

**2X660 MW ENNORE SEZ COAL BASED STPP
AT ASH DYKE OF NCTPS, CHENNAI.**

VOLUME: IIB & III.

**TECHNICAL SPECIFICATIONS
FOR
PRE-TREATMENT PLANT.**

SPECIFICATION NO.: PE-TS-412-158-A002



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW BUILDING, NOIDA, INDIA.



TITLE:
**TECHNICAL SPECIFICATION FOR
 PRE-TREATMENT PLANT.**
 2X660 MW ENNORE SEZ COAL BASED STPP
 AT ASH DYKE OF NCTPS, CHENNAI.

BHEL DOCUMENTS NO.: PE-TS-412-158-A002
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**SECTION – A
SCOPE OF ENQUIRY**


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1. SCOPE OF INQUIRY/ INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, civil design and construction works, manufacture, supply, fabrication, assembly, inspection/testing at vendor's & sub-vendor's works, painting, maintenance/special tools & tackles, mandatory spares along with spares for erection as required, startup and commissioning spares as required, forwarding, proper packing, shipment and delivery at site, unloading, handling, transportation & storage at site, in site transportation, assembly, erection & commissioning, trial run at site, Supervision of Complete civil structural, architectural & construction works, preparation and submission of drawing/documents including "As built" drawings and carrying out performance guarantee test (PG Test) at site & equipment/system guarantee, etc. inclusive of all prevailing taxes, duties and other levies and handover in flawless condition of the **PRE-TREATMENT PLANT** for **2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI** to the end customer complete with all accessories for the total scope defined as per BHEL NIT and tender technical specification number as specified above, amendment & agreement till placement of order.

Bidders to please note that originally the plant was Designed and Engineered by M/s Otoklin Global Business Ltd (M/s OGBL), Mumbai, however, the Supply and further Erection work was not completed due some unavoidable contractual difficulties. The Civil front has already prepared at site based on the Detailed Engineering Documents submitted by M/s OGBL and approved by M/s BHEL/Customer/Consultant. Bidder to visit site for readiness of Civil Fronts in totality. The items to be supplied by Bidder should be able to integrate/hook with the existing Civil Work/Foundation. Bidder shall carryout rectification in existing civil work if any, before erection & commissioning of the plant.

- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve them of the responsibility of providing such facilities to complete the supply, erection and commissioning of **Pre-Treatment Plant**.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification are subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

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- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification as "PRE BID CLARIFICATION SCHEDULE". In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of BHEL/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.7 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.8 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.9 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer (**TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**) including their consultant (**CONSULTANT: DESEIN PVT LTD, NEW DELHI**) as interpreted by BHEL in the relevant context. Bidder to refer GCC/SCC for more clarity.
- 1.10 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.
- 1.11 BHEL's/Customer's representative shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.
- 1.12 Pre-bid meeting shall be held before bid submission. Bidder to ask all their queries in pre-bid meeting.



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SECTION - B

(PROJECT INFORMATION)

~~**SPECIFICATION
FOR
EPC CUM DEBT FINANCING CONTRACT
VOLUME II – GENERAL & SCHEDULES**~~

CHAPTER 1

PROJECT SYNOPSIS

1.0 GENERAL BACKGROUND AND SALIENT FEATURES

1.1 Introduction

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

1.2 Location

The proposed site for main power plant is located near Ennore port (approx 5 kms).

The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)

All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.

The nearest airport is at Chennai at a distance of 60 km.

1.3 Type of Plant

The proposed 2x660 MW Super-Critical Power Project consists of coal fired steam generator connected to a reheat type steam turbine generator along with all the required auxiliaries. Circulating cooling water system is envisaged for condenser cooling.

The description and salient technical data of the Steam Generator, Steam Turbine Generator, Auxiliary systems, Electrical, Control & Instrumentation, Civil etc. are explained elsewhere in the specification:

1.4 PROJECT INFORMATION

Project Title : **2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS**

Owner : **TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

LOCATION

The site is located near Vayalur Village, Ennore

Latitude : 13⁰17' N to 13⁰18' N

Longitude : 80⁰18' E to 80⁰19' E

Distance from Chennai City : 35 km

Nearest Airport is at Chennai at a

Distance of : 60 km

Nearest Seaport is : Ennore

Nearest Railway Station is : Athipattu Pudunagar (approx 5 kms)

Meteorological Condition

Climate : Tropical ,very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind.

Climatological data : Ambient temp. (°C)
Annual Maximum Mean Temp 41.5(°C)
Annual Minimum Mean Temp 24(°C)
Design Ambient temperature 35(°C)

Relative Humidity

Maximum 100%

Minimum 36%

Design 75%

Annual Rainfall

Maximum 2540 mm

Average 1600 mm

Minimum 1175 mm

Prevailing Wind Direction

Nov to Jan – From NW & NE

Feb to Mar – From East & SE
Apr to May – From South & SE
June – From SW
July to Aug – From NW
Sept to Oct – From SE & SW
Wind Speed 11.8 kmph (avg)
50 kmph (max)
Seismic Zone III as per
IS:1893-2002

1.5 Access to Site

Site is well connected to all weather road from Pattamandri on the Thiruvottiyur – Ponneri district highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.

1.6 Plant Rating, Capacity, Availability, PLF

Each of the two units shall have a Turbine maximum continuous rating (TMCR) of 660 MW at generator terminals based on the following site conditions.

- Ambient air temperature
- Condenser cooling water inlet temperature of 33°C and 9°C temperature rise across the condenser.
- Generator power factor of 0.85.
- Fuel specification as given elsewhere.
- Design temperature for electrical equipment is 50°C.

The VWO capacity of the steam turbine shall not be less than 105% of TMCR flow at rated parameters. Boiler maximum Continuous Rating (BMCR) will be established to match the steam flow at VWO conditions, but BMCR flow shall not less than 108% of TMCR flow.

The capacity of the unit is selected so as to deliver the rated output even after ageing that will occur between overhauls, as a result of deposition of salts in turbine blades, wear and tear etc.

The plant load factor (PLF) being considered is 85%.

1.7 Power Evacuation

Power will be evacuated from the proposed thermal power station at 400 KV voltage level through 400 KV transmission lines . The power evacuation lines would be double circuit 400 KV lines which will act as Line in & Line out circuit.

1.8 Site Selection

The following factors which influence the project site selection have been found very favourable to establish and operate the project.

- a. Availability of fuel.
- b. Existing power plant
- c. Availability of adequate cooling water.
- d. Availability of adequate land for locating the power plant with approach roads.
- e. Suitability of land from topographical and geological aspects
- f. Proximity of National Highways, Ports & Transport of fuel & heavy equipment.
- g. Facility for interconnection with transmission and distribution system for evacuation of power.
- h. Environmental aspects.

Total land required for the project is 500 acres which is under the possession of TANGEDCO.

1.9 Fuel

1.9.1 Source of Fuel

Domestic coal requirement for the power plant will be sourced from Kalinga block of Talcher coal fields, Mahanadi and IB valley coal fields in the state of Orissa. Coal will be transported by sea. The port of dispatch and port of receipt for domestic coal would be Paradip port and Ennore port respectively. Imported coal shall be sourced from foreign countries through sea to Ennore port.

Coal can be transported from coal mines to Ennore port by sea and unloaded at proposed coal berth-III. Further the coal can be transported to the proposed power plant through pipe conveyor which shall have a system capacity of 2 x 2000TPH.

The steam generator shall be designed for the following conditions :

- **Best Coal** – 100% Imported Coal
- **Design Coal** – 70% Imported & 30% Domestic Coal
- **Worst Coal** – 50% Imported & 50% Domestic Coal

The analysis of fuel is given below :

1.9.2 Coal Analysis:

Coal Quality Parameters

SL.NO	DESCRIPTION	DOMESTIC COAL	IMPORTED COAL
1.	HIGHER HEATING	2800 (GCV as	6250 (GCV Air

Ash by wt. %	0.1
Water content by volume % max	1
Sediment by weight % max	0.25
Total Sulphur by weight % max	4.5
Gross calorific value, Kcal/kg	10800

1.9.5 Fuel Linkage

TANGEDCO has approached Ministry of Coal through Ministry of Power for the long term linkage of Coal from the coal sources of Talcher or Mahanadi in Orissa.

The coal requirement has been worked as under:-

Coal required at MCR per hr. (Blended) 872 tonnes

Per day 20928 tonnes.

Annual 6.5 MTPA for 85% PLF

1.9.6 Fuel Transportation

The coal shall be received at Ennore port. The coal will be transported by pipe conveyor from coal berth 3 in Ennore Port and then through 2 x 2000 TPH pipe conveyor to the bunker directly or to stockyard.

1.10 Source Of Water

1.10.1 Source

The raw water intake shall be from the existing cooling water forebay of NCTPS PHASE-II.

1.10.2 ~~Chemical analysis of Sea Water:~~

~~As given in Annexure 1, Volume III, Chapter 3.~~

1.10.3 Requirement

The requirement of water for the plant will be for meeting the requirement of make up for the re-circulating cooling water system, dust suppression system in coal handling plants, ash disposal system and the RO/ D.M. water plant which will be supplying the power cycle make up requirements, etc. In addition the water requirements will be for drinking and service purposes. Water requirement is estimated as approx. 15523 m³/hr.

1.11 Source of Equipment

The proposed plant will be supplied, erected and commissioned on Single EPC basis.

1.12 Power Evacuation Plan

Power will be evacuated from the proposed thermal power station at 400 KV voltage level through 400 KV transmission lines . The power evacuation lines would be double circuit 400 KV lines.

1.13 400 KV GIS Switchyard

The 400 KV Switchyard is proposed to have one and a half bus arrangement and will comprise following bays/circuits :

- ◆ 2 – Generator transformer bays
- ◆ 1– Start up transformer bay
- ◆ 4 – Line Bays
- ◆ 2 – Bus VT's
- ◆ 2 – Bus Reactor Bays
- ◆ 2 – Spare bay (Equipped)
- ◆ 1 – Equipped bay for future GT
- ◆ 2 – Equipped bays for future lines

The switchyard will be complete with galvanized steel structures, lightning surge arrestors, OPGW Equipment, CTs, PTs of suitable VA burden and accuracy class as required for measurement protection and communication, insulators, bus-bars clamps & hard wares etc. The switchyard will be controlled by computerized control and data acquisition (SCADA) system.

1.14 Average Yearly Generation

The average yearly generation is calculated considering the following.

- The expected plant load factor is 85 %. With this PLF the average yearly generation will be around 11914 Million units.

1.15 INFORMATION FOR ENVIRONMENTAL APPRAISAL

1.0 GENERAL INFORMATION ABOUT THE PROJECT

- | | | | |
|-----|-----------------------------|---|---|
| 1.1 | Name / Title of the Project | : | 2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS |
| 1.2 | Name of Owner | : | Tamilnadu Generation and Distribution Corporation (TANGEDCO) |

- 1.3 Location of the Project : Near Vayalur Village, Ennore, Tamil Nadu
- 1.4 Site where proposed plant is to be located : Ash dyke of NCTPS
- 1.5 Capacity of the project under consideration : 2x 660MW
- 1.5.1 Govt. land / Private land / others : TANGEDCO land
- 1.5.2 Topographical feature, demographic profile & physiography : Site has differential levels and require filling to maintain the desired grade level of +10.00 meter above MSL
- 1.5.3 Nature of soil : Clayey soil
- 1.5.4 Distance from the nearest town / city / major human settlements : Chennai -35 km
- 1.5.5 Population to be displaced : Nil
- 1.5.6 Distance from water source : Approx. 5 km (from Cooling Water Forebay of NCTPS Stage II)
- 1.5.7 Area of forest land, if involved : Nil
- 1.5.8 Distance of forest from the site : N.A
- 1.6 Is this an extension? If so indicate capacity of existing plant : No
- 1.7 What is the ultimate capacity envisaged : 2x660 MW

2.0 GENERAL ENVIRONMENTAL INFORMATION

- 2.1 Area of the land proposed to be acquired : Refer Plot Plan Land already acquired
- i. Area required for plant : 500 Acres
- ii. Ash disposal : 100 % dry fly ash disposal and

- 100% wet bottom ash disposal is envisaged to existing ash pond.
- iii. Plant facilities : The area is adequate for locating all the required systems for 2x660 MW.
 - 2.2 Area proposed to be built-up or developed : Power station will be built-up in the proposed site as indicated in the plot plan.
 - 2.3 Specify site characteristics River basin/ estuarine / coastal / others : Site is close to Buckingham Canal
 - 2.4 Is the site situated in the forest area? Give following details : No
 - 2.4.1 Area : N.A
 - 2.4.2 Type of forests : N.A
 - 2.5 Is site situated near to the forests? Give the distance from the site. : N.A.
 - 2.6 Give a description of the flora within 25 km of your plant site under the following heads :
 - a. Crops :
 - b. Forest :
 - c. Grass land :
 - d. Endangered species :
 - e. Others (Specify) :
 Refer details in the specification elsewhere.
 - 2.6.2 Give details of the following features, if they exist, within a radius of 25 km of the proposed site? :
 - i. Fisheries :
 - ii. Sanctuary / natural park biosphere reserve :
 - iii. Lakes / ponds / reservoir :
 - iv. Stream / river : Buckingham canal is close to the site
 - v. Estuary / sea : Bay of Bengal is 5 km from site

- vi. Hills / mountains :
- vii. Historic / cultural /
tourist /
archaeological scenic
sites / defence
installations :


2.7 Human settlement :

2.7.1 Total number of persons :
proposed to be employed :

i. During construction : 2500

450(0.75person/MW) TANGEDCO

ii. During operation : direct employees

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SECTION – C
(SPECIFIC TECHNICAL REQUIREMENTS)




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SECTION – C1

(SPECIFIC TECHNICAL REQUIREMENTS FOR MECHANICAL)

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1.0 GENERAL:

1.1 PRE TREATMENT PLANT (PT PLANT)


The intent of this specification is to cover design (excluding civil design of chemical house building/shed and for already approved Civil Structure), engineering, manufacture, supply, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance / special tools & tackles, mandatory spares along with spares for erection as required, start up and commissioning spares as required, forwarding, proper packing, shipment and delivery at site, unloading, handling, transportation & storage at site, in site transportation, assembly, erection & commissioning including supervision of civil works of clarifiers, trial run at site, preparation and submission of drawing /documents including "As Built" drawings and carrying out performance guarantee/Functional/Demonstration tests at site (As applicable) & equipment/system guarantee etc. inclusive of all prevailing taxes, duties and other levies and handover in flawless condition to end customer complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification no. **PE-TS-412-158-A002** for **2X660 MW ENNORE SEZ STPP Pre-Treatment Plant**. The scope of supply shall fully cover the requirement of the Design Criteria and Technical specification of this specification.

The bidder's scope shall also include any other services, etc. if called for in the succeeding sections of the specification.


2.0 BROAD SCOPE OF SUPPLY

Broad scope of supply (Mechanical) for this package is detailed below and as indicated in relevant portion of this specification. Please refer Electrical, C&I & civil specifications also for respective scope and design guidelines for Electrical, C&I & Civil items.

- i. Entire Pre-treatment plant as per P&ID (**PE-V0-412-158-A001: P & ID FOR PRE TREATMENT PLANT**), Data Sheet-A and technical specification requirements.
- ii. Raw water inlet piping to aerator complete with piping, fitting and valves. The inlet piping is to include two number motorized butterfly type control valves with necessary manual isolation/control valve and necessary instrumentation.
- iii. Piping along with valves from raw water supply pumps to aerator as per flow diagram enclosed for pre-treatment plant.
- iv. One number Bypass line to clarified water storage tank with Motorised Valve as per P & ID enclosed .
- v. Mechanical, Electrical, Instrumentation etc. as required for one no (1). Aerator of RCC construction as per P & ID enclosed for pre-treatment plant with accessories as required.
- vi. Mechanical, Electrical, Instrumentation etc. as required for one no (1). Stilling chamber as per P & ID enclosed for pre-treatment plant with accessories as required.
- vii. Mechanical, Electrical, Instrumentation etc. as required for one no (1). Parshall flume as per P & ID enclosed for pre-treatment plant with accessories as required.
- viii. Mechanical, Electrical, Instrumentation etc. as required for one no (1). Flash Mixer with motorized stirrer as per P & ID enclosed for pre-treatment plant with accessories as required.
- ix. Mechanical, Electrical, Instrumentation etc. as required for two (2) nos. 2X50 % calrifloculators with sampling points at different elevation of clarifiers as per P & ID enclosed for pre-treatment plant with accessories as required.
- x. Clarifier bridge (half bridge mechanism) assemblies, hand railings, required motors, valves, piping, instrumentation etc as per P & ID enclosed for pre-treatment plant.
- xi. Sludge disposal system from clarifier with piping, valves and instrumentation up to sludge collection pit as per P & ID enclosed for pre-treatment plant with accessories as required.
- xii. Mechanical, Electrical, Instrumentation etc. as required for one (1) no. RCC Sludge Pit (in twin section) interconnected through gate as per P & ID enclosed for pre-treatment plant with accessories as required.
- xiii. Three (3) nos. sludge transfer pump with electric motor drive, piping, valves, fittings and instrumentation upto guard pond. The distance between Guard pond and PT plant is 350m.
- xiv. Two nos. polyelectrolyte dosing tanks along with motorised stirrer, flushing arrangement, instrumentation, valves, fittings, ladders, platforms, lifting lugs and piping etc. as indicated in P & ID enclosed for Pre-treatment plant.
- xv. Two (2) nos. (1w+1s) polyelectrolyte dosing pumps with electric motor drive, piping, valves, fittings and instrumentation as indicated in P & ID enclosed for Pre-treatment plant
- xvi. Three (3) nos. FeCl₃ dosing tanks along with motorised stirrer, flushing arrangement, instrumentation, valves, fittings, ladders, platforms, lifting lugs and piping etc. as indicated in P & ID enclosed for Pre-treatment plant.
- xvii. Two (2) nos. (1w+1s) FeCl₃ dosing pumps with electric motor drive, piping, valves, fittings and instrumentation as indicated in P & ID enclosed for Pre-treatment plant.
- xviii. Two nos. lime dosing tanks along with motorised stirrer, flushing arrangement, instrumentation, valves, fittings, ladders, platforms, lifting lugs and piping etc. as indicated in P & ID enclosed for Pre-treatment plant.
- xix. Two (2) nos. (1w+1s) lime dosing pumps with electric motor drive, piping, valves, fittings and instrumentation as indicated in P & ID enclosed for Pre-treatment plant.
- xx. One no. Hypo dosing tank along with motorised stirrer, flushing arrangement, instrumentation, valves, fittings, ladders, platforms, lifting lugs and piping etc. as indicated in P & ID enclosed for Pre-treatment plant.
- xxi. Two (2) nos. (1w+1s) Hypo dosing pumps with electric motor drive, piping, valves, fittings and instrumentation as indicated in P & ID enclosed for Pre-treatment plant.
- xxii. Clarified water overhead storage tank (civil work by BHEL) with float type valve, overflow arrangement, level indicator, level transmitter etc.

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- xxiii. Piping along with valves and fittings as required from clarified overhead tank to dosing systems as per P & ID enclosed for Pre-treatment plant.
- xxiv. All pipes, fittings etc. required for hand railing, platforms, and ladders shall be in the scope of bidder of supply and erection of complete PT plant. Hand railing shall be provided by bidder wherever required for safety point.
- xxv. All insert plates, puddle pipes, nuts and bolts, counter flanges, grouting material wherever applicable shall be in the scope of bidder.
- xxvi. Embedment plates with lugs shall also be provided by bidder as per system requirement.
- xxvii. Edge angle required in a proper shape for edge protection in civil works will be provided by bidder.
- xxviii. All sluice gates shall be in the scope of bidder.
- xxix. The pipe sizes indicated in the tender specification/ flow Diagram are minimum. Wherever pipe sizes are not indicated, the same shall be selected based on the specification requirement and shall be subject to BHEL/ customer approval during detailing engineering.
- xxx. **Bidder to be note that the outlet Total Suspended solid guarantee for PT clarifier shall be <10 ppm.**
- xxxi. Centrifugal type blower with acoustic enclosures along with piping valves fitting and instrument as per flow diagram of PT Plant for clarifier sludge sump.
- xxxii. Pipe racks shall be provided by BHEL wherever available. However where pipe racks are not available the pipe shall run on pipe pedestals All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles shall be in the scope of bidder.
- xxxiii. All motorized valves shall be provided with integral starter.
- xxxiv. Wherever terminal points between BHEL and bidder indicated, blank flanges/counter flanges, isolations valves, tees etc. to interconnect the pipes at all terminal points.
- xxxv. RCC pedestals design for all piping of PT plant in bidder's scope.
- xxxvi. Hume Pipe 4 Nos (200 NB Size) each of 6 meter length.
- xxxvii. One (1) number Electrically Operated Monorail Hoist of 1.0 Ton (minimum) safe working capacity and complete with all accessories for handling of Sludge Transfer Pumps within Sludge Sump cum Pump House.
- xxxviii. Two (2) numbers Electrically Operated Monorail Hoists, each of 1.0 Ton safe working capacity and complete with all accessories for handling of chemicals at ground floor and first floor of Chemical House.
- xxxix. The chemical house shall be equipped with two weighing scales of platform & dial type suitable for chemicals being handled. Range of weighing scales shall be suitable for weighing 0-1000 Kg. Technical requirements of weighing scale shall be as specified in Datasheet – A.
- xl. All handrails shall be of 32 mm nominal bore MS pipes (medium class) as per IS: 1161 galvanized using 750 gm/sq. m of zinc. Hand railing shall be a two-rail system with the top rail 1000 mm above the walkway surface and the intermediate rail 450 mm below the top rail. Handrail post spacing shall be limited to 1500 mm as far as possible but can be proportioned to the length of the opening. In such a case spacing shall not exceed 1850 mm centre to centre of posts. Hand railing shall be shop fabricated for specific locations and field welded or bolted to the erected structural steel. Railings shall be provided with 100 mm wide and 8 mm thick MS strip at bottom as toe guard all along the length of railing in horizontal plane. For RCC stairs, hand railing with 20 mm square MS bar balustrade with suitable MS flat and Aluminium / Teakwood handrail shall be provided, unless specifically mentioned otherwise. Hand rail supply shall and erection at site on structures is also in Bidder's scope.
- xli. Finish paints for touch up painting of equipment after erection at site in sealed container. Bidder shall also provide one final coat additionally of same DFT as specified in tender specification at site after completion of erection of each equipment / item.
- xl.ii. Monitoring gadgets, instruments and equipment required for commissioning & maintenance (till PG test and plant handover).
- xl.iii. Instrument hook up material shall be in bidder's scope.
- xl.ii. Wrapping, coating and protection of the entire buried pipe shall be as per IS 10221 or AWWA C 203-93.
- xl.ii. Hydraulics of the Complete Pre-treatment Plant shall be designed to take an occasional over loading of 20% over the design flow.
- xl.ii. One set of all special tools & tackles of reputed make necessary for proper maintenance or adjustment of the equipment being supplied by the bidder, packed in permanent box.
- xl.ii. Bidder to note that the equipment, valves, instruments indicated in the P&ID (**PE-V0-412-158-A001**) attached in the technical specification are minimum and are in bidder's scope. During detailed engineering, bidder to furnish complete and detailed scheme in all respects including all valves, equipment's etc. for smooth, safe, efficient and trouble free operation of the plant meeting the specification requirement and also considering the applicable statutory requirement.
- xl.ii. All channels & brackets, mounting plates as required for mounting of motors, pumps, stirrers, tank etc shall be in bidder's scope.
- xl.ii. All necessary structural steel for pipe supporting structure, platforms, walkways / pathways and access stairs, mechanical plant and equipment, mechanical services and pipe work associated with Pre Treatment Plant.
- l. Instrument hook up material shall be in bidder's scope.
- li. Permanent ladder (not rungs) for approaching the top of tanks, valves for All steel inserts with lugs, plates, bolts, nuts, sleeves, edge angles and all other embedding components etc as required to grout in civil works and to support/hold the equipment being supplied under this specification for opening/maintenance purpose.
- lii. All the first fill and one Year's topping requirements of consumable such as greases, oil, lubricants, servo fluids/control fluids etc. which will be required to put the equipment covered under the scope of specifications, into successful commissioning /

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initial operation and to establish completion of facilities shall be in bidder's scope. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.

liii. All Chemical for Trial Run (Minimum 15 Days) and for PG Test+First fill of all chemical tanks.

3.0 SCOPE OF SERVICE

The bidder's scope also includes following services for scope under this specification:

- 1) Erection and commissioning, unloading, storage and handling at site.
- 2) Supervision of Complete civil structural, architectural & construction works,
- 3) Arrangement of all instruments and lab facilities to carry out trial run/commissioning and PG test.
- 4) Complete grouting for equipment, fixing and any concreting inside the vessels and lining.
- 5) All personnel required during commissioning and PG Test.
- 6) Performance testing.
- 7) Painting as per enclosed painting schedule. However, any variation in the painting schedule as finally approved by customer shall be taken care by the bidder without any commercial and delivery implication. Color-coding scheme shall be intimated to vendor during detailed engineering.

4.0 CIVIL SCOPE

Total Civil construction work along with material (RCC and Reinforcement Steel) at site is in BHEL's Scope of work, however complete grouting for equipment, pumps, blowers etc. fixing of equipment, pumps, blowers etc. as required shall be in bidder's scope.

Detailed Civil designing and input civil assignment drawing shall be provided by bidder. Civil input drawing for chemical house shall be provided by bidder for preparation of civil construction drgs for foundation of equipment by BHEL and furnished to bidder for concurrence during detailed engineering.

Note: The Civil Documents/Drawings already approved as per ANNEXURE-D to be followed by bidder and for that no drawing/documents to be submitted by Bidder. Only those documents not approved or under approval or commented as per Annexure-D shall be submitted by bidder.

5.0 ELECTRICAL SCOPE

Complete electrical as per specification / details indicated in Section IB (Specific Technical Requirement Electrical) and IIB (General Technical Requirement Electrical).

Note: The Electrical Documents/Drawings already approved as per ANNEXURE-D to be followed by bidder and for that no drawing/documents to be submitted by Bidder. Only those documents not approved or under approval or commented as per Annexure-D shall be submitted by bidder.

6.0 C&I SCOPE

Complete C&I as per specification / details indicated in Section IC (Specific Technical Requirement C&I) and IIC (General Technical Requirement C&I).

Note: The C&I Documents/Drawings already approved as per ANNEXURE-D to be followed by bidder and for that no drawing/documents to be submitted by Bidder. Only those documents not approved or under approval or commented as per Annexure-D shall be submitted by bidder.


5.0 TERMINAL POINT

- Raw water: 35m from Aerator central shaft at 0.5m above FGL.
- Service Water: 5m at 0.5m above FGL from PTP chemical House. Line Size shall be 50 NB.
- Potable Water: - Pipe length from Hypo dosing pump to outlet of potable water pump shall be 350 m. All the necessary fitting and flanges needed for connection at outlet header of potable water pump discharge shall be in scope of bidder.
- Instrument Air/Service Air: At Terminal Point 10 meter from PT Plant Boundary at 5-7 kg/cm² (g) pressure.
- From discharge of sludge transfer pumps to guard pond shall be 350m.

Note: Bidder to note that the pipe length indicated in the specification may vary by +10 % for which no extra claim shall be applicable.

6.0 EXCLUSIONS

- a) Service air, Instrument air, upto the terminal point.
- b) Fire fighting facilities. However, bidder to furnish the requirement of same after award of contract.
- c) Drinking water and service water.

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- d) All Civil works at site including Acid/Alkali resistant tiling/lining, excavation, backfilling, cement and steel.
- e) Laying of pipes under road crossing and railway track.
- f) M.C.C. / Switch fuse feeder panels for the power plant and control cabling up to & beyond the battery limit (Refer electrical section for scope).

7.0 QP AND SUBVENDOR APPROVAL

- a) QP requirements part of section-C shall be as per the enclosed QP subject to BHEL/Customer approval. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any implication to BHEL.
- b) Approved subvendor list is enclosed elsewhere of this specification. However, any additional sub-vendor shall be subject to BHEL and Customer approval.

Note: The QAP already approved as per ANNEXURE-D to be followed by bidder and for that no documents to be submitted by Bidder. Only those documents not approved or under approval or commented as per Annexure-D shall be submitted by bidder.

8.0 FUNCTIONAL GUARANTEES (REFER APPROVED PG TEST PROCEDURE ENCLOSED, REF. PE-V0-412-158-A094).

9.0 DESIGN/CONSTRUCTION

In addition to the requirements of Section-C & D the following shall also be complied under scope of this specification:


The P&ID is enclosed herein in this section for bidders compliance.

The material of construction specified in Data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subjects to customer approval during detailed engineering.

10.0 DRAWING/DOCUEMNTS REQUIREMENT (FOR MECHANICAL/ELECTRICAL/C&I/ETC)

After award of LOI, following drawing/documents shall be submitted by the bidder for BHEL/Customer approval. However, any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial implication.

- a) Detailed piping and instrument or engineering flow diagram for process and utility, showing all equipments, machinery, piping and instruments. All pipes should be indicated with diameter, pipe class, pipe number, fluid flowing through it as per the Employer's legend to be furnished later.
- b) Detailed configuration drawings, BOMs, Data Sheets, General arrangements and cross-sectional/assembly drags, along with the manufacturer's catalogue for all the items/equipment including control & instrumentation supplied by the bidder.
- c) Detailed installation drawings for all instruments and instrumentation schedule.
- d) Preparation and finalization of functional write-up and detailed logic diagram, for all control system, electrical wiring and schematic drgs for the development of logic diagrams, GA and layout drgs of control panels, junction boxes, bill of material for panel drgs and terminal, chart for all the panel drgs, inter connection diagram for cabling, cable schedule, earthing layout and cable tray layout drawings..
- e) Design calculation of process and mechanical design, equipments and systems. The bidder shall show, explain and prove the validity of the basis/procedures and methods used in these calculations.
- f) Details civil scope drawing for all civil works.
- g) Detailed piping layout drawings, pipe support drawings, complete bill of materials of the piping, valve schedule etc.
- h) Submission of O&M manual.
- i) P.G Test procedure shall be submitted by bidder during detail engineering and shall be subject to approval by BHEL/Customer.
- j) Against customer / BHEL comments bidder has to give replies point wise during detailed engineering after award of contract.
- k) Spec. for acid/alkali resistant lining and areas requiring such lining.
- l) Cable schedule in BHEL format.

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11.0 DRAWING/DOCUEMNTS REQUIRED ALONG WITH THE BID (Please refer Electrical and C&I portion also).

- Deviation if any strictly in the enclosed Schedule of deviation with cost of withdrawal only with mention of specification clause for which deviation is being asked. (Stamped & Signed)
- Compliance certificate.(Stamped & Signed)
- Schedule of Declaration. (Stamped & Signed)
- Electrical Load data in BHEL format (Stamped & Signed)
- Un Price Schedule duly filled in. (Stamped & Signed)
- List of Start-up & commissioning spares if any. (Stamped & Signed)
- List of Recommended spares if any. (Stamped & Signed).

NOTE-1: - Any item/work either supply of equipment or erection material which have not been specifically mentioned in but are necessary to complete the woks for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.

Note-2: All major drawings/documents shall be approved by BHEL/Customer during detailed engineering. Stage. Successful vendor shall comply with the comment of the BHEL/Customer without price & delivery implication.

Note-3: Bidder to note that BHEL reserve the right for drg/doc submission through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7
- Internet speed – 2 mbps (Minimum preferred)
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked
- Vendor's Internal proxy setting should not block DMS application's link

(<http://124.124.36.198/wrenchwebaccess/login.aspx>)

Note-4: The above Note-1, 2 and 3 shall be applicable for Electrical and C&I also.



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TABLE - A

SEA WATER ANALYSIS:

S.No.	Parameter	Unit	Value (Range)
1	General		
a	pH		7.94-8
b	Conductivity	millisiemens/cm	43.8-44.1
c	Temperature	Deg C	25-32
d	Turbidity (Total Suspended Solids)	PPM	500
e	Total Organic carbon (total/ dissolved)	PPM of C	2.4-2.84
f	CO2	Mg/l	<2
g	TDS	Mg/l	39600-39740
h	BOD	Mg/l	10-12
i	COD	Mg/l	88-96
j	Oil & Grease	Mg/l	<10
k	Phenols	Mg/l	0.08-0.09
l	Free Residual Chlorine	Mg/l	<0.2
2	Cations		
a	Calcium	Mg/l	459-478
b	Magnesium	Mg/l	1510-1516
c	Sodium	Mg/l	10100-12000
d	Potassium	Mg/l	358-450
e	Ammonia	Mg/l	4.43-5.42
f	Strontium	Mg/l	12.9-12.4
g	Barium	Mg/l	1.55-1.58
h	Aluminum Total	Mg/l	1-1.8
i	Aluminum Dissolved	Mg/l	0.8-1.0
j	Manganese Total	Micro g/l	0.2-0.6
k	Manganese Dissolved	Micro g/l	0.1-0.2
l	Iron total	Micro g/l	220-260
m	Iron Dissolved	Micro g/l	Below detectable limit (detectable Limit : 10)
3	Anions		
a	Chloride	Mg/l	18994-19194
b	Sulphate	Mg/l	3710-3949
c	Nitrate	Mg/l	136-152
d	Nitrite	Mg/l	0.46-0.62
e	Bicarbonate	Mg/l	144-148
f	Carbonate	Mg/l	Nil
g	Fluoride	Mg/l	2.64-2.8
h	Boron	Mg/l	0.14-0.17
i	Phosphate	Micro g/l	240-380
j	Sulphide	Micro g/l	Below detectable limit



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			(detectable Limit : 100)
k	Silica Dissolved	Micro g/l as SiO ₂	200-250
4	Heavy Metals		
A	Arsenic	Micro g/l	Below detectable limit (detectable Limit : 2)
B	Mercury	Micro g/l	Below detectable limit (detectable Limit : 1)
C	Cadmium	Micro g/l	120-130
D	Copper	Micro g/l	200-220
E	Nickel	Micro g/l	470-490
F	Molybdenum	Micro g/l	Below detectable limit (detectable Limit : 100)
5	Suspended Particle Size Range		
A	10 micron & above	Mg/l	Below detectable limit(detectable Limit : 10)
B	5 micron to 10 micron	Mg/l	Below detectable limit(detectable Limit : 10)
C	1 micron to 5 micron	Mg/l	Below detectable limit(detectable Limit : 10)
D	0.1 micron to 1 micron	Mg/l	20-26
6	Colloidal Particle Size Range		
A	SDI (10 Minutes)	-	10-20
B	SDI (5 Minutes)	-	20-40
7	Density of sea water	Kg/ cum	1030



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MANDATORY SPARES

TABLE-B

SI. NO.	PARTICULARS	QUANTITY
1.0	CIRL DIAPHRAGM VALVE	
1.1	Complete valve	Two (2) Nos. each of different size of valve in the system
1.2	Diaphragm	Five (5) Nos. each of different sizes valves
1.3	Valve spindle	Two (2) Nos. each of different sizes valves
2.0	Other type valve (except Control Valve)	
2.1	Complete valve	One (1) No. each of different size of valve in the system
2.2	Sampling & needle valve	Four (4) Nos. each type & size
3.0	Pressure Gauge	Two (2) Nos. for each Range/Type
4.0	Level Gauge	
4.1	Glass Tube	Five (5) Nos. for each size
4.2	Off-set value	Two (2) Nos. for each size
5.0	Level Switch (conductivity type)	
5.1	Float & Rod Float & Rod	One (1) No. for each size
5.2	Switch Assembly	One (1) No. for each size
6.0	Clariflocculator Bridge	
6.1	Worm gearbox	One (1) No.
6.2	Shaft for trailing wheel	One (1) No.
6.3	Flocc. Drive head complete with bevel & pinion set.	One (1) No.
6.4	Central bearing housing complete.	Two (2) Sets
6.5	Current collectors.	One (1) Set
6.6	Weir with stuffing box.	One (1) No.
6.7	Bearing; Impeller with shaft & gear unit for each type and size of air blowers.	Two (2) Sets
6.8	Floats for each size and type with links & levers	Two (2) Sets
6.9	Bearings & brake linings for each type & rating of hoists.	Two (2) Sets



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6.10	Rope grid & complete length of wire rope for each type of hoists rating	One (1) No.
6.11	Bearings; shaft sleeve; impeller; and mechanical seal for each type & duty parameters of pump sets.	One (1) set each
6.12	Controller valve assembly complete.	Two (2) No.
6.13	Periphery drive worm gearbox coupling.	Two (2) No.
7.0	415 V Motors	
7.1	Terminal plates	10 Nos. each for small motors upto 30 kW & 4 Nos. each for more than 30 kW
7.2	Heaters	2 sets
7.3	Greasing arrangements	4 sets each type of motor
7.4	Motor of each type and rating	10% of the installed quantity or minimum 1 number whichever be higher
7.5	Bearings (DE and NDE) for each type and rating of motor	4 sets
8.0	BATTERY	
8.1	Battery cell	10 nos.
8.2	MT cell container of each type	10 nos.
8.3	Level indicator	6 nos.
8.4	Vent plugs	12 nos.
8.5	Inter-cell connector	10 nos.
8.6	Set of nuts, bolts and washer	12 nos.
11.0	Each type of lamps, PBs, ILPBs, fuse, MCB, MCCB used in the equipment/system.	20% of Installed of each type.
12.0	Measuring Instruments	
12.1	Indicators, Recorders, Electrical Metering and Skid Mounted Instruments	
12.1.1	Indicators, recorders and meters offered from each model for the project. These instruments shall be supplied with three sets of blank scales.	10 % of Installed of each type/Model or a minimum of one number for each model and type, whichever is more.
12.1.2	For skid mounted instruments (As applicable)	10% of total number of instruments for each Type and model or a minimum of one number for each model and type, whichever is more.
12.1.3	Temperature Transmitters and Electronic Transmitters (For Pressure, DP, Temp, Flow, Level), Temperature, Pressure, Flow & Level Switch, safety switches, Gauges, meters, Transducer or any other instrument etc.	10% of total number of Instruments/transducers offered for each model and type for the project or a minimum of one number, whichever is more.
13.0	Erection hardware	




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13.1	Instrument valves	Ten (10) percent of each type & Size installed
13.2	Condensate pots of each type & Size installed	Ten (10) percent of total number of Installed or four numbers whichever is higher .
13.3	Manifold	Ten (10) percent of each type & Size installed
13.4	Fittings	Ten (10) percent of each type & Size installed
14.0	Control valves, Power Cylinder, Control Dampers, Actuators and Accessories	
14.1	Following spares shall be provided for control valves, Power Cylinder, Control Dampers as applicable.	
4.1.1	One set of spare control valve stem packing for each control valve.	
4.1.2	Two moulded rubber diaphragms for each control valve.	
4.1.3	One sets of each of O-rings and rubber gaskets for each control valve.	
4.1.4	100 percent qty. of lubricants for gaskets for each control valve on one year consumption basis.	
4.1.5	2 sets of limit switches and 1 set of valve positioner for each control valve.	
4.1.6	20% of position transmitter (4-20mA) for total qty. of control valve.	
4.1.7	One (1) set of valve trims (such as plug, stem, seat ring /cage, guide bushing, stem lock pin, packing retaining ring, etc) for each control valve.	
4.1.8	One completes actuator of each type or min 10% for each type and size whichever is more.	
4.1.9	20% of Solenoid valves or min 2 no. of each type for total qty. of control valves.	
4.1.10	20% of I to P converters, Pressure regulators.	
15.0	10% or 1 no. (whichever is more) of each type of sensor/instrument, instrumentation/mechanical fittings etc for any other electronic system.	

