supplier/contractor under the Contract that the supplier/contractor obtains from the relevant Income Tax Authorities in India, a certificate specifying the rate of deduction/withholding of Income tax at source, failing which, payment to the supplier/contractor shall be made by the Owner after withholding/deduction at the rate as may be applicable to the supplier/contractor as per provisions of Income Tax Act, 1961.

iii. TDS on interest recovered on Mobilization/Other Advance will be deposited by the supplier/contractor and same would be reimbursed by the Owner against submission of Form-16A (TDS certificate).

C. INVOICING METHODOLOGY W.R.T. TAXATION

Ffollowing invoicing methodology shall be followed :

1. In case of domestic / foreign PO's (Other than 2 below) , Invoice/E-Invoice shall be raised by the supplier/contractor in the name of Owner and consignee shall be Owner.
2. In case of package MR's (where title transfer or take over is envisaged to take place at site after completion of site work) and tenders, supplier/contractor shall bring material at project site in their own name and they themselves shall be consignee. As per provisions of contract between Owner and supplier/contractor, Invoice/E-Invoice shall be raised by supplier/contractor to Owner after charging GST.

D. APPLICABILITY OF TAX CREDIT

MR/tender pertaining to PMC-1 scope: 100% GST input credit is available to owner, except for Sec 17(5) disallowances.
MR/tender pertaining to EPCM-1 scope: 100% GST input credit is available to owner, except for Sec 17(5) disallowances.
MR/tender pertaining to EPCM-2 scope: GST input credit is to be considered as NIL

E. EVALUATION METHODOLOGY W.R.T. TAXES

Following shall be loaded for evaluation:

1. Applicable Custom Duty, Social Welfare Surcharge etc (Non-MOOWR cases)/Present value (*Note-5) of deferred import duties (MOOWR cases), (excluding IGST & GST Compensation Cess (if applicable) on imported material which shall be dealt as per bid evaluation methodology given in E2 below) shall be loaded for price bid evaluation in respect of supplies for which bill of entry has to be filed by Owner/in the name of Owner (MOOWR cases).
2. a) GST including GST Compensation Cess (if applicable) on which input credit is not available to Owner [Excluding (b) below]
   b) Present Value of GST deferred under MOOWR scheme
3. Applicable Income tax, in case foreign bidder quotes prices net of taxes.

F. TAXATION TERMS FOR INDIAN SOURCED SUPPLIES (Applicable in case of foreign supplier)

Shall be the same as applicable for Indian bidders.

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G. TAX IMPLICATION WHERE FABRICATION YARD IS OUTSIDE THE FACTORY PREMISES, WHEREVER APPLICABLE

In case of package MRs and tenders, since contractors/suppliers shall bring material at project site in their own name and raise invoice to Owner (as per payment milestone achieved) after charging GST, location of fabrication yard whether inside or outside factory premises will not attract any additional liability.

H. TAX IMPLICATION WHERE OWNER WILL ISSUE FREE ISSUE MATERIAL (FIM) TO CONTRACTORS/SUPPLIERS

Where Owner issues FIM's to suppliers/contractors, material will be released against delivery challan and such FIM shall be received back in factory premises as per provision of GST.

I. STATUTORY VARIATION (IN CASE OF MRS & TENDERS)

No variation on account of taxes and duties, statutory or otherwise, shall be payable to Supplier/Contractor except for the following:

1. GST: If after the due date of submission of last price bid and up to the contractual delivery/completion period (*Note 4), any increase/decrease occurs in the applicable rate of GST, the variation in such GST shall be to Owner's account and shall be adjusted (increase / decrease) to / from the Supplier's/Contractor's invoices based on the documentary evidence.

   Any increase in GST after the contractual delivery/completion period (*Note 4) shall be to Supplier's/Contractor's account. However, any decrease in the rate of GST shall be passed on to Owner.

   For calculating Statutory Variations ceiling amount as declared by the Bidder in price schedule shall only be considered.

2. Basic Custom Duty (BCD) & Social Welfare Surcharge (SWS): If after the due date of submission of last price bid and up to the 2/3rd of contractual delivery/completion period (*Note 4), any increase/decrease occurs in the applicable rate of BCD & SWS on materials imported, the variation in such BCD & SWS shall be to Owner's account and shall be adjusted (increase/decrease) to/from the Supplier's/Contractor's invoices based on the documentary evidence.

   Any increase in rate of BCD & SWS on materials imported after the 2/3rd of the contractual delivery/completion period (*Note 4) shall be to Supplier's/Contractor's account. However, any decrease in the rate of BCS & SWS on materials imported shall be passed on to Owner.

   For calculating Statutory Variations in BCD/SWS, ceiling amount of CIF Value and rate of custom duty as declared by the Bidder in relevant price schedule shall only be considered.

Note: Indian supplier/contractor to consider input tax credit of IGST and GST Compensation Cess if any (in case of import of raw Materials / components) in their quoted prices. Hence, Statutory variations on same in case of imported materials from outside India in Supplier's/Contractor's name (i.e., for Indian Bidders) shall be to Supplier/Contractor account.

3. Any new output taxes, duties, cess, levies notified or imposed after the due date of submission of last price bid but upto the contractual date of delivery/completion (*Note 4) shall be to Owner's account. These shall be reimbursed against documentary evidence. However, in case of delay attributable to supplier/contractor, any new output taxes, duties, cess, levies notified or imposed after Time for Completion, defined as above, shall be to supplier's/Contractor's account.

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J. TAX INDEMNITY

Any omission/ errors of interpretation of applicability of taxes, duties, cesses and levies, whatsoever named, howsoever named, as are payable to any government, local or statutory authority in India or in any country other than India by the supplier/contractor shall be to supplier's/contractor's account.

If any fine/penalty/any other levy is required to be met by the Owner arising out of any non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be recovered from any amount payable to the supplier/contractor under this contract or under any other contract of the Owner.

If any tax is paid / required to be paid by supplier/contractor in pursuance of any demand of any law enforcement agency/Tax Authority on account of non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be to supplier's/contractor's account only.

GENERAL:

1. *Note-1: Mode of Transport i.e. Sea / Air or otherwise and Price Basis i.e. FOB/CFR/CIF or otherwise shall be as indicated elsewhere in bidding document as per applicable guidelines/instructions.
2. *Note-2: Applicable INCOTERM shall be as indicated elsewhere in bidding document.
3. *Note-3:Deleted
4. *Note-4:Contractual delivery/completion period shall include extended contractual delivery/completion period for the reasons attributable to Owner or due to Force Majeure condition.
5. *Note-5: To arrive at present value following shall be considered:
   i. Interest rate for discounting to arrive at the present value of deferred import duties = **12 % (i)**
   ii. Project useful life = **25 years (n)**
   i.e. a factor of $1/(1+i)^n = 1/(1.12)^{25} = 5.88\%$ of deferred custom duties shall be considered to arrive at present value.

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ANNEXURE - XXV
TO
SPECIAL CONDITIONS OF CONTRACT

[TERMS & CONDITIONS FOR POST WARRANTY ANNUAL MAINTENANCE CONTRACT]

TERMS & CONDITIONS FOR POST WARRANTY ANNUAL MAINTENANCE CONTRACT

1. Please quote for the Post Warranty Annual Maintenance Contract as per scope defined in Technical Section of Bidding document for a period as defined in Technical Section of Bidding document . Please furnish the year-wise Lumpsum Price as per the Schedule of Price (SOP).

2. The AMC Charges quoted in SOP Format shall be inclusive of all the charges for Transportation, Lodging, Boarding, all insurances including third party insurance (other than insurances covered by BPCL insurance Policy), all Taxes & Duties and all other incidental charges etc. but excluding GST which shall be payable extra at actual on Submission of Invoice as per GST rules. Owner will not have any liability, whatsoever, over and above the quoted prices.

3. The payment terms for the AMC shall be on quarterly basis after completion of the each quarter against submission of Bills duly certified by the Engineer-in-charge.

4. The order for AMC will be placed before the expiry of contractual Warranty Period. The price of AMC services will remain firm & fixed for the complete execution of AMC contract. In case there is delay in start of AMC from the date of expiry of warranty period, the charges shall be paid on prorata basis for the duration curtailed from original specified AMC period.

5. Within 2 weeks of placement of Order for AMC, Seller shall submit CPBG for 5% of the Maximum annually AMC amount which shall be valid for the entire AMC period plus 2 months claim period.

6. Periodic and Preventive maintenance: Vendor shall depute their engineers to installation site as & when required for regular checkups, as part of periodic maintenance. Vendor shall also depute their service engineers periodically for preventive maintenance, major repairs /replacement and reporting. Price shall also include emergency visits as necessary.

7. Scope of AMC shall be as per Technical Section of Bidding document . The quoted lump sum rate shall include providing all manpower, machineries and materials required to carry out the work as per scope of work of AMC defined in the Technical Section of Bidding document.

	Description :	
	AMC after completion of warranty period	Quoted in SOP

Prevailing Rate of GST @ _____%

Term 'AMC' referred in this document shall mean Annual Maintenance Contract(AMC)/Post Warranty Annual Maintenance Contract(PWAMC)/Post Warranty Comprehensive Annual Maintenance Contract(PWCAMC) etc. as per scope defined in the Technical Section of the bidding document.

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ANNEXURE - XXVI
TO
SPECIAL CONDITIONS OF CONTRACT

[SPARE PARTS INTERCHANGEABILITY FORMAT (SPIR)]

OWNER

SPARE PARTS LIST AND INTERCHANGEABILITY RECORD

Rev:--- dated:----

LEGEND

Mandatory field to be fill by manufacturer/supplier/vendor/contractor

To be filled by Contractor in Consultation with PMC/Owner

To be filled by Contractor after discussion with PMC/Owner

32 PROJECT REFERENCE NUMBER :

33 SPIR SUBMITTED DATE :

34 SPIR APPROVAL DATE:

35 PLANNED COMMISSIONING DATE:

MANUFACTURER'S/SUPPLIER'S PARTS DATA

For explanation and filling of columns see explanation sheet of this form

1	EQUIPMENT TAG NO. OR SAP EQUIPMENT NO.																															
2	MANUFACTURER'S MODEL OR TYPE.																															
3	MANUFACTURER'S SERIAL NUMBER																															
4	NO OF UNITS							TOTAL NO. OF IDENTICAL PARTS INSTALLED	ITEM NUMBER	DESCRIPTION OF PARTS	MATERIAL SPECIFICATION	DRAWING NO. INCL. POS. NO	ORIGINAL ITEM MANUFACTURER	PART NUMBER		SAP CODE	UNIT OF MEASURE	UNIT PRICE CURRENCY DATE	DELIVERY TIME IN WEEKS	SHELF LIFE IN WEEKS	SPARE PARTS RECOMMENDED BY MANUFACTURER										
														ORIGINAL ITEM MANUFACTURER	EQUIPMENT MANUFACTURER							COMMISIONING & CAPITAL INSURENCE SPARES	INITIAL (2 YEARLY SPARES)	NORMAL OPERATION	CRITICAL	PLANT	S.LOC	MRP TYPE	MATERIAL TYPE	PLANT MATERIAL STATUS	Min/Max	Lead Time (WEEKS)
								8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
5	NUMBER OF PARTS PER UNIT																															
6	EQUIPMENT LOCATION																															
7																																

NOTES: 38

ABC CRITICALITY INDICATOR OF EQUIPMENT

REMINDER:

MANUFACTURERS TO ATTACH TO THIS FORM ALL DRAWINGS AND PARTS LISTS

37 MANUFACTURER/SUPPLIER's FOCAL POINT EMAIL

EQUIPMENT	
MANUFACTURER	
SUPPLIER	
PROJECT	
PLANT	
OWNER	

SPIR STATUS	36
REVISION	0
DATE	
SIGNATURE/INITIAL	
SHEET NO.	1 OF x
REQUISITION NO.	

SPARE PARTS LIST AND INTERCHANGEABILITY RECORDS

EXPLANATION AND INSTRUCTIONS FOR THE COMPLETIONS OF SPIR FORMS BY CONSULTANT(S)/MANUFACTURER(S)/SUPPLIER(S)/VENDOR(S)

The SPIR form consist of a main sheet and extension sheet formated A3 size.The completed forms shall be emailed to PMC/Owner. Hard copies in A3 format along will other supporting relevant documents shall also be submitted.The consultant/manufacturer/supplier/vendor is required to complete all the columns in consultation with Owner. All information shall be clearly stated in English language.

COLUMN NO	EXPLANATION
1	**EQUIPMENT TAG NO. OR SAP EQUIPMENT NO**. Enter the equipment tag or SAP equipment number
2	**MANUFACTURER'S MODEL or TYPE** State model, type or other positive identification reference of the equipment/instrument ordered
3	**MANUFACTURER'S SERIAL NO.** State serial number or other unique identification of the reference of the equipment/instrument ordered
4	**NO. OF UNITS** Enter the total number of identical assemblies within equipment/instrument as stated in columns 1, 2 and 3.
5	**NUMBER OF PARTS PER UNIT** For each unit or group of identical units, enter in the appropiate space the number of parts fitted in each unit of equipment/instrument
6	**EQUIPMENT LOCATION** Enter the location of the equipment/instrument where installed
7	**ABC INDICATOR OF EQUIPMENT** State the functional criticality of equipment/instrument in the plant i.e A=Extreme B=High C=Medium & D=Low
8	**TOTAL NO. OF IDENTICAL PARTS INSTALLED** Enter the total number of identical parts covered by the equipments specified. This total is equal to the quantity of column 4 multiplied by the sum of quantities of column 5 Ex: C11(C12+D12+E12+F12…….)
9	**ITEM NO.** Serial item number of spare part that is recommended
10	**DESCRIPTION OF PARTS** Enter short identifiable description of part. If an item is interchangeable between two or more units it should be listed only once.
11	**MATERIAL SPECIFICATION** Enter material specification in terms of full International Standards and accepted conventions, not manufacturer's or sub-manufacturer's reference, including material certificates if required
12	**DRAWING NO. INCLUDING POSITION NO.** For each part in column 10, enter the manufacturer's parts list and/or drawing number including the position number. Documents/drawings referred to must always be attached to the SPIR form by the consultant/manufacturer/supplier or vendor
13	**ORIGINAL ITEM MANUFACTURER** Enter the ORIGINAL ITEM MANUFACTURER NAME for the spare part mentioned in column 10 and part number details entered in column 14
14	**MANUFACTURER'S PART NUMBER** Enter the ORIGINAL ITEM MANUFACTURER unique reference number or other information which specifically identifies each part in the manufacture's organization
15	**SUPPLIER'S PART NUMBER** Enter the supplier's unique identification number (Originate Part Manufacturer) of the items from third party manufacturers ("bought- out items") such as ball bearings, oil seals, mechanicals, gaskets, instruments, electrical parts such as fuses, relays etc.
16	**MESC OR SAP NUMBER** Enter the BPCL SAP material code number
17	**UNIT OF MEASURE** Enter the basic unit of measure of the item Example: Nos.: Numbers, ST= set, BX=box (**the build-up of a set/box etc. shall be explained in column 10**) MTR= meters, etc.
18	**UNIT PRICE, CURRENCY & DATE** Enter approximate ex-works price per piece of each part in the currency & date shown at the top of the column
19	**DELIVERY TIME IN WEEKS** State delivery time of spare part to BPCL

COLUMN NO	EXPLANATION
20	**SHELF LIFE IN WEEKS** Enter length of time in weeks for which an item remains usable, fit for consumption
21	**COMMISSIONING and CAPITAL INSURANCE SPARE PARTS RECOMMENDED BY MANUFACTURER** Enter the quantity of commissioning spares required to prepare the equipment ready for start up
22	**INITIAL (2 YEARLY) NORMAL OPERATION SPARE PARTS RECOMMENDED BY MANUFACTURER** Enter the quantity of initial 2 yearly spare parts required to safeguard the operation of equipment during the runing-in and start-up periods and the first 2 year of operation
23	**SPARE PARTS FOR NORMAL OPERATIONS RECOMMENDED BY MANUFACTURER** Enter the quantity of spare parts may be required due to unforeseen failure during normal operation not covered in 2 years operation spares.
24	**CRITICAL SPARE PARTS** Enter the functional criticality of the spare part i.e V=vital E=essential & N=normal based on manufacturer's experience
25	**PLANT (UNIT NO. etc)** Warehouse spares to be stocked in - To be filled in consultation with PMC/ Owner
26	**S.LOC** Storage Location - To be filled in consultation with PMC/ Owner
27	**MRP TYPE** **Material Requirements Planning type e.g. V1, ND etc** - To be filled in consultation with PMC/ Owner
28	**MATERIAL TYPE**
29	**PLANT MATERIAL STATUS**
30	**Min/Max** Minimum & Maximum stock - To be filled in consultation with PMC/ Owner
31	**Lead Time (WEEKS)** Delivery time as per column 19
32	**PROJECT REFERENCE NUMBER** **Project reference sequence number**
33	**SPIR SUBMITTED DATE** Date of submission of SPIR to PMC
34	**SPIR APPROVAL DATE** Final approval date for action by PMC
35	**PLANNED COMMISSIONING DATE** Planned commission date to be entered by Project team
36	**STATUS OF SPIR** Enter the status & revision of SPIR list. f= final, p=preliminary. Revision to be marked as o=original and a,b, c, etc. for subsequent revision
37	**MANUFACTURER'S FOCAL POINT** Enter full details including email address and telephone no.
38	**NOTES** Additional information not covered on previous columns may be filled in here.

ANNEXURE - XXVII
TO
SPECIAL CONDITIONS OF CONTRACT

[CONDITIONS FOR ISSUE AND RECONCILIATION OF MATERIALS]

सामग्री निर्गम एवं रिकोन्सिलिएशन के लिए शर्तें

CONDITIONS FOR ISSUE AND RECONCILIATION OF MATERIALS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
2	27.03 2019	Revised & Updated	SKG	AP	AKK	RKT
1	24 01 2014	Reaffirmed & Issued as Standard	SM	DJ	RKD	SC
0	21.05 2008	Doc No 6-10-0001 Rev 0 has been revised and issued as Standard	AS	GKI	SCB	VC

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Abbreviations:

MS	:	Mild Steel
OFC	:	Optical Fibre Cable
OTDR	:	Optical Time Domain Report
FIM	:	Free Issue Material

Construction Standards Committee

Convenor: Sh. A K Kundu, ED –I/C (Construction)

Members: Sh. Amitava Pal, GGM (Construction)
Sh. Janak Kishore, CGM (Projects)
Sh. Rajeev Jain, GM (SCM)
Sh. Udayan Chakravarty, GM (Piping)
Sh. Ravindra Kumar, GM (Construction)
Sh. S K Goel, AGM (Construction)

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3.0 CEMENT 5
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7.0 CABLES 7
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1.0 CONDITIONS FOR ISSUE OF MATERIALS

Whenever any material is issued as FIM by EIL/Owner, following conditions for issue of material in addition to other conditions specified in the contract shall be applicable:

1.1 Necessary indents shall be raised by the Contractor as per procedure laid down by the Engineer-in-Charge from time to time, when the materials are required for incorporation in permanent works.

1.2 Materials shall be issued only for permanent works and not for temporary works, enabling works etc. unless specifically approved by the Engineer-in-Charge.

1.3 The Contractor shall bear all other cost including lifting, carting from issue points to work site/Contractor's store, custody and handling etc. and return of surplus/serviceable scrap materials to Owner's storage points to be designated by the Engineer-in-Charge. No separate payment for such expenditure shall be made.

1.4 No material shall be allowed to be taken outside the plant without a gate pass.

1.5 The Contractor shall be responsible for proper storage, preservation and watch & ward of the materials.

2.0 RETURN OF UNUSED MATERIAL/ SCRAP

2.1 All unused/scrap materials shall be the property of the Owner and shall be returned in good and acceptable condition category wise by the Contractor at his own cost to Owner's Store(s).

2.2 No credit shall be given to the Contractor for return of scrap. The Contractor should quote the rates accordingly. Contractor shall make his own arrangements for weighing the cut offs to be returned to Owner's stores.

2.3 In case the Contractor fails to return unused materials/ accountable scrap, then recovery for such quantity of materials, not returned by the Contractor shall be affected at following penal rates from the Contractor's bills or from any other dues of the Contractor to the Owner:

S. No.		Material	Penal Rates
1.	(a)	Penal rate for non return of accountable scrap	Issue Rate + 25% or Landed Rate + 25% (in case issue rate are not indicated in the contract)
	(b)	Penal rate for return of serviceable materials in excess of permitted % allowances	
	(c)	Penal rate for issuance of unplanned OFC jointing kits	
2.	(a)	Penal rates for non return of Unused material and or penal rate for generating scrap in excess of permitted % allowances	Twice the Issue Rates or Twice the Landed Rates (in case Issue Rates are not indicated in the Contract)
	(b)	Penal rate for using excess amount of materials like cement than permitted % allowances	

NOTE : 1) Landed Rate shall be arrived from the latest Purchase Order of respective material received at site by Owner/EIL.

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2) In case more stringent penal rates have been indicated elsewhere in the Contract (based on Project requirement), the same shall supersede the above rates.

3.0 CEMENT

In all cases where cement is FIM and supplied by EIL/owner, following methodology shall be adopted for issue & reconciliation -

3.1 Cement as received from cement Manufacturer/Stockists shall be issued to the Contractor. The theoretical weight of cement in each bag for issue purpose shall be considered as 50 Kg or 20 bags per MT. However, cement bags weighing upto 4% less shall be accepted by the Contractors and charged for as full bag.

3.2 The Contractor is required to submit the design mix for different grades of concrete, keeping in view the requirements stipulated in IS:456 and IS 10262, specifically regarding durability, slump and water cement ratio and specific gravity of materials brought to site as analyzed in the laboratories. The design shall be based upon absolute volume method and theoretical consumption of cement shall be worked out on this basis. For other than concrete items, the coefficients for consumption of cement shall be adopted as per CPWD practice.

3.3 The permissible variation between Cement actually used on the job and theoretical consumption worked out on the basis stipulated in above para 3.2 and as determined by Engineer-in-Charge shall be 3% (Three percent only).

If the actual consumption is more than 103% of the theoretical consumption, then recovery at the penal rates for the quantity of cement beyond the limit of 103% of theoretical consumption shall be affected as per clause 2.3 above.

3.4 Unused quantity of cement shall be returned by the Contractor to the Owner's stores in good condition only.

3.5 The Contractor shall maintain a good store for storing cement issued to him. The flooring of the storage house, the clearances of cement bags from the side walls/ floor & stack height etc. shall be as instructed by the Engineer-in-Charge.

3.6 The contractor shall maintain a Cement Register in prescribed format and update the entries on daily basis.

3.7 The cement store shall be offered for inspection and verification by the Engineer-in-Charge or his authorized representative at any time when the Engineer-in-Charge feels the need to do so.

3.8 Empty cement bags shall be the property of the Contractor and shall have to be disposed off by him.

4.0 REINFORCEMENT STEEL BARS / STRUCTURAL STEEL / PLATES

In all cases where Reinforcement Steel Bars/ Structural Steel/ Plates is FIM and supplied by EIL/owner, following methodology shall be adopted for issue & reconciliation -

4.1 The scrap allowance for the reinforcement bars/structural steel including steel plate issued by the Owner, shall be total 3% (2.5% accountable and 0.5% unaccountable) of the actual consumption as incorporated in the works.

4.2 All serviceable reinforcement bars/structural steel/steel plates shall be issued in available length/shapes/sizes and no claims for extra payment on account of issue of non-standard

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lengths/shapes/sizes and bending etc. shall be entertained. Reinforcement bars and structural steel shall be issued on weighment basis as per normal warehousing practice. In exceptional circumstances, the reinforcement bars/ structural steel, if issued on linear measurement, the IS coefficients for unit weight shall be considered. For the purpose of billing and accounting, only linear measurements shall be taken and weight shall be calculated as per IS coefficients in three decimals. The difference in unit weight as per IS and actual as issued, if any, shall be to Contractor's account and Contractor is deemed to have considered the same at the time of bidding.

4.3 Reinforcement bars/structural steel/steel plates shall be issued only for those items where Owner's supply has been specifically mentioned in Schedule of Rates/ Scope of Supply. The storage of these items shall be done in such a way so as to avoid rusting/ damage to any kind to the materials.

4.4 All reinforcement bars/structural steel (except M.S. Plates) in length of 2 meters and above shall be considered as serviceable materials provided the material is in good and acceptable condition. Reinforcement bars/structural steel section (except M.S. Plates) in lengths less than 2M shall be treated as scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

4.5 For the purpose of accounting of the plates, all plates measuring not less than 1 Sq.m in area and having any dimensions not less than 200mm when returned to Owner's store, shall be considered as serviceable material. All other pieces shall be treated as wastage/scrap. The Contractor shall prepare a plate cutting diagram in such a way that the minimum scrap is generated. Also the cut plates should be used at proper places to reduce the scrap.

4.6 The serviceable cut pieces as mentioned in 4.4 & 4.5 above shall be considered as unused material for reconciliation purpose.

4.7 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

5.0 PIPING MATERIALS

In all cases where Piping Materials e.g. Pipes and Pipe fittings are FIM and supplied by EIL/owner, following methodology shall be adopted for issue & reconciliation -

5.1 All serviceable pipes shall be issued in available lengths/shapes and no claims for extra payments on account of issue of non-standard length & shape shall be entertained. Pipes shall be issued on linear measurement basis. All valves, flanges, fittings etc. shall be issued on number(s) basis. Contractor shall store the materials in such a way so as to avoid mixing of different types of material and shall maintain complete identification and traceability at all times.

5.2 The scrap allowance for pipes issued by the Owner shall be 3% (2.5% accountable + 0.5% unaccountable) of the actual consumption as incorporated in the works.

5.3 All pipes in length of 2 meters and above shall be considered as serviceable material provided the material is in good and acceptable condition and has clear identification and traceability (Manufacturer's name, heat number/batch number and test certificates). Pipes in lengths less than 2M shall be treated as scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

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5.4 All unused/scrap pipes, valves, flanges, forged fittings like elbows, reducers tees shall be returned by the Contractor category wise duly cleaned, greased and spec. marked at his own cost to Owner's stores.

5.5 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

6.0 EQUIPMENTS/ INSTRUMENTS

In all cases where Equipments/ Instruments are FIM and supplied by EIL/owner, following methodology shall be adopted for issue & reconciliation -

Various equipment/materials intended for the installation shall be received by Owner in unpacked, skid mounted, crated, packed or loose condition and shall be stored in the warehouses and open yards. In general, materials shall be issued to the Contractor in 'as received' condition. It shall be the Contractor's responsibility to draw, load and transport all materials from Owner's designated places of issue to the point of installation and return all packing materials like steel frames, wooden boxes/scrap etc. to Owner's stores.

All materials supplied by the Owner shall be duly protected by the Contractor at his own cost with appropriate preservative like primer, lacquer coating, grease etc. as required.

7.0 CABLES

In all cases where Cables are FIM and supplied by EIL/owner, following methodology shall be adopted for issue & appropriation /reconciliation -

7.1 All the surplus and serviceable cables out of the cables quantity (ies) issued by the Owner to the Contractor shall be returned by the Contractor to the Owner's store in good condition and as directed by the Engineer-in-Charge.

7.2 The Contractor shall be allowed a cutting/wastage allowance (accountable scrap) of 1.5% for power cables and 3% for the control cables. This cutting/wastage allowance shall be computed on the length of cables actually laid, measured and accepted.

7.3 All cables being returned to store should carry Aluminum sheet tags indicating the size & type of cable. Cables of less than 15 meters length shall be termed as scrap. Cables of lengths 15M and above shall be termed as serviceable material & shall be returned size wise and Category wise to the Owner's store in wooden drums. Cables of serviceable length being returned to stores in drum(s) shall be accepted only after Megger value continuity test and physical measurement is carried out by the Contractor to the satisfaction of Engineer-in-Charge. Empty cable drums and major packing material (as decided by Engineer-in-charge) shall be Owner's property and shall be returned to Owner's Store/designated place without any additional cost.

The contractor shall strive to avoid generation of cut pieces of length 15m and above, as far as practicable, by effectively planning & executing the construction works.

7.4 While carrying out material appropriation with the Contractor, the above points shall be taken into account. All serviceable materials returned by the Contractor (size wise & category wise) shall be deducted from the quantity (ies) issued to the Contractor for the respective sizes. Scrap generated for power cable and control cable shall also be returned to Owner's store on

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Lot basis. Wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

8.0 LINE PIPES

In all cases where Line Pipes are FIM and supplied by EIL/owner, following methodology shall be adopted for issue & appropriation /reconciliation

8.1 All bare/ coated line pipes as per Line Pipe specifications shall be issued on linear measurement basis. The serviceable line pipes shall be issued in available lengths and shapes and no claim for extra payment on account of issue of non-standard length and shape shall be entertained. Contractor shall store and maintain the line pipes in proper manner to avoid mixing of different classes of pipes. Contractor shall maintain complete identification and traceability at all times. All cut pieces when returned to Owner's storage points after beveling, shall be considered as serviceable material provided:

a) Corrosion Protection Coating is intact.

b) Pipe pieces have pipe specifications, manufacturer's logo/name and heat number duly authenticated with hard stamp of the authorized inspector as per approved procedure.

All cut pieces of pipes measuring less than 2 M shall be treated as wastage/scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

8.2 For the purpose of accounting of bare/ coated line pipes, following allowances shall be permitted:

a)	Unaccountable wastage	
	- upto 100 Km	0.1%
	- 101 to 500 Km	0.07%
	- beyond 500 Km	0.05%
b)	Scrap (All cut pieces of pipes measuring less than 2 Meter)	0.25%
c)	Serviceable materials (All cut pieces of pipe measuring 2 Meter and above)	0.5%

The percentage allowance shall be accounted on the basis of pipe book chainage for main pipeline.

8.3 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

9.0 OPTICAL FIBRE CABLE

In all cases where OFC is FIM and supplied by EIL/owner, following methodology shall be adopted for issue & appropriation /reconciliation -

9.1 For the purpose of accounting of optical fibre cable, all cut pieces measuring in length of 40 m and above when returned to Owner's storage points shall be treated as serviceable materials. All cut pieces of cable measuring less than 40 M shall be treated as scrap.

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For the purpose of accounting of OFC (Optical Fibre Cable) following allowances shall be permitted:

a)	Unaccountable wastage	0.5%
b)	Scrap (All cut pieces of cables measuring less than 40 M)	0.25%
c)	Serviceable material (measuring 40m to 750m)	0.25%

The percentage allowance shall be accounted on the basis of pipe book chainage for main pipeline.

Cables returned in original drum (measuring 750m and above) with Optical Time Domain Report (OTDR) shall be considered as unused material.

9.2 The contractor shall strive to avoid generation of cut pieces of length 40m and above, as far as practicable, by effectively planning & executing the construction works.

9.3 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 2.3 above shall be affected from the contractor.

10.0 OFC JOINTING KITS

The Contractor shall make a schedule for use of Cable jointing kits and get the same approved from Engineer-in-charge. The quantity mentioned in this schedule shall be termed as 'planned' usage quantity which shall be issued to the Contractor. However, any jointing based on site requirements as decided by Engineer-in-charge shall be included in planned quantity.

Any unplanned jointing required to be carried out by the Contractor due to reasons not attributable to Owner/EIL shall be issued from spare quantity, if available with Owner. Such unplanned OFC Jointing Kits shall be charged from the contractor at penal rates as per clause 2.3 above.

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ANNEXURE - XXVII
TO
SPECIAL CONDITIONS OF CONTRACT

[CALIBRATION REQUIREMENTS OF MONITORING AND MEASURING DEVICES AT CONSTRUCTION SITES]

निर्माण स्थलों पर निगरानी और मापने के उपकरणों की आंशांकन आवश्यकताएँ

CALIBRATION REQUIREMENTS OF MONITORING AND MEASURING DEVICES AT CONSTRUCTION SITES

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
1	02.07.2020	Revised & Updated	DG	RK	AKK	SKS
0	28.04.2015	Doc No. 9-1940-0030 Rev 0 has been issued as Standard	DJ	SNB	MD	SC

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Abbreviations:

BIS	:	Bureau of Indian Standard
NABL	:	National Accreditation Board for Testing and Calibration Laboratories
CEIL	:	Certification Engineers International Ltd.
LRS	:	Llyod's Register Group Limited
BV	:	Bureau Veritas
ABS	:	ABS Consultancy
DNV	:	Det Norske Veritas
IRS	:	Indian Registrar for Shipping
PMI	:	Positive Material Identification

Construction Standards Committee

Convenor: Sh. A K Kundu, ED (Construction)

Members:
Sh. Janak Kishore, ED (Projects)
Sh. Biswajit Mandal, Sr. GM (SCM)
Sh. Udayan Chakravarty, Sr. GM (Piping)
Sh. Ravindra Kumar, GM (Construction)
Sh. Debasish Ghosal, GM (Construction)
Sh. Pankaj Kumar Rai, AGM (Construction)

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Requirement for control of monitoring and measuring devices.

Sl. No.	Description	Calibration requirements	Frequency	Remarks
A.	**Civil-Survey**			
A.1.	Theodolite	To check for permanent adjustments by traversing and observing the closing error. (Refer Note).	Once in a year or project duration whichever is earlier.	Record to be maintained
A.2.	Level Instruments (Auto Level / Dumply Level)	To check by backsight / foresight readings, the temporary adjustments of level. (Refer Note).	Every use.	Record to be maintained
A.3.	Steel measurement tapes	----	----	a. "Freemans" make or BIS approved make shall be used. b. Mutilated, or broken tapes shall not be used. c. Marking on the tape shall be legible
A.4.	Cross staff	---	---	Same as 3b & 3c above.
A.5.	Distomat	Actual Physical Verification at Site.	Before using first time at site.	Records to be maintained.
A.6.	Total Station	To check for permanent adjustments by traversing and observing the closing error, etc. (Refer Note).	Once in a year or project duration whichever is earlier.	Record to be maintained
B.	**Civil Laboratory**			
B.1.	All balances - Mechanical	Check for zero error	Whenever used.	---
B.2.	Weigh Batcher / Batching Plant	Calibration of scales	Once in three Months.	Records to be maintained.
B.3.	Cube testing machine	Calibration certificate from manufacturers or from calibrating laboratories / agency. (Refer Note).	As per manufacturer specification or once a year whichever is earlier	Records to be maintained.
B.4.	Moisture Meter	Calibration of scales .	6 months.	Records to be maintained.
B.5	Vicat Appratus	Calibration certificate from manufacturers or from calibrating laboratories / agency. (Refer Note).	As per manufacturer specification or once a year whichever is earlier.	Records to be maintained.

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Sl. No.	Description	Calibration requirements	Frequency	Remarks
C.	**Mechanical/ Electrical/Welding**			
C.1	Pressure gauges	Calibration certificate from calibrating laboratories / agencies or calibrate by dead weight testers with standard weights or with master Gauge. (Refer Note)	Once in 6 months	Records to be maintained.
C.2	Dial gauges	Check for Zero error.	Whenever used	---
C.3	Dead weight tester	Calibration from manufacturer or calibrating laboratories / agency. Calibration certificate shall not be older than one month from the date of mobilization. (Refer Note).	As per manufacturer's recommendation or once in a six month whichever is earlier.	Records (Calibration certificate) to be maintained.
C.4	Vernier caliper / screw gauge	Check for Zero error.	Whenever used.	---
C.5	Holiday tester	Calibration from manufacturer or calibrating laboratories / agency or calibration by zeep meter. (Refer Note).	Once in 6 months.	Records to be maintained.
C.6	Elcometer	Check with standard test films supplied by the manufactures.	Before use .	Records to be maintained.
C.7	Universal Testing machine	Calibration Certificate from various third party inspection agency. Viz. CEIL, LRS, BV, ABS, DNV or IRS etc.	As per manufacturer's recommendation or once a year whichever is earlier.	Records to be maintained.
C.8	Charpy V-notch Impact testing machine.	Calibration Certificate from various third party inspection agency. Viz. CEIL, LRS, BV, ABS, DNV or IRS etc.	As per manufacturer's recommendation or once in a year whichever is earlier.	Records to be maintained.
C.9	Hardness Testing machine.	Check with the standard test block supplied with the machine as per manufacturer's Recommendation.	Before use.	Records to be maintained.
C.10	Chemical Analysis, ex : PMI etc.	Check with the standard samples.	Before use.	Records to be maintained.
C.11	Various Digital and Analog meters.	Calibration Certificate from calibrating laboratories / agencies or the Manufacturer (Refer Note).	Once in Six Months or as per manufacturer's recommendation whichever is earlier.	Records to be maintained.

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Sl. No.	Description	Calibration requirements	Frequency	Remarks
C.12	HIPOT Kit, Multimeter / Clampmeter, Ohmicron Kit, CT Analyser, CRM Kit, BDV Kit, Tachometer etc.	Calibration Certificate from calibrating laboratories / agencies (Refer Note).	Once in Six months.	Records to be maintained.
C.13	Temperature / Pressure recorders	Calibration from manufacturer or any calibrating laboratories / agency (Refer Note).	Once in Six months.	Records to be maintained
C.14	Temperature gauges	Calibration Certificate from calibrating laboratories / agencies (Refer Note).	Once in Six months.	To be discarded in case of damage or malfunctioning.
C.15	Thermocouples	Manufacturer's Certificate or Chemical Check	---	---
C.16	Vibration probes	Calibration from calibrating laboratories / agencies (Refer Note).	Once in a year.	To be discarded in case of damage or Malfunctioning.
C.17	Decibel-Meter	Calibration from calibrating laboratories / agencies (Refer Note).	Once in a year.	To be discarded in case of damage or Malfunctioning.
C.18	Manual Torque Wrench / Electric Torque Machine	Calibration from manufacturer or any calibrating laboratories / agency (Refer Note).	As per manufacturer's recommendation or once in a year whichever is earlier.	Records to be maintained
C.19	Mother Oven	Calibration from manufacturer or any calibrating laboratories / agency (Refer Note).	As per manufacturer's recommendation or once in a year whichever is earlier.	Records to be maintained.

Note: If Error is found, it has to be sent to manufacturers or their agents (Calibrating laboratories / agency) or to any other lab / agency for recalibration / rectification and certification. The calibrating laboratory / agency shall be NABL accredited or any other lab accredited as per ISO/IEC:17025 by any of the National/International accreditation body for relevant testing.

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ANNEXURE - XXX
TO
SPECIAL CONDITIONS OF CONTRACT

[FORM OF CONTRACT]

FORM OF CONTRACT

CONTRACT NO.:

THIS CONTRACT made at Bina, Madhya Pradesh on this _____ day of _____ 20__. ("**Contract Document**")

BETWEEN

BHARAT PETROLEUM CORPORATION LIMITED (BPCL), having its Registered office at 4&6, Currimbhoy Road, Ballard Estate, Mumbai 400 001 (hereinafter referred to as the "**OWNER**" which expression shall include its successors and assigns) of the One Part;

AND

_____, a Company registered in India under the Indian Companies Act 1913/1956 having its registered office at _____ (hereinafter referred to as the "**CONTRACTOR**" of the other part:

WHEREAS the **OWNER** issued Tender No._____ for Residual Process Design, Detailed Engineering, Procurement, Supply, Transportation, Storage, Fabrication, Construction, Installation, Testing, Pre-commissioning, Commissioning, Performance, Guarantee Test Run and handing over of Unit for the _____ of **Bharat Petroleum Corporation Limited (BPCL)**, at _____ ("**Project**").

AND WHEREAS the Contract with respect to the said Tender has been awarded to the CONTRACTOR, pursuant whereto, the CONTRACTOR has to make supplies of materials and to execute works and to undertake services with the use of the said material as more specifically mentioned and described in the Contract Documents as hereinafter defined.

NOW THEREFORE, in consideration of the premises and the mutual covenants herein contained, the Parties hereby agree as follows:

ARTICLE 1: CONTRACT DOCUMENTS

1.1 The following documents shall constitute the entire agreement between the OWNER and the CONTRACTOR in relation to the Project, and each shall be read and construed as an integral part of the Contract Document shall comprise the following:

(i) Form of this Contract Document;

(ii) Special Conditions of Contract;

(iii) General Conditions of Contract;

(iv) Form of Bid, including formats attached to the Form of Bid as embodied in the CONTRACTOR's final bid;

(v) Form of Schedule of Payment as embodied in the CONTRACTOR's final bid;

(vi) Bidding Document No._____;

(vii) Addendum/Addenda to the Bid Documents;

(viii) Plans Exhibits _____ to _____;

(ix) Drawings Exhibits _____ to _____;

(x) Notification of Acceptance of Bid; and

(xi) Detailed Letter of Acceptance (including Statement of Agreed Variations and other enclosures/annexures to the Detailed Letter of Acceptance).

1.2 A copy of each of the Tender Documents is annexed hereto and the said copies have been collectively marked Annexure 'A' while a copy of the Detailed Latter of Acceptance of Tender alongwith Annexures thereto and a copy of Notification of Acceptance of Bid dated _____ are annexed hereto have been collectively marked as Annexure 'B'.

1.3 The rule of construction, if any, that a contract should be interpreted against the parties responsible for the drafting and preparation thereof , shall not apply.

1.4 *Order of Precedence*

In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article 1.2 (*Contract Documents*) above.

If multiple standards or specification apply to the obligations and/or works to be performed by the CONTRACTOR, then it shall be deemed that the highest or most stringent requirement is binding on the CONTRACTOR.

1.5 *Definitions*

Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions of Contract and/or the Special Conditions of Contract.

ARTICLE 2 : SERVICES, SUPPLIES AND WORK

2.1 This Contract Document shall come into full force and effect on _____.

2.2 The CONTRACTOR shall make the Supplies specified in the Contract Documents upon the terms and conditions and within the time specified in the Contract Documents.

2.3 The CONTRACTOR shall undertake the works and perform the services specified in the Contract Documents upon the terms and conditions and within the time specified in the Contract documents.

ARTICLE 3: PRICE AND COMPENSATION

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3.1 The terms and procedures of payment by the OWNER to the CONTRACTOR for the supply and works under the Contract Documents are set out in Clause [x] of the Special Conditions of Contract.

ARTICLE 4: GOVERNING LAW & DISPUTE RESOLUTION

4.1 The Contract shall be governed in all aspects by the law of the Republic of India, without application of the doctrine of Renvoi.

4.2 **Mediation and Arbitration:**

(i) In the event of a dispute arising out of or in connection with this Contract Document, including any question regarding its existence, validity or termination, the parties shall first seek settlement of that dispute by mediation in accordance with the Mediation Act, 2023.

(ii) If the dispute is not settled by mediation within [90] days of the appointment of the Mediator, or such further period as the parties shall mutually agree in writing, the dispute shall be referred to and finally resolved by arbitration as per India International Arbitration Centre (Conduct of Arbitration Proceedings) Regulations for the time being in force, which Regulations are deemed to be incorporated by reference into this Article.

(iii) The language to be used in the mediation and in the arbitration shall be English.

(iv) In any arbitration commenced pursuant to this clause the number of arbitrator/s shall be:

(a) 1 (One) - if the total claim including counterclaim, if any, under arbitration is INR 50 Crores (Indian Rupees Fifty Crores) or less; or

(b) 3 (Three) – if total claim including counterclaim, if any, is of more than Rs. INR 50 Crores (Indian Rupees Fifty Crores).

(v) The seat of arbitration shall be Mumbai, India.

(vi) The cost of the proceedings shall be equally borne by the parties, unless otherwise directed by the arbitrator/s.

(vii) Neither party shall be entitled to and claim for any pre-reference or pendente-lite interest, i.e. from the date of cause of action till date of Award by Arbitral Tribunal and claim for any such interest shall not be entertained by Arbitral Tribunal and be void. Further, Arbitral Tribunal shall have no power or authority to award pre-reference or pendente-lite interest in the matter.

4.3 In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/Port Trusts inter se and also between CPSEs and Government Departments/Organisations (excluding disputes relating to Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for its resolution through AMRCD as mentioned in DPE OM no. 05/0003/2019-FTS-10937 dated 14th December, 2022 and the decision of

AMRCD on the said dispute will be binding on both the parties.

(* The exclusion would also include disputes concerning GST, State level Sales Tax / VAT etc; though not mentioned explicitly).

ARTICLE 5: ENTIRE CONTRACT

The Contract Documents mentioned in Article-1 hereof embody the entire Contract between the parties hereto, and the parties declare that in entering this Contract they do not rely upon any previous representation, whether express or implied and whether written or oral, or any inducement, understanding or agreements of any kind not included within the Contract Documents and all prior negotiations, representations, contracts and/or agreements and understandings are hereby cancelled.

ARTICLE 6: NOTICES

6.1 Subject to any provisions in the Contract documents to the contrary, any notice, order or communication sought to be served by the CONTRACTOR on the OWNER with reference to the CONTRACT shall be deemed to have been sufficiently served upon the OWNER notwithstanding any enabling provisions under any law to the contrary, only if delivered in accordance with the terms and conditions of the General Conditions of Contract and Special Conditions of Contract.

6.2 Without prejudice to any other mode of service provided for in the Contract Documents or otherwise available to the OWNER, any notice, order or other communication sought to be served by the OWNER on the CONTRACTOR with reference to the CONTRACT, shall be deemed to have been sufficiently served if delivered by hand or through Courier to the principal office of the CONTRACTOR at _____ or other address for service subsequently notified by CONTRACTOR to the OWNER in this behalf in writing.

ARTICLE 7: WAIVER

No failure or delay by the OWNER in enforcing any right or remedy of the OWNER in terms of the CONTRACT or any obligation or liability of the CONTRACTOR in terms thereof, shall be deemed to be a waiver of such right, remedy, obligation or liability, as the case may be, by the OWNER and notwithstanding such failure or delay, the OWNER shall be entitled at any time to enforce such right, remedy, obligation or liability, as the case may be.

ARTICLE 8: NON-ASSIGNABILITY

The Contract and benefits and obligations thereof shall be strictly personal to the CONTRACTOR and shall not on any account be assignable or transferable by the CONTRACTOR.

ARTICLE 9: LANGUAGE OF CONTRACT AND COMMUNICATION

The language of the Contract shall be English and all communications, drawings, design, data, information, codes specifications and other document whatsoever supporting the bid or otherwise exchanged under the Contract shall be in English. In the event that any technical documentation is in any language other than English, the document should be translated and presented to the OWNER/Engineer-in-Charge in English and English document/translated document shall be regarded as the only authentic document.

ARTICLE 10: GOVERNMENT OF INDIA NOT LIABLE

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It is expressly understood and agreed by and between the CONTRACTOR and the OWNER that the OWNER is entering into this agreement solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this agreement and has no liabilities, obligations or rights thereunder. It is expressly understood and agreed that the OWNER is an independent legal entity with power and authority to enter into contracts, solely in its behalf under the applicable laws of India and general principles of Contract Law. The CONTRACTOR expressly agrees, acknowledges and understands that the OWNER is not an agent, representative or delegate of the Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Contract. Accordingly, CONTRACTOR hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Government of India arising out of this Contract and covenants not to sue the Government of India on any matter, claim, cause of action or thing whatsoever arising out of or under this Contract.

ARTICLE 11: LIABILITY AND LIMITATION OF LIABILITY

11.1 No Director, employee, consultant or agent of the OWNER or other person representing the OWNER or acting on behalf of the OWNER in or pursuant to the Contract or in the discharge of any obligation to the OWNER under the Contract or otherwise in relation to the Contract shall have any personal liability to the CONTRACTOR or any Sub-Contractor, agent, representative, director or employee of the CONTRACTOR or to any other person acting for or on behalf of the CONTRACTOR and the CONTRACTOR on its own behalf and on behalf of its Sub- Contractors, directors, employees, agents and representatives hereby waives and disclaims any and all right of action which it or they may have whether under tort or Contract or otherwise against the OWNER or any director, employee, agent, consultant or representative of the OWNER for act of omission or commission done or omitted to be done.

11.2 Where the CONTRACTOR is a Consortium of one or more entities or persons, all members of the Consortium shall be jointly and severally liable for the performance of the Contract and of all obligations of the CONTRACTOR arising under the Contract and for the discharge of all the CONTRACTOR's liabilities to the OWNER under or in respect of the Contract and any claim of the OWNER without any limitation of liability as between the OWNER and the members aforesaid, notwithstanding the existence of any agreement between the said members inter se limiting the liability of any member for or in the performance of any duties or obligations under the Contract.

11.3 The limitation of liability of the CONTRACTOR under this Contract Document is as set out under Clause [46] of the Special Conditions of Contract.

11.4 The total liability of the OWNER to the CONTRACTOR under and in accordance with the provisions of this Contract Document, shall not exceed the Lumpsum Price. For the avoidance of doubt, this Article shall not limit the liability in any case of fraud, wilful misconduct or gross negligence by the OWNER.

11.5 The OWNER shall not be liable to for any loss of profit, loss of any contract or for any indirect or consequential loss or damage which may be suffered by the CONTRACTOR in connection with this Contract Document.

ARTICLE 12: CONFIDENTIALITY

12.1 All confidential information and documents (whether financial, technical or otherwise) provided by either Party to the other shall be kept confidential and shall not, without the previous written consent of the other Party be used, copied, published, disclosed or otherwise dealt with by the receiving party. Provided that the receiving party may disclose the confidential information to Sub-contractors, agents, employees, directors, advisors or any person contractually required to or otherwise responsible for the performance of the obligations under the Contract Document ("**Permitted Disclosures**"), for the purpose of this Contract Document.

12.2 Any Permitted Disclosure of the confidential information, on a need-to-know basis, by a Party shall not be breach of its obligations herein, if:

(a) the Party is required to disclose such confidential information by Applicable Laws, government instrumentalities, any judiciary body having competent jurisdiction, reporting requirements or by any regulatory body or any applicable taxation authority, or pursuant to any request of the foregoing;

(b) the confidential information has come within the public domain, other than by a breach of these confidentiality obligations by that Party;

(c) the disclosure is made to the Party's actual or prospective financiers or its advisors who have a legitimate need to know the confidential information and are bound by a duty of confidentiality;

(d) the disclosure is made to the Party's affiliates and its and its affiliates' directors, employees, respective professional advisers or consultants, for completion of scope under this Contract Document; or

(e) such disclosure as mutually agreed between the Parties.

12.3 The Party must promptly notify the other Party of such requirement stipulated in Article 12.2 (a) to (e), so that other Party has the opportunity to contest such disclosure or seek protective order in respect thereof. Any such disclosure shall be made in the form mutually agreed between the Parties.

12.4 For the avoidance of doubt, the CONTRACTOR shall not make any public announcement or media release in respect of any confidential information, without the prior written of the OWNER unless they are in relation to the Permitted Disclosures.

IN WITNESS WHEREOF THE PARTIES hereto have executed this Contract in duplicate at the place, day and year first above written.

SIGNED & DELIVERED	SIGNED & DELIVERED
FOR & ON BEHALF OF	FOR AND ON BEHALF OF
Bharat Petroleum Corporation Limited (BPCL)	_____
	(CONTRACTOR)
BY _____	BY _____
(THIS DAY OF _____ 20__)	
IN THE PRESENCE OF:	IN THE PRESENCE OF:
1.	1.
2.	2.

ANNEXURE A

TENDER DOCUMENTS

[***To be annexed separately***]

ANNEXURE B

NOTIFICATION OF ACCEPTANCE OF BID

[***To be annexed separately***]

ANNEXURE - XXXI
TO
SPECIAL CONDITIONS OF CONTRACT

[PROCUREMENT OF TMT BARS, CEMENT AND STRUCTURAL STEEL]

Annexure-I

CONTRACT CLAUSE FOR ACCEPTANCE OF STRUCTURAL STEEL AND TMT BAR MANUFACTURERS

1. Steel manufacturers having valid BIS certificate and listed in the BIS website as on date of procurement of steel shall be allowed for supply of steel (Structural and TMT bars) and contractor shall procure from them with prior intimation to Engineer-in-charge.

2. Tests after receipt of structural steel at site :
   In addition to availability of valid BIS license and MTC, testing at site shall be conducted by the contractor as per following requirement:

   - For each category/size of structural steel procured, one sample for every 50 MT or part thereof shall be drawn and tested in approved laboratory
   - The charges for such testing shall be borne by the contractor.

3. Tests after receipt of TMT bars at site:

   In addition to availability of valid BIS license and MTC, testing at site in approved laboratory shall be conducted by the contractor as per the following requirement:

   - Under 10 mm bars, one sample (diameter wise) for each 25 MT (or part thereof) for consignment below 100 MT and one sample (diameter wise) for each 40 MT for consignment above 100 MT shall be tested
   - For 10 mm to 16 mm bars , one sample (diameter wise) for each 35 MT (or part thereof) for consignment below 100 MT and one sample (diameter wise) for each 45 MT (or part thereof) for consignment above 100 MT shall be tested.
   - Over 16 mm bars one sample (diameter wise) for each 45 MT (or part thereof) for consignment below 100 MT and one sample (diameter wise) for each 50 MT (or part thereof) for consignment above 100 MT shall be tested.
   - The charges for such testing shall be borne by the contractor



Annexure - I

CONTRACT CLAUSE FOR ACCEPTANCE OF CEMENT MANUFACTURERS.

1. Cement manufacturers having valid BIS certificate and listed in the BIS website as on date of procurement of cement shall be allowed for supply of cement and contractor shall procure cement from them with prior intimation to Engineer-in-charge.

2. **Tests after receipt of cement at site:** Each batch of cement (week wise as mentioned on cement bags) supplied by the contractor after delivery at site shall be subjected to the tests and analysis required by the relevant Indian Standard Codes. The contractor shall carry out and bear the cost of all tests and analysis to ensure quality of cement before using in actual works.

9/4/15

ANNEXURE - XXXII
TO
SPECIAL CONDITIONS OF CONTRACT

[DISCONTINUATION OF HYDRA CRANES WITHIN BINA REFINERY]

DISCONTINUATION OF HYDRA CRANES WITHIN BINA REFINERY PREMISES

The present Hydra Cranes can be substituted with suitable/equivalent hydraulically operated cranes that are equipped with rear mounted boom and out rigger supports. Some of the models having these features are mentioned below for your easy reference:

Sr. no.	Manufacturer	Models
1	Escort Construction Eqp. Ltd(ECEL)	TRX Series :K10,F15,TRX 1651,TRX 2319, MAC 1214
2	Action Construction Eqp. Ltd. (ACE)	FX 120,FX 150, 15XWE ,15 XWF, Rhino 110 FC

All the contractors are requested to take cognizance of the above, and arrange for alternate equipment, to carry out various jobs inside Bina Refinery.

Please ensure strict compliance failing which suitable action shall be taken as deemed fit.

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

SCHEDULE OF PRICES (SOP)
(Rev. 0)

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

INDEX TO SCHEDULE OF PRICES

Sr. No.	Description	Form No.
1.	PREAMBLE	
2.	LUMPSUM PRICE	SP-0
2.1	Break up of LUMPSUM PRICE of SP-0	
	A. Schedule of Price for Design and Detailed Engineering.	SP-1
	B. Schedule of Price for Supply Portion.	SP-2
	C. Schedule of Price for Construction / Installation Portion	SP-3
2.2	Further Breakup of Prices of SP-1, SP-2 and SP-3	
	A. Breakup Price for Design and Detailed Engineering	SP-4
	B. Breakup of price for Supply Portion.	SP-5
	C. Breakup of price for Construction / Installation Portion	SP-6
3.	Two Years Operation & Maintenance Spares	SP-7
4.	Details of Goods And Service Tax (GST)	SP-8A and SP-8B
5.	Details of Custom Duty & Custom related duties	SP-9
6.	Guaranteed Power Consumption for Steam Generation Plant	SP-10
7	Comprehensive/Non Comprehensive Post Warranty Annual Maintenance Contract	SP-11A and SP-11B

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

PREAMBLE TO SCHEDULE OF PRICES

1.	Bidder's quoted prices shall be strictly as per various FORMS included under Schedule of Prices. Bidder shall quote LUMPSUM PRICE for entire scope of work as per provisions of the Bidding Document in FORM SP-'0'. This LUMPSUM PRICE may also be referred to as Lumpsum Price or Contract Price. Bidder shall also quote break up of LUMPSUM PRICE separately for Design and Detailed Engineering (FORM SP-1), Supply (FORM SP-2) and Construction / Installation (FORM SP-3). Bidder shall furnish further break up of lumpsum prices as per FORM SP-4, SP-5 and SP-6.
1.1	These Breakup of Prices (i.e. FORM SP-1, SP-2, SP-3 and further break-up in FORMs SP-4, SP-5 and SP-6) are only meant for the purpose of Milestone Payment and finalization of Billing Break-up during the execution of the Contract.
2.	Bidder to note that breakup of lump sum price is for reference only and total price payable under the Contract shall be restricted to the Lump sum Price / Contract Price indicated in Schedule of Price FORM SP-0. The Price evaluation shall be based on the Lump sum Price quoted in FORM SP-0, in line with provisions of Bidding Document.
2.1	The above Lumpsum Price (FORM SP-0) shall be considering entire Contract as "Works Contract Service".
3.	The quoted price shall be deemed to be inclusive of all the taxes & duties except GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively and GST Compensation cess, if applicable). It is clarified that prices, taxes, duties including GST on any transaction between Contractor and their sub-contractor/ sub-supplier shall be included in the Lumpsum price quoted by the Contractor.
4.	The quoted price shall also include the insurance, all applicable taxes, Duties, Cesses, Royalty and Levies as per Bidding Documents.
5.	The price quoted shall be lumpsum price for the entire scope of work, whether specifically mentioned or not, to be executed on Lumpsum turnkey (LSTK) basis. Unless the basic parameter changes or additional / extra requirements (scope of work and / or supply and / or services) are made, total payments to be made to the Contractor shall be limited to lumpsum price indicated / finally accepted as per **FORM SP-0 only.**
6.	Obligation of the Contractor is not limited to the quantities that the Contractor may either indicate in the Breakup of Lumpsum Prices along with his bid or in further detailed breakup of lumpsum prices furnished after award of Work during billing breakup finalization. Contractor shall carry out entire scope of work / supplies / Services as detailed in various sections / volumes of the Bidding Document within the quoted Lumpsum Price.
6.1	Break up of LUMPSUM PRICE is required to be submitted in FORM SP -1, SP-2, SP-3, SP-4, SP-5 and SP-6 which shall be used for milestones payment purpose only. Further Break-up of these forms as required shall be submitted and got approved from Engineer-in-charge / Owner in the billing schedule after award of Contract. Billing schedule shall be allowed to revise two times only, one after achieving 50% overall Project progress and second time after achieving 90% Overall progress.
7.	Lumpsum price shall be deemed to be inclusive of the cost of any other supplies / work(s) / Services not specifically mentioned in the Bidding Document but are essentially required for the efficient, trouble free working of the complete package, irrespective of whether the above unspecified supplies / work(s) / services are specifically mentioned in the bidder's bid or not.