Notes:

- 1) Mandatory spares listed above is bare minimum requirement. In case any additional mandatory spares requirement is covered elsewhere in the tender specification apart from specified above, same shall be deemed to have been covered in bidders scope of supply.
- 2) Unless stated otherwise, a "set" or "Lot" means items required for complete replacement in one equipment of each type/ size/ range.
- 3) In case of Bought Out items, itemised spares list may be vendor specific and may differ from the list of spares mentioned above. In such cases, the quoted price shall be considered for applicable items only without any change in the contract price.
- 4) In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

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PERCENTAGE OF BILLING BREAK UP (BBU)

TABLE-C

Bidder to submit BBU during detailed engineering after approval of Basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL / customer for the same. None of the items supplied for the project as non-billable. Incomplete BBU shall not be review by BHEL.

Break-up (%) of Supply prices of Pre Treatment plant package. (To be used during contract execution for payment).	
Lump sum firm price for supply of Clarifier Mechanism along with accessories inclusive of all taxes, duties and other levies as applicable.	13% of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of pumps, blowers, agitators, Motors inclusive of all taxes, duties and other levies as applicable.	25% of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Piping & fittings inclusive of all taxes, duties and other levies as applicable.	13% of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Valves inclusive of all taxes, duties and other levies as applicable.	16% of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Instrument & analysers inclusive of all taxes, duties and other levies as applicable.	18% of Total supply price of Pre Treatment plant package.
Lump sum firm price for supply of Misc. Balance Items inclusive of all taxes, duties and other levies as applicable.	15% of Total supply price of Pre Treatment plant package.



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DATA SHEET-A

1.0	INLET VALVES	
1.1	Inlet valves	The referred clause shall be read as Inlet valves:-Two (2) numbers motorized butterfly flow control valve, located at inlet to aerator, with manual upstream and downstream isolation valves along with by-pass manual butterfly flow valve. Control valve shall have "auto manual" selection option, position indicator with "openclose" push buttons. Inching operation of valve shall be possible from DDCMIS based control panel.
1.2	Inlet control valve size	Suitable to cater to total flow
1.3	Code	AWWA – C 504 for butterfly valve
1.4	Control	Under "Auto" mode of flow control valve, valve shall automatically maintain the level of water in the clarified water reservoir, i.e valve shall automatically close when reservoir level becomes high.
2.0	AERATOR	
2.1	Nos.	One (1) [common for two clarifier].
2.2	Material of construction	RCC
2.3	Surface flow rate	0.045 m ² / hr/ m ³
2.4	Riser	Min 250 mm.
2.5	Tread	Max 400 mm.
2.6	Number of steps	7 Nos (Min).
3.0	STILLING CHAMBER	
3.1	No.	One (1) [common for two clarifier].
3.2	Purpose	To dampen out any turbulence of the incoming water.
3.3	Retention time and capacity	60 seconds and (min) 75 Cum.
3.4	Material of construction	RCC
3.5	Drain arrangement	Suitable draining arrangement shall be provided for the stilling chamber and drain lines shall be connected to sludge sump.
4.0	PARSHALL FLUME	
4.1	No.	One (1) [common for two clarifier].
4.2	Purpose	To measure flow.
4.3	Material of construction	RCC
4.4	Capacity	1.2 times of clariflocculator (min).
5.0	FLASH MIXER	
5.1	Nos.	One (1)
5.2	Retention time	60 seconds
5.3	Capacity	Minimum 75 cum.
5.4	MOC of Flash Mixer Pit	RCC
5.5	Agitator (MOC: Duplex Stainless Steel)	One (1) for flash mixer
5.6	Free board	500 mm (min)
5.7	Motor rating for agitator	DDE (During Detail Engineering).
5.8	Drain arrangement	Suitable draining arrangement shall be provided for the stilling chamber and drain lines shall be connected to sludge sump.
6.0	CLARIFLOCCULATOR	
6.1	Number	Two (2X50%)
6.2	Capacity (Net output)	1160 cum/hr.
6.3	Type	Radial, conventional.
6.4	Effluent water quality	Turbidity and TSS shall be less than 10 NTU/PPM.
6.5	Side Water Depth (SWD)	Minimum 4.5 meter.
6.6	Rise rate	1.2 CuM/Hr/SqM (maximum).
6.7	Retention Time	Flocculation zone 30 min, Clarifier zone-150 min.
6.8	Sludge Blow Off	By gravity through telescopic stand-pipe for continuous discharge and through manual operated blow-off valve for intermittent.
6.9	Platform with hand railing	Shall be provided (1 meter wide all along Clariflocculator)
6.10	Rake bridge (Half Bridge)	Shall be provided (MOC: MS as per IS 2062 corroborated or FRP coated). Gearbox for scraper drive shall be of oil-free type.
6.11	Flocculation agitator (MOC: Duplex Stainless Steel)	Two (2) Numbers. Vertical slow speed motor reduction gear driven.
6.12	Velocity in launder	0.4 m/s (max).
6.13	Free board b in launder and channel	Minimum 300 mm.
6.14	MOC of inlet Pipe	MS internally coated with Corrocoat



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6.15	Surface flow rate of clarifier zone	Not more than 1.2 cum/hr/ m2.
7.0	CLARIFIER SCRAPPERS	
7.1	Type	Designer's Design Specific (shall be furnished DDE).
7.2	Number required	One per clarifier.
7.3	Material	Mild steel (MS) with FRP coated.
7.5	Traction drive	Slow speed motor driven.
8.0	SUITABLE ACCESSORIES	
8.1	Access ladder, platform, staircase, hand railings etc.	Shall be provided of structural steel.
8.2	Walkway	Shall be provided with hand railings around launder periphery of width 1000 mm.
8.3	Electrical requirements	For each clariflouculator, one (1) Distribution Board to be located on clariflocculator bridge for all drives of clariflocculator bridge assembly.
9.0	SLUDGE SUMP	
9.1	Number	One (1) with two compartments.
9.2	Capacity (effective)	300 Cum (each compartment).
9.3	Dimension	Suitable
9.4	Material	RCC with FRP/PP lining.
9.5	Location	Shall be finalized during Detailed Engineering (DDE).
9.6	Isolation gates with hand wheel and penstock	Two number per compartment.
9.7	Instrument	As per Flow Diagram.
9.8	Air Agitation facility	Air Agitation with pipe grid by 2x100 Air Blower (Twin Lobe Positive Displacement Type, MOC-Casing-CI IS-210 FG 260, Shaft-CS to EN8 (BS 970), Lobe-CI IS 210 FG 260) and sludge recirculation line shall be provided in sludge sump.
9.9	Hoist	
9.9.1	Type	Electric in monorail
9.9.2	Location	sludge transfer pumps
9.9.3	Number	One (1).
9.9.4	Capacity	1 T
10.0	CHEMICAL HOUSE	
10.1	Number	One (1).
10.2	Type	Two storied building of civil construction.
10.3	Building dimensions	DDE
10.4	Ground floor	Storage of chemical required for FeCl ₃ , Lime, Poly Electrolyte and NaOCl dosing (for Potable water) for 30 days storage capacity and MCC.
10.5	First floor	Location of all chemical dosing tanks and pumps and Control room for DDCMIS for entire PT Plant.
11.0	WEIGHING SCALE FOR CHEMICAL HOUSE	
11.1	Type	Platform, dial type.
11.2	Number	One (1)
11.3	Capacity	0-1000 Kgs
12.0	HOIST	
12.1	Type	Electric in monorail
12.2	Location	ground and first floor of chemical house
12.3	Number	Two (2).
12.4	Capacity	1 T
13.0	OVERHEAD CLARIFIED WATER STORAGE TANK	
13.1	Capacity (Net)	To suit water requirement for chemical preparation for one day requirement+ flushing requirement of dosing lines +20 % margin.
13.2	Location	Top of Chemical House.
13.3	Nos.	One (1)
13.4	Material	RCC
13.5	Free board over the maximum water level	300 mm
13.7	Instruments	As per flow diagram.
19.1	POLYMER DOSING SYSTEM (@ 1 ppm)	
	a) Tank –	Number-Two (2) numbers. Capacity- 12 Hrs storage capacity (each) for minimum 0.5% (w/v) solution. Type – vertical. Material- RCC+FRP/PP lining.



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		Instrument- As per Flow Diagram. Motorized Stirrer (MOC-SS316)-One (1) number per tank vertical type. Dissolving Basket- 1 no per tank (MOC SS 316 L). Free board- 300 mm (min).			
	b) Pump -	Number-Two (2) numbers. Type – Plunger Type positive displacement pump. Capacity (each)- 1000 LPH (minimum). Material- SS-316 (all wetted parts). Instrument- As per Flow Diagram. Suction strainer (MOC:CPVC Sch 10) -2X100 %.			
19.2	FeCl₃ DOSING SYSTEM (@ 40 ppm)				
	a) Tank –	Number-Three (3) numbers Capacity- 12 Hrs storage capacity (each) for minimum 10% (w/v) solution. Type – vertical. Material- RCC+FRP/PP lining. Instrument- As per Flow Diagram. Motorized Stirrer (MOC-Duplex SS)- One (1) number per tank vertical type. Dissolving Basket- 1 no per tank (MOC Duplex SS). Free board- 300 mm (min).			
	b) Pump-	Number-Two (2) numbers (1W+1S) Type – Plunger Type positive displacement pump. Capacity (each)- 2000 LPH (minimum). Material- Duplex SS (all wetted parts). Instrument- As per Flow Diagram. Suction strainer (MOC:CPVC Sch 10) -2X100 %.			
19.3	LIME DOSING SYSTEM (@ 10 ppm)				
	a) Tank –	Number-Two (2) numbers Capacity- 12 Hrs storage capacity (each) for minimum 5% (w/v) solution. Type – vertical. Material- RCC+FRP/PP lining. Instrument- As per Flow Diagram. Motorized Stirrer (MOC-SS316)- One (1) number per tank Horizontal type. Dissolving Basket- 1 no per tank (MOC SS 316 L). Free board- 300 mm (min).			
	b) Pump-	Number-Two (2) numbers (1W+1S) Type – Screw Type positive displacement pump. Capacity (each)- 1000 LPH (minimum). Material- SS-316 (all wetted parts). Instrument- As per Flow Diagram. Suction strainer (MOC:CPVC Sch 10) -2X100 %.			
19.4	NaOCl DOSING SYSTEM FOR POTABLE WATER (@ 2 ppm)				
	a) Tank –	Number-One (1x100%). Capacity- 500 Ltrs (considering 7-10% commercial grade NaOCl). Type – vertical cylindrical. Material-FRP with 6mm thickness. Instrument- As per Flow Diagram. Free board- 300 mm (min).			
	b) Pump-	Number-Two (2) numbers (1W+1S) Type – diaphragm type positive displacement pump. Capacity (each)- 5 LPH (minimum). Material- PVDF and PTFE (all wetted parts). Instrument- As per Flow Diagram. Suction strainer (MOC:CPVC Sch 10) -2X100 %.			
20.0	MOC and type of the pumps shall be as per the following details.				
	Pump Description	Quantity	Pump Type	Capacity	Material of Construction
20.1	Sludge transfer pump	Three (3X100%)	Vertical, Non clot type. Impeller – semi open. Lubrication-Self lubricated.	500 CuM/Hr. (each).	Casing – Duplex SS 2205 UNS 31803. Impeller- Duplex SS 2205 UNS 31803. Shaft- Duplex SS 2205 UNS 31803. Shaft sleeves- Duplex SS 2205 UNS 31803. Packing-Braided Impregnated Teflon. Flexible coupling- Duplex SS 2205 UNS 31803. Nuts and Bolts-SS 316L.



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21	VALVES	Material of Construction
i.	Gate (All gate valves shall have flanged end connections, it shall be outside screw rising stem type with hand wheel)	Body/Bonnet – Super duplex stainless steel, ASTM A890-5A (CE3MN). Stem – stainless steel AISI 410/ 13% chrome steel. Disc/Gate – Super duplex stainless steel, ASTM A890-5A (CE3MN). Seat & seat rings – Duplex Stainless Steel. Hand wheel- Cast iron.
ii.	NRV (All NRV shall have flanged end connection. For bore greater than 50 mm valves shall be swing check type. For bore smaller than or equal to 50 mm it shall be piston type).	<u>Swing Check type</u> Body – Super duplex stainless steel, ASTM A890-5A (CE3MN). Disc/door – Super duplex stainless steel, ASTM A890-5A (CE3MN). Hinged pin – Duplex Stainless Steel. <u>Piston type</u> Body – Super duplex stainless steel, ASTM A890-5A (CE3MN). Hinge pin – SS316 Piston – Super duplex stainless steel, ASTM A890-5A (CE3MN).
iii	Ball valve	Type :Full bore Rating: PN 10 (min). Body: Super duplex stainless steel, ASTM A890-5A (CE3MN). Ball: Super duplex stainless steel, ASTM A182-F53 or ASTM A890-5A (CE3MN). Seat ring: PTFE Stem: Super duplex stainless steel, ASTM A890-5A (CE3MN) or Zeron 100 Seat: Nitrile rubber,PTFE
iv	Globe valve	Type: Double flanged. Rating: PN 10 (min). Body: Super duplex stainless steel, ASTM A890-5A (CE3MN). Plug: Super duplex stainless steel, ASTM A890-5A (CE3MN). Seat ring: Super duplex stainless steel, ASTM A890-5A (CE3MN).
v	Plug Valve	Type :Full bore Rating: PN 10 (min). Body: Super duplex stainless steel, ASTM A890-5A (CE3MN). Plug: Super duplex stainless steel, ASTM A890-5A (CE3MN). Sleeve: PTFE.
vi	Butterfly valve	Butterfly valves shall be of double flanged type of low leakage rate confirming to AWWA-C-504 class 150 (min.) or BS:5155 PN 10 (min.) Body: ASTM A995 Gr. 5A - CE3MN (Duplex Stainless Steel). Disc: ASTM A995 Gr. 5A - CE3MN (Duplex Stainless Steel). Shaft: ASTM A276 S31803 (Duplex Stainless Steel). Seat rings: Nitrilerubber, EPDM,Hypalon All the butterfly valves shall be provided with Hand wheel or lever as per the requirements. All the butterfly valves shall be provided with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 Cl.150 (min).
vii	Diaphragm valve	The Diaphragm shall conform to following requirement i) Design standard: BS:5156 or equivalent of required rating/class. (minimum rating of valves shall be PN 10). ii) Type: Flanged and lined body ends, sealed bonnet, weir pattern, tight shut off type iii) Material of Construction a. Body , Bonnet: Cast iron IS 210 Gr. FG 260 or equivalent or Cast steel ASTM A-216 Gr. WCB b. Body lining : Soft natural rubber, ebonite , Polypropelene c. Handwheel : Cast Iron d. Compressor : Duplex Stainless steel. e. Stem and Bush : Duplex Stainless steel.
21	PIPE	Refer P&I Diagram.
22	SAFETY EQIPMENTS	Four sets of safety equipment comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided. A personnel water drench shower and eye bath shall be provided.

Bidder to note that this is a sea water application plant. Bidder to select MOC to suit sea water application wherever required and not indicated in technical specification.



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SECTION – C2

(SPECIFIC TECHNICAL REQUIREMENTS FOR ELECTRICAL)



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ELECTRICAL EQUIPMENT SPECIFICATION



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**TECHNICAL SPECIFICATION
FOR
PRE-TREATMENT PALNT
(ELECTRICAL PORTION)**



TITLE :
**ELECTRICAL EQUIPMENT SPECIFICATION
FOR
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1.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:**

- a) Services and equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Electrical load requirement for Condensate Polishing Unit
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
- g) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
- h) Motor shall meet minimum requirement of motor specification.
- i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- j) Cable BOQ worked out based on routing of cable listing provided by the vendor for “ both end equipment in vendor’s scope”shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:**

Refer “Electrical Scope between BHEL and Vendor”.

3.0 **DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

3.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.

3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 **List of enclosures :**

- a) Electrical scope between BHEL & vendor.
- b) Technical specification for motors.
- c) Datasheets & quality plan for motors.
- d) Electrical Load data format.
- e) BHEL cable listing formt.



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ELECTRICAL LOAD FORMAT



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ELECTRICAL SCOPE FOR VENDOR AND BHEL

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGES: PRE-TREATMENT PLANT

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2X660 MW ENNORE SEZ COAL BASED STPP

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL BHEL BHEL	BHEL Vendor BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals by Vendor.
4	Junction box for control & instrumentation cable	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL Vendor	BHEL Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands ,lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL	BHEL	
10	Equipment grounding (including electronic earthing) & lightning protection	BHEL	BHEL	Refer note no. 4 for electronic earthing
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)**PACKAGES: PRE-TREATMENT PLANT****SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT****PROJECT: 2X660 MW ENNORE SEZ COAL BASED STPP**

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.




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SECTION – C3

(SPECIFIC TECHNICAL REQUIREMENTS FOR C&I)

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1.0 SCOPE OF SUPPLY

Instrumentation (Minimum) as shown in the flow diagram, however any additional instrumentation required to complete the system will be in bidder's scope. All required piping, tubing and wiring for instrumentation including fittings, support and other accessories.


- Instruments (Transmitter, Indicator, Gauges, Switches, Analysers, Actuators, etc) as indicted in enclosed P&ID **PE-V0-412-158-A001**.
- Any other instrument not listed but required to complete the system.

2.0 CONTROL PHILOSOPHY (PROCESS INSTRUMENTATION, CONTROL AND INTERLOCKS):


- i) The operation of the Pre-Treatment Plant shall be done from DDCMIS based. Two no. OWS, one no. Operating cum engineering station with one no. A3/A4 size colour LJP shall be provided provided by BHEL. In addition Backup control desk with coloured Mimic, H.W. Annunciator, P.B. Ammeters, parameters Indicators, recorders and indication Lamps, Ammeters shall also be provided by BHEL. Separate Local control panel is not envisaged.
- ii) A mimic with the status of drives including ON, OFF, TRIP indication of respective motors/pumps and control valve shall be provided on the OWS of DDCMIS.
- iii) All the dosing pumps shall be capable of being adjusted manually to any output with in the stated range.
- iv) All pumps shall trip at level low in respective tanks or Sumps.
- v) All remote indications from instruments as per P & ID such as raw water flow transmitter, opening / closing status and percentage positioning indicator for inlet motor operated flow control valve, level indicating controller for Clarified Water Tank etc. shall be available on the OWS.
- vi) Detailed control write-up of PT Plant shall be submitted after placement of order on PT plant vendor.
- vii) Alarm annunciations as per P & ID & as per system requirement and trip annunciation of all drives shall be displayed on OWS.
- viii) Local Start/Stop facility from individual pump shall be provided.
- ix) The dosing of chemical at various stages of process shall be controlled through Stroke controller in local through Stroke adjustment. The command for the same shall be issued from OWS of DDCMIS.
- x) The following pumps shall be started and stopped from DDCMIS.
 - xi) Alum dosing pumps.
 - xii) Lime dosing pumps
 - xiii) PE dosing pumps.
 - xiv) Naocl dosing pumps.
 - xv) Sludge transfer pump.
- xvi) Suitable arrangement by adjustable timers shall be provided for sludge blow down valve of Clarifier with the provision for manual intervention and adjustment independently.
- xvii) Provisions for data transfer with reference to important parameters related with Pre Treatment Plant from PT Plant DDCMIS to main plant DDCMIS shall be made through soft link through OPC on Fiber optic.
- xviii) All pumps and agitators shall trip at level low in respective tanks.
- xix) Alarms pertaining to Clarified water tank- Very High (VH), High (H), Low (L), Very Low (VL) shall be included in PT plant controls.
- xx) Torque trip for all the clarifier shall be provided.
- xxi) The dosing of chemical at various stages of process shall be controlled through Stroke controller in
- xxii) local through Stroke adjustment. The command for the same shall be issued from OWS of DDCMIS.
- xxiii) Number of signals / Annunciation shall be provided in DDCMIS and the same shall be decided During Detailed Engineering stage.

3.0 SPECIFIC TECHNICAL REQUIREMENTS (C&I)


- 1) The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire PTP. The requirements given are to be read in conjunction with detailed technical specification enclosed in the specification. Further in case of any discrepancy in the requirement noted by the bidder in the specification, the same will be brought to the notice of BHEL in the form of pre- bid clarification. In absence of any pre-bid clarification, the more stringent requirement as per BHEL's interpretation shall be complied by the bidder during contract stage without any commercial implication to BHEL.

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1. The instrumentation to be provided for PTP shall be as per the technical specification document / drawings wherever provided for the respective systems as a minimum requirement for bidding purpose. However for completeness of the system and its associated equipment, Bidder shall also provide all the necessary instruments to the process requirement even if it is not specifically indicated in the given technical Specification document / drawings. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any technical, commercial and delivery implication to BHEL.
2. The make/model of various instruments/items/systems shall be subject to approval of owner/purchaser during detailed engineering stage. No commercial implication in this regard shall be acceptable.
3. All the instruments/equipment/electrical items shall be provided & designed with maximum star rating as available in line with energy conservation policies notified by BEE, GOI at the time of supply.
4. Instruments shall be suitable for sea or saline water application. MOC of impulse tubing & impulse pipe shall be CPVC (3/8") Sch 80 or better, Industrial grade up to manifold. MOC of impulse tubing, fittings (from manifold to instrument) and manifold shall be super duplex SS in case of sea water applications.
5. The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifold and all the other accessories required for mounting/ erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg / Cm².
6. All the instruments/drives shall be terminated on JB's in field. JB's shall be in Bidder's scope. Bidder to consider minimum 5 nos. of JB's.
7. All local gauges, transmitters and switches shall be mounted on suitable enclosures, racks subject to owner's approval. The same shall be in Bidder's scope. All transmitters shall be HART compatible.
8. All the instruments indicated in PID are minimum requirement and it is mandatory to use sensors/signals/measurements with 1 out of 2 logics for all control & interlock (Analog & Binary) application/service as explained below: Dual sensors shall be provided for instruments required for auto starting of LT driven pumps or LT driven pump tripping due to very low level of water/ discharge pressure very low. Dual measurement shall be employed for the measurements used for analog control functions.
9. All the instruments/ sensors/transmitters/switches meant for redundant applications shall have completely separate and independent impulse pipes/ root valves etc. No redundant instrument shall share a single process tapping. There will be separate and independent tapping for every individual instrument.
10. Doppler effect type flow meters shall be used for sludge applications.
11. DP instruments with min. Capillary length of 15m to be supplied in case of Installation in pit.
12. Instrument installation shall be as per the attached "Standard Hook-up diagram of instrument."
13. All motorised valves of 200NB or more than 200NB size shall be provided with integral motorized bypass valves on all process lines.

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14. All motorised actuator shall be provided with conventional actuators with integral starter for ON/OFF valves. Non-contact type electronic 2- wire position transmitters shall be provided for all inching type motorised valves. The detailed specification is attached elsewhere in the specification.
15. Valve end position (Open & Close) shall be monitored for the manual critical valves, wherever provided.
16. Bidder to comply with codes and standards as mentioned in the specification.
17. Bidder must offer general tools and tackles and special calibration instruments required during start-up, trial run, operation and maintenance of the system.
18. All approval/Inspection are to be carried out by Owner or owner appointed agency only.
19. Bidder shall provide erection hardware as per installation drawings.
20. Bidder to provide mandatory spares as per mandatory spares list attached elsewhere in the specification.
21. Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification.
22. Power Supply Requirement: Power supply for instruments, analysers etc. shall be provided at a single point which shall be decided during detail engineering. Further any electrical distribution shall be in bidder's scope. Any other voltage requirement for instruments, analysers etc. to be arranged/derived by bidder by providing suitable control transformer.
23. All cables terminated in the terminal block, power distribution scheme instruments shall be ferruled. Ferruling shall be double cross ferruling (i.e.) source and destination addresses shall be marked on both sides of the tube ferruling.
24. Scope of Instrumentation cables (Screened Control Cables), Fibre Optic cable & Control cables shall be as per Electrical Cable scope matrix in Electrical portion of specification.
25. Number of pairs to be selected for Instrumentation cable (Size: 0.5 mm2):
 - a) F-Type: 2P/4P/8P/12P/24P
 - b) G-Type: 4P/8P/12P
26. Number of cores to be selected for Control cable (Size: 2.5 mm2):
 - a) 3 Core
 - b) 5 Core
 - c) 12 Core
27. Each pneumatic device requiring air supply and intended for field mounting shall include a filter regulator air set with gauge, to owner's approval.
28. Bidder's presence is required for 3 Man days (Excluding travel time) at EDN Bangalore during FAT of DDCMIS for certifying correctness & completeness of implementation of Control logic. Intimation to attained FAT shall be informed in 2 days advance. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.

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29. Contractor's C&I representative shall be present at BHEL-PEM for 3 man days, for preparation of Control scheme of PTP. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.

30. Bidder's presence is required for 15 Man days (in three visit) at site during commissioning of DDCMIS for assistance related to process correctness. Three visit with total 15 Man days (Excluding travel time) in which one visit shall be of 5 Man days each. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.

31. Bidder to ensure participation of their senior personnel and experts in discussions with Owners and other equipment bidders during various stages of contract implementation as required by the Owner.

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SECTION-D
(GENERAL TECHNICAL REQUIREMENT)



TITLE:

**TECHNICAL SPECIFICATION FOR
PRE-TREATMENT PLANT.**

2X660 MW ENNORE SEZ COAL BASED
STPP AT ASH DYKE OF NCTPS, CHENNAI

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SECTION-D1

(GENERAL TECHNICAL REQUIREMENT FOR MECHANICAL)

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1.0 SYSTEM DESCRIPTION PRE-TREATMENT PLANT (Ref. Drg. no. PE-V0-412-158- A001):

Pre-Treatment Plant (PTP) shall receive Raw Water (Sea Water Analysis) as per the analysis given in **TABLE – A**. PTP shall mainly consist of equipment such as inlet flow control station, cascade aerator, stilling chamber, parshall flume, clarifloculators, alum dosing system, Lime Dosing System, polyelectrolyte dosing system, Chlorine (NaOCl) Dosing system, sludge sumps and pumps, sludge transfer system to Guard Pond (at ETP).


The major technical parameters of this equipment are listed in Data Sheet-A.

The stream has one number inlet (regulating) valve to regulate inlet flow entering the cascade aerator to stilling chamber. Water from the stilling chamber where Sodium Hypochlorite (Chlorine) @ 5 ppm is dosed is passed through parshall flume. The flow after parshall flume goes to a distribution chamber to clarifloculators where FeCl₃ @ 40 ppm**, Lime @10 ppm** and Coagulant aid (Polyelectrolyte) @1 ppm** may also be dosed if necessary. The sludge from the clarifiers collected by gravity into a sludge sump. From the sludge sump the sludge is pumped to Guard pond (located at ETP). One number telescopic type continuous bleed and intermittent bleed through valve per clarifloculator on sludge line from clarifier to sludge sump shall be provided.

A chemical house is located near the clarifiers with FeCl₃, Lime, polyelectrolyte dosing systems and Potable water Hypo chlorite Dosing system (commercial grade) and MCC room. The solution preparation tanks are on the first floor and space for storage of chemicals and MCC room are on the ground floor.

The clarified water shall be stored in the clarified water storage tank for various uses in the power plant.

**** NOTE: FINAL DOSING RATE SHALL BE DECIDED AT SITE BY JAR TEST METHOD.**

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SECTION-D2

(GENERAL TECHNICAL REQUIREMENT FOR ELECTRICAL)



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STANDARD SPECIFICATION FOR LV MOTORS

TITLE :
GENERAL TECHNICAL REQUIREMENTS
FOR
LV MOTORS

SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : II-B
REV NO. : 00 DATE : 29/08/2005
SHEET : 1 OF 1

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : **II-B**
SECTION : **D**
REV NO. : **00** DATE : 29/08/2005
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1.0 INTENT OF SPECIFICATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer's work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0 CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0 DESIGN REQUIREMENTS

3.1 Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2 Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3 Starting Requirements

3.3.1 Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.



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The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

- i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.
- ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)
- iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor

3.4 **Running Requirements**

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

3.5 **Stress During bus Transfer**

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.

4.0 **CONSTRUCTIONAL FEATURES**

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy

4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.

Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled

4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.



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- 4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.
- 4.5 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.
- 4.6 In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.
- 4.7 **Terminals and Terminal Boxes**
- 4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.

Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".
- 4.7.2 unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.
- 4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.
- 4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.
- 4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.
- 4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.
- 4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.
- 4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.
- 4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.
- 4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

4.9 **General**



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- 4.9.1 Motors provided for similar drives shall be interchangeable.
- 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.
- 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.
- 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.
- 4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.
- 4.9.6 Name plate with all particulars as per IS: 325 shall be provided
- 4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0 INSPECTION AND TESTING

- 5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.
- 5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.
- 5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.
- 5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT

- a) OGA drawing showing the position of terminal boxes, earthing connections etc.
- b) Arrangement drawing of terminal boxes.
- c) Characteristic curves:
(To be given for motor above 55 kW unless otherwise specified in Data Sheet).
 - i) Current vs. time at rated voltage and minimum starting voltage.
 - ii) Speed vs. time at rated voltage and minimum starting voltage.
 - iii) Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.
 - iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.





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BASIC TECHNICAL FEATURES OF LT AND HT MOTORS

BASIC TECHNICAL FEATURES

FOR HT/LT MOTORS

(FOR BHEL-PEM SCOPE PACKAGES)

					PROJECT	2X660MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT AT ASH DYKE OF NCTPS,CHENNAI					
REV	DATE	ALTD	CHD	APPD		OWNER	TAMIL NADU GENERATION & DISTRIBUTION CORPORATION LIMITED				
02	13.05.15	RKG/AB	SL	RG				OWNER'S CONSULTANT	DESEIN PRIVATE LIMITED, DESEIN HOUSE,NEW DELHI		
REVISED AS PER TANGEDCO COMMENTS DATED 10.04.2015						EPC CONTRACTOR			BHARAT HEAVY ELECTRICALS LIMITED POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA(U.P) INDIA		
REV	DATE	ALTD	CHD	APPD			01	13.03.15	BKR-SD-	SL-SD-	RG-SD-
REVISED AS PER TANGEDCO COMMENTS DATED 13.02.2015											
						BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA					
						TITLE	BASIC TECHNICAL FEATURES FOR HT/LT MOTORS				
					DEPT CODE	DRN	NAME BKR	SIGN	DATE		
					E	DSGN	BKR	-SD-	13.01.15		
						CHD	SL	-SD-	13.01.15		
						APPD	RG	-SD-	13.01.15		
					DRAWING NO. PE-DC-412-565-E003						
					SHEET	1	OF	7	REV. 02		



2 x 660 MW ENNORE SEZ STPP
BASIC TECHNICAL FEATURES
FOR HT / LT MOTORS
(FOR BHEL-PEM SCOPE PACKAGES)

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1.0 This document covers the basic technical features of high tension (HT) and low tension (LT) squirrel cage induction AC motors employed for driving auxiliaries of BHEL-PEM scope packages in **2 x 660 MW ENNORE SEZ STPP**.

2.0 CODES AND STANDARDS

The motors shall generally conform to IS 325/IEC-60034. LT motors above 10 kW with continuous duty (S1) shall be energy efficient ~~IE2~~^{IE3} conforming to IS-12615: 2011.

3.0 DESIGN REQUIREMENTS

3.1 General Requirements

The design ambient temperature shall be 50 deg C.

3.2 Supply system and rated voltage of motors

KW rating	Supply system	Rated voltage of motor
Above 1500 kW	11 KV	11 KV
Above 160 kW up to & including 1500 kW	3.3 KV	3.3 KV
From 200W up to & including 160 kW	415 V	415 V
Below 200W	240V	240V

3.2.1 Supply voltage & variations shall be as follows:-

Voltage variation (AC Supply) (+/-) 10%
Frequency variation (+) 3% to (-) 5%
Combined V & F variation 10% (sum of absolute values)

3.2.2 Motors shall be capable of running continuously at rated output for each of the conditions specified.

3.3 Motor Rating

Motor ratings shall be adequate to meet the requirements of the drive equipment. Motors shall be continuously rated at the design ambient temperature of 50 degree C and relative humidity of 85%. Maximum continuous motor ratings shall have at least a 10% margin above the maximum load demand of the driven equipment under entire operating range including voltage & frequency variation.

3.4 Starting Requirements

3.4.1 Motor shall start smoothly and rapidly. Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% of the motor's full load torque.



2 x 660 MW ENNORE SEZ STPP
BASIC TECHNICAL FEATURES
FOR HT / LT MOTORS
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3.4.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

Minimum Starting Voltage requirement for all motors (except mill motors):

1. 85 % of rated voltage for motors up to 1000 kW
2. 80 % of rated voltage for above 1000 kW and up to 4000 kW
3. 75 % of rated voltage for above 4000 kW

3.4.3 The locked rotor current of the HV (11 kV) motors (except MDBFP motors) shall not exceed 650% of full load current inclusive of tolerance as per IS: 325 and for MV (3.3 kV) motors locked rotor current shall not exceed 700% of full load current inclusive of tolerance as per IS: 325. For LT motors (except energy efficient motors) locked rotor current shall not exceed 700% of full load current inclusive of tolerance as per IS: 325. For LT energy efficient motors above 10kW with S1 duty, locked rotor current shall be as per IS: 12615-2011.

3.4.4 The following frequency of starts shall apply to HV (11 kV), MV (3.3 kV) & LT motors

- i) Two nos. consecutive cold starts in quick succession with third start after 5 minutes in cold condition.
- ii) Two nos. consecutive hot starts in the interval of 15 minutes in hot condition.

3.4.5 Locked motor withstand time of motors under hot condition at highest voltage limit shall be as follows:

- a) For motors with starting time up to 20 sec.
 - at least 2.5 sec. more than starting time.
- b) For motor with starting time above 20 secs but not exceeding 45 secs.
 - at least 5.0 sec. more than starting time.
- c) For motors with starting time above 45 secs.
 - at least 10% more than starting time.

The starting time of the motor referred above is at minimum permissible voltage. For motors and in cases where the above requirements are not complied with, speed switches of approved make & type shall be provided to bypass the locked rotor protection for a pre-selected time during starting of motors. The speed switches shall have one NO & one NC contacts having maximum interrupting capacity of 5 Amps at 240V AC and 0.25 amps at 220 V DC.

3.5 Running Requirements

3.5.1 Motors shall run satisfactorily at a supply voltage of 80% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.5.2 Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.

3.6 Stress during bus Transfer:



2 x 660 MW ENNORE SEZ STPP
BASIC TECHNICAL FEATURES
FOR HT / LT MOTORS
(FOR BHEL-PEM SCOPE PACKAGES)

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- 3.6.1 Motors shall withstand the voltage and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.
- 3.6.2 Motor windings shall be adequately braced to satisfactorily withstand the mech. Stresses during above condition.
- 3.6.3 Motors shall be capable of withstanding heavy in-rush transient current caused by bus transfer without damage.
- 3.6.4 Motor and driven eqpt. Shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.7 Noise level

The maximum noise level for motors shall be in line with IS 12065.

3.8 Vibration

The maximum vibration for motors shall be in line with IS: 12075.

3.9 Crane duty motors will be of squirrel cage induction motor and shall suit the duty class S4, cyclic duration factor 40% and 300 starts. Crane duty motors shall be provided with VVFD for speed control.

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4.0 CONSTRUCTIONAL FEATURES

4.1 Degree of Protection

4.1.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Canopy shall be provided for outdoor motors. CW motors (in case of screen prot. Drip proof) shall conform to degree of protection IP: 23 as per IS: 4691. The degree of protection for terminal boxes shall be IP 55 for outdoor area & IP 54 for indoor area as per IS 4691.

4.1.2 The stator laminations shall made from suitable silicon steel/magnetic steel sheet varnished on both sides and pressed to form a rigid core.

4.1.3 The rotor shall be of rigid cage construction with die cast aluminium / copper alloy / copper bars firmly wedged in bar slots and brazed to the end rings. The rotor cage shall be designed to operate satisfactorily under respective starting and load duty cycle.

4.2 Enclosure and Cooling

4.2.1 Motors shall generally have totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) enclosures or Closed Air circuit Air (CACA), the method of cooling conforming to IC-0141 or IC-0151 or IC-0161 of IS: 6362 up to 3000 kW motor. CW Motors may be screen protected drip proof (SPDP).

4.2.2 Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.



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4.2.3 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.

4.3 Class of Insulation

HV/MV/LT motors shall have class F insulation. The temperature rise of all motors shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits, 10deg C rise above the temperature limits specified in IS: 325 shall be permissible.

4.4 Bearings

4.4.1 Horizontally mounted motors shall have grease lubricated ball/roller or sleeve bearings. For HV/MV motors, the bearings shall be regreasable type and for LV motors, these bearings can be either sealed life lubricated type or regreasable type as per manufacturer's standard.

4.4.2 The vertical motors shall have a combined thrust and guide bearing on top and guide bearing at bottom. If the ball or roller bearings can take vertical thrust, thrust and guide bearing need not be provided.

4.4.3 After taking all motor driven equipment loads and thrust (if any) into account, the bearings shall be suitable for min. 20,000 working hours. Re-greasable bearings shall be provided with grease nipples and relief holes for on-line re-greasing and shall be suitable for 8000 working hours without changing of the grease.

4.4.4 The bearings of solidly coupled motors shall be of the same type as those of the driven equipment.

4.4.5 For motors below 15 kW shall be provided with sealed ZZ bearing.

4.4.6 Motors rated above 1000kW shall be provided with insulated end shield on non-driving end to prevent flow of shaft current.

4.5 Terminals and Terminal Boxes

4.5.1 Motors of rating 90 kW and up to 160kW will be controlled by air circuit breaker with numerical protection. For all motors of rating up to 90kW shall be provided with MCCBs. The terminal box of motors for HV (11 kV), MV (3.3 kV) & LT motors shall be designed for the maximum fault current for a duration of at least 0.25 secs. **11kV & 3.3kV motors terminals shall be able to withstand 44kA for 0.25 seconds.**

1

4.5.2 Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.

4.5.3 For HV/MV motors, the main terminal box shall be of phase-segregated type with clamping arrangement for the terminals.

4.5.4 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A,C,B or V, W & U respectively.

4.5.5 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.



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- 4.5.6 Motor terminals and terminal leads shall be fully insulated with no bar live parts.
- 4.5.7 Separate terminal boxes shall be provided for space heaters and temp. Indicators. If this is not possible in case of LT motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material for single core cables) with double compression tinned brass glands shall be provided in terminal boxes.
- 4.5.8 Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 180 and 90 degree for HT and LT motors respectively.
- 4.5.9 Cable glands and cable lugs as per selected cable sizes shall be provided in line with cable erection philosophy. For single core cable termination, gland plates shall be of non-magnetic material.
- 4.6 Grounding

Two separate earthing terminals suitable for connecting G.I. strip grounding conductor shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

4.7 General

- 4.7.1 Motors provided for similar drives shall be interchangeable.
- 4.7.2 An arrow block shall be screwed on the body of the motors on the non-driving end to indicate the direction of rotation of the motors.
- 4.7.3 Motors for Fuel oil unloading and drain oil pumps located in hazardous areas shall be with flame-proof enclosures in accordance with IS 2148 / IEC 60079.
- a) Fuel oil area: Group - IIB.
- b) Hydrogen generation plant area: Group - IIC

- 4.8 Neutral terminal box of motors rated 1000kW and above shall provision of mounting Neutral CTs of PS class identical to the CTs to be provided at switchgear end. Further the neutral terminals of HV motors rated below 1000kW shall be accessible.

1

5.0 ACCESSORIES

5.1 SPACE HEATERS

All motors rated 30KW and above shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

The leads from space heaters of each motor shall be brought out to a separate terminal Box. Space heaters shall be mounted inside the motor in accessible places so that their removal and replacement is simple.

5.2 RESISTANCE TEMPERATURE DETECTORS (RTDs)

- 5.2.1 HV/MV motors stator windings shall be provided with 12 nos. Simplex 3 wire Platinum RTDs with 100 ohms resistance at 0 deg C for remote monitoring of winding temperature. The leads from RTDs of each motor shall be brought out to a separate terminal Box.



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5.2.2 For HV/MV motors, each bearing shall be provided with 1 no. Duplex 3 wire Platinum RTDs with 100 ohms resistance at 0 deg C for remote monitoring of bearing temperature. The leads from these RTDs shall be brought out to a separate terminal Box or the terminal box same as for winding RTDs.

5.3 DIAL TYPE TEMP. INDICATORS

5.3.1 For HV/MV motors, each bearing shall be provided with dial type thermometer with adjustable alarm contact and resistance type temperature detector. The indicators shall have 2 nos. NO contacts rated for 5A, 240 V AC and 0.5 A, 220 V DC for alarm/trip purpose.

5.4 Vibration monitoring pads

5.4.1 Provision shall be made in all HV/MV motors for mounting vibration detectors.

6.0 NAME PLATE

Motors shall have stainless steel name plate with all particulars as per IS: 325. In addition bearing identification number and type of lubricant is to be indicated.

7.0 PAINTING

Motor including fan shall be painted with corrosion proof paints of colour shade Siemens grey (RAL 7032).

8.0 TESTING

8.1 Type Tests

For HT & LT Motors, type test reports for type tests as per IS: 325/ IS: 12615 conducted on equipment similar to those proposed to be supplied and carried out within last five years shall be submitted. However, if such reports are not available, one motor of each type shall be subjected to type tests for free of cost.

8.2 Routine Tests

All motors shall be subjected to routine tests as per IS: 325/ IS: 12615 in the presence of customer or customer representative.



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MOTOR DATA SHEET-A

SPECIFIC ELECTRICAL REQUIREMENT

SL.NO.	PARAMETERS	UNIT	ENNORE
	MOTOR		
1	DESIGN AMBIENT TEMP	DEG. C	50
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, \pm 10%
3	FREQUENCY WITH VARIATION	Hz	50 (+) 3% to (-) 5%
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10%
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	160 kW
6	SYSTEM FAULT LEVEL AND ITS DUARTION	KA	50 KA, 1 Sec
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.25 sec
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F and temp rise limited to Class-B
9	MIN. STARTING VOLTAGE		85%
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		Upto 200W
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	For LT motors (except energy efficient motors) locked rotor current shall not exceed 700% of full load current inclusive of tolerance as per IS: 325. For LT energy efficient motors above 10kW with S1 duty, locked rotor current shall be as per IS: 12615-2011.
12	ACCEPTABLE NOISE LEVEL	DB	85dB at 1.0m in line with IS 12065
13	TYPE OF STARTER PROVIDED IN MCC		DOL
14	DOP OF ENCLOSURE		Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. The degree of protection for terminal boxes shall be IP 55 for outdoor area & IP 54 for indoor area as per IS 4691.
15	SPACE HEATER REQUIREMENT		30KW & ABOVE
16	PAINT SHADE		Shall be confirmed during detailed engineering.
17	SPECIAL REQUIREMENT		For HT & LT Motors, type test reports for type tests as per IS: 325/ IS: 12615 conducted on equipment similar to those proposed to be supplied and carried out within last five years shall be submitted. However, if such reports are not available, one motor of each type shall be subjected to type tests for free of cost. All motors shall be subjected to routine tests as per IS: 325 / IS: 12615. The motors shall generally conform to IS: 325 / IEC-60034.




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MOTOR DATA SHEET-C

	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
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S. No.	Description	Data to be filled by successful bidder
A.	General	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	Design and Performance Data	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a) Voltage	
6	b) Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB)	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			


	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
		SECTION D
		REV NO. 00 DATE
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S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	Constructional Features	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	Characteristic curves/ drawings (To be enclosed for motors of rating $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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QUALITY PLAN FOR AC MOTORS BELOW 55 KW (LV MOTORS)

		QUALITY PLAN	CUSTOMER :			PROJECT			SPECIFICATION :			
			BIDDER/ VENDOR :			TITLE			NUMBER :			
SHEET 1 OF 2		SYSTEM			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION TITLE				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION VOLUME III			
1	2	3	4	5	6	7	8	9	P	W	V	REMARKS
1.0	ASSEMBLY	1.WORKMANSHIP 2.DIMENSIONS 3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA MA MA	VISUAL -DO- VISUAL	100% -DO- 100%	MANUF'S SPEC MFG. DRG./ MFG. SPEC. MFG.SPEC./ RELEVANT IS	MANUF'S SPEC MFG. DRG./ MFG. SPEC. MFG.SPEC. RELEVANT IS	-DO- -DO- -DO-	2 2 2	- - -	- - -	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC. 2.OVERALL DIMENSIONS & ORIENTATION	MA MA	-DO- MEASUREMENT & VISUAL	100% 100%	IS-325/ BHEL SPEC./ DATA SHEET APPROVED DRG/DATA SHEET	SAME AS COL.7 APPROVED DRG/DATA SHEET & RELEVANT IS	TEST REPORT INSPN. REPORT	2 2	1 1	- -	NOTE -1 & NOTE-3 NOTE -1 & NOTE-3
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									



QUALITY PLAN

CUSTOMER :

PROJECT

SPECIFICATION :

BIDDER/ :

TITLE

NUMBER :

VENDOR

QUALITY PLAN

SPECIFICATION :

SYSTEM

NUMBER PED-506-00-Q-006, REV-01

TITLE :

SHEET 2 OF 2

ITEM AC ELECT. MOTORS BELOW 55KW (LV)

SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
<p>NOTES:</p> <p>1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON</p> <p>2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p>3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p> <p><u>Legends for Inspection agency</u></p> <p>1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)</p> <p>P. PERFORM W. WITNESS V. VERIFY</p>												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			



TITLE:
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CABLE SCHEDULE FORMAT

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

1. For the purpose of clarity, it may please be noted that the information given in regard to the cables to be routed through WinPath as per the system elaborated below is called "Cable List", while the term "Cable Schedule" applies to the cable list with routing information added after routing has been carried out.
2. The cable list shall be entered as an MS Excel file in the format as per enclosed template EXT_CAB_SCH_FORMAT.XLS. No blank lines, special characters, header, footer, lines, etc. shall be introduced in the file. No changes shall be made in the title line (first line) of the template.
3. The field properties shall be as under:
 - a. UNITCABLENO: A/N, up to sixteen (16) characters; each cable shall have its own unique, unduplicated cable number. In case this rule is violated, the cable cannot be taken up for routing.
 - b. FROM: A/N, up to sixty (60) characters; the "From" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - c. TO: A/N, up to sixty (60) characters; the "To" end equipment/ device description and location to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - d. PURPOSE: A/N, up to sixty (60) characters; the purpose (i.e. power cable/ indication/ measurement, etc.) to be specified here. Information in excess of 60 characters will be truncated after 60 characters.
 - e. REMARKS: A/N, up to forty (40) characters; Any information pertinent to routing to be specified here (e.g., cable number of the cable redundant to the cable number being entered). Information in excess of 40 characters will be truncated after 40 characters.
 - f. CABLESIZE: A/N, 7 characters exactly as per the codes indicated below shall be specified here. The program cannot route cables described in any other way/ format.
 - g. PATHCABLENO: Field reserved for utilization by the program. User shall not enter any information here.
4. One list shall be prepared for each system/ equipment (i.e., separate and unique cable lists shall be prepared for each system).
5. The cables shall be described as per the scheme listed below:

A	NN	A	NNN
Cable	No. of cores	Cable code	Cable size
Voltage	(e.g. 01,03,3H, 07)	(See C below)	(e.g. 035,185,2.5, 0.5)
Code (see B below)			

- (A) SYSTEM VOLTAGE CODES:
 (ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V
 (dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V

- (B) CABLE VOLTAGE CODES:
 A = 11KV (Power cables)

Explanatory notes for filling up cable list for routing through WinPath, the cable routing program (developed by Corporate R&D) being used in PEM.

- B = 6.6KV (Power cables)
- C = 3.3KV (Power cables)
- D = 1.1KV (LV & DC system power & control cables)
- E = 0.6KV (0.5 sq. mm. Control cables)

(C) CABLE CODES

PVC Copper

- A = Armoured FRLS
- B = Armoured Non-FRLS
- C = unarmoured FRLS
- D = Unarmoured Non-FRLS

PVC Aluminium

- E = Armoured FRLS
- F = Armoured Non-FRLS
- G = unarmoured FRLS
- H = Unarmoured Non-FRLS

XLPE Copper

- J = Armoured FRLS
- K = Armoured Non-FRLS
- L = unarmoured FRLS
- M = Unarmoured Non-FRLS

XLPE Aluminium

- N = Armoured FRLS
- P = Armoured Non-FRLS
- Q = unarmoured FRLS
- R = Unarmoured Non-FRLS

- S = FIRE SURVIVAL CABLES
- T = TOUGH RUBBER SHEATH
- U = OVERALL SCREENED
- V = PAIRED OVERALL SCREENED
- W = PAIRED INDIVIDUAL SCREENED
- Y = COMPENSATING CABLES
- I = PRE-FABRICATED CABLES
- Z = JELLY FILLED CABLES



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SECTION-D3

(GENERAL TECHNICAL REQUIREMENT FOR C&I)



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GENERAL TECHNICAL REQUIREMENT



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DATA SHEET FOR MOTORIZED VALVE

~~C.~~SPECIFICATION
FOR
MOTORISED
VALVE ACTUATOR

	Data Sheet FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-ID-412-145-I902	
			VOLUME II B	
			SECTION D	
			REV. NO. 01	DATE: 04.07.15
			SHEET 1 OF	3
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL *	* PROJECT	2x 660 MW ENNORE STP		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	<input type="checkbox"/> ON / OFF	<input type="checkbox"/> INCHING	
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY		
	* OPENING / CLOSING TIME			
	* WORKING PRESSURE			
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
ACTUATOR RATED TORQUE	BIDDER TO SPECIFY			
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:68		
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL		
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM.		
HANDWHEEL	* REQUIRED	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED	<input type="checkbox"/> SIDE MOUNTED	
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT- INCLUSIVE OF I.S. TOLERANCE		
	ACTUATOR APPLICABLE WIRING DIAGRAM	<input type="checkbox"/> ENCLOSED (BIDDER TO CONFIRM) A: <input type="checkbox"/> DRG. NO. 3-V-MISC-24227 R00 B: <input type="checkbox"/> DRG. NO. 3-V-MISC-24550 R00 C: <input type="checkbox"/> DRG. NO. 3-V-MISC-24283 R00 D: <input type="checkbox"/> DRG. NO. 4-V-MISC-90271 R11 E: <input type="checkbox"/> For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram		
	COLOUR SHADE	<input type="checkbox"/> BLUE (RAL 5012) <input type="checkbox"/> DURING DETAIL ENGG.		
	PAINT TYPE (## Refer Notes)	<input type="checkbox"/> ENAMEL <input checked="" type="checkbox"/> EPOXY <input type="checkbox"/>		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		
	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC		
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER <input type="checkbox"/> 230 V <input type="checkbox"/> 110 V		

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-ID-412-145-I902				
			VOLUME II B				
			SECTION D				
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			SHEET	2 OF		3	
Data Sheet A & B							
DATA SHEET-A (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)			
	@ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 67 <input type="checkbox"/> FLAME PROOF					
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B					
	@ WINDING TEMP PROTECTION	<input checked="" type="checkbox"/> THERMOSTAT (3 Nos.,1 IN EACH PHASE) <input type="checkbox"/> -----					
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED					
INTEGRAL STARTER	INTEGRAL STARTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED					
	TYPE OF SWITCHING DEVICE	<input checked="" type="checkbox"/> CONTACTORS <input type="checkbox"/> THYRISTORS					
	TYPE	<input checked="" type="checkbox"/> CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)					
	STEP DOWN CONT. TRANSFORMER	<input checked="" type="checkbox"/> REQUIRED					
	OPEN / CLOSE PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED					
	STOP PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED					
	INDICATING LAMPS	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED					
	LOCAL REMOTE S/S	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED					
	STATUS CONTACTS FOR MONITORING	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED					
INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (MOTOR THERMOSTAT TRIP, O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, PHASE LOSS, S/S IN LOCAL/OFF MODE, STOP PB OPTD, TORQUE OPEN/CLOSE CUTOFF)		1				
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	<input type="checkbox"/> INTERPOSING RELAY <input type="checkbox"/> OPTO COUPLER <input type="checkbox"/> EITHER					
	QUANTITY	<input checked="" type="checkbox"/> 2 NOs. <input type="checkbox"/> 3 NOs.					
	DRIVING VOLTAGE	<input checked="" type="checkbox"/> 20.5 – 24V DC <input type="checkbox"/> _____ V DC					
	DRIVING CURRENT	<input checked="" type="checkbox"/> 125mA MAX <input type="checkbox"/> _____ mA MAX					
	LOAD RESISTANCE	<input checked="" type="checkbox"/> > 192 ohms - <25 k ohms <input type="checkbox"/> > _____ ohms - < _____ ohms					
TORQUE SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY					
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos					
	CONTACT TYPE	2 NO + 2 NC					
	RATING	5A 240V AC AND 0.5A 220V DC					
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE					
	ACCURACY	+3% OF SET VALUE					
LIMIT SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY					
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No	2 Nos. (ADJ.)	<input type="checkbox"/> 1 No.	<input checked="" type="checkbox"/> 2Nos.		
	CONTACT TYPE	2 NO + 2 NC					
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC					



**Data Sheet
FOR
MOTORISED VALVE ACTUATOR**

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SHEET 3 OF

3


Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty & other specific applications)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	<input type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER <input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) CONTACTLESS	
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/>	
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA	
	ACCURACY	± 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	230V AC, 1 PH., 50 Hz	
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	@ <input checked="" type="checkbox"/> IP 68 @ <input type="checkbox"/>	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET (9 PIN) (FOR COMMD, LS/TS FEED BACK, PoT)	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED <input type="checkbox"/> 2 NOS. <input type="checkbox"/>	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:-----	
	@ SPACE HEATER CABLE GLAND	SIZE:-----	
	OTHER CONTROL CABLE GLANDS	QUANTITY & SIZE :Cable gland suitable for 8Px0.5 sq mm & 2P x 0.5 sq mm Cable.	
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.

NOTES:

- SCOPE:** DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
 - CODES & STANDARDS:** DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATION STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH:
IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722
 - ACTUATOR SHALL HAVE HARDWIRED CONTACTS FOR FOLLOWING SIGNALS (a) ACTUATOR IN LOCAL MODE (b) ACTUATOR IN REMOTE MODE.
 - BIDDER TO ENSURE AVAILABILITY OF SPARE 1NO + 1NC LIMIT SWITCH & TORQUE SWITCH. 
 - SS TAG NAME PLATE SHALL BE PROVIDED.
 - TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
 - CABLE GLANDS OF DOUBLE COMPRESSION TYPE, Ni PLATED BRASS MATERIAL SHALL BE PROVIDED.
 - THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION.THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
 - THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
 - THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.
- \$\$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.**
- ## EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.**

NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @= TO BE FILLED BY ES



TITLE:
**TECHNICAL SPECIFICATION FOR
PRE-TREATMENT PLANT.**

2X660 MW ENNORE SEZ COAL BASED
STPP AT ASH DYKE OF NCTPS, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-158-A002	
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DATA SHEET FOR MEASURING INSTRUMENT

~~D.~~SPECIFICATION

FOR

MEASURING INSTRUMENTS

CHAPTER-3**FIELD AND MEASURING INSTRUMENTS****3.00.00 FIELD & MEASURING INSTRUMENTS (PRIMARY & SECONDARY INSTRUMENTS)****3.01.00 GENERAL REQUIREMENTS**

3.01.01 Instruments, control devices and other equipment accessories covered under this specification shall be furnished in accordance with I&C specification sheets and drawings enclosed herewith and the requirements of all applicable clauses of this specification.

3.01.02 The instrumentation and control equipment shall conform to all applicable codes and standards including those referred in Cl. no. 1.08.00 in this Volume. All equipment and systems shall also fully comply with the design criteria stated in chapter-2 of this part.

3.01.03 The instrumentation/control equipment and accessories shall be from the latest proven design for which the performance and high availability have been demonstrated by a considerable record of successful operation in power station service for similar applications. The bidder shall furnish sufficient evidence to fully satisfy the Owner in this regard.

3.01.04 For plug in type instruments, The plug & sockets shall be polarized to prevent wrong connections and have facility for secure coupling in plug-in position to prevent loose connections. Signal/Electrical connection shall be screwed connection with double compression type Nickel-plated brass cable glands for Explosion proof area, Flame proof area and high vibration prone area.

3.01.05 Every instrument requiring power supply shall be provided with a pair of easily replaceable glass cartridge fuse of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.

3.01.06 All field instruments shall be weatherproof, drip tight, dust tight and splash proof suitable for use under outdoor ambient conditions prevalent in the subject plant. All field-mounted instruments shall be mounted in suitable locations where maximum accessibility for maintenance is achieved. The enclosures of all electronic instruments shall conform to IP-65 unless otherwise specified (Explosion proof for NEC article 500, class 1, Division 1 area & flame proof) and an anti corrosive paint shall be applied to the field mounted enclosures / instruments. All the field instruments shall also be provided with SS tag nameplate and double compression type Nickel-plated brass cable gland. Gaskets, Fasteners, Counter and mating flange shall also be included wherever required with the field instruments.

3.02.00 Following minimum requirement of field instruments shall be fulfilled by Bidder (In addition, Redundancy criteria for field instruments shall be as specified elsewhere in specification): -

- i. Level switches / pressure switches / flow switches/any other process switches etc. for OLCS / Alarms / Interlocks / Protection. Pressure switches at inlet, outlet



- of individual pumps and discharge header of pumps for protection and auto start / stop & alarms.
- ii. Level switches for sump/tank level high/normal/ low/very low interlocks.
 - iii. Level Transmitters (Type as per Owner approval) for open sump/tank/bunker/vessel/heaters.
 - iv. Stand pipes on both side of tank for all level instruments (LT, LS & LG).
 - v. Flow elements with flow transmitter & Flow meter for flow measurement of process medium like Steam, Water, Air, Flue Gas, Fuel oil, open channel liquid, solid fuel, ash flow, DM water, Raw water, Instrument and Service air etc. as decided by owner.
 - vi. Pressure gauges and temp. Gauges at inlet and outlet of each heat exchanger and cooler.
 - vii. DPG, DPT & DPS across the filters/strainers.
 - viii. Tapping points/test points shall be provided.
 - ix. All primary Instruments, hardware & JBs etc used for measurement for HFO, LDO & Turbine Lube Oil system shall be flame proof (IEC-79.1, Part I). All primary Instruments, hardware & JBs etc used for measurement for Hydrogen shall be intrinsically safe and explosion proof as per NEC article 500, class 1, Division 1 area I.
 - x. All Thermocouples & RTDs shall be Duplex.
 - xi. All Field Instruments used in acid or alkaline atmosphere shall be with standard Anti corrosion coating i.e. the combination of Polyurethane and epoxy resin baked coating (ANSI/ISA-71.04).
 - xii. All primary instruments installed at "Minus level or Floor" shall be with protection class of IP 68.
 - xiii. Transmitters (all type) for monitoring & controls purpose.
 - xiv. Pull cord, belt sway, zero speed switches, emergency stop PB for conveyers, other limit switches, cable gland etc. of CHP which produce spark shall be provided with dust and flame proof enclosure conforming to IS-2148.
 - xv. Lockable Deinterlock switches shall be provided for CHP as per requirement.
 - xvi. Bidder shall provide electronics weighing in motion system as per IS-11547, hermetically sealed load cell of precision strain gauge type, 100% over load protection of cell and 250% overload protection for the construction; one calibrator attachment with two weighers.



- xvii All field mounted push button, selector switch etc. shall be as per IEC or NEMA 4X protection.
- xviii All limit switch shall be conform to IEC-60947-5-1.
- xix At APH, **temperature measuring device of different lengths forming grid** shall be provided to have average temperature for variable flow of flue gas, secondary air and primary air. These temperatures may be connected to nearest remote I/O panel.
- xx. On both left and right sides of furnace, separate lines shall be laid and provided with **furnace pressure transmitters having wide range** than the furnace pressure transmitter.
- xxi. Temp. Transmitters are envisaged with RTD & Thermocouples for monitoring services/application only. However any RTD & Thermocouples are used for control, interlock & protection application, same shall be directly wired to DDCMIS/DCS/PLC using instrumentation & Extension cables respectively.
- xxii. As for the water flow/ steam flow measurements, **necessary flow elements/transmitters are chosen in the process line and supplied such that their algebraic summations shall be mass balanced for calculating the system efficiency.**
- xxiii. Contacts less, electronic 2-wire position transmitters shall be provided for all inching type motorised valve and dampers.
- xxiv. For CW sump level, Raw water reservoir level, Turbine oil tank, coal bunkers, Ash Silo, LDO/HFO tank, DM water tanks, CS tank, Acid and alkali applications, only non contact type level transmitters like Acoustic, Ultrasonic, Radar based shall be provided by bidders as specified in NIT and as approved by owner.
- xxv. Considering the type of application, wireless technology to bring signals to DDCMIS may be adopted by interfacing with OPC gateway to avoid cabling for smart level transmitters specified above at sr. no. xxiv. However Wireless technology as adopted by Bidder shall be reliable and field proven in power plants and same shall be approved by Owner.
- xxvi. For Turbine oil, HFO/LDO applications & H₂ Gas application, zener protection on power supplies shall be included.
- xxvii. Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application. For HFO, LFO Applications, SS capillary with thin wafer element with ANSI RF flanged ends are to be provided. For hazardous area, explosions proof enclosure as described in NEC article 500 shall be provided.

FIELD INSTRUMENTS SHALL BE SUPPLIED & OFFERED AS PER DATA SHEETS SPECIFIED BELOW:



2 x 660 MW ENNORE SEZ Supercritical Thermal Power
Project at Ash Dyke of NCTPS
Spec. No. CE/C/P&E/EE/E/OT.No.03/2013-14

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3.03.00 TRANSMITTERS, SWITCHES, GAUGES AND PANEL MOUNTED INSTRUMENTS**3.03.01 Pressure, Differential Pressure, DP type Level and Flow Transmitters (PT, DPT, LT & FT)**

Smart Transmitters of the electronic type shall be furnished.

All Transmitter shall be installed in closed LIE in the boiler area. Similarly transmitter for TG shall also be in LIE except the transmitters located in covered area on TG floor and these shall be mounted in LIR.

Transmitters shall be equipped with mounting brackets suitable for a mounting in transmitter enclosures.

In general, Transmitters are envisaged to be grouped at several places as to be decided during detailed engg. stage. For this purpose, suitable enclosures complete with all tubing, fittings, purge meters, loop cable trays etc. shall be provided.

Type/Construction	:	Sealed capacitance/ Inductance/ Silicon resonance type
Material		
- Body	:	Die cast Aluminum with epoxy coating for air & flue gas SS316 for other services
- Diaphragm	:	316 SS
- Measurement element	:	Teflon seal
- Valves	:	Carbon steel for non-corrosive Applications SS316 for corrosive applications.
Output signal	:	4 to 20 mA Amp. DC (Two wires) HART Compatible
Local Indicator	:	LCD indicator (5 digit) with scale of Engg. unit
Overall Accuracy	:	$\pm 0.04\%$ or better of Span for BTG package $\pm 0.065\%$ or better of Span for BO P packages $\pm 0.2\%$ or better of span for remote seal type transmitter.
Turn down ratio	:	100:1 in general
Stability	:	$\pm 0.15\%$ of URL for 5 years.
Response time	:	150 msec.
Power supply	:	24V DC nominal
Drive capability	:	600 Ohms nominal
Enclosure Class	:	IP-65 (Explosion proof for NEC Class-1, Division 1 area)
Span and Zero	:	Locally adjustable, non-interacting



2 x 660 MW ENNORE SEZ Supercritical Thermal Power
Project at Ash Dyke of NCTPS
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Zero suppression / elevation : At least 100% of Span

Connection

- Process : 1. Half (1/2) inch NPT (F)
Quarter (1/4) inch NPT
with/without oval flanges
- Electrical : Suitable for Plug in type connection (Both side of transmitter), unused entry with blind plug.

Accessories

- For Absolute Pressure Transmitters: Two (2) valve SS316 manifold
- For Gauge & Vacuum pressure transmitter : Three (3) valve SS316 manifold
- For DP, level & flow transmitter : Five (5) valve SS316 manifold
- For oil and corrosive liquids : Separator diaphragm seals
- For all transmitters : Mounting bracket

Manifold should not be mounted on the transmitter, Manifold shall be non integral and standalone type. Snubbers/Pulsation dampners shall be used where the process media is unstable for measurement such as the discharge of a pump. Over range protection shall be used where necessary. The coil syphons & condensate pots shall be used for steam services. Transmitters shall be provided with suitable drain & vent points.

3.03.01.01 Transmitters & other HART based instruments shall be supplied along with 3 Nos. of universal type hand held/portable pressure calibrators. Temperature transmitters shall be supplied along with 3 Nos. of hand held/portable mV source generators.

3.03.02 PRESSURE SWITCHES (PS) & DIFFERENTIAL PRESSURE SWITCHES (DPS)

Applicable Standards : IS3624 - 1966/ISA-RP-8.1 except as modified in spec.

Type/Construction : Bourdon/Sealed Diaphragm Piston Actuated preferable. Indicators with contacts are not acceptable.

Materials

- Bellows : 316 SS
- Bourdon tube : 316 SS
- Movement : 316 SS
- Enclouser : Die-cast aluminum with stoved enamel black finish. Epoxy coating shall be provided for corrosive atmosphere.
- Protective Diaphragm : Teflon



Accuracy	:	\pm One (1) percent or better
Repeatability	:	\pm 0.5(half) percent or better
Setting & Differential	:	Adjustable
Contact		
- Number	:	DPDT /2 SPDT
- Type	:	Auto reset with internal Adjustable snap action micro switch
- Rating	:	5 Amp, 240V AC / 0.2 Amp, 220V DC
Connection - instrument	:	Half (1/2) inch NPT Male Process
Electrical	:	Suitable for Plug in type connection. All the switches are internally connected and brought to the surface with Amphenol male/female connection. Cabling need not be terminated inside the switch. Cable ends are to be soldered in connector and to be inserted for easy maintenance.
- Over range protection	:	One Fifty (150) percent of full scale
Enclosure Class	:	IP-65 or better (Explosion/Flame proof for NEC Class-1, Division 1 area)
Accessories		
- 3 / 5 valve manifold	:	As applicable for all switches
- Self cleaning type pulsation dampners/Snubber (Material SS316)	:	Pump and compressor discharge lines
- Syphon	:	For all steam lines
- Protective separating diaphragm	:	For fuel oil & corrosive liquid lines.
Mounting	:	Local (in LIE/LIR for BTG package).

3.03.03 PRESSURE & DIFFERENTIAL PRESSURE GAUGES (PG & DPG)

Applicable standard	:	IS:3602-1966, IS/3624, ASME B 40.1
Type/Construction	:	
-760 mm to 1.0Kg/cm2	:	Bellows/Diaphragm
-Above1.0Kg/cm2	:	Bourdon Tube
- Suction side of pumps	:	Compound gauge
Materials		
- Bourdon tube	:	316 SS
- Bellows	:	316 SS
- Movement	:	316 SS
- Case	:	SS 316/ Die-cast aluminum with stoved enamel black finish. Epoxy coating



	:	shall be provided for corrosive atmosphere.
- Protective Diaphragm	:	Teflon
Dial size	:	150mm with shatter proof glass
Scale Details	:	Graduations in black lines on white dial, on white dial, 270 Deg. pointer deflection scale provided with glass cover. Smallest scale division shall be one (1) percent of full scale value or smaller. Pointer stop for all gauges.
Accuracy	:	± One (1) percent or better
Connection - Instrument Process	:	1/2 inch NPT Male Bottom
Mounting	:	Local
	:	1/2 inch NPT Male (Back entry) mounted on local gauge board.
Enclosure Class	:	IP-65 or better (Explosion/Flame proof for NEC Class-1, Division 1 area)

Accessories

- 3 way needle valve/manifolds	:	For all gauges
- Self cleaning type Pulsation dampener/snubber (S316)	:	Pump and compressor discharge lines
- Syphon	:	For all steam lines
- Protective separating	:	For fuel oil and corrosive liquid lines

Other particulars

- External Zero adjustment	:	For all gauges
- Safety device	:	
Ranges 5 to 20 Kg/cm ²	:	Rubber blow out disc with open front construction.
Ranges above 20 Kg/cm ²	:	Neoprene safety diaphragm at the back with solid front construction.
- Over range protection	:	One Fifty (150) percent of full scale

Other Requirments

:	:	Movement mechanism shall be glycerin filled for oil services & vibration prone area.
:	:	For Fuel oil & corrosive liquid lines diaphragm type sensors required. Armored capillary of 10 M for Fuel oil & Corrosive liquid service.