8.	The Bidder shall carefully examine the various clauses of Bidding document inclusive of Scope of Enquiry, General Terms and Conditions for Works Contract, Special Conditions of Contract, Tender Specifications, Technical and Commercial Amendment (if any) etc. The bidder shall include in his prices any sum he may consider necessary to cover the fulfilment of the various clauses contained therein. The items of work described and the Lumpsum Price stated in the Schedule of Price shall be inclusive of everything necessary to complete the said items of work within the contemplation of the Contract.
9.	General directions and descriptions of work and materials given in the specifications are not necessarily repeated in the Schedule of Price.
10.	Bidder to note that breakup of Lumpsum Price is for interim payment purposes only and total price payable under the Contract shall be restricted to the Lumpsum Price / Contract Price mentioned in FORM SP-0.
11.	The Price for Design and Detailed Engineering quoted in FORM SP-1 shall not exceed 5% (Five Percent) of the Lumpsum Price of FORM SP-0.
12.	The Price of Supply quoted in FORM SP-2 shall not exceed 60% (Sixty Percent) of the Lumpsum Price of FORM SP-0
13.	In case the prices are beyond the limits mentioned under Sl. Nos. 11, 12, then such additional amount shall be raised by Contractor in the final bill and shall be paid to the Contractor in the final bill / invoice only. Billing schedule shall be prepared as per above clause no.11 & 12 only.
14.	In case of any contradiction between Lumpsum Price mentioned in FORM SP-0 and subsequent Break-up of price mentioned in FORMs SP-1, SP-2, SP-3, SP-4, SP-5, SP-6, the Prices indicated in FORM SP-0 shall be final & binding and shall be considered as “Lumpsum Price” for complete Scope of Work and break-up of Prices shall be reworked to match with Price as per FORM SP-0.
15.	In case of contradiction between Break up of Prices as per FORM SP-1, SP-2 and SP-3 and further Breakup of prices as per FORM SP-4, SP-5 and SP-6, following order of precedence shall apply :
15.1	SP-1, SP-2, SP-3. SP-4, SP-5, SP-6.
16.	Following Forms of Schedule of Price are also enclosed.
i)	FORM SP-7, indicating Recommended spares for 2 years Operation and Maintenance (O&M spares). Prices as per FORM SP-7 shall be submitted within 03 Months of award of work as per provision of SCC clauses 34.8.3(b).
ii)	FORM SP-8A, indicating the details of Goods and Service Tax (GST) in respect of Lumpsum Price quoted under FORM SP-0.
iii)	FORM SP-8B, indicating the details of Goods and Service Tax (GST) in respect of PWCAMC prices quoted under FORM SP-11.
iv)	FORM SP-9A and SP-9B indicating details of Custom and Custom related duties for the Built-in import content directly imported by the Contractor in his name.
v)	FORM SP-10 indicating Guaranteed Values. Refer Loading and Penalty Criteria attached as Annexure-II to SCC of the Bidding Document .
vi)	FORM SP-11A indicating price breakup of 5 (Five) years Post Warranty Comprehensive Annual Maintenance Contract (PWCAMC) for Package Control System
vii)	FORM SP-11B indicating price breakup of 5 (Five) years Post Warranty Comprehensive Annual Maintenance Contract (PWCAMC) for UPS, DC charger, SAS, VFDs/Soft starters (except air fin coolers VFDs), Thyristor control Panel (TCP)
17.	**Currency of Bid**
17.1	Bidders are allowed to quote in currency(ies) as under:
i)	INR and/or

18.	It shall be the sole responsibility of the CONTRACTOR to duly observe and perform and fulfil all obligations of all laws, rules, regulations, orders and formalities during the entire period / currency of the Contract, applicable to Good and Service Tax (GST), Customs Duty, etc. on the import, manufacture, sale and / or supply of any material(s) / equipment to the OWNER and performance of the works contract service under the Contract. The CONTRACTOR shall keep the OWNER and its Project Management Consultant (PMC) indemnified from and against any and all claims, demands, prosecutions, actions, proceedings, penalties, damages, demurrages and / or other levies whatsoever made or levied by any Court, Tribunal or the Customs or other Authorities with respect to any alleged breach, evasion or infraction of such duties, taxes, charges or levies or any breach or infraction of any applicable laws, rules, regulations, orders or formalities concerning the same and from the consequence thereof.
19.	The Lumpsum Price of Works Contract Service shall be deemed to cover various factors including but not limited to cost of materials /equipment / Services, overheads, bidding cost, financing costs, profits, mobilization & demobilization cost, etc., as applicable. Unless the scope expressly excludes certain provisions from the CONTRACTOR's scope in the Bidding document / Contract, no additional payment on any such head expressly not mentioned herein in the Bidding Document / Contract shall be entertained on a later date.
20.	Bidder shall submit their Priced Bid duly filled in with prices, stamped & signed by Bidder on each page and scanned & uploaded in the respective "PRICE BID" folder only on the e-Procurement Portal as mentioned in the ITB / IFB in the following manner:
i)	Lumpsum Price as per FORM SP-0.
ii)	Breakup of Prices as per FORM SP-1,SP-2 &SP-3 and further Break-Up of Prices as per FORM SP-4, SP-5 & SP-6.
iii)	Break-up of Goods and Service Tax (GST) in FORM SP-8A& SP-8B and Details of Custom Duty as per FORM SP-9.
iv)	Duly filled in Prices for Guaranteed Values in SP-10. Refer Loading and Penalty Criteria attached as Annexure-II to SCC of the Bidding Document.
v)	Bidder's quoted prices shall be strictly as per various FORMS included under Schedule of Prices and other provisions of bidding document. a) Bidder shall quote LUMPSUM PRICE for entire scope of work as per provisions of the Bidding Document in 'FORM SP-0' in excel sheet titled 'BoQ1' . This LUMPSUM PRICE may also be referred to as Lumpsum Price or Contract Price. The above Lumpsum Price (FORM SP-0) shall be considering entire Contract as "Works Contract Service". The Lumpsum Contract Prices shall be considered for evaluation. Bidder shall quote the Lumspum Contract price in INR as per provisions of ITB. b) Bidder to quote PWAMC charges in 'FORM SP-11A & 11B'. The prices for PWAMC shall not be included in Lumpsum price in SP-0, but same shall be considered for evaluation. c) Bidder shall also quote break up (in lumpsum) of LUMPSUM PRICE (i.e. FORM-SP-0) separately for Design and Detailed Engineering (in FORM SP-1), Supply Portion (in FORM SP-2) and Construction/Installation etc. (in FORM SP-3) and their further break-up in percentage as per FORM-SP-4, FORM-SP-5, FORM-SP-6. d) Bidder to quote Details of Goods and Service Tax (GST) & GST Compensation Cess ,as applicable on SP-0 prices along-with details of Service Accounting Code(SAC) in FORM SP-8A . Bidder to quote details of Details of Goods and Service Tax (GST) & GST Compensation Cess , applicable of PWAMC Charges on SP-11A & SP-11B prices along-with details of Service Accounting Code(SAC) in FORM SP-8B. GST & GST cess shall be considered for evaluation as per provisions of bidding document.

vi)	e) Bidder to indicate details of CFR value , Customs and Customs related duties for goods imported under MOOWR scheme, where BPCL shall become consignee of goods by filling Bill of Entry in BPCL name, in FORM SP-9A. The Custom Duties & related levies for goods imported under MOOWR scheme indicated in FORM-SP-9A should not be included in the Lumpsum Contract Price. The Custom Duties & related levies indicated herein shall be considered for evaluation & capping purpose as per provisions of bidding document. f) Bidder to indicate details of CIF value , Customs and Customs related duties included in Lumpsum Contract Price for goods imported for Home Consumption by Contractor , where Contractor will become consignee of goods by filling Bill of Entry in Contractor's name, and/or any built-in import content in Indigenously sourced goods in FORM SP-9B. g) Bidder to quote prices for Operation and Maintenance spares for Two (02) years in FORM-SP7. The prices for Operation and Maintenance spares shall not be included in the Lumpsum Contract Price. Same shall not be considered for evaluation. h) Bidder shall quote "Guaranteed Utility Consumption" figures in FORM-SP-10. Same shall be considered for evaluation and award as per provisions of " Loading & Guarantee Criteria" covered in Annexure-II to SCC.
vii)	a) Bidder to quote Total Lumpsum charges for PWAMC for specified item(s) and for specified period in FORM SP-11A & SP-11B. b) The charges for PWAMC quoted in FORM SP-11A & SP-11B shall not be included in the total Lump sum Price. c) The quotation by the bidder for PWAMC charges for the period as mention in FORM SP-11A & SP-11B is mandatory and shall be considered in the evaluation of the bid. d) PWAMC charges shall be quoted in INR only and shall be inclusive of all taxes & duties except GST.
viii)	a) The quoted Lumpsum Prices shall be deemed to be inclusive of all the taxes & duties except GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively and GST Compensation cess, if applicable) as per provisions of bidding document. b) For Imported Goods where goods are cleared by filing into Bill of Entry in the name of Owner (for imports under MOOWR scheme), bidder should not include Customs Duty and other Customs related duties in their quoted prices as per provisions of the Bidding Document. c) For Imported Goods where Contractors will become consignee of the goods by filling Bill of Entry for Home consumption, Customs Duty and other Customs related duties shall be INCLUDED in the quoted supply price. d) It is clarified that prices, taxes, duties including GST on any transaction between Contractor and their sub-contractor/ sub-supplier shall be included in the Lumpsum price quoted by the Contractor. Contractor shall consider the impact of availability of Input Tax Credit on GST to the Contractor in their quoted price.
	Bidder to include prices for Foreign Sourced Goods in the Lumpsum Contract (SP-0) Prices and in SUPPLY PRICE (SP-2). SUPPLY PRICE (SP-2) shall include all applicable taxes & duties except GST and Custom Duties & related levies of goods imported under MOOWR scheme, which are consigned to Owner after filling Bill of Entry in Owner's name.
21.	Lump sum price shall be exclusive of Comprehensive Insurance (Marine cum transit cum storage and erection) till handing over of the package, as per provision of the Bidding Document. However, all other insurances to be taken by the Contractor, required, if any, as per provision of the Bidding Document shall be included in the quoted Lumpsum price.
22.	BREAK-UP OF DESIGN AND DETAILED ENGINEERING PRICE (SP-1) shall include Design and Detailed engineering as per requirement of Technical Part of the Bidding Document for complete work in accordance with the various provisions of the Bidding Document.
23.	BREAK-UP OF SUPPLY PRICE (SP-2) shall include Sale and Supply of all Materials (except CIVIL AND STRUCTURAL MATERIALS AND OTHER MATERIALS FOR CONSTRUCTION AS SPECIFIED IN FORM SP-3) required for incorporation in the permanent Works as determined by Bidder, within the scope of work, to be necessary to establish, commission and operate the works / proposed facilities, delivered in respect of imported materials / equipment and delivered for Indigenous materials / equipment, at the price of materials / equipment, as specified in the Schedule of Prices. SUPPLY PRICE shall include price of all Materials / equipment required for completion of the Works in all respects and also shall include all associated activities. The guidelines for covering the materials / equipment and associated activities under Supply Price is specified herein below:
a)	SUPPLY PRICE (SP-2) shall include supply and transportation up to Project Site / fabrication yard of all materials as mentioned under SP-2, and SP-5.

b)	SUPPLY PRICE(SP-2) shall include supply of any other Materials, not mentioned under SP-2 and SP-5, but required as per provisions of the Bidding or Contract Documents, and as per the guidelines mentioned under this clause 23.0
c)	SUPPLY PRICE (SP-2) shall include the price of mandatory spare parts but exclude the price of 2 years recommended spare parts.
d)	SUPPLY PRICE(SP-2) shall include the price of spare parts for pre-commissioning, commissioning and the price for such spares shall be included in the individual equipment.
e)	SUPPLY PRICE(SP-2) shall include price for special tools and tackles, if any.
f)	SUPPLY PRICE (SP-2) shall include first fill of lubricant, catalyst, chemicals etc.
g)	SUPPLY PRICE(SP-2) shall include prices for Built-In Import content billed to and shipped to in the name of Contractor.
h)	SUPPLY PRICE(SP-2) shall include the cost of all inspections including Third Party Inspection.
i)	SUPPLY PRICE(SP-2) shall also include any incidental or auxiliary supplies which are not specified in the Bidding Document specifically but which are required for completion of Works in all respects which could be reasonably implied from the contents of the Bidding Document.
j)	SUPPLY PRICE(SP-2) Price shall include all materials which are in the form of finished goods. Construction materials such as civil, structural shall not be included under SP-2 and shall be included under the Price of Construction.
24.	BREAK-UP OF CONSTRUCTION PRICE (SP-3)
a)	SP-3 Price shall include supply of all construction materials as required for completion of the Work in all respects. Construction Materials, in general, shall include cement, Iron/Steel, reinforcement bar, sand, M-sand, aggregates, stones, bricks, earth and clay, woods and boards of all kinds, sanitary pipes and fittings, sewage pipes and fittings, drainage pipes and associated fixtures and fittings, cisterns, toilets, toilet seats and other sanitary fittings of any kind whatsoever, water proofing compounds, chemicals, paints, varnishes, white-washes, distempers, plaster of paris and other finishing materials whatsoever, barricading materials of all kinds and welding and other electrodes, lead, alloys& other material, compounds and consumables whatsoever involved for and / or incorporated in the permanent Works.
b)	SP- 3 Price shall include prices of all type of construction services required for completing the Works in all respects including construction, testing, pre-commissioning, commissioning and handing over to Owner. This shall include all type of Services required for completing the works in all respects as per the scope of work specified in the Bidding Document. The major services are specified here in below, without being limited to :
i)	SP-3 Price shall include - Supply, procurement, mobilization and deployment of all Skilled/ Unskilled Manpower/ labour, construction plant/equipment/machinery necessary for lifting, loading, handling, removing, transporting, unloading or securing the materials.
ii)	SP-3 Price shall include - The cost of mobilization including but not limited to mobilization of vehicles, movements, machinery, equipment, gear, tools, tackles, Heavy lift cranes of different capacities for erection of FIMs supplied by Owner and Contractor's own scope of equipments& structural items, and other items and goods and personnel necessary for or to perform the works contemplated under the Contract.
iii)	SP-3 Price shall include - The cost of all construction plants and equipment, vehicles, movements, supply of water and power, construction of temporary roads and access, temporary works, pumps, wiring, pipes, scaffolding, piling, shuttering and other materials, supervision, labour, fuel, stores, geo technical investigation
iv)	SP-3 Price shall include - All supervision charges, establishment charges, overheads, contingencies, site organization, charges etc.
v)	SP-3 Price shall include - The cost of all indemnities under the Contract, and insurance premium for the "Insurance" not covered under Owner's Insurance policy but are required as per provisions of the Bidding Document.

vi)	SP-3 Price shall include - The cost of all rents, royalties, licenses, permits, permission and any other fee, duty, penalty, levy payable on the excavation, removal of transportation of any material or acquisition or use of any right of way or other right, licenses, permit, privilege, permission or uses required for the performance of work. This provision shall apply for the construction materials.
vii)	SP-3 Price shall include - Assembly of sub-assemblies, installation, alignment, welding, and completion up to Erection of all the disciplines – civil and structural, mechanical, pressure vessels, rotary equipment, package equipment, HMTD equipment, piping, electrical, instrumentation, insulation, fire proofing, refractory, painting, etc. as required according to the specifications and drawings.
viii)	SP-3 Price shall include – All Testing works including Hydraulic /pneumatic testing at Site.
ix)	SP-3 Price shall include - Pre-commissioning of the Complete Unit
x)	SP-3Price shall include - Commissioning of the Complete Unit
xi)	SP-3 Price shall include the cost of transportation from the factory or ware house or other places of delivery in respect of construction materials and to transport these to the Contractor's stockpiles, godowns or other places of storage approved by the Owner, and to transport the same from the said godowns or places of storage to the work site (including for SP-2 Material) for incorporation in the permanent work.
xii)	SP-3 shall also include any incidental or auxiliary works which are not specified above or in the specifications or in the Conditions of Contract or in the Bidding Document specifically but which are required for completion of Works in all respects and which could be reasonably inferred from the contents of the Contract Document.
25.	The unpriced commercial bid shall contain the unpriced copy of price bid with the word "QUOTED" mentioned in the Price Column. Also, the unpriced copy must indicate the GST percentage(%) along with correct SAC codes in FORM-SP8A and FORM-SP 8B of this Schedule of Prices (SOP). Bidder to ensure, filling correct applicable SAC codes as the quoted Price shall be FIRM and binding for the capping of payment. In case of any ambiguity indicated in SAC code, then the Owner reserves the right to evaluate the offers with applicable taxes under the relevant SAC code of particular services.
26	Spares for start-up/commissioning and mandatory spares and any other Tools and Tackles as required are in CONTRACTOR's scope and are deemed to be included in their quoted Lumpsum Price, irrespective of whether such spares/items are categorically mentioned or not in the bidder's bid. No claim on this issue shall be entertained at a later date after award of work and at any stage during the faithful execution of the contract.
27	The Prices for CPWAMC shall not be included in the Lumpsum Price quoted in FORM SP-0.
28	Prices of CPWAMC shall be inclusive of all applicable taxes and duties except GST as quoted in FORM-SP-8B, which shall be paid extra against submission of documentary evidence.
29	The prices for CPWAMC shall remain valid upto the defect liability period. In case of award, the price for CPWAMC shall remain firm till 5 years after completion.
30	**The Prices for CPWAMC shall be considered for evaluation.** OWNER shall place the order for CPWAMC before completion of work.
31	The prices for Non Comprehensive Maintenance shall remain valid upto the defect liability period. In case of award, the price for Non Comprehensive Maintenance shall remain firm till 5 years after completion.
32	**The Prices for Non Comprehensive shall be considered for evaluation.** OWNER shall place the order for CPWAMC before completion of work.

33	Following shall be considered for Evaluation of Prices i) Lumpsum Prices quoted in FORM-SP-0 ii) Total AMC / CAMC / PWCAMC Charges for all items mentioned in FORM-11A & 11B. iii) Total Amount of GST calculated based on FORM-SP-8A & FORM-SP-8B as per provision of bidding document after setting off Input Tax Credit available on GST. iv) Total Present Value of Custom Duties & Related Levies (Basic Custom Duties, Social Welfare Surcharges & GST on custom duties) for Imported supplies under MOOWR scheme indicated by bidder FORM-SP-9A. v) Loading on account of Guaranteed Utilities Consumption values quoted in Form SP-10 Note: a) The factor for arriving at Present value of deffered custom duties & related levies shall be 5.88% b) Input Tax Credit Available to Owner:100%
34	a) Bidder shall submit unpriced copy of their Schedule of Prices(SOP) indicating "QUOTED"(blanking-out prices) against prices quoted in FORM SP-0,SP-1, SP-2, SP-3, SP-11A and SP-11B of BoQ1. CFR value in FORM-SP-9A and CIF values in in FORM-SP-9B. All other break-ups, details, rates in the forms of SOP shall be disclosed in the Un-priced bid only. b)Priced Bid duly filled in with prices,percentages,rates other details and upload the same in the respective “PRICE BID” folder only on the e-Procurement Portal as mentioned in the ITB/IFB
35	a) In case of this contradiction, Prices of FORM SP-1, FORM SP-2 and FORM SP-3 shall be modified on Pro-rata based on Price quoted in Form SP-0, limited to lump sum prices quoted in Form SP-0. b) In case of any contradiction between Lump Sum Prices indicated in FORM SP-1, FORM SP-2, FORM SP-3 and their break down in FORM SP-4, FORM SP-5 and FORM SP-6 respectively; the prices in FORM SP-1, FORM SP-2, FORM SP-3 shall prevail respectively

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Item Rate BoQ

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE SP-0 [LUMPSUM PRICE]

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	TEXT #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	in INR	Total Lumpsum Price In Figures To be entered by the Bidder Rs. P	TOTAL AMOUNT In Words
1	2	4	5	12	13	55
1	**LUMPSUM TURNKEY BASIS WITH SINGLE POINT RESPONSIBILITY INCLUDING BUT NOT LIMITED TO THE FOLLOWING ACTIVITIES OF WORKS:** Residual Process Design, Detailed Design and Engineering, 3D Modeling, Hazop /Hazid, SIL , preparation and submission of engineering drawings & related documentation including Asbuilt/ Final documentation providing all services and completing the work in all respects as per provision of Bidding Document. Supply of all materials including - procurement services, shop fabrication, third party inspection, expediting, project management, planning, scheduling, monitoring, transportation, all loading and unloading; payable in the Contractor's country; insurance in Contractor's scope; all type of freights including ocean freight / air freight and inland freight, custom clearance, all type of handling including port handling, stevedoring, handling at worksite etc., supply of start-up / pre-commissioning / commissioning / mandatory spares,chemicals/consumables/ lubricants (Except Owner supplied chemicals) for first fill and 6 (six) months operation as per tech. specifications. Construction / Erection including loading/unloading of the materials at Contractor's warehouse, transportation of the materials from Contractor's workshop / Store to erection site, assembly / sub-assembly of the equipments, erection, installation, testing, Inspection, refrectory, dryout, alkali boilout, pre-commissioning, trial run, commissioning & PGTR, Training to owner personals, handing over to owner inlcluding all disciplines of work and supplly of material as per Tender requirements such as structural, civil, mechanical, piping, electrical, instrumentation, insulation, painting, supply of all accessories and materials for erection / testing; supply of all consumables, providing all construction plants, equipments, special tools and tackles; providing supervisory personnel, tradesman skilled / unskilled labour; insurance in Contractor's scope; completing all works in all respects as per provisions of Bidding Document. Completion of all works in all respects as per provisions of the Bidding Document and directions of the Engineer-in-Charge, including any other activity of work required to complete the Plant in all respects to make the Plant functional.					
1.01	**Lumpsum Price [SP-0]**	1.000	Lumpsum	**INR**		INR Zero Only

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Item Rate BoQ

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

NOTES:-

1. Break-up of Charges for all services for Design & Detailed Engineering, as per scope defined in Technical Section of Bidding Document, included in Total Contract Price (SP-0) to be indicated in this FORM SP-1.

2. Bidder to furnish further breakup of Form SP-1 prices in Form SP-4 in terms of percentage, in unpriced part of their Bid.

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE SP-1 [Schedule of Lump-sum Price for Design and Detailed Engineering]

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	TEXT #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	in INR	Total Lumpsum Price In Figures To be entered by the Bidder Rs. P	TOTAL AMOUNT In Words
1	2	4	5	12	13	55
1.01	**Lump sum Engineering price for completion of scope of work as per bidding document witch includes following but not limited to: RESIDUAL PROCESS DESIGN , DETAILED ENGINEERING preparation of Datasheets, Smart plant P&IDs, PFDs, specifications for procurement, GAD, & Layouts, 3D Model, Hazop /Hazid, SIL, engineering fabrication drawings, Procurement & Construction schemes, Control Logics, Cause & Effect diagrams, Electrical System studies, Statutory approval from various Statutory state & central Government bodies, approval of drawings &documents from OWNER/EIL, submission of Final Technical documents, AS BUILT Documents and 3D Model, Pre-commissioning, Commissioning and Operating manuals for all units including packages as per Bidding Document requirements)**	1.000	Lumpsum	**INR**		INR Zero Only

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Item Rate BoQ

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Note:
1. Break-up of Prices for Supply Portion included in Total Contract Price(SP-0) to be indicated in this FORM SP-2.
2. Bidder to furnish further breakup of Form SP-2 prices in Form SP-5.

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE SP-2 [Schedule of Lump-sum Price for Supply]

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	TEXT #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	in INR	Total Lumpsum Price In Figures To be entered by the Bidder Rs. P	TOTAL AMOUNT In Words
1	2	4	5	12	13	55
1.01	**Lumpsum price for supply portion for completion of scope of work as per bidding document wich includes following but not limited to: Procurement, supply, Third Party Inspection, Transportation,Port handling, Shop fabrication, Assembly, Testing of all items, equipment's, Components, Materials, bought out items, Procurement of raw materials and sub-ordered equipment, shop fabrication/assembly, inspection, Charges for Third party inspection agency(TPIA), testing, supply of all commissioning and mandatory spares, consumables, lubricants/ chemicals (Except Owner supplied chemicals) for first fill and 6 (six) months operation as per tech. specifications ,special tools and tackles , receipt, accounting, storing & preservation of materials as required for work as per Bidding Document per Bidding Document requirements**	1.000	Lumpsum	INR		INR Zero Only

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Item Rate BoQ

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

Contract No: JP/B957-420-PG-T-7410/1009

Note:
1. Break-up of Charges for all services for Construction/Installation activities included in Total Contract Price(SP-0) to be indicated in this FORM SP-3.
2. Bidder to furnish further breakup of Form SP-3 prices in Form SP-6.

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE SP-3 [Schedule of Lump-sum Price for Construction/Installation]

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	TEXT #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	in INR	Total Lumpsum Price In Figures To be entered by the Bidder Rs. P	TOTAL AMOUNT In Words
1	2	4	5	12	13	55
1	**Lump sum price for construction portion as per requirement detailed out in various section of bidding document witch includes following but not limited to: Construction, installation completion of work in all respects for Package including required Cranes, Scaffolding, temporary barricading, Transportation and site handling of material/equipments, supply of consumables, tools and tackles, field engineering services, Receipt, storage, conservation, preservation of FIM and contractor supplied items etc. Fabrication, construction, assembly, erection at site for all piping, civil, structural, architectural, mechanical, electrical and instrumentation works within battery limit, refractory, insulation, coating, painting, testing, etc. providing all temporary works/structures and equipment for completion, obtaining statutory approvals, pre-commissioning, commissioning, performance guarantee test runs, Training to Owner personals, completing all the work in all respects to make system smooth, operable and handing over as per Bidding Document requirements and instructions of the Engineer In Charge**	1.000	Lumpsum	**INR**		INR Zero Only

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Item Rate BoQ

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Notes:

I. Refer Loading & Guarantee Criteria attached as Annexure-II of SCC of the Bidding document and its Amendment (if any).
II. The guarantee values as above should be quoted in Priced Bid. Guaranteed values should not be quoted/ mentioned in the Un-priced Bid.
III. The guarantees as quoted by bidder in this format shall be considered for price loading purpose for evaluation and award. (Refer Loading and Guarantee Chapter of tender for details).

Name of the Bidder/ Bidding Firm / Company :			
PRICE SCHEDULE SP-10 [GUARANTEED UTILITIES FOR STEAM GENERATION PLANT] **(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)**			
NUMBER #	**TEXT #**	**TEXT #**	**NUMBER #**
Sl. No.	**Item Description**	**Units**	**Bidders Guaranteed Utilities Consumption figures In Figures To be entered by the Bidder**
1	**2**	**5**	**13**
1	**GUARANTEED UTILITIES AS PER BIDDING DOCUMENT AND SUBSEQUENT AMENDMENT, IF ANY**		
1.1	Total Guaranteed Fuel (RLNG) consumption for Normal Guarantee Operation	Kg/Hr	
1.2	Turndown of UB Required Turndown: ≤ 20% MCR on gaseous fuels delivering VHP steam at 108.7 kg/cm2(g) and 510 deg. C at package battery limit	%MCR	

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Item Rate BoQ

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE SP-11(A) [PRICES FOR POST WARRANTEE COMPREHENSIVE ANNUAL MAINTENANCE FOR PACKAGE CONTROL SYSTEM]

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	TEXT #	TEXT #	NUMBER #	TEXT #
Sl. No.	**Item Description**	**Units**	**in INR**	**Total Lumpsum Price In Figures To be entered by the Bidder Rs. P**	**TOTAL AMOUNT In Words**
1	**2**	**5**	**12**	**13**	**55**
1	**5 (Five) years Post Warranty Comprehensive Annual Maintenance Contract (PWCAMC) for Package Control System as per technical portion of bidding document & as per preamble to SOP**				
1.01	**First year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.02	**Second year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.03	**Third year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.04	**Fourth year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.05	**Fifth year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only

Validate Print Help

Item Rate BoQ

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE SP-11(B)

[PRICES FOR POST WARRANTEE COMPREHENSIVE ANNUAL MAINTENANCE FOR UPS, DC CHARGER, SAS, VFDS/SOFT STARTERS (EXCEPT AIR FIN COOLERS VFDS), THYRISTOR CONTROL PANEL (TCP)]

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	TEXT #	TEXT #	NUMBER #	TEXT #
Sl. No.	Item Description	Units	in INR	Total Lumpsum Price In Figures To be entered by the Bidder Rs. P	TOTAL AMOUNT In Words
1	2	5	12	13	55
1	**5 (Five) years Post Warranty Comprehensive Annual Maintenance Contract (PWCAMC) for UPS, DC charger, SAS, VFDs/Soft starters (except air fin coolers VFDs), Thyristor control Panel (TCP)as per technical portion of bidding document & as per preamble to SOP**				
1.01	**First year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.02	**Second year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.03	**Third year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.04	**Fourth year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only
1.05	**Fifth year after expiry of defect liability**	Lumpsum	**INR**		INR Zero Only

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder:

PRICE SCHEDULE SP-4
FURTHER BREAK-UP OF PRICE FOR DESIGN & DETAILED ENGINEERING

S. No.	DESCRIPTION	IN PERCENTAGE
1.	Design and Detailed Engineering of Steam Generation Package	
	Process Engineering, Detailed Engineering including Thermal / mechanical / Electrical / Instrumentation / Civil, Structural & Architectural / Piping design - Engineering , detailed engineering, preparation of Datasheets, P&IDs, PFDs, specifications for procurement, GAD & Layouts, Stress Analysis, Single Line Diagrams, Lighting Layouts, earthing Layouts, Fire Alarm and Public address system layout, Design Calculations, engineering & fabrication drawings / schemes, Control logics etc., review / approval of drawings & documents from OWNER/EIL, supply of documents / manuals, study of existing plant and hook up studies at all stages as per Bidding Document requirements, 3-D modeling and final documentation.	
i	Residual Engineering for Process , Hydraulic, Civil Structural & Architectural, Mechanical, Electrical, Instrumentation & Piping Engineering	
ii	Detailed Engineering	
iii	Vendors final documents for supply items duly certified by TPI	
iv	Single line Diagram and Cable Schedule	
v	3D model	
vi	Stress Analysis	
vii	HAZOP and SIL and Other Safety Study	
viii	Statutory approvals	
ix	As –Built Documentation	
	TOTAL OF FORM SP-4	0.00%

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder:

PRICE SCHEDULE SP-5
FURTHER BREAK-UP OF PRICE FOR SUPPLIES

S.No.	DESCRIPTION	IN PERCENTAGE
1	**SUPPLY OF EQUIPMENTS/MATERIALS (OTHER THAN SUPPLY OF MATERIALS FOR INSULATION, PAINTING WHICH SHALL BE INCLUDED IN SP-3/SP-6):**	
1.1	**Supply of All equipment and material as detailed below**	
	BREAK UP OF SUPPLY PRICE	
1	**MECHANICAL EQUIPMENT OTHER THAN PIPING**	
1.1	Burner, Fans/ Blower	
1.2	Dosign System	
1.3	Blow Down System	
1.4	Feed Water Control Station & heating System	
1.5	Deaerator System	
1.6	BF Water Pumping System	
1.7	PRDS System	
1.8	Steam Venting System	
1.9	DM Water Condensate System	
1.20	Firing System	
1.21	Fuel Tank	
1.22	Auxiliaries and accessories as required.	
1.23	All Packaged items	
1.24	Chain Pulley, EOT crane and handling equipment etc.	
2	**PIPING**	
2.1	A/G PIPING MATERIALS along with all valves, fittings, flanges, fasteners, etc. excluding Fire-fighting system	
2.2	UNDER GROUND PIPING along with all valves, fittings, flanges, fasteners, etc. excluding firefighting system.	
3	**ELECTRICAL**	
3.1	H V Switchboard 6.6KV INDOOR, 1250A, 40KA(1 SEC), Switchboard with Vaccum Circuit Breaker, CT, PT, Surge Arrestor, Busbar Differential Protection and Numerical Relays, IAC Rating 40 kA (1 Sec.)	
3.2	6.6KV INDOOR, 1250A, 40KA(1 SEC), Switchboard with Vaccum Circuit Breaker, CT, PT, Surge Arrestor, Busbar Differential Protection and Numerical Relays, IAC Rating 40 kA (1 Sec.)	
3.3	V/F controlled soft starter for boiler feed pump motor	
3.4	V/F controlled soft starter for FD fan motor	

Name of the Bidder:

PRICE SCHEDULE SP-5
FURTHER BREAK-UP OF PRICE FOR SUPPLIES

S.No.	DESCRIPTION	IN PERCENTAGE
3.5	BUS DUCTS	
3.6	CAPACITOR BANKS	
3.7	TRANSFORMERS	
3.8	MV Switch Boiard 415V, 2500A, 65kA (1 sec.), DO PMCC with SF Air circuit breaker panels & SF MCCB Feeder and NR with IEC 61850 protocol	
3.9	SUBSTATION AUTOMATION SYSTEM	
3.10	BATTERY, BATTERY CHARGERS and DCDB	
3.11	UNINTERRUPTED POWER SUPPLY SYSTEM	
3.12	CABLES	
3.13	CABLING SYSTEM	
3.14	LIGHTING SYSTEM (LED LIGHTING)	
3.15	EARTHING AND LIGHTNING PROTECTION SYSTEM	
4	**INSTRUMENTATION**	
4.1	Package PLC	
4.2	ANALYZERS (except density, moisture, PH/conductivity).	
4.3	All Analyser other than specified in 4.2	
4.4	Control Valves / PSVs/ Shut Down Valves	
4.5	All Field Instruments	
4.6	Cabling, Cable Ducts/Trays, Junction Boxes and others	
4.7	Any Other Instrumentation items	
5	**Mandatory Spares**	
6	**Special Tools & Tackles**	
7	**chemicals/ lubricants (Except Owner supplied) for first fill and 6 (six) months operation as per tech. specifications.**	
8	**UG/AG Fire-fighting System.**	
9	**Construction Material (steel, Cement, Rebar, aggregate, gravels, sand etc.**	
10	**Any other material / item required for completion of the package works but not specifically identified and covered above for completion of Units. (BIDDER TO SPECIFY).**	
	TOTAL OF SP-5	0.00%

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder:

PRICE SCHEDULE SP-6
FURTHER BREAK-UP OF PRICE FOR CONSTRUCTION / INSTALLATION

S. No.	DESCRIPTION	IN PERCENTAGE
	CONSTRUCTION AS DETAILED IN FORM-SP-3 (as per SOW & Other attachments of Tender):	
2.1.1	**CIVIL/STRUCTURAL WORK**	
2.1.1.1	All Civil Works as mentioned elsewhere in the Bid Document.	
2.1.1.2	All Structural Works mentioned elsewhere in the Bid Document.	
2.1.2	Civil works for Building	
2.1.3	**MECHANICAL EQUIPMENT OTHER THAN PIPING Including Free Issue materials**	
2.1.3.1	Burner, Fans/ Blower	
2.1.3.2	Dosign System	
2.1.3.3	Blow Down System	
2.1.3.4	Feed Water Control Station & heating System	
2.1.3.5	Deaerator System	
2.1.3.6	BF Water Pumping System	
2.1.3.7	PRDS System	
2.1.3.8	Steam Venting System	
2.1.3.9	DM Water Condensate System	
2.1.3.10	Firing System	
2.1.3.11	Fuel Tank	
2.1.3.12	Auxiliaries and accessories as required.	
2.1.3.13	All Packaged items	
2.1.3.14	Chain Pulley, EOT crane and handling equipment etc.	
2.1.3.15	Any Other MECHANICAL EQUIPMENT OTHER THAN PIPING	
2.1.4	**PIPING**	
2.1.4.1	Above Piping(A/G) PIPING works along with all valves, fittings, flanges, fasteners, etc. excluding fire-fighting system	
2.1.4.2	UNDER GROUND(U/G) PIPING works along with all valves, fittings, flanges, fasteners, etc. excluding fire-fighting	
2.1.5	Electrical works	
2.1.6	Instrumentation Works	
2.1.7	Chemicals, oil, lubricants filling	
2.1.8	UG/AG Fire-fighting system.	
2.1.9	Insulation including supply of materials	
2.1.10	Painting including supply of materials	
2.1.11	Fire proofing including supply of materials	
2.1.12	Refractory dry out, Alkali bailout, chemical cleaning	

Name of the Bidder:

PRICE SCHEDULE SP-6
FURTHER BREAK-UP OF PRICE FOR CONSTRUCTION / INSTALLATION

S. No.	DESCRIPTION	IN PERCENTAGE
2.1.13	Commissioning including pre-commissioning, start-up, Training, performance Guarantee runs.	
3.1	Any other activity not mentioned above but required for completion of package works (BIDDER TO SPECIFY)	
	TOTAL OF SP-6	**0.00%**

NOTES:
1. The breakup of prices given above are exclusive of supply of materials covered in SP-5 but are inclusive of materials for Civil, Structural, General Civil, Architectural, Painting, Insulation, Acid/Alkali proofing etc.
2. Total price as per FORM SP-6 shall be inclusive of Construction/Erection, testing and commissioning of the materials supplied by Owner (if any, as specified in job specification) including transportation of materials from Owner's storage point within the Refinery Complex to the Contractor's ware house/work site.

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder:

FORM-SP-7

PRICE SCHEDULE OF RECOMMENDED SPARES FOR TWO YEARS OPERATION AND MAINTENANCE

SL. NO.	DESCRIPTION OF RECOMMENDED SPARES	UNIT	QTY.	RATE			AMOUNT
				in INR	IN FIGURES	IN WORDS	
	2	3	4	5A	5B	5C	8
i)							
NOTE :							

1) Prices as per FORM SP-7 shall be submitted within 3 months of award of work as per provisions of SCC Cl. No. 34.8.3 (b).

2) These Two years Operation and Maintenance (O&M) spares shall not be considered for evaluation.

3) Prices of Two years Operation and Maintenance (O&M) spares shall be kept valid for a period of 12 Months after Contractual Commissioning. Owner reserves the right to place the Order for such O & M Spares.

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder:

FORM-SP-8A

DETAILS OF GOODS AND SERVICES TAX (GST) ON LUMPSUM PRICE QUOTED AT FORM SP-0 CONSIDERING CONTRACT AS WORKS CONTRACT SERVICE [FORM SP-8A]

SL. NO.	DESCRIPTION	Total Amount on which GST is applicable	Percentage (%) Rate of GST Applicable on (A)	SAC CODE as per GST act / Rules
		(A)	(B)	(C)
	GST on Lumpsum Price			
1.1	CGST and SGST on Lumpsum Price (INR)	As quoted in FORM-SP-0 (in BoQ1)		

NOTE :	
1)	Bidder to indicate GST Compensation cess **IF APPLICABLE** on SP-0 Price:_____% (Lumpsum Price in SP-0) . The GST Compensation cess calculated as above shall be considered for loading as per provision of bidding document.
2)	In case GST Compensation Cess is not indicated above, the same shall be read as Not Applicable.
	The GST shall be payable to the Contractor only upon submission of GST invoice in accordance with GST Act.
3)	Bidder shall submit this format alongwith his unpriced bid, indicating the rate of GST, considering works contract services. Bidder shall not indicate any prices in any Column.
4)	GST shall be reimbursed in Indian rupees only as per the provisions of GST Act/Rules.

PROJECT : BINA PETROCHEMICAL & REFINERY EXPANSION PROJECT (BPREP)
OWNER : M/s BHARAT PETROLEUM CORPORATION LIMITED
NAME OF WORK: STEAM GENERATION PACKAGE
BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Name of the Bidder:

FORM-SP-8B

DETAILS OF GOODS AND SERVICE TAX (GST) ON CPWAMC QUOTED AT SP-11

SL. NO.	DESCRIPTION	Total Amount on which GST is applicable	Percentage (%) Rate of GST Applicable on (A)	SAC CODE as per GST act / Rules
		(A)	(B)	(D)
	GST on PWAMC			
1	CGST and SGST on Post Warranty Comprehensive Annual Maintenance Contract (PWCAMC) for Package Control System for FIRST YEAR / SECOND YEAR / THIRD YEAR / FOURTH YEAR / FIFTH YEAR	**As quoted in Form SP-11A (in BoQ6)**		
2	CGST and SGST on Charges fpr Post Warranty Comprehensive Annual Maintenance Contract (PWCAMC) for UPS, DC charger, SAS, VFDs/ Soft starters (except air fin coolers VFDs), Thyristor control Panel (TCP) for FIRST YEAR / SECOND YEAR / THIRD YEAR / FOURTH YEAR / FIFTH YEAR	**As quoted in Form SP-11B (in BoQ7)**		

1)	Bidder to indicate GST Compensation cess IF APPLICABLE on SP-11 Price:_____. The GST Compensation cess calculated as above shall be considered for loading as per provision of bidding document.
	In case GST Compensation Cess is not indicated above, the same shall be read as Not Applicable.
2)	The GST shall be payable to the Contractor only upon submission of GST invoice in accordance with GST Act.
3)	Bidder shall submit this format alongwith his unpriced bid, indicating the rate of GST. Bidder shall not indicate any prices at Col. (A) above.
4)	GST shall be reimbursed in Indian rupees only as per the provisions of GST Act/Rules.

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Bidder Name:

DETAILS OF CFR VALUE, CUSTOMS DUTY AND CUSTOMS RELATED DUTIES ON IMPORTED GOODS WHERE GOODS ARE CLEARED BY FILING INTO BILL OF ENTRY IN NAME OF OWNER (FOR IMPORTS UNDER MOOWR SCHEME)
FORM-SP-9A

NOTES :

1) Bidder to indicate **CFR value** of Imported Goods where goods are cleared by filing into Bill of Entry in the name of Owner **(for availing benefits under MOOWR scheme)**. **The Currency of quote in Col.2 below shall be in INR as indicated in FORM-SP-0 .**

2) The CIF value shall be calculated in INR/ Equivalent INR considering CFR Value quoted in Col.3 plus Marine insurance charges. Marine Insurance charges shall be considered @ 1.0 % of the CFR value quoted by bidder in **Col. 3.**

3) In case , BPCL is not able to register under MOOWR scheme. Payment of Custom Duties & related levies to Custom Authorities for items imported under MOOWR scheme indicated below shall be the responsibility of Contractor. BPCL shall reimburse the same subject to capping specified in SCC/SSCC.

5) The Customs Duty and other custom related duties, IGST on imported goods as indicated above shall be extra and not to be included in the Lump-sum Prices quoted in Form-SP-0 as per the provisions of the Bidding Document.

6) Bidder to indicate rates of Basic Custom Duty (As % of CIF value) , Other Customs Related duties , if applicable (As % of CIF value) , Social Welfare Surcharge (SWS) (As % applicable on Custom Duties) , IGST Rates & GST cess (if applicable) as Percentage under Column 4,5, 6 ,7 & 8 respectively. Bidder to indicate IGST Rates as Percentage applicable on Imported Goods in line with provisions of bidding document.
Bidder shall also indicate Custom Tariff Code & Country of origin under Col. 11 & 12 respectively.

7) **Bidder to submit Un-priced Copy of "Form-SP-9A" blanking out values under Col.(3) of this form , however indicating rates/ details under 4 to 11 (i.e as percentage/tariff code etc) along-with Un-priced Offer.**

SL NO.	ITEM	ITEM DESCRIPTION	CFR VALUE OF IMPORTED GOODS INCLUDED IN LUMPSUM PRICE FOR SUPPLY AS PER FORM SP-0 (Refer Notes above)		Basic Custom Duty (BCD) applicable on Imported Goods (Extra on the Lumpsum Contract Price) (Refer Notes above)	Other Customs Related duties applicable on Imported Goods (Extra on the Lumpsum Contract Price) (Other than IGST, Social Welfare Surcharge) (Refer Notes above)	Social Welfare Surcharge (SWS) applicable on Imported Goods (Extra on the Lumpsum Contract Price) (Refer Notes above)	IGST applicable on Imported Goods (Extra on the Lumpsum Contract Price) (Refer Notes above)	GST cess, if applicable on Imported Goods (Extra on the Lumpsum Contract Price) (Refer Notes above)	Custom Tariff Considered (Bidder to indicate) (Refer Notes above)	Country of origin (Bidder to indicate) (Refer Notes above)
			Currency (INR)	Amount (In figures only)	As Percentage of CIF value (derived based on CFR value quoted in Col.3 & Note:1 & 2 above) (%)	As Percentage of CIF value (derived based on CFR value quoted in Col.3 & Note:1 & 2 above) (%)	As Percentage (Rates Applicable on Total Basis Custom Duty) (%)	As Percentage (Rates applicable on CIF value,BCD, other custom duties, SWS) (%)	As Percentage (Rates applicable on CIF value,BCD, other custom duties, SWS) (%)		
(0)	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)	(11)
1			INR								
2			INR								
3			INR								
4			INR								
5			INR								
6			INR								
7			INR								
8			INR								
9			INR								

Tender Inviting Authority: GM (SCM), EIL

Name of Work: STEAM GENERATION PACKAGE OF BINA PETCHEM AND REFINERY EXPANSION PROJECT(BPREP) OF M/S BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

BIDDING DOCUMENT NO.: JP/B957-420-PG-T-7410/1009

Bidder Name:

DETAILS OF CIF VALUE, CUSTOMS DUTY AND CUSTOMS RELATED DUTIES INCLUDED IN QUOTED SUPPLY PRICE FOR IMPORTED GOODS FOR WHICH CONTRACTOR BECOMES THE CONSIGNEE OF GOODS BY FILING BILL OF ENTRY FOR HOME CONSUMPTION (NON-MOOWR IMPORTS)
FORM-SP-9B

NOTES :

1) **Bidder to quote of CIF value of Imported Goods [in Col. (3) of this form] for supply goods,where Contractors will become consignee of the goods by filling Bill of Entry for Home consumption, included in their Lumpsum supply price in INR only.**

2) **The Insurance for imported items procured by Contractor where Contractor becomes consignee of goods for Home Consumption shall be in Contractor's Scope.**

3) **The CIF value quoted in this form shall be considered for capping purpose for variation in BCD, SWS etc as per Annexure-XXIV of SCC .**

4) Bidder to indicate rates of Basic Custom Duty (As % of CIF value) , Other Customs Related duties , if applicable (As % of CIF value) , Social Welfare Surcharge (SWS) (As % applicable on Custom Duties) , IGST Rates & GST cess (if applicable) as Percentage under Column 4,5, 6 ,7& 8 respectively. Bidder to indicate IGST Rates as Percentage applicable on Imported Goods in line with provisions of bidding document.
Bidder shall also indicate Custom Tariff Code & Country of origin under Col. 10 & 11 respectively.

5) **Bidder to submit Un-priced Copy of "Form-SP-9B" blanking out values under Col.(3) of this form , however indicating rates/ details under 4 to 11 (i.e as percentage/tariff code etc) along-with Un-priced Offer.**

SL NO.	ITEM	ITEM DESCRIPTION	CIF VALUE OF IMPORTED GOODS (NON-MOOWR) INCLUDED IN LUMPSUM PRICE (Refer Notes above)	Basic Custom Duty (BCD) on Import Goods (NON-MOOWR) (Included in the Lumpsum Contract Price) (Refer Notes above)	Other Customs Related duties on Import Goods (NON-MOOWR) (Included in the Lumpsum Contract Price) (Other than IGST, Social Welfare Surcharge) (Refer Notes above)	Social Welfare Surcharge (SWS) on Import Goods (NON-MOOWR) (Included in the Lumpsum Contract Price) (Refer Notes above)	IGST applicable on Imported Goods on Import Goods (NON-MOOWR) (Included in the Lumpsum Contract Price) (Refer Notes above)	GST cess, if applicable on Imported Goods (NON-MOOWR) (Included in the Lumpsum Contract Price) (Refer Notes above)	Custom Tariff Considered (Bidder to indicate)	Country of origin (Bidder to indicate)
			Amount (In INR only) (Refer Note 1 above)	As Percentage of CIF value (Col.3) (%)	As Percentage of CIF value (Col.3) (%)	As Percentage (Rates Applicable on Custom Duty) (%)	As Percentage (Rates applicable on CIF value,BCD, other custom duties, SWS) (%)	As Percentage (Rates applicable on CIF value,BCD, other custom duties, SWS) (%)		
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)	(11)
1										
2										
3										
4										
5										
6										
7										
8										
9										

Steam Generation package for BPREP

(Document No : B957-420-80-44-PG-T-7410)

B	**DESIGN SPECIFICATION**
B-1	**STEAM GENERATION PACKAGE**

PROJECT : MPMC AND PMC/EPCM SERVICES FOR ETHYLENE CRACKER UNIT AND UTILITIES & OFFSITES RELATED TO BINA PETCHEM & REFINERY EXPANSION PROJECT (BPREP)

UNIT : STEAM GENERATION PACKAGE

OWNER : BHARAT PETROLEUM CORPORATION LIMITED (BPCL)

PMC : ENGINEERS INDIA LTD.

JOB NO. : B957

_____ **EIL** _____ **BPCL**

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
3	13.02.2025	ISSUED FOR CLIENT APPROVAL	PK	SBC/AD	DD
2	09.01.2025	ISSUED FOR CLIENT APPROVAL	PK	SBC/AD	DD
1	20.12.2024	ISSUED FOR CLIENT APPROVAL	PK	SBC/AD	DD
0	19.12.2024	ISSUED FOR CLIENT APPROVAL	PK	SBC/AD	DD

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ABBREVIATIONS

BPCL- Bharat Petroleum Corporation Limited
BEDB-Basic engineering design basis
BFP-Boiler feed pump
BFW-Boiler feed water
BMS-Burner management system
BOP-Balance of Plant
CBD-Continuous Blowdown
CEMS-Continuous emission monitoring system
CPCB- Central pollution control board
CPP-Captive power plant
DCS-Distributed control system
DP-Differential pressure
EIL-Engineers India Ltd.
EWLI-Electronic water level indicator
ESD- Emergency Shutdown
FD-Forced draft
HP-High pressure
IBD-Intermittent blowdown
KOD-Knock out drum
LP-Low pressure
MCR-Maximum continuous rating
MP-Medium pressure
MTPD-Metric ton per day
MSSV-Main steam stop valve
OEM-Original equipment manufacturer
OSBL-Outside Battery Limit
OSHA-Occupational safety and health administration
PLC-Programmable Logic controller
PMS-Piping material specification
SPCB-State pollution control board
STG-Steam turbine generator
SWAS-Steam and water analysis system
TDH-Total dynamic head
TPH-Ton per hour
UB-Utility boiler
VHP-Very High Pressure

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1. INTRODUCTION

Bharat Petroleum Corporation Limited (BPCL) is operating a 7.5 MMTPA (on 8000 hrs per year basis) Bina Refinery (BR) at Sagar, Madhya Pradesh. The existing refinery is producing MS and HSD conforming to BS VI specifications by processing of high sulfur crudes besides other petroleum products like LPG, Naphtha, Kerosene, ATF, Petcoke and Sulphur. In order to remain competitive and improve refinery profitability further, Bina Refinery (BR) has embarked on Petrochemical Diversification Plan and as a part of further expansion of Petrochemical portfolio, it is intended to set up world scale Ethylene Cracker & Associated Units and Ethylene and Propylene based Petrochemical units for its diversification to Petrochemicals along with expansion of its refinery capacity to about 11 MMTPA. To cater the steam requirement, a new steam generating unit is planned.

This Design Basis documents contains technical information/data & basis for basic concept, basic design and engineering guidelines for Steam generation package (SGP).

EPC Package for Steam generation shall comprise of the following major systems / equipments:

a) Utility Boiler (UB)
b) Deaerator & storage system
c) BFW Pumps for UBs
d) Gas Conditioning System & KOD
e) Closed blowdown Tank (underground) with pumps
f) Electrical Substation, Rack room (SRR)
g) Other associated auxiliaries & BOP system as necessary and deifined hereunder

This document provides the basic definition of the Steam generation package including necessary guidelines and basis to enable EPC Contractor to develop the detailed design and engineering for the defined systems and units for smooth execution of the project. This document also defines the process interface required w.r. to process units and same shall be read in conjunction with Indicative plot plan (attached elsewhere in the tender). In case of any contradiction between this document and its attachment, generally the requirements stated in this document shall prevail.

Guarantee requirements of various parameters are defined in the Performance Guarantee and Loading & Penalty criteria document (No. B957-420-80-44-LPC-3201) attached elsewhere in the tender. All design considerations & technical requirements specified in this design basis are applicable for Performance Guarantee and Loading & Penalty criteria document.

2. DESIGN DATA

2.1. SITE CONDITION

Altitude	Refer BEDB Part B (B857-999-79-41-ODB-1001) for site conditions
Temperature	
Relative Humidity	

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2.2. FUELS & FUEL SPECIFICATION

Utility Boiler (UB)	
Normal/ Main Fuel	i) 100% Natural Gas (NG)
Alternate Fuel	ii) 100% Fuel oil iii) 100% Refinery Fuel Gas (RFG) iv) 100% Cracker Off Gas v) 100% PFO
Start Up	High Energy Ignitors

Refer clause no.6.6.1 of BEDB Part B (B857-999-79-41-ODB-1001) for fuel specifications.

2.3. POLLUTION CONTROL

The stack pollutions level shall not exceed the following limits or the maximum limits as specified by CPCB/SPCB limits known at the time of submission of offer whichever is stringent.

MAX. LIMITS FOR UTILITY BOILER (WITH 3% O2 DRY BASIS):

PARAMETER	GASEOUS FUELS	LIQUID FUELS
Sulphur Dioxide (SO2)	50 mg/NM3	850 mg/Nm3
Oxides of Nitrogen (NOx)	250 mg/NM3	350 mg/Nm3
Particulate Matter (PM)	5 mg/NM3	50 mg/Nm3
Carbon Monoxide (CO)	100 mg/NM3	150 mg/Nm3

Emission limits as specified shall be met as guarantee for all applicable fuels with the entire range of Utility Boiler operation including minimum turndown for all applicable fuels as per tender. In case of mixed fuel (gas & liquid use), the limit shall be computed based on heat supplied by gas & liquid fuels.

2.4. NOISE LEVEL

Noise generated shall not exceed 85 dBA at 1 m distance from the source of individual equipment under normal range of operating conditions. However in the case of lifting of safety valves, during upset conditions, higher values of noise level (115 dBA) is allowed as per OSHA standard.

3. STEAM GENERATION PACKAGE DESCRIPTION

The Package shall consist of 1 No. of Utility Boiler (UB) and Balance of plant (BOP) equipment/ system as defined here under along with all necessary associated system auxiliaries & accessories.

Steam & BFW export requirements during various scenarios of process complex as per Annexure 2 attached with this document shall be met from Steam generation package.

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Steam generation from this Utility boiler shall be at single level i.e. VHP steam @ 108.7 kg/cm2 (g) (normal) & 510 deg C (normal) at steam generation package Battery Limit **(**B/L). VHP steam from utility boiler shall be used to meet export requirements of process units as per Annexure -2 and its own internal steam requirements.

It is contractor's responsibility to ensure the VHP steam design pressure and design temperature from Utility Boiler at package B/L is in line with the design pressure (118 kg/cm2(g) & design temperature (540 °C) of VHP steam OSBL header. However, any adjustment necessary in design steam parameters of boiler to match the OSBL header steam parameters, same shall be done within the boiler system. Boiler system and pipe size needs to be designed accordingly. VHP steam pressure shall match & float with OSBL header in all operating scenario.

Export requirement of steam & boiler feed water shall be met for all operating cases. DM water, Polished condesate, Natural gas, Refinery fuel gas, Fuel oil, Off gas, PFO, Instrument Air, Nitrogen, service water, plant air, cooling water, electric power shall be available at B/L of Steam generation package during normal operation.

UB shall be designed to operate during black out condition (Power failure case as defined in Case-7 of Annexure-2) for 12 hrs. To sustain boiler operation during Case -7 of Annexure 2, all LT power loads shall be hooked from existing emergency DG set of existing Utility Boiler. During black out condition, gaseous fuels (for the duration till switchover from gaseous fuels to Fuel Oil). Instrument Air & Cooling water shall be available at B/L of Steam generation package and all other utilities shall be arranged within this boiler package. Boiler shall be running continuously at minimum turn down capacity during normal operation with gaseous fuel. However, Boiler shall be ramped up from minimum turndown to 100% MCR during blackout with gaseous fuels and it should have a compulsory provision of switch-over to Fuel oil in planned way. Fuel oil pump shall keep on running continously with long re-circulation to enable firing of Fuel oil.

This Design basis is prepared considering that steam necessary for the process unit during all operating scenario of new petchem complex shall be available from the existing steam generation system of existing BPCL refinery during annual maintenance, IBR inspection & shutdown of new boiler.

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3.1 Utility Boiler

Quantity	1 Nos. (1 W + 0 S)
Type	Forced draft, Natural Circulation
Steam parameters	VHP steam
MCR Capacity	265 TPH (Minimum) @ 108.7 kg/cm2 (g) (normal) & 510 deg C (normal) at Steam generation Package B/L (Normal Operation)
Normal continuous rating (minimum)	At Turn down capacity-On continuous basis with Gaseous fuels
Minimum Turndown	≤ 20% to ≤30% of MCR (for superheat temperature and auto combustion control) with Gaseous fuels ≤ 30% of MCR (for superheat temperature and auto combustion control) with Fuel oil / PFO
Design Code	Indian Boiler Regulation (IBR) latest Edition
Performance code	PTC- 4.0 [latest revision]

Contractor shall be responsible for determining the MCR capacity of boiler considering the internal steam consumptions under his scope while meeting the export VHP steam & BFW parameter (i.e. flow, pressure and temperature) at Steam generator package B/L for all cases. However, minimum capacity of utility boiler is mentioned as above.

Contractor shall report Export VHP steam flows for all applicable cases as per Annexure 2 when boiler is required to be operating at its miniumum turndown with gaseous fuels and Export VHP steam flow is higher than required flows from steam generation package as per Annexure 2.

SGP shall be designed for 100% Fuel gas, 100% Natural gas, 100% Off gas, 100 % Fuel oil and 100%PFO, meeting Steam & BFW parameters (Flow, temperature & pressure as per table 10.1) for all operating scenerio as per Annexure-2.

In addition, combination firing of gaseous fuel (natural gas, refinery fuel gas, Off gas) and Fuel oil, PFO simultaneously shall also be considered for any operating load of boiler between ~~20%~~ minimum turndown to 100% of Boiler MCR meeting VHP steam, LP steam and VHP BFW outlet parameters. Burner system shall be suitable for combination firing of main/normal and alternate fuels and simultaneous combustion of different fuels. During combined firing case**,** on outage of any fuel , other fuel shall able to take up the full load without variation in steam load and VHP steam outlet parameters.

Note-

A) All burners (N-1) shall be designed to keep on running continously during minimum turndown with Gaseous Fuels meeting VHP steam B/L parameters, Where, N is total numbers of burner.

B) Refer Loading & Penalty criteria for boiler minimum turn down range.