- : Contact type pressure gauges are not acceptable for interlock & protection.
- : For condensate storage tank the pressure gauge in terms of 0-10000 mm wc or suitable range having **dial size of 300mm or bigger size** shall be provided.

3.03.04 TEMPERATURE TRANSMITTERS

Type	:	SMART type configurable from control room through HART protocol (HMS System).
Display type	:	Indicating type (5 digit LCD Display),
Accuracy	:	$\pm 0.10\%$,
Ambient temperature error	:	0.1% per 10°C change
Output	:	4-20 mA DC (2 wire system) HART compatible signals for analogue monitoring inputs to the distributed control system (DDCMIS), DCS & PLC.
Protection class	:	NEMA 4/IP66 or equivalent degree of protection for enclosure)/ (Explosion/Flame proof for NEC Class-1, Division 1 area)/ flame proof (IEC-79.1, Part I). As applicable).
Material of accessories	:	SS316.
Stability	:	$\pm 0.1\%$ or ± 0.1 deg C of reading (whichever is great) for 2 years in case of RTD inputs and for 1 year in case of Thermocouples inputs.
Operating Voltage	:	16 – 48 V DC
Calibration	:	as per NIST monograph 125 for T/C & European Curve Alpha = 0.00385 for RTD .
Ref. Junction compensation	:	Provided
Span/zero adjustment	:	Locally adjustable, Non interacting
Auto calibration	:	Provided
Burn out protection upscale	:	Provided
Input - output isolation	:	Provided
Circuit ungrounded	:	Provided

Any RTD & Thermocouples shall be directly wired to DDCMIS/DCS/PLC for metal temperature application, bearing & winding temp application only.

The Temperature transmitter shall accept Universal dual inputs of all types of thermocouples & RTD, 0-5V input signals etc.



Temp., Fuel oil temp. measurement as per IBR rules and regulations

3.03.10 TEST THERMOWELLS (TW)

Applicable Standard	:	ASME PTC 19.3 TW - 2010
Type/Construction	:	Machined from Bar Stock
Material	:	316 SS/F11/F22/F91
Connection	:	
- Pipe	:	M33 x 2
- Test Instrument	:	To suit test instruments
Accessories	:	Plug with chain
IBR Certification	:	For high pressure service, Steam Temp., Fuel oil temp. measurement as per IBR rules and regulations Bidder shall provide calculation for thermowell as per ASME – PTC-19.3 TW - 2010.

Test wells shall be provided on main steam, reheat steam, extraction steam, feed water, condensate, spray water lines and other piping as required to meet ASME test requirements.

3.03.11 DIRECT MOUNTED LEVEL TRANSMITTERS (LT)

Displacer type level transmitter shall not be used in the process anywhere in the plant.

3.03.12 Ultrasonic Level Transmitter (for Water sump/Tank level, Raw water reservoir level, Cooling water fore bay level measurements)

Principle of Operation	:	Detection of reflected ultrasonic pulse
Measuring Ranges	:	Up to 30 meters (typical)
Signal Processing	:	Microprocessor Controlled Signal Processing
Operating Freq.	:	10 KHz to 50 KHz (typical)
Display	:	Head mounted alpha-numeric back lit LCD/LED
Calibration & Configuration	:	Accessible from front of panel & HART calibrator.
Diagnosis	:	On-line
Status	:	For power, Hi / Lo / V. Hi / V. Lo-level indication, fault etc.
Construction	:	Plug-on board
Power supply	:	240 V AC 50 Hz / 24V DC
Signal Output	:	4-20 mA DC with HART (isolated) - 600 Ohm load.
Hysteresis	:	Fully adjustable preferred
Output contacts	:	2SPDT Potential free changeover contacts @ 8A 230V AC.
Accuracy & Repeatability	:	± 0.25% of span or better
Resolution	:	± 0.1% of span
Temperature Compensation:	:	To be provided with Transducer.



Operating temp.	:	Transmitter-50 deg C and Sensor – 80 deg C
MOC Sensor	:	Body- PVDF and Face – Polyurethane
Humidity	:	1% to 95% non condensing.
Enclosure	:	IP-67 Epoxy painted die cast Aluminum or SS316L housing.
Cable Connection	:	3/4" ET
Mounting	:	2" – 4" NPT or flanged
Accessories	:	Cable gland, prefab cable, mounting accessories like EPDM seal, SS316 flanged etc. Additional separate local display unit with large Alphanumeric back light LCD/LED & to be provided for the applications which will be decided during detailed engineering.

3.03.13 CAPACITANCE TYPE LEVEL TRANSMITTER

The total system shall consist of capacitance probe, pre-amplifier and transmitter

Type	:	Capacitance type
Probe	:	a) Rod or suspended electrode. b) Rope type probes may be used only where required probe length is greater than 3 meters
Probe Mounting	:	Stainless steel 1 1/2 ANSI RF Flange / 3/4" NPT (M)
Material of construction	:	316-SS
Insulation	:	PTFE Part/Full as per service.
Transmitter	:	The transmitter shall receive output of the preamplifier and convert it into 4-20 mA DC output signal.
Accuracy	:	± 1% of Full scale
Repeatability	:	± 0.5 % of Full scale
Load	:	Min 600 Ohms
Enclosure	:	Powder/Epoxy coated Die cast aluminum. with neoprene gasket conforming to IP-65. (Explosion proof for NEC Class-1, Division 1 area).
Ambient temperature	:	0-60 °C.
Mounting	:	Wall / Surface
Supply voltage	:	240V AC, 50Hz / 24V DC
Response time	:	100 m sec or better
Cable connection	:	3/4" ET
Accessories	:	Counter flange, Cable gland, prefab cable if any
Preferable features	:	Alarm output contacts with adjustable set point facility

3.03.14 GUIDED WAVE RADAR/RADAR LEVEL TRANSMITTER

Type	:	Guided wave Radar (Contact type)/Radar (Non-contact type) as finalized by owner.
Application	:	For Turbine Lube oil tank, HFO & LDO tank level,



Output Signal	:	Pulse
Material of Construction	:	AISI 316
Sensor Seal	:	PTFE / higher based on temperature
Flow range	:	As required.
Linearity	:	0.25% or better.
Repeatability	:	0.02% or better.
Ambient temperature	:	50 deg C
Mounting	:	On-Line mounting with flanges of stainless steel.
Enclosure	:	IP 65
Accessories	:	Nuts, bolts, gaskets etc.
Transmitter		
Electronics	:	Solid State
Power Supply	:	240V AC, 50Hz. UPS
Input	:	Input from Sensor
Display	:	4-1/2 digit LCD
Output	:	Isolated 4-20mA DC HART
Measuring Accuracy	:	0.5% of full scale range
Totalized Value	:	Required
Housing	:	IP 65 (Explosion proof for NEC Class 1, Division 1 area)
Nameplate	:	Tag number, service engraved in stainless steel tag plate
Accessories	:	Clamping strip, bracket, prefab cable etc. Special tool kit for calibration/ configuration.

3.03.23 Flow Transmitter (Ultrasonic)

Type	:	ULTRA SONIC, 2-wired
Sensing element	:	Non-contact
Output	:	4-20mA with HART Protocol
Accuracy	:	± 0.1% FS
Supply	:	24 V DC
Enclosure class	:	IP-65
Transmitter		
Mounting	:	On Nozzle
Mounting position	:	Top mounted
Housing	:	Plastic
Display	:	Head mounted LCD Display and remote LCD display
Process connection	:	NPT/Flanged
Electrical connection	:	NPT
Turn Down ratio	:	1:100
Measuring range	:	Adjustable (as per process requirement)
Totaliser	:	Required
Accessories	:	As per process requirement Additional separate local display unit with large Alphanumeric back light LCD/LED & to be provided for the applications which will be decided during



- b) Nuts, bolts, gaskets, mesh etc.
Special tool kit for calibration/configuration.

3.03.25 Electromagnetic Flow meter

Electromagnetic flow meters shall have separate transmitter having accuracy $\pm 0.2\%$ with zero stability feature, suitable for process medium with ≤ 5 micron Siemens conductivity, flanges material SS-316, electrode & measuring tube material SS-316, liner material Teflon and enclosure IP-66, local digital display configurable as totaliser, 4-20 mA output signal HART compatible with zero and span field adjustable. Application – DM Water and for other application as decided by owner.

3.03.26 FLOW GAUGES (FG)

- Type/Construction :
- a) On-line type Rotameter for 50 Nb and below lines
 - b) Bypass type Rotameter for above 50 Nb lines.

Material

- For On-line type

- Metering Tube : Borosilicate glass
 Float : 316 SS
 Packing : Teflon
 End fittings : 304 SS

-For Bypass type

- Metering Tube : Borosilicate glass
 Float : 316 SS
 Packing : Teflon
 End Fittings : 304 SS
 Orifice Plate : 316 SS
 Carrier ring : 304 SS
 Flanges & Mating flanges : Same as pipe material, 200 lbs ANSI - RF
- Impulse pipe : Same as pipe material
- Fittings : 2000 ANSI, SW ends to match with pipe material.
- Dial Size/Scale length : 250 mm
 Scale Details : Direct reading type engraved on detachable Aluminum scale
- Accuracy : \pm Two (2) percent
 Reproducibility : Half (1/2) percent
 Rangeability : 1:10
 Connection : SCRD NPT



- Accessories : a) Isolating valves (for Bypass type only)
- b) Bolts, Nuts and Gaskets as required
- Tests : Shall be tested at two hundred (200) percent of the maximum process pressure

3.03.27 SIGHT FLOW GLASS INDICATORS

- Type/Construction : Flapper type.
- Materials** :
- Body : Carbon steel/SS316 as per process requirement
- Glass : Toughened Borosilicate
- Gaskets : Neoprene
- Bolts & nuts : SS
- Flappers / Rotating Wheel : 316 SS
- Flappers / Rotating Wheel holder : 304 SS
- Process Connection : SW (Socket Welded)
- Accessories : Scale, Bolts, Nuts, Cover plates and Gaskets as required
- Tests : Tested at two hundred (200) percent of the maximum process pressure.

3.03.28 SOLID FLOWMETER

- Type : Online Impact type Microprocessor Based
- Measuring Principle : The system measurement is basically pertains to the measurement of horizontal deflection using LVDT, created by the impact of solid flow upon online sensing plate. The horizontal deflection being proportional to the impact forces, LVDT convert this horizontal movement into electrical signal. The inbuilt integrator convert this signal into time based flow rate indication & provide totalized flow also.
- Sensing plate : 316 SS
- Sensing head : Sensing mechanism shall be mounted outside the process flow line.
- Enclosure : 316 SS
- Enclosure protection : IP 67 class
- Accuracy : +/-1%
- Repeatability : +/- 0.2%
- Drift : Both zero & span \pm 2% / month
- Output : 4-20mA DC isolated, load 600 ohm (min)
- Digital communication : yes, (HART) facility
- Power supply : 240 V AC, 50Hz. UPS
- Ambient condition : Temperature -60⁰ C, RH-95%
Environment – Highly Dusty



Accessories : Shall be complete with all the accessories including digital display for flow rate, integral vents, baffles for air separation, etc. which ever required for satisfactory operation.

Note:-

1. The above on line flow meter shall not create any obstruction on flow.
2. User's list shall be submitted to support on proven satisfactory performance for similar process application.

3.03.29

Instrument Air System

The instrument Air Supply System for various pneumatic Control & Instrumentation devices like pneumatic actuators, power cylinders, I/P converters, pneumatically operated valves etc. shall be complete in all respect with necessary Air Filter Regulators, valves, piping/tubing etc.. Each pneumatic instrument shall have an individual air shut off valve. The pressure-regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built in filter-housing blow down valve.

Filter shall be of minimum 5-micron size & sintered bronze material.

On collection of water in the drains of instrument air lines, mechanical automatic drains and periodically solenoid operated drains (with electronic timer - 15m, 30m, 60m and 2 Hours & Timing adjustable) are to be provided.

For mechanical type & Electrical type, the locations to be provided in the instrument air lines of boiler area, Chimney area, turbine area etc., shall be decided during detailed Engineering.

Bulk header nearby the crowded applications shall be provided and from this bulk header individual air lines with necessary isolation valves are laid to the application.

These bulk header are to be provided with **mechanical / electronic based automatic Drains.**

Individual moisture separator for O₂ analyzer or vital application shall be provided nearby the instrument so as to enhance the cell life or the performance of vital final control elements.

3.03.30

Air Filter Regulator (AFR)

Constant bleed type AFR with an accuracy of ± 1.0 % inlet pressure range of 5-8 kg/ cm² and suitable spring ranges (AFR) for use with positioners in control valves, control damper, E/P converters and shut off valves for phosphor bronze filter element; Filtering particles above five microns. Weather and water proof enclosure. Material of accessories will be SS316.

Air filter regulators shall be provided in the :

- (a) Air supply line to valve positioners / power cylinders
- (b) Air supply line to electric to pneumatic converters.



- (c) Air supply line to pneumatic interlocked block valves.
- (d) For each instrument rack, field instruments enclosure for purging.

3.03.31 **Electro-Pneumatic Convertors (E/P)**

Two wire type E/P convertors with an accuracy of $\pm 0.25\%$ accepting 4-20 mA dc signals from control system and converting to 0.2 to 1 kg/cm² air pressure to operate valve positioner of all final control elements; Housed in cast aluminum casing (with polyurethane paint); NEMA 4 or equivalent degree of protection for enclosure. Material of accessories will be S S. E/P convertors shall have fail freeze (stay put) feature also. Process connection shall be 1/4" NPT (F) and Electrical connection shall be 1/2" NPT (F). Zero/span adjustment facility shall be provided. The E to P convertors shall **retain the pneumatic signal (last value) even in failure of control signal** and shall have **self volume boosters**. Necessary air lock devices and pressure switches for air pressure low alarming shall be provided.

3.03.32 **Solenoid Valves**

Solenoid valves shall be provided with control valves / pneumatic control valves hooked up with process interlock requirements and where direct tripping is involved. The number of ways for solenoid valve shall be provided as indicated below:

- (a) Two (2) way solenoid valves shall be provided, where process line of less than 50 mm with low pressure and temperature application.
- (b) Three (3) way solenoid valve shall be provided commonly, where the pressure is admitted or exhausted from a diaphragm valve or single acting cylinder, e.g, Pneumatic operated spray water block valve.
- (c) Four (4) way solenoid valve shall be provided for operating double acting cylinders, e.g, Pneumatically operated on-off type dampers.
- (d) For operation of the fuel oil corner nozzle valves, fuel oil trip valves etc., **double coil solenoid valve** (latch coil & relatch coil) shall be adopted.
Single coil usage requires always power and loss of power leads to closure of above valves resulting the unit trip or loss of generation.
- (e) Solenoid Valve coils shall be Class-H high-temperature or Class-F construction as applicable and shall be designed for continuous duty. Three-way solenoid valves shall be designed for universal operation so that the supply air may be connected to any port. Solenoid enclosures shall be NEMA-4)/ (Explosion proof for NEC Class-1, Division 1 area)/ flame proof (IEC-79.1, Part I) As applicable). Body material of solenoid valve shall be Die Cast Aluminum or SS316.
- (f) All solenoid shall be with varister, LED indication, surge suppress diode and circuits.

3.03.33 **Power Cylinders (Pneumatic)**

Mounting Type	:	a) Fixed position mounting (End mounting).
	:	b) Trunnion mounting
Control Signal	:	0.2 to 1 Kg/Sq. cm. from I/P converter for modulating purposes. 24V/48VDC operated solenoid valve operating on pneumatic line.



		The Pilot solenoid will have separate coils for open closing purpose.
Supply Air Selection	:	0-7 Kg / Cm ² .
	:	Based upon thrust / torque, stroke length, angular movement, full-scale travel time, repeatability, space factor etc. Provision for air-to-open and air-to-close operation.
Casing	:	IP-65.
Accessories (as required)	:	<ul style="list-style-type: none"> a) Air lock relay b) Hand wheel. c) Air filter regulator with gauge. d) Volume Booster. e) Limit Switches. f) Positioner with Input, Output and supply pressure gauges. g) Pilot Solenoid Valve (Double Coil type) h) Position Transmitter (4-20 mA DC linear output, LVDT or non contact type).
Fail-safe operation	:	Stay put, open or close position on pneumatic / electrical power supply failure as per process safety criteria.
Repeatability	:	Better than 0.5% of full travel.
Hysteresis	:	Less than 1% of full travel.



3.03.42

Junction Boxes

- Local LCD Display for Dew Point

v.	Type	:	Flame proof/weather proof
vi.	Enclosure	:	IP-65/Explosion/Flame Proof as per area classification.
vii.	Material	:	FRP with protective Coating
viii.	Cable entry	:	Bottom or Side
ix.	Cable glands	:	Double compression type – Nickel plated brass with PVC hoods.
x.	Mounting	:	Indoor/Outdoor
xi.	No. of terminals	:	As required with standardization with 20% spare of each size & type.
xii.	Terminals	:	Phoenix/Wago (screw less cage clamp type spring loaded)
xiii.	Grounding	:	Two terminals for body and shield ground
xiv.	Door	:	Hinged, lockable type.
xi.	Suitable mounting clamps and other accessories shall be in scope of bidder.		
xii	The brackets, bolts, nuts, screws, glands, lugs required for erection shall be of brass, included in bidder scope of supply. High voltage & insulation resistance test shall also be conducted.		
Xiii	M6 Ni plated Brass earthing stud shall be provided (external 2 nos. internal 1 no.)		
xiv	Gasket (Normal)- Neoprene thickness 6.0 mm		

3.03.43

Interposing Relays (IPR)

Electromagnetic type IPRs with modular design, plug-in type connections, suitable for channel/DIN rail mounting in cabinets; coil rating 24V D.C; 2 set of silver plated change over contacts rated for 0.5A 220 V DC/8 A 240 V AC. Free wheeling diode across relay copper coil and self reset type status LED indicator flag (electronic) shall be provided. Manual forcing/override facility is required. The test voltage for relay shall not be less than 4 KV with operating temperature from –20 deg. C to 60 deg. C. The relay shall have the necessary approvals like V0 inflammability class in accordance with UL94”, IEC60664/IEC60664A/DIN VDE 0110. Facility to stimulate IPR manually shall be provided. The VA burden of relays shall be suitable to match the capacity of output modules. Interposing relay & sockets for mounting the interposing relay shall be of same make only.

3.03.44

RECORDERS (CHARTLESS)

Type	:	Micro-processor based, Digital TFT display type
- No. of Channels	:	Forty Eight (48) point).



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6 Nos. of recorders shall be supplied with BTG packages and the parameters shall be decided during detailed Engineering. Quantities of recorders for BOP packages shall be decided during detailed Engineering.
(Simultaneous parameter display preferred)

Input Signal	:	Fully configurable multi range (Programmable) universal (input)
Recording method	:	Continuous with different colour, for each channel
Display colour	:	Selectable from 30 Colours
Bar graph facility	:	To be provided
Digital indication	:	To be provided
Accuracy	:	+/- 0.1 % for reading for DC V Input And 0.1 Deg for TC/RTD input
Programmability	:	Front key board
Data Storage	:	hard disk/ Flash Memory
Data Retrieval	:	Compact 4 GB flash Memory card and USB port with 8 GB USB drive.
Scan rate	:	≤ 20 m second for individual channel. Selection of scan time for individual channel is required.
Power Supply	:	240 VAC 1 Phase UPS
Ambient Temperature	:	0-50 Degrees
Mounting	:	Front panel mounted weather & Dust proof IP 65
Application software	:	Yes, To be provided
Internal Memory	:	400 MB or more
Screen	:	≥ 10.5" colour LCD TFT
Resolution	:	≥ 640 X 480 Pixels
Type of Display	:	i) Trends ii) Bar Graph iii) Digital display/ values
Event Sampling	:	1/2/5/10/30/60/120 sec.
Zoom & Scroll Facility	:	Required
OWS and printer connectivity port	:	Required
Communication	:	Necessary software shall be supplied for uploading the data. Additional MODBUS/PROFIBUS ports connectivity between recorder and third party systems.

3.03.45 DIGITAL INDICATOR

Type	:	Programmable electronic digital indicator with floating point decimal.
Input	:	4-20 mA DC/1-5V DC/RTD/T/C.
Number of inputs	:	One
Range	:	As per requirement/adjustable by end user



		through key pad available on the indicator.
Number of digits	:	Four plus sign
Digit height	:	20 mm or larger
Display	:	Fluorescent red
Input over range/open sensor (T/C)	:	All digits to flash
Input hold time	:	0.7 seconds max.
Accuracy	:	$\pm 0.25\%$ of span
Power supply	:	240V AC, 50Hz
Mounting	:	Flush panel, compatible for mounting on mosaic grid panel
Size	:	96x48 mm
Other Particular	:	Indicator receiving thermocouple signal shall have automatic cold junction compensation.
	:	Retransmission Output 4 -20 mA isolated required.
	:	24 V DC inbuilt power supply
	:	Alarm contact with 2 N/O/NC contact (rating 5A/230 V AC)

3.03.46 RECEIVER INDICATORS (SINGLE/DUAL CHANNEL)

Type	:	Analogue indicator
Input Signal	:	Universal input (T/C, RTD, 4-20 mA, Voltage)
Scale	:	Range fully configurable and programmable
Measurement Accuracy	:	$\pm 0.2\%$ of span ± 1 count
Resolution	:	0.5% Span
Dead band	:	$\pm 0.2\%$ of span
Repeatability	:	0.2% of span
Full scale response time	:	Less than two(2)seconds
Power Supply	:	240V AC, 50 Hz
Connection	:	Plug in type
Accessories	:	Mounting Bracket for Bins
Other Particulars	:	Indicator receiving thermocouple Signal shall have automatic cold junction compensation.
	:	Retransmission Output 4 -20 mA isolated required.

3.03.47 Temperature Scanner

Type	:	Microprocessor based Electronic Digital Scanner.
No. of channels	:	16/24 (as per the application)
Input	:	RTD /Thermocouple/4-20mA
Accuracy	:	± 0.1 of FS ± 1 count
Number of digits	:	4 digit (7 segment display with Engg. Units)
Digit height	:	12 mm or larger
Display color	:	Fluorescent red/green
Display mode for	:	



Input over range/open sensor	:	All digits to flash
Mounting	:	Panel mounting
Zero and Span	:	Adjustable by digital calibration
Serial communication communication	:	Isolated RS232/485 for modbus-RTU
Memory Capacity	:	5MB Flash
Alarm output	:	Required
Contact rating	:	2A at 220 V AC
Power supply	:	240 V AC/24 V DC
Properties	:	i. Any channel shall be configured for Data Logging ii. Channel to Channel online Isolation shall be provided iii. Real Time RTC Interface for Printer shall be provided
Operation Modes	:	Auto/manual mode, Run mode, Verify mode, Calibration Mode, Program mode.

3.03.48 AMMETERS (AMM)

Input	:	4-20 mA DC
Mounting	:	Flush panel, compatible for mounting on mosaic grid panel
Face Dimensions	:	96 x 96 mm
Scale/Type	:	Moving coil, circular, FSD 240 deg. With six times suppression scale
Zero adjustment	:	Screw on meter face
Accuracy	:	± 1 percent (class 1)
Indication	:	Pointer with scale
Magnetic Shield	:	Shielded Case
Quantities	:	For all HT Motors & LT motor with rating ≥ 30 KW and other critical application motors/drives.

3.03.49 VOLTMETER:

Input	:	4 - 20 mA DC
Mounting	:	Flush Panel, compatible for mounting on mosaic grid panel
Face Dimension	:	96x96 mm
Range	:	As per requirement
Accuracy	:	$\pm < 0.5$ %
Indication	:	Digital type 4 1/2 digit
Magnetic Shield	:	Shielded Case
Connection	:	Plug in type
Quantities	:	For 230 V AC input power supply, UPS power supply, 24 V DC interrogation voltage & 220 V DC.

3.03.50 FREQUENCY METER/MW METER (DIGITAL)

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Type : Electronic digital 7- segment with fluorescent display
 Input : 4 - 20 mA DC
 Mounting : Flush Panel compatible for mounting On mosaic grid panel
 Number of digits : 4 1/2 digit
 Face Dimension : 192X192 mm
 Digit size : Approximately 40 mm
 Range : As per requirements
 Accuracy : ± 0.2 Hz
 Display : Red LED display.
 Connection : Plug in type
 Magnetic Shield : Shielded Case

3.03.51 AC CURRENT TRANSDUCERS

Input : 0 - 1 A CT current
 Output : Dual 4-20 mA with 500 impedance
 Mounting : Back rail
 Accuracy : $\pm 0.25\%$

3.03.52 DC CURRENT TRANSDUCERS

Input : 0 - 75 mV
 Output : Dual 4-20 mA with 500 impedance
 Mounting : Back rail
 Accuracy : $\pm 0.25\%$

3.03.53 AC VOLTAGE TRANSDUCERS

Input : 0 - 110 V PT, Volts
 Output : 4-20 mA with 500 impedance
 Mounting : Back rail
 Accuracy : $\pm 0.25\%$

3.03.54 DC VOLT TRANSDUCERS

Input : System Voltage
 Output : 4-20 mA with 500 impedance
 Mounting : Back rail
 Accuracy : $\pm 0.25\%$

3.03.55 TRANSDUCERS FOR POWER

Input : CT and PT (1A) (110V)
 Output : 4-20 mA with 500 impedance
 Mounting : Back rail
 Accuracy : $\pm 0.25\%$

3.03.56 TRANSDUCERS FOR FREQUENCY



Input	:	110 V PT Volts
Output	:	4-20 mA with 500 impedance
Mounting	:	Back rail
Accuracy	:	$\pm 0.25\%$

3.03.57 TRANSDUCERS FOR POWER FACTOR

Input	:	PT (110V)
Output	:	4-20 mA with 500 impedance
Mounting	:	Back rail
Accuracy	:	$\pm 0.25\%$

3.03.58 TRANSDUCERS FOR MVAR

Input	:	CT & PT (110V/1A)
Output	:	4-20 mA with 500 impedance
Mounting	:	Back rail
Accuracy	:	$\pm 0.25\%$

3.03.59 DIFFERENTIAL FREQUENCY TRANSDUCERS (FOR SYNCHRONIZATION)

Input	:	110 V PT
Output	:	4-20 mA with 500 impedance
Mounting	:	Back rail
Accuracy	:	$\pm 0.25\%$

3.03.60 DIFFERENTIAL VOLT TRANSDUCERS (FOR SYNCHRONIZATION)

Input	:	System voltage
Output	:	4-20 mA with 500 impedance
Mounting	:	Back rail
Accuracy	:	$\pm 0.25\%$

3.03.61 PUSH BUTTONS (PB)/ ILPBs FOR ON/OFF, OPEN/CLOSE, START/STOP

Type	:	Momentary/Miniaturised Suitable for mosaic grid 24x48 Mm with 2 PB and 3 coloured LED.
Contact Configuration	:	2 NO + 2 NC
Contact Material	:	Hard Silver Alloy
Contact Rating	:	500V / 10 A
Insulation Voltage terminals and earth	:	2 KV for 1 minute between
Lamp Rating :-		
a) Voltage	:	240 V AC
b) Watt	:	2 Watt (approx.)
Colour		



5.19.00 Technical Specification of Chlorine Analyzer

- i) Type Microprocessor based Continuous flow through sample type with automatic temperature compensation.
- ii) Analyzer power supply 240V AC, 50 Hz, Single Phase from UPS
- iii) Analyzer output
 - i) 4-20 mA, DC spare output
 - ii) 4-20 mA, DC isolated output for DDCMIS
- iv) Accuracy 0.005 mg/ltr. or 1% of range.
- v) Sensitivity 0.001 mg/ltr. (1 ppb)
- vi) Range As per schedule.
- vii) Annunciation contacts:
 - Number As per schedule, 2 SPDT



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-	Type	Snap action micro switch
-	Rating	5A, 240V AC, 0.2A, 220V DC
-	Mounting	Flush
viii)	Terminal points	All components piped & wired to terminal points
ix)	Accessories	<ul style="list-style-type: none"> i) Flow regulator ii) Flow gauges iii) Sample rate set valves iv) Other accessories as required to make the system complete

5.20.00 Technical Specification of Residual Chlorine Analyser

SENSOR

Method	:	Amperometric
Electrodes	:	Gold Cathode/Silver Anode
Cell Material	:	PVC
Electrolyte	:	Potassium Bromide

TRANSMITTER

Type	:	Microprocessor Based with self diagnostic features
Transmitter Output	:	4 – 20 mA
Enclosure Protection	:	IP65
Enclosure Material	:	Polyester coated Al.
Electrical Connection	:	½" NPT (F)
Mounting	:	FIELD
Display Type	:	LCD
Display Details	:	4 digit backlit LCD matrix
Diagnostics	:	Required
Meter Range	:	0-1 mg/l
Resolution	:	0.01 ppm
Area Classification	:	SAFE
Electromagnetic Compatibility	:	BUILT – IN
Temp. Compensator	:	AUTO – BUILT – IN
Temp. Compensating element	:	PT100





TITLE:

**TECHNICAL SPECIFICATION FOR
PRE-TREATMENT PLANT.**

2X660 MW ENNORE SEZ COAL BASED
STPP AT ASH DYKE OF NCTPS, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-158-A002

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REV. NO. 0.0

DATE:

Page

HOOK UP DRAWING

INSTRUMENT HOOK UP
L.DRAWINGS

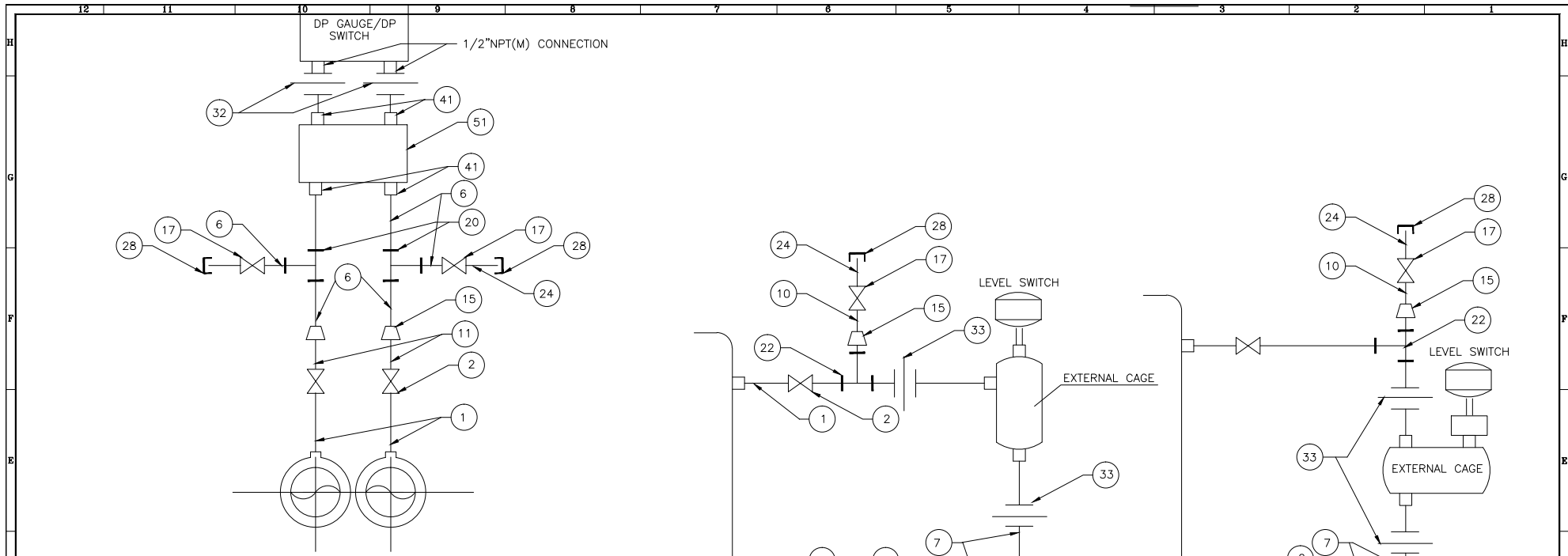


FIG-A

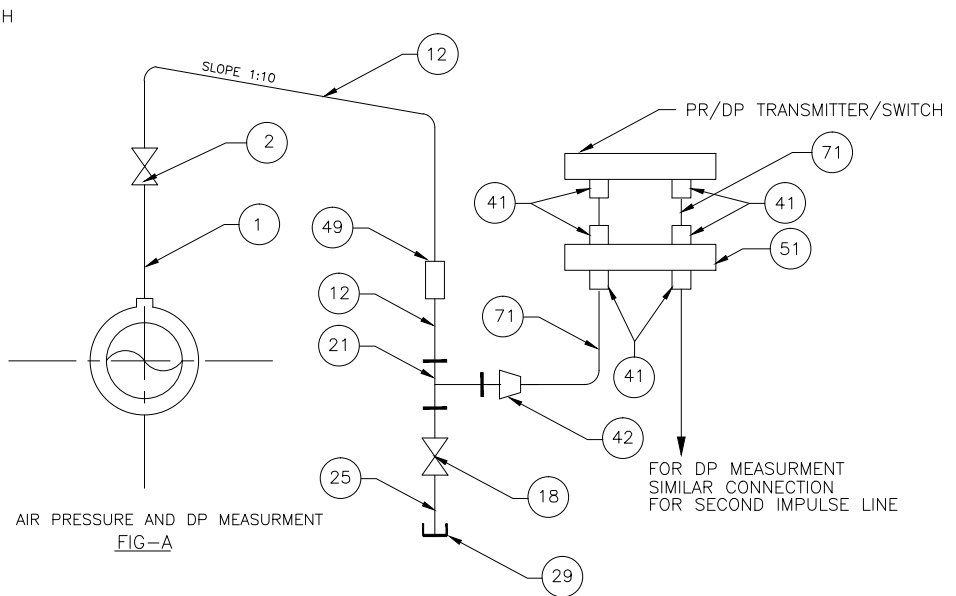
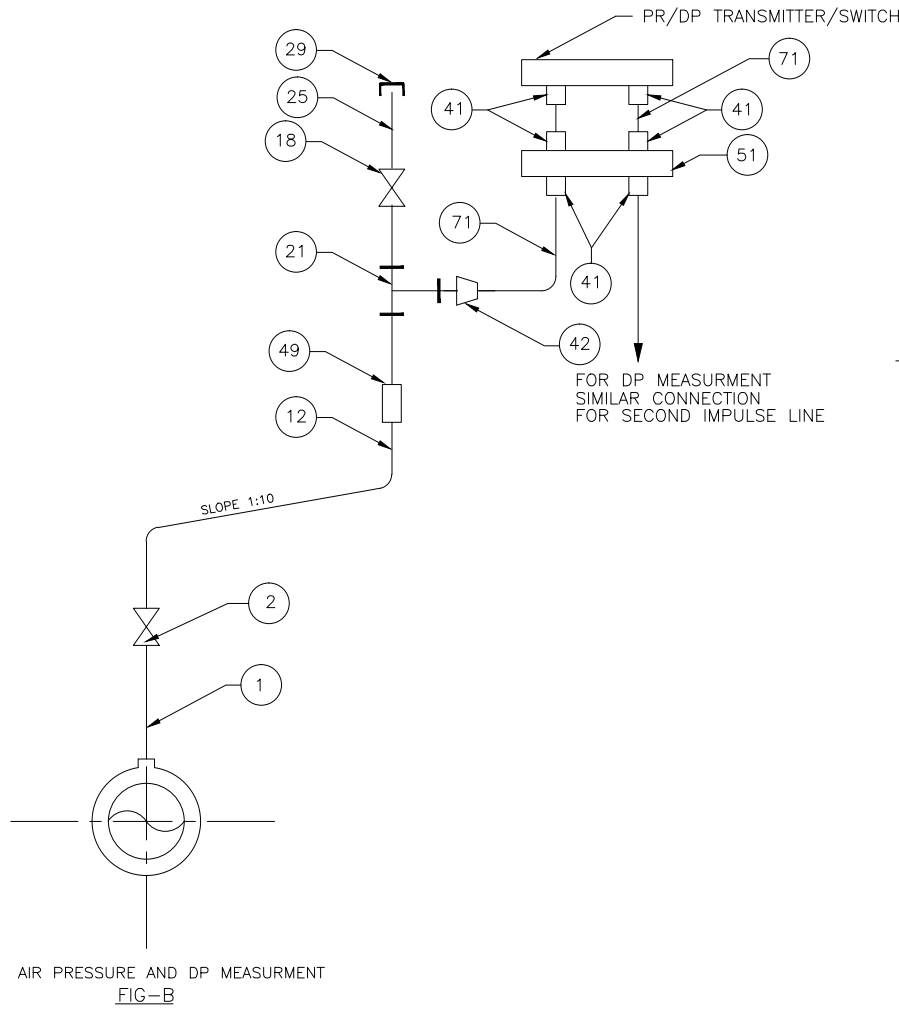
FIG-B

FIG-C

TAG NO.	DESCRIPTION	A	B	C
78	1/2" NPT(F) X 1/2" NPT(M) SNUBBER/PULSATION DAMPNER	1	-	-
51	5 VALVE MANIFOLDS, SS-316	-	-	-
41	1/2" NPT(M) X 1/2" OD TUBE COMPRESSION FITTING,SS-316	-	-	-
38	3 WAY GAUGE VALVE 1/2"NB SW	1	-	-
33	1" SW EQUAL PIPE UNION	-	2	2
32	1/2" NPS,3 PIECE PIPE UNION 1/2" NPT(F) SCREWED AND 1/2" SW CONNECTION	1	-	-
28	1/2" NPT(F) CS. CAP	1	2	2
24	1/2" NPS,SCH 80/160 X 1/2" NPT(M) CS/AS NIPPLE	1	2	2
22	1" SW EQUAL TEE CS/AS	-	1	2
20	1/2"SW EQUAL TEE CS/AS	1	-	-
17	1/2" SW,CS/AS, GLOBE VALVE	1	2	2
15	1" TO 1/2" SOCKET WELD REDUCER	1	2	2
11	1"NPS SCH 80/160 CS/AS NIPPLE	1	-	-
10	1/2"NPS,SCH 80/160 CA/AS NIPPLE	-	2	2
6	1/2"NPS,SCH 80/160 CARBON/ALLOY STEEL PIPE	AS REQD.		
7	1" NPS,SCH 80/160 CS/AS STEEL PIPE	AS REQD.		
2	1/2"3/4"/1" ROOT VALVE - SW GLOBE VALVE	2	2	2
1	1/2"/3/4"/1" CARBON/ALLOY STEEL NIPPLE OF MTL SAME AS THAT OF MAIN PIPE (AS PER PROCESS REQD.)	AS REQD.		
		A	B	C
		QTY.		

NOTE:-
WITH VALVE OF SIZE 1/2"SW NIPPLE PIECE IS NOT REQUIRED

11	10	9	8	7	6	5	4	3	2	1	
REFERENCE DRAWINGS.		NOTES		NOTICE		REVISIONS		APPROVED		<p>DESEIN CONSULTING ENGINEERS NEW DELHI - INDIA</p>	
1. DO NOT SCALE, ASK WHEN IN DOUBT.		2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.		3. ABOVE DRAWING IS FOR BASIC GUIDE LINE TO BE MET BY BIDDER, ANY FURTHER IMPROVEMENT DURING DETAILED ENGINEERING SHALL ALSO BE CONFIRMED/PROVIDED BY CONTRACTOR.		4. QUANTITIES OF INSTRUMENTS/ ERECTION HARDWARE SHALL BE AS PER NET AND AS FINALISED DURING DETAIL ENGINEERING.		5. FOR DM PLANT MATERIAL OF ERECTION HARDWARE SHALL BE SS 316 ONLY.		<p>CLIENT: TAMILNADU GEN. & DIST. CORPORATION</p> <p>PROJECT: 2480MW ENNORE SEZ COAL BASED SUPERCRITICAL THERMAL POWER PROJECT AT ASH DYKE OF NCTPS, CHENNAI</p> <p>TITLE :- INST. DRAWING FOR DIFF. PRESS. SWITCH/GAUGE/LEVEL SWITCHES</p>	
1. PART		1. DO NOT SCALE, ASK WHEN IN DOUBT.		THIS DRAWING IS THE PROPERTY OF DESEIN PRIVATE LIMITED, NEW DELHI, AND IS LENT SUBJECT TO THE CONDITION THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT OR OTHERWISE DISPOSED OF, DIRECTLY OR INDIRECTLY. IT SHALL NOT BE USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS, APPARATUS, OR PARTS THEREOF EXCEPT FOR THE PROJECT SPECIFICALLY PROVIDED FOR BY CONTRACT AGREEMENT WITH DESEIN.		PRELIMINARY		25.04.13		SIN	
PRINT DISTRIBUTION										<p>NAME: VIKAS</p> <p>SIGN: SKM/SN</p> <p>DATE: 23.04.13</p> <p>SCALE: N.T.S.</p> <p>JOB. No. D-4027</p> <p>DWG.No. 114-04-0108</p> <p>Sheet No. 11 of 19</p>	

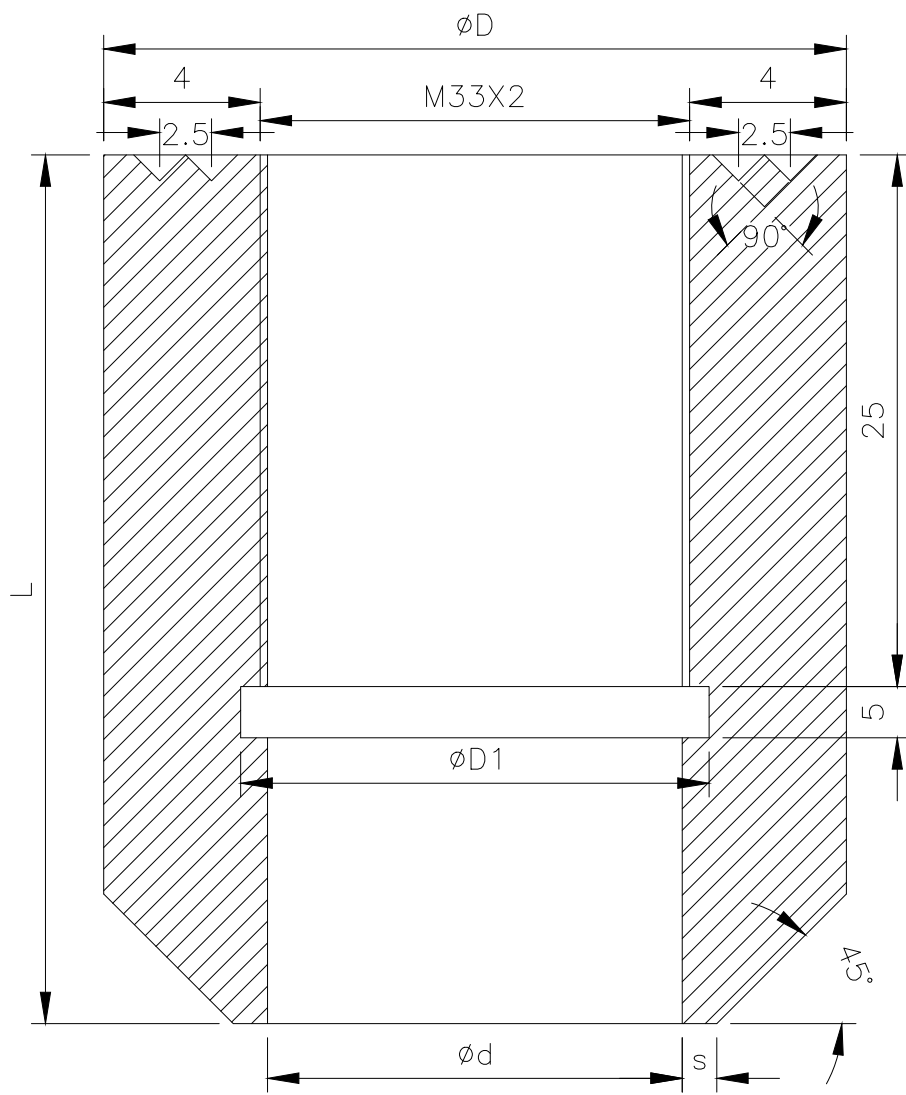


71	1/2"OD IMPULSE TUBE,SS-316	AS REQD.
51	5/3/2-VALVE MANIFOLDS,SS-316	1 1
49	3/4"SW,CS/AS BULK HEAD PIPE UNION	1 1
42	3/4"BW X 1/2"OD TUBE FITTING,SS-316	1 1
41	1/2"NPT(M) X 1/2"OD TUBE COMPRESSION FITTING,SS-316	6 6
29	3/4"NPT(F) CS CAP	1 1
25	3/4"NPS,SCH-80 X 3/4"NPS(M)CS NIPPLE	1 1
21	3/4" EQUAL TEE,CS	1 1
18	3/4" SW,CS GLOBE VALVE	- 1
12	3/4" NPS. SCH-80 CARBON STEEL PIPE	AS REQD.
2	1/2"/3/4"/1" ROOT VALVE - SW GLOBE VALVE	1 1
1	1/2"/3/4"/1" CARBON/ALLOY STEEL NIPPLE OF MTL. SAME AS THAT OF MAIN PIPE(AS PER PROCESS REQD.)	AS REQD.
TAG NO.	DESCRIPTION	A B QTY.

BILL OF MATERIAL

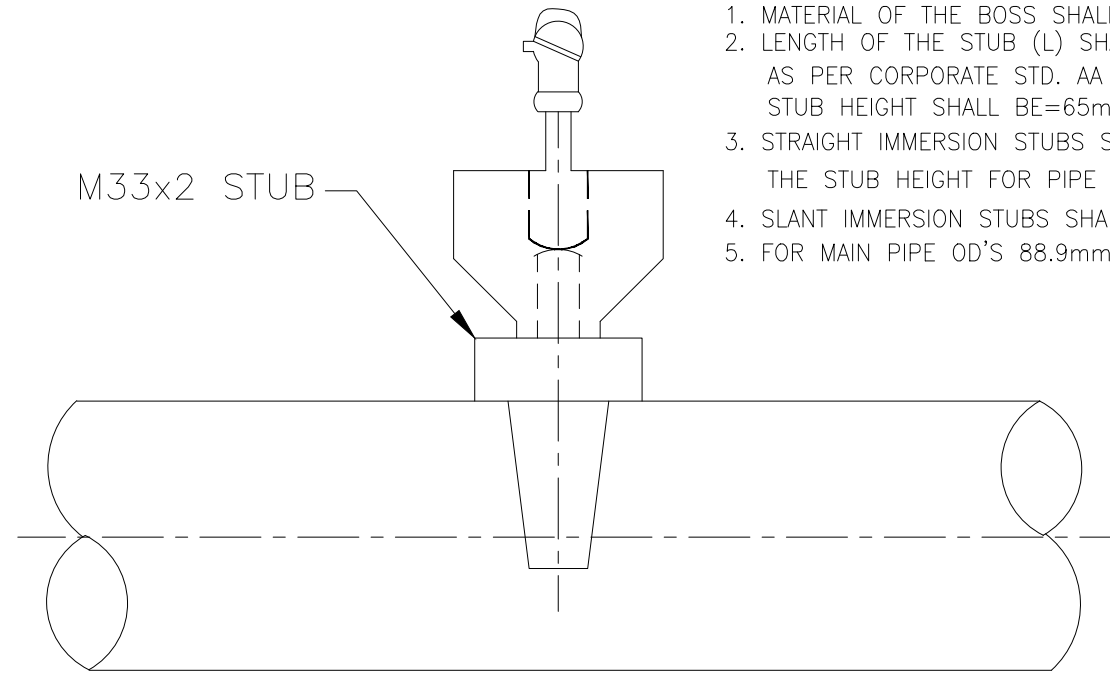
NOTE:-
 QUANTITY IN COLUMN A&B TO BE DOUBLED
 FOR DP TAPPING EXCEPT ITEM NO. 51

11	10	9	8	7	6	5	4	3	2	1	
REFERENCE DRAWINGS.		NOTES		NOTICE		REVISIONS		APPROVED		<p>DESEIN CONSULTING ENGINEERS NEW DELHI - INDIA</p> <p>CLIENT: TAMILNADU GEN. & DIST. CORPORATION</p> <p>PROJECT: 2x660MW ENHANCED SEZ COAL BASED SUPERCRITICAL THERMAL POWER PROJECT AT ASH DYKE OF NCTPS, CHENNAI.</p> <p>TITLE :- INST. DRAWING FOR PRESS. & DIFF. PRESS. TRANSMITTERS/SWITCH (AIR SERVICE)</p> <p>FOR BID PURPOSE ONLY:</p>	
1. DO NOT SCALE, ASK WHEN IN DOUBT.		2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.		3. ABOVE DRAWING IS FOR BASIC GUIDE LINE TO BE MET BY BIDDER, ANY FURTHER IMPROVEMENT DURING DETAILED ENGINEERING SHALL ALSO BE CONFIRMED/PROVIDED BY CONTRACTOR.		4. QUANTITIES OF INSTRUMENTS/ ERECTION HARDWARE SHALL BE AS PER NET AND AS FINALISED DURING DETAIL ENGINEERING.		5. FOR DM PLANT MATERIAL OF ERECTION HARDWARE SHALL BE SS 316 ONLY.		<p>NAME: VIKAS</p> <p>SIGN: SKM/SN</p> <p>DATE: 23.04.13</p> <p>SCALE: N.T.S.</p> <p>JOB No. D-4027</p> <p>DWG.No. 114-04-0103</p> <p>REV. 0</p>	
6. THIS DRAWING IS THE PROPERTY OF DESEIN PRIVATE LIMITED, NEW DELHI, AND IS LENT SUBJECT TO THE CONDITION THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT OR OTHERWISE DISPOSED OF, DIRECTLY OR INDIRECTLY. IT SHALL NOT BE USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS, APPARATUS, OR PARTS THEREOF EXCEPT FOR THE PROJECT SPECIFICALLY PROVIDED FOR BY CONTRACT AGREEMENT WITH DESEIN.		PRELIMINARY		PARTICULARS		DATE: 23.04.13		SIN		<p>DATE: 23.04.13</p> <p>CIVIL MECH. ELEC. C&I H.O.D.</p>	
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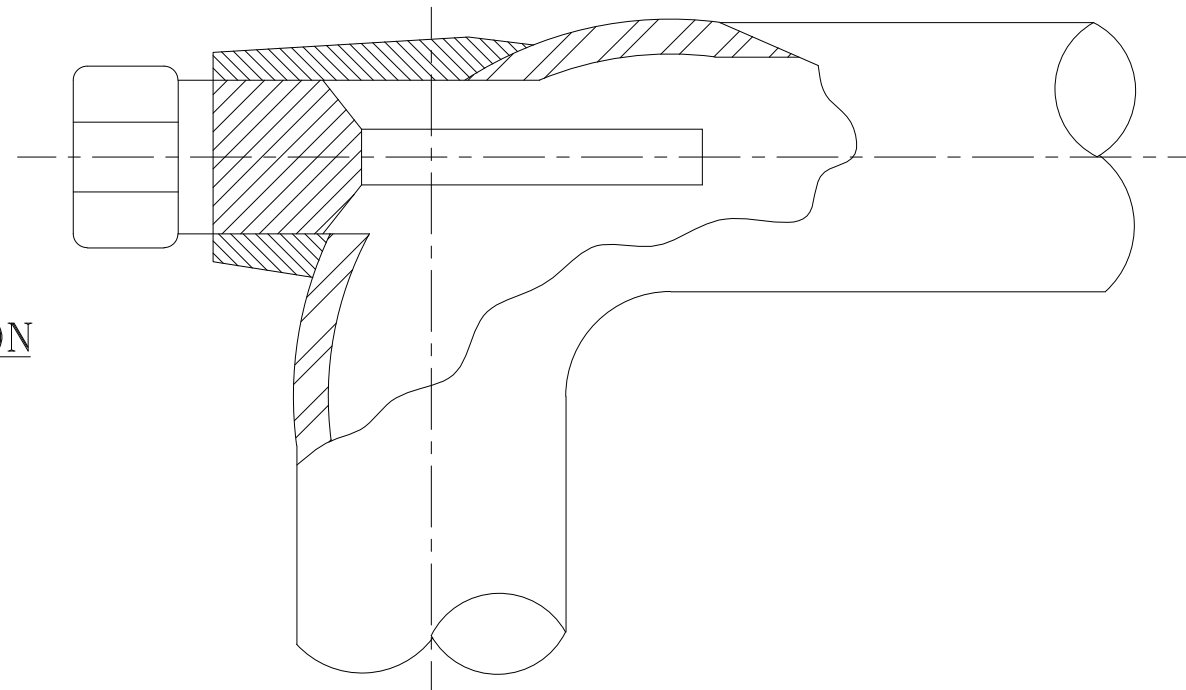


TEMPERATURE STUB FOR STRAIGHT IMMERSION

FOR PIPE OD BELOW 219.1mm	29	55	33.5	1.5	65
FOR PIPE OD 219.1mm & ABOVE	29	55	33.5	1.5	45
MAIN PIPE SIZES	d	D	D1	S	L



INSTALLATION TYPE-1
(FOR MAIN PIPE OD 168.3mm & ABOVE)

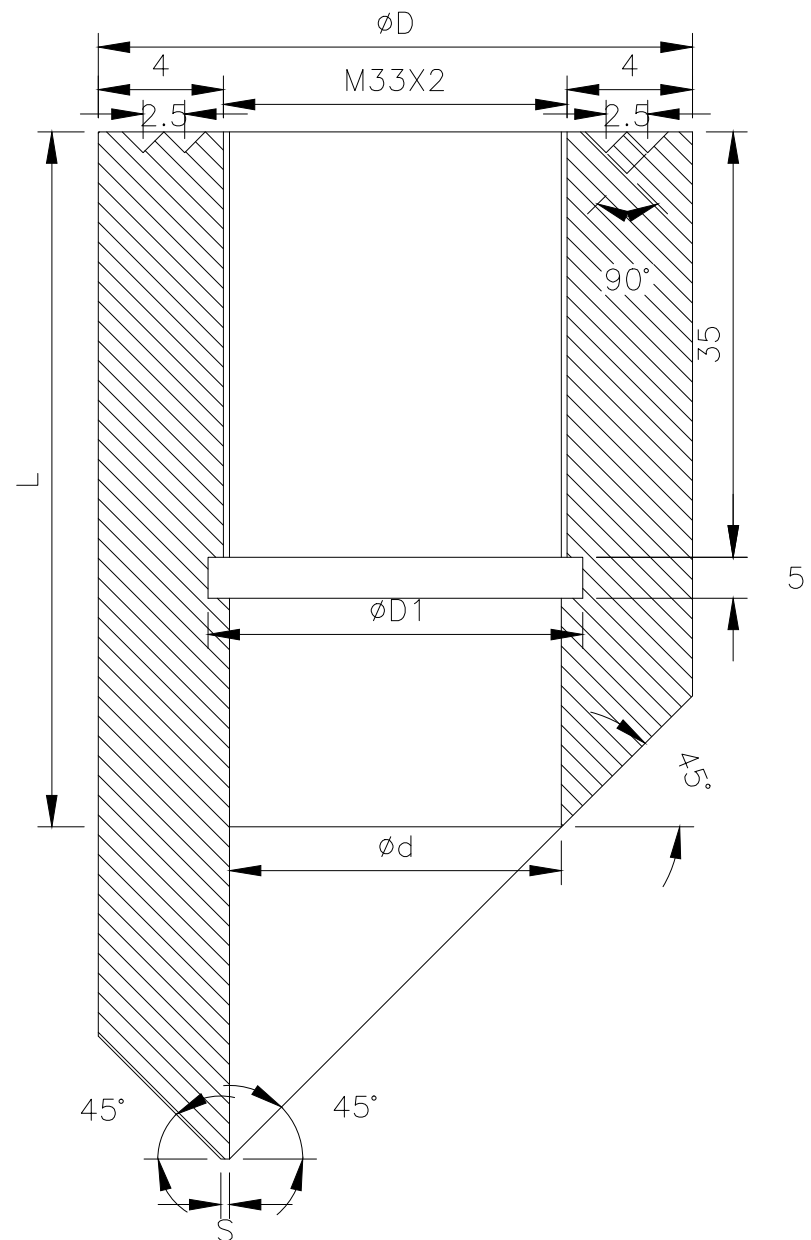


INSTALLATION TYPE-2
(FOR MAIN PIPE OD 88.9mm & BELOW)

NOTE :-

1. MATERIAL OF THE BOSS SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED.
2. LENGTH OF THE STUB (L) SHALL BE 65/45 mm DEPENDING UPON PIPE SIZE, AS PER CORPORATE STD. AA 7326102.(FOR PIPE OD 88.9mm TO 159mm STUB HEIGHT SHALL BE=65mm & FOR PIPE OD >219.1mm STUB HEIGHT SHALL BE=45mm)
3. STRAIGHT IMMERSION STUBS SHALL BE USED FOR PIPE OD'S 168.3mm & ABOVE. THE STUB HEIGHT FOR PIPE OD, 168.3mm TO <219.1mm SHALL BE 65mm.
4. SLANT IMMERSION STUBS SHALL BE USED FOR PIPE OD'S 88.9mm TO 159mm.
5. FOR MAIN PIPE OD'S 88.9mm & BELOW SUITABLE EXPANDER SHALL BE USED.

11	10	9	8	7	6	5	4	3	2	1	
REFERENCE DRAWINGS.		NOTES		NOTICE		REVISIONS		APPROVED		<p>DESEIN CONSULTING ENGINEERS NEW DELHI - INDIA</p> <p>CLIENT: TAMILNADU GEN. & DIST. CORPORATION PROJECT: 2x660MW ENNORE SEZ COAL BASED SUPERCRITICAL THERMAL POWER PROJECT AT ASH DYKE OF NCTPS, CHENNAI. TITLE :- INST. DRAWING FOR TEMPERATURE STUB</p> <p>FOR BID PURPOSE ONLY:</p>	
		1. DO NOT SCALE, ASK WHEN IN DOUBT. 2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. 3. BULK HEAD FITTING SW TYPE SHALL BE PROVIDED AT LIE/LIR 4. ABOVE DRAWING IS FOR BASIC GUIDE LINE TO BE MET BY BIDDER, ANY FURTHER IMPROVEMENT DURING DETAILED ENGINEERING SHALL ALSO BE CONFIRMED/PROVIDED BY CONTRACTOR. 5. QUANTITIES OF INSTRUMENTS/ ERECTION HARDWARE SHALL BE AS PER NIT AND AS FINALISED DURING DETAIL ENGINEERING 6. FOR DM PLANT MATERIAL OF ERECTION HARDWARE SHALL BE SS 316 ONLY.		THIS DRAWING IS THE PROPERTY OF DESEIN PRIVATE LIMITED, NEW DELHI, AND IS LENT SUBJECT TO THE CONDITION THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT OR OTHERWISE DISPOSED OF, DIRECTLY OR INDIRECTLY. IT SHALL NOT BE USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS, APPARATUS, OR PARTS THEREOF EXCEPT FOR THE PROJECT SPECIFICALLY PROVIDED FOR BY CONTRACT AGREEMENT WITH DESEIN.		6 5 4 3 2 1 0 A		PRELIMINARY PARTICULARS DATE CIVIL MECH. ELEC. C&I H.O.D.		NAME SIGN. DATE VIKAS SKM/SN S.K.M. 23.04.13 23.04.13 24.04.13 SCALE N.T.S. JOB. No. D-4027 DWG.No. 114-04-0111 Sheet No. 14 of 19	
SR. No. PARTY PRINT DISTRIBUTION										REV. 0	

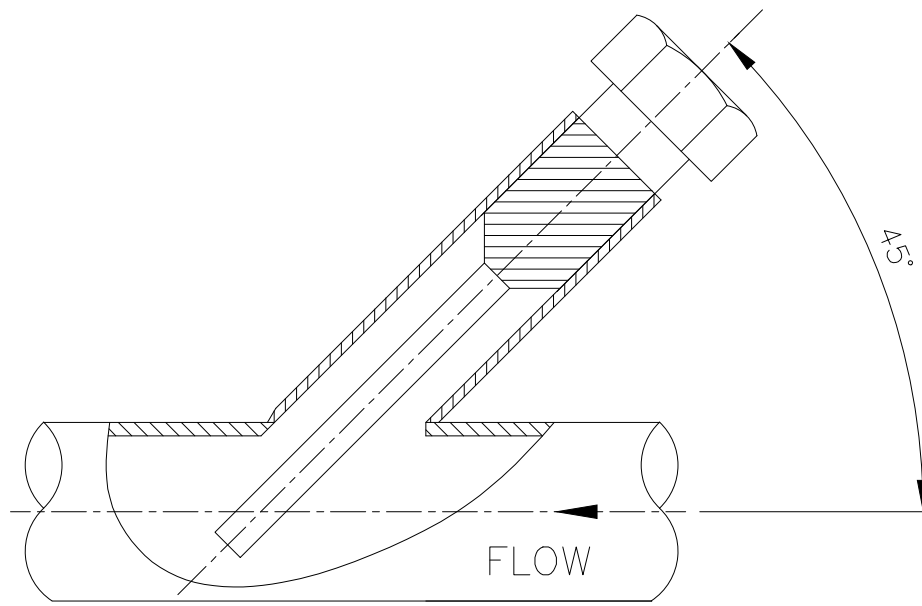


TEMPERATURE STUB FOR SLANT IMMERSION

FOR PIPE OD BELOW 219.1mm	29	55	33.5	1.5	65
FOR PIPE OD 219.1mm & ABOVE	29	55	33.5	1.5	45
MAIN PIPE SIZES	d	D	D1	S	L

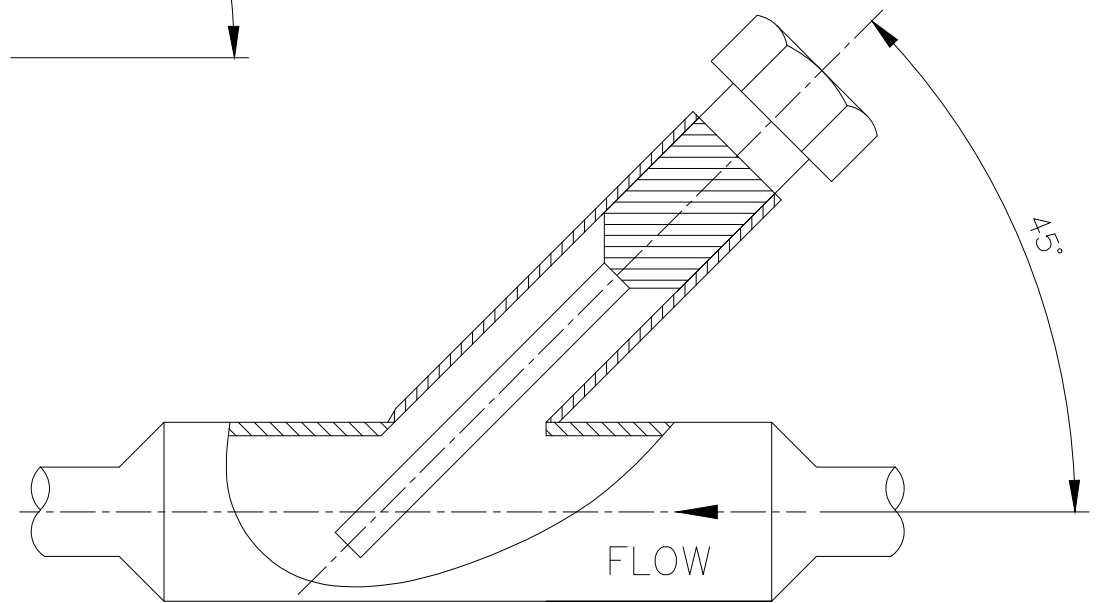
NOTE :-

1. MATERIAL OF THE BOSS SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED.
2. LENGTH OF THE STUB (L) SHALL BE 65/45 mm DEPENDING UPON PIPE SIZE, AS PER CORPORATE STD. AA 7326102.(FOR PIPE OD 88.9mm TO 159mm STUB HEIGHT SHALL BE=65mm & FOR PIPE OD >219.1mm STUB HEIGHT SHALL BE=45mm)
3. STRAIGHT IMMERSION STUBS SHALL BE USED FOR PIPE OD'S 168.3mm & ABOVE. THE STUB HEIGHT FOR PIPE OD, 168.3mm TO <219.1mm SHALL BE 65mm.
4. SLANT IMMERSION STUBS SHALL BE USED FOR PIPE OD'S 88.9mm TO 159mm.
5. FOR MAIN PIPE OD'S 88.9mm & BELOW SUITABLE EXPANDER SHALL BE USED.



INSTALLATION TYPE-3

(FOR MAIN PIPE OD 88.9mm TO 159mm)



INSTALLATION TYPE-4

(FOR MAIN PIPE OD 88.9mm & BELOW)

SR. No.	PARTY	PRINT DISTRIBUTION	REFERENCE DRAWINGS.	NOTES	NOTICE	REVISIONS	APPROVED	DATE	CIVIL	MECH.	ELEC.	C&I	H.O.D.	CLIENT	PROJECT	TITLE	JOB. No.	DWG.No.	REV.	
11														DESEIN CONSULTING ENGINEERS NEW DELHI - INDIA	TAMILNADU GEN. & DIST. CORPORATION	INST. DRAWING FOR TEMPERATURE STUB	D-4027	114-04-0111	0	
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TITLE:

**TECHNICAL SPECIFICATION FOR
PRE-TREATMENT PLANT.**

2X660 MW ENNORE SEZ COAL BASED
STPP AT ASH DYKE OF NCTPS, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-158-A002

VOLUME **II-B**

SECTION -D

REV. NO. 0.0

DATE:

Page

ERECTION HARDWARE

CHAPTER-9

ERECTION HARDWARE

9.00.00 **PROCESS CONNECTION AND PIPING**

9.00.01 **General Requirements**

This section covers the material requirement for instrument connection to process, instrument process, piping, tubing, supports, Instrumentation cables, control cables and power cables for connecting UPS, 24/48 V DC, unregulated power supply for cubicle illumination, compensating cables/Extension cables, transmitter racks and main accessories to be furnished under this specification and the requirements of installation and routing. Impulse lines, fittings and other accessories required for the erection of complete Instrumentation and Control System supplied under various packages of this specification shall be supplied on "as required" basis. Bidder shall offer all necessary items for this section based on his experience on similar plants, plant layout diagrams, installation drawings and other applicable sections of this specification. Based on the good engineering practices Bidder shall furnish installation drawings during the engineering of the system for Owner's review and approval. The installation of the drawings shall be suitable for his installation of his range of instrumentation.

The Bidder shall furnish and test all required erection hardware, which is necessary for proper installation and interconnection of the equipment/systems furnished by the Bidder and their integration with main equipment/systems as per the enclosed installation drawings and other applicable clause. The Bidder shall furnish all hardware and accessories to ensure that the equipment/systems furnished form a complete and operational system meeting the intent and requirement of this specification.

All materials, furnished shall conform to the latest editions of America National Standard Code for Pressure piping, Power piping, ANSI B311.1, ANSI B16.11, ASME Boiler and Pressure Vessel Codes, IBR and other applicable ASME, ANSI and Indian Standards. Schedule numbers, sizes and dimensions of all carbon steel, stainless steel and alloy seamless steel pipe shall conform to ANSI B.36.10 and of stainless steel pipe shall conform to ANSI B 36.19 unless otherwise specified.

All materials supplied under this section shall be suitable for intended service; process operating conditions and type of instruments used and shall fully conform to the requirements of this specification.

The Bidder is responsible for the performance of the equipment furnished on system basis any shortfall in erection material observed during erection stage shall be compensated by the Bidder at no extra cost. (Installation drawings # 114-04-0000, 0100 to 0113 shall also be referred by bidder).

9.01.00 **GUIDLINE FOR INSTALLATION AND ROUTING OF INSTRUMENT PIPING**

9.01.01 **General Requirements**

The following general erection guidelines have been enumerated here to enable the Bidder to estimate the requirement of instrument piping in plant:-

- i) All instrument piping shall be in accordance with good engineering practice. It shall be finalized during engineering stage. Instrument piping shall be complete with fittings, valves and other required accessories.
- ii) Instrument piping shall not be routed:-
 - a) Across equipment removal areas
 - b) Below mono-rails and cranes
 - c) Above or below removable gratings
 - d) Above or below cable trays.
- iii) Primary Impulse Piping System:
 - a) The primary impulse piping system shall include the instrument piping and all required accessories from process tap off point (root valves onwards) up to the respective instruments. From the same source, Tee off for instruments are not allowed. Separate tapping shall be provided for each instrument. The Bidder shall provide the necessary fittings and accessories along with impulse pipes for completeness and arrangements as per the finalized Instrument Installation Diagrams. Special accessories such as reservoirs and other devices shall be installed as required for flow primary element connection as required by the design of instruments, in accordance with the instructions of the instrument manufacturer.
 - b) The Bidder shall prepare impulse pipe routing drawings.
 - c) Impulse piping shall include a blow-down line and shut-off valve adequate for the duty requirements and for withstanding continuous design pressure and temperature of process medium. For process pressure above 40 Kg/Cm²g, double valves shall be used before connecting to the blow-down header (This arrangement shall be provided for installation for the new transmitter if the existing transmitter has the same arrangement.)
 - d) To assure a constant static head the connections from low pressure steam and low pressure liquid filled lines should preferably slope downward continuously towards the instrument as the instrument is mounted below the source point. If downward slope is not feasible or the instrument is mounted above the source point, the line should slope upward continuously and a "pigtail" installed at the instrument to assure a water seal for temperature protection. Upward sloping liquid lines should be used only if the process pressure is sufficient to assure a head of liquid at the instrument. Horizontal runs should have a slope of not less than 40 mm per meter and must be adequately supported to maintain a constant slope. Vacuum connections to the condenser should always slope upward to the instrument.
 - e) Primary process piping for steam flow, liquid flow and manometric level measurement systems should preferably slope downward from the primary element connections to the instrument. Primary piping for flue gas and air flow measurement systems should preferably slope upward from

the primary element connections to the instrument. If these requirements cannot be met, special venting or drain provisions will be required. Horizontal runs must have a slope of not less than 40 millimeters per meter and must be adequately supported to maintain a constant slope.