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4. SPECIAL DESIGN REQUIREMENTS FOR MAJOR EQUIPMENTS

4.1 UTILITY BOILER (UB)

i. Boiler shall be of water tube, water wall membrane panel construction, natural circulation and forced draft type.

ii. At low loads, lower ambient and during startups, provision shall be considered to avoid steaming in economizer.

iii. Drum Level control shall be with 0-30% and 100% control valves operating based on UB load from drum level control signal. 1x30% and 2x100% feed water control valves shall be considered. 2 x 100% feed water control valves shall be suitable for continuous operation of Utility boiler at minimum turndown.

iv. The burner shall be low NOx type. MCR of boiler shall be achieved considering one burner under Cleaning/Maintenance.

v. Steam atomization shall be considered for liquid fuel.

vi. Scanner air fans shall be considered for cooling of scanners.

vii. Steam drum shall be designed with minimum 4 minutes of capacity of storage between normal water level and low-Low trip level. Sufficient residence time shall be considered in steam drum between Low-Low trip and drum bottom considering service & total surface area requirements so that steam generating coils never run dry even in upset scenarios like steam drum trip.

viii. Steam drum and all manifolds shall be designed for maximum internal pressure as well as full vacuum.

ix. UB shall be installed, as required, with tubular air preheater (TAPH) to maximize the efficiency. Cold end side tube module shall be made of corten steel. Steam Coiled Air Pre-Heater (SCAPH) shall be considered before Air Pre-Heater to heat the air with Steam in winters/cold weather for achieving required air temperature. Control valve in steam line shall be considered to maintain the outlet flue gas temperature and to avoid cold corrosion.

x. Economizer shall be non-steaming at all loads including minimum turndown case. BFW at inlet of economizer shall be minimum 110 deg C for Natural Gas and for Fuel gas firing at 132 deg C and fuel oil firing at 145 deg C or atleast 10 deg.C more than the acid dew point of the flue gases of respective fuels, whichever is higher.

xi. Minimum Flue gas temperature at stack inlet shall be 120 deg C for Natural gas, 142 deg. C for fuel gas firing, and 155 deg.C for fuel oil firing. However, it is to be ensured that stack inlet temperature shall be 20 deg C above acid dew point for all fuels.

xii. No heat recovery shall be permitted in stack.

xiii. The main stack for UB shall refactory lined steel stack. Top 6.0 m of the stack shall be of SS material. The height of stack shall be in compliance with statutory requirement or as per the formula given below or 100 M (min.) whichever is higher (for all applicable fuels):

H =14(Q) ^0.3

Where, H = Stack Height in Meters

Q =Total SO2 emission in Kg/Hr.

Top of stack shall be at least 5.0 m higher than highest working platform within a radius of 30 m and at least 3.0 m higher than highest working platform for 30-50 m radius.

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xiv. Continuous on-line stack monitoring system consisting of sampling probes, piping, analyzers, etc. for analysis of SOx, NOx, HC, CO & PM shall be considered on stack of UB. The stack analyzers shall be located in an analyser shelter / building with suitable redundant HVAC near the stack. Any other analyzers which are deemed necessary as per CPCB/SPCB guidelines shall also be considered.

Stack Monitoring system readings shall be made available in DCS. And further necessary provision to transmit CEMS analyzer reading directly to the MOEFCC & CPCB/SPCB server.

For NH3, Methanated Hydrocarbon, Non-methanated Hydrocarbon, Benzene and VOC manual monitoring shall be provided in stack (Hold).

xv. Continuous blow down rate shall be designed for 5% of MCR of utility boiler. However normal blowdown shall be in range of 0.5% to 1% as per OEM. UB shall be equipped with separate continuous blow down (CBD) tank and intermittent blow down tank. Flashed steam from CBD tank shall be recovered and utilized in Deaerator. Intermittent blow down shall be led to IBD tank. Intermittent blow down (designed for minimum 5% of MCR of utility boiler or as per vendor's standard whichever is higher) shall be led to IBD tank.

Blowdown from IBD tank shall be cooled in separate heat exchangers (2 x 100%) upto 50 Deg C with DM water and shall be routed to a underground blowdown pit (by gravity) and then pumped (2 x 100% common pumps) to Package B/L at 5.5 kg/cm2g (Hold) for further treatment. DM water from DM pump discharge header shall be routed through heat exchanger & hot DM water from outlet of above heat exchanger shall be sent to Deaerator.

Provision for quenching of blowdown with service water in blowdown pit/ IBD tank shall be considered and shall be started in auto in case blowdown water temperature is not below 50°C .

Additional provision shall also be considered to route blowdown through open funnels to storm water sewer from IBD tanks.

xvi. Solenoid operated valves shall be considered in CBD line from steam drum to CBD tank.

xvii. Following minimum Motor operated valves with emergency power for Boiler shall be considered:-

- Main steam valve and its bypass.
- Start-up vent valve and its isolation valve.
- Continuous blowdown valve and isolation valve.
- Emergency drain valve and its isolation valve
- 1st isolation valve of each feed control valve
- Economizer inlet valve

xviii. Following online analyzers shall be considered in SWAS system of Boiler system

- Silica, pH, sodium & Conductivity analyzers for superheated steam
- Silica, pH & Conductivity analyzers for Drum Water
- Silica, pH and Conductivity analyzers for boiler feed water

xix. Utility boiler shall also have manual sampling collection for the following:-

- Saturated steam, superheated steam, boiler feed water & drum water

xx. Minimum Control & instrumentation for boiler shall be as follows.

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- Two out of three logic shall be considered for all instruments used for tripping of the Boiler.
- For steam drum, Three (3 Nos.) “DP type level transmitter with constant head chamber assembly.” shall be considered for three element drum level control system and for annunciation.
- For steam drum, two nos. of gauge glass (Bi-color Type) shall be considered at drum floor.
- One no. of “ EWLI (Electronic water level Indicator) with conductivity probes shall be considered and provision for indication shall be considered at drum floor feed water control station and DCS operator console with 4-20 mA from EWLI.
- 2 out of 3 logic for trip for steam drum level shall be considered from additional two (2 Nos.) DP type level transmitter with constant head chamber assembly and from above EWLI.

xxi. O2 analyzer for measuring excess O2 in flue gas at economizer outlet shall be considered for automatic control of the fuel/trim.

xxii. Burner interlock shall be through dedicated plant BMS for UB. Separate PLCs shall also be considered for the interlocks of the balance areas of package which shall also be serially interfaced with DCS.

xxiii. BMS PLCs shall be serially interfaced with the DCS and with the provision of Burner operation from DCS HMI as well as manual operation from local panel, whenever required by Operators.

xxiv. Local control panel shall be considered at each burner floor along with ESD monitors, push button and indications light etc.

xxv. Burner startup shall be from the DCS without any manual intervention at field. However, provision to start-up the burner from Local Control panel shall be considered.

xxvi. Necessary provision shall be made to keep the boiler preserved for long duration. Nitrogen gas shall be used for water side preservation for long shutdown of boiler & purging of Fuel gas line. Double isolating valves, NRV with blinding provision shall be considered to avoid back flow of steam/ gas to nitrogen system during normal operation.

xxvii. For Positive isolation of boiler, double isolation valves with drain facility shall be considered for VHP steam (this includes one motor operated valve MSSV which is integral part of Boiler) and drain size shall be atleast 2” in between two valves.

xxviii. There shall be double isolation valves in each BFP discharge line. In the VHP steam, VHP BFW line drain & vent line there shall be double isolation valves.

xxix. The moisture carry over, with saturated steam from the drum shall not be higher than 0.02% during normal operation and not higher than 0.2% during upset conditions. The steam as measured at drum outlet shall have an impurity not greater than 0.02 mg/kg (ppm) silica.

xxx. Steam drum manhole size shall be minimum 24” (elliptical 510 x 610) and opening from inside.

xxxi. Skin thermocouples shall be furnished on super heater tubes, steam drum for monitoring (in the control room DCS) metal temperature.

xxxii. Steam water separators of high efficiency cyclone type backed up adequately by scrubbers or as per OEM recommendation with proven record shall be considered inside the steam drum. All internals shall be removable type with suitable metallurgy.

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xxxiii. Soot Blowing system shall be provided in super-heater, economiser and air pre-heaters area with suitable automatic sequential control, steam pressure reducing station, warm up system, piping, valves motor control centre, drives, instrumentation, insulation, etc.

For the Soot Blowers of the UB, separate PLC shall be considered and same shall be serially interfaced with DCS. Soot Blowing operation shall be started only after achieving desired temperature and required temperature logic of PLC.

4.2 Deaerator

i. One (1 x 100%) deaerator cum feed water storage shall be sized and considered to meet the maximum feed water requirement for Utility boiler operating at MCR along with maximum VHP BFW export feed water, maximum blowdown and spray water requirement of PRDS Desuperheaters. Deaerator shall be spray and tray type.

ii. Required internal steam at lower pressure shall be considered with in package and accordingly required 2X100% PRDS/PRV shall be considered. However, during normal operation required lower pressure steam for Deaerator shall be taken from exhaust of turbo drives as available & additional steam as required for Deaerator shall be taken from above mentioned PRDS/PRV. However PRDS/PRV capacity shall be designed without considering exhaust steam from turbo drives.

iii. The Deaerator shall be designed considering following:

- Storage capacity shall be suitable for 20 minutes hold-up between normal level to low level for total rated flow with maximum BFW export.
- Normal level of feed water storage shall be at 3/4th of the vessel diameter.
- De-aerator shall have vent condenser for energy economy. Internal vent condenser as required shall be supplied to limit the steam venting loss to less than 0.5%.
- The oxygen content of the deaerated water (without any chemical injection) shall be limited to 7 ppb (m) (0.005 cc/liter) under all condition of operation. The free CO2 content of the water shall be zero ppm.
- Deaerator overflow/drain shall be routed to DM water tank after stabalization.

iv. The dearator design should capable of achieving the specified O2 content in deaerated water at the condensate temperature of 95 deg. C and BFW temperature of 110 deg. C with zero DM water. Although, the Dearation & pegging steam should be sized to operate the dearator at full load when the entire dearator feed water is sourced from DM water.

v. Following online analyzers as minimum shall be considered:-

- O2 analyzer at deaerator feed storage tank outlet.
- pH & Conductivity analyzers for DM water line at B/L
- pH & Conductivity analyzers for polished condensate line at B/L

vi. Following manual sampling collection shall also be considered:-

- DM water
- Polished condensate

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4.3 Boiler Feed Water Pumps

i. Following Boiler Feed water Pumps shall be considered.

a) Boiler Feed Water Pumps (2 x 100%) for Boiler MCR with maximum Blowdown and maxium export of VHP BFW.

b) One Boiler feed water pump shall be with steam turbine driven which shall be in normal operation while stand by pump shall be motor drive. Auto Start facility shall be considered for standby Boiler Feed water Pump. Motor for standby pump shall be designed for the end of the curve operation. Minimum flow recirculation valve or auto recirculation valve shall be considered.

ii. VHP Export BFW shall be taken from the same BFP discharge as for utility boiler. Control valve with flow element shall be provided for BFW export.

iii. Boiler feed water pump suction strainer shall be considered with high DP alarm and trip.

iv. Reacceleration facility shall also be considered for all above these pumps.

v. Standby BFW pump (motor driven) shall be considered along with variable speed drive.

vi. Design pressure and design temperature of UB BFW header shall be as per VHP export BFW design pressure & design temperature.

vii. During UB shutdown, this BFW export shall be provided from existing CPP spray water header (This is OSBL side not under scope of Boiler vendor) .

4.4 Gas Conditioning System (GCS)

i) There shall be common Gas conditioning skid for Natural gas,Off gas & Refinery fuel gas.

ii) Gas conditioning skid:

a. Natural gas shall be available at battery limit though dedicated header and shall be let down via (2 x100%) control valves before KOD. 2x100% PSV shall be installed downstream of control valves.

Off gas and Refinery fuel gas (RFG) connection from process complex shall be available at battery limit of Steam generation package through common header and shall be routed common KOD.

b. Gas conditioning system shall consist of as a minimum a common KOD for all gases Gases along with necessary auxiliaries / accessories. Gases after KOD shall be further conditioned as per requirement of utility boiler/burner vendor and routed to Utility Boiler within the package. Natural gas/Fuel gas/ Off gas heating for UB shall be decided by contractor. 1X 100% gas heater (if required) shall be provided for heating gas up to required temperature by using LP steam for heating.

c. Gas line shall be steam traced from KOD outlet to individual UB burners.

d. Gas line for boiler shall have 1 Working + 1 Standby filters / strainers. Location of filter shall be before Main trip valve and before flow control valve. Mesh size of filter shall be suitable of boiler burners (as recommended by OEM) however as a minimum strainer of mesh size 200 (Tyler standard) in Monel metal shall be considered. Piping work along with valves after filter to individual burner shall be in stainless steel (SS304).

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e. PDT shall be considered across these strainers.

iii) All burners shall be provided with High Energy Ignitors which are capable to ingnite all fuels without pilot.

iv) All burners shall be designed for quick start-up from DCS during ramp-up requirement. BMS shall be designed accordingly.

v) All gaseous fuel vents except block and bleed near burner area shall be connected to Close blow down drain tank (buried horizontal) which shall also acts as Flare KOD. Gas condensate from the KOD/heater/Filter shall be routed via gravity to this drain tank/ flare KOD.

vi) Flare KOD shall be floated with the LP flare header at battery limit and drain from flare KOD shall be pumped to battery limit to light slop header via 2X100% pumps. Pumps shall have auto cut-in at high level and stopping at low level. This gas condensate tank shall be sized for storage of 24 hrs. of condensate storage (between normal level to low level) at worst operating condition and pumped in 2 hrs. The minimum capacity of this drain tank shall be 2m3. Emergency power back up shall be considered for these pumps from existing Boiler DG. A common drain line from Flare KOD drain & Liquid closed blow down tank drain shall be routed to slop header at Stean generation package B/L and shall be considered while design & configuring the system.

4.5 Liquid fuel (Fuel oil) storage & forwarding system –

i. Fuel oil and PFO shall be available at battery limit for combustion in boilers through dedicated headers.

ii. One (1) No. of insulated fuel oil storage (Atmospheric Fixed roof) tank with non-contact level instrument shall be provided for fuel oil storage capacity of the tank (i.e. pump able storage capacity between normal levels to Low Low level, minimum 85% of Tank height) shall be sufficient for one day storage of one utility boiler operating at MCR Long recirculation return line from boiler shall also be routed back to this tank.

iii. The tank shall be provided with heating arrangement (Steam coil arrangement) to maintain the flowabilty of fuel oil.

iv. Fuel oil fuel forwarding system (includes pumping units (2 Nos. of Pumps-1W+1S), heating system, necessary associated auxiliaries / facilities eg. filters etc.) shall be provided to cater to Utility Boiler requirements. 2 x 100% fuel oil strainer for each pump at suction near pump house shall be based on OEM (boiler burner/pump vendor) recommendations.

v. Fuel oil heating as required for firing in UB shall be provided. 1 x 100% steam heater shall be provided for fuel oil heating.

vi. The fuel oil lines and PFO from Battery limit to UB shall be electric traced to maintain the flowability of fuel oil.

vii. Mass flow meter at inlet & return line from utility boiler shall be considered.

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viii. Fuel oil line for boiler shall have 1 Working + 1 Stand-by filters/strainers. Location of filter shall be before Main trip valve and before flow control valve. Mesh size of filter shall be suitable for boiler burners (as recommended by OEM) however as a minimum strainer of mesh size 100 (Tyler Standard) in Monel metal shall be provided. Piping work along with valves after filter to individual burner shall be in stainless steel (SS304).Steam tracing of fuel oil line to be provided from FO pump discharge to burner.

ix. All Fuel oil drains (i.e. from skid, filters, flushing drain etc.) with double isolation valves and PSV vents shall be connected to a closed blow down drain tank. The minimum capacity of this drain tank shall be 2 M3. Drain tank's level shall be indicated in DCS. Drain from closed blow down drain tank shall be pumped (2 x100% pumps) at 5.5 kg/cm2(g) to battery limit for further routing to slop header. These pumps shall have emergency power back-up.

(a) Closed blowdown drain tank shall be provided with nitrogen purging provision with double block, blind and bleeder arrangement. Closed blowdown drain tank shall float with flare header with provision for venting to atmosphere with double valve/blind isolation assembly and flame arrestor.

(b) Closed blowdown tank shall have LP steam coil provision for heating.

(c) Closed blowdown system shall be provided with flushing oil and utility connection to flush out with steam (if required).

(d) Closed blow down tank shall be placed in RCC pit and sand packed by vibro compression with lean concrete on top – 100mm thk. Cathodic protection shall be considered. Design temperature of this tank shall be 200 °C. Tank shall have heating coil.

x. A common drain line from Flare KOD drain (section 4.4) & this closed blow down tank drain shall be routed to slop header at Steam generation package B/L and shall be considered while design & configuring the system.

xi. Hydrocarbon gas detection system shall be considered near FO tank, each filter station, closed blowdown drain tank, and applicable areas to detect the HC leakages as necessary as per the service conditions of the specific area & package. Gas (HC) detector interface shall be considered in DCS.

HC analyzer shall be provided in this suspect condensate line. Manual sampling provision of steam condensate line shall also be provided. Manual draining of condensate to Storm sewer on high alarm in HC analyzer shall be provided as an additional provision.

xii. OISD-244 shall be followed for liquid fuel storage & forwarding system.

xiii. PFO shall be provided at B/L at 18 kg/cm2(g) pressure (Hold) & 80 °C temperature (Hold) and PFO return long recirculation shall be routed back to B/L. No storage of PFO shall be considered with in steam generation package.

xiv. All drain lines of fuel oil & PFO shall have electrical tracing upto close blow down tank.

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5. OTHER DESIGN CONSIDERATIONS FOR STEAM GENERATION PACKAGE CONFIGURATION

i) DM water and polished condensate shall be available at package B/L. There shall be 2 DM water lines at package B/L, from new and existing RO-DM Plant.

ii) DM water and polished condensate available at steam generation package battery limit shall be fed to DM tank.However provision shall be provided to bypass DM water tank & send DM water and condensate directly to Deaerator. Deaerator level control shall be provided at common water line.. DM water storage tank capacity (between normal water level to low water level) shall be suitable to feed boiler at MCR & maximum export BFW for at least 12 hour, without any DM water available at B/L. Tank shall be carbon steel with epoxy coating and shall be provided with minimum three layers of Poly Propylene balls at the top to minimize ingress of air into water. This shall be provided with breather for CO2 trapping.

Control valve shall be provided in both DM water lines & condesate line to DM water tank to maintain 12 hrs stored capacity all the time for Boiler MCR & maximum BFW export + 4 hrs of DM water required for once through cooling . Condensate utilization shall be priority over DM water.

DM water transfer pumps (1W+1S) shall be installed to transfer water to Deaerator. Each pump shall be sized for boiler MCR operation and maximum BFW export.,

Deaerator overflow/drain shall be routed to DM water storage tank after stabilizing at atmospheric pressure.

Provisions for DM water connection to CW supply header (NNF) shall be provided as a contingency measure with double isolation valve. Storage capacity of DM water tank shall also include storage of 4 hrs of cooling water requirement of SGP via DM water.

iii) All steam condensates from steam traps, shall be recovered and routed condesate recovery tank. Condensate from recovery tank shall be pumped to Deaerator with 2X100% condensate transfer pump.

iv) All steam condensates from Steam heaters and heating coils, Steam tracing shall be recovered and routed to suspect condensate tank. Condensate from suspect condensate tank shall be pumped to B/L with 2X100% suspect condensate transfer pump. Destination location for routing of suspect condensate is CPU.

v) Steam safety valves exhaust shall be provided with dedicated silencer to meet noise level within OSHA'S limit. Silencer drains shall be routed to safe location.

vi) Location of MSSV(Main steam stop valve) shall be as close as possible (wrt minimum piping lengths) to SGP B/L and it shall be nearer to OSBL VHP steam header.

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vii) Vent control valve (routed to safe location) at VHP header shall be provided to vent VHP steam (Refer case-6 of Annexure-2). These control valve shall be operated based on pressure signal with additional operation of manual override from the control system for operation of this valve. Capacity of this vent control valve shall be suitable for 30% MCR steam venting. Any drains from vent control valve shall be routed to safe location.

This vent capacity may be built in Start-up vent valve (if feasible) else separate vent control valve shall be provided. In case common valve is considered, Pneumatic operation for controlling action shall be envisaged.

viii) The minimum following corrosion allowances to be adopted by package vendor:

For CS Tube	:	1.5 mm
For A.S Tube	:	1.0 mm
For Pipes	:	3.0 mm up to first isolation valve Main steam line of boiler and remaining as per PMS
All CS plate	:	3.0 mm
For Drum Internal	:	1.5 mm
For ducting and casing	:	3 mm

ix) All sampling lines and sample cooler shall be made of stainless steel material.

x) The SWAS analyzers shall be located in an analyser shelter / building with suitable redundant HVAC. This analyser shelter / building for SWAS analyzers can be common with CEMS analyser shelter / building.

xi) The skin temperature of the cladding shall not be more than 60 degC at an ambient temperature of 40 degC @ wind velocity of 1 m/s.

xii) All utility lines including Fuel Gas line (NG/RFG/Off gas), Fuel oil, DM water, cooling water, instrument air, plant air, service water, and N2 line shall have flow, temperature & pressure measuring instruments at Steam generation package B/L.

xiii) Hydrocarbon gas detection system shall be considered near KOD, each filter station, drain tank, FD fan suction of UB, each burner floor of UB and other applicable areas to detect the gas leakages as necessary as per the service conditions of the specific area & package. HC detectors shall be connected with DCS .

xiv) Chemical dosing system shall be provided as follows:-

a) DM water system & Boiler Feed Water- LP chemical for pH control (Morpholine)

- One No. of such skid shall be considered.
- This chemical dosing skid shall comprise of one common solution preparation tank with agitator, separate metering tank for each consumer, separate dosing pumps (1W+1S for each DM water system and Boiler feed water system) with necessary suction filters, valves, relief valves, connecting pipes, discharge pressure gauges/switches, fittings and flushing lines for cleaning the complete system.

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- 2 days storage shall be considered for both mixing and metering tanks. However, 12 hours hold up in metering tank shall be maintained continuously. For the same alarm shall be generated when holdup reduces to 12 hours and then to be refilled.
- Emergency DG power shall be provided to both the pumps**.**
- Morpholine dosing rate shall be approximately 2ppm (neat). Dosing rate shall be adjusted to maintain the pH of condensate to > 8.3.

b) For Utility Boiler -HP chemical Tri sodium Phosphate

- One No. of such skid shall be considered.
- This chemical dosing skid shall comprise of one solution preparation tank with agitator for UB, metering tank for UB, dosing pumps (1W+1S), necessary suction filters, valves, relief valves, connecting pipes, discharge pressure gauges/switches, fittings and flushing lines for cleaning the complete system.
- 2 days storage shall be considered for sizing of both mixing and metering tanks. However, 12 hours hold up in metering tank shall be maintained continuously. For the same alarm shall be generated when holup reduces to 12 hours and then to be refilled.
- Emergency DG power shall be provided to both the pumps**.**
- Analytical grade Tri-sodium phosphate (TSP) as PO4 mg/l @ 2 mg/l (approx) based on BFW flow rate shall be dosed into drum to maintain the boiler water pH in the specified range. The PO4 in the boiler water shall be 15-20 ppm.

c) Deaerator - LP chemical **(**Carbohydrazide/ Hydrazine**)**

- One No. of such skid shall be considered.
- This Chemical dosing skid will comprise of one solution preparation tank with agitator, one metering tank, dosing pumps, necessary suction filters, valves, relief valves, connecting pipes, discharge pressure gauges/switches, fittings and flushing lines for cleaning the complete system.
- 2 days storage shall be considered for both mixing and metering tanks. However, 12 hours hold up in metering tank shall be maintained continuously. For the same alarm shall be generated when holup reduces to 12 hours and then to be refilled.
- Emergency DG power shall be provided to both the pumps
- Hydrazine/Carbohydrazide shall be dosed inside the de-aerated water storage tank through spargers laid at bottom of the tank to maintain 1ppm of each of the chemical on 100% basis of BFW.
- Hydrazine/Carbohydrazide dosing rate shall be adjust to get 0.02-0.05/0.04-0.06 ppm hydrazine/carbohydrazide in CBD.

d) Storage tanks and all associated interconnecting piping work of dosing system shall be from stainless steel material.

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e) All dosing pumps/tanks shall be installed inside a shade with roof.

f) For chemical dosing system, running indication of individual dosing pump and the tank level shall be provided at DCS.

g) Safety shower and eye wash arrangement shall be considered for applicable locations including near chemical dosing skid.

xvi) Black out operation of Boiler (During total power failure):

- During Black-out (tripping of all electrical generators), utility boiler along with all necessary auxiliaries and facilities shall sustain operation and ramped up to MCR capacity within 10 minutes max. This rampup shall be ensured necessarily. The following minimum steam turbine drives are envisaged for the same:-

  i. Boiler Feed Water Pump (1 no.)
  ii. FD Fan of boiler (1 no.)
  iii. Fuel Oil Pump (1 no.)
  iv. DM water Pump (1 no.)

  BFP drive turbine & FD fan drive turbine shall be considered with speed control system and minimum turndown of UB shall be achieved through drive turbine speed control system.

  Lube oil systems of the BFPs, FD fans, Fuel oil Pump and DM water pump etc. shall be suitably designed to sustain boiler operation in case of total power failure. Emergency Power to this system shall be connected from existing UB DG (Not is scope of EPC Package contractor).

- Utility boiler along with all necessary auxiliaries and facilities shall be designed to operate uninterruptedly during total power outage through existing black out DG set (DG not in EPC package contractor scope) along with steam turbine drives to sustain the operation. DG set start time shall be considered as approx. 30 sec to 2 minutes from zero period. Accordingly UB package shall be designed to operate uninterruptedly without emergency power during total black out for first 30 sec to 2 minutes and afterwards power from existing DG set shall be ensured.
- Gaeous(for the duration till switchover from gaseous to Fuel Oil happens for UB burner) as required for boiler operation during such scenario shall be made available at Steam Generation Package B/L for boiler black out operation.
- Instrument air shall be available at package B/L from Process unit from same Instrument air header for UB operation during total power failure for black out operation.
- Cooling water required for UB & its all auxiliaries shall be through cooling water provided at B/L of steam generation package.
- Fuel available during black out shall be Gaseous fuel (for the duration till switchover from Gaseous to Fuel Oil happens for new UB burner),
- Following are the minimum MOVs / drive required on emergency power (from Black out DG) and running in normal operation with normal power for Utility boiler:-

  i. CBD inching valve
  ii. Scanner & seal air fan of UB
  iii. Main steam stop valve and its bypass valve.

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iv. Economiser inlet valve.

v. 1st isolation valve of FEED control station.

vi. Start-up vent valve.

vii. HP & LP dosing pumps

However, for sustained operation of utility boiler during black out, UPS as required shall also be considered in design.

xvii) Steam enthalpy values shall be as per IAWPS-IF97 ASME Industrial Formulation.

xviii) All general design consideration as applicable in the BEDB part-B (B857-999-79-41-ODB-1001) as attached elsewhere shall be followed.

xix) Local instruments, gauges, panels etc. shall be considered for efficient operation and monitoring of various parameters such as pressure, temperature, draft, level etc. as applicable for the following:

(i) Flue gas path
(ii) Feed water
(iii) Saturated and superheated steam
(iv) Fuel gases
(v) Fuel Oils
(vi) Instrument air
(vii) Cooling water
(viii) Nitrogen
(ix) DM water
(x) Flare
(xi) Service water
(xii) Plant air
(xiii) Condensate

xx) All disposal from chemical cleaning of utility boiler shall be disposed after neutralisation, Suitable arrangement for the same shall be considered.

xxi) 2X100% PRDS/PRV (as required) shall be provided for internal steam requirements of package for each steam levels.

xxii) Special type insulation (iner layer calcium silicate & outher layer PUF) shall be considered in VHP ISBL line after MSSV as considered for VHP OSBL line.

xxiii) LP steam export shall be considered in case of excess LP steam generation within package via turbodrives after internal consumption in package. Battery limit parameters for export LP steam shall be as per table 10.1. Except export of 219.3 TPH VHP steam (refer cl. 2.3.1 (a)), no other steam export at any other level is required at battery limit. However, excess steam (if any after meeting internal consumption) at any other level within package shall be terminated at B/L at LP steam level only. Excess steam at any level in SGP package shall be converted to LP steam level for export. Dump condenser for condensing steam from any level shall not be considered in SGP.

xxiv) Boiler system must be provided a suitable instrumentation and control system for the safe and intended working. Suitable safety interlocks leading to alarms and trips shall be provided to ensure that the boiler remains within safe operating condition.

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xxv) Stack height should be sufficient to generate adequate draft, conforming to the Environment assessment study report and related regulatory clearances and sufficiently higher from other operating platforms in vicinity.

xxvi) SPPID (Smart plant P&ID) software version 11.00.00.0907 shall be used for preparing P&IDs. Any additional requirement shall be finalized during Kick off meeting.

xxvii) New Steam generation package power- Normal power for SGP shall be provided from refinery STG. Emergency power during blackout as well as Power as required for blackstart of new UB shall be from existing UB DG set (3 MW). All the arrangements to connect Power from existing DG set of 3MW for black start & blackout operation shall be in contractor scope. Refer electrical document for further details.

6.0 DESIGN MARGINS ON VARIOUS EQUIPMENTS

Boiler Feed water Pump (Each) (For Utility Boiler)	Capacity: 10% on flow based on MCR condition Head: For calculation of Head, following cases (case -1 & case-2) will be evaluated and maximum value of head will be selected. Case-1: 110% MCR flow and Pump TDH with drum normal operating pressure. Frictional drop to be calculated on 100% MCR flow with 15% margin on frictional pressure drop. Frequency margin (3%) on calculated TDH would be applied for this case only. Case-2: 100% MCR flow and Pump TDH considering steam drum maximum safety valve set pressure with 3% accumulation. Frictional drop to be calculated on 100% MCR flow with 15% margin on frictional pressure drop.
Forced Draft Fan of Boiler	Capacity: 10% on flow based on MCR condition. Head: 20% on head based on MCR condition
Burner	10% on capacity based on MCR condition

7.0 SPARING PHILOSOPHY

The following shall be the sparing philosophy for the major equipment:-

BFW pumps - 2 Nos. (1W+1S), One Turbine Driven and one Motor driven. One (1 No.) Standby motor driven pump shall also have auto change over facility. Motor shall have provision of back-up from DG set
Drive Turbine shall be back-pressure type

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Blow down pumps	-	1 operating + 1 standby (All motor driven) All shall have provision of back-up from emergency DG set
FD Fan for Utility Boiler	-	2 Nos. (1W+1S) 1 x 100% Steam Turbine driven 1 X 100% Motor drive Drive Turbine shall be back-pressure type Motor shall have provision of back-up from emergency DG set. Standby motor driven fan shall also have auto change over facility
LP Chemical dosing skid (Morpholine)	-	1 no. (Common for BFW system & DM water system)
LP Chemical dosing Pumps(Morpholine)	-	2 operating (one each for BFW system & DM water system +2 standby (one each for BFW system & DM water system) (All motor driven) All pumps shall have provision of back-up from emergency DG set
LP Chemical dosing skid (Carbohydrazide/ Hydrazine)	-	1 no.
LP Chemical dosing Pumps (Carbohydrazide/ Hydrazine)	-	1 operating + 1 standby (All motor driven) All pumps shall have provision of back-up from emergency DG set
HP Chemical dosing skid	-	1 no.
HP Chemical dosing Pumps	-	2 Nos. (1W+1S) (All motor driven) All pumps shall have provision of back-up from emergency DG set
Sealing air fans for UB	-	1 operating + 1 standby (All motor driven) (1 No. AC with provision for emergency power from Black out DG + 1 No. DC)
Scanner cooling fans for UB	-	1 operating + 1 standby (All motor driven) (1 No. AC with provision for emergency power from Black out DG + 1 No. DC) AC driven fan shall also have power from emergency DG set Additionally Instrument air provision (Auto cut in/off) with suitable connection to each

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		scanner is also to be considered for cooling in case of tripping of both scanner air fans
Fuel oil Pumps for UB	-	2 Nos. (1W +1S), One Turbine Driven and one Motor driven. One (1 No.) Standby motor driven pump shall also have auto change over facility. Electric motor driven pump shall also have power from emergency DG set Drive Turbine shall be back-pressure type
Flare KOD drain pump	-	1 operating + 1 standby (All motor driven)
Closed blowdown drain pump	-	1 operating + 1 standby (All motor driven)
DM Water transfer Pumps	-	2 Nos. (1W+1S), One Turbine Driven and one Motor driven. One (1 No.) Standby motor driven pump shall also have auto change over facility. Electric motor driven pump shall also have power from emergency DG set Drive Turbine shall be back-pressure type

8.0 UTILITIES

The following utilities/services shall be available at Steam generation Package battery limit.

- DM water
- Instrument air
- Service Water
- Plant air
- Nitrogen
- Fuel gas (RFG)
- Natural gas (NG)
- Fuel oil
- Off gas
- Fire Water
- Polished condensate
- PFO
- Cooling water

Instrument air shall be used only for Instruments operation and as specified in this document. For no other purpose instrument air shall be considered.

9.0 SPECIFICATIONS

9.1 DM WATER QUALITY

S. No.	Parameter	Specification
1.	pH	6.5-7.0
2.	Conductivity at 20 deg. C, Micro-mho/cm	0.2 max

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3.	Total suspended solids,	Nil
4.	Total Dissolved Solids, mg/l	<0.1
5.	Total (reactive) Silica as SiO2, ppm	0.02 max
6.	Total Iron as Fe , ppm	0.02 max
7.	Total Copper, ppm	0.003 max
8.	Turbidity NTU	Nil
9.	Organic Matter as KMnO4 value at 100deg C. ppm	1 max
10.	Sodium, ppm	0.01 max
11.	Oil content, ppm	Nil
12.	Chlorides as Cl, ppm	Nil

9.2 BFW (BOILER FEED WATER) AFTER DE-AERATOR AND CHEMICAL DOSING

Sr no.	Parameter	Value
1.	pH at 25 deg C(copper alloy pre-boiler system)	8.8-9.2
2.	pH at 25 deg C(copper free pre-boiler system)	9.0-9.4
3.	Cation Conductivity at 25 deg. C or ambient temperature, micro-mho/cm	0.2 max
4.	Total suspended solids	Nil
5.	Dissolved Oxygen, ppm	0.005
6.	organic matter $KMnO_4$ value at 100 deg. C, ppm	5 (max)
7.	Total SiO_2 , ppm	0.02 max
8.	Copper, ppm	0.005
9.	Total Fe, ppm	0.03 max
10.	Turbidity, NTU	Nil
11.	Total hardness ,ppm	Nill
12.	Total residual hydrazine ,ppm	0.01-0.02 max

9.3 STEAM PURITY (SATURATED STEAM)

pH	> 8.3
Cation Conductivity at 25 deg. C micromho/cm	0.2 max
Total Fe, ppm	0.02 max
Copper, ppm	0.003 max
Total SiO2, ppm	0.02 max
Na + K, ppm	0.01 max

9.4 RECIRCULATING COOLING WATER QUALITY

Refer clause no. 6.4.1 of BEDB part-B (B857-999-79-41-ODB-1001)

9.5 FUEL OIL SPECIFICATION, RFG & NATURAL GAS SPECIFICATION

Refer clause no. 6.6.1 and 6.6.2.1 of BEDB part-B (B857-999-79-41-ODB-1001

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9.6 OFF GAS SPECIFICATION

Parameter	Unit	Value
Hydrogen	mole%	2.15
Carbon Monoxide	mole%	0.13
Methane	mole%	97.6
Ethylene	mole%	0.13
Mol. Wt.		15.77
LHV	Kcal/kg	11968

9.7 PFO (Pyrolysis Fuel oil) analysis (Hold)

Component	Unit	Specification	Test method
Flash Point	°C	above 70	ASTMD93
Boiling range	°C	200+	ASTM3734/D1160
BMCI		105-125	Calculation
Total Sulfur	Wt%	0.4 (max) -Hold	
Total Nitrogen	ppmw	<4.0	
Pour point	°C	-10	ASTDM97
Lower heating value	Kcal/kg	>8500	
Higher heating value	Kcal/kg	>9200	
Conradson carbon residue (CCR)	Wt%	<12	
Asphaltenes (C7 insolubales)	Wt%	<6	
Metal content (Ni, V, Lead)	ppb	<80	

Composition of PFO as provided above is under hold. PFO provisioning for firing in Boiler shall be necessarly considered. No additional emission control equipment shall be considered for firing PFO to meet emission norms.

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10.0 BATTERY LIMIT CONDITIONS

10.1 Export & Import at Steam Generation Package battery limits

Export from Steam Generation Package to Refinery /Petchemical unit

Parameter	Units	Min.	Normal	Max.	Mech. Design.
VHP Steam					
Pressure	Kg/cm^{2}g	100	108.7	110.7	118/FV
Temperature	^{o}C	490	510	510	540
VHP Boiler Feed Water					
Pressure	Kg/cm^{2}g	-	125	-	185
Temperature	^{o}C	-	110-145	-	170
Blowdown					
Pressure	Kg/cm^{2}g	5	5.5(H)	6	10.2
Temperature	^{o}C	-	50	-	65
Cooling water return					
Pressure	Kg/cm^{2}g	2.5			10.55
Temperature	^{o}C		45		65
Slop Header					
Pressure	Kg/cm^{2}g	-	-	-	-
Temperature	^{o}C	-	-	-	-
LP Steam Export (if excess in any operating scenario)					
Pressure	Kg/cm^{2}g	6	-	-	7/FV
Temperature	^{o}C	200	-	-	240
Flare Header (Note-1)					
Pressure	Kg/cm^{2}g		1.5 (H)		3.5
Temperature	^{o}C		-		200(H)
PFO return (Hold)					
Pressure	Kg/cm^{2}g	-	-	-	-
Temperature	^{o}C	-	-	-	-
Suspect condesate					
Pressure	Kg/cm^{2}g	-	5 (H)	-	14 (Hold)
Temperature	^{o}C	-	Hold	-	200 (Hold)

Note-1: Refer Low pressure flare condition in cl. 6.7.4 of BEDB Part-B (B857-999-79-41-ODB-1001)

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Import from Refinery / Petchemical unit

Parameter	Units	Min.	Normal	Max.	Mech. Design.
Refinery Fuel gas/Off gas					
Pressure	Kg/cm²g	2.5	3	3.5	6
Temperature	°C	Amb.	40	60	75
Natural gas					
Pressure	Kg/cm²g	-	45	-	Hold
Temperature	°C	-	Above 0	-	Hold
Fuel oil					
Pressure	Kg/cm²g	8	9	10	19.6
Temperature	°C	-	55	-	75
DM water					
Pressure	Kg/cm²g	4.5	5	5.5	17
Temperature	°C	40	40	40	65
Instrument Air					
Pressure	Kg/cm²g	4.5	6.5	7	10.5
Temperature	°C	Amb.	Amb.	50	65
Emergency Instrument Air					
Pressure	Kg/cm²g	4.5	6.5	7	10.5
Temperature	°C	Amb.	Amb.	50	65
Plant Air					
Pressure	Kg/cm²g	3.5	7	8	10.5
Temperature	°C	Amb.	Amb.	50	65
Nitrogen					
Pressure	Kg/cm²g	4.5	6.5	7	10.5
Temperature	°C	Amb.	Amb.	Amb.	65
Service water					
Pressure	Kg/cm²g	-	4	-	15
Temperature	°C	-	Amb	-	65
Polished Condensate from CPU					
Pressure	Kg/cm²g	3.5	4	4.5	15.5
Temperature	°C	-	60	95	120
PFO					
Pressure	Kg/cm²g	-	18 (hold)	-	-
Temperature	°C	-	80 (hold)	-	-
Cooling water supply*					
Pressure	Kg/cm²g		4.5		10.55
Temperature	°C		33		65
LP Steam (as available in operating case-6)-#					
Pressure	Kg/cm²g			4	7/FV
Temperature	°C			175	240

Note-1: All B/L pressures are as measured at grade.

#Provision for interconnection with Existing Refinery LP steam header to be provided (Not in SGP vendor scope)

2- *Cooling water pressure drop within the unit Battery limit (including cooling water piping and equipment) shall not be more than 2 Kg/cm2.

11.0 BUILDINGS:-

Following building/ sheds need to be considered:-

i. Substation room
ii. SRR
iii. SWAS, CEMS analyser Shelter/Building

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12.0 ATTACHMENTS

Sl. No.	Doc. No.	Description
1	Annexure-1	Design Basis/ Philosophy- Steam Generation Package
2	Annexure-2	Export from SGP to Petchem/ Refinery

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1.0 DESIGN AND CONSTUCTION CODE

The following codes in their latest edition shall form the basis of design, materials selection, manufacture, testing and acceptance of equipment and all their requirements shall be complied with.

a. IBR

b. ASME Sec. I

c. ASME Sec. VIII Div. I

d. ASME B-31.1 /ASME B 31.3

e. ASME Sec .II

f. ASME Sec. IX

g. ASME Sec V

h. TEMA

i. ANSI

j. API

k. NFPA 85

l. IS: 800

m. IS: 6533, IS: 875, IS:1893 and IS: 800 (as applicable): for stack

n. PNGRB: Petroleum and Natural Gas Regulatory Board Notification F. No. PNGRB / Tech / 8-T4SR & GP / (1) / 2023 (P-4247).

o. Structural steel: Follow the requirement mentioned in structural design basis.

p. Applicable all local codes for Boiler of installation state for design and installation.

Any other applicable code / standard / specifications as listed elsewhere in the tender or necessary for design, construction, installation as per local law and service conditions.

2.0 Design Requirements for Major Equipment

2.1 Boiler

2.1.1 Flue gas path of boiler shall have smooth flow without any obstacles other than heat transfer coil, dead zone & pockets to avoid any kind of turbulences and eddy current in the path.

2.1.2 Seamless tube shall be used for heat transfer in boiler.

2.1.3 There shall be 2 no. of manhole on either dish end side of steam drum. Steam drum man holes shall be internal opening type and clear opening size of manhole shall be 24”NB or equivalent size.

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2.1.4 Height between platform top of steel and Steam drum / Mud drum centre line shall be within 930 mm – 1300 mm.

2.1.5 Drum manhole side platforms shall have minimum clear operating and maintenance space of 1500 mm.

2.1.6 No circumferential joints shall be present in heat transfer tubes/coil up to 11.5 m length.

2.1.7 Safety valve exhaust bend / elbow shall be supported suitable after analysis and considering discharge / pop up thrust.

2.1.8 MOC of supports and fins in super heaters coils shall be superior than the coil MOC and needs to be designed for expected tip temperature in extreme case.

2.1.9 Economiser & air pre-heater casing shall be provided with sufficient nos. of nozzles and effluent outlet flanges for necessary water wash during annual overhaul. Water wash effluent neutralization and disposal facility shall be considered.

2.1.10 Normal walkway platform shall be minimum 1000 mm and maintenance platform shall be minimum 1500 mm in boiler.

2.1.11 Access Doors minimum dimensions shall be 600 mm X 600 mm for maintenance / inspection in boiler, economizer, APH & duct etc. and shall be provided at regular intervals between & both ends of each tube harps / bundle and compartment for ease of inspection / maintenance / approach.

2.1.12 Flue gas and air duct plate minimum thickness shall be 6 mm.

2.1.13 Boiler operating platforms, Burners floor & Steam Drum operating platforms shall have two way accesses through staircases for easy access & movements other than emergency ladders up to grade.

2.1.14 Galvanised electro forged grating shall be as per Type –II of EIL standard (7-68-0697).

2.1.15 Inlet/Outlet duct connection to fans shall be flanged type.

2.1.16 Manual shut-off blinds operated by hand wheel and gear box arrangement shall be provided for ducts up to flow area 4 m2. Electric motor shall be provided for shutoff blinds for ducts with flow area more than 4 m2. Provision shall be made to declutch motor and operate manually with hand wheel and gear box.

2.1.17 All dampers shall have provision for manual operation from nearest platform.

2.1.1 All expansion joints shall be flanged connection type.

2.1.2 All low point drains and high point vent shall have proper isolation and shall be approachable for maintenance.

2.1.3 Boiler flue gas side shall have proper draining mechanism to take out wash water and debris during cleaning / shut down.

2.2 Stack

2.2.1 Ladder in stack shall be staggered in each level and Stack platform shall be provided at a maximum interval of 6 meters.

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2.2.2 Fixing arrangement for aviation lighting shall be provided along with all round platform.

2.2.3 Rail arrangement shall be provided for stack painter's trolley.

2.2.4 Stack shall be provided with rain hood.

2.2.5 Flue gas entry nozzle to stack shall be at 45 Deg angle.

2.2.6 Stack shall be provided with castable refractory lined sloped & conical bottom base plate by strengthening with structural members, so that rain water does not collect at the bottom of the stack. One Gate valves shall be provided at outlet of drain connected to stack conical bottom plate at lowest point with drain collection funnel for connecting to UG piping.

2.2.7 Two no. of access doors shall be provided one above bottom conical base plate (refractory lined) & one below bottom conical base plate with size of 600 mm X 600 mm.

2.2.8 Suitable cross vent holes shall also be provided for the bottom part of stack below stack base plate for ventilation.

2.2.9 PMN nozzles platform width shall be 1400 mm & 1000 mm for normal platforms.

3.0 Job specific requirements:

3.1 Unless otherwise specified in process datasheet or tender, Minimum Metal Design Temperature (MDMT) shall be lower of minimum atmospheric temperature and minimum temperature envisaged during operation.

3.2 Extensive modularization is necessary considering ODC limit.

3.3 Preservation of materials and fabricated finish goods during storage & after erection till the start of commissioning shall be considered as per site climate conditions.

4.0 Mandatory Spares

4.1 This section defines the Philosophy for mandatory spares to be supplied by the bidder as part of the contract.

4.2 Contractor shall supply mandatory spares for Utility Boiler pertaining to FE Department spares scope as follows for boiler.

S. No.	ITEMS	PARTS	DESCRIPTION
1.	Steam Drum, Mud drum, Attemperators, Vessels, Tanks	Gasket	400%
		Fastener	20% (for each size)
		Steam purifier / Demister / Replaceable internals	200% of each type
2.	Pressure parts, APH tubes (if applicable)	All types of tubes	5% of each size / type
3.		Gasket	200%

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	Stack / Access Doors / Expansion Bellow/ Soot Blower, silencer	Fastener	20%
4.	Other equipment / components/ valves at flue gas side in boiler	Gasket	400%
		Fastener	20% (for each item)
5.	Burner	Liquid fuel Tip Assembly	1 set of each type
		Liquid fuel Gun Assembly	1 no. of each type

4.3 The spare quantities where specified in terms of percentage, shall be rounded off to the next higher integer.

4.4 All spares supplied by package vendor shall be properly wrapped and packed so that spares will be preserved as new condition under the normal condition of storage envisaged and shall be properly tagged & coded so that at a later stage same can be identified. Packing list shall be furnished so that parts can be identified.

4.5 Mandatory spares handover to owner with proper packing list and identity tags in a single lot in an exclusive container/box.

4.6 These spares shall not be used during construction, erection or commissioning.

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The governing operating scenarios steam and BFW demand within the Complex are as per below table from Steam Generation Package (SGP) to Petchem/ Refinery.

Governing operating scenarios

Case No.	Case description
1.	ECU running normal and other Polymer units running normal
2	ECU running normal and other Polymer units running at maximum.
6	ECU CGC Trip and other Polymer units running normal
7	Total Power Blackout
13	ECU Design Case-1 running normal and other Polymer units running normal.
16	ECU start-up after feed in & other Polymer units normal

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ANNEXURE-2((Export from SGP to Petchem/ Refinery)

Overall Export Steam & BFW requirement

Case No.	Case-1a	Case-2b	Case-6	Case-7	Case-13	Case-16
VHP Steam Requirement (TPH)-Note 1	**25.0**	**67.5**	**0.0**	**219.3**	**39.8**	**215.8**
HP Steam Requirement (TPH)	0	0	0	0	0	0
MP Steam Requirement (TPH)	0	0	0	0	0	0
LP Steam Requirement (TPH)	(-)4.9	0.0	0.0	(-)15.0	(-)4.9	0.0
Total Steam requirement (TPH)	**25.0**	**67.5**	**0.0 (Note-3)**	**219.3**	**39.8**	**215.8**
Steam requirement with 10% margin (TPH)	**27.5**	**74.3**	**0.0**	**219.3**	**43.8**	**215.8**
VHP BFW (TPH) (Note-1,2)	**1.53**	**3.9**	**1.53**	**35**	**1.53**	**1.53**
Condensate Available, TPH (min / normal / max)	**0 / 32.3 / 85**	**0 / 32.3 / 85**	**0 / 32.3 / 85**	**0**	**0 / 32.3 / 85**	**0 / 32.3 / 85**
Any Excess LP Steam available in new Steam Gen Block	**Vendor to Report**	**Vendor to Report**	**Vendor to Report**	**Vendor to Report**	**Vendor to Report**	**Vendor to Report**

Notes:

1) This does not include new Steam Generation Block internal consumptions.

2) Please consider 10% margin on the BFW consumption figures provided

3) During Case-6 boiler will not be tripped and will be operated at turndown capacity. As there is already excess steam available in the complex during this case, provisions shall be made in new steam gen block to vent the excess steam generated from new UB (after steam gen block internal consumption) during turndown operation. One no. vent control valve of 30%MCR shall be considered with in steam generation package to achieve this.

4) Other than above cases, max. VHP BFW export shall be 31 TPH, during that case VHP steam requirement shall be 38.8 TPH. BFW pumps & other auxiliaries shall be designed accordingly.

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BASIC ENGINEERING DESIGN BASIS (PART-B)

JOB NO: **B857**

PROJECT: **EPCM Services for Site Enabling for Bina Petrochemical and Refinery Expansion Project**

CLIENT: **BPCL - BINA REFINERY**

EIL SIGNATURE:

CLIENT SIGNATURE:

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Legend:***Bold italic*** text denotes change with respect to previous revision.

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ABBREVIATIONS

Code	Description
APH	Air Pre-Heater
ASME	American Society of Mechanical Engineers
B/L	Battery Limit
BDEP	Basic Design Engineering Package
BEDB	Basic Engineering Design Basis
BFW	Boiler Feed Water
BMS	Burner Management System
CBD	Closed Blow Down
CBFS	Carbon Black Feed Stock
CCR	Continuous Catalytic Reformer
CDU	Crude Distillation Unit
CFPP	Cold Filter Plugging Point
CLO	CLarified Oil
CMR	Control Room Reset
CPCB	Central Pollution Control Board
CPP	Captive Power Plant
CPU	Condensate Polishing Unit
CRWS	Contaminated Rain Water Sewer
CS	Carbon Steel
CW	Cooling Water
DCS	Distributed Control System
DHDT	Diesel HydroTreating Unit
DM	De-Mineralised
DP	Differential Pressure
ECS	Emission Containment Seals
EIL	Engineer's India Limited
FD	Forced Draft
FFB/FF	Foundation Field Bus
FG	Fuel Gas
FLO	FLushing Oil
FMR	Field Manual Reset
FO	Fuel Oil
FOE	Fuel Oil Equivalent
GC	Gas Chromatograph
GT	Gas Turbine
HAS	High Alloy Steel
HC	Hydro Carbon
HFLO	Heavy FLushing Oil
HFO	Heavy Fuel Oil
HDPE	High Density Poly Ethylene
HHV	High Heating Value
HLL	High Liquid Level
HOL	High Operating Level
HP	High Pressure
HP	Horse Power
HRSG	Heat Recovery Steam Generation
HS	Hand Switch
HTD	High Torque Drive
ID	Induced Draft
ID	Inside Diameter
ISA	International Society of Automation

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Code	Description
ISBL	In Side Battery Limit
KCS	Killed Carbon Steel
KOD	Knock Out Drum
LAS	Low Alloy Steel
LFO	Light Fuel Oil
LLDPE	Linear Low Density Poly Ethylene
LFZ	Lekki Free Trade Zone
LHV	Low Heating Value
LLL	Low Liquid Level
LO	Lock Open
LOL	Low Operating Level
LSHS	Low Sulphur Heavy Stock
LP	Low Pressure
LPG	Liquefied Petroleum Gas
LSFLO	Low Sulphur FLushing Oil
MCF	Minimum Continuous safe Flow
MDMT	Minimum Design Metal Temperature
MFB	Minimum Flow Bypass
MINAS	MInimals NAtional Standard
MOC	Material Of Construction
MOV	Motor Operated Valves
MP	Medium Pressure
MPMC	Managing Project Management Consultant
NB	Nominal Bore
OD	Outside Diameter
ODC	Over Dimensional Consignment
OISD	Oil Industry Safety Department
OSBL	Out Side Battery Limit
OWS	Oily Water Sewer
P&ID	Process & Instrumentation Diagram
PD	Positive Displacement
PFD	Process Flow Diagram
PLC	Programmable Logic Control
PLEM	Pipe Line End Manifold
PMS	Piping Material Specification
PP	Poly Propylene
PRT	Power Recovery Turbine
PSA	Pressure Swing Adsorption
PSV	Pressure Safety Valve
PT	Pressure Transmitter
RFCC	Resid Fluidised Catalytic Cracking
RLNG	Regassified Liquefied Natural Gas
RO	Reverse Osmosis
RO	Restriction Orifice
SBM	Single Buoy Mooring
SDV	Shut Down Valve
SPM	Suspended Particulate Matter
SRU	Sulphur Recovery Unit
SS	Stainless Steel
TEMA	Tubular Exchanger Manufacturers Association
TGTU	Tail Gas Treating Unit
TPD	Tons Per Day
TPH	Tons Per Hour
TTL	Tangent Tangent Line

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Code	Description
TTP	Tertiary Treatment Plant
UOM	Unit Of Measurement
UPS	Uninterrupted Power Supply
USD	US Dollar
VHP	Very High Pressure
VLCC	Very Large Crude Carrier
VSD	Variable Speed Drive
WAO	Wet Air Oxidation
WC	Water Column

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1.0 INTRODUCTION

Bharat Petroleum Corporation Limited (BPCL) is operating a 7.5 MMTPA (on 8000 hrs per year basis) Bina Refinery (BR) at Sagar, Madhya Pradesh. The existing refinery is producing MS and HSD conforming to BS VI specifications by processing of high sulfur crudes besides other petroleum products like LPG, Naphtha, Kerosene, ATF, Petcoke and Sulphur. In order to remain competitive and improve refinery profitability further, Bina Refinery (BR) has embarked on Petrochemical Diversification Plan and as a part of further expansion of Petrochemical portfolio, it is intended to set up world scale Ethylene Cracker & Associated Units and Ethylene and Propylene based Petrochemical units for its diversification to Petrochemicals along with expansion of its refinery capacity to about 11 MMTPA.

As part of EPCM Services for Site Enabling for Bina Petrochemical and Refinery Expansion Project, EIL will be involved in the preparation of Basic Engineering Design Basis (BEDB Part B) for the Bina refinery.

The Design Basis presented here intends to provide the Engineering contractors with technical information required to complete the engineering design specifications of the complex in a uniform and consistent manner.

Basic Engineering Design Basis (BEDB) for all facilities, containing technical information agreed between Client and EIL shall be binding on the process design and engineering of units, utility systems and offsite facilities. The BEDBs for each facility are in two parts:

Part A: Unit Design Basis providing necessary data for a specific process unit/utility systems/offsite facilities.

Part B: Basic Engineering Design Basis defining overall project requirements for making all units, utility systems and offsite facilities compatible and ensuring uniform design practices for the total complex.

This document constitutes Part B of the Basic Engineering Design Basis.

This Part B is applicable for new units under BPREP Projects. Philosophy for revamp units will be same as existing philosophy.

2.0 PROJECT DETAIL

2.1 PROJECT TITLE

The following major Refinery & Petrochemical units/facilities are proposed to be set up in the complex.

- ***Crude Distillation Unit (CDU)***
- ***Bitumen Blowing Unit (BBU***
- ***Revamp of existing FCHCU for conversion of FCHCU to OHCU and 140% capacity enhancement***
- ***LPG Treating Unit (LPGTU)***
- ***Fuel Gas Amine Treating Unit (FGTU)***
- ***Refinery Sour Water Stripper Unit (SWS)***
- ***Amine Regeneration Unit (ARU)***

- ***Ethylene Cracker and Associated Units (ECU Block)***
- ***Polypropylene Unit (PPU)***

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- ***LLDPE/HDPE Swing Unit***
- ***Butene-1 Unit***

- ***Utility & Offsites consisting of Raw Water Treatment Plant, RODM, Condensate Polishing Unit, Steam, Power, Cooling water, Instrument Air/ Plant Air, N2, tankages and other important facilities required or refinery and ECU/Petrochemical units***

- ***Effluent treatment, Flare system and other waste disposal facilities***

This Refinery & Petrochemical Complex will also have required infrastructure, utilities and offsites facilities to support smooth operation of the complex.

Following shall be used for all documentation.

Project name	Bina Petrochemical and Refinery Expansion Project (BPREP)
Owner	BPCL-Bina Refinery
Location	Bina, Madya Pradesh
Remarks	

2.2 DEFINITION OF FEED STOCK

S.No.	Feed Name	Feed Source	Mode of Receipt	Facilities to be provided	Remarks
1	Arab Mix (65 AL:35 AH), Saharan Blend, Upper Zakum & Kuwait Super Light	Crude Oil Terminal	Blended Crude through Vadinar Bina Pipeline	Augmentation of VBPL and COT	
2	RLNG	New RLNG Pipeline	Pipeline	-	
3	MR Naptha	BPCL Mumbai Refinery	Pipeline/ Rakes/ Tank Lorry	New storage tanks at Manmad & Mangalia,booster pumps,railway loading/unloading at Mangalia,Bina etc.	

2.3 DEFINITION OF PRODUCTS

S.No.	Product Name	Storage Days	Mode of Dispatch	% of total	Remarks
	Refinery Products:				
1	LPG	-	Road	-	
2	SKO	-	Rail/Road/Pipeline	-	
3	ATF	-	Rail/Road/Pipeline	-	
4	MS BS VI	-	As Existing	-	
5	HSD BS VI	-	As Existing	-	
6	Bitumen VG 30	12.5	Road	100%	

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S.No.	Product Name	Storage Days	Mode of Dispatch	% of total	Remarks
7	Petcoke	-	As Existing	-	
8	Sulphur	-	As Existing	-	
	Petrochemical Products:				
1	Linear Low Density Poly Ethylene (LLDPE)	21	Road	100%	Note-1
2	High Density Poly Ethylene (HDPE)	21	Road	100%	Note-1
3	Poly Propylene	21	Road	100%	Note-1
4	Benzene	15	Road	100%	
5	Toluene	15	Road	100%	
6	Mixed Xylene	15	Road	100%	
7	LSHS Premium (PFO)	7	Road	100%	Note-1

Notes
NOTE-1 In future rail mode of evacuation may be evaluated.

2.4 LIST OF FACILITIES AND UNIT NUMBERS

2.4.1 UNIT AND UTILITY SYSTEM

The following New Refinery Units/ Revamp Refinery Units & Petrochemical units/facilities and Utilities are proposed to be set up in the complex.