- f) Primary process piping from the field which enters the instrument enclosure from the bottom shall extend into the enclosure approximately 150 millimeters and be equipped with a socket weld to flare less tubing coupling of stainless steel. This coupling shall be used to connect the field primary process line to the enclosure process line. The field primary process line shall be anchored to the enclosure angle with U-bolts. Holes for supporting U-bolts shall be field or drilled.
- g) All impulse piping shall be supported rigidly at an interval not exceeding 1.5 meters so as to prevent excessive sag in piping. Process piping shall not be used for supporting impulse piping.
- h) Impulse lines subject to severe sonic pulsations such as boiler feed pump discharge, shall be of sufficient length and of suitable configuration to scatter harmful sonic wave energy before it reaches the instrument.
- i) Impulse piping shall be installed to permit thermal expansion without placing excessive stress on the piping and without affecting the gradient of slope. Long continuous straight runs of piping shall always be avoided. If required, expansion loops shall be provided at least every 2.5 meters to break the continuity.
- j) All welded and screwed fittings shall conform to ANSI B16.11. Threads of piping components shall be taper pipe thread in accordance with ANSI B2.1. All threads shall be clean machine cut with all burrs and chips removed. Lubricants shall be of dry film type. Any one of the following compounds may be used as a pipe thread sealer. Bidder shall supply adequate amount of his preferred sealer for erection purpose.
 - a) Permatex
 - b) Molycote
 - c) Neolube(Teflon tape shall not be used as a pipe thread sealer).

9.01.02 Impulse Piping System

Impulse piping system consists of primary impulse pipes/tubes, valves, fittings, valve manifolds and other accessories between the source connection point (source shut-off valve onwards) and all instruments/devices. Impulse pipe span for supporting clamp shall be 1.5 mtr. This will also include all piping and valves etc. required for instrument drain and vent connections. The Bidder shall furnish and test all items required for completeness of this specification.

9.01.03 AIR SUPPLY PIPING

The piping for air supply shall be as specified below (However the Bidder shall supply the materials as required basis to complete the system in all respect)

i) Individual Supply Lines and Control Signal Lines:-

Air lines shall be ¼ inch size, connected by brass/SS316 flare less tubing fittings. Copper/SS316 tubing shall be light drawn tampered tubing conforming to ATM B75 except copper tubing in tubing cables shall be annealed soft temper tubing conforming to ASTM B68 or B75. Fittings on the branch line to facilitate connections to the individual supply line shall be cast brass screwed type.

ii) Flexible Hoses:-

Flexible hoses shall be ¼ inch SS flexible hose pipe and with Buna-N liner steel wire braid reinforcement complete with ¼ inch brass/SS316 fittings and shall have swivel male pipe threads. Each hose shall be done meter in length.

iii) Pipe Material Specification:-

The piping material shall be carbon steel hot-dipped galvanized inside and outside as per IS-1239 or the equivalent of these standard heavy quality with screwed ends. The piping threads shall be as per ASA B.2.1.

iv) Isolating Valves:-

Gate valves as per ASTM B62 inside screw rising stem screwed female ends as per ASA B.2.1 valve bonnet shall be union type and trim shall be stainless steel body rating 150 pounds ASA. Valves sizes shall be ½ inch to 2 inch.

v) Fittings:-

Forged cast steel A234 Gr. WPM galvanized inside and outside; screwed as per ASA B2.1 dimensions as per ASA B16.11, rating 2000 pounds, elbows and soft seats. The size of the fittings shall be ½ inch through 2 inch.

vi) Air Filter Regulator Set:-

An instrument Air Filter Regulator Set with mounting assemblies shall be provided for each pneumatic device requiring air supply.

vii) Instrument Air Piping System:-

a) Instrument Air shall be made available by the bidder at 3.5 to 7.0 Kg/cm² pressure. The instrument air may be arranged as under:-

11. For the control valves and power cylinders in owner's scope but controlled by bidder's control system, the instrument air requirement for E/P converter shall be tapped from the nearby instrument air header laid by bidder / already laid existing piping with accessories available near the control valves or damper.

Complete hardware required for interfacing with Owner system shall be in bidder scope.

- b) Air supply piping shall be installed at site always with a slope of over 1/100 to prevent accumulation of condensed water within the pipe.
- c) All joints in the instrument air sub-header shall be of screwed type.
- d) Instrument air line shall be separate for each individual instrument, equipment & drive with own isolation valve and other required hardware. Tee off of instrument line for two or more same/similar services instrument, equipment & drive are not acceptable.
- e) Instrument air flushing/purging lines shall be provided for Bowl Mill DP, secondary air flow measurement instrument and other all flue gas services instruments etc.

viii) Signal / Control Air Tubing System:-

Necessary tubes with fittings and accessories for output signal from pneumatic instruments mounted in the field and control signals to final control elements shall be covered under this tubing system.

9.02.00 SPECIFICATION FOR ERECTION HARDWARE

The erection hardware shall meet the following specifications:-

	<u>Item</u>	<u>Specification</u>
9.02.01	Impulse Piping	
	i) High pressure and high temperature services (Medium: Steam & Water and furnace region)	Seamless Alloy Steel piping to ASTM A335 GR.P91/22 (schedule XXS/160 for high pressure & high temperature)
	ii) Low pressure and low temperature services (Medium: Steam & Water)	Seamless carbon steel piping to STM A106, Gr.C
	iii) Low pressure and low temperature services (Air, Flue gas)	ERW carbon steel piping to IS 1239:1973 Heavy class System)
	iv) Steam and water analysis system	Seamless stainless steel piping to ASTM A312 GR. TP-321
	v) Seamless copper tubing	ASTM B-75

9.02.02 **Fittings Double compression type**

- i) Material for socket weld fittings ASTM A105
ASTM A182,
Gr. F22
6000/3000 lbs
- ii) Dimensions of fittings ANSI B16.11
- iii) Fittings for steam and water analysis. Gr. F-321

9.02.03 **Valves**

- i) 3 – way valves SS body/forged CS
body stellite internals and SW ends
as per requirement for 2500 lb/800 lb
ASA ratings.
- ii) 5- valve manifolds FAS body/FCS body
316SS stellite internals with NPT(F)
SCRD ends for 3000/2500 lb/1500
lb/800 lb ASA ratings. Construction –
Single block (Bar stock)
- iii) 3-valve manifolds FAS body/FCS body
316SS stellite internals with NPT(F)
SCRD ends for 3000/2500 lb/1500
lb/800 lb ASA ratings. Construction –
Single block (Bar stock)
- iv) 2-valve manifolds FCS body, 316SS
stellite internals, NPT(F) SCRD
ends. Construction – Single block
(Bar stock)
- v) Isolation and drain valves Globe valves with
FAS body/FCS body, 316SS stellite
internals SW ends for 3000/2500
lb/1500 lb/800 ASA ratings.

9.02.04 Condensation vessels FAS/FCS body with NPT (F) SCRD
connection and vent plugs for 3000/2500/1500/800
lb ASA ratings.

9.02.05 Racks and Associated Equipment ANSI C83.9-1972

9.02.06 Code for pressure piping, welding and Hydrostatic testing ANSI B-31.1

- 9.02.07** Flexible conduits with fittings Lead coated, paper insulated, heat resistant flexible metallic conduits with necessary fittings.
- 9.02.08 3 Valve manifold shall be used, wherever Diff Pressure transmitter/switch have been used for pressure measurement.
- 9.02.09 5 Valve manifold shall be used for Diff. Pressure & Flow measurement Transmitters/Switches.
- 9.02.10 In addition to above, table # 9.1 shall also be followed for selection of specific erection hard ware as per process requirements.

9.03.00 TRANSMITTER & SWITCHES ENCLOSURES

In general, BTG process transmitters & switches installed at outdoor location and in areas where they are subjected to splashing oil, water, steam etc., shall be mounted in closed type transmitter rack. For other areas (indoor), open type racks may be used for installation of transmitters and process switches. However the actual requirement shall be finalized during detailed Engineering considering following:-

- i) Transmitter/Switches enclosures shall be free standing, enclosed type offering protection against dust, moisture and vermin. Enclosures shall be suitable for outdoor installations, in thermal power plants.
- ii) The enclosures shall comprise of Galvanized Sheet mounting plate internally. Also external-mounting brackets in Polyamide or Stainless Steel shall be available. Alternatively transmitter enclosures can be glass Fiber Reinforced Polyester (GRP) compression moulded and shall be weather proof.
- iii) Instrument piping inside the enclosure shall conform to the specification and in line with typical installation drawings enclosed with the specification.
- iv) Blow down header shall be provided inside the enclosure as called for.
- v) Bulk head connection shall be provided to receive and terminate the impulse pipes from root valves.
- vi) Instrument tubing, fittings and isolation, drain valves shall be to ANSI code for pressure piping. Piping/tubing shall be subject to hydrostatic tests at 1.5 times maximum system pressure.
- vii) Support angles shall be provided for valve manifolds, wiring trays etc. Enclosures shall be complete with necessary bulk head fittings, junction boxes, drain header and other accessories as needed on the basis of approved hook up drawings.
- viii) Sufficient spacing among adjacent transmitters shall be maintained to offer easy accessibility and operational convenience. The enclosure shall be designed with sizes to suit the grouping and to completely include all the hardware for hooking up

the transmitters to the process on the basis of approved installation diagrams. A maximum of five (5) transmitters are envisaged to be grouped in one enclosure.

- x) A minimum of twenty (20) percent spare terminals shall be provided. Only one wire per terminal shall be used on the outgoing side of these blocks (for cable panel). Any common connections required shall be provided on the panel side of the block. All incoming power terminals are to be clearly identified in a manner distinctly different from all other terminals and grouped in a logical pattern.
- xi) Chapter no. 6 of this volume shall also be referred for designing of Transmitter/Switches enclosures.

9.04.00

LOCAL INSTRUMENTS, LOCAL BOARDS AND TAPPING POINTS

- i) All local gauges as well as sensors, Transmitters and switches any other instruments for parameters like pressure, temperature, level, flow etc for safe and efficient operation of equipment under the scope of specification, shall be provided by bidder as approved by Owner. Such equipment shall be listed by the Bidder detailing the items with the respective functions in service. All field mounted instruments shall be mounted in such a way as not to be affected by vibration & environmental conditions. Racks to mount these instruments shall be furnished by bidder complete with requisite erection hardware, tubings and junction boxes with all terminals of the instruments duly wired complete with cable glands. Groupings of instruments, actual number of racks for instruments and its construction shall be to Owners approval.
- ii) Transmitters & Switches provided shall be mounted in transmitter/Switches enclosures to owner's approval. The junction box for electrical connections shall be outside the transmitter enclosures.
- iii) All erection hardware required for complete installation/ implementation of entire instrumentation specified is included in bidders scope. Any change in size, type, rating or in quantity deemed necessary during engineering shall be supplied within package price with no additional financial implication to owner.
- iv) Bidders scope includes providing counter flanges on pipe lines/ vessels to suit owner arranged flanged devices. Counter flanges shall be complete with gaskets, nuts, bolts and other requisite accessories for proper installation.
- v) Separate and independent tapping on equipment/associated piping shall be provided to suit the philosophy of redundant primary sensors. Separate sensors for control and monitoring etc are as decided by Owner. This shall include application such as first stage pressure. Wherever the process value being measured needs to be compensated for temp, pressure variations, the tapping points for such compensating elements shall be provided in requisite number along with the tapping for the process value.
- vi) Wherever transmitters & switches are provided, in addition Local gauges shall also be provided by bidder for local field monitoring.

- vii) Local instruments and remote sensors & transmitters to be furnished with the equipment shall generally be as indicated herein and as per redundancy criteria indicated elsewhere but not be limited to the following: -

1. Pressure Measurement

i. **Pressure Gauge** for:

- a) Shell pressures of all Deaerator, HP and LP heaters and other vessels.
- b) Mercury manometers shall be provided during air outlet flows measurement.
- c) Bleed steam pressure at extraction point for all turbine extractions and for pressure on drain lines.
- d) Pressure gauges at inlets and outlets of condensate extraction pumps, main oil pump, each auxiliary oil pump, AC standby oil pump, DC Emergency oil pump, jacking oil pumps, DM makeup pumps, DMCW pumps, BFP, or any other pumps etc.
Pressure Gauge at outlet of each type of Fan.
- e) Lube oil pressure before and after oil coolers, HPT & IPT front seal chamber leak off pressure.
- f) MS pressure downstream of ESV, after HPT control valves and after HPT first stage, HRH steams pressure after IV, Gland steam header pressure, HPT exhaust etc.
- g) Condensate pressure in condensate pump discharge header, and feed water pressure at inlet and outlet of each LP & HP heaters.
- h) LP turbine exhaust pressure and condenser pressure
- i) Relay/Lube/Control oil pressure, Drain oil lines pressure.
- j) Pressure gauges for vacuum pumps and each pump discharge.
- k) Pressure gauge at Instrument and service air header in compressor room and in the field at the main location of instrument/service air header, the pressure gauges shall be provided.
- l) Pressure gauges at inlet and outlet of each heat exchanger and cooler.
- m) Frame mounted Pressure Gauges (FMG) shall be provided for Main steam Pressure, Feed water pressure to economizer, CRH Steam Pressure, HRH Steam Pressure etc.
- n) For condensate storage tank the pressure gauge in terms of 0-10000 mm wc or suitable range having **dial size of 300 mm or bigger size** shall be provided.
- o) **U tube manometer with Hg filled for direct measurement of condenser vacuum** shall be provided in the fixed with isolation valve for local indications.
- p) Above are the minimum requirements, actual quantities shall be as decided during detailed engineering by owner.
- q) Pressure gauge for all BoP packages as decided during detailed engineering by owner.

ii. **Pressure Switches**

- a) Pressure switches at condensate Extraction Pump Discharge header, Boiler feed pump, seal water line or any other pumps for alarm (high & low) and interlock purpose.

- b) Pressure switches for steam supply to LP/HP heaters.
- c) Pressure switches for initiation of turning gear.
- d) Pressure switches for control oil, jacking oil and lube oil pressure for all required alarms and interlocks.
- e) Steam pressure downstream of ESV, steam pressure after first stage of HPT, gland steam header pressure and suction line from turbine glands to Gland cooler.
- f) Pressure switches for condenser vacuum low, very low alarms & interlocks.
- g) Condenser water box pressure for alarm interlocks.
- h) Pressure switches (low & high) for individual pumps/blowers suction/discharge and discharge header – alarms, interlocks and protection
- i) At the main location of instrument air header the pressure low switches shall be provided for alarms in DDCMIS
- j) Pressure switches/any other process switch etc. for OLCS / Alarms / Interlocks / Protection. Pressure switches at inlet, outlet of individual pumps and discharge header of pumps for protection and auto start / stop & alarms.
- k) Above are the minimum requirements, actual quantities shall be as decided during detailed engineering as per redundancy criteria by owner.
- l) Pressure switches for all BoP packages as decided during detailed engineering. by owner.

iii. **Differential Pressure Transmitters, Diff Pressure Switches & Diff. Pressure Gauges**

- a) Pressure across strainers and filters.
- b) Diff. Pressure Transmitters/switches/Gauges for all BoP packages as decided during detailed engineering by owner.
- c) Diff. Pressure Transmitter across condenser on CW lines, Air pre heaters on air & flue gas lines, on PA lines, CEP suction strainers, Feed control station etc.
- d) Above are the minimum requirements, actual quantities shall be as decided during detailed engineering as per redundancy criteria by owner.

iv. **Pressure Transmitters**

- a) For all services as mentioned for Pressure gauges & Pressure Switches.
- b) Pressure Transmitters at condensate Extraction Pump individual Discharge and discharge header, Boiler feed pump individual Discharge and discharge header, seal water line or any other pumps/fans/HT/LT unidirectional drive for alarm (high & low) and interlock purpose.
- c) Pressure transmitter for wind box (Left/Right) & pulverizer seal air fans discharge pressure.
- d) Pressure Transmitters as on required basis for monitoring, interlocks & controls as per redundancy criteria and approved by owner.
- e) Above are the minimum requirements, actual quantities shall be as decided during detailed engineering as per redundancy criteria and approved by owner.
- f) Pressure Transmitters for all BoP packages as decided during detailed engineering by owner.

2. Temperature Measurements:-

The Bidder shall furnish all temperature sensing elements to be installed in their piping. The scope of supply shall include, but not limited to the following: -

- i) Duplex RTDs for all bearing, drain oil from bearings, LPT exhaust steam, 3 no's of duplex RTDs each on left and right CW outlet of condenser etc.
- ii) 6 no. duplex or 12 no. simplex Embedded temperature detectors for various motor stator windings and duplex RTDs for Motor/Pump bearing temp.
- iii) Chromel-alumel surface/other thermocouples for turbine casings, ESV, IV bodies, superheated steam, hot reheat steam piping, steam of first stage HPT, inlet bowl of IPT, steam exhaust of HPT, down stream of ESV and IV, steam in ESVs and IVs, steam admission pipes metal temperatures, HPC, IPC flange metal temperature etc.
- iv) For all HP heaters remote monitoring with redundant independent sensors of inlet/outlet temperatures of feed water and extraction steam shall be provided in addition to local gauges.
- v) For all LP heaters remote monitoring with redundant independent sensors of inlet/outlet temperatures of feed water and extraction steam shall be provided in addition to local gauges.
- iv) Temperature sensors for HP-LP bypass system for measurement as well as for control.
- v) Adequate number of temperature Elements shall be furnished to provide initiating contacts for temperature interlocking and trip circuits. The temperature elements shall be provided, but not limited to the following: -

Steam temperature of HPT exhaust, steam temperature after ESV (L&R), IV (L&R), LPT exhaust hood steam, drain oil temperature of all journal bearings and thrust bearing & lube oil header temperatures, thrust bearing of each condensate extraction pump and vacuum pump protection, interlocks.

- vi) Metal Temp measurement and steam temp measurement at each super heater & Reheater location.
- vii) Temp. Element & Temp gauges at Feed water line to economizer inlet, economizer to steam separator, spray water lines to desuperheaters, Soot blower steam, Soot blower steam drain lines, steam drain lines, Flue gas & air lines etc
- viii) Temp. Measurements (Local & remote) for all BoP packages as decided during detailed engineering.
- ix) Thermocouples for Temp. above 200 deg C shall be provided by bidder.
- x) For plate heat exchangers, spare thermowell provision shall be made at inlet & outlet of ACW & DMCW lines in addition to local & remote temperature monitoring points.
- xi) Each ESP Hopper shall be provided with RTDs to control the temperature of ash through Hopper heater.

xii) Temperature gauges.

- a) For bearing temperatures AC and DC lube oil pumps, LPT exhaust hood etc.
- b) For condensate and feed water at inlet and outlet of HP heaters, Vacuum pumps, LP heaters etc.

- c) Steam & water inlet/outlet of LP and HP heaters, steam and air mixture inlet to vacuum pumps, and drain lines etc.
- d) Journal/thrust bearing drain oil, lube oil at inlet/outlet of oil coolers, cooling water at inlet and outlet of oil coolers etc.
- e) Thrust bearing of each condensate extraction pump.
- f) Temp. Gauges at inlet and outlet of each heat exchanger and cooler.
- g) Frame mounted Temperature Gauges (FMG) shall be provided for Main steam Temperature, Feed water Temperature to economizer, CRH Steam Temperature, HRH Steam Temperature etc
- xiii) Above are the min. requirements, actual quantities shall be as decided during detailed engineering by owner.

3. Level Measurement

- i) Level gauges - level gauges for boiler separator, HP heaters, LP heaters, deaerator, drain cooler, gland steam cooler, vacuum tanks, condenser hot well CBD tank, stator water tank, Stator water expansion tank and other pressure vessels, main oil tank and all oil tanks in BTG & BOP package. The level gauges shall be mica shielded steel armoured transparent glass type. Level gauges for condenser hot well shall be provided on both sides.
- ii) Level switches for HP/LP heaters, drain cooler, gland steam cooler, condenser hot well, deaerator, main oil tank and other pressure vessels, tanks, sumps etc. The separate switches for high, very high and low levels shall be provided as per interlocks and protection requirements.

External cage mounted magnetic level switches/ displacer type shall be employed for low pressure & low temp. services.

However conductivity type level switches shall be provided for high pressure & high temp services like HP heaters, CRH/HRH drain Pot, Turbine Drains etc.

- iii) Level Transmitters (Type as per Owner approval) for open sump/tank/bunker/vessel/heaters.
- iv) Level measurement for all BoP packages as decided during detailed engineering.
- v) Level switches for OLCS / Alarms / Interlocks / Protection. Level switches for sump/tank level high/normal/ low/very low interlocks.
- vi) Each ESP hopper must be provided with 3 nos. level switch (switches 2 nos. for high level and One no. for low level.)
- vii) Above are the min. requirements, actual quantities shall be as decided during detailed engineering by owner.

4. Flow Measurements:-

- a) Primary Elements: Flow nozzles shall be used for feed water flow and other critical measurements where weld-in construction is required. Flow nozzles shall be made of stainless steel, with three sets of pressure taps installed in the pipe wall where required. One no. spare set of pressure tap shall also be provided on flow nozzle,

wherever required. Installation of flow nozzles and pressure taps shall be made in the pipe fabricator's shop and shall be witnessed by a representative from the flow nozzle manufacturer.

- b) Paddle type orifice plates shall be used for other flow measurements where flanged construction and higher pressure loss are acceptable. Orifice plates shall be made of stainless steel. Orifice flanges shall be of the raised face weld neck type with dual sets of taps.
- c) Construction and installation of flow nozzles and orifices shall conform to the requirements of ASME Performance Test Code PTC-19.5, and discharge coefficients shall be predicted in accordance with data published in ASME Research Report on Fluid Meters.
- d) Airfoil or venturi flow sections, shall be used for measuring boiler combustion airflow.
- e) A special high accuracy flow nozzle pipe shall be provided to determine feed water flow to the economizer. This nozzle shall be hydraulically calibrated and utilized for feed water flow control and for turbine testing as described in ASME PTC 6 (latest revision).
- f) Orifice plates shall be supplied with carrier rings as per process requirement.
- g) Doppler effect type flow meters shall be used for sludge applications.
- h) For Raw water, water treatment plant and effluent treatment plant, ultrasonic type flow meters to be used.
- i) Secondary Elements: Secondary elements for differential type flow sensors shall be strain gauge or capacitance type differential pressure transmitters. Square root extraction required for the DP transmitters shall be performed electronically in the transmitter itself.
- j) HFO/LDO flow meters shall be based on coriolis mass flow technology. Fuel Oil meters shall be provided for fuel oil unloading system and near boiler after day oil tank (at main supply & return line).
- k) Flow nozzles shall be provided for following services in main plant:-
 - i) Steam flow measurement for BFP Turbines.
 - ii) Feed water flow measurement
 - iii) Auxiliary steam flow measurements
 - iv) HP bypass flow measurements
 - v) BFP suction flow.
 - vi) Deaerator water flow measurement
 - vii) HP heaters drain Flow measurements.

Orifices shall be provided for following services:-

- i) Spray water flow measurement

- ii) Condensate flow measurements
 - iii) DM/hotwell makeup to condenser.
 - iv.) Condensate dump flow to CST
 - v) Gland Steam Condensate flow measurements
- l) For DM water flow & Ash Slurry flows measurements online electromagnetic flow meter shall be used.
 - m) At CW & ACW pump discharge headers flow transmitters shall be provided (Non Contact ultrasonic Type are preferable). In addition flow measurement shall also be provided for CW water used any where except condenser service.
 - n) Instrument and Service Air - Vortex/Swirl type Flow meter
 - o) Flow transmitters for general applications shall be of the differential pressure type
 - p) Flow switches for OLCS / Alarms / Interlocks / Protection.
 - q) Lubricating oil Flow transmitter/meter with switch shall be provided for Bearing systems of APH, FD, PA, etc.,
 - r) Sight glasses flapper indication type shall be provided on lube oil cooling water piping as required to ensure indication of fluid flow.
 - s) On line Fuel flow & velocity measurement facility in each Pulverized Fuel (PF) pipe for each coal pulveriser shall be provided by bidder for accurate, absolute and simultaneous measurement of coal velocity, coal density, coal mass flow rate and air-to-fuel ratio. The equipments shall compromise of sensors working on micro wave technology.
 - t) In addition to the **conventional triple DP measurement techniques** involving venturi/Airfoil for secondary air flow measurement, One number **Flow measurement** system each on Left side and Right side shall be provided **as redundant/checking measurement for secondary air flow** which could be used in the optimization package.

On line secondary air flow & velocity measurement facility in each on left side & right side shall be provided by bidder for accurate, absolute and simultaneous measurement of air velocity & flow rate. The equipments shall compromise of sensors working on tribo-electric (Correlation technique) technology.
 - u) Any other flow element/meter required for system shall be finalised as per system requirement and as per approved drawings/documents by owner.

9.05.00

Process Connections

The type of instrument source connection shall depend upon the process parameters and the tapping size. The source connection drawings shall be finalised during the engineering stage.

Size of tapping point stub, number and size of root valves for different types of measurements are as follows:

Sl. No.	Quantity of root valves	Size of stub and root valve	Service Condition
Pressure and Differential Pressure Measurement			
(i)	2	25NB	≥ 40 bar(g) OR 425°C
(ii)	1	15NB	< 40 bar(g) AND 425°C .
Level Measurement			
(a) Level Gauge & Switch			
(i)	2	25NB	≥ 40 bar(g) OR 425°C
(ii)	1	25NB	< 40 bar(g) AND 425°C
(b) Level transmitter (displacement type)			
(i)	2	40NB	≥ 40 bar(g) OR 425°C
(ii)	1	40NB	< 40 bar(g) AND 425°C
(c) Stand pipe for level measuring instrument			
(i)	2	80 NB	≥ 40 bar(g) OR 425°C
(ii)	1	80 NB	< 40 bar(g) AND 425°C
<i>Flow Measurement</i>			
(i)	2	25NB	≥ 40 bar(g) OR 425°C
(ii)	1	25NB	< 40 bar(g) AND 425°C
Sampling system measurement (Steam and Water Service)			
(i)	2	25 NB	≥ 40 bar(g) OR 425°C
(ii)	1	25 NB	< 40 bar(g) AND 425°C


Technical Specifications for C&I Systems-Table-No. 9.1

S.No.	System/Line Description	Piping Class	Impulse Pipe material	Schedule (Size)	Materials for fitting/ valve body	Valve steam material	Rating of Piping Fitting	Pressure Class of valve
1	Main steam, Up steam & down stream of HP bypass and up stream of auxiliary steam pressure reducing valve.	A	ASTM-A335 Gr.P-91/22 (Note-2)	XXS (½ Inch)	Note-3	Note-3	9000lb	3000 SPL
2	BFP discharge/ superheater attemperator/spray to PRDS	B	ASTM-A106 Gr. C	160 (½ Inch)	Note-3	ASTM-A-182 Gr.F6a	6000lb	2500 SPL
3	Reheater attemperator	C	ASTM-A106 Gr. C	160 (½ Inch)	ASTM-A-105	ASTM-A-182 Gr.F6a	6000lb	1500 SPL
4	Hot. Reheat/Down stream of Aux.Steam pressure reducing valve upto desuperheater/flash tank drain manifold, HRH upstream & down stream of LP Bypass valve.	D	ASTM-A335 Gr.P-91/22 (Note-2)	160 (½ Inch)	ASTM-A182 Gr.F-22	Note-3	3000lb	2500 SPL
5	Cold reheat upto Tee-off for HP bypass.	E	ASTM-A335 Gr.P-22	80 (½ Inch)	ASTM-A182 Gr.F-22	ASTM-A-182 Gr.F6a	3000lb	800
6	Cold reheat down steam of Tee-off (HP Bypass)	F	ASTM-A106 Gr. C	80 (½ Inch)	ASTM-A105	ASTM-A-182 Gr.F6a	3000lb	800

7	BFP suction/condensate system/Extraction to LPH/HPH and Extractions to BFPT, Desecrator, auxiliary steam.	G	ASTM-A106 Gr. C, ASTM-A335 Gr.P-11/22	80 (½ Inch)	ASTM-A105	ASTM-A-182 Gr.F6a	3000lb	800
8	Air/Flue gas outside furnace.	M	ASTM-A106 Gr.B/C	80 (¾ Inch)	ASTM-A105	ASTM-A-182 Gr.F6a	3000lb	800
9	Air flue gas inside furnace	N	ASTM-A335 Gr.P-22	80 (¾ Inch)	ASTM-A182 Gr.F-22	ASTM-A-182 Gr.F6a	3000lb	800
10.	Purge Air	O	ASTM-A106 Gr.C	80 (¾ Inch)	ASTM-A105	SS316	3000lb	800
11.	DM Cooling water	P	ASTM-A312 TP 316	80/40 (1/2 Inch)	ASTM – A 182 F 316	SS316	3000lb	800
12.	CW & ACW	Q	ASTM-A106 Gr.C	80 (1/2 Inch)	ASTM-A105	SS316	3000lb	800

Note:-

- 1). Above requirements are minimum to be complied by bidder. Rating of piping / fittings / valves etc. is subjected to be approved by owner as per the final design pressure & temperature finalized during the detailed engineering, as per ANSI B 31.1.
- 2). In case temperature is more than 540 deg C, the material shall be P-91 only.
- 3). Material shall be compatible with that of the impulse pipe material and design parameter.
- 4). For DM Plant or DM water services, complete erection Hardware material shall be SS316 only.

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-412-158-A002
	TECHNICAL SPECIFICATION FOR PRE-TREATMENT PLANT.	VOLUME II-B
	2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI	SECTION -D
		REV. NO. 0.0 DATE:
		Page

**DRAWING DOCUMENTS DISTRIBUTION SCHEDULE
(ANNEXURE-A)**



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**TECHNICAL SPECIFICATION FOR
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S.NO.	DESCRIPTION	TANGEDCO	DESEIN/ CONSULTANT	BHEL (PEM)	BHEL SITE AND REGION
1	Drawing for approval/ information	5+1S+2CD	5+1S+1CD	2+1S	--
2	Final drawing (APPROVED)	4+1S+3CD	4+1S+3CD	1+1S	10+1S+1CD
4	AS BUILT DRAWINGS	4+1S+3CD	4+1S+3CD	1+1S	10+1S+1CD
5	CD ROM "FINAL DRAWING"	2CD	1-CD	1CD	2CD
6	Type test reports	2+1S	2+1S	---	2+1S
7	O & M Manuals for approval	2+1CD+SS	2+1CD+SS	1+CD+SS	-----
8	Final O & M Manuals	4+6CD+SS	4+4CD+SS	1+CD+SS	10+5CD+SS
9	Performance guarantee test reports	2+1S	2+1S	---	2+1S

* Applicable for vendor drawings
 CD - Compact Disc (Read Only)
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NOTE: ALL DRGS. SHALL BE PREPARED ON COMPUTER **AUTOCAD (LATEST VERSION)** AND OTHER DOCUMENTS (LIKE DATA SHEET ETC.) ON **MS-OFFICE (LATEST VERSION)**. SOFTWARE. BIDDER NOT COMPLYING WITH THE REQUIREMENT SHALL NOT BE CONSIDERED.



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**SITE STORAGE AND PRESERVATION
(ANNEXURE-B)**

SITE STORAGE AND PRESERVATION GUIDELINES FOR MECHANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)



PROJECT ENGINEERING MANAGEMENT, POWER SECTOR
BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

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- 2 PURPOSE OF STORAGE & PRESERVATION
- 3 MEASURES TO BE TAKEN FOR STORAGE AND PRESERVATION
 - a) GENERAL STORAGE REQUIREMENTS
 - b) GENERAL PRESERVATION REQUIREMENTS
 - c) GENERAL INSPECTION REQUIREMENTS
- 4 TYPE OF STORAGE FOR VARIOUS EQUIPMENT
5. CONCLUSION
6. STACKING ARRANGEMENT FOR PLATES AND STRUCTURAL STEEL

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.
11. Following preservatives/preservation methods can be used depending upon type of equipment
 - a. Rust preventive fluid (RPF)
 - b. Rust protective paints
 - c. Tarpaulin covers, in case of outdoor storage
 - d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –
 - Ingress of moisture and corrosion damages.
 - Damage to protective coating.
 - Open ends in pipes, vessels and equipment -
 - In case any open ends are noticed, same shall be capped.
2. Any damages to equipment / materials.
 - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
 - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere. (C)**

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.



ii **Semi-closed storage. (S)**

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.





iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.



The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H ₂ SO ₄)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self- life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self- life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

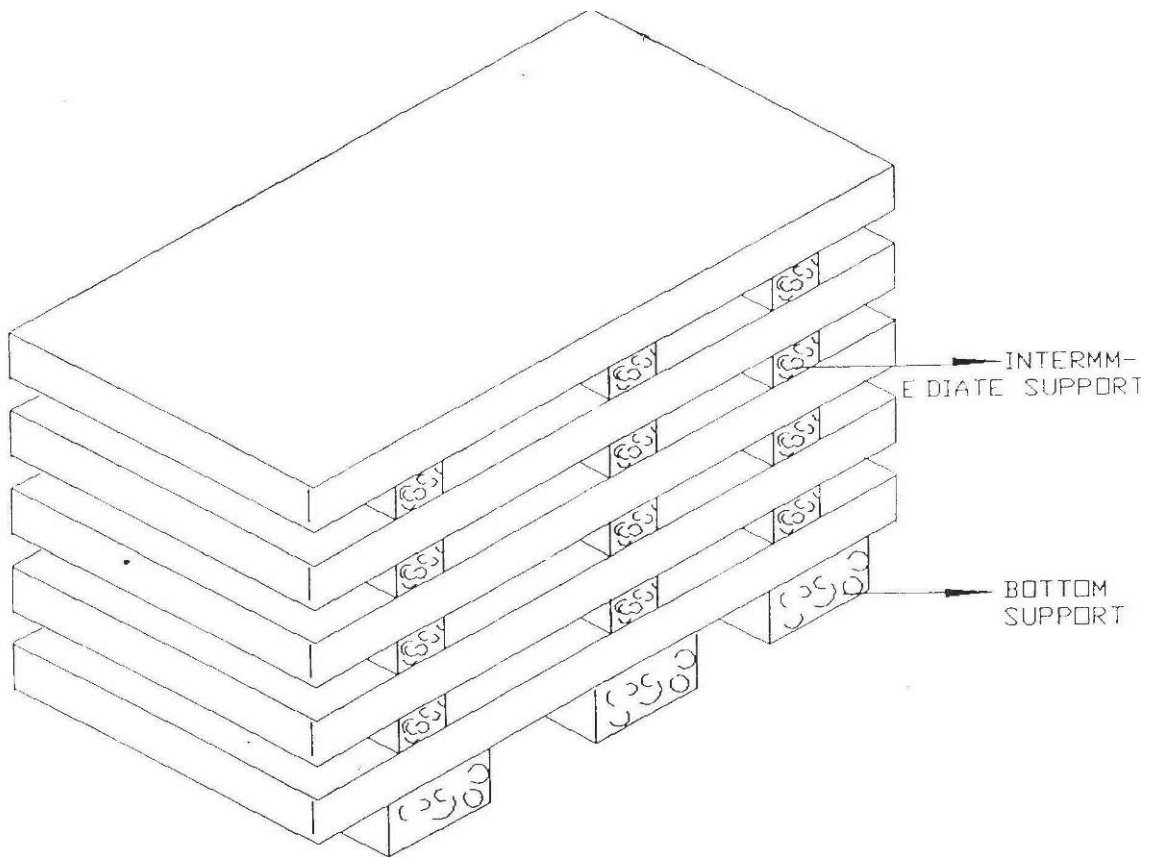


Figure - 1 - PLATE STACKING ARRANGEMENT

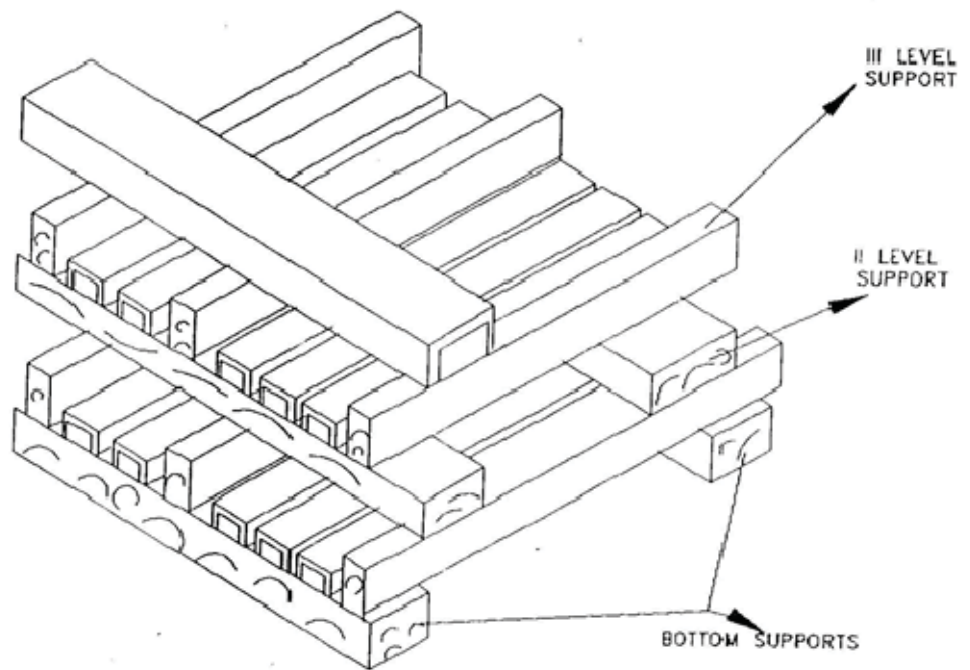



Figure - 2 - STRUCTURAL STEEL STACKING ARRANGEMENT

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-412-158-A002	
	TECHNICAL SPECIFICATION FOR PRE-TREATMENT PLANT.	VOLUME II-B	
		SECTION -D	
	2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI	REV. NO. 0.0	DATE:
		Page	

**ALREADY APPROVED DOCUMENTS (SUBMITTED BY M/S OGBL)
(ANNEXURE-C)**

NOTE:

- 1) BIDDER CAN ALSO GO WITH OTHER MAKE/SUB-VENDOR ITEMS FOR WHICH THE MODIFICATION WORK ON EXISTING CIVIL FOUNDATION TO BE TAKEN CARE BY BIDDER AT SITE.
- 2) THE MAKE OF ITEMS SHALL BE AS PER ENCLOSED APPROVED SUB VENDOR LIST (PE-V0-412-158-A006) ONLY. HOWEVER, ANY ADDITIONAL SUB-VENDOR REQUIRED THE SAME SHALL BE SUBJECT TO BHEL/CUSTOMER APPROVAL DURING DETAILED ENGINEERING WITHOUT ANY COMMERCIAL/DELIVERY IMPLICATION TO BHEL/CUSTOMER.