S.No.	Facility	Unit Number	Capacity	UOM	Remarks
	NEW PROCESS UNITS / REVAMP OF EXISTING UNITS (REFINERY):				
1	***Crude Revamp Unit/ VDU Revamp Unit/NSU Revamp Unit***	***11/12/13***	4.0	MMTPA	***This capacity is addition to the existing capacity in same plot plan.***
2	Bitumen Blowing Unit (BBU)	130	300	KTPA	
3	***FCHCU Revamp Unit***	16	3.55	MMTPA	(140% Capacity revamp)
4	LPG Treating Unit	***14***	90	KTPA	
5	***Fuel Gas Amine Treating Unit-II***	122	40	KTPA	
6	***Sour Water Stripper Unit (New)***	***128(HOLD)***	75	TPH	***Requiremet will be confirmed later.***

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S.No.	Facility	Unit Number	Capacity	UOM	Remarks
6.1	***Sour Water Stripper Unit-II***	***28(HOLD)***			***Requirement will be confirmed later.***
7	***Amine Regeneration Unit-II***	127	100	TPH	
	PETROCHEMICAL BLOCK:				
8	***Ethylene Cracker Unit (ECU)***	300	1200	KTPA Ethylene	
8.1	***C4 Hydrogenation Unit(THU)***	***301***			
8.2	***Pyrolysis Gasoline Hydrogenation Unit(PGHU)***	***302***			
8.3	***Benzene, Toluene and Xylene Extraction(BTX) Unit***	***303***			
8.4	***Spent Caustic Treatment and Neutralization(SCTP)***	***304***			
8.5	***Refinery Off Gas (ROG) Unit***	***305***			
9	***Polypropylene Unit***	310	550	KTPA	
10	***LLDPE/HDPE Swing Unit(LINE 1) & Common Facilities***	320	***575***	KTPA	
11	***LLDPE/HDPE SWING UNIT(LINE 2)***	330	***575***	KTPA	
12	Butene-1 Unit	340	50	KTPA	
	NEW UTILITY SYSTEMS:				
1	***Treated Raw Water System***	401	3100	m3/hr	
2a	***Cooling Water System (Refinery Revamp)***	***137***	8000	m3/hr	
2b	***Cracker Cooling Water System (CT-1)***	410	80000	m3/hr	
2c	***Polymer Cooling Water System (CT-2)***	411	48000	m3/hr	
3a	***Steam Generating Unit***	420	360	TPH VHP Steam	
3b	***Power Block***	421	260	MW	
4	RO –DM Plant	422	210	m3/hr	
5	Condensate Polishing Unit	423	90	m3/hr	
6	***Compressed Air Plant***	430	24000	NM3/hr	
7	***Nitrogen Plant***	431	13000	Nm3/hr	
8	***Flare System***	530	-	-	
9	***Effluent Treatment Plant (ETP)/Sewage Treatment Plant(STP)***	450	260	m3/hr	

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S.No.	Facility	Unit Number	Capacity	UOM	Remarks
10	Zero Liquid Discharge (ZLD)	451	60	m3/hr	
11	***Process & Offsite Interconnection***	***440***			
12	***Utility Interconnection***	***441***			

Notes

Note: Capacity of Utility System are indicative and shall be finalized later in Individual Utility Design Basis.

Note-1 DELETED.

2.4.2 OFFSITE AND OTHER FACILITIES

The project complex essentially consists of the following New Offsite and Other facilities.

S.No.	Facility	Unit Number	Remarks
	AUGMENTATION OF CRUDE RECEIPT:		
1	Augmentation of existing crude oil pipeline	04	
2	Augmentation of Crude Oil Terminal	03	
	OFFSITE FACILITIES AUGMENTATION		
1	***Feed, Intermediate and Finished Product tanks (Refinery revamp)***	52	Bitumen, Black slop tank
2	***DELETED***		
3	***Feed , Intermediate and Finished Product Tanks (Petrochemical)***	500	Note-1
4	Chemical Tanks	510	Hexene-1, Hexane, Iso pentane
5	Additional Raw water Intake Facilities	400	
6	Vapour recovery system	501	
7	Polymer Warehouse	540	
8	RLNG receipt station & distribution	520	
9	***Marketing Terminal***	***600***	
	NEW INFRASTUCTURE, etc.		Additional Land Requirement, Township etc.

Notes

Note-1 Intermediate tanks include :Ethylene, Propylene, Off spec Propylene,Butene-1,Off spec Ethylene, Off spec C4 Mix, RPG, BTX Feed Tank, Off spec Benzene + Toluene, Pyrolysis Gas Oil (C9 + cut)

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2.5 UNITS OF MEASUREMENT

2.5.1 GENERAL

Units of measurement shall be followed as per Table below. (Refer Annexure A)
Additionally, licensor""s own engineering standards shall be issuable with extant units of measurement.

Owner may indicate preferred units of measurement, if different from the defaults below:

Parameter	UOM	Project Philosophy	Remarks
Temperature	Refer Annexure A		
Pressure (gauge)	Refer Annexure A		
Pressure (absolute)	Refer Annexure A		
Vacuum	Refer Annexure A		
Mass	Refer Annexure A		
Volume	Refer Annexure A		
Length	Refer Annexure A		
Pipe Size	inch		
Liq relative density	sp gr T DEG C/15 DEG C		
Liq density	kg/m^3		
Vap flowing density	kg/m^3		
Furnace draft	Refer Annexure A		
Storage tank pressure	Refer Annexure A		
Flowing mass	Refer Annexure A		
Flowing vapor	Refer Annexure A		
Flowing liquid	Refer Annexure A		
Standard vapor	Nm^3/hr at 0 DEG C & 1.033 kg/cm^2a		
Standard liquid	Sm^3/hr at 15 DEG C		
Thermal conductivity	Refer Annexure A		
Heat Transfer coefficient	Refer Annexure A		
Enthalpy	Refer Annexure A		
Entropy	Refer Annexure A		
Heat Rate	Mkcal/hr or MM kcal/hr		
Viscosity	Refer Annexure A		
Kinematic Viscosity	Refer Annexure A		
Composition	Refer Annexure A		
Power	Refer Annexure A		
Sound Power	Refer Annexure A		

2.5.2 SPECIAL REQUIREMENT

Units of measurement in PFDs & Flow instruments:

Description	Selected Option	Remarks
PFD		
Gases	***kg/hr***	

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Description	Selected Option	Remarks
Liquids	***kg/hr***	
Solids	***kg/hr***	
Steam	***kg/hr***	
FLOW METER		
Gases	***kg/hr***	***Note-1***
Liquids	***kg/hr***	***Note-1***
Steam	***kg/hr***	***Note-1***

Owner's Requirement

Note-1 For polymer unit all flow equal to or more than 100000 to be shown in T/h. For ECU flow equal to more than 10000 to be shown in T/h.

3.0 PLANT LOCATION

Refer Engineering Design Basis for complete details of plant location. The proposed project is located in Bina, Dist. Sagar in Madhya Pradesh.The site is well connected by state highways and road network. The nearest important town is Bina,which is 15 Km from the site. The nearest airport to the site location is Bhopal, which is 165 Km away from the Bina Refinery site and the nearest rail junction is Bina which is situated on the broad guage line between New Delhi to Bhopal.

3.1 Site Location
- State : Madhya Pradesh
- Nearest Important Town : Bina
- Nearest Railway : Bina
- Nearest Port : Kandla
- Nearest Airport : Bhopal

3.2 Source of Water : River Betwa

3.3 Rainy season : June to September

4.0 METEOROLOGICAL DESIGN DATA

4.1 METEOROLOGICAL DATA

Refer Engineering Design Basis for complete details of meteorological design data. This section presents relevant data towards preparing process engineering specifications.

S.No.	Parameter	Unit	Min.	Nor.	Max.	Design
1	Barometric pressure	mbar	936.3	947.4	954.2	
2	Ambient temperature	DEG C	1.1	***30***	45.6	
3	Relative humidity	%	16.4		80	54
4	Rainfall data for 1-hour period	mm			No data	
5	Rainfall data for 24-hour period	mm			360 (Note-1)	
6	Wind Velocity	km/hr	2		25	***Note-2***

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S.No.	Parameter	Unit	Min.	Nor.	Max.	Design
7	Wind direction					W to E

Notes
Note-1 Total annual rainfall is 900-1100 mm.
Note-2 Refer EDB for design wind velocity.

4.1.1 GENERAL PARAMETER

S.No.	Parameter	UOM	Design Value
1	Elevation above mean sea level	m	411.6 Avg(Note-1)
2	Earthquake design criterion		As per site spectra curve (Note-2)

Note-1 Unit wise elevations are as below:
1. ECU - 404.6 m
2. PPU - 409 m
3. LLDPE/ HDPE Swing - 406 m
4. Butene-1 - 395.6 m
5. SWS/ ARU - 422 m
6. BBU - 422 m

The levels mentioned are above MSL (Mean Sea Level)
Unit elevations are to be confirmed from Model.
Note- 2 Zone-II (Low Damage Risk Zone, MSK VI) and Zone factor of 0.10, refer site specific Seismic spectra.

4.2 DATA FOR EQUIPMENT DESIGN

S.No.	Parameter	UOM	Design Value
1	Design Dry bulb temperature	DEG C	42
2	Design Wet bulb temperature	DEG C	25.7
3	Low Ambient temperature for MDMT	DEG C	1.1
4	Design air temperature for air cooled exchangers where followed by water cooling	DEG C	45.6
5	Design air temperature for air cooled exchangers where not followed by water cooling	DEG C	45.6
6	Coincident temperature and relative humidity for Air Blower / Air Compressor design	DEG C	42 @ 54% relative humidity
7	Min. Design temperature for equipment	DEG C	65

5.0 ECONOMIC OPTIMISATION CRITERIA

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5.1 UNIT RATES FOR FEED, PRODUCT AND UTILITIES

5.1.1 UNIT RATES FOR FEED AND PRODUCT

Feed and Product unit rates.

S.No.	Feed/Product	UOM	Rate Per Unit	Currency
	FEED:			
1	Arab Mix (65 AL:35 AH)	MT	43017	INR
2	Saharan Blend	MT	48312	INR
3	Upper Zakum	MT	43823	INR
4	Kuwait Super Light	MT	48634	INR
5	RLNG	MT	51622	INR
6	MR Naptha	MT	48989	INR
	PRODUCTS:			
1	LPG	MT	50016	INR
2	BS VI Gasoline	MT	59198	INR
3	Kerosene	MT	60569	INR
4	ATF	MT	55833	INR
5	BS VI Diesel	MT	55752	INR
6	Bitumen(VG 30)	MT	36904	INR
7	Coke	MT	11702	INR
8	Sulphur	MT	11275	INR
9	LLDPE	MT	108993	INR
10	HDPE	MT	103393	INR
11	Polypropylene-Homo	MT	110560	INR
12	Polypropylene-Random	MT	117564	INR
13	Polypropylene-Impact	MT	113857	INR
14	Benzene	MT	60463	INR
15	Toluene	MT	64811	INR
16	Mix xylene	MT	77418	INR
17	LSHS (PFO)	MT	39234	INR

5.1.2 UNIT RATES FOR UTILITIES

Utility unit rates:

S.No.	Utility	UOM	Rate	Rate Unit
1	Power	Kwh	5.54	INR
2	Steam:			
2.1	Very High Pressure steam	MT	Note-1	INR
2.2	High Pressure steam	MT	-	INR
2.3	Medium Pressure steam	MT	-	INR
2.4	Low Pressure steam	MT	-	INR
3	Fuel Fired			
3.1	Fuel oil	MT	-	INR
3.2	Fuel gas	MT	-	INR
4	Treated Raw water	KL	37.16	INR
5	Recirculating cooling water	KL	1.93	INR
6	Demineralised Water	KL	55.24	INR
7	Boiler Feed Water	MT	-	INR

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S.No.	Utility	UOM	Rate	Rate Unit
8	Nitrogen/ Inst. Air	Nm3	6.01/1.49	INR
9	Plant Air	Nm3	1.43	INR

Notes

NOTE-1 2378 (upto 80 TPH) and 4224 (above 80 TPH)

5.2 OPTIMISATION CRITERIA

Licensor/Designer and engineering contractor shall use a default criterion of a maximum 3 year straight-line payback for recovering incremental investment.

If owner prefers otherwise, fill below:
As a part of optimizing downgrading / removal of any equipment , piping items etc. should not be done without consent of client.

5.3 PLANT LIFE

The design life of the project facilities shall be 25 years, i.e. the design shall be such that the unit will be able to operate at 100% of design feed throughput for 25 years, with scheduled maintenance turnarounds occurring every 4 years.

Design life of equipment normally specified in the data sheet, otherwise the following design life for new units and new/replaced equipment/lines etc. in revamp units, shall be applied:

S.No.	Type of Equipment	Design Life	Owner Special Requirement	Remarks
1	Reactor/ Heavy wall vessels or exchanger (including non-removable internals and catalyst bed support beam if any.)		30 years	Note-1
2	Reactor removable internals		25 years	
3	Columns, other vessels		25 years	
4	Stainless steel, high alloy and non-ferrous material heat exchanger shell and similar devices		25 years	
5	Piping		20 years	
6	Steel/ High alloyed steel heat exchanger tube bundle		12 years	
7	Carbon steel Heat exchanger tube bundle		5 years	
7.1	Low alloyed steel Heat exchanger tube bundle		8 years	
8	Extruder Screw		16 years	

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S.No.	Type of Equipment	Design Life	Owner Special Requirement	Remarks
9	Rotating Equipment		20 years	

Notes:
1. DELETED.
2. DELETED.

6.0 UTILITY SPECIFICATIONS

6.1 UTILITY CONDITIONS AT UNIT BATTERY LIMITS

A) Utility conditions at unit B/L of New Refinery Units/ Revamp Refinery Units [All B/L pressures are as measured at grade]

S.No.	Describe	Parameter	Min.	Nor.	Max.	Design	Remarks
1.1	Very High Pressure (VHP) Steam						Not Applicable
		Pressure, kg/cm2 g	N/A	N/A	N/A	N/A	
		Temp., Deg C	N/A	N/A	N/A	N/A	
1.2	High Pressure (HP) Steam						
		Pressure, kg/cm2 g	37	38	40	46/FV	
		Temp., Deg C	370(Note-10)	380	390	420	
1.3	Medium Pressure (MP) Steam						
		Pressure, kg/cm2 g	16	17	18	22/FV	
		Temp., Deg C	260	270	280	350	
1.4	Low Pressure (LP) Steam						
		Pressure, kg/cm2 g	3	4	5	7/FV	
		Temp., Deg C	Saturated	175	190	240	
2	Condensate Return (Suspect/ Pure)						
		Pressure, kg/cm2 g	1.5	***2 (Note-15)***	2.5	***(Note-2,16)***	
		Temp., Deg C		90	95	120	
3	Service water						
		Pressure, kg/cm2 g		4		10.5 (Note-12)	

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S.No.	Describe	Parameter	Min.	Nor.	Max.	Design	Remarks
		Temp., Deg C		Amb.		65	
4	Recirculating cooling water						
		Supply Pressure, kg/cm2 g		4.3(Note-14)		***7.0(Note-2)***	
		Return Pressure, kg/cm2 g		2.3		***7.0(Note-2)***	
		Supply Temp., Deg C		33		65	
		Return Temp., Deg C		45		65	
5	Demineralised water						
		Pressure, kg/cm2 g	4.5	5	5.5	15.8 (Note-13)	
		Temp., Deg C	Amb.	40	45	65	
6	Boiler feed water						
		Pressure, kg/cm2 g		26	29	45	
		Temp., Deg C		105	110	150	
7	Plant air						
		Pressure, kg/cm2 g	3.5	7	8	10.5	
		Temp., Deg C	Amb.	Amb.	50	65	
8	Instrument air						
		Pressure, kg/cm2 g	4.5	6.5	7	10.5	
		Temp., Deg C	Amb.	Amb.	50	65	
9	Fuel gas						
		Pressure, kg/cm2 g	2.5	3	3.5	6	
		Temp., Deg C	Amb.	40	60	75	
10	Fuel Oil						
		Supply Pressure, kg/cm2 g	8	9	10	19.6	
		Return Pressure, kg/cm2 g	2			19.6	
11	Nitrogen						
		Pressure, kg/cm2 g	4.5	6.5	7	10.5	

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S.No.	Describe	Parameter	Min.	Nor.	Max.	Design	Remarks
		Temp., Deg C	Amb.	Amb.	Amb.	65	
12	HP BFW						
		Pressure, kg/cm2 g				75	
		Temp., Deg C				150	
13	RLNG						
		Pressure, kg/cm2g		HOLD		***49***	
		Temp, Deg C		HOLD		***65***	

B) Utility conditions at unit B/L of Petrochemical Block Units [All B/L pressures are as measured at grade]

S.No.	Describe	Parameter	Min.	Nor.	Max.	Design	Remarks
1.1	Very High Pressure (VHP) Steam						
		Pressure, kg/cm2 g	***94(HOLD)***	***105***	***110***	***118/FV***	
		Temp., Deg C	***455(HOLD)***	***495***	***500***	***540***	
1.2	High Pressure (HP) Steam						
		Pressure, kg/cm2 g	37	38	40	46/FV	
		Temp., Deg C	***370(NOTE-10)***	380	390	420	
1.3	Medium Pressure (MP) Steam						
		Pressure, kg/cm2 g	16	17	18	22/FV	
		Temp., Deg C	260	270	280	350	
1.4	Low Pressure (LP) Steam						
		Pressure, kg/cm2 g	3	4	5	7/FV	
		Temp., Deg C	Saturated	175	190	240	
2	Condensate Return (Suspect / Pure)						
		Pressure, kg/cm2 g	***4.5***			***13(Note-2)***	
		Temp., Deg C		***102***	***105***	120	
3	Service water						

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S.No.	Describe	Parameter	Min.	Nor.	Max.	Design	Remarks
		Pressure, kg/cm2 g		4		***15(Note-2)***	
		Temp.,Deg C		Amb.		65	
4.1	***Cracker Cooling Water System (CT-1)***						
		Supply Pressure, kg/cm2 g		5		***10.55(Note-2)***	
		Return Pressure, kg/cm2 g	2.5			***10.55(Note-2)***	
		Supply Temperature, Deg C		33		65	
		Return Temperature, Deg C		45		65	
4.2	***Polymer Cooling Water System (CT-2)***						
		Supply Pressure, kg/cm2 g		4.5		***10.55(Note-2)***	
		Return Pressure, kg/cm2 g	2.5			***10.55 (Note-2,8)***	
		Supply Temperature,Deg C		33		65	
		Return Temperature, Deg C		45		65	
5	Demineralised water						
		Pressure, kg/cm2 g	4.5	5	5.5	***17.0(Note-2)***	
		Temp., Deg C	Amb.	40	45	65	
6	***MP Boiler feed water***						
		Pressure, kg/cm2 g		26	29	***46.0(Note-2)***	
		Temp., Deg C		105	110	150	
7	Plant air						
		Pressure, kg/cm2 g	3.5	7	8	10.5	
		Temp., Deg C	Amb.	Amb.	50	65	
8	Instrument air						
		Pressure, kg/cm2 g	4.5	6.5	7	10.5	
		Temp., Deg C	Amb.	Amb.	50	65	

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S.No.	Describe	Parameter	Min.	Nor.	Max.	Design	Remarks
9	Fuel gas						
		Pressure, kg/cm2 g	2.5	3	3.5	6	
		Temp., Deg C	Amb.	40	60	75	
10	Fuel Oil						
		Supply Pressure, kg/cm2 g	8	9	10	19.6	
		Return Pressure, kg/cm2 g	2			19.6	
15	Nitrogen						
		Pressure, kg/cm2 g	4.5/ 6.0 (Note-7)	6.5	7	10.5	
		Temp., Deg C	Amb.	Amb.	Amb.	65	
16	RLNG						
		Pressure, kg/cm2g		HOLD		***49***	
		Temp, Deg C		HOLD		***65***	
17	***HP Boiler Feed Water***						
		Pressure,kg/cm 2g	***48***	***52***	***58***	***82***	
		Temp,Deg C	***120***	***120***	***135***	***155***	

Note:

1. Above provided battery limit conditions are indicative and will be firmed during detailed engineering.

2. The battery limit pressures for liquid lines at individual unit battery limits will vary depending up on the location/ elevation of the unit and shall be finalized during detail engineering.

3. Mechanical design conditions of utility systems will be verified during detailed engineering based on final hydraulics.

4. In case any utility is required at higher/ lower than the conditions indicated above, Licensor to include the facility to meet the requirements.

5. Steam generators, if applicable, shall be floating on steam headers, i.e. no pressure control shall be provided on steam generators unless warranted for process reasons. Accordingly, Licensor shall consider the normal battery limit steam pressure as indicated in the table above for estimation and guarantee of the steam generation quantity. However, design of steam generation facilities shall be capable of operating at minimum as well as maximum battery limit pressure condition also.

6. Licensor shall superheat the steam generated in the fired heater (in case of steam generation is envisaged anywhere in the unit) continuously to match the battery limit condition indicated in the table above unless warranted otherwise for process reason.

7. In Petrochemical Block units, for Polypropylene unit and Butene-1 Nitrogen Min. pressure at unit B/L , required is 6.0 kg/cm2g . For other units in Petrochemical block, it is 4.5 kg/cm2g.However for SWING Nitrogen Min. Pressure at unit B/L shall be 6.3 kg/cm2g.

8. Cooling water pressure drop within the unit Battery limit (including cooling water piping and equipment) shall not be more than 2 Kg/cm2.

9. DELETED.

10.For refinery equipment design minimum HPS temperature shall be 330 deg C .Therefore due to integration of HPS , the same has to be applicable for both Table 6.1

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A and 6.1 B.
11.For safety showers and eye wash drinking water shall be considered.
12.In view of large elevation difference between SW / BCW pumping facility and process units (All Process units being at higher elevation), all the service water and bearing cooling water lines located at higher plateau in the process unit area shall have design pressure of 10.5 kg/cm2g and units (ETP) in the lower plateau shall have deign pressure of 14.0 kg/cm2g.
13.The design pressure corresponds to lower elevation units.
14.Supply pressure is 3.5 kg/cm2g for LPGTU . Other process units it is 4.3 kg/cm2g.
15.For new condensate systems, the normal operating pressure of 2.5 kg/cm2g is to be considered.
16.The existing condensate system design pressure is 7 kg/cm2g. For new condensate systems, the design pressure of 13 kg/cm2g is to be considered. For Revamp sections, the design pressure shall be suitably decided on case to case basis during the course of detail engineering.

6.2 CONSTRAINTS ON UTILITIES

Constraint on Utilities if any, to be confirmed by Client.

For New Refinery Units/ Revamp Refinery Units and Petrochemical Block Units, for those Utilities where Utility requirement is to be met from existing refinery utility system, adequacy of existing refinery utility system shall be required.

For New utility Systems, for Refinery and Petrochemical Units Constraints are as below:

1	Raw Water	NO CONSTRAINT
2	Very Very High Pressure Steam	N/A
3	Very High Pressure Steam	NO CONSTRAINT
4	High Pressure Steam	NO CONSTRAINT
5	Medium Pressure Steam	NO CONSTRAINT
6	Low Pressure Steam	NO CONSTRAINT
7	Condensate Return	NO CONSTRAINT
8	Cooling Water Supply	NO CONSTRAINT
9	Cooling Water Return	NO CONSTRAINT
10	Demineralised Water	NO CONSTRAINT
11	Boiler Feed Water	NO CONSTRAINT
12	Plant Air	NO CONSTRAINT
13	Instrument Air	NO CONSTRAINT
14	Nitrogen / Inert Gas	NO CONSTRAINT
15	Fuel Oil	N/A
16	Fuel Gas	NO CONSTRAINT
17	Natural Gas	NO CONSTRAINT
18	Power	NO CONSTRAINT
19	Hydrogen	NO CONSTRAINT

6.3 STEAM & CONDENSATE SYSTEMS

6.3.1

Philosophy towards design of equipment generating or consuming steam shall be as per table below:

S.No.	EIL default Philosophy	Remarks

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S.No.	EIL default Philosophy	Remarks
1	Steam turbine drives and ejectors shall be rated based on MINIMUM steam conditions available at unit battery limits.	ISBL pressure & temperature drop to be accounted additionally
2	All other steam consuming equipment including heat exchangers shall be rated based on NORMAL steam conditions	ISBL pressure & temperature drop to be accounted additionally
3	All steam generating equipment shall be rated based on delivering steam at MAXIMUM conditions to the header.	ISBL pressure & temperature drop to be accounted additionally
4	NORMAL steam conditions shall be used for operating utility estimates, heat and material balances and battery limits connectivity.	

6.3.2

A) Handling condensate at unit battery limit is as given below:

i) Pure Condensate:
This is condensate produced by a source where the possibility of contamination by leakage across the heat transfer surface is minimal. This is ascertained by comparing the process and steam side operating pressures for the exchanger. If the process side operating pressure is lower than the steam side operating pressure, possibility of contamination of condensate produced with process fluid is minimal and the condensate produced from such a source is deemed 'pure condensate'.

ii) Suspect Condensate:
This is condensate produced by a source where the possibility of contamination by leakage across the heat transfer surface exists. This is ascertained by comparing the process and steam side operating pressures for the exchanger. If the process side operating pressure is higher than the steam side operating pressure, possibility of contamination of condensate produced with process fluid exists and the condensate produced from such a source is deemed 'suspect condensate'.

iii) Surface Condenser Condensate:
Condensate produced by the surface condenser of a condensing type steam turbine is normally considered as pure.

iv) Tracer / Traps Condensate:
Condensate produced by the tracing is suspect condensate.

B) Condensate handling within Process units:

i) Condensate coming from the exchangers (Suspect and pure Condensates) which may be consuming VHP, HP, MP or LP steam.
Each unit shall have separate headers for collection of suspect condensate and pure condensate within process unit.

ii) Condensate obtained from the steam drives in the process unit.
Condensate obtained from the condensing type steam drives shall be collected and pumped through dedicated surface condensate header to polished condensate tanks in the Condensate Polishing Unit. However, connections for routing it to Condensate Polishing Unit Feed tanks shall also be provided in case of contamination. YES

- Condensate recovery shall be maximized from process consumers.
- No cooling of the flashed condensate is envisaged within process units.

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• VHP, HP and MP level condensate generated within units shall be flashed within the respective units in a LP flash drum for recovery of LP steam.
• LP condensate shall be flashed at atmospheric pressure and the flashed condensate is pumped to OSBL.
• LP flash vessel is equipped with vent condenser to minimize loss of condensate flashing.

Following shall be considered with in unit for condensate recovery :

1. All condensate (pure and Surface) generated in a facility will be considered as normally uncontaminated and will be directly reused for steam generation.

2. Suspect condensate generated shall be treated in a centralized Condensate Polishing Unit before being used for steam generation.

3. For units generating high pressure steam, Unit′s designer′s advice on requirement of Condensate Polishing Unit will be followed.

4. HC detector / conductivity analyser shall be provided in the pure and surface condensate headers respectively at each unit B/L to detect any leakages into the condensate system.

5. Piping provision will be kept in each process unit to manually divert the pure / surface condensate (when contaminated) into suspect condensate header after checking the quality of contaminated condensate.

6. Contamination detection by on-line analyzers at unit B/L sensing conductivity and pH, with an option of automated drainage with operator intervention upon detection to OWS/ CRWS shall be done as per unit designer′s advice.

6.3.3
Condensate loss can be reduced in a number of ways like condensate recovery from line steam traps, steam tracers and storage tank heating coils.

OWNER's Preference:
Each unit shall have dedicated condensate recovery system for recovering condensate discharged from process steam traps and tracer / steam traps. Steam trap / tracer condensate in the respective units wherever feasible shall be recovered in an atmospheric buried drum by gravity and pumped to Condensate Polishing Unit through suspect condensate header.

OWNER TO SELECT FROM BELOW REQUIREMENTS:

1	Condensate recovery from line steam traps - In OSBL other utility / offsites facility, if feasible:	YES
2	Condensate recovery from storage tank heating coils, if feasible.	YES

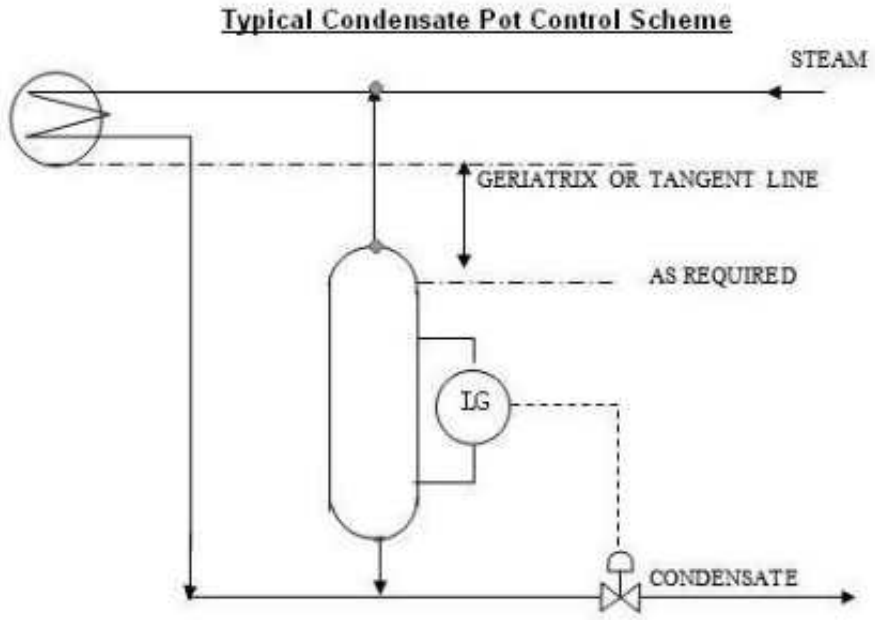
6.3.4
Condensate recovery from steam consumers shall be done in one of the following ways.

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1	Flash VHP, HP and MP condensate for recovery of LP steam. Return LP condensate under own pressure to utility system. Condensate return shall be two-phase.	NO
2	Flash VHP, HP and MP condensate for recovery of LP steam. Pump out LP condensate after atmospheric flashing	NO
3	Flash VHP, HP and MP condensate for recovery of LP steam. Cool LP condensate to 90 DEG C in air-cooled exchanger and return under own pressure to utility system.	NO
4	In addition to the pure/surface condensate, the suspect condensate should also have a HC detection/ conductivity analyser to monitor the extent of leakage.	YES
5	Flash VHP, HP, MP condensate at MP, LP level condensate flash drum for recovery of MP, LP steam. Flash LP condensate from flash drum along with other LP condensates from unit to an atmospheric flash drum with vent condenser(preferably air cooled exchanger). Pump Atmospheric condensate to OSBL. The above philosophy shall be followed unless a different philosophy is specified by unit licensor.	YES

6.3.5 CONDENSATE CONTROL FOR STEAM CONSUMERS

For steam flows upto 500 kg/hr to a steam-heated exchanger, steam traps shall be considered for condensate removal. For larger consumers, condensate shall be collected in a pot provided with a level control valve for condensate withdrawal. The condensate pot top elevation shall be 300mm lower than the exchanger geriatrix or bottom tangent line unless warranted otherwise from a process control scheme consideration.



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6.4 WATER SYSTEMS

6.4.1 WATER QUALITY

The quality of treated raw water/ circulating cooling water / DM Water / Boiler Feed Water as applicable are as per Table below:

S.No.	Parameter	Treated raw water (NOTE-2)	DM Water	BFW	Recirculating Cooling Water
1	pH	7.5-8.5	6.5-7.0	8.5-9.5	7.5-7.8/7.8(Max)
2	Turbidity, NTU (5 min settled)	<1	Nil	Nil	<5 / 10(Max)(Note-4)
3	Total suspended solids, mg/l	<0.5	Nil	Nil	<5 / 10(Max)(Note-4)
4	Total Dissolved solids, mg/l	200-250	<0.1	<0.5	800/1000(Max)
5	Conductivity @ 20 Deg C, micromho/cm	-	<0.2		
5a	Specific electrical conductivity at 25 deg.C measured after Cation exchanger in the H+ form and after CO2 removal, micromho/cm	-			
6	M-alkalinity as CaCO3, ppmw	95-120			100/120(Max)
7	Ca hardness as CaCO3, ppmw	60-75			280-350/360(Max)
8	Total Hardness as CaCO3, mg/l	154-190			616-760/780(Max)
9	Total Silica as SiO2, ppm	<25			<100 / 100(Max)
9a	Total reactive silica as SiO2, mg/l		<0.02	0.02 max	
10	Colloidal silica, mg/l	<5			<20/20 (Max)
11	Chloride as Cl, ppmw	20-25			80-100/100(Max)

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S.No.	Parameter	Treated raw water (NOTE-2)	DM Water	BFW	Recirculating Cooling Water
12	Free Residual chlorine, mg/l	-			
13	Sulphate as SO4, mg/l	35-45			420-540/550(Max)
14	Organophosphate as PO4, mg/l	-			10-15 / 15 (Max)
15	Dissolved Oxygen, mg/l	-		<0.005	
16	Dissolved Iron (as Fe), mg/l	-			
17	Iron + Manganese, mg/l	<0.1			0.4/0.5(Max)
18	Organic matter as KMnO4 at 100 Deg C, mg/l	<5	<1	<5	<20/20(Max)
19	Total copper as Cu, mg/l		<0.003	<0.003	
20	Zinc as Zn, mg/l	-			1-2 / 2(Max)
21	Zinc Sulphate as Zn, mg/l				
22	Polymeric Dispersant, mg/l				20-30/30(Max)
23	Benzotriazole, mg/l				0.5
24	Inorganic Polyphosphate as PO4, mg/l				8-10 / 10(Max)
25	Oxidizing biocide, free ClO2, mg/l				0.2-0.4 / 0.4(Max)
27	Corrosion rate miles/year				<3 / 3(Max)
28	Total iron as Fe mg/l		0.02 max	<0.03	
29	Sodium , mg/l		<0.01		
30	Cation conductivity at 25 deg C or ambient micro mho/cm			<1 after addition of Hydrazine/carbohydrazine and morpholine.	
31	Oil		Nil		<10/10(Max)

Notes:
1. For further details on water qualities, reference is to be made to Part-A utility system design basis.
2. Treated raw water is same as service water and potable water.
3. Total alkalinity will find its own level depending upon maintained pH.Total alkalinity as CaCO3 will be about 100-120 ppm.
4. 10 ppm is at the outlet of cooling tower sump. SS filter shall be designed for the inlet value of 60 ppm.

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6.4.2

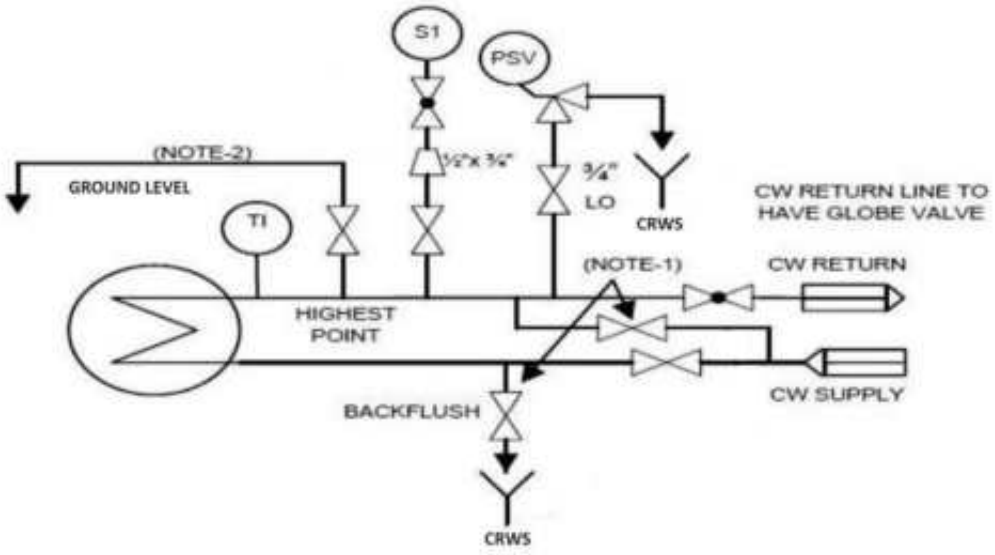
Owner can choose to provide back flush arrangement for cooling water consumers connected to a recirculating / cooling water system.

1	All cooling water consumers	YES
2	Only overhead condensers	NO
3	Cooling water consumers with water line sizes greater than ____ NB	NO

If owner has any other preference, specify below:

DELETED

6.4.2.1 TYPICAL COOLING WATER PIPING AND INSTRUMENTATION AT HEAT EXCHANGERS



Notes:
1. Backflush lines to be provided with
i) Same size as main cooling water line when main line size is <=6″.
ii) One size lower to be provided for main line size > 6″ upto 10".
iii) For line size above 10", backflush line size shall be limited to maximum of 10".
2. 1" Vent valve to be provided for all CW exchangers.
3. Sample point is to be provided at the highest point to facilitate venting.

OWNER TO CONFIRM IF THE BELOW REQUIREMNT IS TO BE FOLLOWED.

a). Spectacle blind shall be provided in backflush line for critical equipment. YES

Owner's Requirement:
1) End dummy (flanged connection) to be provided at the d/s of backflush drain towards funnel.
2) The CWS line to the exchangers should have a minimum straight length in order to carry out a flow survey with an ultrasonic meter.
3)For initial flushing of cooling water lines, jump-over between Cooling water supply and
cooling water return header shall be provided with a line and spectacle blind just

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outside unit battery limit in OSBL as well as at end of the main header/sub header in ISBL. A drain provision shall be provided to grade/SS from the ISBL jump-over.

6.4.3

All pump bridle cooling water lines (for bearing cooling, gland cooling, seal cooling) shall be minimum 1.5" NB. Tapping for BCW should be taken from recirculating cooling water supply header within respective unit ISBL.
Owner to indicate if otherwise:

Owner Preference:
1)BCW return lines to be routed to cooling water sump through a separate header. This is applicable for petrochemical cooling tower i.e CT-01 and CT-02.

2)Facility to check flowing of bridle cooling water e.g. Sight Glass and pressure indication or, open funnel to be provided. In addition, for each connection separate routing to SS will be provided to examine and ensure flow through the line by operator.

3)Individual connection for pumps should have isolation valves and flange on downstream at main header.

6.5 COMPRESSED AIR & NITROGEN SYSTEMS

6.5.1 PLANT AND INSTRUMENT AIR SPECIFICATION

The specifications of plant air and instrument air are indicated in below:

Owner's Requirement:

Interconnection will be provided between the existing refinery nitrogen distribution network and petrochemical nitrogen distribution network .Prior to opening this connection operator to ensure that petrochemical nitrogen network will not be adversely affected. This will be further verified while preparing the utility design basis and nitrogen distribution P&IDs.

S.No.	Parameter	Plant Air	Instrument Air
1	Dew Point at atmospheric pressure	Water free	(-)40 DEGC
2	Oil Content, ppm	nil	nil

6.5.2 INERT GAS SOURCE

Inert Gas (Nitrogen) shall be generated from a cryogenic air separation unit.

6.5.3 INERT GAS SPECIFICATION

S.No.	Parameter	Inert Gas
1	Water Dew Point at atmospheric pressure	(-)100 DEG C
2	Oil Content, ppm	Nil
3	Nitrogen purity, vol%, min	99.99
4	Oxygen content, vol ppm	3 max
5	Carbon dioxide content, vol ppm	1 max
6	Carbon monoxide content, vol ppm	Traces

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S.No.	Parameter	Inert Gas
7	Noble Gas, vol ppm	Balance

Unit and Offsite designers are required to indicate whether there is requirement of prioritized continuous demand or intermittent large demand of Plant Air, Instrument Air or Inert Gas.

6.6 FUEL SYSTEMS

6.6.1 LIQUID FUEL SYSTEM

Liquid fuel system for the project shall be one of the following.

1 Liquid fuel system applies to this project. YES
2 Existing liquid fuel system in Refinery shall cater to this project. YES
3 One new single liquid fuel system for this Project. NO

6.6.1.1 PROPERTIES

S.No.	Parameter	UOM		
			BLEND 1	BLEND 2
1	Name		UCO +HCU Kero + HCGO	HCU Kero + HCGO
2	Density @15 Deg C	kg/m3	830	798.6
3	Sulphur content	wt%	0.5, max	0.5, max
4	Nitrogen content	ppmw	465	472
5	Nickel content	ppmw	<1	<1
6	Vanadium content	ppmw	<1	<1
7	Sodium content	ppmw	1	1
8	Flash Point	Deg C	48.6	41.32
9	Kinematic Viscosity at 50 °C	cSt	3.3	0.94
10	Kinematic Viscosity at 100 °C	cSt	1.4	0.57
11	Initial Boiling Point @ 1atm,, ASTM D86	Deg C	142	144
12	Conradson Carbon Residue	wt%	0.04	0.04
13	LHV	kcal/kg	~10200	~10200

6.6.2 FUEL GAS SYSTEM

Fuel gas system for the project shall be one of the following.

1 Fuel gas system applies to this project. YES
2 New fuel gas system for this project independent of existing Fuel Gas system. NO
3 New fuel gas system for this project integrated with existing Fuel Gas system. YES
4 Preferential RLNG consumers identified- HGU YES

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5 RLNG back-up for internal fuel gas YES

6.6.2.1 PROPERTIES

Fuel gas properties to be updated based on final BDEB of all the units.

S.No.	Parameter	UOM						
1	Name		Fuel Gas	Fuel Gas	Fuel Gas	R-LNG	LPG	
2	Case #		Normal	Low MW	High MW		Startup	
3	Composition							
	Hydrogen	mol%	48.72	75.56	42.29	-	0.0	
	CO2	mol%	0.08	0.05	0.12	0.0-0.16	0.0	
	CO	mol%	0.0	0.0	0.0	-	0.0	
	Oxygen	mol%	0.0	0.0	0.0	0.2	0.0	
	H2S	ppmv	150 ppmv	150 ppmv	150 ppmv	4 ppmv	0.0	
	Water	mol%	0.55	0.07	0.8	-	0.0	
	Methane	mol%	27.10	13.54	33.74	92.38-95.99	0.0	
	Ethane	mol%	13.86	6.96	15.4	2.85-5.92	2.0	
	Ethylene	mol%	1.03	0.64	1.49	-	0.0	
	Propane	mol%	3.48	1.37	2.33	0.25-1.48	36.0	
	Propene	mol%	0.29	0.18	0.42	-	0.0	
	i-Butane	mol%	0.68	0.26	0.38	0.03-0.34	26.0	
	n-Butane	mol%	2.33	1.27	0.46	0.04-0.34	35.0	
	Butenes	mol%	0.01	0.01	0.02	-	0.0	
	C5+	mol%	1.84	0.07	2.57	0.0-0.06	0.0	
	NH3	mol%	0.01	0.0	0.01	-		
4	Molecular weight		14.65	7.62	15.05	16.75-17.52	52.7	
5	LHV	kcal/kg	12420	14840	12250	11800	10980	
6	Nitrogen	mol%				0.12-0.43		

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Notes:
1. Main burner and pilot burner fuel gas are same. R-LNG backup considered for fuel gas in the Refinery and petrochemicals complex.
2. OSBL Fuel gas systems including new heaters to be designed for high H2 content for PSA trip case.

6.6.3 BASIS OF DESIGN FOR FUEL GAS KOD / FUEL GAS LINES

Fuel gas liquid knockout drums and tracing for piping shall be:

1	Separate KOD for each process unit.	YES
2	Common KOD for a group of functionally clustered units, as indicated:	NO
3	Fuel gas lines shall always be heat traced from ISBL KOD upto individual furnaces.	***YES***
4	Fuel gas lines will be steam-traced from source upto ISBL KOD.	NO
5	Fuel Gas lines in OSBL shall be electric traced	***YES***
6	Fuel gas piping shall be steam traced within and outside the unit battery limits.	***NO***
7	KOD drain shall be routed to a closed system	YES
	Owner''s Requirement:	
a)	Fuel gas KOD shall be located preferably close to Heaters	YES
b)	***Fuel gas network shall be electrically traced.***	***YES***

6.6.4 BASIS OF DESIGN FOR FUEL OIL HEATING SYSTEM

In-line strainers are required for burner piping for each unit. These shall be located not more than 20 meters upstream of the burner manifold and shall be provided as 1 serving + 1 spare strainer with mesh sizes 100 for Fuel Oil, 200 for Fuel Gas and 200 for atomizing steam. All mesh sizes are Tyler standard.

In-line strainers for FO, FG and atomizing steam to be provided on common header supplying to all heaters within each unit.

Hot Liquid fuel temperature shall be assumed to drop by 5 deg C between unit battery limits and burner manifold.

Burner turndown requirements have to meet at liquid fuel pressures at burner not less than the normal anticipated return header pressure indicated in Table-6.1. The fuel oil system shall be designed for a recirculation rate of 2:1

6.7 FLARE SYSTEMS

6.7.1 FLARE SYSTEM DESIGN PHILOSOPHY

1	Flare system design philosophy:	New facility
2	Details of flare system:	

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2.1	New hydrocarbon flare system design will consider:	Demountable flare stack required	The complex shall have the following flare systems: a) Common Hydrocarbon flare system for the flare releases from the Ethylene Cracker and its Associated Units (ECU+AU), Offsite facilities. b) Hydrocarbon flare system for the Cryogenic Ethylene storage tanks in Offsite. c) Hydrocarbon flare system for Polymer and Butene-1 units.
3	Acid/ Sour gas flare will be considered for Acid/ sour gas routing.		Sour flare system for the Caustic oxidation facility of the ECU+AU.
3.1	Location for acid / sour gas flare will be:		The acid/ sour flare shall be mounted on the same derrick structure as hydrocarbon flare
4	Hydrocarbon flare header	Hydrocarbon Flare Will be segregated as given below: 1) LP flare 2) Polymer flare 3) LLP flare	
5	Special flare stack requirement	Demountable type of flare stack for LP flare, Polymer flare, LLP flare and main sour flare. Smokeless Flare also to be considered.	
6	Other Requirements	1. Flare mitigation shall be considered for minimizing flare load. SIL-3 loops and corresponding redundant elements shall be identified and implemented.	If owner has any specific additional or different preferences, indicate below:

6.7.2 PHILOSOPHY OF FLAMMMABLE VAPOR RELIEF

Philosophy of relieving flammable vapours shall be:

1	Vapour releases of all molecular weights to be connected to flare system	YES
2	Vapour releases below molecular weight of _____ vented to atmosphere.	NO
3	Hot hydrogen-rich gases (>300 C) vented to atmosphere	NO
4	Others	
4.1	Flare KOD pumps shall be provided with emergency power back up (as per OISD requirement)	YES
4.2	Flare header to be designed for steam out condition (with LP steam)	YES
	Owner''s Requirement:	
a)	Flare KOD to be provided with level transmitter and indication at respective unit DCS.	YES
b)	Liquid level and residence time for horizontal KO drums shall be min. 30 mins.	YES

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c) The liquid from flare (KOD) to be routed to the CBD/slop system with automatic On/Off valve and pump (auto cut in high level). YES

6.7.3 BASIS OF DESIGN FOR FLARE KOD SIZING

For adherence to OISD standard # 106, EIL recommends that individual units shall be provided with a flare knock-out drum whenever significant liquid relief is anticipated from the pressure relieving devices, apart from the main knock-out drums at the flare.
Licensor/ Unit designer / contractor shall specify a horizontal unit flare KOD, sized to separate out liquid droplets down to a size of 400 micron.

Owner's Requirement:

Flare knockout drum to be provided at each process unit battery limit

6.7.4 FLARE BACK PRESSURE

Maximum flare backpressure shall be considered for sizing of pressure relief devices:

S.No.	Flare system	Superimposed backpressure(kg/cm² g)	Total Built-up back pres. at unit battery limits(kg/cm² g)	Total Built-up back pres. at PSV outlet(kg/cm² g)
	Existing Flare System:			
1	HC flare	0.1	1.4	1.7
2	Acid Flare		0.5	0.7
	New Flare System:			
1	Low Pressure HC flare	0.1	1.5	1.7
2	***Polymer Flare***	***0.1***	***1.5***	***1.7***
3	LLP Pressure HC Flare	0.05(Note-1)	0.5(Note-1)	Note-1
4	Acid Gas flare	0.1	***0.5***	***0.7***

Note-1: This Back Pressure for LLP Flare is corresponding to PP unit and for SWING Unit LLP Backpressure shall be 0.035 / 0.35 kg/cm2g.

6.7.5 BASIS OF PSV OVERPRESSURE

Overpressure (as percentage of set pressure) for sizing relief valves shall be:

S.No.	Contingency	Condition-1	Condition-2
1	Steam generating / consuming equipment	5% (as per IBR)	5% (as per IBR)
2	Fire case	21%	as per designer

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S.No.	Contingency	Condition-1	Condition-2
3	Thermal relief (piping / equipment)	25%/10%	as per designer
4	Operational failures	10%	as per designer

Legend:

Condition-1: Low pressures < 70 kg/cm^{2}g
Condition-2: High pressures > 70 kg/cm^{2}g

Notes:

6.8 LIQUID PUMPOUT & DRAIN SYSTEMS

6.8.1 NON-CONGEALING HYDROCARBON DRAINS PHILOSOPHY

1	Connect, equipment to buried closed blow down (CBD) network, leading to a closed blow down drum. Design CBD system for 90 °C assuming only cooled liquid drains. Intermittent high temperature drainage can be tolerated by system. CBD discharge shall be through a water-cooled exchanger to off plot.	NO
2	Connect, equipment to buried closed blow down (CBD) network, leading to a closed blow down drum. Design CBD system for highest anticipated drainage temperature with associated higher cost towards piping coatings, thermal expansion, etc. CBD discharge shall be through a water-cooled exchanger to off plot.	NO
3	Connect, equipment to over ground evacuation network, leading to an evacuation pump and passing through a water-cooled exchanger. Residual drains routed to buried closed blow down system. Fuel Gas or inert gas will be required to displace equipment inventory.	NO
4	Connect equipment drain to buried closed blowdown (CBD) network, leading to a closed blow down drum (which shall be placed in RCC pit and sand packed by vibro compression with lean concrete on top – 100mm thk. Cathodic protection is required). Design CBD for 200 °C. CBD drum shall have cooling coil/ heating coil, as applicable. CBD discharge shall be through a water-cooled exchanger to off plot. However, applicability of water-cooled exchanger to be decided on case-to-case basis.	YES
5	Any hydrocarbon/non-hydrocarbon liquid drains generated in the polymer units shall be collected and reused, with suitable treatment/ separation facilities within the process unit, which will be specific to the technology selected for the unit. All facilities required for this shall be considered within the unit scope.	YES

6.8.2 SIZING OF BURIED CLOSED BLOWDOWN DRUM / PUMP

EIL recommends to follow a standard size of buried CBD drum and pumps. Philosophy for unit design will be:

Owner's Requirement:

(1) CBD process inlet / outlet lines to have proper isolation.
(2) CBD drum shall be provided with nitrogen purging provision with double block, blind and bleeder arrangement.
(3) CBD process inlet line strainer shall be 1+1 with individual isolation/ drain facility.
(4) CBD header to be provided with utility connection to flush out with steam (if required).

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(5) Nitrogen purging provision with double block, blind and bleeder arrangement shall be provided

1	Standard size of 40m3 for vessel and 40 m3/hr for pump (1 operating + 1 spare) unit to cater to only residual drains.	YES
2	Individually sized for each unit for single largest equipment inventory.	NO
3	Others:	
a)	The CBD drum shall be a horizontal underground vessel, floating with flare with a provision for venting to atmosphere with double block valve/ blind isolation assembly with flame arrestor.	YES
b)	Two vertical submerged centrifugal pumps (one operating and one installed spare) shall pump out the drum inventory to a slop header at a battery limits pressure of 5 kg/cm2g.	
	i. CBD pumps will have emergency power supply.	YES
	ii. Provision for operating both the pumps in parallel will be considered.	YES

6.8.3 CONGEALING HYDROCARBON DRAINS

1	Separate from system for non-congealing hydrocarbon drains.	YES
2	If combined with non-congealing drains will be:	
2.1	Provided with combined cooling and heating coil	NA
2.2	Provided with separate cooling and heating coils	NA
3	Displace equipment inventory, for liquid filled equipment like heat exchangers, with flushing oil to slop header for cool drains (<90 °C) or to an available product rundown for compatible temperatures. Hot drains to be displaced through an identified cooler.	YES
4	Pump out inventory from other equipment by an independent pump out pump through the identified cooler.	NO

6.8.4 STEAM GENERATOR BLOW DOWN DRAINS

1	Flash VHP, HP & MP blow downs for recovery of LP Steam (if adequate steam generation is feasible). Flash LP blowdown at atmospheric pressure. Cool blowdown to 40 DEG C in cooling water exchanger and then pumped to RO-DM Plant as feed.	YES
2	Direct service water quench of blow downs and routed to storm water sewer.	NO
3	Cool blow downs to 40 DEG C in cooling water exchanger and route to storm water sewer.	NO
4	Cool blow down to 40 DEG C in cooling water exchanger and route to separate blowdown sewer / pump to blowdown line as required.	NO

6.8.5 CAUSTIC DRAINS

All bulk caustic inventory drains shall leave process unit under own pressure or be pumped out. For residual caustic drains such as unpumpable vessel bottoms, level gage drains, etc., one of the following shall be adopted: Owner to indicate.

1	Provide underground caustic CBD system with buried vessel and pump out.	NO
2	Collect residual drains by temporary facility like drums and jars.	NO
3	Collect residual drains by temporary facility and route to neutralization pit.	YES

6.8.6 ACIDIC DRAINS

1 Amine systems : -

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1.1	Individual units handling amine will be provided with separate buried amine closed blow down system from where amine stream will be pumped to regeneration unit.	YES
1.2	Bulk amine drains shall be only lean amine, displaced to amine storage tank. All rich amine streams shall be routed to amine regeneration section under own pressure or under inert gas pressure or displaced with water.	NO
1.3	Residual amine drains shall be connected to a buried amine closed blowdown system located in the Amine Regeneration section. Amine-bearing drains from Amine Wash sections shall be routed to this buried vessel or collected through temporary facilities.	NO
1.4	Cathodic protection for Amine CBD shall be provided.	YES
2	Sulphuric acid systems : -	
2.1	When consumed only in non-process areas, temporary facilities will be defined.	NO
2.2	Suitable neutralisation facilities within acid tank dyke shall be provided and also dyke shall be considered for H2SO4 storage	YES
3	Acidic wash water : -	
3.1	Acidic wash water from sources such as Air Preheater washings shall be routed to oily water sewer.	NO
3.2	Neutralisation facility to be provided for acidic wash water such as air preheater washing water. Centralised facility to be explored if feasible.	YES
4	Process sour waters : -	
4.1	Sour water within sour water stripper Unit which will have large inventory of sour water will be provided with sour water blowdown drum for any drains. For other units, all sour water will be pumped to sour water stripper unit . The residual low holdup drains (very infrequently) will be drained in OWS after dilution.	YES

6.8.7 WATER DRAINS

1	Flare water seal drum drain	
1.1	To oily water sewer	NO
1.2	To be routed to separate sump with pump out arrangement to SWS unit	YES

6.9 ELECTRICAL SYSTEMS

6.9.1 SYSTEM DESIGN

Following Standard voltage ratings will be applied to various equipment & services.

S.No.	Type Of Load	Power	Supply	Frequency	Phase	Voltage
1	Lighting		AC	50 +/- 3%	1	240 V +/- 10%
2	Instrumentation Power supply		AC UPS	50 +/- 3%	1	110 V +/- 10%
3	UPS (UPS Output specifications)		AC	50 +/- 1%	1	110 V +/- 1%
4	Motor					
4.1		P<0.18 kW (Except MOV's)	AC	50 +/- 3%	1	240 V +/- 10%

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S.No.	Type Of Load	Power	Supply	Frequency	Phase	Voltage
4.2		0.18 kW <= P <= 132 kW (Except VFD Motors)	AC	50 +/- 3%	3	415 V +/- 10%
4.3		>132 kW	AC	50 +/- 3%	3	6600 V +/- 10%

6.9.2 REACCELERATION FEATURE

Designer may specify reacceleration feature in some critical pump motor drives to ensure faster start-up or to minimize plant down time in case of process disturbances due to momentary voltage dips. Owner to check one:

1	No reacceleration feature is desired	NO
2	Reacceleration to be specified for identified motors to cover brief interruptions upto 5 seconds in normal power supply. Such pumps to be identified based on designers own experience.	YES
3	Re-acceleration feature is acceptable for critical pump motors of 415 V rating (MV) and auxiliary drives of HV motors such as Lube oil pumps, etc. For HV motors re-acceleration feature shall be provided wherever required for process consideration.. Provision for metering number of hours run shall be given for all HV motors and large MV motors of rating above 55 KW & up to 132 KW i.e (55 KW < Large MV MOTOR <= 132 KW)	YES
4	In case of very large number of drives requiring reacceleration facility, stage wise grouping of such driver depending upon permissible time of failure shall be provided by Licensor. Same shall be finalised during detail engineering.	YES

6.9.3 EMERGENCY POWER

Emergency power supply may sometimes be stipulated to aid in safe shutdowns or to minimize impact of normal power supply failure. Analysis of such emergency power supplies usually lead to a requirement of continuously running a diesel generator or to ensure backup motive steam drives in power plants. Requirement of emergency power may be minimized through strategies such as steam turbine drives for standby pumps, steam turbine drive for some cooling water pumps, etc. Nominal requirements of emergency power such as for local panels, frame heating of compressors, etc., can be then examined and suitably implemented. Emergency power drive requirement can be also stipulated to reduce overall flare load during General Power failure depending on feasibility.

OWNER'S SPECIFIC REQUIREMENT:

To meet the complex's emergency requirements during Power failure (Emergency lighting, DCS UPS, etc.) an appropriately sized DG set will be provided.

Emergency Power for Critical drive(s) of the unit(s) will be provided by Electrical Power. Such critical drive(s) will be identified by unit's designer/ Licensor.

Unit designer/ licensor shall specify the requirement of emergency power, if any, within ISBL based on designer's own experience.

If owner has any specific additional or different preferences, indicate below:

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OWNER TO CHECK IF THE BELOW IS REQUIRED:

1. If emergency oil pump is provided for compressor, the same to be provided with emergency power backup in case of AC motor drive. YES
2. Emergency power back up shall be provided for CBD pumps & flare KOD pumps. YES

6.10 CAUSTIC STORAGE, PREPARATION, DISTRIBUTION

6.10.1 RECEIPT, PREPARATION, DISTRIBUTION

6.10.1.1 FRESH CAUSTIC RECEIPT

EIL recommends that commercial caustic (46 WT%) required in a project be received by the owner in a centralized non plant area like ETP/ DM plant area.

Owner's preference:

6.10.1.2 FRESH CAUSTIC PREPARATION

EIL recommends that caustic of highest concentration(20 wt%) required in the project be also prepared in the same area as defined in Section 6.10.1.1. This caustic is pump-able to all consuming units and separate solution making arrangement shall be provided if a unit requires lower strength.

If owner prefers otherwise:
NOTE-1 : For cracker 12 wt% caustic is required at unit battery limit. Additional facility to be provided in offsites

6.10.1.3 FRESH CAUSTIC DISTRIBUTION

1	Pumped from central storage area directly to consuming units, whether needed continuously or needed in batches.	NO
2	20% caustic will be prepared and supplied from centralized RO/DM to individual units. Further dilution facility and storage of lower concentration caustic to be provided within the unit to meet unit's requirement.	YES
3	Stored in consuming units and pumped thereafter for continuous or regular batch consumers such as LPG contactors or injections.	NO

6.10.2 CAUSTIC HANDLING EQUIPMENT DESIGN

Caustic handling equipment shall be of Carbon Steel construction and stress relieved whenever required for the operating temperatures selected.

6.10.3 SPENT CAUSTIC HANDLING

EIL recommends that any process unit discharging spent caustic from a contactor with light hydrocarbons shall degas the stream in an atmospheric vessel floating with flare header and then pump this out to effluent treatment plant or to spent caustic storage. Spent caustic storage in unit area allows reuse of such caustic in other potential areas. Owner prefers:

1	Spent caustic storage in unit area for reuse by other consumers	NO

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2 Spent caustic totally routed to effluent treatment plant YES

If owner prefers otherwise:

6.10.4 BATTERY LIMIT CONDITIONS FOR CAUSTIC

Battery limit conditions at unit battery limits for caustic distribution shall be as below:

S.No.	Caustic stream	Operating Pressure P(Kg/cm² g)	Operating Temperature T(DEG C)	Mechanical Pressure P(kg/cm² g)	Mechanical Temperature T(DEG C)
1	Fresh Caustic (Note-1)	***6.0***	***45(Max)***	***15.0***	***65***
2	Spent Caustic (Note-2)	6.0 (HOLD)	45 (HOLD)	BY DESIGN (HOLD)	65 (HOLD)

NOTES:
1. Operating and Design conditions shall be finalized based on the operating conditions in the source unit/units of Fresh Caustic.
2. Operating and Design conditions shall be finalized based on the operating conditions in the source unit/units of Spent Caustic.

6.11 FLUSHING OIL SYSTEMS

6.11.1 NORMAL FLUSHING OIL (FLO)

Normal flushing oil (FLO) shall be straight-run light gas oil, charged to a refinery header from the crude unit to a pressure of 7 kg/cm2 at 40 deg C. FLO is also stored in offsites (DHDT feed tanks are used for this purpose) from where it can be charged as a backup into the same header. This FLO is to be used for startup / shutdown flush out of heavy oil equipment and also as external flush for pump API seal plans, instrument flushing as suited. The battery limit conditions at unit battery limits are:

Owner's requirement:

1)Normal FLO pump drives:
1.1 Running motor YES
1.2 Running turbine NO
1.3 Spare motor YES
1.4 Spare turbine NO

2)Booster FLO pump drives:
2.1 Running motor YES
2.2 Running turbine NO
2.3 Spare motor YES
2.4 Spare turbine NO

S.No.	Stream	Operating Pressure P(Kg/cm² g)	Operating Temperature T(DEG C)	Mechanical Pressure P(kg/cm² g)	Mechanical Temperature T(DEG C)
1	FLO	BY OWNER	BY OWNER	***16.5***	***65***

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6.11.1.1 FLUSHING OIL SYSTEM DESIGN

When also used as external flush for pump API seal plans, or for purging instruments in congealing service, the FLO needs to be boosted, the pressure becoming known only during detailed engineering.

Owner to select from options:

1	Centralised FLO booster system to receive FLO from offsite in an adequately sized surge vessel and pump it into a higher pressure header connected to relevant units.	NO
2	Individual unit FLO booster system to receive FLO from offsite in an adequately sized surge vessel and pump it to required higher pressure in unit.	YES
3	High pressure FLO pump located at offsite FLO tank, charging high pressure header	NO

If owner has any specific additional or different preferences, indicate below:

6.11.2 HEAVY FLUSHING OIL (HFLO)

Tie in will be from existing HFLO system.

6.11.3 LOW SULPHUR FLUSHING OIL (LSFLO)

NOT APPLICABLE

6.12 HOT OIL SYSTEM

Hot oil system is required as:
1) Centralised facility: NO
2) Unit wise facility for: Polymer Units based on Licensor requirement - YES

6.13 OTHER UTILITY SYSTEM CONSIDERATIONS

If owner has any other consideration or constraint related to utility systems for the project, these shall be filled in below:

(1) Chemical dosing system:
(a) Rain guard
(b) Chemical transfer pump for transferring chemicals from drum/barrels.
(2) Provision to be provided for receiving ISO containers for large volume consumption chemicals, for ex. DMDS etc.
(3) TSP dosing to be provided at individual units separately for individual boilers/ steam generators. Separate level of steam generators within a unit will be fed through separate pumps from common vessel.

7.0 GENERAL DESIGN PHILOSOPHY

7.1 ENERGY INTEGRATION

Improvement in overall energy efficiency shall call for unit-level and total plant-level optimisation of energy. Designer of a particular unit shall indicate the following at the outset of design activities:

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(a) The total energy consumption expressed as equivalent fuel oil (Btu/bbl or FOE%:specific energy consumption (MBN, EII, etc.) and a comparison with Solomen bench marks or equivalent.
(b) The preferred temperatures for hot feeds and products from an energy integration standpoint, if these are significantly different from that stipulated in unit BEDB.
(c) Energy shall be preferentially recovered into process streams. Steam generation shall be considered thereafter to recover excess available energy. Steam generation levels shall be chosen to preferably match the corresponding steam level demand within unit.
(d) Low-level energy recoverable for external consumption, say, for Boiler Feed Water/ DM water preheats which can be used in other Units. This requirement shall be chosen to match the total complex requirement.To the extent possible, hot stream integration shall be done for inter/ intra units for energy optimization. This is to be discussed during kick off meeting with licensors and holistic approach to be adopted while integrating between process units of different licensors.

Owner's Requirement:
(a) EII should be as low as possible and comparable with world best and energy number to be made as low as possible.
(b) The unit design shall be optimized & total energy consumption shall be optimized with the appropriate usage of new technologies such as high efficiency trays/packing, high efficiency heaters, heat integration, optimization of heat recovery by pinch analysis, energy efficient ejector design, VFD drives etc.
(c) All the motors in BPREP shall be FLP Energy efficient IE-3 motors for GG-IIA/B/C under Zone-1 or 2 as per area Classification.

7.2 VACUUM DESIGN

7.2.1
Vacuum design conditions shall be stipulated for:
(a) Equipment operating normally under vacuum conditions
(b) Equipment that are subjected to vacuum conditions during start-up, shutdown, regeneration or evacuation
(c) Liquid full vessels that can be blocked in and cooled down
(d) Distillation columns and associated equipment that can be subjected to vacuum conditions through loss of heat input.
(e) All steam users consuming steam during normal operation.
(f) Pressure vessels containing liquids having vapor pressure at minimum ambient temperature less than atmospheric pressure.

7.2.2
Vacuum design conditions are not to be specified for the eventuality of blocking in after equipment steam-out or operator mal-operation.

Owner's Requirement:

Vessels operating under vacuum conditions shall be provided with a rupture disc arrangement in addition to relief valves, with rupture disc. To be decided on a case to case basis.

7.3 FEED, INTERMEDIATE AND PRODUCT STORAGE

The design specifications of tankage outside the unit battery limits shall be prepared by offsite designer, as defined in the relevant scope of work. Should the designer of a particular process unit have specific requirements towards feed, product or intermediate product tankage such as segregation of cracked or straight run / uncracked feed etc. inert gas

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blanketing and the required minimum purity of the inert gas, material of construction, etc., the same shall be conveyed during preparation of BEDB-Part A or relevant licensor document.

If owner has any other preference, specify below:
For storages, TFMS shall incorporate guidelines / recommendations from relevant OISD/API RP 545/API 2350/MB Lal committee report (for example; ROSOV, Rim seal foam protection, High Volume Long Range Monitors, bypass conductors in floating roof tanks for lightening protection, electrical insulation of all gauge and guide pole assemblies, gas detectors, level measurement practices etc.)

7.4 BASIS OF DESIGN FOR AROMATICS HANDLING

7.4.1
Special precautions could apply towards handling process streams containing aromatics.

Parameter	EIL Default	Owner Preference
Benzene content greater than (wt%) :	1	Same as EIL Default
C6 through C9 aromatics greater than (wt%) :	25	Same as EIL Default

7.4.2 AROMATICS HANDLING DESIGN PROVISION

The design and equipment provisions toward special precautions shall be:

1	Closed Sampling point piping as defined in standard legend P&ID	YES
2	Dual mechanical seals for pumps	YES
3	Connecting the following to the unit closed blow down system/ as per service:	
3.1	Vessel and pump drains	YES
3.2	Drains of equipment which can be isolated for maintenance	YES
3.3	Control valve, level gage and level instrument drains	YES

If owner has any known constraints or any other preference, specify below:

OWNER TO CHECK IF BELOW IS REQUIRED:
a. Double block isolation with provision for blinding to be provided for all drains. YES
b. Licensor to consider closed circulation type sample points/ Closed sampling systems type with break off flange provision. Draining/ venting of sample to be strictly avoided. YES

7.5 BASIS OF SELECTION OF METALLURGY

7.5.1 GENERAL GUIDELINE

Metallurgy shall be specified by respective unit designer based on process considerations. If a unit designer has specific stipulations towards either an associated upstream or downstream unit for, say, piping metallurgy, exchanger tube metallurgy, etc., the same shall be identified by unit designer during the finalization of BEDB.

Piping metallurgy shall follow an unified overall Piping Material Specification (PMS).

In case overall project PMS does not cover some of the new requirements, Licensor shall furnish the specification for allotment of PMS class (by PMC) for necessary incorporation of the same in the P&IDs to be issued for engineering.

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7.5.2 MINIMUM METALLURGY FOR WATER COOLED EXCHANGER

For cooling mediums for heat exchangers, metallurgy can be selected for either long tube life at a higher initial cost or for shorter tube life at a lower initial cost with up gradations being decided in the course of operating the plant. In specific cases superior metallurgy is dictated by considerations such as sea water cooling, compatibility with NACE MR-01-75, etc., and shall be as per designer.

The minimum metallurgy preferred by owner are:

Type of service	Shell	Tube	Channel	Channel cover	Tube sheet	Remarks
Re-circulating Cooling Water (with Treated Raw water make-up)		KCS	KCS	KCS	KCS	Note-1
Tempered Water		KCS	KCS	KCS	KCS	Note-1,2
Console Lube oil coolers	-	-	-	-	-	Metallurgy shall be as per the requirement of package vendor/ Equipment Design Basis

Notes:
1. The minimum metallurgy indicated here are general guidelines only, the final metallurgy shall be decided by the Licensor/ Designer meeting design requirements.
2. Tempered water quality is same as Boiler Feed Water (BFW) quality.
3. In case cooling water is in the Shell side, Unit designer philosophy with respect to material of construction shall be followed.
4. If Carbon steel is specified on tube side for recirculating cooling water service, the minimum material of construction for CONSOLE LUBE OIL COOLERS shall be as per respective governing API Codes of main equipment. However minimum metallurgy for lube oil coolers shall be SS and above.

7.5.3 METALLURGY FOR STEAM TRACER

1 As a default all steam tracer shall be :

Stainless Steel	NO
As per PMS	YES

7.5.4 CATHODIC PROTECTION REQUIREMENT FOR COOLING WATER EXCHANGERS

1 ***Requirement of coating plus cathodic protection for cooling water side of exchangers in case of dissimilar metallurgy only.*** YES
Sacrificial anode, if required, shall be sized and positioned in such a way that flow restriction is not there.

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7.6 CORROSION ALLOWANCE REQUIREMENT

Minimum corrosion allowances shall be as follows. These are applicable to an equipment in general, unless Licensor's proprietary design requirement calls for different values:

Service	EIL Default	Owner Value
Carbon Steel pressure vessels	3.0 mm	Same as EIL Default
Carbon Steel atmospheric vessels	3.0 mm	Same as EIL Default
Alloy Steel vessels	1.5 mm	Same as EIL Default
Stainless Steel vessels	Nil	Same as EIL Default
Clad vessels	3.0 mm clad thk	Same as EIL Default
LINED VSSELS (rubber lined etc)	3.0 mm + lining	Same as EIL Default
Carbon Steel/LAS exchangers	3.0 mm	
SS/HAS/Non Ferrous exchangers	Nil	
CS storage tank bottommost shell course & bottom plate	3 mm/1.5 mm for internally painted	
CS storage tank, shell other course	1.5 mm/CS storage tanks for naphtha and gasoline middle shell course - 3.5 mm	
CS buried vessel (External corrosion)	1.5 mm	3 mm
CS sphere	1.5 mm	

8.0 EQUIPMENT DESIGN PHILOSOPHY

8.1 OVER DESIGN PHILOSOPHY

Owner may wish to impose over design margins on equipment over and above the margins built in by unit designer as per designer's own practice.Such over designs can allow an owner to debottleneck operations in future, recognizing that these would also call for higher investment and that these could also hamper operation on account of turndown limitations or sub-optimal operations.
For Owner's margin, refer Process Package of respective units.

	% turnup	% turndown
Process Towers (atmospheric or above)	Refer Process Package of respective units.	Refer Process Package of respective units.
Process Towers (vacuum)	Refer Process Package of respective units.	Refer Process Package of respective units.
Fired Heaters (potentially coking services)	Refer Process Package of respective units.	Refer Process Package of respective units.
Fired Heaters (clean services)	Refer Process Package of respective units.	Refer Process Package of respective units.
Heat exchangers (fouling service): overdesign on duty	Refer Process Package of respective units.	Refer Process Package of respective units.
Heat exchangers (fouling service): overdesign on flow	Refer Process Package of respective units.	Refer Process Package of respective units.
Heat exchangers (clean service): overdesign on duty	Refer Process Package of respective units.	Refer Process Package of respective units.

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	% turnup	% turndown
Heat exchangers (clean service): overdesign on flow	Refer Process Package of respective units.	Refer Process Package of respective units.
Tower overhead exchangers: overdesign on flow & duty	Refer Process Package of respective units.	Refer Process Package of respective units.
Pump around exchangers: overdesign on flow & duty	Refer Process Package of respective units.	Refer Process Package of respective units.
Recycle compressors	Refer Process Package of respective units.	Refer Process Package of respective units.
Make-up compressors	Refer Process Package of respective units.	Refer Process Package of respective units.
Pumps in general	Refer Process Package of respective units.	Refer Process Package of respective units.
Reflux and pumparound pumps	Refer Process Package of respective units.	Refer Process Package of respective units.
3-phase separators (in and out flowrate)	Refer Process Package of respective units.	Refer Process Package of respective units.
2-phase separators(in and out flowrate)	Refer Process Package of respective units.	Refer Process Package of respective units.
Crude preheat exchangers	Refer Process Package of respective units.	Refer Process Package of respective units.

Definition of critical equipment service:
A critical service equipment is defined as equipment that must be maintained in operation in the event of power failure in order to protect personnel, equipment or catalyst or safe shutdown

Licensor defined critical equipment services shall additionally apply.

8.2 SELECTION OF MECHANICAL DESIGN CONDITIONS

Equipment and piping systems shall be designed for the most stringent coincident temperature and pressure conditions, accommodating the maximum expected working pressure and temperature without causing a relieving condition.

The design shall be such that instrument safeguarding systems or availability of emergency power or steam are not relied upon for overpressure protection.Abnormal conditions shall be evaluated considering a single contingency.A double or multiple contingencies shall not be considered, but, if one failure is a result of another failure, both failures are to be considered as one contingency.Guide for "Pressure relief and depressurizing systems", API RP 521 shall be followed for evaluating failures.

Additional specifications other than that mentioned in 8.2.1 & 8.2.3, if any specified by Licensor to be followed.

8.2.1 MECHANICAL DESIGN PRESSURE FOR PRESSURE SYSTEMS

Mechanical design criteria laid down in this section shall be followed as standard.Deviations to these criteria are not permissible for any facility, except for high pressure equipment working above 70 kg/cm^{2}g or for identified critical equipment for which designer of a particular unit has to necessarily follow the designer's company standards that ensure plant safety and operating personnel protection.

8.2.1.1
Pressure system protected by a pressure relief device connected to the flare system shall

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have a mechanical design pressure, calculated at the location of the relieving device, as the higher of the following:

i) For operating pressures above 70 kg/cm2g, design pressure shall be equal to the 105% of maximum working pressure, subject to a minimum of 77 kg/cm2g.

ii) For operating pressure upto and including 70 kg/cm^{2}g, design pressure shall be the highest of the following:
a) Maximum operating pressure (kg/cm^{2}g) x 1.1
b) Maximum operating pressure + 2.0 kg/cm^2
c) 3.5 kg/cm^{2}g

The design pressure of pressure system protected by a pressure relief device and not connected with flare system shall be maximum operating pressure plus 0.7 kg/cm2.

Owner's Requirement:

1. Equipment subjected to start up or shut down evacuation is designed for full vacuum & for the highest pressure the equipment can experience.
2. For equipment equipped with steam out the following sentence will be specified on the data sheet: Subject to steam out condition with the pressure & temperature of steam.

8.2.1.2
The design pressure calculated as per 8.2.1.1 is at the location of the relieving device such as the top of a vertical vessel.The design pressure at the bottom of the vessel and of associated pieces of equipment shall be determined by adding applicable maximum operating liquid heads and pressure gradients.

Owner's requirement:

For critical and fouling service, relief valves shall have independent tap-off from vessel / column. For steam / hot condensate relief valves to atmosphere, provide tell-tale holes at low point on discharge to prevent accumulation of condensate

8.2.1.3
Vessels operating under vacuum shall be, in general, designed for an external pressure of 1.033 kg/cm^{2}abs and full internal vacuum, unless otherwise specified.Vacuum design stipulations shall be as per section 7.2.0.

8.2.1.4
Emergency vacuum pressure of 0.4 kg/cm^{2}abs can be considered by designer based on the process requirements and assessment of transient operations.

8.2.1.5
For a full liquid system at the discharge of a centrifugal pump, the mechanical design pressure shall be as under:

P(des) = P(max) suction + DELTA P(max)
where,
P(max) suction = Maximum pressure at suction vessel bottom during suction system relieving conditions (as per 8.2.1.2)
DELTA P(max) = Pump differential pressure at pump shutoff head with maximum operating density.If not known:
DELTA P(max) = 1.2 x DELTA H x Density(max): constant speed pump
DELTA P(max) = 1.1 x 1.2 x DELTA H x Density(max): variable speed pump

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DELTA P(max) = 1.3 x DELTA H x Density(max): high head multistage pump
DELTA P(max) = 1.3 x 1.1x Del H x Density(max): variable speed high head multistage pump

Where, DELTA H is the pump head at rated condition.

8.2.1.6
For a full liquid system at the discharge of a positive displacement pump, the mechanical design pressure shall be the higher of:

P(des) = P(rated) discharge + 2 kg/cm ^{2}
P(des) = 1.1 x P(rated) discharge

8.2.1.7
For shell-and-tube heat exchangers, the low pressure (LP) side shall be preferably specified with a design pressure at least equal to 10/13 of high pressure (HP) side design pressure, in order to avoid having to install a pressure relief device on the LP side.The 10/13 criteria shall necessarily be adhered to when:

(1) LP fluid is on the tube side.
(2) Relief discharge cannot be connected to flare header owing to nature of fluid.
(3) Relief discharge is two-phase and cannot be connected conveniently to a low pressure destination with free-draining piping.
(4) Liquid relief cannot be connected to a closed blow down system.
(5) When the 10/13 criteria calls for an increase by less than a factor of 13/10 of the mechanical design pressure of the LP side as would be calculated from normal estimation procedures.

However, based on process considerations and designer's own practice, heat exchanger can be designed without upgrading design pressure by providing tube rupture pressure relief valve after getting consent on case-to-case basis from owner.

Owner's Requirement:

Inlet/outlet piping of the tube side HE to be provided with removable spool piece.

8.2.2 MECHANICAL DESIGN PRESSURE FOR STORAGE TANKS AND ATMOSPHERIC VESSELS

8.2.2.1
Design pressure of storage tanks shall be in accordance with API-620, API-650 and API-2000, as appropriate.

8.2.2.2
Blanketed storage tanks shall have a blanketing design pressure of 150 mmwc , unless a higher pressure is deemed necessary from process considerations.The design pressure of blanketed storage tanks shall be determined to allow adequate overpressure for out breathing and emergency relief devices. The blanketed tanks shall also be designed for 50mmwc vacuum.

The above shall be applicable for new tanks. However, for existing tanks blanketing considerations shall be reviewed on case to case basis.

8.2.3 MECHANICAL DESIGN TEMPERATURE

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8.2.3.1
For systems operating at or above 0 DEG C, the mechanical design temperature shall be the higher of the following:

T(des) = 65 DEG C
T(des) = T(max) + 15 DEG C (Note-1)
T(des) = T(relief) , excluding fire relief temperatures

Where,
T(max) = Maximum operating temperature expected considering different possible operations for the equipment or system, including air drying or gas drying conditions.
T(relief) = Temperature corresponding to pressure relief conditions for an operational failure case (specifically excluding fire relief case).

Notes:
1. Pumps in hydrocarbon service shall be designed for continuous operation at a minimum of 28 deg. C higher than specified maximum operating temperature. (as per OISD 119 requirement)
2. The maximum operating temperature is defined as the highest material balance temperature. Consideration shall also be given to other condition such as start up, shut down, catalyst regeneration, failure of upstream cooling and steam-out. Such temperatures should be considered on a case to case basis to establish if they should be taken as the maximum operating temperature.
3. In case of coolant failure of process units, the maximum operating temperature upstream of the cooler shall be taken as the downstream operating temperature. This should apply to downstream pipe work, only upto the next major item of equipment. For failure of rundown coolers, the higher design temperature shall only be taken to the battery limit. A high temperature alarm shall be installed downstream of all product rundown cooler.

8.2.3.2
For systems operating below 0 deg C, the mechanical design temperature shall be equal to the lowest anticipated operating temperature.

8.2.3.3
For pressure vessels storing refrigerants or liquefied hydrocarbons at ambient temperature, the design temperature (based on depressurization) shall correspond to the coincident design pressure when this lowest temperature is reached.The coincident design pressure can be different from the maximum design pressure specified for the vessel depending upon the system under consideration.However, if this calls for a change in metallurgy, then other strategies to avoid this situation shall be evaluated.

If owner has any specific additional or different preferences, indicate below:

1. Vessels provided with drying air / gas connection shall have a design temperature equal to the drying air / gas normal temperature plus 10 Deg C.

2. Each set of mechanical design pressure and temperature, for the possible operations as defined above, shall be mentioned in process specification sheet.

8.2.4 STEAM OUT CONDITIONS

Vessels provided with steam out conditions shall be designed for the following steam out conditions when LP Steam is considered adequate:

a) Pressure = 0.5 kg/cm2g

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b) Temperature = Maximum LP Steam temperature= 190 Deg C

If a specific equipment requires steam out with MP steam, steam out temperature shall be as following:

a) Pressure = 0.5 kg/cm2g
b) Temperature = Maximum MP Steam temperature= 280 Deg C

Steamout point to be provided for all vessels to make them HC free.

8.2.5 MINIMUM DESIGN METAL TEMPERATURE (MDMT)

Designer shall specify MDMT based on international design practice. Ambient temperature data are as per Section 4.

8.3 HEAT EXCHANGERS AND COOLERS

8.3.1 FOULING FACTOR

8.3.1.1 FOULING FACTORS FOR PROCESS STREAMS

Fouling factors for process streams shall be decided by designer based on past experience and good design practices.However, owner's overriding considerations towards fouling factors for specific units or process streams shall be the basis of specifications, if spelt out in respective unit BEDB Part-A documents.

8.3.1.2 FOULING FACTOR FOR UTILITY STREAMS

EIL recommends the following default fouling factors for utility streams which is recommended to be followed as a minimum. However, in case client has other controlling preferences, same is to be followed for the particular service.

Note-1: In case of Plate & Frame exchanger, fouling factor for cooling water shall be decided by designer.

Utility Stream	EIL Default	Owner Preference
Cooling Water	0.0004 hr-m^2-DEG C/kcal (Note-1)	Same as EIL Default
DM Water	0.0001 hr-m^2-DEG C/kcal	Same as EIL Default
Tempered Water	0.0002 hr-m^2-DEG C/kcal	Same as EIL Default
Condensate	0.0001 hr-m^2-DEG C/kcal	Same as EIL Default
Steam	0.0001 hr-m^2-DEG C/kcal	Same as EIL Default
Nitrogen	0.0001 hr-m^2-DEG C/kcal	Same as EIL Default
Plant Air	0.0001 hr-m^2-DEG C/kcal	0.0002 hr-m^2-DEG C/kcal
Chilled Water		0.0002 hr-m^2-DEG C/kcal
Boiler Feed water		0.0001 hr-m^2-DEG C/kcal
Treated Water		0.0002 hr-m^2-DEG C/kcal
Natural Gas		0.0002-0.0004 hr-m^2-DEG C/kcal
Refrigerant Liquids / Hydraulic Fluids		0.0002 hr-m^2-DEG C/kcal

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Utility Stream	EIL Default	Owner Preference
Industrial Organic Heat Transfer Media		0.0003 hr-m^2-DEG C/kcal
Calcium Chloride / Sodium Chloride Solution		0.0006 hr-m^2-DEG C/kcal
Methanol / Ethylene Glycol Solutions		0.0003 hr-m^2-DEG C/kcal

8.3.2 VELOCITY CONSTRAINTS

It is recommended that constraints be specified for tube side velocities for better on-stream factors of heat exchangers / air coolers, as applicable in fouling services.The considerations for the limitations are as follows:
Cooling water flow rates are normally not expected to be turned down during operation and can be designed for a velocity constraint applied only for normal flow.

Residue and heavy oil services would have flow rates turned up or turned down during operation and need to be designed for a velocity range that will ensure low fouling regime.

Respective unit designers shall be required to specify velocity ranges as part of heat exchanger specifications.

Service	Minimum (m/sec)	Maximum (m/sec)
Cooling water	1.0 @ normal flow	As per designer
Residues, Heavy oils	As per designer	As per designer

8.3.3 GENERAL SELECTION OF HEAT EXCHANGER TYPES

8.3.3.1

All exchangers to be designed as per ASME Code / TEMA-R/ Any other relevant international standard. All shell and tube heat exchangers shall follow TEMA-R unless specified otherwise.

The following general criteria for selection of type of heat exchanger will be followed:

a) Floating head heat exchangers -
In general, floating head exchangers will be preferred with the following features:
i. Horizontal
ii. Single shell pass
iii. Floating head tube bundle (TEMA type 'S')
iv. Two or more tube passes per shell

b) U-tube exchangers -
U-tube exchanger will be considered in case of services with:
i. Steam condensing/ generating in the tube side.
ii. Hydrogen service or other clean service in the tube side requiring no cleaning.

c) Fixed tube sheet heat exchangers -
The use of fixed tube sheet heat exchangers shall be minimized to the extent possible.These can be used in limited services such as:
i. Vertical thermosyphon reboilers where clean fluid is on shell side.

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ii. Steam-out conditions shall be specified for fixed tube sheet heat exchangers, considering shell-side or tube-side or both sides simultaneously being steamed out at one time.
iii. Start-up and upset condition for fixed tube sheet exchangers shall be specified as well.
iv. Expansion bellows are not preferred on fixed tube sheet heat exchangers.
v. Intercooler/Aftercooler, only where shell side fluid is clean and non-fouling .

d) Double pipe or multi-tube heat exchanger -
Double pipe or multi-tube heat exchanger should not be used except in the event of infeasible shell-and-tube heat exchanger design.

e) Stubbed-in reboiler type -
Stubbed-in reboilers be avoided as far as possible in order to facilitate equipment maintenance.

If owner has any known constraints or any other preference, specify below:

1.The spare exchanger philosophy should be indicated by the Licensor based on the fouling service and the exchangers that are prone to leak based on historical data.
2.As far as possible, Exchangers with shell type K- shall not be provided with rear head of type S & T [U tube bundle shall be considered]. To be reviewed on case to case basis and any design requirement / limitation to override the requirement.

8.3.3.2 GENERAL CRITERIA OF SELECTION OF TEMA TYPE OF EXCHANGERS AND DESIGN OF TUBE PITCH

Shell side fouling resistance(Hr-m² -DEG C/ Kcal)	Tube side fouling resistance(Hr-m² -DEG C/ Kcal)	TEMA type(preferred)	Tube Pitch
>0.0002	>0.0002	Floating head	Square/rotated square
<=0.0002	-	Fixed tube sheet	Triangular pitch
-	<=0.0002	U tube bundle	-Triangular pitch in case shell side fluid is clean. -Square/rotated square in case shell side fluid is fouling.

Owner's Requirement:

For hydrogen service fixed tube sheet type exchanger may be used in case shell side fluid fouling resistance is <= 0.0002hr m2 oC/kcal.

8.3.3.3
Vertical thermo siphon, horizontal thermo siphon, or, kettle type reboilers can be specified by unit designers, as found appropriate.Considerations shall be given to:

a. Process fluid degradation
b. Fouling tendency of process fluid
c. Process hold-up volumes within exchangers and constraints, if any
d. Film boiling possibilities and temperature difference between hot and cold fluids
e. Width of boiling range
f. Vaporization rates and variations anticipated

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g. Equipment investment
h. Equipment space and installation constraints, if any.

8.3.3.4 SELECTION OF HEAD FOR EXCHANGER DESIGN

The following criteria will be followed as default:
a) TEMA type B stationary head: hydrogen services or when steam or other clean fluid is on tube side, not requiring cleaning.
b) TEMA type A stationary head: when tube side fluid is cooling water or similar process fluids, requiring cleaning.
c) TEMA type B or C stationary heads:
-Shall not be used when design pressure is higher than 140 atm.
-Tube-sheet shall not be full diameter extended type when TEMA type B stationary head is used.

8.3.4 PREFERRED SIZES FOR SHELL AND TUBE EXCHANGERS WITH REMOVABLE BUNDLES

8.3.4.1 SELECTION OF TUBE DIAMETER AND THICKNESS

EIL's default tube diameter and thickness in mm:

Type	Category-A	Category-B
Tube Metallurgy		
CS/LAS	***2.5/3.0***	***2.0/3.0***
SS/HAS/Admiralty/Cu-Ni	***2.0/2.5***	***1.6/2.0***
Titanium	***1.2***	***0.9***
IBR Service		
CS/LAS	2.5	2.1
SS/HAS	2.1	2.1
Notes	***1,2,3***	***1,3***

Legend:
Category-A: 25 mm OD (Notes 1,2)
Category-B: 20 mm OD, (Note 1)

Notes:
1:In case of heavy fouling application on tube side, 25 mm tube will be preferred.
2:Higher tube OD may be used, to overcome design constraints.
3:The Normal thickness indicated above is applicable for design pressure below 100 kg/cm2g. Above 100 kg/cm2g, the higher thickness shall be used and further increased if
required on a case to case basis.

If owner has any other preference, specify below:

8.3.4.2 SELECTION OF TUBE LENGTH

Shell and tube floating head type : 6/9 meters
U-tube type : 6 meters max. (straight portion)

Note:In case of design constraints, lower tube lengths may be used for removable tube bundle exchanger.

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If owner has any other preference, specify below:

8.3.4.3 SELECTION OF REMOVABLE TUBE BUNDLE

Maximum tube bundle diameter:
6m tube length:1.6 meters
9m tube length:1.4 meters

Maximum tube bundle weight:25 tons

Note:In case of design constraints, lower tube lengths may be used for removable tube bundle exchanger.

If owner has any other preference, specify below:

8.3.5 PHILOSOPHY FOR STACKING OF HEAT EXCHANGERS

The extent of stacking of exchanger's influences equipment layout and equipment approach for operation and maintenance is indicated as below (EIL's recommendation are indicated)

1	Stack up to 3 shells when shell diameters are less than 450 mm or equal to 450mm and individual shell isolation and bypasses are not provided.	YES
2	Stack up to 2 shells when shell diameters are more than 450 mm and individual shell isolation and bypasses are not provided.	YES
3	Stack up to 2 shells, regardless of shell diameter and regardless of whether individual shell bypasses are provided or not.	NO
4	Do not stack exchangers, in case individual shell isolation and bypasses are provided.	YES
5	Do not stack exchangers when located at elevations other than at grade level.	NO

If owner has any other preference, specify below:

(1) Cooling water exchanger in critical services such as overhead condensers, Compressor interstage and after stage coolers etc. shall have two shells in parallel each shell sized at 50% of the design capacity. Each exchanger shell is to have isolation valves to isolate the exchanger in the event of tube leaks.

The impact of isolation valves on pressure relief system will be discussed on case to case basis.

(2) For two shells in parallel each shell sized at 60%

(3) Some heat exchanger shells may require provision for independent isolation and maintenance from process angle. This requirement to be discussed service wise during P & ID review and will be de-stacked with independent isolation/bypass requirement.

(4) Inlet/outlet piping of the tube side of shell and tube heat exchanger shall be designed to have removable spool piece

8.3.6 GENERAL DESIGN CRITERIA OF AIR-COOOLED HEAT EXCHANGER

8.3.6.1 PHILOSOPHY FOR AIR COOLER DESIGN

The following philosophy for selection of air cooler will be followed:

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a) Air cooled heat exchange is to be maximized except for specific intermittent services or small cooling duties where air-cooled exchanger is not justified.

b) Refer section 4.2 for design ambient air temperatures for air-cooled heat exchanger thermal design.

c) The lowest process stream outlet temperature for air cooled heat exchange shall be:

Description	Selected Option
Air cooled exchanger not followed by water cooling:	55 DEG C
Air cooled exchanger followed by water cooling:	65 DEG C

Owner's Requirement:

Client requirement of provision of spare bank for air coolers shall be reviewed on case to case basis.

8.3.6.2 GENERAL DESIGN CRITERIA FOR AIR COOLERS

a) Type of Air cooling:
Forced draft fans are preferred for air cooled heat exchangers.
Natural draft air cooled heat exchange can be considered, if found warranted; when fan cooled or water cooled heat exchanger has specific problems in an application.
However, for low approach temperature less than 12 DEG C, induced draft fan shall be used.

b) Type of drives (speed reducer):
i. HTD Belts upto & including 60HP
ii. Gear drive for more than 60 HP

c) Requirements of winterising or of highly congealing service air coolers will be met by the following selected options:
Louver with hot air recirculation and steam coils — NO
Only steam coils with air temperature regulation — YES

d) When fluid outlet temperature requires to be controlled (regulated manually, say, for seasonal climatic variation) or when stipulated to conserve power, 100% of fans in a bay, if required shall be provided with:
i) Auto Variable Pitch Control — NO
ii) Variable speed control — YES
iii) Louver Control — NO

e) MOC of fans shall be: High efficiency FRP, aerodynamic blades

If owner has any specific additional or different preferences, indicate below:

(1) Air fin motor shall be of greasing facility (Sealed bearing ZZ/2RS not considered)
(2) Emergency stop to be provided at ground floor
(3) Wherever a control is required for the air cooler fans, 50% of fans in the bay will be provided with variable frequency drive (VFD)

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All fin fan coolers shall be provided with start / stop push buttons located near the fan and in the control room. Vibration switches and control room alarms for fans shall be provided if recommended by vendor.
For all fin coolers, wired type vibration probe with 4-20mA signal, alarms shall be considered. Two probes shall be provided at fan bearing and two at motor.

8.3.7 PREFERRED SIZES FOR AIR COOLED EXCHANGERS

8.3.7.1 SELECTION OF TUBE BUNDLE LENGTH AND WIDTH

Air cooled exchanger tube length depends upon location of air cooler and bundle width depends on no. of bundles:

	Air cooler located on pipe rack	Air cooler located on technological structure
Tube Length	Pipe rack width + 0.5 m	Suitable tube length to be adopted.Preferred tube lengths: 8.5 m 10.5 m 12.5 m
Bundle Width	4.2 m max (single bundle) 3.2 m max (multiple bundle)	4.2 m max (single bundle) 3.2 m max (multiple bundle)

8.3.7.2 SELECTION OF TUBE DIAMETER AND THICKNESS

Preferred tube OD/ Thickness:

Tube Metallurgy	Tube Diameter	Tube Thickness
Carbon Steel/LAS	25mm OD	2.5 (min)
SS/HAS	25mm OD	2.0 (min)

Note:Higher tube OD may be used where design constraint exist.

8.3.7.3 SELECTION OF FIN DESIGN

Design Temp DEG C	Fin MOC/Type	No of Fins/Inch	Fin height, mm
Upto 400	Aluminium G Type	11 (max)	12.5/ 16
>400	Welded CS	6 (max)	12.5/ 16

Auto-variable type blade pitch control or any other automatic control is not required. High vibration in air-cooler fan to trip the fan through MCC. All air-coolers are to be provided with a stop switch at grade along with one at air-cooler platform.
Max. Noise level 85 dB(A) below 1 m of fan ring.

8.3.7.4 SELECTION OF TYPE OF HEADERS

Parameter	Range	Type
Design Pressure	<= 50 Kg/cm^{2}g	Cover
Design Pressure	> 50 Kg/cm^{2}g	Plug

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Parameter	Range	Type
Fouling factor	<= 0.0004 Hr-m^2-DEG C/ Kcal	Plug
Fouling factor	> 0.0004 Hr-m^2-DEG C/ Kcal	Cover
H2 Partial Pressure	> 7.0 Kg/cm^2 abs	Plug
Corrosion Allowance	<= 3.0 mm	Single Plug
Corrosion Allowance	> 3 mm & Sour service	Double plug

If owner has any known constraints or any other preference, specify below:

(i) If interpass temperature difference exceeds 110 deg C or if inlet temperature exceeds 180 deg C, split headers shall be used.
(ii) Minimum slope of 10 mm/meter shall be provided for single pass exchanger.
(iii) Cover header shall be flanged type. In case of split header or high thickness application, plug type header shall be considered

8.3.8 PHILOSOPHY FOR GROUPING OF AIR-COOLED EXCHANGERS

Large air-cooled exchangers shall be divided into sections and fans sized and provided in each section.

Air-coolers, which are smaller than section size, can usually be grouped into one section and provided with a common set of fans, provided these services do not require outlet temperature control and unless the designer has an over-ruling consideration.

Owner's Requirement:

Design concept of grouping of air coolers in multiple services, with common fan shall be avoided to the extent possible.

8.3.9 ISOLATION FACILITIES FOR HEAT EXCHANGERS/AIR COOLERS

1	Isolation and bypass valves for process side of all exchangers/air coolers:	YES
2	Isolation and bypass valves for only those exchangers/air coolers which can be taken out for maintenance when plant is running:	NO
3	Isolation philosophy in cooling water side of water cooled exchangers:	
a)	Isolation valves at only inlet in cooling water side	NO
b)	Isolation valves at both inlet & outlet in cooling water side	YES

8.4 FIRED HEATERS

Applicable Standards: API530, 535,560 & OISD STD -111, OISD STD-152 Latest editions

For New Process Heaters, Type of APH and UV scanners will be decided during detail design.
This section is applicable for Process Fired heaters, however for specialty furnaces (Reformer, Cracker, Thermal Oxidizer, Incinerator or CPP Boilers), Licensor requirements shall govern.

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8.4.1 SELECTION OF FUEL

1 Fired heaters for continuous operation shall be designed with:

1.1 100% firing on either fuel oil or fuel gas or any combination of both, unless constrained to reject use of fuel oil from reasons of process or acid gas dew point.
YES
1.2 100% firing on fuel gas only.
NO
1.3 100% firing on fuel gas only for heaters less than 1.5 MMKcal/hr.
YES

OWNER's Preference:

a) For Cracker, 100% only on Fuel gas .
b) For New CDU/ HCU Revamp, both on fuel gas and fuel oil.
c) For Utility Boilers, 100% firing on either fuel oil or fuel gas or any combination of both.

For Licensed units/design, licensor specifications shall be governing.

8.4.2 TARGET EFFICIENCIES

Achievable fuel efficiency depends on service, process temperatures, furnace heat duty and quality of fuel. Target efficiency shall be maximized and options for heat recovery such as air pre-heater, steam generation/ superheat etc., shall be considered.

a) 92% on fuel gas fired heaters with outboard APH system only.It is to be maximised based on the dew point constraints and margin.
b) 90% on combination firing heaters (with either fuel oil or dual fuel mode) with outboard APH system only and typical sulfur content in fuel of less than 0.5 wt%.

Excess air levels shall be considered as follows for reporting efficiencies:
For Natural draft: Fuel oil - 25 %, Fuel gas - 20 %
For Forced draft: Fuel oil - 20 %, Fuel gas - 15 %

For licensed units/design, licensor specification shall govern.

8.4.2.1 AIR PREHEATING

Air preheating shall be adopted as per heat recovery potential and following shall be adopted(tentative values of absolute heat duty which will be finalized on case to case basis during design):

NOTE:
For Air preheaters with Cast APH only, steam APH shall be provided for combustion air preheating upstream of Cast APH.

Common APH for small duty heater may be considered as per heat recovery potential and operating philosophy of heaters.

For licensed units, licensor recommended heat recovery option shall be used.

Absolute heat duty (MMkcal/hr)	Air preheating design
< 7	None
>= 7 < 15	On board Cast APH

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Absolute heat duty (MMkcal/hr)	Air preheating design
>=15 < 20	On board / Out board (will be considered based on heat recovery potential.)
>= 20	Outboard Cast & Glass APH

8.4.2.2 OTHER DESIGN ASPECTS FOR AIR PREHEATER

a) Design margin for outboard Air Preheater

10% on flow and duty for both air and flue gas.
Flue gas inlet temperature plus 25 DEG C.

b) Individual bypass for cast and glass air preheaters will be provided for Absorbed heat duty >= 30 MMkcal/hr.

c) Hot water washing shall be provided for outboard Air preheater. In case of fan impellers, normal water washing shall be used for FD fans and steam shall be provided for ID fans. (Requirement to be confirmed by client)

For Licensed Units design, licensor specifications shall be governing.

8.4.3 COKE THICKNESS FOR HYDRAULIC CALCULATIONS

Coke laydown shall take place in fired heaters handling hydrocarbons. Heater tube diameter selection and hydraulics shall take cognizance of this as per respective unit BEDB-Part A document.

For Licensed Units/design, licensor specifications shall be governing.

8.4.4 AUXILIARY UTILITY FOR HEATER

Detail heater design shall have provision for coil purging, snuffing steam and water washing of fan impellers and out-board air pre-heaters, as applicable.

Mechanical decoking / pigging facility to be provided. Steam air decoking shall be considered, wherever specified/ applicable.

For Licensed Units/design, licensor specifications shall be governing.

8.4.5 HEATER STACK

8.4.5.1
Stacks shall be individually mounted on each heater unless there are considerations such as grade-mounted APH or combined APH system for a group of heaters.

8.4.5.2
Minimum fired heater stack heights shall be higher of indicated heights in respective unit BEDB part A documents or as calculated from the formula below:
a) 30m

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b) H = 14(Q)^0.3 where, H: stack height, metres and,
Q: total SO2 emission, kg/hr

c) As per EIA / GLC dispersion analysis or state PCB norms stack height is 75m .
Stack height of min. 100 m to be considered for Utility Boilers

d) Top of stack shall be at least :
i. 5.0 m higher than highest working platform within a radius of 30m
ii. 3.0 m higher than highest working platform for 30-50m radius.

e) The maximum height of stack is not to exceed _____m from Mean Sea Level (by owner), if applicable.

f)The stack height shall also be such that emission from the stack shall meet ground level concentration as per the National Ambient Air Quality Standard (NAAQS) specified for the land-use category.

g) Stack shall be sized as per API 560 guidelines.

8.4.5.3
For pollution monitoring, sampling nozzles shall be provided on the stack as per Central Pollution Control Board guidelines:
a) 4 nozzles (6"NB size with 1" inside lining), for stack diameter >= 2m
b) 2 Nozzles (6"NB size with 1" inside lining), for stack diameter <2m

If owner has any specific additional or different preferences, indicate below:

8.4.6 SOOT BLOWERS

a) Soot blowers shall be specified for studded convection section of fired heaters having fuel oil firing or combination firing. These shall be long retractable type, with single electric motor drive having medium pressure steam as the motive medium, to be operated once every 8-hour shift for best results.

b) Operation of soot blower shall be provided either from automatic through PLC sequential panel (Enclosed in dedicated AC room) at grade or through local push buttons at each soot blower.

Facilities shall be provided for manual retraction of lance in case of motor or power failure and for bypassing any soot blower. Operating platform will be provided to have access to each soot blower.

c) For fuel gas only fired heaters, provision for steam lancing shall be kept.

If owner has any specific additional or different preferences, indicate below:

All soot blowers shall be provided with limit switches

8.4.7 BURNERS

8.4.7.1 EMISSION

a) Burners shall be Low NOx type.Ultra Low NOx burners shall be considered when recommended by licensors or owner on case to case basis.
b) MOEF notification G.S.R. 186(E) dated 18th Mar 2018 Permissible emissions are:

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S.No.	Parameter	Maximum emission limit (mg/Nm^3)-Existing plants	Maximum emission limit (mg/Nm^3)-New plants/ Expansion
1	NOx - Oil firing		350
2	NOx - Gas firing		250
3	CO - Oil firing		150
4	CO - Gas firing		100
5	Particulate matter - Oil firing		50
6	Particulate matter - Gas firing		5
7	SO2		Oil Firing 850, Gas Firing 50

NOTES:
1) All values are corrected to 3% O2 vol (dry basis).
2) For combination firing, the limit should be computed based on heat supplied by gas and liquid fuel.
3) Noise limitation: 85dB at 1.0m from burner.
4) Pilot burners shall be provided with flame ionization rod for pilot flame detection.

In case owner has any constraint/other requirement based on environmental study approval, indicate below:

8.4.7.2 TURNDOWN REQUIREMENT

Turn down shall be:
5:1 for gas firing.
3:1 (2:1 for duty <= 1MMkcal/hr) for oil firing.
In case of limitation of turndown, few burners may be kept off.
In case Owner has any other preference, indicate below:

8.4.7.3 EXCESS AIR LEVELS

Burners shall be specified for operation at following excess air levels (in addition to excess air levels to be used for heater design):

	Fuel Oil	Fuel Gas
Natural Draft	15 %	10 %
Forced Draft	10 %	5 %

8.4.7.4 OTHER DESIGN ASPECTS FOR BURNERS

a) Continuous self-inspirating, fuel gas fired pilot for each burner.

b) Provision of portable igniters shall be kept.
Number of igniters will be as follows:
Battery operated : 1 No. (min) per heater.
Mains operated ignitor : 1 No. (min) of hand held ignitor with sufficient cable length per row such that all burners in that row can be ignited . If number of burners per row are large (greater than 6), more to be provided from either side of the row. (Ignitor attached to individual burner not preferred)

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c) MP Steam with 10~50°C super heat shall be used as atomising medium.

d) Minimum height of burner plenum/ burner button from grade shall be 2000 mm.

e) Metallurgy of the pilot gas line shall be stainless steel.

f) Burners are to be designed for max mol% H2 in fuel gas resulting due to various scenarios (eg : failure of PSA).
(For very high H2 content confirmation from burner vendor shall be taken)
Owner's Requirement:

Low NOx Burners incorporate stringent design features to meet the critical combustion and emission requirements. Accordingly, the combustion testing of the burners becomes a very important and critical activity as it involves verification of all critical operating parameters such as flame pattern / stability, burner capacity, turndown, flame dimensions, etc. which directly affect the performance of the burners and fired heater. During the combustion test, important operating conditions are simulated and performance parameters are verified at full operating range.

g) UV scanner for furnace burners are required as per OISD norms.

h) Performance testing requirement: EIL recommends performance testing for all burners.;

OWNER'S Preference:
1) Burners to be tested for performance. YES
2) Witnessing of burner performance test by owner/ owner's representatives. YES
3) Spare - igniters portable charging type to be done as 2 numbers as most of the time existing portable gets issues.
4) For new heaters, venturi tube instead of pitot tube for combustion air flow measurement shall be used.

8.4.8 CONVECTION SECTION TUBES

Gas Firing : Finned tubes / Studded tubes / Bare tubes
Fuel Oil / dual firing : Studded tubes / Bare tubes
(Default selection is finned tubes for gas firing and studded tubes for Fuel oil /dual firing)

Provision for 2 future rows in the convection hydrocarbon section shall be kept.

Convection banks for BFW preheating, steam generation and steam superheating shall be designed for dry run conditions wherever the BFW feed pump does not have an emergency drive backup.

If owner has any specific additional or different preferences, indicate below:
a. Studded tubes wherever provided should have soot blowers/ manual steam blowing provision through drop-out doors or Lancing doors.
b. Process streams preheating should be given preference for convection banks heat recovery over BFW preheating/ steam generation or steam superheating etc.

8.4.9 RETURN BENDS

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EIL recommends return bends as a preference instead of plug headers.
Bends shall be inside fire box for radiant section (outside in case of cabin heaters) and inside header box for convection section. Requirement of plug headers shall be specific to furnace service and will be specified in BDEP.

For Licensed Units/design, licensor specifications shall be governing.

If owner has any other preference to be followed for all heaters, indicate below:

8.4.10 CONTROL FOR FD/ID FANS

8.4.10.1 PHILOSOPHY FOR FD/ID FANS

EIL recommends combustion air configuration for forced-draft (FD) heaters considering the following:
a) (1+1) FD fan sized for 100% capacity each but with both running normally at half load. Failure of one FD fan shall cause the other fan to switch over to full load. Failure of both FD fans shall result in heater shutdown and no stipulations shall be made for automatic switchover to ND operation. Cold air bypass shall be provided and heater specifications shall allow operation at design with APH bypassed.

b) Spare induced-draft (ID) fans shall not be provided. Failure of ID fans shall cause APH bypass to open to divert flue gas to the stack.

c) Special requirement: For Hydrogen reformers spare FD/ID fans shall be considered.

If owner has any specific additional or different preferences, indicate below:

8.4.10.2

a) Capacity control of FD fans:
i. Variable frequency Drive: YES
ii. Variable frequency Drive & Inlet Box Damper: NO
iii. Hydraulic coupling / variable speed drive: NO
iv. Inlet Box Damper: NO

b) Capacity control of ID fans:
i. Variable frequency drive: YES
ii. Variable frequency drive and inlet box damper: NO
iii. Hydraulic coupling / variable speed drive: NO

Fan speeds shall be controllable from DCS control room also.

Note : Scheme of fan control (e.g variable frequency drive etc.) to be decided specifically for each unit with the unit/ facility designer with Client/ Owner.

Owner's Requirement:

1 All VFD used for critical process application viz. compressor etc, shall be designed with Dual Redundant Hot Standby arrangement.
2 Each of FD fan inlet damper should have a Hydrocarbon Detector which will automatically shutdown the damper incase of Hydrocarbon detection.

8.4.11 REFRACTORY

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Type of refractory shall be selected based on fuel specification. Radiant section lining shall be ceramic fibre for fuel oil with less than 2 wt% S. For radiant arch, only ceramic fibre module with back up layer of blanket shall be used even though radiant section refractory may be different.

If owner has any other preference, indicate below :

1	Ceramic Fibre	YES
2	Insulating Castable	NO
3	Brick & Block	NO

For licensed units/design, licensor specification shall govern.

8.4.12 STANDARD FIRED HEATER PIPING & INSTRUMENTATION

Standard fired heater piping & instrumentation:

Interlocks as per OISD shall be implemented. The specific recommendations are:

(a) Low-low fuel oil supply pressure shuts down fuel oil supply and return

(b) Low-low fuel gas pressure shuts down fuel gas supply but keeps pilots running.

(c) Low-low heater pass flow shuts down fuel oil and fuel gas but keeps pilots running. 2of 3 logic shall be provided for each pass indication.

(d) Low-Low pilot gas pressure initiates same actions as emergency shutdown.

(e) Low-low differential pressure between atomising steam and fuel oil shuts down fuel oil supply and return.

(f) Emergency shutdown (Local & Supervisory) shuts down fuel oil, fuel gas as well as pilots.

(g) Emergency coil steam, manual or automated, depending on criticality.

(h) High-high arch pressure shuts down fuel oil and fuel gas, but keeps pilot running.

(i) Temperature measurement connections:
■ Below convection section
■ below stack damper
■ at hearth level.
■ downstream of stack damper

(j) Draft gage connections at:
■ Hearth level
■ Below convection
■ Above stack damper
■ Below stack damper
■ Just above convection

(k) ■ Air pressure measurement connections in FD fan suction, cold air duct, across modules, between cast and glass APH and in Hot Air duct.

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(l) Flue gas sampling connections at:
■ Below convection section
■ Below stack damper
■above stack damper
□ Other

(m) On-line analysers:
■ HC detectors at FD fan suction (2 no.s per suction)
■ O2 analyser at arch
■ NOx, SOx and CO analyzer at stack
■ SPM analyser at stack
■ CO analyzer(connection only) at arch

Owner's Requirement:
Process furnaces shall have no oxygen analyser at stack. Out of two furnaces, one furnace shall have a oxygen analyser at stack and the other cracker furnace shall have a provision only for oxygen analyser at stack.

(n) Venturimeter for measurement of combustion air flowrate.

(o) Skin thermocouples shall be considered (minimum 3 nos per pass) for measuring temperature of furnace tubes.

(p) Adequate number of flanged connections shall be provided for steaming out, water freeing, steam air decoking (where applicable) and chemical cleaning.

(q) Decoking facility to be provided for heaters requiring decoking. Facility for hydrokinetic and mechanical decoking to be provided.

(r) Block and Bleed vent of Fuel gas is to be routed to Safe location with steam sparger facility meeting OISD requirement.

(s) FD Fan, two fans installation: individual pressure indication should be provided on fan discharge to check the fan performance.
(t) All instrumentation need in furnaces i.e. provision for measuring FG and air pressure at hearth (burners) shall be made available

(u) Separate nozzle should be provided for isokinetic sample for PM at each heater.

(v) As per latest practice adopted in recent projects, SOx, NOx and CO analysers are provided with a common probe but with separate sampling conditioning systems and separate analysers. SPM shall have a separate analyser. Same is applicable for each stack in the heater area

For licensed units/design, licensor specifications shall govern.

Refer typical P&IDs:
1. Heater - Process section Drawing #B857-79-41-00-1181 (Sheet 1 of 2)
2. Heater - Firing section Drawing #B857-79-41-00-1181 (Sheet 2 of 2)
3. Air preheating system of Heater
i. Drawing #B857-00-02-44-1182 (Sheet 1 of 2)
ii. Drawing #B857-00-02-44-1182 (Sheet 2 of 2)

□ Others (By Owner)

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OWNER TO CHECK IF THE BELOW IS REQUIRED:

1) Local TI point to be provided on FO line near furnace. YES

2) Oxygen analyzer to be provided for each heater box, if a heater with multiple heater boxes and a common stack is suggested, in order to measure exact oxygen content of each heater box. YES

3) Emergency shutdown actuation (field shutdown actuation) of heater to be provided with activation switch and to be located at a convenient location conforming to OISD norms applicable. YES

4) Heater stack to be provided with rain hoods. YES

5) CFD modelling in the combustion air path to be carried out as a part of the detailed design. YES

8.5 VESSELS

8.5.1 HOLD-UP CRITERIA

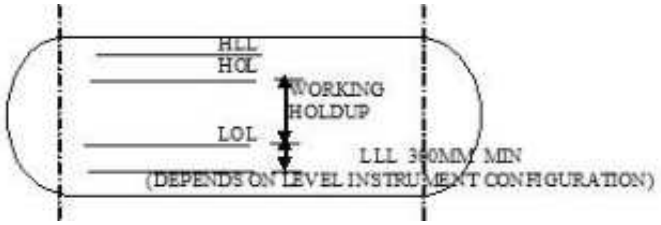
It is recommended that the following minimum requirement towards hold-ups for vessels. Designers can adopt criteria that call for higher hold-up volumes, if warranted from a design point of view. The working hold up volumes are expressed as minutes of liquid residence time between Low Operating Level (LOL) and High Operating Level (HOL) while additional hold ups shall apply between the operating levels and corresponding tripping levels (LLL / HLL), when a shutdown is stipulated. Refer figure below for clarity.

Unit feed surge drum, upstream unit in same control room:	15 minutes
Unit feed surge drum, upstream unit in separate control room:	15 minutes
Surge for fired heater feeds:	10 minutes
Surge for tower feeds, same control station:	8 minutes
Surge for tower feeds, remote control station:	12 minutes
Surge for pumped rundown to storage / other unit surge drum:	2 minutes (min)
Surge for gravity rundown to storage / other unit surge drum:	3 minutes
Surge for tower reflux streams in distillate drums:(this surge is additive to surge for downstream tower feed or rundown)	5 minutes
Compressor suction KOD (based on 5%wt of inlet vapor)	3 minutes
Compressor inter-stage KOD (automated drain)	3 minutes
Compressor inter-stage KOD (manual drain if <5 m^3)	8 - 24 hours
Refrigeration intermediate surge drum:	5 minutes
Refrigeration accummulator:	15 minutes
Offshore product separator:	3 minutes
Offshore dehydrators:	5 minutes
Offshore surge tanks:	10 minutes
Additional surge, LOL to LLL, normal pumps	2 minutes
Additional surge, LOL to LLL, large / high speed pumps	3 minutes
Additional surge, HOL to HLL, gas to fuel gas system	2 minutes
Additional surge, HOL to HLL, gas to large compressors	3 minutes
Additional surge, HOL to HLL, critical compressors	5~10 minutes

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8.5.1.1 TYPICAL HOLD UP SKETCH FOR VESSELS

For horizontal vessels, the normal liquid level shall be fixed at 50% of the vessel diameter.



8.5.2 VESSEL DIMENSIONS

Vessel and tower diameters shall be reported based on inside diameter (ID) while draw off boot diameter shall be reported to outside diameter (OD). Elliptical/Torispherical heads will be normally specified. Hemispherical heads will be considered, when relevant.

8.5.3 NOZZLE SIZES & RATING

8.5.3.1 SIZE AND RATING NOZZLES FOR PROCESS & INSTRUMENTATION NOZZLES

Minimum size and rating nozzles for Process & Instrumentation nozzles (applicable for vessels & columns):

Description	Default	Owner Preference
All nozzle in unclad vessel	1 1/2" NB	2" NB
All nozzle in internally lined vessel.	3" NB	Same as Default

For size / rating requirement of instrument nozzles refer section 9.0

If owner has preference of specifying at least 300# rating for some services of vessel nozzles, indicate below:

All nozzles upto: □ does not apply ■ 2″ NB
Pressure relief valve connection: ■ yes □ no
Level instrument standpipes: ■ yes □ no
All instrumentation connections: ■ yes □ no
■ For LPG and other high pressure services

8.5.3.2 OTHER NOZZLES

Other nozzles (applicable for vessels & columns):

1 Steam Out Nozzles:
1.1 Steam out connections will be provided on vessels which are stipulated to be steamed out during normal startups or shutdowns. Steam out nozzles, shall be located, at minimum elevation, on the head of horizontal vessels and above the bottom tangent line for vertical vessels.
1.2 Permanent connections for steam out will be provided for :
1.2.1 For all columns and vessels: YES
1.2.2 For all columns and critical vessels: NO
2 Access Nozzles (Manhole & Handholes)

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2.1 For vessels less than 900mm diameter:

2.1.1 In-case access is required, they shall be provided with body flanges.

2.1.2 In-case no access is required, hand holes shall be provided in place of body flanges.

2.1.3 In-case of vertical vessels, access shall be through flanged top head.

2.2 For vessels more than 900mm diameter:

2.2.1 In vertical vessels, provided with demisters:
OWNER TO SELECT FROM BELOW OPTIONS:

a) At least one manway will be provided in top head and one manway in the bottom section to facilitate the access. NO

b) At least one manway shall be provided in the bottom section to facilitate the access. of the demister. YES

2.2.2 In horizontal vessels, the manway shall be preferably located on the vessel head, away from the end that has internals such as internal displacers or baffles

2.2.3 Large horizontal vessels above 3000 mm tangent length will additionally be provided with a blanked-off ventilation nozzle at the top of the vessel, near the end opposite the manway.The vessel vent nozzle can be welded to the ventilation nozzle blind flange.

2.3 In case of skirt clad vessels/columns the nozzles at the bottom dished end coming out of skirt shall have a minimum of 6"NB size. This is required to facilitate cladding/weld.
Skirt man way shall be of minimum 24 inch dia

2.4 All manways shall have davit arrangement

2.5 Manways will be of minimum 20" bare ID for vessels of dia 900 mm to 1200 mm and for trayed/ packed towers with the a Long weld neck flange.