TITLE:

**TECHNICAL SPECIFICATION FOR
PRE-TREATMENT PLANT.**

2X660 MW ENNORE SEZ COAL BASED
STPP AT ASH DYKE OF NCTPS, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-158-A002

VOLUME **II-B**

SECTION -D

REV. NO. 0.0

DATE:

Page

Sl. No	Drawing/Document No	Title	Status
1	PE-V0-412-158-A001	P&I DIAGRAM FOR PT PLANT	Approved
2	PE-V0-412-158-A002	LAYOUT FOR PT LANT	Approved
3	PE-V0-412-158-A004	PROCESS SIZING CALCULATION	Approved
4	PE-V0-412-158-A006	SUB VENDOR LIST	Approved
5	PE-V0-412-158-A007	CONTROL PHILOSOPHY	Approved
6	PE-V0-412-158-A056	I/O list	Re Submission Pending
7	PE-V0-412-158-A057	Drive list	Approved
8	PE-V0-412-158-A058	Control Scheme	Approved
9	PE-V0-412-158-A003	HYDRAULIC FLOW DIAGRAM & HYDRAULIC LEVEL CALCULATIONS	Approved
10	PE-V0-412-158-A008	TECHNICAL DATA SHEET FOR HORIZONTAL / VERTICAL CENTRIFUGAL PUMPS	Approved
11	PE-V0-412-158-A010	TECHNICAL DATA SHEET FOR METERING PUMPS	Approved
12	PE-V0-412-158-A012	TECHNICAL DATA SHEET FOR BLOWERS	Approved
13	PE-V0-412-158-A014	TECHNICAL DATASHEET FOR BALL VALVES	Approved
14	PE-V0-412-158-A015	TECHNICAL DATASHEET FOR BUTTERFLY VALVES	Approved
15	PE-V0-412-158-A016	TECHNICAL DATASHEET FOR DIAPHRAGM VALVES	Approved
16	PE-V0-412-158-A017	TECHNICAL DATASHEET FOR GATE VALVES	Approved
17	PE-V0-412-158-A018	TECHNICAL DATASHEET FOR NON RETURN VALVES	Approved
18	PE-V0-412-158-A028	MECH. GA FOR CASCADE AERATOR, STILLING CHAMBER, FLASH MIXER AND PARSHALL FLUME FOR CLARIFIER	Approved
19	PE-V0-412-158-A030	MECH. GA FOR CLARIFIER	Approved
20	PE-V0-412-158-A033	MECH. GA AND DATA SHEET FOR CLARIFIER BRIDGE MECHANISM	Approved
21	PE-V0-412-158-A035	MECH. GA FOR CHEMICAL HOUSE INCLUDING ALL DOSING TANKS	Approved
22	PE-V0-412-158-A036	MECH. GA FOR SLUDGE SUMP	Approved
23	PE-V0-412-158-A094	PG TEST	Approved
24	PE-V0-412-158-A021	VALVE SCHEDULE	Approved
25	PE-V0-412-158-A049	INSTRUMENT SCHEDULE	Approved
26	PE-V0-412-158-A092	PAINTING SCHEDULE	Approved
27	PE-V0-412-158-A060	CIVIL DESIGN CALCULATION FOR CASCADE AERATOR, STILLING CHAMBER, FLASH MIXER AND PARSHALL FLUME FOR CLARIFIER	Approved
28	PE-V0-412-158-A061	CIVIL GA FOR CASCADE AERATOR, STILLING CHAMBER, FLASH MIXER AND PARSHALL FLUME FOR CLARIFIER	Approved
29	PE-V0-412-158-A062	CIVIL GA & RC DETAILS FOR STILLING CHAMBER, FLASH MIXER AND PARSHALL FLUME(Sh1) & STAIRCASE OF CASCADE AERATOR(Sh2)	Approved
30	PE-V0-412-158-A064	CIVIL GA AND RC DETAILS OF CLARIFLOCCULATOR	Approved
31	PE-V0-412-158-A065	CIVIL GA AND RC DETAILS OF CLARIFLOCCULATOR OUTLET CHANNEL	Approved
32	PE-V0-412-158-A075	CIVIL DESIGN CALCULATION FOR SLUDGE SUMP	Re Submission Pending



TITLE:

**TECHNICAL SPECIFICATION FOR
PRE-TREATMENT PLANT.**

2X660 MW ENNORE SEZ COAL BASED
STPP AT ASH DYKE OF NCTPS, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-158-A002

VOLUME **II-B**

SECTION -D

REV. NO. 0.0

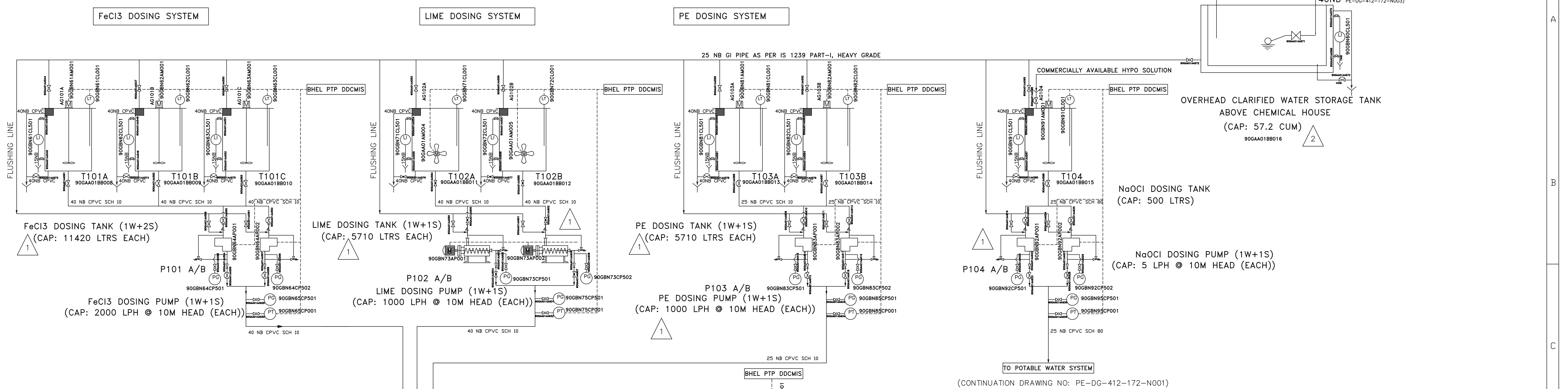
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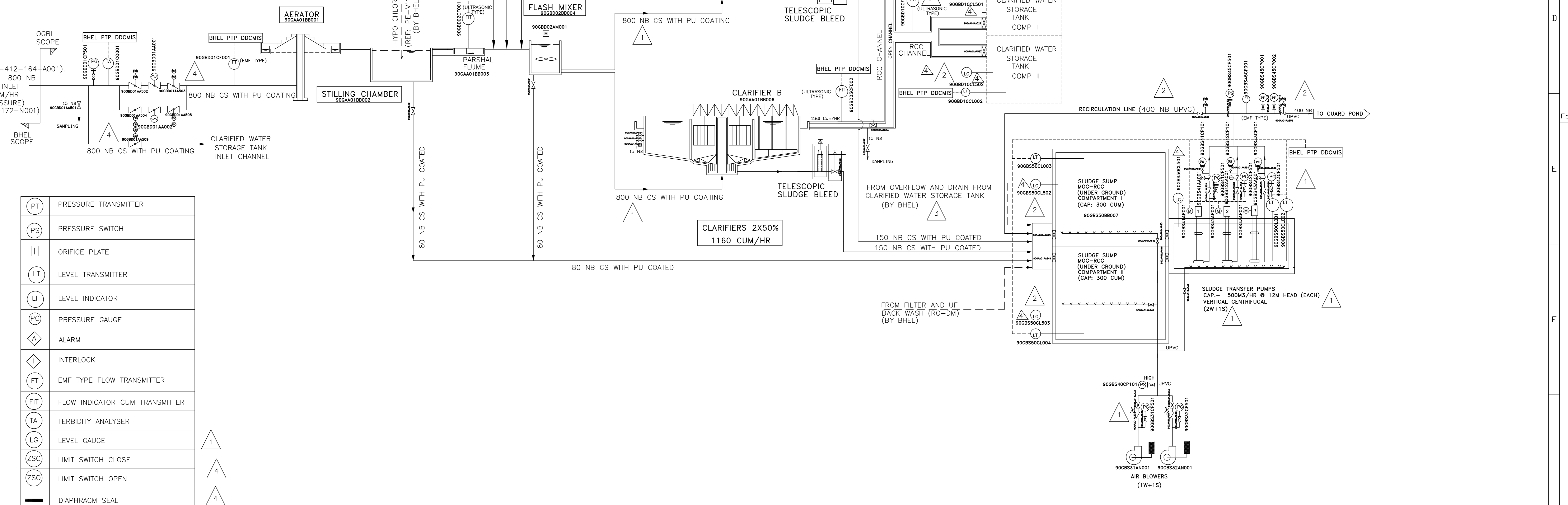
33	PE-V0-412-158-A077	Civil GA and Reinforcement Drawing For Sludge Sump	Re Submission Pending
34	PE-V0-412-158-A046	TECHNICAL DATSHEET AND HOOK UP DRAWING FOR LOCAL INSTRUMENTS	Approved
35	PE-V0-412-158-A048	TECHNICAL DATSHEET AND HOOK UP DRAWING FOR ANALYSERS	Approved
36	PE-V0-412-158-A027	TECHNICAL DATA SHEET HOIST, WEIGHING SCALE , TROLLEY AND CHAIN PULLEY BLOCK	Approved
37	PE-V0-412-158-A024	PIPING SPECIFICATION	Approved
38	PE-V0-412-158-A047	TECHNICAL DATSHEET AND HOOK UP DRAWING FOR TRANSMITTERS	Re Submission Pending
39	PE-V0-412-158-A068	Ground improvement of Clarifier-PTP	Approved
40	PE-V0-412-158-A067	Ground improvement of Cascade aerator, Stilling Chamber, Flash Mixer AND Parshall Flume -PTP	Approved
41	PE-V0-412-158-A026	TECHNICAL DATA SHEET FOR AGITATOR	Approved
42	PE-V0-412-158-A009	QAP FOR HORIZONTAL / VERTICAL CENTRIFUGALPUMPS WITH MOTOR	Approved
43	PE-V0-412-158-A011	QAP FOR METERING PUMPS WITH MOTOR	Approved
44	PE-V0-412-158-A013	QAP FOR BLOWERS WITH MOTOR	Approved
45	PE-V0-412-158-A020	QAP FOR VALVES	Approved
46	PE-V0-412-158-A054	QAP / CHECK LIST FOR ALL INSTRUMENTS	Approved
47	PE-V0-412-158-A097	QAP FOR 800 NB BUTTERFLY VALVES	Approved
NOTE: FOR "Re Submission Pending" THE LATEST DRAWING/DOCUMENT ENCLOSED, FURTHER TO BE REVISED BY BIDDER.			

PIPE SIZES OF CS MATL.

NB	OD	THICK.
200	219.1	6.4
250	273.0	6.4
300	323.9	6.4
350	355.6	8.0
400	406.4	8.0
450	457.0	8.0
500	508.0	8.0
600	610.0	8.0
700	711.2	10.0
800	813	10.0



5. P&ID FOR EFFLUENT TREATMENT PLANT (PE-DG-412-164-A001).



SYMBOLS

	DIAPHRAGM VALVE
	GATE VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	BALL VALVE
	AGITATOR VERTICAL
	'Y' TYPE STRAINER
	NON RETURN VALVE
	METERING PUMP
	ISOLATION GATE VALVE
	MOTOR OPERATED
	SAFETY RELIEF VALVE
	CENTRIFUGAL PUMP (VERT)
	FLOAT VALVE
	AGITATOR (HORIZONTAL TYPE)
	ISOLATION GATE VALVE
	PRESSURE TRANSMITTER
	PRESSURE SWITCH
	ORIFICE PLATE
	LEVEL TRANSMITTER
	LEVEL INDICATOR
	PRESSURE GAUGE
	ALARM
	INTERLOCK
	EMF TYPE FLOW TRANSMITTER
	FLOW INDICATOR CUM TRANSMITTER
	TURBIDITY ANALYSER
	LEVEL GAUGE
	LIMIT SWITCH CLOSE
	LIMIT SWITCH OPEN
	DIAPHRAGM SEAL

REFERENCE DRAWINGS

1. P&ID FOR PLANT WATER SYSTEM (PE-DG-412-172-N001).
2. WATER BALANCE DIAGRAM (PE-DG-412-172-N110).
3. P&ID FOR HYPO CHLORITE DOSING (PE-V11-412-174-A101).
4. P&ID FOR SERVICE WATER SYSTEM (PE-DG-412-172-N003).
5. P&ID FOR EFFLUENT TREATMENT PLANT (PE-DG-412-164-A001).

NOTES:

1. THE DOSING OF CHEMICAL AT VARIOUS STAGES OF PROCESS SHALL BE CONTROLLED THROUGH STROCK ADJUSTMENT FROM OWS AS PER TECHNICAL SPECIFICATION/ CONTRACT VOL V, ANNEXURE C, CL. NO. 5.00.00
2. KKS NO: 90GBD01AA502 TO 90GBD01AA505, 90GAA01AA652 & 90GAA01AA651 VALVE PROVIDED WITH LIMIT SWITCHES.

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No. OFF

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE	DRN	FAISAL N	FN	SIGN	DATE
MAX	DESN	FAISAL N	FN		26-09-18
	CHD	MUJAZZAM I	MI		26-09-18
	APPD	ASLAM A	AA		26-09-18

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

BHARAT HEAVY ELECTRICALS LTD
GLOBAL BUSINESS LIMITED

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

BHCL LOA NO: PW/PE/PG/EN1/P-310/17

TITLE P&I DIAGRAM FOR PT PLANT

DEPT. SCALE OGBL DOC NO.

SIGN OGBL/OC-983/P&ID/PTP/18/300

DATE SHEET 1 OF 1 REV 4

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD	APPD	
				02	08.06.18	FN	MI	AA	00	10.02.18	FN	MI	AA
				03	25.07.18	FN	MI	AA	01	02.05.18	FN	MI	AA

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CUSTOMER'S DRAWING NO. 90GAA01BB016

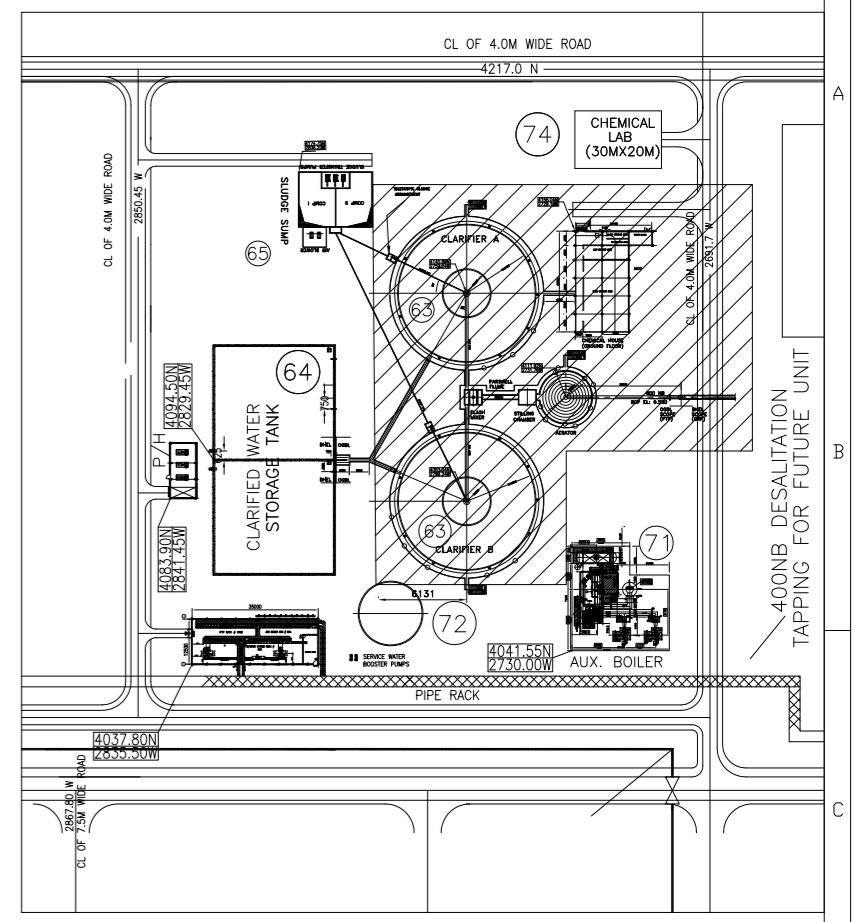
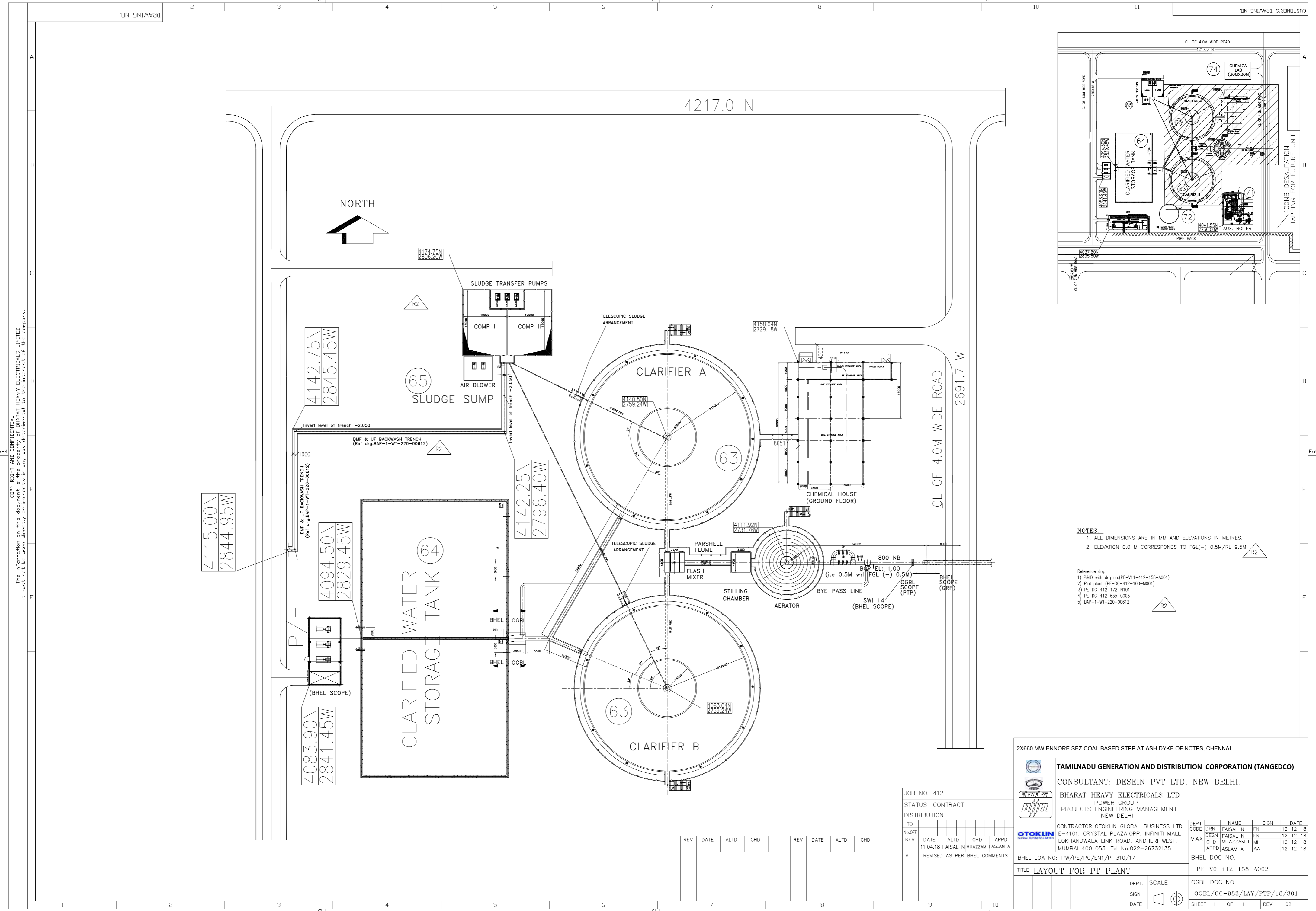
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Fold-4

Fold-1

Fold-1



- NOTES:-**
1. ALL DIMENSIONS ARE IN MM AND ELEVATIONS IN METRES.
 2. ELEVATION 0.0 M CORRESPONDS TO FGL(-) 0.5M/RL 9.5M

- Reference drg:
- 1) P&ID with drg no.(PE-V11-412-158-A001)
 - 2) Plot plant (PE-DG-412-100-M001)
 - 3) PE-DG-412-172-N101
 - 4) PE-DG-412-635-C003
 - 5) BAP-1-WT-220-00612

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.	
	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LTD POWER GROUP PROJECTS ENGINEERING MANAGEMENT NEW DELHI
	CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD E-4101, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135
DEPT CODE	DRN FAISAL N FN 12-12-18
MAX	DESIGN FAISAL N FN 12-12-18
	CHD MUAZZAM I MI 12-12-18
	APPD ASLAM A AA 12-12-18
BHEL LOA NO: PW/PE/PG/EN1/P-310/17	
BHEL DOC NO. PE-V0-412-158-A002	
TITLE LAYOUT FOR PT PLANT	
DEPT. SCALE OGBL DOC NO.	
SIGN OGBL/OC-983/LAY/PTP/18/301	
DATE SHEET 1 OF 1 REV 02	

JOB NO. 412	
STATUS CONTRACT	
DISTRIBUTION	
TO	
No.Off	
REV	DATE ALTD CHD APPD
A	11.04.18 FAISAL N MUAZZAM I ASLAM A
REVISED AS PER BHEL COMMENTS	





REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD

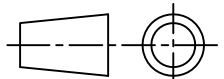
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -
-------------	-----------	---	------------	-----------------	---------------	-----------

HYDRAULIC FLOW DIAGRAM & HYDRAULIC LEVEL CALCULATIONS		NAME	SIGN	DATE	
	PREP	FAISAL N	FN	11-12-18	
	CHKD	MUAZZAM I	MI	11-12-18	
BHEL LOA NO: PW/PE/PG/EN1/P-310/17		APPD	ASLAM A	AA	11-12-18

DEPT.						CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A003	REV 02
SIGN		N.A.					OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/HFDLC/PTP/18/302	
DATE							NO. OF SHEETS 6 EXCLUDING COVER PAGE	

HYDRAULIC CALCULATIONS AND DIAGRAM FOR PRE TREATMENT PLANT		
CLIENT: BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT: 2X660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT		
PACKAGE: PRE TREATMENT PLANT		
BHEL DOC NO-PE-V0-412-158-A003		
OTOKLIN DOC NO-OGBL/OC-983/HFDLC/PTP/18/302		

Flow	=	2854.00 m3/hr
	=	0.7928 m3/sec

1 Cascade aerator

Top of aerator	=	7.586 m
Provided no. of steps	=	7
Height of each step	=	0.250 m
Top of aerator (1st step)	=	7.336 m
Top of aerator (2st step)	=	7.086 m
Top of aerator (3st step)	=	6.836 m
Top of aerator (4st step)	=	6.586 m
Top of aerator (5th step)	=	6.336 m
Top of aerator (6th step)	=	6.086 m
Top of aerator (7th step)	=	5.836 m
Water level in collection tray	=	5.546 m (R2)
Invert level of bottom of collection tray	=	4.706 m (R2)

2 Cascade Aerator collection tray to Raw water channel

Total flow	=	2854.00 m3/hr
	=	0.793 m3/sec

For launder design, consider half of the launder circumference for half of the flow and other half of the launder for the other half flow.

Half Flow	=	1427 m3/hr
	=	0.396 m3/sec
Velocity in open channel	=	0.6 m/sec
Width of channel	=	0.8 m
Depth of channel	=	0.83 m

By using Manning's Formula

$$V = 1/n \times (r)^{2/3} \times (S)^{1/2}$$

Where,

S = Slope of Hydraulic gradient.

V = Velocity in mps &

n = Manning's Co-efficient of Roughness = 0.014

r = Hydraulic radius in meters. (A/P)

Area (A)	=	0.664 m ²
Perimeter (P)	=	2.46 m
Hydraulic radius	=	0.270 m
S	=	0.000 (i.e. 1 in 2595)

Half length of the launder	=	Mean dia of aerator X 3.14/2
	=	23.55 m
Loss in launder	=	0.010
	=	0.01 m (Considered)
Invert level of Lowest point of collection channel	=	5.536 m (R2)
Invert level of Highest point of collection channel	=	5.561 m (R2)
Consider free fall	=	0.05 m (R1)
Water level in raw water channel upstream	=	5.486 m (R2)
(Considering no loss in the channel, as the length is very small)		
Water depth in Channel	=	0.83 m (R1)
Invert level of water channel	=	4.656 m (R2)

3 STILLING CHAMBER

Size of stilling chamber	=	4.4x 4.4 x 4.1 Depth (R1)
Water level	=	5.486 m (R2)

Hence loss for direction change in stilling chamber due to baffle wall

Considering opening of size at the bottom	=	4 m X 1.2 m	
Flow	=	0.793	
Velocity	=	0.6 m/sec	
Therefore, Velocity Head	=	$v^2/2g$	
	=	0.018	
	=	0.025 m	(selected) (R1)
K value for change in direction	=	$2^{*0.5}$	
	=	1	
Loss of Change in direction	=	0.025	
Now TWL at outlet of stilling chamber	=	5.461	(R2)
Invert level	=	1.361 m	(R2)

4 STILLING CHAMBER TO FLASH MIXER THROUGH PARSHALL FLUME

Flow	=	0.793 m ³ /sec	
Velocity	=	0.6 m/sec	
		(as per process calculation)	
Ha	=	0.72	
Hb	=	0.504	
Therefore head loss in parshell flume	=	0.216 m	
Top water level	=	5.461	(R2)
Invert level in flume upstream	=	4.741	(R2)
Top water level in flume down stream	=	5.245	(R2)
Water depth in flume downstream channel	=	1.51 m	
Invert level in flume downstream	=	3.735 m	(R2)
Note: As the channel length is very small, head loss through the channel from parshall flume to Flash mixer is negligible.			
Consider free fall to flash mixer	=	0.095 m	(R1)
Top water level in flash mixer	=	5.150 m	(R2)
Depth of flash mixer	=	4 m	
Invert level in flash mixer	=	1.150 m	(R2)

5 FLASH MIXER TO CLARIFLOCCULATOR

Pipe loss			
Design flow	=	1427 m ³ /hr	
	=	0.396 m ³ /sec	
Velocity	=	0.800 m/sec	
Pipe dia	=	0.794	
	=	800 mm	
a Entrance loss	=	$0.5V^2/2g$	
	=	0.016 m	
b Exit loss	=	$V^2/2g$	
	=	0.033 m	
c Bend loss	=	$K \cdot V^2/n \cdot 2 \cdot g$	
	=	0.037 m	
d Line loss	=	$4 \cdot f \cdot l \cdot V^2/2 \cdot g \cdot d$	
where,			
f: friction co efficient	=	0.01	
l: length	=	40 m	
V: velocity	=	0.8 m/sec	
d: dia of pipe	=	0.8 m	
Line loss	=	0.065 m	
e Loss due to exit in port			
Considered port size 0.3m X 0.5m, 6 nos.			
Velocity	=	0.440 m/sec	
Velocity head	=	0.010 m	

Loss in port (V)	=	$0.62 \cdot (2 \cdot g \cdot h)^{1/2}$	
0.440	=	$0.62 \cdot (2 \cdot 9.81 \cdot h)^{1/2}$	
h	=	0.026 m	
f Loss in Exit			
K value for exit	=	1	
Loss in Exit	=	0.010 m	
g Loss in change in direction			
K value for change in direction	=	1	
Loss in change in direction	=	0.010 m	
h Loss in central shaft considered as negligible.			
Total head loss	=	0.197 m	
Provided	=	0.400 m	
Water level in Clariflocculator	=	4.750 m	R2
SWD of clarifier	=	4.500 m	
Invert level in clarifier	=	0.250 m	R2

6 LOSS THROUGH ORIFICE

Provided 318 nos. of submerged orifice at C/C 375 mm by way of 50 mm OD PVC pipe orifice to give 46 mm dia orifice

Area of orifice	=	0.002 m ²	
Flow	=	0.396 m ³ /sec	
Flow through each orifice	=	0.001 m ³ /sec	
Velocity	=	0.750 m/s	
Flow velocity through orifice (V)	=	$0.62 \cdot (2 \cdot g \cdot h)^{1/2}$	
0.7504	=	$0.62 \cdot (2 \cdot 9.81 \cdot h)^{1/2}$	
h	=	0.074668 (say 0.08m)	
Considered free fall for orifice	=	0.05 m	
Top water level in launder	=	4.620 m	

7 CLARIFLOCCULATOR LAUNDER

For launder design, considered half of the launder circumference for half of the flow and other half of the launder for the other half flow.

Q	=	0.198 m ³ /sec	
Velocity considered	=	0.6 m/sec	
Width of launder	=	0.8 m	
Depth of launder	=	0.6 m	R2

By using Manning's Formula

$$V = 1/n \cdot X (r)^{2/3} \cdot X (S)^{1/2}$$

Where,

S = Slope of Hydraulic gradient.

V = Velocity in mps

n = Manning's Co-efficient of Roughness = 0.014

r = Hydraulic radius in meters. (A/P)

A	=	0.48 m ²	
Perimeter (P)	=	2 m	
r	=	0.24 m	
S	=	0.0005 m	(i.e. 1 in 2113)
Half length of the launder	=	60.602 m	
Loss in launder	=	0.0287 m	
S provided	=	0.05 m	(R1)
Top water level in launder (highest)	=	4.620 m	R2
Top water level in launder (lowest)	=	4.570 m	R2
Water depth in launder	=	0.6	
Invert level in launder (lowest)	=	3.970 m	R2

Invert level in launder (Highest)	=	4.020	R2
8 GATE AT OUTLET OF THE CLARIFLOCCULATOR			
Gate size	=	800 mm X 800 mm	
Flow	=	0.3964 m ³ /sec	
Sludge quantity from each clarifier	=	29.1500	
Velocity	=	0.6 m/sec	
Losses in gate	=	KV ² /2g	
	=	0.020 m	
9 FOR COLLECTING CHANNEL			
Flow	=	0.387 m ³ /sec	(as per process calculation)
Total length of the channel 1	=	34.630 m	R2
Velocity assumed	=	0.600 m/sec	
Area	=	0.645 m ²	
Width	=	0.800 m	
Depth	=	0.810 m	R2
By using manning formula			
$V = 1/n \times (r)^{2/3} \times (S)^{1/2}$			
Where,			
S = Slope of Hydraulic gradient.			
V = Velocity in mps			
n = Manning's Co-efficient of Roughness = 0.014			
r = Hydraulic radius in meters. (A/P)			
A	=	0.648 m ²	
Perimeter (P)	=	2.42 m	
r	=	0.267768595 m	
S	=	0.0007 m	(i.e. 1 in 2113)
Hence S provided	=	0.0258	
Considered	=	0.03 m	
Free fall considered	=	0.140 m	R2
Top water level in collecting channel	=	4.380 m	R2
Water depth in channel	=	0.810 m	
Invert level in collective channel	=	3.570 m	R2

Now,			
Total length of the channel 2	=	10.380 m	} R2
S Provided	=	0.008	
Considered	=	0.03	
Free fall considered	=	0.140	
Top water level in collecting channel	=	4.380	
Water depth in channel	=	0.810	
Invert level in collective channel	=	3.570 m	

10 COMMON CHANNEL LEADING TO CWST

Flow	=	0.774 m3/sec	
Velocity	=	0.6 m/sec	
Area required	=	1.290 m2	
Depth	=	0.8 m	R2
Width	=	1.613 m	R2

By using manning formula

$$V = 1/n \times (r)^{2/3} \times (S)^{1/2}$$

Where,

S = Slope of Hydraulic gradient.