3.0 Level Instrument Nozzles

3.1 GWR type Instrument level instrument shall be considered for measurement ranges 1200 mm for clean, non congealing services when directly mounted on a vessel, two flanged nozzles affording 2" ID shall be provided. When mounted on a standpipe, two flanged 2" NB nozzles shall be provided. Bridles shall not be considered for mounting external displacer and level gauge glass. For ranges greater than 1200 differential pressure level transmitters shall be considered, preferably mounted from the standpipe having level gauges. However instruments involved in interlock application and all diaphragm seal instruments will be mounted directly on vessel.

3.2 All instrument standpipes shall have isolation valves.

3.3 The visible length of the level gauge shall cover the maximum operating range, where level guage is used in conjunction with a level transmitter, the visible range of the level gauge shall cover the entire range of level instrument.

3.4 Wherever critical level monitoring is required, the indication and control shall be from different set of nozzles in the vessel/ columns

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8.5.3.3 STANDARD SIZE OF STEAM-OUT, VENT, DRAIN, ACCESS NOZZLES (MANHOLE & HANDHOLES) AND VENTILATION NOZZLE

Standard size of Steam-out, vent, drain, access Nozzles (Manhole & Handholes) and ventilation nozzle as per EIL's default shall be as follows. In case owner decides otherwise then same to be indicated.

Vessel volume m3	Length (Horizontal vessel) mm	Vessel/ tower diameter(mm)	Steam-out size (clad/ unclad)	Vent size (clad/ unclad)	Drain size (clad/ unclad)	Ventilation size	Manhole size
less than 6.0	-		3"/ 2" NB	3"/ 2" NB	3"/2" NB	-	
6.0 - 15.0	-		3"/ 2" NB	3"/ 2" NB	3"/ 2" NB	-	
more than 15	-		3"/ 2" NB	3"/ 2" NB	3"/ 3" NB	-	
-	3000 - 4500				-	4" NB	
-	4500 - 7500				-	6" NB	
-	>7500				-	8" NB	
		900					18" NB
		Above 900 - 1200					20" NB
		>1200					24" NB

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8.5.4 VESSEL SIZE LIMITATIONS

Single-piece heavy equipment such as Reactors considered to be shop-fabricated and transported to site shall have to be within the following shipping envelope (dimensions including projections):Owner to indicate.

1	Maximum TL to TL	40 m
2	Maximum width / diameter	6.0 m
3	Maximum weight	650 MT

For general single piece equipment ODC limits, reference is to be made to project guidelines

Owner's Requirement:

Designer to provide permanent facilities for removal / neutralisation of pyrophoric iron from the columns (eg. Vacuum column, Stabiliser column, etc.). Typically, the facilities envisaged are circulating vessel, pumps, etc.

8.6 TOWERS

8.6.1 TRAY & PACKING SELECTION

Circular moving conventional floating valve trays with legs and anti-spin feature will be used for vapour-liquid mass transfer application unless Licensor has requirement of specific type of trays to comply to their performance guaranteed. Proprietary internals shall be minimized to the extent possible. However, for liquid-liquid mass transfer applications and for services where some extent of fouling is anticipated, sieve tray, fixed valve trays or baffle trays shall be used. Anti spin feature is not required in trays of crude and vacuum columns. Single-pass, Two-pass and Four-pass trays can be envisaged as appropriate. Three-pass trays are not preferred.

Bubble cap trays may also be specified for certain applications depending on their suitability for the service. Caged valves are not to be used.

Random or structured packings will be specified as considered necessary in services such as vacuum distillation, light end fractionation and product fractionators in low pressure applications

For columns having very high number of valves and also experiencing high L/G ratios, options of application of suitable high capacity trays can be explored.

8.6.2 TRAY / PACKING TURNDOWN

All trays and packing shall be designed for the same turndown as defined in respective unit BEDB. In some services, the reflux and reboiler rates may be turned down to a ratio different from the unit turndown, while still meeting the overall turndown.

8.6.3 HOLD-UP CRITERIA FOR TOWER BOTTOMS & TOWER DRAW-OFFS

Hold-up volumes for tower bottoms and tower draw-off trays shall follow Section 8.5.1. Licensors/ Designers can adopt criteria that call for higher hold-up volumes, if warranted from a design point of view. Specific to towers, the following additional stipulations shall be followed as minimum requirement:

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Surge for thermosiphon reboiler feed:	1 minute
Surge on drawoff for product (for chimney tray):	2 minutes
Surge for tower bottoms quench:	2 minutes
Surge on draw-off for circulating reflux:	1 minute
Surge for direct feed to another tower (excluding circulating flows)	5 minutes
Surge feed to storage/ downstream unit feed surge drum	3 minutes
Additional surge, LOL to low pre-alarm/ HOL to high pre-alarm	1 minute
Additional surge, low pre-alarm to LLL/ high pre-alarm to HLL	1 minute

8.6.4 PHILOSOPHY FOR TRAY SELECTION / MANHOLE AND HANDHOLE REQUIREMENT

1	Trayed columns	Manholes shall be provided above top tray, below the bottom tray, at the feed tray, at any other tray at which removable internals are located, and at intermediate points so that the maximum spacing of manholes in the trayed section does not exceed 10 meters.
2	Columns of diameter <900mm	
2.1		Flanged column sections shall be used.
2.2		Trays shall be Cartridge type trays
2.3		Column diameter shall be specified preferably in Std. pipe sizes.
3	Other trayed columns	Each set of 10 to 15 (maximum) trays shall be approachable from column manholes one above and one below the set of trays such that maximum spacing between two consecutive manholes in trayed sections does not exceed 10m
4	Packed columns:	
4.1		Each packed bed will have a manhole each above and below the bed.
4.2		For packed beds with random packing, hand holes shall be provided just above the packing support plates, for removal of packing. These shall be two in number and opposite to each other for columns with diameter exceeding 1000mm.
4.3		However, in the smaller diameter columns, if the column diameter permits, one of the hand holes shall be replaced by manhole.

All the above mentioned philosophy is applicable for selection of packed bed also.

If owner has any specific additional or different preferences, indicate below:

8.6.5 DATASHEET REQUIREMENTS FOR TOWERS

1 Trays shall be numbered from bottom to top.
2 Tray man ways shall be provided on each tray where access for inspection and maintenance through tray is required.

If owner has any specific additional or different preferences, indicate below:

Tray sections should be sized appropriately to facilitate removal through manways.

8.6.6 NOZZLE REQUIREMENTS FOR TOWERS

Refer Section 8.5.3 under "vessels".

Critical column (handling liquid above auto ignition high volume, choking/ coking tendency)

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will have minimum two independent level measurement device for column bottom level.

Column handling hydrocarbon above auto ignition at its bottom will have isolation facility by way of remote operated SOVs at column bottom.

8.6.7 SPECIAL REQUIREMENT FOR COLUMNS

8.6.7.1 VACUUM TOWERS

Provision of rupture discs on vacuum towers shall be considered. Rupture discs may be provided upstream of relief valves on vessels operating under vacuum.

8.6.7.2 PACKED TOWERS

1	1+1 Basket strainers in lines going to packed beds:	YES
2	Single basket strainers in lines going to packed beds:	NO
3	Pressure drop indication for each packed section/bed to be provided in the control room:	YES
4	Temperature instruments to be provided for detection of pyrophoric fire in vacuum column:	YES

8.7 PUMPS

8.7.1 SELECTION OF TYPE OF PUMPS

1 All centrifugal pumps within process battery limits shall be specified to conform to API Standard 610. However, centrifugal pumps not handling the process fluid shall be non API unless required by Licensor.

2 Pump specifications shall assume unsheltered outdoor location. The pipe rack above the pump bay may accommodate air-cooled heat exchangers, in which case, the unit has to be provided with a safety system to minimise accidental pump hydrocarbon leakages from being fanned out as an explosive vapor cloud.

3 In special applications, low flow, high head, integrally geared pumps can be specified, if found necessary .

If owner has any other preference, indicate below:

a) All centrifugal pumps having rolling element bearings shall be suitable for pure oil mist lubrication.

(In the past only purge oil mist lubrication provision has been kept)

b) For fire water pumps NFPA guidelines shall be followed. Specification shall confirm to TAC requirement .However no certification is being issued by TAC

8.7.2 SPARING OF PUMPS

Process pump services in continuous service will, in general, be provided with installed spare. Intermittent pump services such as chemical unloading, batch make-up, etc., shall not be provided with installed spare.These shall be decided on a case-to-case basis and possibility of common spares shall be examined.

Where more than one operating pump is found necessary for a service, or when defined by owner, pump capacity and spare shall be as follows:

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# Operating pumps	Rated capacity per pump	Spare pumps	Remarks
2	50% of total rated flow	1	
3	33% of total rated flow	1	
4	25% of total rated flow	2	

Owner may exercise the option of specifying at least 2 operating pumps for specific services as an operational strategy.
Does owner have such a requirement? □ yes □ no

If yes, list services where this requirement is to be enforced:
(a)
(b)
(c)
(d)
To be decided on case-to-case basis.

8.7.3 SPECIFICATION OF PUMP SEALS

1 Single mechanical seals shall normally be specified for centrifugal pumps unless other considerations prevail (as per following sections).
Seal flushing where necessary, shall preferably be with the process fluid itself through an appropriate API seal plan for all clean liquids.
2 External seal flushing oil shall be made a requirement only when a self-flushing plan is infeasible. Seal flushing plan shall be as per guidelines laid down in latest version of API 682.
2.1 For refinery services, normal flushing oil (FLO) and a heavy flushing oil (HFLO) will be available as defined in Section 6.11.
2.2 If otherwise, pumps shall be specified such that pump vendor is completely liable for compatible seal fluid selection which shall be verified by EIL.
3 Dual mechanical seals shall necessarily be specified for the following pump services:
3.1 Process liquids: butanes and lighter
3.2 For Hydrocarbon liquids with vapor pressure >10 psi at pumping temperature
3.3 Sour waters >100 ppm H2S
3.4 Residue streams temperature > autoignition temperature
3.5 Fouling service or environmentally hazardous service
4 Requirement of Emission Containment Seals (ECS): Dry running emission containment seals (ECS) can be used as back up seals when dual unpressurized seals are used. ECS can be used for :
4.1 As back up seal for applications of all light hydrocarbon below Auto-ignition temperature. No
4.2 As back up seal for light hydrocarbons below auto-ignition temperature exception LPG, Propylene and products containing H2S and other environmental consideration. Yes
5 For vacuum services, type of seal shall be determined during Basic Design by Licensor.

Owner's requirement
Dual seals should be specified for sour waters > 10ppm H2S, all seal flush lines should be SS304/316 MOC and following the OISD 125 guidelines.
Specific recommendation for pump seals shall be provided by designer/Licensor in pump

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data sheet.
Outer seal condition detection facility (e.g buffer with Nitrogen) shall be provided for ECS.

8.7.4 SPECIFICATION OF DRIVES

1 Motor drives shall be normally specified for pumps. Steam turbine drivers will be specified as required for critical services.
2 Emergency drive requirement for specific services to be defined by designer/ licensors based on criticality.

In case Owner has any specific requirement for drive selection for any particular service same needs to be indicated:

8.7.5 STARTING FREQUENCY

Starting frequency for pumps with motor rating >100 KW to be defined by Owner based on the operating practice to be followed in the complex:

1 >=1 time in a week YES
2 <1 time a week NO

8.7.6 MINIMUM FLOW BYPASS (MFB) PROVISIONS & CONTROLS

8.7.6.1 REQUIREMENT OF MFB FOR CENTRIFUGAL PUMPS

Requirement of MFB for centrifugal pumps is usually determined in the course of detailed engineering. In some instances, owner may want to specify a MFB from operational or equipment health considerations, regardless of actual MFB requirements determined by vendor data. Preferences for such MFBs are: Owner to indicate.

1 High pressure, multistage pumps: YES
2 Pumps with source vessel level control valve or LIC/FIC Cascade control at discharge: YES
3 Pumps with TIC or TIC/FIC control at discharge line and with single destination: YES
4 Single destination having fail close type control valve on pump discharge: YES

8.7.6.2 PUMPS WHERE DISCHARGE FLOW IS UNDER LEVEL CONTROL OR TEMPERATURE CONTROL

For Pumps where discharge flow is under level control or temperature control.

1 When the motor rating is less than or equal to 15.0 KW, manual MFB arrangement will be considered unless or otherwise specified by Design / Licensor based on process requirement.
1.1 add line with globe valve, restriction orifice (RO), local FI and gate valve assembly from the common discharge line back to common suction line (after sufficient length for heat dissipation) or to suction vessel (below LLL).
1.2 Size this line and RO for pump "min safe flow".
1.3 Add the value of min. safe flow to specify the pump flows as:
Revised rated flow = rated flow (process requirement) + "min safe flow".
Revised normal flow = normal flow (process requirement) + "min safe flow".
Revised min. flow = minimum flow (process requirement) + "min safe flow".
2 When the motor rating is more than 15.0 KW, it is recommended to use an automatic MFB. The arrangement is as follows:

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2.1 Put an FIC (set at minimum safe flow value) at common discharge with a MFB line with FIC control valve assembly back to suction line (after sufficient length for heat dissipation) or to a suction vessel (below LLL).
2.2 Size the control valve and MFB line for the "min safe flow".

8.7.6.3 PUMPS WHERE DISCHARGE FLOW IS UNDER FLOW CONTROL

For pumps where discharge flow is under flow control i.e. FC

1 When the process normal or rated flow is less than pump "min safe flow" and motor rating is less than 15.0 KW.
1.1 Same as Section 8.7.6.2 Sl.No. 1
2 When the process normal or rated flow is less than pump "min safe flow" and motor rating is more than 15.0 KW.
2.1 Same as Section 8.7.6.2 Sl. No.2 above but size the control valve for the difference of "min safe flow" and process minimum flow.
3 When the process min flow is less than pump "min safe flow".
3.1 Same as Section 8.7.6.2 Sl No.1 above and size this line and RO for the difference in pump "min safe flow" and process min flow. But do not revise pump rated and normal capacity.
4 When the process min flow is more than pump "min safe flow".
4.1 No action required.

8.7.7 PUMP COOLING MEDIUM

Bearing CW used for pump cooling (indirect) shall be disposed as indicated in Section 6.4.3.
Temperature not to exceed 10 DEG C or as per Section 6.1, whichever is lower.
Pressure drop not to exceed 0.7 Kg/cm^{2}g or as per Section 6.1, whichever is lower.

8.7.8 SPECIFICATION FOR AUTO-START PUMPS MOTOR RATING

For autostart pumps, electric motor shall be specified for end of the curve condition with discharge valve fully open conditions.

Owner's Requirement:

1.Warm up bypass across pump discharge for hot pumps shall be given.
2.Pumps taking suction from vessels containing greater than 7m3 of LPG, Hot Gasoline and Hot auto-ignition material will be protected by changing pump suction and discharge isolation valves to fire-safe remotely actuated valves. The valves to be motor operated (MOVs) from a safe location. For new systems, MOV safe location shall be considered 15m.These pumps shall have a DCS stop facility in central control room along with running lamp indication.
The MOVs shall have position (open & close) indicators. The new MOVs shall have position (open & close) indicators and inching facility. Hand switches to close and open from the field from a safe distance and from control room shall be provided.
Start permissive interlock shall be provided for the pump to start only when suction valve in open position.

8.8 COMPRESSORS

Specification of a compressor shall assume installation under a compressor shed.

8.8.1 SELECTION OF TYPE OF COMPRESSORS

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1 Centrifugal compressors, conforming to API Standard 617(latest edition), will be specified wherever suitable.
2 Axial compressors are not preferred below capacities of 150,000 Nm3/hr.
3 Driver selection shall be based on process requirements, criticality of service, capital cost and owner's preference as per respective unit BEDB.
4 Reciprocating compressors, conforming to API Standard 618(latest edition), shall be specified.
5 Screw compressors, conforming to API Standard 619(latest edition), can be specified in special cases where found to have an operating, economic or maintenance advantage over other choices.

8.8.2 COMPRESSOR DRIVER SELECTION

1 For Centrifugal compressors, driver selection will be based on Process requirement, criticality of service, capital cost & owner's preference as specified in respective unit BEDB Part A.
2 For Reciprocating compressor normally motor drive will be specified.
3 For Screw compressor drive requirement will be specified as in centrifugal compressor.

8.8.3 COMPRESSOR SPARING PHILOSOPHY

1 Centrifugal Compressor:
1.1 No spare to be considered
1.2 Spare rotor requirement(Yes)
2 Screw Compressor:.
2.1 Normally no spare compressor to be considered
2.2 ***Specific service for which spare screw compressor to be provided (e.g., screw compressors for pneumatic conveying system)***
This is to be addressed in unit/ utility system design basis.
2.3 Spare rotor requirement(Yes)
3 Reciprocating Compressor:
3.1 100% standby to be provided for continuous operating reciprocating compressor.
3.2 ***Specific intermittent service for which spare reciprocating compressor to be provided.***
This is to be addressed in unit/ utility system design basis.

8.8.4 COMPRESSOR SEALS

Owner's preference for centrifugal/ screw compressor seals are:

1 Centrifugal and oil free screw compressor (Other than air & N2 service): Dry Gas Seals
2 Oil flooded screw compressor (Other than air & N2 service): Conventional liquid Seals

Bi-directional & interchangeability in Drive-end and driven end to be considered.

8.8.5 COMPRESSOR CONTROLS

1	Alarm status in control room for all compressors	YES
2	Hard-wired alarm annunciation in control room for Critical compressors	YES
3	Dedicated PLC not envisaged for each compressor, Compressor controls shall be part of Main Control system except Licensor specific requirement.	YES
4	Conventional relay logics	YES

Refer section 9.0 for additional controls/ Instrumentation requirements.

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Owner's preference:

OWNER TO CHECK IF THE BELOW IS REQUIRED:

1. Reciprocating compressors have a trip on high discharge pressure. YES
2. Vibration measurements should be indicated in control room. YES
3. A common alarm/trip alarm should be there in control room. YES
4. Manual tripping provision from control room and field. YES

8.8.6 OTHERS

Unit designers shall address issues such as common or individual compressor suction and inter stage KODs, common or individual compressor inter stage coolers, etc., as part of unit operability and cost saving factors.

Owner's Requirement

1 NRV shall be provided on air compressor discharge.
2 Ampere indication for all the critical electric drives shall be provided on DCS.
3 Motor Winding Temperature indication for motor rating above 160 KW shall be provided in DCS.

8.9 STEAM TURBINE DRIVES

8.9.1 WHEN TO SELECT A STEAM TURBINE DRIVE?

Steam turbine drives shall be specified in extremely critical services where even short-term failure of a drive can result in a shutdown from where an operational recovery is difficult, time-consuming or has a large economic penalty, such as irreversible catalyst poisoning.

Steam turbine drives shall also be specified for the following drives that, among other considerations, shall ensure that a power failure does not automatically lead to a steam failure:

1	Cogeneration / Steam generation plant BFW pumps	YES
2	Compressor lube oil & seal oil pumps	YES
3	Emergency evacuation pumps	YES
4	***All utility drives which are required to operate during power failure. YES/ NO*** ***This shall be finalized on case to case basis during utility system design.***	

Other:Owner's preference:

a)	Turbine condensate pumps	YES
b)	Steam Drives as mentioned in respective unit Process packages to be considered.	YES

8.9.2 PREFERRED TYPE OF STEAM TURBINE DRIVE: BACKPRESSURE OR CONDENSING?

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1 Backpressure steam turbine for a large driver in an unit will be evaluated when there is a demand of the letdown steam within the same or neighboring unit.
2 When there is a large use of lower pressure steam (MP or LP level) , a back pressure steam turbine to drive a pump/ compressor shall be evaluated to minimise let down through pressure reducing station (PRDS) from higher pressure steam level to lower pressure steam level.
3 Condensing steam turbine drives shall otherwise be considered.

The preferred type of turbine drives will be decided during steam power balance of the complex.

If owner has any specific additional or different preferences, indicate

8.9.3 CONDENSING TURBINE EXHAUST

1 Steam condensing pressure at turbine exhaust shall be considered as 0.12 kg/cm2(a)for the purpose of basic engineering specifications.
2 Only water-cooling shall be considered for exhaust condensation.
3 Cleanliness factor of 0.6 shall be considered for surface condensers.

8.10 BOILER REGULATION REQUIREMENTS

8.10.1 SCOPE OF BOILER REGULATION

Steam generators / steam users shall meet IBR regulations. Major IBR requirements are summarised below:

1 Boiler : "Boiler" means a pressure vessel in which steam is generated for use external to itself by application of heat which is wholly or partly under pressure when steam is shut off but does not include a pressure vessel-
1.1 With capacity less than 22.75 litres (Five Gallons) (such capacity being measure from the feed check valve to main steam stop valve).
1.2 With less than one kg/cm2 design guage pressure and working gauge pressure; or
1.3 In which water is heated below 100 degrees centigrade;
1.4 "Boiler component" means steam piping, feed piping, economizer, superheater, any mounting or other fitting and any other external or internal part of a boiler which is subject to pressure exceeding 1 kg/cm2g.
2 Steam Pipe : Any pipe through which steam passes if:
2.1 The pressure at which steam passes through such pipe exceed 3.5 kg/cm2g above atmospheric pressure
2.2 Pipe exceeds 254 millimeters in internal diameter and the pressure of steam exceeds 1 kg/cm2 above the atmospheric pressure and includes in either case any connected fitting of a steam pipe.
3 "Feed pipe" means any pipe or connected fitting wholly or partly under pressure through which feed water passes directly to a boiler and which does not form an integral part thereof.
"Economizer" means any part of a feed pipe that is wholly or partially exposed to the action of flue gases for the purpose of recovery of waste heat.
"Superheater" means any equipment which is partly or wholly exposed to flue gases for the purpose of raising the temperature of steam beyond the saturation temperature at that pressure and includes re-heater.
4 The following items will be under IBR scope :
4.1 All steam users where downstream piping is connected to IBR equipment i.e. when condensate from the steam user is being flashed to generate steam to be used for external use. In that case the first steam users, condensate pot, (if provided) and steam generated from the condensate pot will also be covered under IBR.

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4.2 Boiler Feed Water (BFW) piping starting from BFW pumps to the steam generator. This is part of 'Boiler component' as "Feed pipe".
4.3 All steam generators in which steam is generated for external use by application of heat & operates under pressure
4.4 All steam piping upto the last inlet flange of non-IBR equipment, including the stripping steam to column.
4.5 Steam lines to the steam users where downstream system is not in IBR (upto last flange of the equipment.).
5 The following will not under IBR scope :
5.1 Steam tracing
5.2 Heating coils
5.3 Heating coils tanks
5.4 Steam Jackets
5.5 Steam out Connection (after the last spectacle blind)
5.6 All steam users(Heat exchangers, vessels, condensate pots etc) - where condensate is flashed to lower pressure i.e. downstream is not connected to IBR. IBR specification break will be done at last flange upstream of user equipment upstream
5.7 Equipment/ lines associated with Condensate Stabilization unit where the stabilization is done at a operating pressure less than 1 kg/cm2g.
5.8 Deaereater & BFW pumps, including pump suction lines. (IBR starts from BFW pump discharge)
5.9 Steam turbines.

8.10.2 MATERIAL CERTIFICATE

This section is only for information on IBR requirement

1 All item part of steam piping i.e. pipes, valves, fittings, traps, safety valves must have material certificates, countersigned by the local boiler inspectors.
2 For imported items - Certificates issued by an authority empowered by Central Boilers Board (As listed in the Appendix C of IBR) or under the law in force in a foreign country in respect of boilers manufactured in that country may be accepted.
3 All drawings coming under preview of IBR shall be certified by Local Boiler Inspector.

8.10.3

All datasheets of equipment which come under IBR scope shall have the annotation:"IBR is applicable".

9.0 INSTRUMENTATION

9.1 GENERAL CONTROL PHILOSOPHY

1) Process Control shall be facilitated through: DCS with SMART (HART Protocol) / Wireless wherever applicable.

1.1) SMART with HART Protocol will be considered for Following
1) All Open Loops
2) All Closed Loops

1.2) Wireless only for the Pumps in Offsite area and for all other pumps seal instrumentation, vibration, temperature and accelerometer shall be wired SMART transmitter with HART Protocol.

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2) Interlocks and shutdowns through Programmable Logic Controller (PLC).

If owner has any known constraints or any other preference, specify below:
a) All process interlocks and shutdowns shall be implemented through Quad/ TMR Programmable Logic Controller (PLC). Redundancy in the field shall be provided based on process requirement.
b) PLC should have SIL 3 class with sequence of event recording facilities.

9.2 GENERAL REQUIREMENT

9.2.1 BASIC DESIGN PHILOSOPHY

The following general requirements towards basic engineering design are recommended. Detailed instrumentation design philosophy would be developed in the course of detailed engineering.

1	All symbols in P&ID shall be as per ISA	YES
2	Sensor / transmitter for shutdowns separated from that for control / indication	YES
3	Solenoid valve operation with interlock & shutdown system	YES
4	Solenoid valve in sequence operation from DCS system	NO
5	Hand switches/Push buttons shall be in auxiliary console and status indication will be provided in DCS. Status indication for some critical pumps to be provided in auxiliary console also.	YES
6	Selector switch and status indication shall be in DCS Console	YES
7	Emergency switch/ emergency interlock bypass switches shall be hardwired only	YES
8	Shutdown signals shall be repeated in DCS through soft link	YES
9	Analog inputs for shutdown and interlocks shall be connected directly to PLC without use of receiver switch or trip amplifier	YES
10	For all temperature inputs, the field signals shall be temperature element with transmitter	YES
11	Rotating Equipment with auto start facility shall have Local-Remote / switch in local Control Station	YES
12	Rotating Equipment with auto start facility from control room (with auto as well as manual operation from DCS) shall have Auto-manual switch in PLC/DCS	YES
13	Instruments shall have individual tappings from process lines and equipments	YES
14	Shutdown valves to be	
14.1	FMR at field to be provided for all process shutdown interlock trips.	YES
14.2	Common trip reset for major interlock to be provided in control room. Grouping of major interlock to be decided on case to case basis.	YES
14.3	Provision to close and reset critical S/D valves from HWC also to be provided. Identification of critical S/D valves to be done based on designer''s requirement.	YES
15	All critical PLC input (for trip & shutdown) should have 2oo3 logic. The critical trips will be considered for:	
15.1	Heater	YES
15.2	Compressor	YES
15.3	Reactor	YES
15.4	Boiler	YES
16	For centrifugal Compressor Bearing temperatures 2oo3/2oo2 voting shall be considered as applicable. For axial displacemnt 2oo2 voting shall be considered.	
17	Local/Remote selector switch in Local control station (LCS), LCS start/stop, Emergency PB station shall be directly wired to MCC.	YES
18	If local panel start/stop PBs are used in the sequence, then it would be connected to PLC.	YES

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Others: Owner''s preference-

a) All MCC signals will be interfaced through isolating relays and fuse terminals to PLC/DCS.

b) All solenoid valve operation shall be through the PLC only, and should be shown in corresponding logic diagram. No direct operated solenoid valves shall be considered. Critical Shutdown valves shall be provided with double SOV.

c) Push buttons and status indication shall be realised in DCS except for shutdown applications. No hardwired indicators/recorders shall be used.

d) For shutdown valves, requirement of Tight Shut Off (TSO) shall be indicated wherever applicable. All TSO valve shall be as per API 598 tight shut off.

e) Signals of PLC with repeat alarm indication in DCS shall be shown connected to DCS from PLC through software link.

f) For line mounted temperature instruments, Nozzle size shall be 1.5" for upto 600 Class and 2" for above 600 Class.

g) One single tapping point shall not be used for connecting multiple instruments on process lines.

h) Where local loop indicators are used in a DCS loop (for repeat indication), such indicators shall bear a suffixed instrument tag number to distinguish these from the DCS instruments.

i) Transmitters for flow, pressure and differential pressure shall be of ±0.065% accuracy.
For low vacuum pressure measurements flanged diaphragm (Without caplillary) shall be considered.

j) Hydrocarbon detectors should be infrared (IR) type in general.

k) ISA type K thermocouples are preferred for General Service. Pt-100 RTDs may be used in special applications like high accuracy requirements

l) Proximity type position switches (intrinsically safe) with voltage level of 24 V DC to be used for on/off valves.

m) All control valves (including self actuated PCV)and shutdown valves flange rating shall be minimum 300 class.

n) Control valve positioners to be Electro-pneumatic (Smart type) type.

o) Temperature transmitters to be generally used with temperature elements,except for special applications where no temperature transmitter to be used. Temperature transmitters will be field mounted(but not head mounted).
Smart type transmitter for all Open loops, closed loops and Safety system loops. Licensor to review this and incorporate/
clarify in case of any objection.

p) On/off valves which are used in shutdown application shall be provided with redundant SOVs with local indication and online replacement facility.

q) Critical rotating equipment, pumps to have vibration monitoring system with control room indication.

9.2.2 PROCESS SWITCH TYPE

Process Switch type shall be as follows:

If owner has any specific additional or different preferences, indicate:
i) For Flow, Pressure, level, temperature switches shall be realized Through field transmitters along with set point generated in control system
ii) Package items shall have tripping through transmitters.
iii) Direct actuated field switches can be used in special cases as recommended by licensor

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or for proprietary vendor specific requirement.

1	Flow	Through Transmitter
2	Pressure	Through Transmitter
3	Temperature	Through Transmitter.
4	Level	Through Transmitter
5	Interface Level	Through Transmitter

9.2.3 FLUSHING REQUIREMENT

EIL recommends continuous flushing oil purge for flow, level and pressure transmitters in heavy residue , congealing services (except for bitumen product which can become off-grade) and services with fines for temperature above 200 °C in the vacuum service and for temperatures above 300 °C in the atmospheric service.

For some instruments (flow and pressure) in high temperature congealing service, flushing oil purge with diaphragm seal will be used. The requirement will be decided on case-to-case basis and the same will be defined in the P&ID.

For instruments in vapor phase of congealing services e.g. in vacuum column instruments in vapor phase in the above temperature range, nitrogen purge/ any other shall be used by Licensor.

If owner has any specific additional or different preferences, indicate below:

9.2.4 NOTES ON GENERAL REQUIREMENT FOR INSTRUMENTATION

All temperature elements are assumed to have minimum line size expansion of 4" to be implemented in the course of detailed engineering. These do not necessarily appear in Piping & Instrumentation Diagrams.

Instrument impulse lines to be insulated/traced, wherever required, to avoid congealing, condensation.

Auto / Manual (A/M) selection switch feedback shall be connected to PLC system for pumps wherever auto-cut in facility is envisaged.

Air Fin Coolers (AFC) shall be provided with vibration transmitter and shall be connected to PLC system. DO contact from PLC to MCC shall be used for tripping of AFC fans

9.3 LEVEL INSTRUMENTS

9.3.1 GENERAL INSTALLATION GUIDELINE

The usage of standpipe shall be considered for clean, non-viscous and non crystallizing services. Stand pipe shall be used if more than 4 nozzles on vessel are anticipated for mounting all the level Instruments in a given services.Stand pipes for level transmitter/Gauges may be considered on case to case basis where mounting of level gauges/transmitters directly on vessel is not feasible.
However, Standpipe shall not be applicable for level Instrument related to Interlock & shutdown applications. Separate nozzle directly punctured on vessel shall be considered for Level instrument in Interlock & shutdown application.

If owner has any specific additional or different preferences, indicate below:

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a) Level instrument tappings shall be from vessel / stand pipe only and not from process line.
b) The visible length of the level gauge shall cover the maximum operating range. When level gauge is used in conjunction with a level instrument, the visible range of the level gauge shall cover the entire range of level instrument.

9.3.2 GUIDELINE FOR STANDPIPE

Owner to indicate agreement with EIL stipulations for standpipes

1	Standpipe shall not have instruments other than for level	YES
2	Standpipe accommodating level gauge / transmitter shall be separate from standpipe /vessel tappings for level transmitters for alarm and trip	YES
3	Standpipe shall not be connected to process lines	YES
4	Separate isolation, vent and drain shall be provided for standpipes.	YES

9.3.3 LEVEL INSTRUMENT NOZZLE SPECIFICATION

The level instruments nozzles size on vessels shall be as follow:

Notes:
1. Displacer only where specific Licensor requirement.

S.No.	Type of Level Instruments	Nozzle Size Unlined	Nozzle Size Lined	Nozzle Size Lined/Unlined	Nozzle Size Direct	Remarks
1	Guided Wave Radar	2"	3"			Note-1
2	DP Level Transmitters	2"	3"			
3	Level Gauges	2"	3"			
4(a)	Standpipe (rating upto 600#)	2"	3"			
4(b)	Standpipe (rating > 600#)		3"			3" for Unlined Nozzle size
5	Dia. Seal DP Level Transmitter (Directly on vessel only)			3"		
6	Extended / Flush Diaphragm seal DP level Transmitter (Directly on vessel only)				4"	

Notes
Note: The top and bottom level nozzles tap-off shall be taken from side only.

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9.3.4 TANK LEVEL INSTRUMENTS

For Tank Level Gauges, owner to indicate :

Owner's preference:
a) Tank Level Gauges shall be Radar type for Feed & Product tanks with Tank Farm Management System integrated with DCS.
b) For highly viscous liquids stored in fixed roof tanks, Radar type gauges shall be considered.
c) Temperature & density measurement with the servo gauges shall be considered. For temperature measurement of hydrocarbon tanks, average temp measurement over the entire liquid column in tank should be considered.
d)SIL (safety integrity level) of the tank level control must be improved and independent overfill protection meeting requirement of Part 1 of EN 61511 shall be provided.

Where Density measurement is mandatory, separate pressure transmitter at Tank lower liquid level to be used in conjunction with Radar Level instrument.

1	Feed tanks	For Class A & Class B 3 no. Radar Gauges shall be considered ; For Class C Only 2 no. Radar Gauges shall be considered.
2	Intermediate tanks	For Class A & Class B 3 no. Radar Gauges shall be considered ; For Class C Only 2 no. Radar Gauges shall be considered
3	Product tanks	For Class A & Class B 3 no. Radar Gauges shall be considered ; For Class C Only 2 no. Radar Gauges shall be considered
4	Highly viscous services	Radar
5	Mounded LPG bullets /propylene bullets	1 no. servo and 2 no. Radar Gauges shall be considered. The same is applicable for Spheres.
6	Tank Farm Management system	YES, to be integrated with DCS.

9.3.5 TYPE OF LEVEL INSTRUMENT FOR SPECIFIC SERVICE

Specific selection of type of level instruments for congealing / high viscosity service.

1	Diaphragm seals Owner"s Requirement For Desalter	YES
1	Profiler type multiple probes	YES
2	RF admittance type	YES

9.3.6 LEVEL INSTRUMENT FLANGE RATING

Level Instruments / Standpipe Nozzle min. flange rating for vessels shall be

1	Minimum 300#	YES
2	As per Vessel Rating	NO
3	For Tanks-As per Tanks Rating	YES

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9.3.7 GENERAL GUIDELINE FOR TYPE OF LEVEL INSTRUMENT

Philosophy for selecting type of level instrument.

1	Generally Guided Wave Radar type instruments shall be used for level measurement up to 1200mm	YES
2	Differential pressure transmitter shall be used for level measurement above 1200mm and for service requiring purge or where liquid might boil in external portion	YES
3	For interface applications, Guided wave radar type shall be used	YES
4	In General Magnetic type Level Instrument shall be used for local Measurement	YES

If owner has any specific additional or different preferences, indicate below:

a) Displacer type may be used in interface application where guided wave radar are not suitable.
b) Interface type level instruments shall be clearly identified in the P&ID.
c) Radar type level transmitters shall be used for underground CBD vessels.

9.4 FLOW INSTRUMENTS

9.4.1 GENERAL REQUIREMENT

General requirements for flow instruments:

a) For only local indications, use following type of instruments:
- Calibrated differential pressure gauge across flow element.
- Rotameter (for line sizes upto 1 1/2")

b) Liquid flow measurement process data shall indicate flow in kg/hr and shall include density at standard conditions in addition to flowing density and normal / minimum / maximum flows, etc. For more details refer Section-2.5.2 .

c) Gas/ vapour flow measurement process flow data will be indicated in kg/hr .For more details refer Section-2.5.2 .

d) Orifice with flow transmitter : Separate tapping on Orifice flanges for 2oo3 voting service

If owner has any specific additional or different preferences, indicate below:

Mass flow meters/ Ultrasonic flow meters will be used for feed & product streams at unit battery limit with minimum pressure drop.

9.4.2 SPECIAL SERVICE REQUIREMENT

Other special requirement for flowmeter are:

1	Flare header in each unit to be provided with an ultrasonic flow meter at the unit battery limit.	YES
2	FD fan air flow measurement	
2.1	Averaging Pitot tube	NO
2.2	Venturi meter	YES
2.3	Thermal Mass Flow meter	NO
3	Flow instruments at compressor suction	

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3.1	Venturi meter at all compressor suction	YES
4	For highly viscous and fouling service:	
4.1	Mass Flow (Coriolis type)	YES
4.2	PD meter	NO
4.3	Wedge, for very high viscous service / slurry	YES
4.4	Orifice	NO
4.5	Target	NO
4.6	Ultrasonic	YES
5	For Cooling water service flow instruments shall be as follows	
5.1	Type of flow meter for cooling water line size upto 28" is Electromagnetic type.	YES
5.2	Type of flow meter for cooling water line size > 28" is Annubar Type	NO
5.3	Type of flow meter for cooling water line size > 28" is Ultrasonic Type	YES
6	General service flow instrument requirement:	
6.1	For 2" lines and above:Orifice plate	YES
6.2	For 1 1/2" lines and below:Variable Area meter (For pump seal flow application)	YES
6.3	For 1 1/2" lines and below:Meter Run	NO
6.4	For 1 1/2" lines and below:Integral Orifice (For other flow application)	YES
7	Feed and product run down flow meter	
7.1	Mass Flow (Coriolis type)/ Ultrasonic	YES
8	Steam line flow meter	
8.1	For VHP /HP/MP steam, flow nozzles shall be used, if the measurements are unidirectional.	YES
8.2	***LP Steam-Flow Nozzle***	***YES***
9	***Fuel Gas and Fuel Oil supply/return line flowmeter***	
9.1	Coriolis type flowmeter	YES
10	Vortex flowmeter for Instrument Air and High Rangeability application	YES
10.1	***For Plant Air-Orifice Flowmeter***	***YES***
11	***For local indication and purging/dosing application-Variable Areameter***	***YES***
12	***Blending Application***	
12.1	***Coriolis / Ultrasonic Type***	***YES***
13	***Heater Pass Flow(Control and shutdown)***	
13.1	***For general service Heaters***	
a)	***Coriolis/Ultrasonic Type***	***YES***
13.2	***For heater handling highly viscous service***	
a)	***Ultrasonic Flowmeter***	***YES***
14	***For Custody Metering***	
a)	***Gas and Liquid Metering -Coriolis or Ultrasonic Owner""s Requirement***	***YES***

Cooling water flow meter shall be installed above Ground Only.

9.4.3 FLOW INSTRUMENT FLANGE RATING

Flow Instruments min. flange rating shall be:

1	Minimum 300# (Note-1)	YES
2	As per Line Rating	NO

Note-1: Applicable for measuring orifice only.

9.5 PRESSURE AND TEMPERATURE INSTRUMENTS

9.5.1 NOZZLE SIZE FOR PRESSURE / TEMPERATURE INSTRUMENT

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Pressure & Thermowell nozzles on vessels shall be flanged. Nominal diameter shall be specified to ensure this minimum ID or ID of lining.
Pressure & Thermowell min. flange and nozzle size for vessels shall be

S.No.	Type of Pressure/Temperature Instruments	Nozzle Size Unlined	Nozzle Size Lined	Nozzle Size Lined/Unlined	Nozzle Size Direct	Remarks
1	Pressure instrument nozzle size	2"	3"			
2	***Diaphragm seal type Differential Pressure instrument nozzle size***			***3"***		
3	***Diret DP Instrument nozzle size***	***2"***	***3"***			
4	Temperature instrument nozzle size	2"	3"			

9.5.2 FLANGE RATING FOR PRESSURE/ TEMPERATURE INSTRUMENT

Pressure & Thermowell min. flange rating for both vessels and lines shall be

1	Nozzle rating for Vessel	
1.1	As Per Vessel Rating	NO
1.2	Minimum 300#	YES
2	Nozzle rating for Lines	
2.1	As Per Line Rating	YES
2.2	Minimum 300#	NO
3	Minimum 300# for all thermowell nozzles	YES

9.6 START / SHUT DOWN OPERATION FROM CONTROL ROOM

Emergency operations to be enabled from the control room

1	Single emergency shutdown of total complex: (OWNER to Check as it""s typically selected as "NO" in similar Projects)	NO
2	Respective unit emergency shutdown:	YES
3	Fired heater emergency shutdown (in addition to field):	YES
4	All rotating equipment shutdown (control room and field):	NO
5	Critical rotating equipment shutdown (in addition to field):	YES
6	Damper and gate operation (in addition to field):	YES
7	Shutdown valves to fail-safe position:	YES
7.1	All SOV (interlock SOV) shall be with Field Manual Reset:	YES
7.2	CMR type shall be on case to case basis as per P&ID.	YES

Owner''s preference:

a)	Remote stopping facilities for pumps handling hydrocarbon above auto ignition temperature.	YES
b)	Solenoid valve reset will be through separate push button from field.	YES
c)	Shutdown valve on product to storage lines to be provided for products with high RVP. These shutdown valves shall be actuated by low level signal from the source column bottom/ overhead accumulator through dedicated level transmitter, located preferably close to the source.	YES

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9.7 STATUS INDICATION LAMPS IN CONTROL ROOM

1	All continuously running rotating equipment:	YES
2	Critical continuously running rotating equipment:	YES
3	Open/close indication for all Shutdown Valves:	YES
4	Alarm status in control room for all compressors.	YES
5	Hard Wired Alarm Annunciator System for all critical equipments and critical process alarms as shown in P&ID.	YES
6	Hard Wired alarm anuciator shall be considered for SRR for temperature high. For UPS, hardwired signals for UPS fault and load on bypass supply shall be considered.	YES

9.8 CONTROL VALVE

9.8.1 CONTROL VALVE MANIFOLDS

a) As a default, control valves upto 12" size shall be provided with a manifold of block and bypass valves. Bypass valves shall be globe valves.
The following philosophy is to be adopted for manifold valve size.
The control valve inlet & outlet block valve size shall be same as corresponding line size.
The bypass valve and line size shall be same as control valve size.

b) Beyond 12" size, block and bypass requirement will be decided on case to case basis.

c) Control valves not having block and bypass provision shall be provided with hand wheel for manual operation.

d) Antisurge valve will have no bypass. Only 'LO' type isolation valve shall be provided.

e) In no event shall shutdown valves be provided with block and bypass valves or handwheel.

f) All control valves connected to flare line shall be TSO; i.e. leakage class VI.

9.8.2 CONTROL VALVE DRAIN / VENT

1	All control valves shall be provided with 3/4" drain valves, which can be provided as:	
1.1	Upstream and downstream of all control valves	YES
1.2	Upstream and downstream of fail close valves, upstream of fail open valves	NO
1.3	Upstream and downstream of fail close valves, downstream of fail open valves	NO
1.4	Upstream of all control valves	NO
2	EIL"s default philosophy for drain valve end connection is as follows	
2.1	Shall be capped in all non-hydrocarbon & non-IBR steam service	YES
2.2	Shall be blind-flanged in all hydrocarbon & IBR steam service	YES

All control valves drain tip shall be at least 30 cm above the floor.

If owner has any specific additional or different preferences, indicate below:

a) Control valves
in fuel lines to fired equipment should be provided with minimum stop arrangement. The stop devices shall not form part of the hand wheel mechanism.

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b) For systems, with very high pressure drop (i.e, 15 kg/cm2g or above) across control valve, the bypass globe valve shall be provided with restriction orifice.
c) In special cases where a control valve service has to handle a wide variation of flows and pressure drops, more than one control valve in parallel may be specified as appropriate
d) Shutdown valves shall not be provided with block/ bypass valves unless dictated by specific designer's recommendation or process requirement, depicted in final BDEP or FEED packages. Shut down valves shall not have any hand-wheel, limit stops after shutting off. Fluid pressure to assist in keeping the valve closed. The actuator should be capable of opening the valve against the full upstream pressure.

9.8.3 FLANGE RATING FOR CONTROL VALVE/ SDV

Control valves and shutdown valves body and flange rating shall be

1	Minimum 300#	YES
2	As per line rating for > 300# lines	YES

9.9 PRESSURE RELIEF VALVE (PSV)

9.9.1 PSV SPARING PHILOSPHY

Safety valve or pressure relieving device shall be mounted on a pipeline immediately adjacent to the pressure vessel.

1	Owner to indicate preferences towards sparing of pressure relief valves:	
1.1	PSV for operational failures shall have installed spare:	YES
1.2	PSV exclusively for non-operational failures (external fire or Heat exchanger tube rupture) shall have installed spare:	YES
1.3	PSV for thermal relief shall have installed spare	NO
1.4		
A	Steam Generators in IBR service shall have minimum two PSVs (no isolation valves allowed).	YES
B	PSV in IBR steam in other services such as Let down station, Steam turbine outlet, condensate flash drums, condensate pots etc shall have installed spare	YES
1.5	PSV in spared equipment shall have spare PSV	NO
2	The spare PSV capacity philosophy for multiple PSV is as follows:	
2.1	***Only one spare:***	***NO***
2.2	***Percentage of spare PSV for multiple PSV is 25%*** ***Example :For PSVs upto 4 working no. of spare required will be 1 , and for 5 working PSVs upto 8 no. of spare PSVs required will be 2 and so on.***	

9.9.2 PSV ISOLATION PHILOSOPHY

1	In case downstream is connected to a closed system:	
1.1	In general PSV shall have upstream and downstream isolation	YES
1.2	In case equipment is spared, PSV shall have only downstream isolation	YES
2	In case downstream is connected to an open system:	
2.1	In general PSV shall have only upstream isolation	YES
2.2	PSV in IBR steam in steam generation services shall have no isolation.	YES

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2.3	***For PSV""""s provided in IBR steam in other services such as let down station, steam turbine outlet, condensate flash drum, condensate pot etc, Inline PSV""""s shall have LO isolation valve and standby PSV shall have LC isolation valve.***	YES
3	¾″ bleed valves shall be provided downstream of inlet isolation valve and upstream of outlet isolation valve for all PSV′s (except thermal relief valves/any valve releasing to atmosphere)	YES
4	PSV bypass shall be provided with 2″ gate valve followed by spectacle blind and globe valve	YES
5	Downstream bleeder is not required for safety valves released to atmosphere	YES

Owner's preference:

The upstream isolation valves shall be locked open (LO) for the in-line PSVs and locked close (LC) for the spare PSVs. The downstream isolation valves shall be locked open (LO) for the in-line PSVs and for the spare PSVs.

9.10 CONTROL PHILOSOPHY FOR VENDOR PACKAGE ITEMS

9.10.1 COMPRESSOR CONTROL AND INTERLOCKS

For all vendor package supplies, monitoring, control and logics shall be implemented in control room with minimum instrumentation in local control panel for startup and shutdowns.

Vibration monitors shall be located in Control Room/ Satellite Rack Room (Not Local control Panel)

Repeat indications, if required, may be provided on Local control Panel.

If owner has any specific additional or different preferences, indicate below:

9.10.2 CONTROL FOR MAJOR PACKAGE ITEMS

For all compressors and charge pumps, the logic implementation shall be done through a separate PLC supplied by respective equipment supplier. For other packages, the logic implementation shall be through a main PLC.

Package vendors shall supply Governor Control Systems and Anti Surge Control Systems which shall be mounted in dedicated cabinets in SRR and control & operation shall be provided in operator consoles in control room.

9.10.3 COMPRESSOR CONTROLS AND INTERLOCKS

1	Compressor shut down and interlock shall be implemented in:	
1.1	Unit PLC	YES
1.2	Independent PLC	NO
2	For compressor controls, owner's preference is:	
2.1	Only start-up and shutdown from local panel, normal control from control room	YES
2.2	Start-up/normal control from local panel, only critical parameters /trip alarms to be provided in central control room	NO
3	Owner''s Requirement a)Control from DCS control room through DCS HMI. b) Remote emergency trip for compressors to be provided at at a safe distance (15m) away from the compressors.	

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9.10.4

Package control and interlock shall be mostly implemented in unit PLC except for some packages which mandate proprietary PLC / control system or only if recommended by licensor/client.

1	Major package interlocks, shutdown and controls, shall be implemented in:	
1.1	Unit PLC	YES
1.2	Independent PLC	NO
1.3	Independent PLC from equipment supplier for Conveying System, Extruder, Bagging Machines	YES

9.11 STANDARD INSTRUMENTATION FOR EQUIPMENT

9.11.1 PACKED TOWERS

I	***Packed Towers***	
1	Local differential pressure indication for each bed:	YES
2	Local differential pressure indication for total section:	YES
3	Control Room differential pressure indication for each bed (through PT and calculation block):	YES
4	Control Room differential pressure indication for total section:	YES
5	Control Room differential pressure indication for critical beds:	NO
6	1 operating and 1 standby Basket strainers in lines going to packed beds:	YES
7	Single basket strainers in lines going to packed beds:	NO
8	Control room TI in the column packings for detection of pyrophoric fire during shutdown.	YES

FOR OTHER EQUIPMENTS LIKE REACTOR, TRAYED COLUMN, PUMP AND COMPRESSORS

II	***For Reactors and Trayed Columns***	
1	***Two PT"s shall be used for differential Pressure measurement***	***YES***
III	***PUMPS/COMPRESSORS***	
1	***DPT/ DPI (DCS) across permanent strainers in compressor suction and slurry/ coking service pumps suction is to be provided***	***YES***
2	***All pumps shall have pressure gauge at pump suction and discharge piping***	***YES***

If owner has any specific additional or different preferences, indicate below:

a) Critical sections such as Vacuum Tower wash oil zone, shall have indication in DCS. These shall be finalized during P&ID review.
b) The strainers shall be 1 operating + 1 standby, each provided with isolation valves to enable maintenance with the unit on-line. The strainers shall be located as close as possible to the respective tower inlet nozzle.

9.11.2 HEAT EXCHANGERS AND AIR COOLERS

1	Thermowell at process inlet & outlet of each exchanger shell / air cooler (If shells are stacked then across the stacked shell only):	YES
2	Thermowell at cooling water outlet of each exchanger/ shell and air cooler:	NO
3	Local TI at cooling water outlet of each exchanger/ air cooler:	YES
4	Local TI at process inlet and outlet of each exchanger/ air cooler:	NO
5	Control Room TI at process inlet and outlet of each exchanger/ air cooler:	YES
6	Local PI at process inlet & outlet of each exchanger(*)/ air cooler:	YES

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*If shells are stacked then across the stacked shell only

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9.11.3 BATTERY LIMIT INSTRUMENTATION

9.11.3.1 UTILITY LINES

As a minimum, the following shall be provided in utility headers of the Unit:
Owner to indicate the requirement.

S.No.	Utility	local PI	DCS PI	PAL/PAH	local TI	DCS TI	TAL/TAH	DCS FI	FAL/FAH	DCS FQ
1	MP Steam	Yes	Yes		Yes	Yes		Yes		Yes
2	LP Steam	Yes	Yes		Yes	Yes		Yes		Yes
3	Condensate	Yes	Yes		Yes	Yes		Yes		Yes
4	CW supply	Yes	Yes		Yes	Yes		Yes		Yes
5	CW return	Yes	Yes		Yes	Yes		Yes		
6	Instrument Air	Yes	Yes	PAL	Yes	Yes		Yes		Yes
7	Plant Air	Yes	Yes		Yes	Yes		Yes		
8	Inert Gas	Yes	Yes		Yes	Yes		Yes		
9	Fuel Gas	Yes	Yes		Yes	Yes		Yes		Yes
10	Fuel Oil	Yes	Yes		Yes	Yes		Yes		
11	DM Water	Yes	Yes		Yes	Yes		Yes		
12	Service Water	Yes	Yes		Yes	Yes		Yes		
13	Flare	Yes	Yes		Yes	Yes		Yes		Yes
14	VHP Steam	Yes	Yes		Yes	Yes		Yes		Yes
15	HP Steam	Yes	Yes		Yes	Yes		Yes		Yes
16	BFW	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17	Fire Water	Yes	Yes							

- Temperature instruments and pressure instruments provided in buried lines / vessels shall be located above ground level.
- For vapour line, Temperature/Pressure compensation is to be provided for flow measurement.
- For recirculating cooling water flushing arrangement at battery limit outside unit B/L as well as within unit B/L for the header shall be provided.

9.11.3.2 PROCESS LINES

Owner to indicate the requirement.
Minimum requirement as preferred by owner is indicated below, however same to be finalized on case to case basis during design stage.

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S.No.	Process	local PI	DCS PI	PAL/PAH	local TI	DCS TI	TAL/TAH	DCS FI	FAL/FAH	DCS FQ
1	Feed		YES			YES		YES		
2	Product		YES			YES		YES		

For vapor Lines, Temperature / Pressure compensation is to be provided for Flow measurement.

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9.11.3.3 OTHERS

Type of flow instruments at battery limit is to be decided by Owner. EIL's default is Flow orifice for all services. For special service flow instruments requirement refer clause 9.4.2.

9.11.4 OWNER'S SPECIAL REQUIREMENT

1 Shut down and alarm philosophy:
Inventory isolation valves (remote operated MOV's) will be provided for the common pump suction lines for the listed services.

1.1 For liquids of C4 or lighter

1.2 Hydrocarbon above auto ignition

1.3 Naphtha Service

1.4 Sour water hold-up in column & vessel, chances of H2S release

1.5 For debutanizer / stabilizer bottoms being routed to OSBL directly or through other equipment, column bottom low level shutdown valve to be provided. All these valves and associated accessories to be fire safe type as indicated in P&ID.

1.6 The inventory valves are MOV with switch at a safe distance.MOV safe location shall be considered 15m.
These pumps shall have a DCS stop facility in central control room along with running lamp indication. The MOVs shall have position (open & close) indicators. MOVs shall have position (open & close) indicators and inching facility. Hand switches to close and open from the field from a safe distance and from control room shall be provided. Start permissive interlock shall be provided for the pump to start only when suction valve in open position.

2 Licensor shall indicate auto restart requirement for motors in the datasheet.

3 VFD type drives may be considered if applicable for process feed control /energy optimization.

4 Local Pressure & temperature Instruments at the battery limit on the feed & product lines shall not be provided.

5 In general, local pressure instruments on any service except pump discharge line, are not to be provided unless required by process reason.

6 For line size less than 2″ Y type strainers and for 2″ and above T type strainers shall be provided. However, for steam service irrespective of line size Y type strainer shall be provided.

7 SDV to be provided at downstream of hydrocarbon vessel water boot (with interface) with low level trip logic.

8 For air fin vibration monitoring/trip, the following philosophy to be adopted:-
- All cooling tower fans will be provided with vibration transmitter with trip facility and online vibration monitoring(wireless) device.
- All Fin fans in process units: vibration transmitter with trip facility

9 For all critical PLC inputs, 2 out of 3 logic shall be implemented from field so that failure of an instrument does not lead to plant trip (applicable for all critical inputs in compressors, reactors, boilers and heaters).

10 All pumps shall have pressure gauges at pump suction and discharge piping

10.0 PIPING & INSULATION

10.1 GENERAL DESIGN GUIDELINE

Detailed Engineering Design Basis shall define the detailed design requirements for overall piping, insulation, painting and corrosion protection standards.

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10.2 INSULATION THICKNESS

To be adopted as per EIL Standard and shall be selected from the insulation thickness tables:

10.2.1.1 FOR HEAT CONSERVATION (IH & IT) – A
10.2.1.2 FOR HEAT CONSERVATION (IH & IT) – B
10.2.2.1 FOR PERSONNEL PROTECTION (IS) – A
10.2.2.2 FOR PERSONNEL PROTECTION (IS) – B
10.2.3.1 FOR ELECTRICALLY TRACED (IE) – A
10.2.4.1 FOR COLD INSULATION WITH ANTI SWEAT (IC) – A
10.2.4.2 FOR COLD INSULATION WITH ANTI SWEAT (IC) – B
10.2.4.3 FOR COLD INSULATION WITH ANTI SWEAT (IC) – C
10.2.5.1 FOR HEAT CONSERVATION DUAL TEMPERATURE (IK) – A

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10.2.1 FOR HEAT CONSERVATION (IH & IT)

10.2.1.1 FOR HEAT CONSERVATION (IH & IT) - A

Nominal Dia. Inches, NB	Operating temperatures, Deg.C											
	Material Type	30- 125	126-150	151-175	176-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550
0.5	Rock wool Pipe section as per IS 9842, Gr.3	25	25	40	40	40	50	65	75	90	90	100
0.75		25	25	40	40	40	50	65	75	90	100	115
1		25	25	40	40	50	50	65	80	100	100	125
1.5		25	25	40	40	50	50	65	80	100	115	140
2		25	25	40	40	50	65	80	90	115	125	150
3		25	25	40	40	50	65	80	100	115	140	165
4		25	40	40	40	65	75	90	100	125	140	165
6		25	40	40	50	65	80	90	115	125	150	175
8	Rock wool Blanket as per IS 8183, Gr.4	25	40	40	50	65	80	90	115	125	150	175
10		25	40	40	50	65	80	100	115	140	165	190
12		25	40	40	50	65	80	100	125	140	165	190
14		25	40	40	50	65	80	100	125	150	175	200
16		25	40	40	50	65	80	100	125	150	175	200
18		25	40	40	50	65	80	100	125	150	175	200
20 and Above		25	40	50	65	80	90	100	125	150	175	215

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10.2.1.2 FOR HEAT CONSERVATION (IH & IT) - B

Nominal Dia. Inches, NB	Operating temperatures, Deg.C				
	Ambient to 550	551-600	601-650	651-700	701-760
		INNER + OUTER			
0.5	Rock wool for temperature up to 550°C	25+80	25+90	25+100	25+125
0.75		25+90	25+100	25+115	25+125
1		25+90	25+100	25+125	40+125
1.5		25+100	25+115	25+125	40+140
2		25+100	25+115	25+140	40+150
3		25+115	25+125	40+140	50+165
4		25+125	25+140	40+150	50+175
6		25+140	40+150	40+165	65+190
8		25+150	40+165	50+165	65+215
10		25+165	40+175	50+200	75+225
12		25+175	40+190	65+200	75+240
14		25+190	40+200	65+215	90+250
16		25+190	40+200	65+225	90+250
18		25+200	40+225	65+240	90+265
20 and Above		25+215	40+225	65+250	90+265

Material

Inner Layer : Ceramic Fibre (ASTM C892, Type-III, Grade-8)

Outer Layer: Rock wool (IS 8183, Gr.4)

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10.2.2 FOR PERSONNEL PROTECTION (IS)

10.2.2.1 FOR PERSONNEL PROTECTION (IS) - A

1. Wire mesh shall be used instead of Insulation material upto a maximum temperature of 175 Deg C, beyond this insulation material shall be used.
2. For specification of wire mesh, Piping Design Basis shall be referred:

Nominal Dia. Inches, NB	Operating temperatures, Deg.C				
	Up to 175	176-200	201-250	251-300	301-350
0.5	Metal Cage	40	50	50	65
0.75		40	50	50	65
1		40	50	65	65
1.5		40	50	65	65
2		40	50	65	75
3		50	65	75	80
4		50	65	75	90
6		50	65	80	90
8		50	65	80	100
10		50	75	80	100
12		50	75	90	100
14		50	75	90	115
16		65	80	90	115
18		65	80	90	115
20 and Above		65	80	90	115

Material
Cellular Glass (ASTM C552, Type-II, Grade-6)

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10.2.2.2 FOR PERSONNEL PROTECTION (IS) - B

Nominal Dia. Inches, NB	Operating temperatures, Deg.C					
	Up to 175	176-550	551-600	601-650	651-700	701-760
			INNER + OUTER			
0.5	Metal Cage	Rock wool for temperature up to 550°C (Refer Annexure –IX) Cellular Glass for temperature up to 350°C (Refer Annexure –X)	25+80	25+90	25+100	25+125
0.75			25+90	25+100	25+115	25+125
1			25+90	25+100	25+125	40+125
1.5			25+100	25+115	25+125	40+140
2			25+100	25+115	25+140	40+150
3			25+115	25+125	40+140	50+165
4			25+125	25+140	40+150	50+175
6			25+140	40+150	40+165	65+190
8			25+150	40+165	50+165	65+215
10			25+165	40+175	50+200	75+225
12			25+175	40+190	65+200	75+240
14			25+190	40+200	65+215	90+250
16			25+190	40+200	65+225	90+250
18			25+200	40+225	65+240	90+265
20 and Above			25+215	40+225	65+250	90+265

Material
Inner Layer: Ceramic fibre (ASTM C892, Type-III, Grade-8)
Outer Layer: Rock wool (IS 8183, Gr.4)

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10.2.3 FOR ELECTRICALLY TRACED (IE)

10.2.3.1 FOR ELECTRICALLY TRACED (IE) - A

Nominal Dia. Inches, NB	Operating temperatures, Deg.C											
	INNER + OUTER											
	30- 40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150
0.5	25+25	25+25	25+25	25+25	25+25	25+25	40+25	40+25	40+25	40+25	40+25	40+25
0.75	25+25	25+25	25+25	25+25	25+25	25+25	40+25	40+25	40+25	40+25	40+25	40+25
1	25+25	25+25	25+25	25+25	25+25	40+25	40+25	40+25	40+25	40+25	40+25	40+25
1.5	25+25	25+25	25+25	25+25	40+25	40+25	50+25	50+25	50+25	50+25	65+25	65+25
2	25+25	25+25	25+25	40+25	40+25	40+25	50+25	50+25	50+25	50+25	65+25	65+25
3	25+25	25+25	25+25	40+25	40+25	50+25	65+25	65+25	65+25	65+25	65+25	65+25
4	25+25	25+25	25+25	40+25	40+25	50+25	65+25	65+25	65+25	65+25	75+25	75+25
6	25+25	25+25	25+25	50+25	50+25	65+25	75+25	75+25	75+25	75+25	90+25	90+25
8	25+25	25+25	25+25	50+25	50+25	65+25	75+25	75+25	75+25	75+25	90+25	90+25
10	25+25	25+25	25+25	50+25	50+25	65+25	75+25	75+25	90+25	90+25	90+25	90+25
12	25+25	25+25	40+25	65+25	65+25	65+25	75+25	75+25	90+25	90+25	90+25	90+25
14	25+25	25+25	40+25	65+25	65+25	65+25	90+25	90+25	90+25	90+25	90+25	90+25
16	25+25	25+25	40+25	65+25	65+25	65+25	90+25	90+25	90+25	90+25	90+25	90+25
18	25+25	25+25	40+25	65+25	65+25	65+25	90+25	90+25	90+25	90+25	90+25	90+25
20 and Above	25+25	25+25	40+25	65+25	65+25	75+25	90+25	90+25	90+25	90+25	90+25	90+25

Material

Inner Layer: Rock wool (IS 8183)

Outer Layer: Polyisocyanurate (PIR) (ASTM C591, Grade-2, Type-II)

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10.2.4 FOR COLD INSULATION WITH ANTI SWEAT (IC)

10.2.4.1 FOR COLD INSULATION WITH ANTI SWEAT (IC) - A

Nominal Dia. Inches, NB	Operating temperatures, Deg.C													
	30 to 5	4 to -7	-8 to -18	-19 to -32	-33 to -45	-46 to -60	-61 to -75	-76 to -90	-91 to -100	-101 to -120	-121 to -130	-131 to -145	-146 to -155	-156 to -170
0.5	25	40	60	70	80	90	90	100	100	110	120	130	140	150
0.75	25	40	60	80	80	90	100	110	110	120	130	130	140	150
1	25	40	70	80	90	100	110	110	120	130	130	140	150	165
1.5	40	50	70	80	90	110	110	120	130	130	140	150	165	175
2	40	50	70	80	90	110	120	120	130	140	150	165	175	190
3	40	60	80	90	100	120	120	130	140	150	165	175	190	200
4	40	60	80	90	110	120	130	140	150	165	175	175	190	200
6	40	70	90	110	110	130	140	150	165	175	175	190	200	215
8	40	70	90	110	120	140	150	165	175	175	190	200	215	225
10	50	70	90	115	125	140	150	165	175	190	200	215	225	240
12	50	80	90	115	130	150	160	175	190	190	200	215	225	240
14	50	80	100	120	130	150	160	175	190	200	215	225	240	250
16	50	90	100	120	130	160	175	190	200	215	225	225	240	250
18	50	90	110	125	140	160	175	190	200	215	225	240	250	265
20 and above	50	90	110	130	140	175	190	200	215	225	240	250	265	290

Material
Cellular Glass (ASTM C552, Type-II, Grade-6)

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10.2.4.2 FOR COLD INSULATION WITH ANTI SWEAT (IC) - B

Nominal Dia. Inches, NB	Operating temperatures, Deg.C													
	30 to 5	4 to -7	-8 to -18	-19 to -32	-33 to -45	-46 to -60	-61 to -75	-76 to -90	-91 to -100	-101 to -120	-121 to -130	-131 to -145	-146 to -155	-156 to -170
0.5	25	25	40	50	50	60	60	70	70	80	80	90	100	110
0.75	25	25	40	50	60	60	60	70	80	90	90	100	110	120
1	25	25	50	50	60	70	70	80	90	100	100	110	120	130
1.5	25	40	50	60	70	70	80	90	100	110	110	120	130	140
2	25	40	50	60	70	70	80	90	110	120	120	130	140	150
3	25	40	60	70	80	80	90	100	110	120	130	140	150	160
4	25	50	60	70	80	80	90	100	110	120	130	150	160	170
6	25	50	60	70	80	90	100	110	120	130	140	160	170	180
8	25	50	60	70	80	90	100	110	120	130	140	160	170	180
10	40	50	60	70	80	90	100	110	120	130	140	160	180	190
12	40	65	70	80	90	100	110	120	130	140	150	170	190	200
14	40	65	70	80	90	100	110	120	130	140	150	170	190	200
16	40	65	70	80	90	115	125	140	150	165	175	190	200	210
18	40	65	70	80	90	115	125	140	150	165	175	190	200	210
20 and Above	40	65	70	80	100	115	125	140	150	165	175	190	200	210

Material

Polyisocyanurate (PIR) Insulation (ASTM C591-17, Grade-2, Type-II)

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10.2.4.3 FOR COLD INSULATION WITH ANTI SWEAT (IC) - C

Nominal Dia. Inches, NB	Operating temperatures, Deg.C													
	30 to 5	4 to -7	-8 to -18	-19 to -32	-33 to -45	-46 to -60	-61 to -75	-76 to -90	-91 to -100	-101 to -120	-121 to -130	-131 to -145	-146 to -155	-156 to -170
	INNER + OUTER													
0.5	25+50	25+50	25+50	25+50	25+50	40+50	40+50	50+50	50+50	50+50	75+50	75+50	75+50	75+50
0.75	25+50	25+50	25+50	25+50	25+50	40+50	50+50	65+50	75+50	75+50	80+50	80+50	90+50	90+50
1	25+50	25+50	25+50	25+50	25+50	40+50	50+50	65+50	75+50	80+50	90+50	90+50	100+50	115+50
1.5	25+50	25+50	25+50	25+50	40+50	50+50	65+50	75+50	80+50	90+50	100+50	100+50	115+50	125+50
2	25+50	25+50	25+50	25+50	40+50	50+50	65+50	75+50	80+50	90+50	100+50	115+50	125+50	140+50
3	25+50	25+50	25+50	40+50	50+50	65+50	75+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50
4	25+50	25+50	25+50	40+50	50+50	65+50	75+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50
6	25+50	25+50	25+50	40+50	50+50	65+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50
8	25+50	25+50	25+50	40+50	50+50	65+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50
10	25+50	25+50	25+50	40+50	50+50	65+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50
12	25+50	25+50	40+50	65+50	75+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50	175+50
14	25+50	25+50	40+50	65+50	75+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50	175+50
16	25+50	25+50	40+50	65+50	75+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50	175+50
18	25+50	25+50	40+50	65+50	75+50	80+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50	175+50
20 and Above	25+50	25+50	40+50	65+50	75+50	90+50	100+50	115+50	125+50	140+50	150+50	165+50	175+50	190+50

Material

Inner layer: Polyisocyanurate (PIR) Insulation (ASTM C591, Grade-2, Type-II)

Outer layer: Cellular glass (ASTM C552, Type-II, Grade-6)

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10.2.5 FOR HEAT CONSERVATION DUAL TEMPERATURE (IK)

10.2.5.1 FOR HEAT CONSERVATION DUAL TEMPERATURE (IK) - A

NOTE :Higher of either thickness mentioned in Table 10.2.5.1 and Table 10.2.4.1 shall be considered

Nominal Dia. Inches, NB	Operating temperatures, Deg.C						
	30- 125	126-150	151-175	176-200	201-250	251-300	301-350
0.5	25	25	40	40	50	50	65
0.75	25	25	40	40	50	50	65
1	25	25	40	40	50	65	65
1.5	25	25	40	40	50	65	65
2	25	40	40	40	50	65	75
3	25	40	40	50	65	75	80
4	25	40	40	50	65	75	90
6	25	40	40	50	65	80	90
8	25	40	50	50	65	80	100
10	25	40	50	50	75	80	100
12	25	40	50	50	75	90	100
14	25	40	50	50	75	90	115
16	25	40	50	65	80	90	115
18	25	40	50	65	80	90	115
20 and Above	25	40	50	65	80	90	115

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10.3 HEAT TRACING PHILOSOPHY

1	Within the Unit battery limit, steam tracing shall be provided.	NO
2	In offisites, heat tracing shall be provided by:	
2.1	Steam tracing	NO
2.2	Electrical tracing for temperatures up to 150 °C	YES
2.3	Electrical tracing for temperatures up to 250 °C	YES
3	Steam tracing philosophy to be adopted for piping handling congealing services shall be as follows:	
3.1	LP Steam shall be used for services with viscosity up to vacuum gas oil viscosity and MP steam shall be used for heavy residues.	NO
3.2	MP Steam shall be used for all the congealing services.	ISBL

If owner has any specific additional or different preferences, indicate below:

In ISBL Electrical tracing shall be preferred . If Electrical tracing is not feasible steam tracing shall be done with Low Pressure Steam, unless specified otherwise.

10.4 GUIDELINE FOR INTER EQUIPMENT SPACING

It is mandatory to adhere to PNGRB Guidelines and stipulations of OISD standard # 118 (latest edition) for minimum inter-equipment spacing and inter-distance between process unit and offsites for hydrocarbon industry in India.

If owner has any specific additional or different preferences, indicate below:

10.5 PIPING MATERIAL SPECIFICATION

Piping Material Specification (PMS) shall be provided to process licensor for selection of piping class.

In case process licensor does not find suitable piping class from standard piping material specification, licensor shall provide required details for developing new piping material specification.

All small bore(1.5" and below) chemical injection lines (corrosion inhibitor lines) are to be of stainless steel metallurgy.

10.6 GUIDELINE FOR USE OF GEAR AIDED AND MOTOR OPERATED VALVES

a) Gear-aided operation shall be as per PMS.

b) Motor Operated valves shall be provided as follows:
For all the frequently operated valves, which can be opened or closed during normal Unit operation (such as isolation valves for pumps, compressors, filters etc., which are provided with standby or bypass) of size:

1 EIL default: 16" YES

Owner's preference : Same as EIL default

Unit battery limit isolation valves in hydrocarbon service for sizes above:
14 "

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If owner has any specific additional or different preferences, indicate below:

10.7 SPECIAL ITEM IDENTIFICATION

All special purpose valves/ critical piping shall be tagged in P&IDs or identified in appropriate piping class. The BDEP shall contain appropriate specifications towards the same in case of any special requirement.

10.8 UNDERGROUND AND ABOVE GROUND LINES

1. All piping within a process unit shall be above ground except for oily water sewer and various closed blow down systems as applicable.
2. Cooling water supply and return headers shall be on pipe rack for sizes up to 36" or below and underground headers shall be provided above 36" size.
3. Fire Water Header if laid above ground shall run away from process lines.
4. Bearing cooling water return if considered through open funnels and sump system, will also be underground.
5. Steam condensate recovery header shall be kept above ground.
6. External wrapping & coating to be considered for all underground piping irrespective of service.

Owner's Requirement
1. All lines should be laid above ground in general. Underground lines shall be considered in case to case basis.
2. For CBD lines, high temperature resistant paint system shall be followed. CBD lines should be designed with higher schedule.

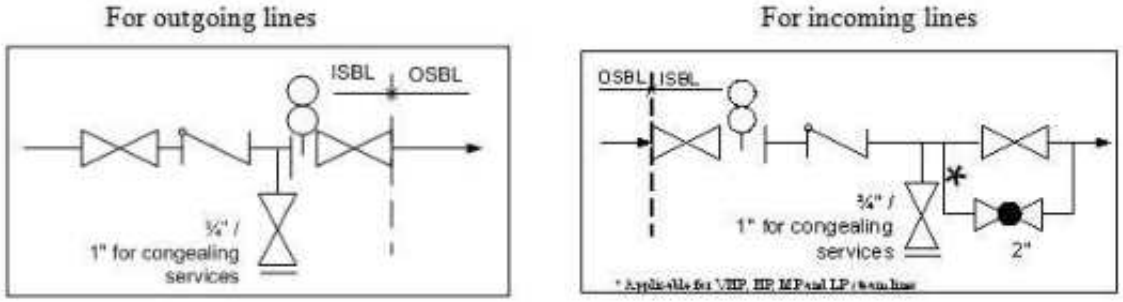
10.9 DESIGN REQUIREMENT FOR CONDENSING VAPOR LINE

All condensing vapor lines shall be specified with no pockets, free draining requirement as applicable.

10.10 BATTERY LIMIT ISOLATION

The Battery limit isolation for all the incoming and outgoing Process and Utility lines from / to the Process units shall be configured.

If owner has any specific additional or different preferences, indicate below:
1. NRV is not required for crude line as crude supply is independent for CDU.



10.10.1 BATTERY LIMIT ISOLATION REQUIREMENT

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Incoming / Out going streams	Double Block Isolation valves	Single Block Isolation valve	Non Return Valve (unit side)	Spectacle Blind (unit side)	Bleeder
Hydrocarbon lines:					
All Hydrocarbon heavier than LPG	YES		YES	YES	YES
All Hydrocarbon lighter than LPG	YES		YES	YES	YES
Hydrogen	YES		YES	YES	YES
Utilities:					
VHP/ HP steam	YES			YES	YES
MP/ LP steam	YES			YES	YES
Condensate	YES			YES	YES
Instrument Air	YES			YES	YES
Plant Air		YES		YES	YES
Nitrogen	YES		YES	YES	YES
CW supply/ Return		YES		YES	YES
VHP/HP/MP Boiler Feed Water	YES			YES	YES
DM Water		YES		YES	YES
Service water		YES		YES	YES
Caustic	YES		YES	YES	YES
Sulphuric acid	YES		YES	YES	YES
Flare	YES			YES	YES
Fuel Oil and Fuel Gas	***YES***		***YES***	***YES***	***YES***

The above requirements are EIL default.

If owner has any specific additional or different preferences, indicate below:
1.) Separate corrosion probe to be considered at each unit B/L CW return line.
2.) In steam line Warm up/ Equalization line shall be provided with a break-off flange, one globe & one gate valve. Further, for VHP steam the OSBL side isolation shall be considered with double valves.
3.)All vents and drains in VHP Steam service will be double valve.
4.) Sample connection to be provided at N2 header.
5.) 2" Valve for inertization in Flare Line on OSBL side as well as ISBL side at unit battery limit to be provided
6.)ISBL main flare header shall have "LO" valve.

10.11 VALVE TYPE FOR COOLING WATER / RAW WATER SERVICE

For cooling water / raw water services, butterfly valves can be used including and beyond following size.Gate valves to be used for lower sizes.

1 EIL default: 12" YES

Owner's preference : _____

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If owner has any specific additional or different preferences, indicate below:

10.12 VALVE TYPE FOR FLARE LINE BATTERY LIMIT ISOLATION

For flare line isolation valves at battery limit, following to be used

1 EIL default: Triple offset butterfly valve YES

Owner's preference :

10.13

For steam out temperature /pressure of piping, refer section. 8.2.4 wherever applicable.

Owner's Special Requirement:
1.Tapping point of Nitrogen/other service to HC service to be provided with Double block , NRV, globe valve and bleed arrangement.
2.Necessary provision (stub and valve with blind flange) shall be made in piping in process units to carryout chemical decontamination of Hydrocarbon pump, heat exchangers and associated system in fouling hydrocarbon services. This will be identified on case to case basis by owner.
3.For cooling water lines greater than equal to 42" manway can be provided every 100 m(appx) in horizontal lines only. However no. of manways to be minimized in consideration of man entry for inspection and cleaning inside the header.
In between vent can also be provided for proper ventilation
4.Control valve , level instrument , stand pipe drain and vents in services having either hydrogen service, light hydrocarbon(Naphtha and lower cuts) or Wet H2S/sour service need to be connected to closed systems (CBD/flare) as applicable with double block and break flanges.

11.0 ENVIRONMENTAL CONTROL

1 Total sulphur dioxide emission from complex shall be maximum 31.4 TPD.
2 Sulphur recovery in SRU shall be: 99.9 % min.
3 Low NOx burners shall be used in all furnaces.
4 Continual online monitors for SO2, NOx, CO and SPM in all stacks shall be provided. All stack analysers to be provided with connectivity to MPPCB & CPCB. For NH3, Methanated Hydrocarbon, Non-methanated Hydrocarbon, Benzene and VOC manual monitoring shall be provided in all stacks.
5 Emission from the stacks shall be as per the norms as stipulated by MoEFCC, CPCB & SPCB.
6 Emission from the project will be such that the National Ambient Air Quality standards 2009 (NAAQS, 2009) are met outside battery limits.

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7 Liquid Effluents generated in the complex shall be routed to centralized Effluent Treatment Plant (ETP) in the Complex. The Treatability of the Effluent(s) in a Typical ETP (consisting of oil removal section (API/TPI/DAF) followed by conventional activated sludge process) of the Complex is to be confirmed by the Unit Licensors. Effluent Streams with contaminants requiring Specific Treatment shall be identified and Recommendations on Treatment Process (either considered within the Unit or to be considered in the ETP) to be included in the Effluent Summary Document in the BDEP. The treated effluent in the complex shall be processed through a Zero Liquid Discharge (ZLD) Plant. The Treated Effluent from the ETP shall conform to Environmental (Protection) Amendment Rules, 2008 (For Petroleum Oil Refinery) and Environment (Protection) Fourth Amendment Rules, 2012 (for ""'Petrochemical (Basic and Intermediates) as a minimum and the Stipulations as given in the Environmental Clearance and Consent to Establish (CTE) for the Project by MoEFCC / SPCB.

8 All unit designers have to necessarily furnish complete effluent characteristics as defined in the section 15.1

9 Noise level: 85 dB(A) at 1 meter from source of equipment. Noise concentration in ambient air at the boundary of the industrial unit shall not exceed following levels:
Between 6 a.m. and 10 p.m.: 75 dB(A)
Between 10 p.m. and 6 a.m.: 70 dB(A)

10 The hazardous waste generation and its Handling shall comply with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

11 Sulphur dioxide emission from stacks of Furnace, boiler, and Captive Power Plant shall be maximum of 50 mg/Nm3 and 850 mg/Nm3 for gas and liquid fuel operated respectively as per MoEFCC prescribed Oil Refinery Industry standard. For NOx, the emission will be 250 mg/Nm3 and 350 mg/Nm3 for gas and liquid fuel operated respectively.

12 Continuous online (24x7) monitoring system, both for emissions and effluent shall be installed within the plant site for measurement of discharge and pollutants concentration.
Owner''s Requirement
a)Ultra Low NOx burners shall be considered when recommended by licensors or owner on case to case basis.
b)Volatile organic compounds (VOCs)/Fugitive emissions shall be controlled at 99.997% with effective chillers/modern technology.
c)Stack height of Utility Boilers to be minimum 100 m
d)As a standard monitoring practice, all major equipment like furnaces, GTs, STGs, turbine drives and motor drives more than 1 MW – the operation efficiency of these equipment should be displayed on the DCS to know the equipment performance.

12.0 SAFETY

This section presents a short list of additional safety aspects that will be reflected, as appropriate, in the basic engineering design or in the detailed engineering stages.This list is not intended to be a complete enumeration of safety features for a project. Additional safety standards requirement for equipment as per process package to be adopted.

1 Push buttons for stopping critical motors/ MOV, if identified, shall be provided at a safe location, away from the fire-zone of the respective motors. This is in addition to usual start/ stop push buttons provided for such motors.

2 Gas detectors shall be provided in the critical process and offsites areas.The requirement of steam / air curtain shall be based on designers requirement and as finalised to be consistent with rotating equipment seal selection and leakage potential.

3 Suction / discharge valves of suction filter should be close to the pump in order to avoid hydrocarbon wastage during filter cleaning and pump maintenance.

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4 ***Flare line isolation valve at unit battery limits should be installed only in the horizontal line with stem in horizontal position to avoid free fall of gate and blockage of flare system.Each flare header leaving a unit shall be provided with such isolation valves to facilitate maintenance of flare piping and piping and pressure relief valves within the unit.***

All PSV isolation valves to have their stem horizontally or vertically downwards.

5 Dip hatch for the tanks should have the aluminium guide extended upto top surface of the tanks (Short guides may cause serious hazards). Dip hatch cover should be ensured with a rubber gasket for non sparking.

6 Sprinkler system to be provided :
- air fin cooler located above any piperack or equipment .
- Pumps in plant/ offsites operating above auto ignition, LPG, unstabilized naphtha.
- Fire proofing requirement.
- Auto start facility for new firewater pumps as part of additional fire fighting facilities to be provided

7 MOVs are to be provided for all HT motor pumps suction and discharge lines.

If owner has any specific additional or different preferences, indicate below:

a) The number and location of the gas detectors shall be based on applicable standards.
b) Communication system to cover all areas of plants and offsites shall be provided.
c) Emergency lights in plant area and control room shall be provided and these shall be LED type.

8 No operator cum maintenance cabin is allowed within the unit premises (unless cabins are blast resistant). All such manned/ recurring function buildings should be outside the unit at safe location.

13.0 PROCESS FLOW DIAGRAMS & PIPING & INSTRUMENTATION DIAGRAMS

13.1 LEGEND P&IDS

The following standard legend P&IDs shall be adhered to across all process and utility facilities:

1 Standard symbols & nomenclature: Drawing # B857-79-41-00-1191
2 General notes & typical details: Drawing # B857-79-41-00-1192
3 Typical details for heater- process and firing section: Drawing # B857-79-41-00-1181
4 Typical details for air preheating system of heaters: Drawing # B857-02-44-00-1182

13.2 INSTRUMENT REQUIREMENTS FOR P&IDS

All designers are required to adhere to the following requirements in Piping & Instrumentation Diagrams:

1 Control valve / Shut-down valve failure position shall be indicated
2 Control valve / Shut-down valve sizes shall be indicated
3 Pressure relief valve set points shall be indicated
4 Pressure relief valve sizes with orifice designations shall be indicated
5 Interlocks shall be shown with sequence numbers matched to description
6 Minimum Flow stops, handwheels for control valves, as required shall be shown
7 Advanced or complex control loops shall be explained, mathematically if necessary
8 Solenoid valves and limit switches shall be shown where stipulated.
9 Coupons and corrosion probes wherever required shall be shown

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10 Interface type level instruments shall be clearly identified in the P&ID
11 Pressure and temperature elements shall be shown for flow measurement (except mass flow meters) with pressure and temperature compensation, where stipulated
12 Block & Bypass valves shall be provided for Mass Flow meters, Ultrasonic Flowmeters ,Magnetic flowmeters, Integral Orifices, Positive Displacement meters and Rotameters (unless Licensor/ Designer specifies otherwise) except for ultrasonic flowmeter in flare and magnetic flow meter in cooling water line.
13 Sampling system for online & manual analysis
14 Desuperheater shall be with separate BFW control valve.

13.3 PREFERRED DRAWING SIZE AND MEDIA

All P&IDs and PCDs shall preferably be drawn in drawing size ISO A1. Smart P&ID Software -Intergraph Smart P&ID version 2019 shall be used for preparation of P&ID's.

13.4 MISCELLANEOUS

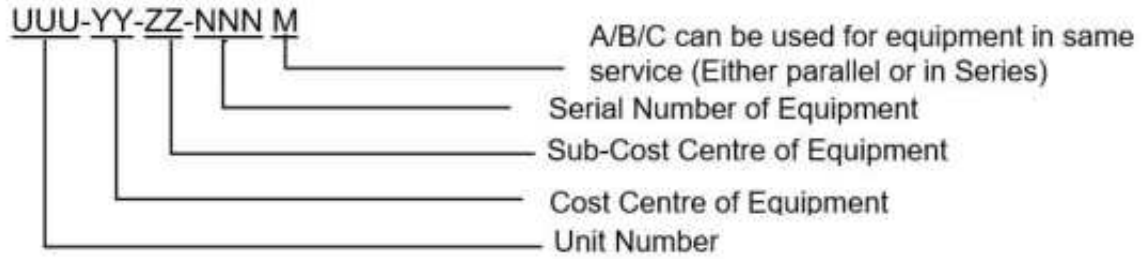
P&ID to indicate rating of control valves, safety valves, vessel flanges if they differ from line rating.

14.0 NUMBERING SYSTEM

14.1 EQUIPMENT NUMBERING PHILOSOPHY

14.1.1 GENERAL EQUIPMENT NUMBERING PHILOSOPHY

Equipment numbering shall be as per Owner's requirement and is as outlined below:



The Cost and Sub-cost centers serving as equipment designations, are summarized in Section 14.1.1.1 covering the requirement of basic engineering. The serial number shall be as assigned by unit designer. Separate series can be used to designate different sections within the same unit.

Suffix A/B/C can be used for equipment in same service (Either parallel or in Series) after Equipment Serial Number.

Equipment numbering philosophy for the following is covered under Annexure C :
(1) Modified/Replacement in existing equipment,
(2) New equipment in existing services.

14.1.1.1 EQUIPMENT DESIGNATION

For Equipment Designation, refer Annexure-B.

14.1.2 EQUIPMENT NUMBERING PHILOSOPHY FOR VENDOR PACKAGED

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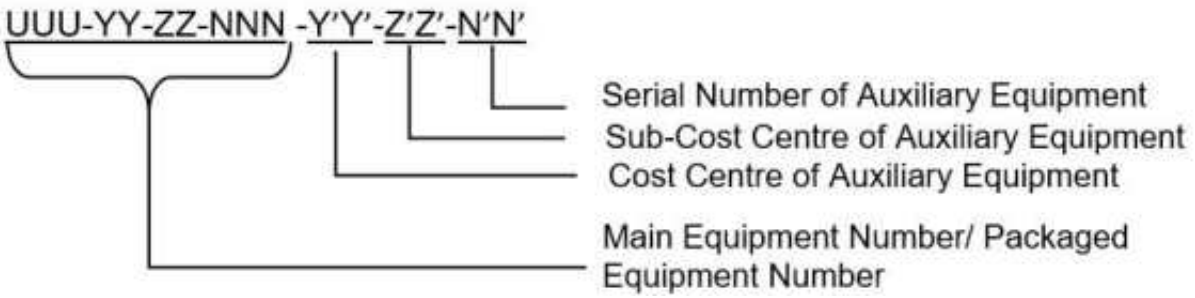
ITEMS

Equipment Numbering philosophy for Vendor packaged items in inline with OWNER's Equipment Numbering Philosophy

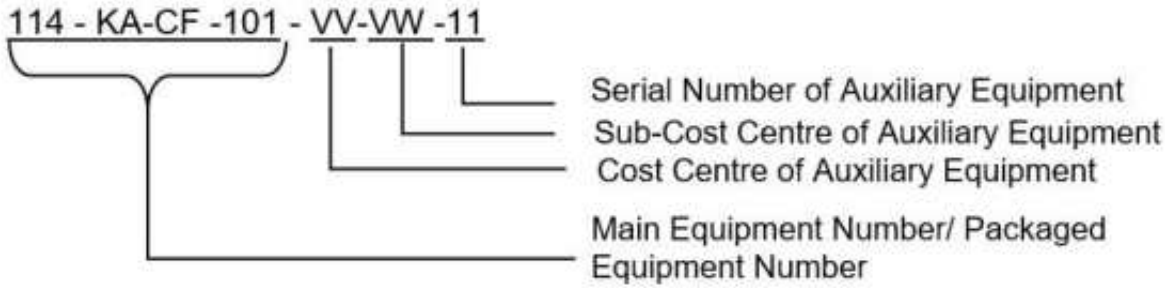
a) Philosophy for equipment numbering will be in line with the earlier section.
b) Additional equipments prepared by vendor will follow the philosophy as given in figure.

The Cost and Sub-cost centers of auxiliary equipment within a package / associated with a main equipment serving as equipment designations, shall be as per Section 14.1.1.1

Serial number of Auxiliary equipment within a package / associated with a main equipment shall start with 1 and listed within two digits in case required. If there are multiple items for a particular service considering spare, etc., same can be identified as 1 A/B, etc., same way as it is followed for main equipment.



14.1.2.1 EXAMPLE



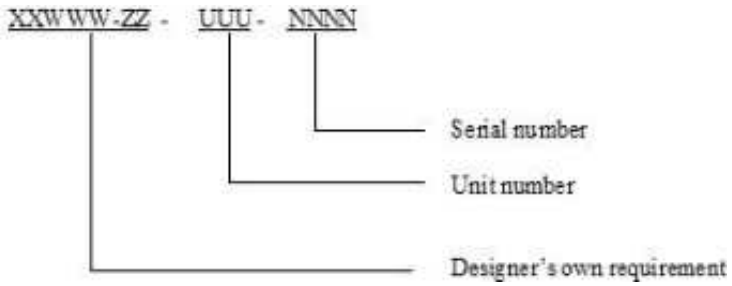
14.2 DRAWING NUMBERING PHILOSOPHY

14.2.1 GENERAL DRAWING NUMBERING PHILOSOPHY

Drawing numbering shall be as per Owner's requirement and is as outlined below:

Specific to the numbering of Process Flow Diagrams and Piping & Instrumentation Diagrams, Process control diagram (if applicable), material flow diagram, the following system shall be adhered to by all licensors / designers:

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For EIL designed units, XXWWW-ZZ will be indicated as JJJJYY-ZZ. Here JJJJ refers the Job no. and YY and ZZ are Process department unit code 79 and section code 41 respectively.

This numbering essentially ensures that the first part of the drawing number takes care of a licensor''s or designer''s own company numbering requirements while the second part of the number ensures a uniform philosophy for all PFD / P&ID serial numbers which will then be utilised for numbering instruments and lines as per 14.3 and 14.4 below.

In the four-digit drawing serial number, the digits shall be used as follows:
First digit:''0'' for PFDs and ''1'' for P&IDs, ''2'' for PCDs, ''3'' for MFD, ''4'' for CFD.
Second digit:''0'' for iso size A0, ''1'' for iso size A1, so forth.
Last 2 digits:Serial number starting from ''11'' for P&IDs and CFDs, from ''01'' for PFDs and MFDs.

For those units where the total number of P&IDs are exceeding 99, the P&ID number beyond 99 shall be considered as follows:
NNMMM, where
First two digits remain same, i.e. 11
Last three digits shall be 111 to 999, depending upon the number of P&ID.

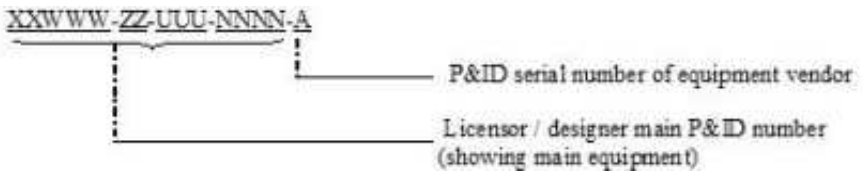
P&ID numbering philosophy of dismantling line is covered under Annexure C .

14.2.2 DRAWING (P&ID) NUMBERING PHILOSOPHY FOR VENDOR PACKAGED ITEMS

Drawing (P&ID) Numbering philosophy for Vendor packaged items is in inline with OWNER's P&ID Numbering Philosophy

a) Philosophy for P&ID numbering will be in line with the earlier section.However, serial number shall be 3 digit "NNN" instead of "NNNN" as indicated below.
b) Additional P&ID''s prepared by vendor will follow the following philosophy:

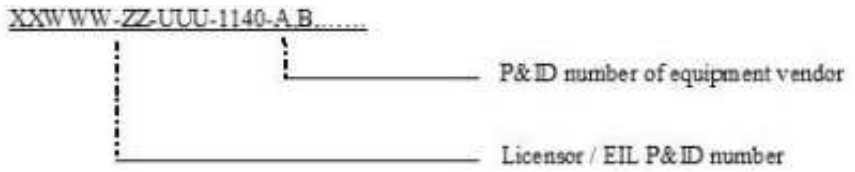
The P&ID number in Licensor''s / designer''s package will be used.
Suffix A, B,--------Z, as demonstrated below shall be added by vendors of packaged equipment/ main equipment for assigning numbers to the P&IDs to be prepared by them.



14.2.2.1 EXAMPLE

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Example: Consider there is a compressor having tag number UUU-YY-ZZ-101 in EIL P&ID with drawing number as XXWWW-ZZ-UUU-1140. Packaged equipment vendor for this compressor should number his P&IDs as follows:



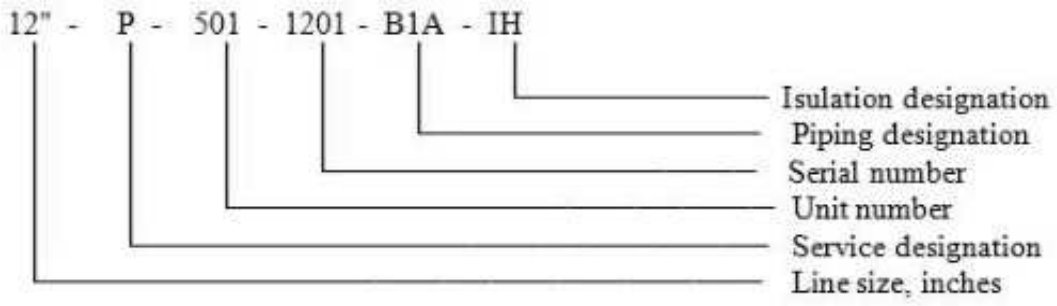
Equipment vendor should number the P&ID from alphabet "A" to "Z". If serial numbers "A" to "Z" are not sufficient, vendor can use "A1" to "Z1" for subsequently.

Note
1. Process engineers shall ensure that no other equipment except packaged equipment/ main equipment are shown in EIL generated P&IDs.

14.3 LINE NUMBERING PHILOSOPHY

14.3.1 GENERAL LINE NUMBERING PHILOSOPHY

Line numbering shall be as per Owner's requirement and is as outlined below:



Service designation and insulation designation are listed in legend drawing # B857-79-41-999-1191, issued for the project.

In the four-digit line serial number, the digits shall be used as follows:
First 2 digits: Same as last 2 digits of P&ID serial number.
Last 2 digits: Serial number starting from '01'

The line numbering (for P&ID number beyond 99) shall be considered as follows:
MMM01, where
First 3 digits corresponds to the last three digits of P&ID number
Last 2 digits is the serial number starting from 01, In case line numbering exceeds 99, the numbering beyond 99 shall be considered as 111,112... .

Line numbering philosophy for replaced line is covered under Annexure C.

14.3.2 LINE NUMBERING PHILOSOPHY FOR VENDOR PACKAGED ITEMS

Line Numbering philosophy for Vendor packaged items in inline with OWNER's Line Numbering Philosophy

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a) Philosophy for line numbering will be in line with the earlier section.
b) Additional line numbers by vendor will follow the following philosophy:

In the four digit line serial number, the digits shall be followed as follows:

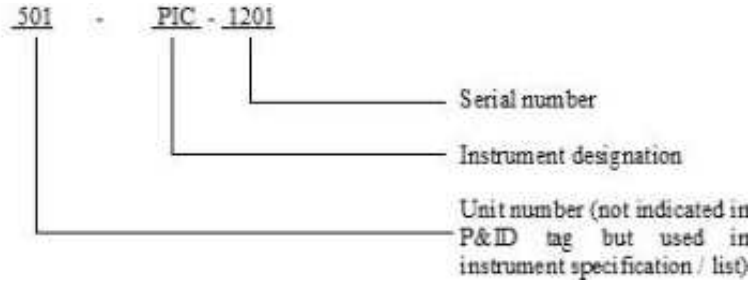
First 2 digits: Same as last 2 digits of Designer / Licensor P&ID serial number (e.g. "40" in the earlier example)
Last 2 digits: Serial number starting from "21" to "99"

Notes:
1. Designer/vendor shall ensure that no more than 20 lines for each service are covered in designer generated P&IDs related to packaged/ main equipment. In case there is any, the allocated line no. to vendor needs to be changed with last number of designer line number + 1 instead of '21'.
2. Package vendor to allocate line nos. designated per P&ID based on their requirement. No repetition of line nos. will be acceptable.
3. In case package vendor needs more no. of lines than allocated, it may be allowed to consider suffix A/B/C in line no. for similar service lines for no. of parallel trains e.g. two parallel pump suction/ discharge lines may have A/B in line with equipment numbering.

14.4 INSTRUMENT NUMBERING

14.4.1 GENERAL INSTRUMENT NUMBERING PHILOSOPHY

Instrument numbering shall be as per Owner's requirement and is as outlined below:



Instrument depiction shall be as per ISA. The relevant table for the alphabetic depiction of instrument type is included in drawing # B857-79-41-999-1191, issued for the project.

In the four-digit instrument serial number, the digits shall be used as follows:
First 2 digits: Same as last 2 digits of P&ID serial number.
Last 2 digits: Serial number starting from '01'.

The instrument numbering (for P&ID number beyond 99) shall be considered as follows:
MMM01, where
First 3 digits corresponds to the last three digits of P&ID number
Last 2 digits is the serial number starting from 01

Instrument numbering philosophy for Modified/Replacement instruments is covered under Annexure C .

14.4.2 INSTRUMENT NUMBERING PHILOSPHY FOR VENDOR PACKAGED ITEMS

Instrument Numbering philosophy for Vendor packaged items in inline with OWNER's Instrument Numbering Philosophy

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Instrument numbering philosophy for vendor packaged items:
a) Philosophy for instrument numbering will be in line with the earlier section.
b) Additional instrument numbers by vendor will follow the following philosophy:

In the four digit instrument serial number, the digit shall be used as follows:

First 2 digits: Same as last 2 digits of EIL P&ID serial number
Last 2 digits: Serial number starting from "51" to "99"

Notes:
1. Designer/vendor shall ensure that no more than 20 instruments of each type are covered in designer generated P&IDs related to packaged/ main equipment.
2. Package vendor to allocate instrument nos. designated per P&ID based on their requirement. No repetition of instrument nos. will be acceptable.
3. In case package vendor needs more no. of instrument than allocated, it may be allowed to consider suffix A/B/C in instrument no. for similar service instruments for no. of parallel trains e.g. two parallel pump suction/ discharge instruments may have A/B in line with equipment numbering.

14.5 OTHER DOCUMENT NUMBERING SYSTEM

With the exception of the above documents, licensor / designer shall follow their respective company procedures for document numbering.

15.0 STANDARDS AND CODES

Standards and Codes shall be as per Detailed Engineering Design Basis.

15.1 EFFLUENT DATA

15.1.1 AQUEOUS EFFLUENT DATA

Description	UOM
Source / Originating Point	
Flow Rate (Average/Peak)	M^3/hr
Frequency of flow	Continuous / Intermittent
Duration if Intermittent	hours / day (frequency of generation)
Temperature	DEG C
Color/ Odour	
Pressure	Kg/cm^2a
Sp. Gravity	
Viscosity	cP
Vapor Pressure	$Kg/cm^2(g)$
pH	
BOD, 20 DEG C	mg/lit
COD	mg/lit
TOC	mg/lit
Suspended Solids	mg/lit
Sp. Gravity of solids	
Particle size	Microns
Total Dissolved solid	mg/lit
Volatile matter	mg/lit
Total Oil content	mg/lit

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Description	UOM
Sp. gr. of Oil	
Viscosity of Oil	cP
Pour Point of Oil	DEG C
Alkalinity	mg/lit
Sulphides	mg/lit
H2S	mg/lit
Phosphates	mg/lit
Sulfates	mg/lit
Chlorides	mg/lit
Fluorides	mg/lit
Nitrates	mg/lit
Total Nitrogen	mg/lit
Free/Fixed Ammonia	mg/lit
Cyanides	mg/lit
Sodiumates	mg/lit
Calcium	mg/lit
Magnesiums	mg/lit
Phenolic Compounds	mg/lit
Heavy Metals	mg/lit
Chromium	mg/lit
Nickel	mg/lit
Lead	mg/lit
Zinc	mg/lit
Mercury	mg/lit
Any other	mg/lit
Emulsified oil	
Other Toxic / Corrosive Contaminants (Amines, Salts, etc)	mg/lit
Chemical Composition	% wt.
Recommended Treatment of Effluent Stream(s)	

15.1.2 GASEOUS EFFLUENT DATA

Description	UOM
Source/Originating Point	
Type of Emission (Fugitive/Stack)	
Flow rate	m^3/hr
Type of Flow (Cont./Intermit)	
Frequency and Duration If Intermittent	
Height of Stack/Source	m
Diameter of Stack (TIP)	m
Temperature of Gases	DEG C
Pressure	$Kg/cm^2 a$
Mol. Weight of Gases	
Density of Gases	Kg/m^3
Viscosity of gases	CP
Exit Velocity of Gases	m/sec
Composition of Gases (WT%)	
Hydrocarbons (HC)	
CO (Carbon monoxide)	

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Description	UOM
CO2 (Carbon Dioxide)	
SO2 (Sulphur Dioxide)	
N2S (Nitrogen sulphide)	
SO3 (Sulphur oxide)	
NOx (Oxides of Nitrogen)	
N2 (Nitrogen)	
O2 (Oxygen)	
H2O (Water vapors)	
Any other component (Chemical Composition)	
Suspended particulates matter (SPM)	
Density & Bulk Density	Kg/m^3
Dust Load	g/m^3
Nature of Dust	
Amorphous	
Crystalline	
Needle shaped	
Fibrous	
Metallic	
Particle Size Distribution (wt%)	
Upto 5 microns	
5-20 microns	
20-40 microns	
40-80 microns	
Above 80 microns	

15.1.3 SOLID EFFLUENT DATA

Description	UOM
Source/Originating Point	
Quantity of Solid Waste	Kg/day
Continuous/Periodical	
Frequency & Duration, if periodical	
Temperature	
Density	
Physical Condition (Slurry / Sludge/ Powder/Lumps)	
Viscosity, If slurry/sludge	
Nature of Waste (Hazardous/ Toxic/Explosive/Corrosive/Abrasive/Radioactive)	
Calorific Value	Kcal/kg
Chemical Composition	Wt%
Volatile Matter	Wt%
Moisture Content	Wt%
Recommended Final Disposal Mechanism	Landfill / Incineration / Others (to be Specified)
Recycling of Waste Required	Yes/No
Recovery of Valuable component	Yes/No
Schemes of Reuse/Recycle	
Sale value of Waste	Rs./Ton
Availability of Land for Disposal	Yes/No
Leachate Characteristics (If Slurry)	

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16.0 ANNEXURE

Document No.	Rev. No.	Date	Description
ANNEXURE-A	A	***20-Sep-2024***	UNIT OF MEASUREMENT
ANNEXURE-B	A	***20-Sep-2024***	***EQUIPMENT DESIGNATION***
ANNEXURE-C	A	***20-Sep-2024***	***NUMBEIRNG PHILOSOPHY FOR REVAMP UNITS***
ANNEXURE-D	***1***	***20-Sep-2024***	***LEGEND P&IDs***
ANNEXURE-E	***0***	***20-Sep-2024***	***BLINDING PHILOSOPHY***

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ANNEXURE-A

Units Of Measurement

QUANTITY	UNIT	SYMBOL
Acceleration	meter per second square	m/s^2
Amount of Substance	kilogram mole	kg-mol or kmol
Angular Velocity	radians per second	rad/s
Area	square meter	m^2 or mm^2
Boiling point @ STP	degree centigrade	°C
Composition	volume percentage	Vol% or Wt % or Mole%
Concentration	parts per million, weight or weight percent	ppmw or ppbw or wt%
Concentration	parts per million, volume	ppmv or ppbv
Conductivity	micro-siemens per centimetre	µS/cm
Density	kilograms per cubic meter	kg/m^3
Differential head	meter	m
Dew Point	degree centigrade	°C
Electrical Current	ampere	A
Energy - Electrical	kilowatt hour	kWh
Energy	Kilo calories	kcal
Enthalpy	kilocalories per kilogram	kcal/kg
Entropy	kilocalories per kilogram-degree C	Kcal/kg-°C
Flash point	degree centigrade	°C
Flow - Liquid Volumetric	Cubic meter per hour Litre per hour Litre per minute	m^3/h LPH LPM
Flow – Liquid mass	Kilogram per hour Metric ton per hour Metric ton per day	kg/hr MT/hr MT/day
Flow -Gas and Vapor	kilograms per hour tons per hour cubic meter per hour	kg/h MT/h m^3/h
Flow - Gas and Vapor	normal cubic meter per hour	Nm^3/h
Flow - Gas and Vapor	standard cubic meter per hour	Sm^3/h
Flow -Steam	kilograms per hour tons per hour	kg/h t/h
Force	newton	N
Freezing point	degree centigrade	°C
Furnace draft	Millimetre of water column	mm of WC
Heat	Kilocalories/hr	Kcal/hr or MM Kcal/hr or MKcal/hr
Heat transfer coefficient	Kilo calorie per hour square meter degree	kcal/hr-m^2-°C
Length	millimetre	mm
Length	meter	m
Length	kilometre	km
Line Sizes	inches	”

QUANTITY	UNIT	SYMBOL
Mass	kilogram	kg
Mass	Metric ton	MT
Mass Transfer	Kilogram per hour meter squared	$kg/m^2.h$
Molar Flow	kilogram mole per hour	kmol/hr
Molecular Weight	kilogram per kilogram mole	kg/kmol
Momentum	kilogram meters per second	kg m / s
Moment of Inertia	kilogram meters squared	kgm^2
Noise	A weighted decibel	dB (A)
NPSH	meter	m
Periodicity, Frequency	hertz	Hz
Power	watt	W or kW or MW
Pour point	degree centigrade	°C
Pressure - Gauge	Kilogram per square centimetre (gag.)	Kg/cm^2g
Pressure – Absolute	Kilogram per square centimetre (abs.)	Kg/cm^2a
Pressure-Absolute (Vacuum service)	Millimetre of mercury or Millimetre water column	mmHg or mmWC
Production	metric tons per day	MT/d
Production Capacity	Kilo metric tons per Annum/ Million Metric Tonnes per Annum	KTPA/ MMTPA
RVP	kilopascal	Psi or KPa
Specific Heat	kilo Cal per kilogram degree Celsius	kcal/kg-°C
Speed - Linear	meter per second	m/s
Speed - Rotating	revolutions per minute	rpm
Stress	newton per square meter	N/m^2
Storage tank pressure	Millimetre of water column	mm of WC
Surface tension	dyne per centimetre	dyne/cm
Temperature	degree centigrade	°C
Thermal conductivity	kilocalories per hour meter centigrade	kcal/hr-m-C
Time	Hour or second	H or s
Viscosity - dynamic	centipoises	cP
Viscosity - kinematic	centistokes	cS
Volume	cubic meter	m^3
Voltage	volt	V
Radiation	Kilo calorie per meter squared	$Kcal/m^2$
Sound	Decibel, “A” weighted sound level	dBA
Torque	Newton meter	Nm
Smoke Point	Millimetres	mm

Standard cubic meter (Sm^3) and normal cubic meter (Nm^3) do not have a universally accepted definition, so their reference pressure and temperature shall always be specified.
For this project, standard conditions shall be defined as 15 °C and 1.03323 kg/cm^2a. Normal conditions are at 0 °C and 1.03323 kg/cm^2a

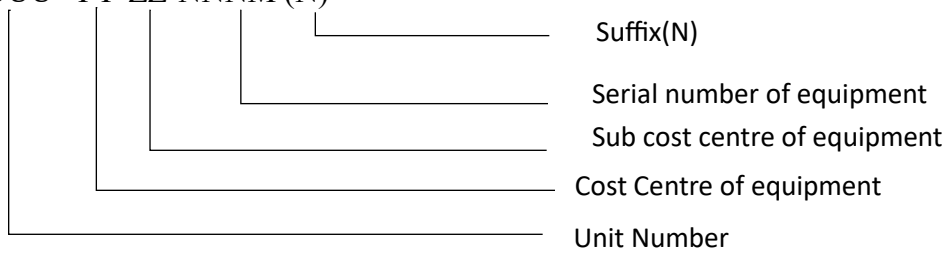
ANNEXURE-B

Equipment designation

Cost Centre	Subcost Centre	Description	Cost Centre	Subcost Centre	Description
AU	00	RCC Tanks	LM	00	Fired boiler
CC	00	Columns, general	LS	00	Flare stock
CC	WI	Columns w/ uncoded internals	LW	00	Waste heat boiler
CT	00	Trays, general	LZ	00	Undefined package equipment
CW	00	Demister for columns	ML	00	Scraper launcher
CP	00	Packed internals for columns	MR	00	Scraper receiver
EA	00	Air cooled heat exchangers	MT	00	Turbo generator
EA	FN	Fans, Air cooled heat exchangers	PA	CF	Pump, Centrifugal
EE	00	Shell & tube heat exch (S&T Hx)	PA	DF	Pump, Diaphragm
EE	AS	S&T Hx, AES, Floating head	PA	GR	Pump, Gear
EE	BM	S&T Hx, BEM, Fixed tubesheet	PA	JK	Pump, Centrifugal jacketed
EE	BU	S&T Hx, BEU	PA	MT	Pump, Metering
EE	AT	S&T Hx, AKT, Kettle	PA	RP	Pump, Reciprocating
EE	AL	S&T Hx, AEL, Fixed tubesheet	PA	SM	Pump, Centrifugal submerged
EE	DP	Double pipe	PA	VT	Pump, Vertical turbine
EP	00	Plate heat exchanger	PM	00	Pump drive, Electric motor
FF	00	Fired furnace, general	PT	00	Pump drive, Steam turbine
FD	00	Direct fired heater	PR	00	Power recovery turbine
FP	00	Air preheater	RB	00	Reactor / Regenerator (R/R)
FI	00	Incinerator	RM	00	R/R mechanical mixer
GJ	00	Cyclones	RT	00	R/R trays
GN	00	Filter, general	RP	00	R/R packed internals
JA	00	Vacuum system	TB	00	Storage bins
JE	00	Evaporator, general	TH	00	Storage hoppers
JS	00	Static Mixer, general	TI	00	Storage silos
JJ	00	Expansion joint, general	TM	00	Storage tank mechanical mixers
JM	00	Air mixer	TS	00	Storage spheres
KA	RP	Compressor, Reciprocating	TT	00	Storage tanks, general
KA	CF	Compressor, Centrifugal	TT	FR	Storage tanks, floating roof
KA	SC	Compressor, Screw	TT	CR	Storage tanks, cone roof
KA	LR	Compressor, Liquid Ring	VV	00	Vessels, general
KA	RT	Compressor, Rotary	VV	HI	Vessels, horizontal w/ internals
KA	TL	Compressor, Twin lobe	VV	HW	Vessels, horizontal, no internals
KA	DF	Compressor, Diaphragm	VV	VI	Vessels, vertical, w/ internals
KM	00	Compressor Drive, Electric motor	VV	VW	Vessels, vertical, no internals
KT	00	Compressor Drive, Steam turbine	VM	00	Mechanical mixer for vessels
LA	00	Air conditioning plant	VW	00	Demister for vessels
LC	00	Refrigeration plant	VP	00	Packing for vessels
LE	00	DM water plant	WH	00	Piping item, steam traps
LF	00	Condensate polishing unit	WK	00	Piping item, air traps
LG	00	Chlorinator	WG	00	Piping item, in-line strainers
LH	00	Effluent treatment plant	WJ	00	Piping item, expansion joint
LI	00	Inert gas generator	WB	00	Piping item, valves
LJ	00	Air drier	XZ	00	Electrical, miscellaneous
LK	00	Cooling Tower	FA	00	Flame arrestor

ANNEXURE-C

1.Equipment numbering philosophy for Modified/Replacement of Existing Equipments:
Modified/replaced equipment tag numbers will be followed by (N)
UUU- YY-ZZ-NNNM (N)

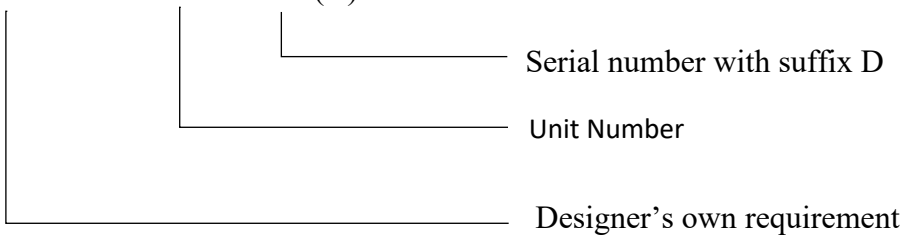


New Equipment in existing service:
New tag number shall be in continuation with the existing tag number, followed by (N). For example:

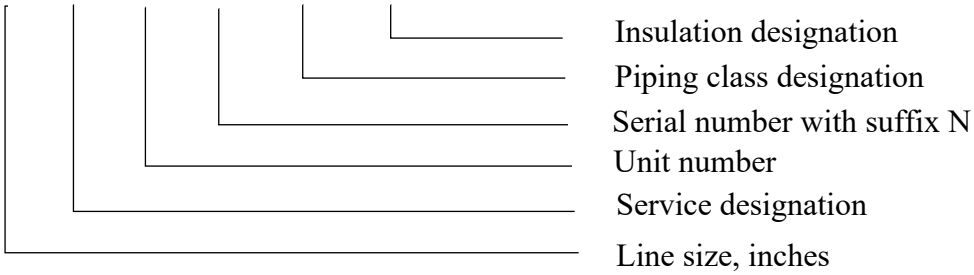
- For Pumps: 17-PA-CF-301C(N) (when existing pump tags are 17-PA-CF-301A/B)
- For Compressors: 17-KA-RP-801D(N) (when existing compressor tags are 17-KA-RP-801A/B/C)
- For Vessel: 17-VV-VI-802D(N) (when existing vessel tags are 17-VV-VI-802A/B/C)

2.P&ID Numbering philosophy for dismantle P&IDs:
Specific to the numbering of Piping & Instrumentation Diagrams, the following system shall be adhered to by all licensors / designers:

XXWWW-ZZ - UUU – NNN(D)



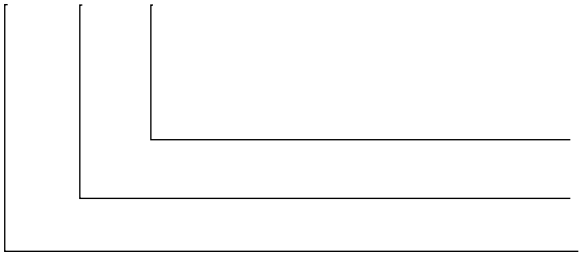
3.Line Numbering philosophy for replaced line:
Serial number shall be followed by suffix N
12" - P - 501 - 1202N - B1A - IH



4.Instrument numbering philosophy for modified/replaced instrument:

Serial number shall be followed by suffix N.

501 - PIC - 1202N



Serial number with suffix N

Instrument designation

Unit number (not indicated in P&ID tag but used in instrument specification / list)

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LINES

LINES IDENTIFICATION

3"– P– 07–1101–A1A– IH

- INSULATION SPECIFICATION
- PIPE MATERIAL SPECIFICATION
- LINE NUMBER
- UNIT NUMBER
- LINE DESIGNATION
- LINE SIZE (IN INCHES)

LINE LEGEND

- PROCESS/UTILITY LINE (FOR NEW UNIT)
- EXISTING PROCESS/UTILITY LINE (FOR REVAMP UNIT)
- NEW PROCESS/UTILITY (FOR REVAMP UNIT)
- DISMANTLE LINE (FOR REVAMP UNIT)
- (B) BURIED LINE
- TRACED LINE
- JACKETED PIPE
- VENDOR LIMIT LINE

INSTRUMENT LINE SYMBOLS

- ELECTRICAL SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- SOFTWARE SIGNAL
- PNEUMATIC SIGNAL
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC/SONIC SIGNAL

LINE DESIGNATION

DESIGNATION	SERVICE
PROCESS LINES	
PL	PROCESS, LIQUID
PG	PROCESS, GAS
PZ	PROCESS, TWO–PHASE
P	PROCESS, GENERAL
WATER LINES	
WB	BOILER FEED WATER
WCS	COOLING WATER SUPPLY
WCR	COOLING WATER RETURN
BCS	BEARING COOLING WATER SUPPLY
BCR	BEARING COOLING WATER RETURN
WDK	DRINKING WATER
WDM	DEMINERALIZED WATER
WQ	QUENCH WATER
WS	SERVICE WATER
WF	FIRE WATER
WR	RAW WATER
WT	TEMPERED WATER
WP	PROCESS WATER
STEAM & CONDENSATE LINES	
SH	HIGH PRESSURE STEAM
SM	MEDIUM PRESSURE STEAM
SL	LOW PRESSURE STEAM
SVH	VERY HIGH PRESSURE STEAM
CL	LOW PRESSURE CONDENSATE
CM	MEDIUM PRESSURE CONDENSATE
CH	HIGH PRESSURE CONDENSATE
CVH	VERY HIGH PRESSURE CONDENSATE
AIR LINES	
AI	INSTRUMENT AIR
AP	PLANT AIR
AB	BREATHING AIR
PA	PROCESS AIR
VENT LINES	
V	VENT ATMOSPHERIC
SV	SAFETY VALVE OUTLET (OTHER THAN FLARE ROUTING)
FLARE LINES	
FL	FLARE
BLOW DOWN LINES	
BD	BLOW DOWN
CBD	CLOSED BLOW DOWN
HBD	HIGH CONGEALING LIQUID BLOWDOWN
CCBD	CAUSTIC CLOSED BLOW DOWN
CLBD	COLD BLOW DOWN (1)
ABD	AMINE BLOW DOWN
SBD	SOUR WATER BLOW DOWN
LTBD	LOW TEMPERATURE BLOW DOWN
UTILITY OIL LINES	
FO	FUEL OIL
HO	HYDRAULIC OIL
FLO	FLUSHING OIL
LSFLO	LOW SULPHUR FLUSHING OIL
HFLO	HEAVY FLUSHING OIL
HTO	HOT OIL
PFL	PRESSURIZED FLUSHING OIL
UTILITY GAS LINES	
FG	FUEL GAS
IG	INERT GAS
NG	NATURAL GAS
DRAIN LINES	
OWS	OILY WATER SEWER
CS	CHEMICAL SEWER
SS	STORM SEWER
CRWS	CONTAMINATED RAIN WATER SEWER
OTHERS	
CA	CAUSTIC
AC	ACID
C	OTHER CHEMICALS
CT	CATALYST
RP	PROPYLENE/PROPANE REFRIGERATION
RE	ETHYLENE REFRIGERATION
RA	AMMONIA REFRIGERATION
ME	METHANOL
ETH	ETHANOL

VALVE, INSTRUMENT AND LINE SYMBOLS

- GATE VALVE NORMALLY OPEN
- GATE VALVE NORMALLY CLOSED (OPTIONAL DESIGNATION)
- GLOBE VALVE NORMALLY OPEN
- CHECK VALVE
- BUTTERFLY VALVE
- PLUG VALVE
- BALL VALVE
- NEEDLE VALVE
- DIAPHRAGM VALVE
- ANGLE VALVE
- BLOWDOWN ANGLE VALVE
- ANGLE BALL VALVE
- ANGLE CHOKE VALVE
- 3–WAY VALVE
- CONTROL VALVE (GENERAL/GLOBE)
- CONTROL VALVE (BALL)
- CONTROL VALVE (DIAPHRAGM)
- CONTROL VALVE (BUTTERFLY)
- 3–WAY CONTROL VALVE
- CONTROL VALVE (ANGLE TYPE)
- CONTROL VALVE (DOWNSTREAM SELF ACTUATING)
- CONTROL VALVE (UPSTREAM SELF ACTUATING)
- CONTROL VALVE WITH POSITIONER
- PILOT OPERATED VALVE
- CONTROL VALVE WITH HAND WHEEL
- PLUNGER OPERATED VALVE
- (M) MOTOR OPERATED VALVE
- SOLENOID VALVE (2–WAY)
- SOLENOID VALVE (3–WAY)
- DRAIN WITH BLIND FLANGE
- CRYOGENIC DRAIN WITH (OPEN) FLANGE
- (1) CRYOGENIC DRAIN WITH (CLOSED) FLANGE
- DRAIN WITH THREADED CAP
- FLOW ELEMENT (ORIFICE)
- TURBINE METER
- PD METER
- ROTAMETER
- CORIOLIS METER
- ULTRA SONIC METER
- MAGNETIC METER
- VORTEX METER
- PITOT TUBE
- ANNUBAR
- VENTURI METER
- STRAIGHTENING VANES
- IN LINE INSTRUMENT (SIGHT GLASS,MASS FLOW METER ETC.)
- STATIC MIXER
- INLET SIZE, INCHES / ORIFICE CODE, LETTER / OUTLET SIZE, INCHES (E 1½ / 24)
- SET PRESS. Kg/CM²G (PSV 1101)
- SAFETY VALVE NUMBER

- 'T'– TYPE STRAINER
- 'Y'– TYPE STRAINER
- (TS) TEMPORARY STRAINER
- CONE TYPE STRAINER
- BASKET STRAINER
- FILTER
- REVERSIBLE BLIND (OPEN) (FIGURE EIGHT)
- REVERSIBLE BLIND (CLOSE) (FIGURE EIGHT)
- LINE BLIND (SPADE)
- SPACER FOR BLIND
- OPEN DRAIN FUNNEL
- EXPANDER/REDUCER
- BELLOWS
- (ST) STEAM TRAP
- (AT) AIR TRAP
- RUPTURE DISK
- UNION
- COUPLING
- BLIND FLANGE
- CAP THREADED
- CAP WELDED
- ADAPTOR
- SLOPE
- (TP XXXX) TIE–POINT
- XXXXX / XX–XXXX CONTINUITY ARROW, LINES
- XXXXX / XX–XXXX CONTINUITY ARROW INSTRUMENT SIGNAL
- XXXXX / XX–XXXX CONTINUITY ARROW, B/L
- PULSATION DAMPNER
- VORTEX BREAKER
- FLEXIBLE LINE/HOSE
- (SP) SPECIALITY ITEM
- SILENCER

SC – SAMPLE CONNECTION
AP – AIR PURGE
SP – STEAM PURGE
AA – AERATION AIR
AS – AERATION STEAM
AG – AERATION GAS
NP – NITROGEN PURGE

INSULATION/TRACING TYPE

IH	HOT INSULATION
IC	COLD INSULATION
IS	SAFETY INSULATION
IT	STEAM TRACED
IE	ELECTRICAL TRACED
IJ	STEAM JACKETED

GENERAL ABBREVIATIONS

ATM	ATMOSPHERE
AR	AUTO RESET
BL	BATTERY LIMIT
CS	CHEMICAL SEWER
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
FB	FULL BORE
FL	FAIL LOCK
FC	FAIL CLOSED
FO	FAIL OPEN
HLL	HIGH LIQUID LEVEL
HS	HOSE STATION/ HAND SWITCH
ISBL	INSIDE BATTERY LIMIT
LC	LOCK CLOSE
LLL	LOW LIQUID LEVEL
LO	LOCK OPEN
MOV	MOTOR OPERATED VALVE
MW	MANWAY
NNF	NORMALLY NO FLOW
NLL	NORMAL LIQUID LEVEL
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
OSBL	OUTSIDE BATTERY LIMIT
PB	PUSH BUTTON
TL	TANGENT LINE
TSO	TIGHT SHUT OFF (CL.IV&V)
UC	UTILITY CONNECTION
VAC	VACUUM
VF	VENDOR FURNISHED
PSO	POSITIVE SHUT OFF (CL.VI)
FMR	FIELD MANUAL RESET (FOR SOV)
CMR	CONTROL ROOM MANUAL RESET (FOR SOV)
FF	FOUNDATION FIELD BUS
XA	MISCELLANEOUS ALARM
YA	MOTOR ALARM
YL	MOTOR RUNNING INDICATION
ESSH	EMERGENCY SHUTDOWN SWITCH
ZLH	CONTROL ROOM INDICATION POSITION SWITCH HIGH (VALVE OPEN)
ZLL	CONTROL ROOM INDICATION POSITION SWITCH LOW (VALVE CLOSE)

INSTRUMENTATION SYMBOLS AND LEGEND

NOTE: INSTRUMENTATION SYMBOLS AND LEGEND SHALL BE AS PER ISA "STANDARDS AND RECOMMENDED PRACTICES FOR INSTRUMENTATION AND CONTROL".

IDENTIFICATION LETTERS

	FIRST–LETTER		SUCCEEDING–LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	
D	USER'S CHOICE	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO(FRACTION)			
G	USER'S CHOICE		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

OTHERS

- (CC) CORROSION COUPON
- (CP/C) CORROSION PROBE/TRANSMITTER
- RUNNING LIGHT (LOCAL)
- RUNNING LIGHT (PANEL)
- RUNNING LIGHT (LOCAL PANEL)
- RUNNING LIGHT (DCS)
- (RTU) REMOTE TRANSMISSION UNIT
- DIAPHRAGM

LESS FREQUENTLY USED SYMBOLS

- STOP CHECK VALVE
- FOUR WAY VALVE
- PRESSURE VACUUM SAFETY VALVE
- PILOT OPERATED SAFETY VALVE
- CONTINUOUS DRAIN
- VANES CONTROL VALVE
- HAND OPERATED VANES VALVE
- SPRING LOADED VALVE
- HAND OPERATED VALVE

ZSH	FIELD POSITION SWITCH HIGH (VALVE OPEN)
ZSL	FIELD POSITION SWITCH LOW (VALVE CLOSE)
ROV	REMOTE OPERATED VALVE
TFMS	TANK FARM MANAGEMENT SYSTEM
SRR	SATELLITE RACK ROOM
GWR	GUIDED WAVE RADAR
KP	KEY PHASER
VR	VIBRATION RADIAL PROBE
VA	VIBRATION AXIAL PROBE.

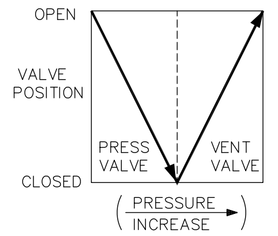
FUNCTION BLOCKS – FUNCTION DESIGNATIONS

NO.	FUNCTION	SYMBOL	NO.	FUNCTION	SYMBOL
1.	SUMMING	Σ	12.	TIME FUNCTION	F(T)
2.	AVERAGING	Σ/n	13.	HIGH SELECTING	>
3.	DIFFERENCE	Δ	14.	LOW SELECTING	<
4.	PROPORTIONAL	K	15.	HIGH LIMITING	⊅
5.	INTEGRAL	∫	16.	LOW LIMITING	⊄
6.	DERIVATIVE	d/dt	17.	REVERSE PROPORTIONAL	–K
7.	MULTIPLYING	X			+
8.	DIVIDING	÷	18.	BIAS	–
9.	ROOT EXTRACTION	√			±
10.	EXPONENTIAL	X^n	19.	CONVERT	⁂
11.	NON LINEAROR UNSPECIFIED FUNCTION	F(X)		* E– VOLTAGE I– CURRENT P– PNEUMATIC A– ANALOG H– HYDRAULIC D– DIGITAL	

FUNCTIONAL SYMBOLS

- FIELD MOUNTED INSTRUMENT
- LOCAL PANEL INSTRUMENT
- REAR LOCAL PANEL INSTRUMENT
- CENTRAL PANEL MOUNTED INSTRUMENT
- REAR CENTRAL PANEL MOUNTED INSTRUMENT

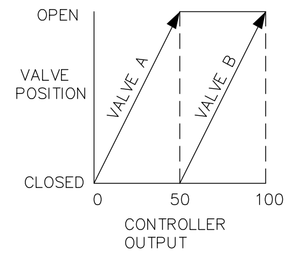
1. SPLIT RANGE VALVES: SOME CONTROL LOOPS HAVE TWO CONTROL VALVES ON THE OUTPUT SIGNAL OF ONE CONTROLLER. FOR EXAMPLE WITH TWO CONTROL VALVES, ONE VALVE PRESSURIZES AND THE OTHER VENTS A VESSEL. A PLOT SHOWS THE VALVE POSITION VERSES PRESSURE.



TYPE–A

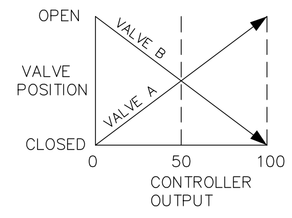
IT IS IMPORTANT TO KEEP THE CONTROL LOOP GAIN CONSTANT FOR GOOD SPLIT RANGE OPERATION. THE GAIN OF EACH VALVE (INCLUDING THE PROCESS) MUST BE MADE SIMILAR. OTHERWISE LIMIT CYCLING OR POOR CONTROL WILL RESULT.

2. WHERE SEQUENCE VALVE OPERATION IS CALLED FOR, THEY ARE INTENDED TO WORK AS FOLLOWS:



TYPE–B

3. OPPOSITE ACTING VALVES CONTROL LOOP NOTED AS OPPOSITE ACTING VALVES HAVE THE FOLLOWING ACTION.



TYPE–C

DCS/COMPUTER SYSTEM SYMBOLS

- SHARED DISPLAY INDICATOR,CONTROLLER, OR OTHER DEVICES WITH OPERATOR ACCESS TO ADJUSTMENTS.
- SHARED DISPLAY DEVICES WITH LIMITED ACCESS TO ADJUSTMENTS LOCATED IN FIELD.
- AUXILLIARY OPERATORS INTERFACE DEVICE FOR EXAMPLE, BACK UP CONTROLLER OR MANUALSTATION.
- COMPUTER COMPONENTS NOT ACCESSIBLE TO OPERATOR LIKE I/O INTERFACE,BLIND CONTROLLER OR A SOFTWARE CALCULATION BOX.
- INDICATOR/CONTROLLER/RECORDER OR ALARM POINT NORMALLY ACCESSIBLE TO OPERATOR THROUGH VIDEO DISPLAY.
- AUXILLIARY COMPUTER COMPONENTS NORMALLY ACCESSIBLE TO OPERATOR.
- SEQUENTIAL LOGIC CONTROL LIMITED ACCESS TO OPERATOR.
- SEQUENTIAL LOGIC CONTROL ACCESSIBLE TO OPERATOR.
- INTERLOCK FUNCTION

No.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
1	28.06.24	REVISED AS MARKED	S.K.L	SD	DK	MS
0	19.04.24	ISSUED FOR ENGG.	S.K.L	SD	DK	MS
B	18.04.24	REISSUED FOR CLIENT COMMENTS	S.K.L	SD	DK	MS
A	28.02.24	ISSUED FOR CLIENT COMMENTS	S.K.L	SD	DK	MS

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम)
ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमैन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM

STANDARD SYMBOLS AND NOMENCLATURE

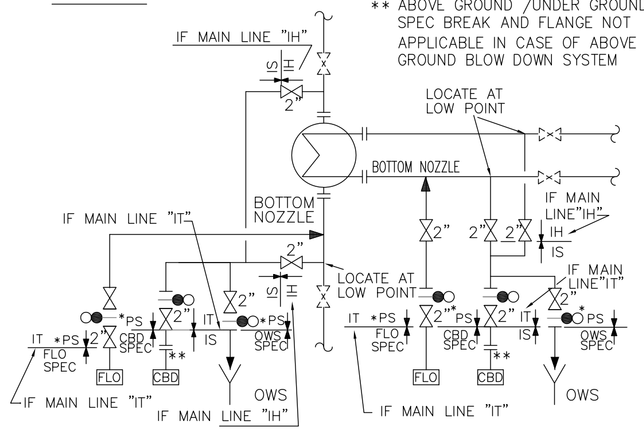
अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	संशो
NTS	B857	79	41	999	1191	1

Page 1117 of 6631 : B857-TENDER DOC-B857-420-80-44-PG-17410 - Rev. A

HEAT EXCHANGER FLUSHING AND DRAIN PLAN (REFER NOTE-14)

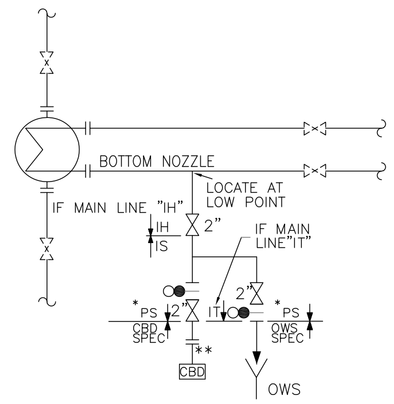
TYPE 'A'

* PS : PROCESS SPEC
** ABOVE GROUND /UNDER GROUND SPEC BREAK AND FLANGE NOT APPLICABLE IN CASE OF ABOVE GROUND BLOW DOWN SYSTEM



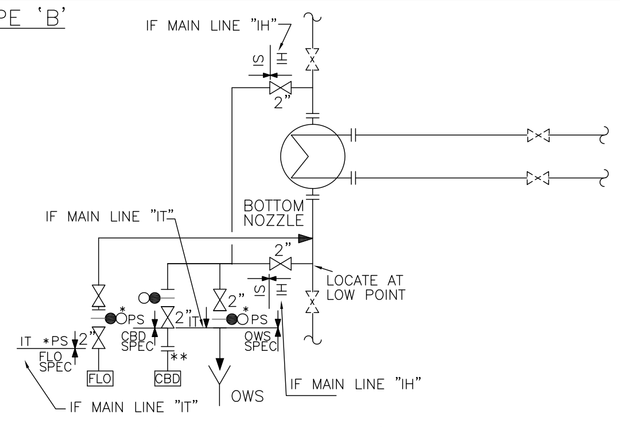
SERVICE : S/S & T/S CONGEALING HC

TYPE 'F'



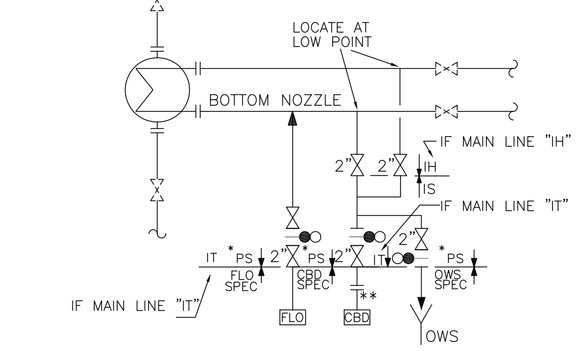
S/S NON HC T/S NONCONGEALING HC

TYPE 'B'



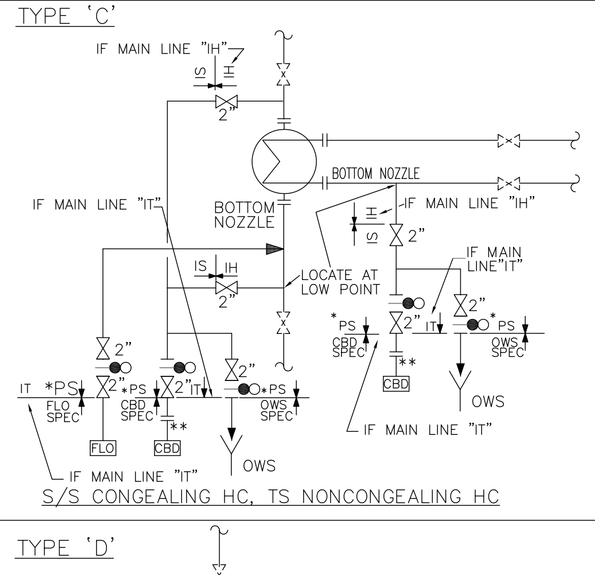
S/S CONGEALING HC, T/S NON HC

TYPE 'G'



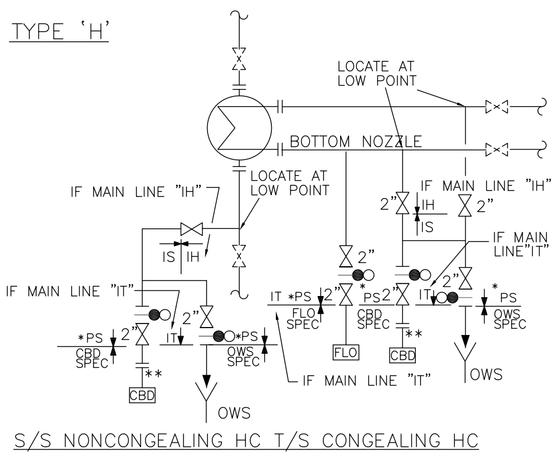
S/S NON HC T/S CONGEALING HC

TYPE 'C'



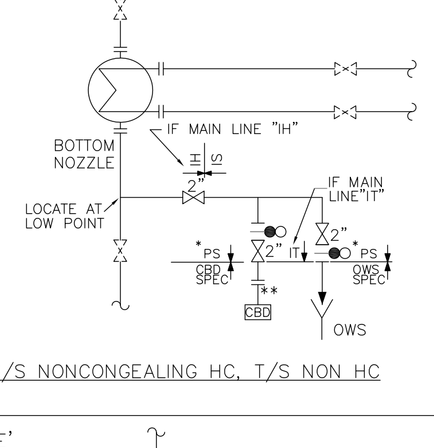
S/S CONGEALING HC, TS NONCONGEALING HC

TYPE 'H'



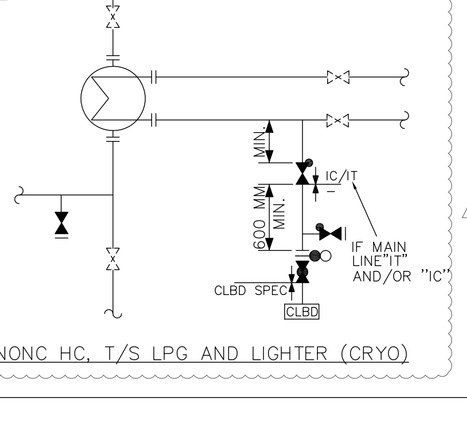
S/S NONCONGEALING HC T/S CONGEALING HC

TYPE 'D'



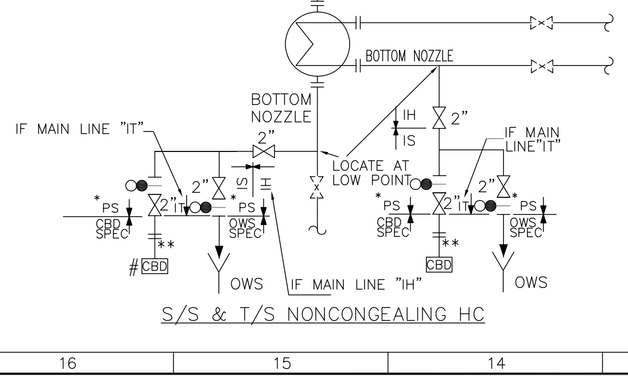
S/S NONCONGEALING HC, T/S NON HC

TYPE 'K'



S/S NONC HC, T/S LPG AND LIGHTER (CRYO)

TYPE 'E'



S/S & T/S NONCONGEALING HC

PUMP VENT/DRAIN/BLEEDER CONNECTION DETAILS FOR

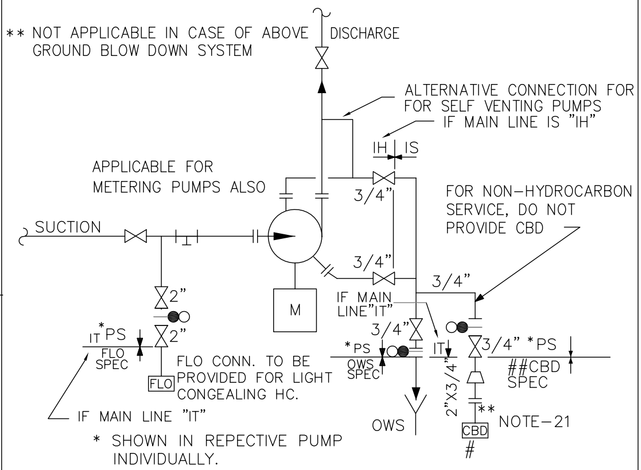
DETAIL-'A'

FOR PUMPS HANDING NON CONGEALING/NON HC LIQUIDS

NOTE-25,32

\# TO BE READ AS
CCBD IN CASE OF CAUSTIC SERVICE
ABD IN CASE OF AMINE SERVICE
SBD IN CASE OF SOUR WATER SERVICE

\## TO BE READ AS
CCBD SPEC IN CASE OF CAUSTIC SERVICE
ABD SPEC IN CASE OF AMINE SERVICE
SBD SPEC IN CASE OF SOUR WATER SERVICE

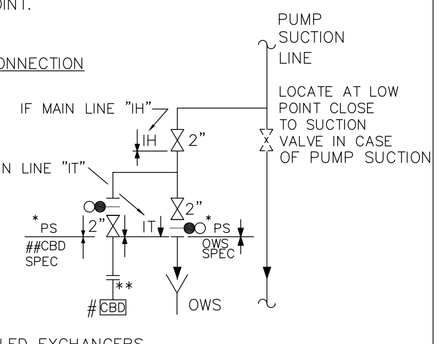


* SHOWN IN REPECTIVE PUMP INDIVIDUALLY.

FOR SELF VENTING PUMPS(WHERE VENT NOZZLE VENT NOT BE AVAILABLE WITH PUMP) VENT CONNECTION TO BE TAKEN FROM DISCHARGE LINE NEAR PUMP AT TOP MOST POINT.

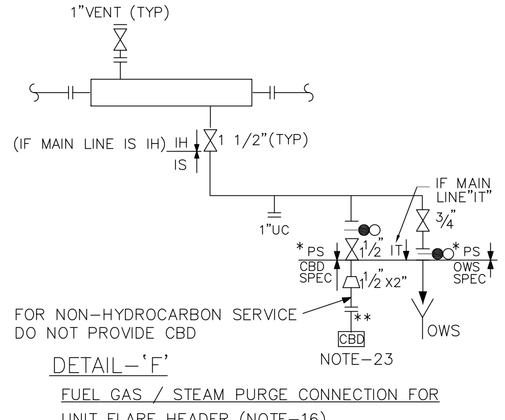
DETAIL-'B'

STANDARD CBD CONNECTION



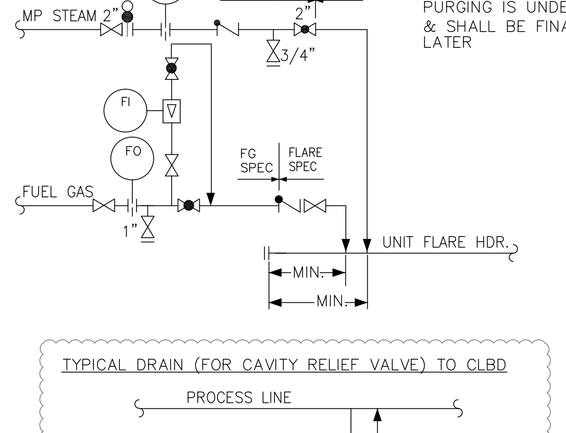
DETAIL-'C'

FOR AIR COOLED EXCHANGERS

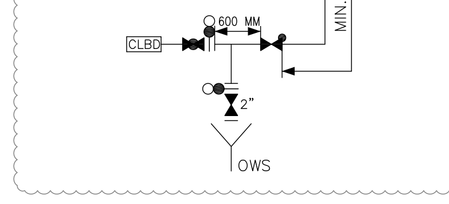


DETAIL-'F'

FUEL GAS / STEAM PURGE CONNECTION FOR UNIT FLARE HEADER (NOTE-16)

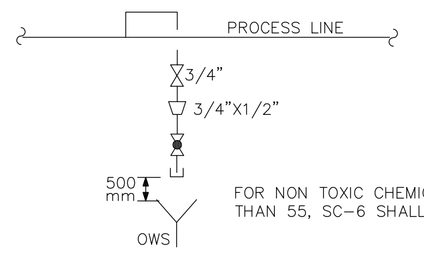


TYPICAL DRAIN (FOR CAVITY RELIEF VALVE) TO CLBD



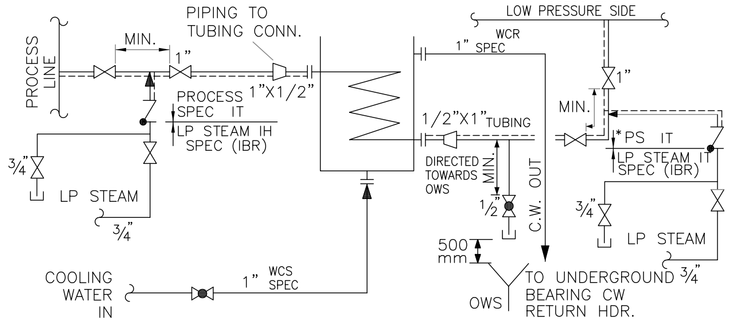
SAMPLE COOLER/COLLECTION DETAILS

SC-1 FOR SAMPLING LIQUIDS AT OR LOWER THAN 55°C



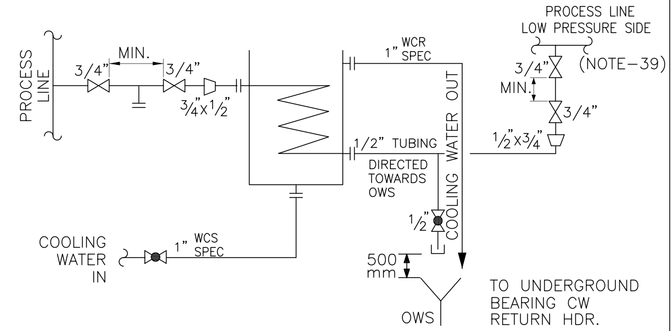
FOR NON TOXIC CHEMICALS HAVING TEMP. LESS THAN 55, SC-6 SHALL BE FOLLOWED.

SC-2 SAMPLING LIQUID ABOVE 55°C/, CONGEALING SERVICES (NOTE-39)

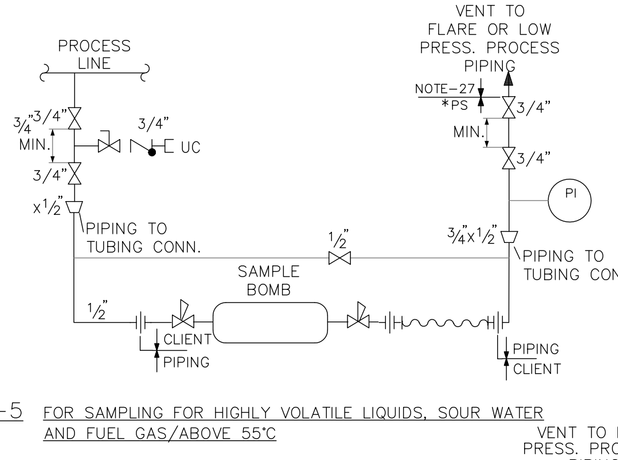


PIPING TO ROUTE RETURN LINE TO LOW PRESSURE SIDE AS AND WHEN FEASIBLE.

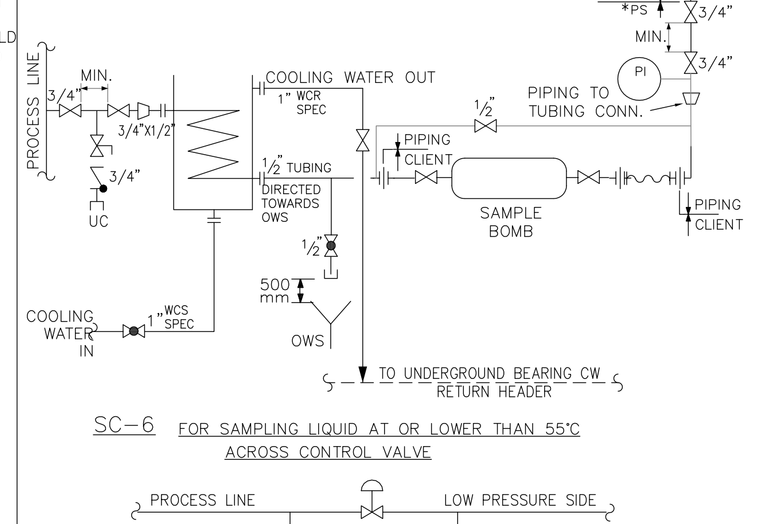
SC-3 FOR SAMPLING LIQUID ABOVE 55°C/, NON CONGEALING SERVICES (NOTE-37)



SC-4 FOR HIGHLY VOLATILE LIQUIDS, SOUR WATER AND FUEL GAS



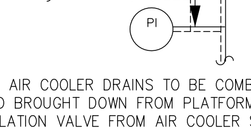
SC-5 FOR SAMPLING FOR HIGHLY VOLATILE LIQUIDS, SOUR WATER AND FUEL GAS/ABOVE 55°C



SC-6 FOR SAMPLING LIQUID AT OR LOWER THAN 55°C ACROSS CONTROL VALVE

NOTES:-

1. ALL INDICATED ELEVATIONS ARE WITH REFERENCE TO GRADE LEVEL WHICH IS 0.0MM.
2. ALL INSTRUMENT TAG NUMBERS TO BE PREFIXED BY UNIT NUMBER.
3. SIZES OF PUMP DRAIN/VENT SHOWN ARE TENTATIVE, WILL BE CONFIRMED BY PUMP VENDORS.
4. UNDESIGNATED PIPING AND VALVING ON EQUIPMENT SHALL FOLLOW THE CLASS AND INSULATION OF ASSOCIATED PIPING OF THE EQUIPMENT UNLESS STATED OTHERWISE.
5. VALVES AND MANIFOLDS ON INSTRUMENTS ARE NOT SHOWN IN P&ID'S AND SHALL BE AS PER ENGINEERING STANDARDS.
6. ALL PSV UPSTREAM PIPING SHALL BE FREE DRAINING TOWARDS VESSEL AND DOWNSTREAM TOWARDS FLARE HEADER. PSV DISCHARGE SHALL JOIN FLARE HEADER AT AN ANGLE OF 45 DEGREE IN THE DIRECTION OF FLOW.
7. ALL HYDROCARBON VENTS TO ATMOSPHERE SHOULD BE VENTED AT MINIMUM 3 METRES ABOVE THE NEAREST OPERATING PLATFORM EXISTING WITHIN A RADIUS OF 15 METRES. A 3/8" DIAMETER WEEP HOLE IN THE TAIL PIPE FOR DRAINAGE TO SAFE LOCATION AT LOW POINT OF LINE SHALL BE PROVIDED.
8. ALL STEAM VENTS TO ATMOSPHERE SHOULD BE VENTED AT MINIMUM 3 METRES ABOVE THE NEAREST OPERATING PLATFORM EXISTING WITH IN A RADIUS OF 8 METRES A 3/8" DIAMETER WEEP HOLE FOR DRAINAGE AT LOW POINT OF LINE SHALL BE PROVIDED.
9. THE INSTRUMENTATION SHOWN FOR VENDOR PACKAGE UNITS IS MINIMUM PROCESS REQUIREMENT. VENDOR TO PROVIDED ADEQUATE INSTRUMENTATION FOR SAFE OPERATION AND MACHINE SAFETY.
10. CBD/OWS DRAINS FOR EQUIPMENT LOCATED AT ELEVATED PLATFORMS CAN BE CLUSTERED AND ROUTED TO RESPECTIVE HEADERS.
11. HIGH POINT VENTS & LOW POINT DRAINS OF PIPING ARE NOT SHOWN IN THE P&ID. THOSE WILL BE FLANGED ONLY AND SHALL BE PROVIDED BY PIPING AS REQUIRED DURING DETAIL ENGG.
12. PSV ISOLATION VALVES (UPSTREAM/DOWNSTREAM) SHALL BE OF FULL PORT SIZE PREFERABLY.
13. ALL SAMPLE POINTS SHOULD BE CONVENIENTLY LOCATED & SHOULD BE APPROCHABLE. THEY SHOULD BE CLOSE TO OILY WATER SEWER FUNNELS AS FAR AS POSSIBLE.
14. i) ISOLATION VALVES SHOWN DOTTED WILL BE PRESENT WHEN INDICATED IN P&ID WHERE EXCHANGER APPEARS.
    ii) DETAILS ARE APPLICABLE FOR INDIVIDUAL EXCHANGER ONLY WHEN SHELL SIDE AND TUBE SIDE ISOLATION VALVES ARE PROVIDED.
    iii) WHEN A BANK OF EXCHANGERS ARE ISOLATED BY TWO ISOLATION VALVES, THEN ONLY ONE FLUSHING OIL CONNECTION IS PROVIDED. HOWEVER DRAIN CONNECTIONS FOR PROCESS FLUIDS FROM BOTTOM NOZZLES WILL BE PROVIDED FOR ALL INDIVIDUAL EXCHANGERS.
    iv) WHEN EXCHANGERS ARE NOT PROVIDED WITH ANY ISOLATION VALVES, DRAIN CONNECTIONS FOR PROCESS FLUIDS AT BOTTOM NOZZLES WILL BE PROVIDED FOR EACH EXCHANGER. FLUSHING CONNECTION WILL BE PROVIDED AT ONLY ONE APPROPRIATE LOCATION.
15. PUMP SUCTION STRAINERS TO BE LOCATED AT MIN. DISTANCE FROM SUCTION ISOLATION VALVES .
16. ALL DEAD ENDS ON FLARE HEADER SHALL BE PROVIDED WITH A PURGE CONNECTION. A PURGE RATE OF 0.1 FT/SEC IN THE HEADER IS TO BE ENSURED.
17. ALL FT,PT (WITH DIAPHRAM) AND DP TYPE LEVEL INSTRUMENTS IMPLUSE LINE MANIFOLD INCLUDING ISOLATION AND DRAIN VALVES ARE TO BE STEAM TRACED ON STEAM TRACED LINE.
18. ALL ISOLATION AND CHECK VALVES ARE TO BE TRACED/ INSULATED AS SHOWN ON RESPECTIVE TRACED/INSULATED LINES.
19. ALL LOW POINT DRAINS SHOULD HAVE 200 MM (MIN.) CLEARENCE FROM FLOOR.
20. ANY REDUCER/EXPANDER ON FREE DRAINING NO POCKETS LINE TO BE ECCENTRIC TYPE,FLAT AT BOTTOM TO AVOID ANY LIQUID ACCUMULATION ETC. FROM FLOOR.
21. FOR CHEMICAL PUMPS DRAIN & VENT TO BE ROUTED TO OWS.
22. FOR GAS AND LIQUID PURGE FOR INSTRUMENTS. THE INSTRUMENT LEADS WILL BE TRACED AND FOR PURGE LINE TRACING TO BE UPTO CHECK VALVE.



23. ALL AIR COOLER DRAINS TO BE COMBINED INTO A COMMON CBD HEADER AND BROUGHT DOWN FROM PLATFORM TO GRADE LEVEL JOIN AFTER IST ISOLATION VALVE FROM AIR COOLER SIDE.
24. ALL PSV UPSTREAM & DOWN STREAM TO BE PROVIDED WITH 3/4" TESTING CONNECTION (FLANGED).

NOTES CONTD. ON SHT 2 OF 2

No.	DATE	संशोधन REVISIONS	ड्रॉन DRN	द्वारा BY	जाँच CHKD	अनुमोदित APPD.
1	28.06.24	REVISED AS MARKED	S.K.L	SD	DK	MS
0	19.04.24	ISSUED FOR ENGG.	S.K.L	SD	DK	MS
B	18.04.24	REISSUED FOR CLIENT COMMENTS	S.K.L	SD	DK	MS
A	28.02.24	ISSUED FOR COMMENTS.	S.K.L	SD	DK	MS

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ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमैन्टेशन डायाग्राम

PIPING AND INSTRUMENTATION DIAGRAM

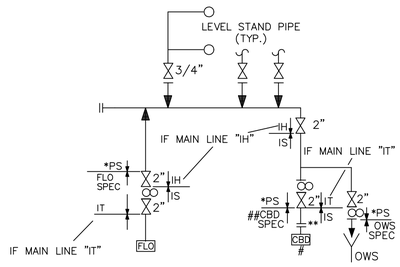
GENERAL NOTES AND TYPICAL DETAILS

SHT 1 OF 2

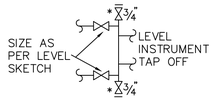
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~	B857	79	41	999	1192	1

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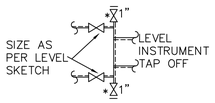
DETAIL-E



DETAIL-STP-1/2 (NOTE-30)



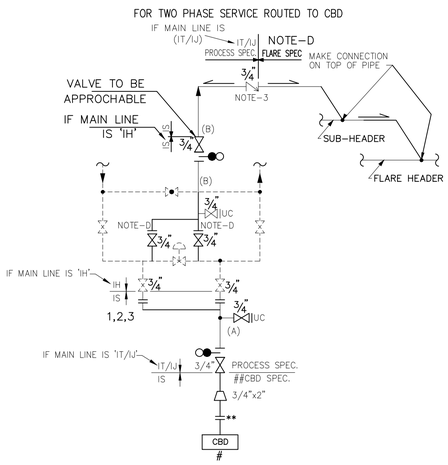
DETAIL-STP-1



DETAIL-STP-2

(*) INCASE OF HIGH AROMATICS/VOLATILE/BENZENE/ TOXIC SERVICES THE BLEEDERS TO BE CONNECTED TO CBD/FLARE WITH DOUBLE BLOCK/BREAK FLANGE ARRANGEMENT. (DRAIN & VENT ARRANGEMENT SIMILAR TO CV DRAIN & VENT ARRANGEMENT)

DETAIL-CV



NOTES :-

A) 3/4" DRAIN VALVES SHALL BE PROVIDED UPSTREAM AND DOWNSTREAM OF ALL CONTROL VALVES.

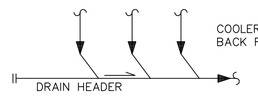
B) DRAIN VALVE END CONNECTION:
   a) SHALL BE CAPPED IN ALL NON-HYDROCARBON & NON-IBR STEAM SERVICE.
   b) SHALL BE BLIND-FLANGED IN ALL HYDROCARBON & IBR STEAM SERVICE.

C) CLOSED DRAIN CONNECTION APPLICABLE FOR LIQUID SERVICE ROUTED TO BLOW DOWN SYSTEM.

D) VENT VALVE END CONNECTION SHALL BE PROVIDED AS UTILITY CONNECTION FOR LIQUID SERVICES WHERE BLOWDOWN SYSTEM IS ABOVE GROUND & GRAVITY DRAINING IS NOT FEASIBLE & VENTING OF CONTROL VALVE IS NOT REQUIRED.

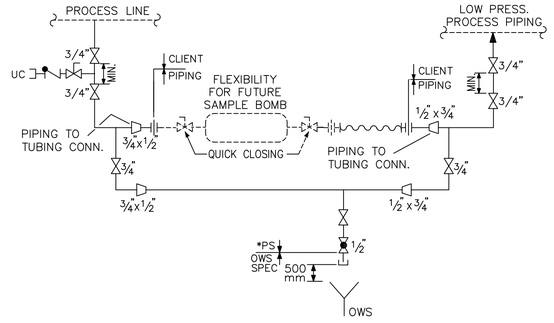
E) VENT CONNECTION TO BE ROUTED TO APPLICABLE FLARE HEADER ONLY FOR
   a) TWO PHASE SERVICE.
   b) VAPOR/GAS PHASE SERVICE, LIGHTER SERVICE-TYPICALLY LIGHT NAPHTHA AND LOWER CUTS.
   c) SOUR WATER.

DETAIL-BF



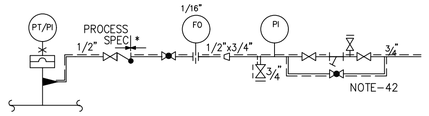
SC-7

FOR GASOLINE / NAPHTHA SERVICE



DETAIL-OP-1

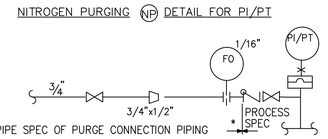
OIL PURGE (OP) DETAIL FOR PT/PI



* PIPE SPEC OF PURGE CONNECTION PIPING

DETAIL-NP

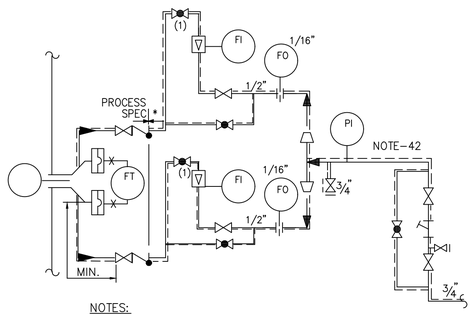
NITROGEN PURGING (NP) DETAIL FOR PI/PT



* PIPE SPEC OF PURGE CONNECTION PIPING

DETAIL-OP-2

OIL PURGE (OP) DETAILS FOR FLOW INSTRUMENTS



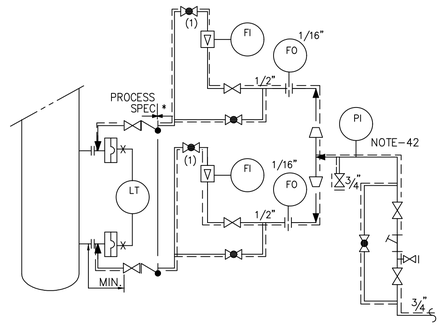
NOTES:

(F) THE ROTAMETER SHOULD BE VISIBLE FROM THE GLOBE VALVE.

* PIPE SPEC OF PURGE CONNECTION PIPING

DETAIL-OP-3 (NOTE-41)

OIL PURGE (OP) DETAIL FOR LEVEL INSTRUMENT



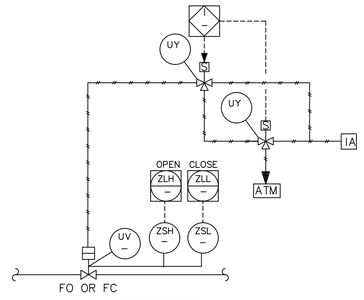
NOTES:

(G) THE ROTAMETER SHOULD BE VISIBLE FROM THE GLOBE VALVE.

* PIPE SPEC OF PURGE CONNECTION PIPING

'NOTES:-

25. FOR SEAL PLAN 52 ADDITIONAL INSTRUMENTS i.e., LSL/LAL AND PSH/PAH WILL BE REQUIRED. FOR SWITCHING ACTION TRANSMITTERS SHALL BE USED. DCS ALARMS BY EIL. INSTRUMENT NOS. WILL BE SHOWN IN RESPECTIVE P&IDS FOR RESPECTIVE PUMPS (DURING DETAIL ENGG.).
26. ALL VALVES IN CAUSTIC SERVICE SHALL BE PLUG TYPE VALVES.
27. PIPE WILL BE FLARE SPEC IF ROUTED TO FLARE & PS IF ROUTED TO PROCESS LINE.
28. OPERATION OF ALL WARM UP LINES ON PUMPS (REQUIREMENT TO BE CONFIRMED FROM P&ID'S) SHALL BE SUCH THAT IF WARM UP LINE FLANGE OR VALVE GLAND LEAK OCCURS IT SHOULD NOT FALL ON CHECK VALVE OR THE PUMP DISCHARGE VALVE.
29. BACK FLUSH DRAINS FROM ALL COOLER/CONDENSER IN TECH STRUCTURE TO BE JOINED IN A COMMON HEADER AND ROUTED TO SS. THE SIZE OF THE COMMON HEADER WILL BE LARGEST OF ALL BACKFLUSH CONNECTIONS. (REFER DETAIL-BF)
30. STAND PIPES FOR ALL LEVEL INSTRUMENTS SHALL HAVE ISOLATION VALVES WITH THE FOLLOWING DETAILS. (REFER DETAIL-STP-1/2)
31. CONTROL VALVES ARE TO BE PREFERABLY LOCATED AT GRADE.
32. FOR LPG UNSTABILIZED NAPHTHA GASOLINE & LIGHTER PUMPS. VENT/ DRAIN CONNECTION TO FLARE AS WELL AS CBD TO BE PROVIDED.
33. FOR ALL CRITICAL SDV'S IN THE FIELD 2 OUTPUT FROM PLC. SHALL BE WIRED TO 2 SOV'S AS PER FOLLOWING DETAILS. SO THAT ONE SOV FAILURE DOES NOT LEAD TO SHUTDOWN.



P&ID REPRESENTATION

34. ALL HEATER INLET CONTROL VALVE ASSEMBLY TO BE LOCATED AT GRADE.
35. FOR INSTRUMENT DRAIN LINES TO BE ROUTED AWAY FROM HOT SURFACE.
36. NRV TO BE PROVIDED ON ALL THE VENT LINE TO FLARE FROM CONTROL VALVES, LG/LTs AND PUMP SEAL FLUSHING POTS ETC. NRV SHALL BE LOCATED AT MIN. DISTANCE FROM FLARE HEADER.
37. WHENEVER POSSIBLE CLOSED SAMPLING FACILITY TO BE CONSIDERED. IN CASE NOT FEASIBLE THEN ONLY OPEN SAMPLING TO BE CONSIDERED.
38. A 4" STUB WITH ISOLATION VALVE AT THE LOWEST POINT IN ALL DEAD END OF COOLING WATER HEADER SHALL BE PROVIDED FOR FLUSHING
39. FOR CLOSED SAMPLING IN CASE LOW PRESSURE PROCESS LINE IS NOT AVAILABLE, IT CAN BE CONNECTED TO CBD/FLARE SPECIFICATION ON CASE TO CASE BASIS.
40. OWS/CBD VENTS IN PROCESS UNITS SHOULD BE DISCHARGED AT MIN. ELEVATION OF 3m ABOVE GRADE OR HIGHER THAN THE TALLEST STRUCTURE WITHIN 15m RADIUS OF ITS LOCATION.
41. THE SAME OIL PURGE DETAIL IS TO BE USED FOR PDT/ PDI.
42. APPLICABILITY OF TRACING FOR PURGE CONNECTION TO BE DECIDED BASED ON FLUID TYPE.

No.	DATE	REVISIONS	DRN	CHKD	APPD.	
0	19.04.24	ISSUED FOR ENGINEERING	S.K.L	SD	DK	MS
B	18.04.24	REISSUED FOR CLIENT COMMENTS	S.K.L	SD	DK	MS
A	28.02.24	ISSUED FOR CLIENT COMMENTS	S.K.L	SD	DK	MS

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ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

भारत पैट्रोलियम कॉर्पोरेशन लिमिटेड
BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमैन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM

GENERAL NOTES AND TYPICAL DETAILS

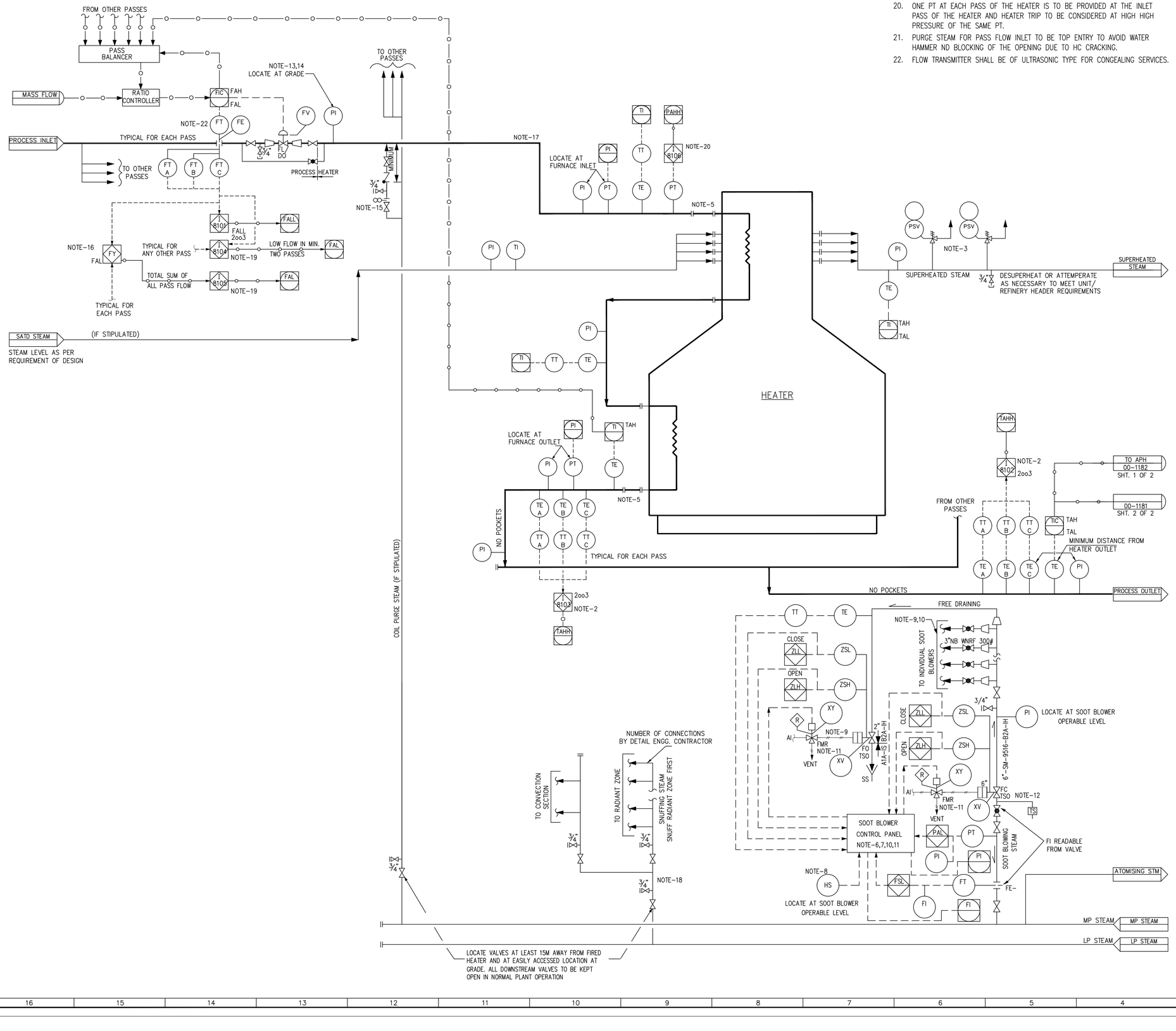
SHT 2 OF 2

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	संशो REV
S	B857	79	41	999	1192	0

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19. HEATER TRIP TO BE CONSIDERED FOR LOW PASS FLOW IN MIN. 2 PASSES (I-8104) OR LOW TOTAL FLOW (I-8105) FOR A MULTI PASS FURNACE.
20. ONE PT AT EACH PASS OF THE HEATER IS TO BE PROVIDED AT THE INLET PASS OF THE HEATER AND HEATER TRIP TO BE CONSIDERED AT HIGH HIGH PRESSURE OF THE SAME PT.
21. PURGE STEAM FOR PASS FLOW INLET TO BE TOP ENTRY TO AVOID WATER HAMMER ND BLOCKING OF THE OPENING DUE TO HC CRACKING.
22. FLOW TRANSMITTER SHALL BE OF ULTRASONIC TYPE FOR CONGEALING SERVICES.

NOTES:

1. FOR P&ID LEGEND, ABBREVIATIONS AND DETAILS, REFER DRAWINGS B857-79-41-00-1191/1192.
2. INTERLOCK LOGIC:

INTERLOCK NO.	ACTUATED BY	ACTION UPON
I-8101 (TYP. FOR EACH PASS)	FT/FALL- A/B/C AT LOW LOW FLOW (2oo3) AND TE/TAHH A/B/C AT HIGH HIGH TEMP. (TYP. FOR EACH PASS) NOTE-14	CLOSE MAIN GAS UV AND FUEL OIL SUPPLY AND RETURN UV, OPEN MAIN GAS BLEED UV (NOTE-13,14)
I-8102	TT/TAHH- A/B/C AT HIGH HIGH HEATER OUTLET TEMPERATURE (2oo3)	CLOSE MAIN GAS UV AND FUEL OIL SUPPLY AND RETURN UV, OPEN MAIN GAS BLEED UV
I-8103 (TYP. FOR EACH PASS)	TT/TAHH- A/B/C HIGH HIGH TEMP. AT OUTLET OF INDIVIDUAL PASS (2oo3) (TYP. FOR EACH PASS)	CLOSE MAIN GAS UV AND FUEL OIL SUPPLY AND RETURN UV, OPEN MAIN GAS BLEED UV
I-8104	FAL AT LOW LOW FLOW OF MIN. 2 PASS	CLOSE MAIN GAS UV AND FUEL OIL SUPPLY AND RETURN UV, OPEN MAIN GAS BLEED UV
I-8105	LOW TOTAL FLOW FOR ALL PASSES (THROUGH CALCULATION BLOCK)	CLOSE MAIN GAS UV AND FUEL OIL SUPPLY AND RETURN UV, OPEN MAIN GAS BLEED UV
I-8106	HIGH HIGH PRESSURE AT INLET OF INDIVIDUAL PASS	CLOSE MAIN GAS UV AND FUEL OIL SUPPLY AND RETURN UV, OPEN MAIN GAS BLEED UV

STARTUP BYPASSES: FEED FALL TO BE CONSIDERED
OTHERS: REFER APH P & ID, B857-02-44-00-1182

3. PRESSURE RELIEF VALVES AT SUPERHEATER OUTLET TO BE SIZED AS PER ASME & IBR, INCLUDING CASE OF BLOCKED IN CONDITION WITH HEATER OPERATING.
4. FOLLOWING FACILITIES SHALL APPEAR ONLY AS STIPULATED FOR A GIVEN HEATER IN BASIC ENGINEERING DOCUMENTS
   a) FUEL GAS FIRING, FUEL OIL FIRING OR COMBINATION FIRING.
   b) PASS BALANCE CONTOLLER.
   c) EMERGENCY COIL, PURGE STEAM
   d) STEAM SUPERHEATING.
   e) AIR PREHEATING
5. MECHANICAL PIGGING OF THE HEATER IS ENVISAGED. SPOOL PIECE IS PROVIDED FOR PIGGING/DECOKING. SPACE TO BE KEPT FOR FIXING AND DISMANTLING TEMPORARY SPOOL PIECES FOR HEATER DRY OUT.
6. SOOT BLOWER INTERLOCK TO BE AS FOLLOWS:
   a) AN INTERLOCK TO PREVENT SOOT BLOWER OPERATION UNTIL THE PIPE HAS REACHED PRESET TEMPERATURE.
   b) RETRACTION OF THE SOOT BLOWER ON LOW STEAM PRESSURE.
   c) RETRACTION OF THE SOOT BLOWER ON LOW STEAM FLOW RATE.
   d) MOTOR OVERLOAD.
7. PROVIDE BYPASS FACILITY FOR EACH SOOT BLOWER INTERLOCK.
8. SOOT BLOWER HAND SWITCH TO BE PROVIDED AT GRADE LEVEL.
9. NOs. OF SOOT BLOWER CONNECTIONS & SIZE SHOWN ARE TENTATIVE AND SHALL BE FINALISED BY DEC.
10. FACILITY REQUIRED TO OPERATE SOOT BLOWER MANUALLY, IF ONE FAILS TO OPERATE AUTOMATICALLY.
11. RESET (FMR) WITH PLC PERMISSIVE.
12. LINE STEAM TRAP TO BE PROVIDED IN THE SOOT BLOWING STEAM LINE. OTHER STEAM TRAP AS REQUIRED FOR PIPING LOW POINTS TO BE SUITABLY PROVIDED. THE TRAP SHOWN IS LINE STEAM TRAP ONLY.
13. IN CASE OF CATALYTIC PROCESS FURNACES, EMPLOYING A LIQUID HYDROCARBON FEED AND RECYCLE GAS STREAM HEATER SHUTDOWN GETS ACTUATED WITH RECYCLE GAS FAILURE (LOW FLOW IN RECYCLE GAS 2oo3).
14. FOR A HEATER TRIP TO BE CONSIDERED ON LOW LOW INDIVIDUAL FEED FLOW ON A PASS COUPLED WITH HIGH HIGH OUTLET TEMP. OF THE SAME PASS.
15. REQUIREMENT OF AUTOMATIC INJECTION OF COIL PURGE STEAM TO BE CONSIDERED IN CASE RECOMMENDED BY LICENSOR OR DESIRED BY OWNER.
16. CALCULATION BLOCK TO ADD LOW FLOW OF ANY 2 PASSES AND TOTAL FLOW OF ALL PASSES.
17. SYMMETRICAL DISTRIBUTION IS REQUIRED FOR ALL HEATER PASSES.
18. STEAM TRAP TO BE PROVIDED IN SNUFFING STEAM LINE.

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BHARAT PETROLEUM CORPORATION LTD.
BINA PETROCHEMICAL AND REFINERY EXPANSION PROJECT (BPREP)

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM
HEATER - PROCESS SECTION
(SHT 1 OF 2)

अनुमाप SCALE	कार्य संख्या JOB NO.	विभाग DEPT.	अनुभाग SECTN.	इकाई UNIT	आरेख संख्या DWG. No.	संशो
NTS	B857	79	41	999	1181	0