V = Velocity in mps

n = Manning's Co-efficient of Roughness = 0.014

r = Hydraulic radius in meters. (A/P)

A	=	1.290	
Perimeter (P)	=	4.025	
r	=	0.321	
S	=	0.0003 (i.e. 1 in 3125)	

Length of the launder	=	20 m
Hence S	=	0.006 m

Considered	=	0.1 m	
Top water level in connecting channel	=	4.280 m	R2
Water depth in channel	=	0.8 m	
Invert level in channel	=	3.480 m	R2

11 ENTRY IN CWST

Head loss for Entry to each compartment

Flow	=	0.390 m3/sec	(as per process calculation)
Velocity	=	0.600 m/sec	
Area required	=	0.65 m2	
Width	=	1.300 m	
Depth	=	0.500 m	

Free fall considered	=	0.261 m
----------------------	---	---------

Loss in exit	=	0.018 m
--------------	---	---------

Loss in gate

Width of gate	=	1.000 m
Depth of gate	=	0.800 m
Loss in gate	=	0.020 m
Total loss	=	0.300 m

Top water level in connecting channel	=	3.980 m	R2
Invert level in channel	=	3.480 m	R2

11 SLUDGE HANDLING SYSTEM

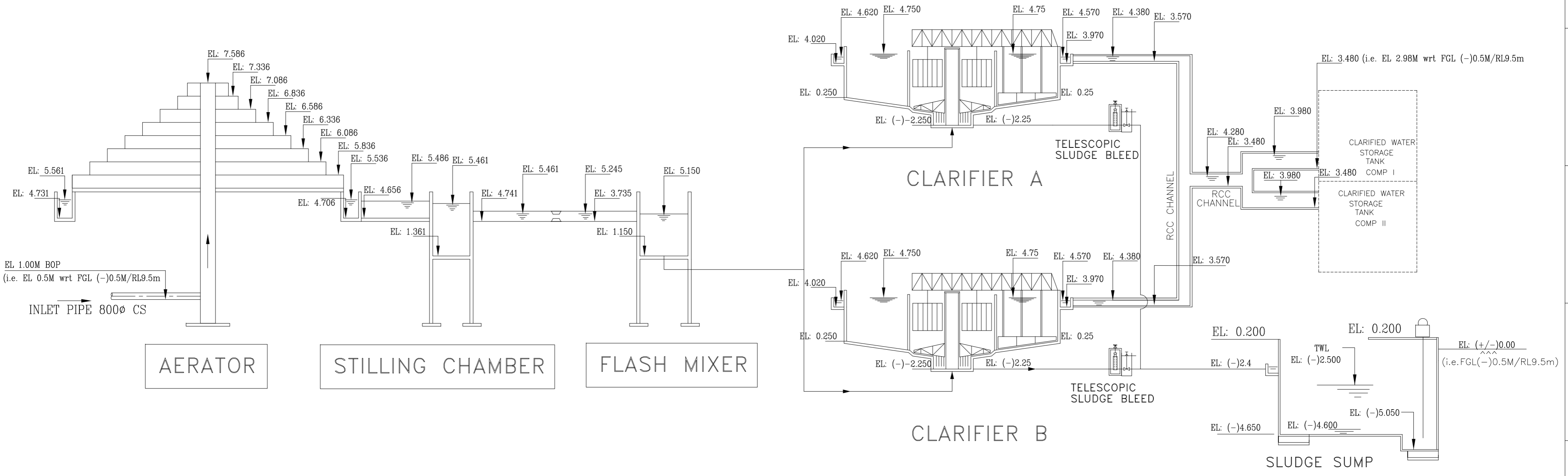
CLARIFLOCCULATOR TO SLUDGE SUMP

Pipe loss	=		
Design flow	=		29 m ³ /hr
	=		0.008 m ³ /sec
Pipe provided	=		0.15 m
Velocity	=		0.456
A Sluice valve loss at the telescopic arrangement			
Sluice valve size	=		150 mm
Loss	=	$K \cdot V^2 / 2g$	0.003 m
	=		0.005 m
B Entrance loss			
	=	$0.5 \cdot V^2 / 2g$	0.005 m
	=		
C Bend loss			
	=	$K \cdot V^2 / 2g$	0.012 m
	=		
D Line loss			
	=	$4fLV^2 / 2gd$	0.283 m
	=		0.024 m
F Loss in exit			
	=		0.024 m
	=		
Total head loss required			
	=		0.327 m
	=		0.35 m
Top water level in clariflocculator			
	=		4.750 m R2
Bottom of sludge pipe at bottom of the clariflocculator			
	=		-2.250 m R2
Considered slope of 1:500			
For 100m length of sludge pipe slop is 0.24m.			
However slop considered as 0.15m			
Hence invert level of Sludge sump pipe entry			
	=		-2.400 m R2
Head provided			
	=		7.150 m >0.35m required
Depth of sludge sump			
	=		2.2 m (R1)
Free board			
	=		0.45 m (R1)
Bottom level of sludge sump			
	=		-5.050 m R2

NOTE :

RL 9.5M i.e FGL (-)0.500 FOR PTP AREA CORRESPONDS TO EL(+/-)0.00M.

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- NOTES:
1. ALL ELEVATION MARKED IN METER.
 2. RL 9.5M i.e FGL (-)0.500 FOR PTP AREA CORRESPONDS TO EL(+/-)0.00M IN THIS DRG.

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD

JOB NO. 412				
STATUS CONTRACT				
DISTRIBUTION				
TO				
No OFF				
REV	DATE	ALTD	CHD	APPD
00	06.06.18	FN	MI	AA
01	15.06.18	FN	MI	AA

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

DEPT	DRN	FAISAL	N	FN	SIGN	DATE
MAX	DESN	FAISAL	N	FN		29-11-18
	CHD	MUZZAM	I	MI		29-11-18
	APPD	ASLAM	A	AA		29-11-18

BHEL LOA NO: PW/PE/PG/EN1/P-310/17

BHEL DOC NO. **PE-V0-412-158-A003**

TITLE **HYDRAULIC FLOW DIAGRAM**

DEPT. SCALE

SIGN

DATE

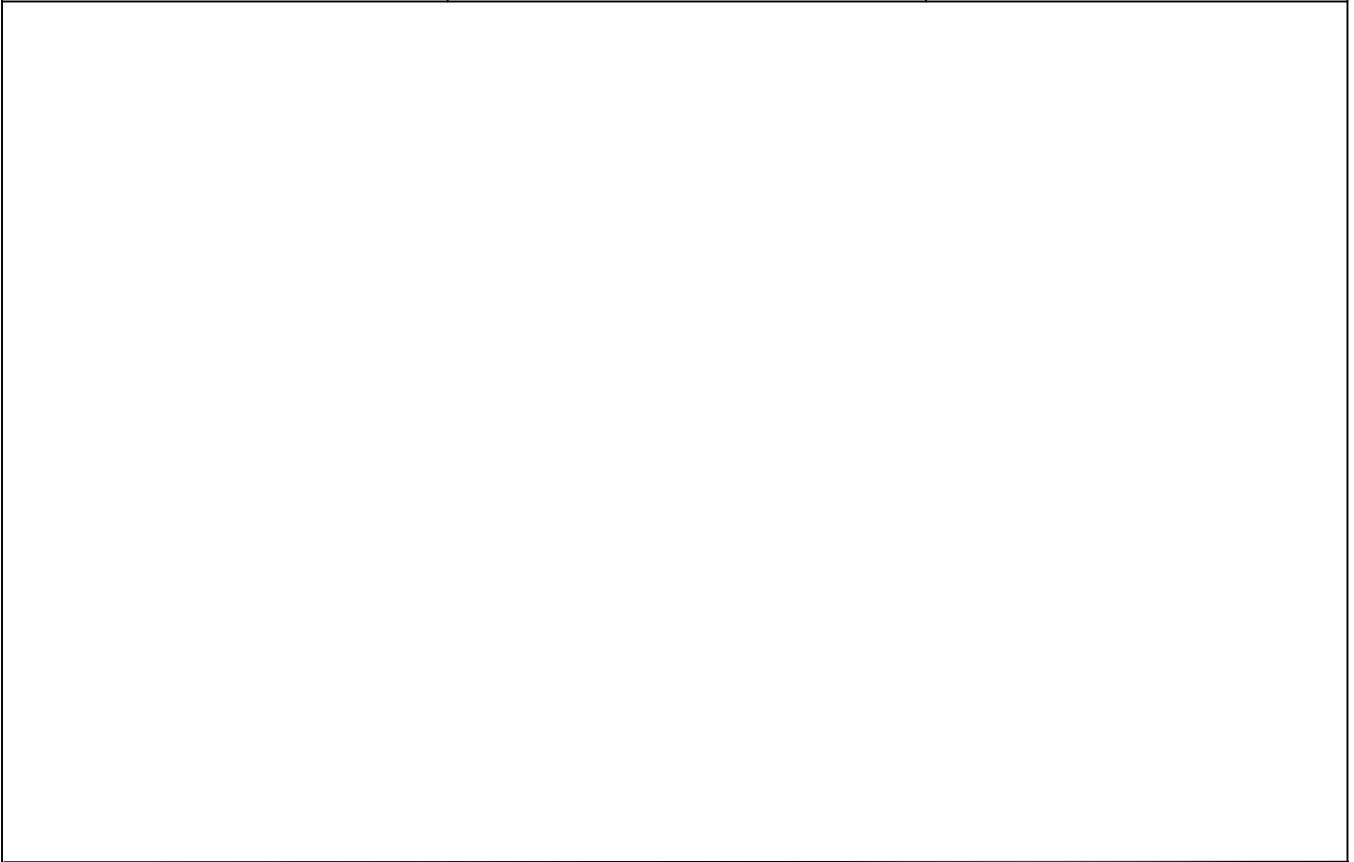
OGBL DOC NO. **OGBL/OC-983/HFDLC/PTP/18/302**

SHEET 6 OF 6 REV 2





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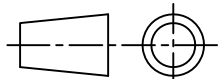
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00	08-03-18	CHECKED: MI	01	09-05-18	CHECKED: MI	
						STATUS : CONTRACT
						JOB NO.: 412

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2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

PROCESS SIZING CALCULATIONS OF PRETREATMENT PLANT		NAME	SIGN	DATE
	PREP	FAISAL N	FN	18-06-18
	CHKD	MUAZZAM I	MI	18-06-18
	APPD	ASLAM A	AA	18-06-18

BHEL LOA NO: PW/PE/PG/EN1/P-310/17					APPD	ASLAM A	AA	18-06-18	
DEPT.					CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A004			REV 02
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/PSC/PTP/18/303			
DATE						NO. OF SHEETS 9 EXCLUDING COVER PAGE			

PROCESS SIZING CALCULATIONS FOR PRE TREATMENT PLANT			
CLIENT: BHARAT HEAVY ELECTRICALS LIMITED			
PROJECT: 2X660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT			
PACKAGE: PRE TREATMENT PLANT			
BHEL DOC NO-PE-V0-4012-158-A004			
OTOKLIN DOC NO-OGBL/OC-983/PSC/PTP/18/303			
1 CASCADE AERATOR			
No of units	No.		1.00
Design Flow	cum/hr		2378
Design Flow with 20% over loading	cum/hr		2854
Design Flow	cum/sec		0.6606
Surface flow rate	m ² /(m ³ /hr)		0.0450
Area required (A)	m ²		107.0234
Number of Steps	No.		7
Velocity of Inlet pipe	m/sec		0.9700
Inlet pipe area	m ²		0.6811
Diameter of inlet pipe	mm		931.4534
Diameter of inlet pipe considered	mm		1000.0000
Wall thickness considered	mm		150.0000
Area for inlet pipe and wall thickness (B)	m ²		1.3267
Total ara required [(A) + (B)]	m ²		108.35
Diameter of bottom tray	m		12.9
Tread of cascade	m		0.83
Riser of cascade	m		0.25
Dia of 1st tray	m		2.96
Dia of 2nd tray	m		4.62
Dia of 3rd tray	m		6.28
Dia of 4th tray	m		7.94
Dia of 5th tray	m		9.60
Dia of 6th tray	m		11.26
Dia of 7th tray	m		12.9
Collecting Channel/Launders			
For uniform collection half flow has been considered			
Inside Dia	m		12.9
Velocity Through channel	m/sec		0.60
Flow Through channel	cum/hr		1426.98
Width (considerd)	m		0.80
SWD of channel	m		0.83
Free board	m		0.30
2 COLLECTING CHANNEL (COMBINED)			
Design Flow	cum/hr		2853.96
Velocity Through channel	m/sec		0.60
Width (considered)	m		1.60
SWD of channel	m		0.83
Channel size (provided) [WXD]	m		1.6x(0.83+0.3 FB)
3 STILLING CHAMBER			
Design Flow	cum/hr		2853.96
Retention time	Sec		60.00
Volume	Cum		47.57
Volume (provided)	Cum		79.38
Width (considered)	m		4.40

	Depth (considered)	m	4.10
	Length	m	4.40
	Length (selected)	m	4.40
	Stilling Chamber size (LxWxD)	m	4.4x4.4x(4.1+0.3 FB)
	Baffle wall opening depth required	m	0.33
	Baffle wall opening depth considered	m	1.20
	Baffle wall opening size (provided) (LXD)	m	4 x 1.20
4	RAW WATER CHANNEL WITH PARSHALL FLUME		
	Design Flow	cum/hr	2853.96
	No of Channel	No	1.00
	Velocity Through channel	m/sec	0.60
	Area	m ²	1.32
	Width (Considered)	m	1.00
	Depth	m	1.32
	Channel size (WxD)	m	1x(1.32+0.3 FB)
	Parshall Flume Throat width (Wp)	mm	600.00
	Formula to calculate flow: $Q=4Wp \times Ha^{1.522 \times Wp^{0.026}}$, Where, Q= Flow in ft ³ /sec, Wp=width of throat in ft, Ha= Depth of flow in upstream of the flume at 1/3rd point in ft. [Reference: THE IMPROVED VENTURI FLUME by RALPH L. PARSHALL]		
	Flow	cuft/sec	28.54
	Parshall Flume Throat width (Wp)	ft	1.97
	Ha	ft	2.37
	Ha	m	0.72
	Hb (Depth of down stream)= 0.7xHa	m	0.50
	Head Loss (Ha-Hb)	mm	216.33
	Up stram Channel size (WxD)xL	m	1x(1.32+0.3 FB) x 2.25
	Down stram Channel size (WxD)xL	m	1x(1.51+0.3 FB) x 3.2
	Prashall flume (WxD)xL	m	1x(1.4+0.3 FB) x 2.3

TABLE 8.10 Free discharge as a function of throat width

Throat width, ft	Free discharge equation, ft ³ /s
0.25	$Q = 0.992 H_a^{1.547}$
0.50	$Q = 2.06 H_a^{1.58}$
0.67	$Q = 3.07 H_a^{1.59}$
$1 \leq W \leq 8$	$Q = 4 W H_a^{1.522 W^{0.026}}$
$10 \leq W \leq 50$	$Q = (3.6875 W + 2.5) H_a^{1.6}$

desirable to design the Parshall flume so that free flow occurs, under some flow conditions the hydraulic jump at the exit section will be submerged, and the free-flow condition will not exist. Nonfree discharge or submerged flow occurs when

$\frac{H_b}{H_a} \geq 0.6$ for $W = 0.25, 0.50, 0.75$ ft (0.076, 0.15, 0.23 m)




$\frac{H_b}{H_a} \geq 0.7$ for $1 \leq W \leq 8$ ft ($0.30 \leq W \leq 2.4$ m)

and $\frac{H_b}{H_a} \geq 0.8$ for $10 \leq W \leq 50$ ft ($0.24 \leq W \leq 15$ m)
















5	FLASH MIXER		
	Number	No	1.00
	Design Flow	cum/hr	2853.96
	Retention time	Sec	60.00
	Volume	Cum	47.57
	Volume (provided)	Cum	77.50
	Width (considered)	m	4.40




	Depth (considered)	m	4.00
	Length	m	4.40
	Length (selected)	m	4.40
	Flash Mixer size (LxWxD)	m	4.4x4.4x(4+0.5 FB)
6	PIPE LINE FROM FLASH MIXER TO EACH CLARIFIER		
	Number	No	2.00
	Design Flow in each line	cum/hr	1426.98
	Velocity	m/sec	1.00
	Pipe dia required	m	0.710
	Pipe Dia Selected	m	0.80
7	CLARIFLOCCULATOR		
	Number		2.00
	Design Flow in each clarifier (inlet)	cum/hr	1189.15
	Inlet water (Raw water) TSS	ppm	500.00
	Outlet water (clarified water) TSS	ppm	10.00
	Sludge Consistency	%	2.00
	Sludge generated per clarifier	cum/hr	29.15
	Sludge blow off (must be less than 3%)	%	2.45
	Flow at each clarifier outlet	cum/hr	1160.00
	As per tender the outlet of each clarifier	cum/hr	1160.00
	Hence, sludge generated	cum/hr	29.15
	Water inlet at each Clarifier	cum/hr	1189.15
	Flocculator Design		
	Retention time	min	30.00
	SWD	m	4.50
	Volume	Cum	594.57
	Area required (A)	Sqm	132.13
	Internail Dia of Central Shaft	m	1.00
	Outer dia of central shaft	m	1.40
	Area of central shaft (B)	Sqm	1.54
	Total Area required (A)+(B)	Sqm	133.67
	Dia required	m	13.05
	Dia Provided	m	13.10
	Wall thickness of Flocculation ozne	mm	150.00
	Area ocupied by flocculator (C)	Sqm	137.82
	Clarifier Design		
	Rise rate	cum/sqm/hr	1.20
	Design flow	cum/hr	1189.15
	Clarifier area (D)	Sqm	990.96
	Total area required (C) + (D)	Sqm	1128.77
	Diameter required	m	37.92
	Diameter selected	m	38.00
	Retention time time in flocculator zone	min	30.59
	Retention time time in clarifier zone	min	225.00
	Weir loading (must be 300 cum/m/day)	cum/m/day	239.19
	Launder Design		
	For uniform collection half flow has been considered.		
	Design flow with 20% over loading for hydraulic	cum/hr	1426.98
	TSS during overloading (Tentative for calculation)	ppm	30.00
	Sludge Generated during over loading	cum/hr	33.58
	Quantity of clarified water during over loading	cum/hr	1393.39
	Design in launder (1/2 flow)	cum/hr	696.70



Design in launder (1/2 flow)	cum/sec	0.19	
Velocity	m/sec	0.40	
Area	Sqm	0.48	
Width (Considered)	m	0.80	
Depth	m	0.60	
Launder size provided (WxD)	m	0.8x0.6+0.3 FB	
OPENING SIZE OF SLOT FROM CENTRAL COLUMN TO FLOCCULATION ZONE			
Velocity considered	m/sec	1.00	
Pipe size required with 20% overloading	m	0.8	
Pipe Size Provided	m	1.0	
Number of Slot provided	No	4.00	
Area required for each slot	sqm	0.10	
Size of each slot provided	mm x mm	750 x 300	
Area of each slot provided	mm x mm	0.23	
OPENING SIZE OF UNDERPASS OF WATER SLOT FROM FLOCCULATION ZONE TO CLARIFICATION ZONE.			
Velocity considered	m/sec	0.60	
Area required	sqm	0.66	
Opening height required	mm	16.06	
Opening height provided	mm	462.00	
POWER CALCULATION FOR FLOCCULATOR PADDLE			
Power input for Flocculator (P)=(G ²)μV			
Velocity Gradient (G)	1/Sec	40.00	
Dynamic Viscosity (μ)	Pascal	0.00089	
Volume of flocculator zone (V)	cum	594.57	
Power (P)	watt	846.67	
Number of flocculator	No	4.00	
Motor Rating (MR)=Power/(E1xE2XE3XE4)/Number of Flocculator	Watt		
E1 (Eff of coupling between drive and RG box)	%	85.00	
E2 (Eff of Reduction Gear Box)	%	85.00	
E3 (Eff of Coupling between R.G.Box & Agitator)	%	85.00	
E4 (Eff of Efficiency of Drive Motor)	%	85.00	
Motor Rating (MR) required	Watt	405.49	
Motor Rating (MR) provided	kW	0.75	
8 CHANNEL (FROM CLARIFLOCCULATOR TO COMMON CHANNEL).			
Design flow with 20% over loading for hydraulic	cum/hr	1393.39	
Design flow with 20% over loading for hydraulic	cum/sec	0.39	
Velocity	m/sec	0.60	
Area required	sqm	0.65	
Width (considered)	m	0.80	
Depth	m	0.81	
Size of Cahnnel provided (WxD)	m	0.8x(0.81+0.3 FB)	
9 COMMON CHANNEL			
Design flow with 20% over loading for hydraulic	cum/hr	2786.79	
Design flow with 20% over loading for hydraulic	cum/sec	0.77	
Velocity	m/sec	0.60	
Area required	sqm	1.29	
Width (considered)	m	0.80	
Depth	m	1.61	

	Size of Channel provided (WxD)	m	0.8x(1.61+0.3 FB)
10	INDIVIDUAL CHANNEL TO CWST		
	Design flow with 20% over loading for hydraulic (half flow)	cum/hr	1393.39
	Design flow with 20% over loading for hydraulic	cum/sec	0.39
	Velocity	m/sec	0.60
	Area required	sqm	0.65
	Width (considered)	m	1.30
	Depth	m	0.50
	Size of Channel provided (WxD)	m	1.3x(0.5+0.3 FB)
11	NaOCl DOSING SYSTEM FOR POTABLE WATER (INTERMITTENT)		
	Number of Dosing Tank	No	1.00
	Potable water flow	cum/hr	10.00
	Storage Time	Hrs	12.00
	Dosing rate	ppm	2.00
	100% NaOCl Required for 12 hours	Kg	0.24
	Strength of Commercial grade NaOCl (w/v)	%	6.00
	Volume of tank required	Ltrs	4.00
	Capacity (as per Tender)	Ltrs	500.00
	Tank Dia (considered)	m	0.80
	Tank Height	m	1.00
	Tank Dimension (Dia x Height) [selected]	m	0.8x(1.0+0.3 FB)
	Dosing pump Number	No	2 (1W+1S)
	Pump Capacity (as per Tender)	LPH	5.00
	Pump Head (Refer Head Calculation)	MWC	10.00
12	FeCl3 DOSING SYSTEM FOR CLARIFIER		
	Number of Dosing Tank	No	3 (1w+2s)
	Storage Time of each tank	Hrs	12.00
	Strength of Chemical solution in tank (w/v)	%	10.00
	Dosing rate	ppm	40.00
	Total Flow of water in clarifier	cum/hr	2378.30
	Volume of each tank	Cum	11.42
	Size of tank (Considered)	m	2.83 X2.83
	Height of Tank	m	1.43
	Tank Dimension (L X W X H) [selected]	m	2.83x2.83x(1.43+0.3 FB+0.1DZ)
	Dosing pump Number	No	2 (1W+1S)
	Pump Capacity required	LPH	951.32
	Pump Capacity Selected	LPH	2000.00
	Pump Head (Refer Head Calculation)	M	10.00
13	POLYMER DOSING SYSTEM FOR CLARIFIER		
	Number of Dosing Tank	No	2 (1w+1s)
	Storage Time of each tank	Hrs	12.00
	Strength of Chemical solution in tank (w/v)	%	0.50
	Dosing rate	ppm	1.00
	Total Flow of water in clarifier	cum/hr	2378.30
	Volume of each tank	Cum	5.71
	Size of tank (Considered)	m	2 X 2
	Height of Tank	m	1.43
	Tank Dimension (L X W X H) [selected]	m	2.0x2.0x(1.43+0.3 FB+0.1DZ)
	Dosing pump Number	No	2 (1W+1S)
	Pump Capacity required	LPH	475.66
	Pump Capacity Selected	LPH	1000.00
	Pump Head (Refer Head Calculation)	M	10.00
14	LIME DOSING SYSTEM FOR CLARIFIER		

	Number of Dosing Tank	No	2 (1w+1s)
	Storage Time of each tank	Hrs	12.00
	Strength of Chemical solution in tank (w/v)	%	5.00
	Dosing rate	ppm	10.00
	Total Flow of water in clarifier	cum/hr	2378.30
	Volume of each tank	Cum	5.71 
	Size of tank (Considered)	m	2 X 2 
	Height of Tank	m	1.43 
	Tank Dimension (L X W X H) [selected]	m	2.0x2.0x(1.43+0.3 FB+0.1DZ)
	Dosing pump Number	No	2 (1W+1S)
	Pump Capacity required	LPH	475.66 
	Pump Capacity Selected	LPH	1000.00 
	Pump Head (Refer Head Calculation)	M	10.00
15	SLUDGE SUMP		
	Sludge generated due to chemical dosing (Density=1.2 kg/m3) (A)	cum/hr	0.05
	Sludge due to TSS (B)	cum/hr	58.30
	Total Sludge flow [(A)+(B)]	cum/hr	58.35
	Number of Sludge sump	No	1.00
	Compartment of Sludge sump	No	2.00
	Sludge Storage time in each compartment	Hr	5.00
	Volume of each compartment required	cum	291.49
	Volume of each compartment selected as per tender	cum	300.00
	Sludge sump Depth (considered)	m	2.00
	Area for sludge sump	sqm	150.00
	Length of sludge sump (considered)	m	15.00
	Width of sludge sump	m	10.00
	Compartment dimension (each) [LxWxD]	m	15x10x2
	Total size of the sludge sump [LxWxD]	m	15x20x2
	Dimension of Inlet Pit [LxWxD]	m	3x1.5x2.0
	Dimension of Pump Pit [LxWxD]	m	6.5x2.5x2.5
16	PUMP HEAD CALCULATION		
A	SLUDGE TRANSFER PUMP		
	Number of pump	No	2W+1S
	Capacity of Pump	Cum/Hr	500.00
	Consider Pump discharge Velocity	M/Sec	2.20
	Dia of Pipe Require	M	0.28
	Dia of Pipe Consider	M	0.40 
	Velocity in the Pipe line	M/Sec	1.11
	Static Head Considered	M	5.00
	Effective Length of Pipe line	M	350.00
	(Considering 10% extra on actual pipe length)		
	Loss in Pipe line		
	Consider C - value		150.00
	$J = 6.815 \times (V/C)^{1.852} \times D^{-1.167}$	M/M	0.00
	Head Loss	M	0.78
	Number of fittings/bends/etc	No	15.00
	Head Loss due to fittings (0.18 m per fittings for 300 NB pipe)	M	2.70 
	Consider 10% margine as per TS	M	3.83 
	Total Head Loss	M	8.83 
	Consider Pump Head	M	12.00 
B	NaOCI DOSING PUMP		

	Number of pump	No	1W+1S	
	Capacity of Pump	Cum/Hr	0.0050	
	Consider Pump discharge Velocity	M/Sec	1.50	
	Dia of Pipe Require	M	0.0011	
	Dia of Pipe Consider	M	0.0250	
	Velocity in the Pipe line	M/Sec	0.0028	
	Static Head Considered	M	5.00	
	Effective Length of Pipe line	M	350.00	
	(Considering 10% extra on actual pipe length)			
	Loss in Pipe line			
	Consider C - value		150.00	
	$J = 6.815 \times (V/C)^{1.852} \times D^{-1.167}$	M/M	0.0000	
	Head Loss	M	0.0003	
	Number of fittings/bends/etc	No	10.00	
	Head Loss due to fittings (0.32 m per fittings for 25 NB pipe)	M	3.20	
	Consider 10% margine as per TS	M	3.5203	
	Total Head Loss	M	8.5203	
	Consider Pump Head	M	10.00	
C	FeCl3 DOSING PUMP			
	Number of pump	No	1W+1S	
	Capacity of Pump	Cum/Hr	2.0000	
	Consider Pump discharge Velocity	M/Sec	1.50	
	Dia of Pipe Require	M	0.0217	
	Dia of Pipe Consider	M	0.0400	
	Velocity in the Pipe line	M/Sec	0.4423	
	Static Head Considered	M	5.00	
	Effective Length of Pipe line	M	30.00	
	(Considering 10% extra on actual pipe length)			
	Loss in Pipe line			
	Consider C - value		150.00	
	$J = 6.815 \times (V/C)^{1.852} \times D^{-1.167}$	M/M	0.0060	
	Head Loss	M	0.1802	
	Number of fittings/bends/etc	No	10.00	
	Head Loss due to fittings (0.29 m per fittings for 40 NB pipe)	M	2.90	
	Consider 10% margine as per TS	M	3.3882	
	Total Head Loss	M	8.3882	
	Consider Pump Head	M	10.00	
D	POLYMER DOSING PUMP			
	Number of pump	No	1W+1S	
	Capacity of Pump	Cum/Hr	1.0000	
	Consider Pump discharge Velocity	M/Sec	1.50	
	Dia of Pipe Require	M	0.0154	
	Dia of Pipe Consider	M	0.0250	
	Velocity in the Pipe line	M/Sec	0.5662	
	Static Head Considered	M	5.00	
	Effective Length of Pipe line	M	30.00	
	(Considering 10% extra on actual pipe length)			
	Loss in Pipe line			
	Consider C - value		150.00	
	$J = 6.815 \times (V/C)^{1.852} \times D^{-1.167}$	M/M	0.0164	
	Head Loss	M	0.4926	
	Number of fittings/bends/etc	No	10.00	

	Head Loss due to fittings (0.32 m per fittings for 25 NB pipe)	M	3.20	
	Consider 10% margine as per TS	M	4.0619	
	Total Head Loss	M	9.0619	
	Consider Pump Head	M	10.00	
E	LIME DOSING PUMP			
	Number of pump	No	1W+1S	
	Capacity of Pump	Cum/Hr	1.0000	
	Consider Pump discharge Velocity	M/Sec	1.50	
	Dia of Pipe Require	M	0.0154	
	Dia of Pipe Consider	M	0.0400	
	Velocity in the Pipe line	M/Sec	0.2212	
	Static Head Considered	M	5.00	
	Effective Length of Pipe line	M	30.00	
	(Considering 10% extra on actual pipe length)			
	Loss in Pipe line			
	Consider C - value		150.00	
	$J = 6.815 \times (V/C)^{1.852} \times D^{-1.167}$	M/M	0.0017	
	Head Loss	M	0.0499	
	Number of fittings/bends/etc	No	10.00	
	Head Loss due to fittings (0.29 m per fittings for 40 NB pipe)	M	2.90	
	Consider 10% margine as per TS	M	3.2449	
	Total Head Loss	M	8.2449	
	Consider Pump Head	M	10.00	
17	BLOWER SIZING			
	Number of Blower	No	1W+1S	
	total Capacity of Sludge Sump	cum	600.00	
	Total surface area of sludge sump	sqm	300.00	
	Air Mixing rate considered (0.01 to 0.015 m ³ /min/m ²)	cum/hr/sqm	0.90	
	Capacity of Blower required	cum/hr	270.00	
	Capacity of Blower (selected)	cum/hr	300.00	
	Head selected	m	4.00	
18	AREA REQUIRED FOR CHEMICAL HOUSE FOR CHEMICAL STORAGE			
A	NaOCI Storage			
	Chemical storage required for	days	30.00	
	Chemical consumption per day	Ltrs/day	8.00	
	Chemical consumption per month	Ltrs/month	240.00	
	Chemical available in carboys	kg	50.00	
	Density of commercial grade chemical	gm/cc	1.10	
	Density of commercial grade chemical	kg/cum	1100.00	
	Chemnical requiriement per month	kg/month	73.33	
	Number of carboys per month	Nos	1.47	
	Size of each carboy (45x35 cm)	sqm	0.23	
	Area selected	sqm	0.25	
B	FeCl3 Storage			
	Chemical storage required for	days	30.00	
	Chemical consumption per day	kg/day	2283.17	
	Chemical consumption per month	kg/month	68494.97	
	Chemical available in carboys	kg	50.00	
	Number of carboys per month	Nos	1370	
	Size of each carboy (45x35 cm)	sqm	215.76	

	Area selected	sqm	240.00	
C	Polymer Storage			
	Chemical storage required for	days	30.00	
	Chemical consumption per day	kg/day	57.08	
	Chemical consumption per month	kg/month	1712.37	
	Chemical available in carboys	kg	50.00	
	Number of carboys per month	Nos	34	
	Size of each carboy (45x35 cm)	sqm	5.39	
	Area selected	sqm	6.00	
C	Lime Storage			
	Chemical storage required for	days	30.00	
	Chemical consumption per day	kg/day	570.79	
	Chemical consumption per month	kg/month	17123.74	
	Chemical available in bag	kg	50.00	
	Number of bag per month	Nos	342	
	Size of each carboy (50x25 cm)	sqm	42.81	
	Area selected	sqm	50.00	
19	OVERHEAD CLARIFIED WATER STORAGE TANK			
	Number	No	1.00	
	Water required for chemical preparation per day (considering volume of each tank)	cum	45.66	
	Flushing water required for dosing line per day (assume)	cum	2.00	
	Total water required with 20% margin	cum	57.20	
	Tank height (selected)	m	2.00	
	Tank length and width	m	5.3	
	Tank dimension (LxWxD)	m	 5.3x5.3x(2.0+0.3 FB)	

2x660 MW ENNORE SEZ STPP

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SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
1	ATMOSPHERIC/STORAGE TANKS	CAT-II	OTOKLIN GLOBAL BUSINESS LTD.	MUMBAI	Approved.
			JASMINO POLYMERTECH	AMBERNATH	Approved.
2	PRESSURE VESSELS	CAT-II	OTOKLIN GLOBAL BUSINESS LTD.	AMBERNATH	Approved.
			JASMINO POLYMERTECH	NAVI MUMBAI	Approved.
3	AIR BLOWERS	CAT-II	KAY INTERNATIONAL	NEW DELHI /	Approved.
			EVEREST BLOWERS	-	Approved.
			SWAN PNEUMATIC	-	Approved.
4	METERING PUMPS AND PRV	CAT-I	VK PUMPS	NASIK	Approved.
			MILTON ROY INDIA	CHENNAI	Approved.
			SWELLORE	AHMEDABAD	Approved.
			DENCIL	-	Approved.
			POSITIVE METERING PUMPS	-	Approved.
			METACHEM	MUMBAI	Not Approved
5	AGITATOR	CAT-II	REMI PEOCESS PLANT & M/C	MUMBAI	Approved.
			FIBRE & FIBRE	MUMBAI / SILVASA	Approved.
			CEECONS	CHENNAI	Approved.
6	VERTICAL CENTRIFUGAL PUMPS	CAT-I	OTOKLIN GLOBAL BUSINESS LTD.	MUMBAI	Approved.
			FLOWMORE LTD.	-	Approved.
			FLOWSERVE INDIA CONTROLS PVT. LTD.	-	Approved.
			JYOTI LTD.	-	Approved.
			WILO MATHER & PLATT PUMPS PVT. LTD.	-	Approved.
			SULZER PUMPS INDIA LTD.	-	Approved.

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SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
			KISHORE PUMPS	-	Approved.
			MATHER & PLAN PUMPS LTD.	-	Approved.
			KIRLOSKAR BROS. LTD	-	Approved.
			WPIL LIMITED	-	Approved.
7	COATING & WRAPPING MATERIAL TAPE	CAT-III	IWL LTD.	CHENNAI	Approved.
			AR LAMINATORS	-	Approved.
			OTOKLIN GLOBAL BUSINESS LTD.	-	Approved.
8	CLARIFIER/CLARIFLOCCULATOR/THICKNER MECHANISM	CAT-II	WTE INFRA PROJECTS PVT LTD	PUNE	Approved.
			CLEAR WATER	-	Approved.
			TRIVENI N	-	Approved.
			METAL FABRICATORS	-	Approved.
			A.V. VALVES LTD	AGRA	Approved.
			TECHNO VALVE	MUMBAI	Approved.
			H.SARKER AND COMPANY	HOWRAH	Approved.
			BDK	-	Approved.
			FLUID LINE	-	Approved.
9	SS GATE/GLV/NRV/BALL VALVE	CAT-II	KIRLOSKAR	-	Approved.
			KSB	-	Approved.
			MICON VALVES	-	Approved.
			GM ENGINEERING	-	Approved.
			CRESCENT VAVLES MFG.CO.PVT.LTD.	-	Approved.
			VALTECH INDUSTRIES	-	Approved.
			HAWA VALVES	-	Approved.
			VENUS PUMPS AND ENGG. WORKS	-	Approved.

2x660 MW ENNORE SEZ STPP

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SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
			FOURESS ENGG. INDIA LTD.	-	Approved.
			LEADER VALVES LTD.	JALANDHAR	Approved.
10	ELECTRIC MOTOR	CAT-III	BHARAT BIJLEE	MUMBAI	Approved.
			SIEMENS	MUMBAI	Approved.
			CGL	-	Approved.
			GE- POWER		Approved.
			ABB	-	Approved.
			NGEF		Approved.
			KIRLOSKAR ELECTRIC CO. LTD		Approved.
			ALSTOM		Approved.
			MARATHON	KOLKATA	Approved.
11	SS BUTTER-FLY VALVE	Cat II	ADVANCE VALVES PVT. LTD.	NOIDA	Approved.
			TECHNO VALVE	MUMBAI	Approved.
			INSTRUMENTATION LTD.	PALAKKAD	Approved.
			WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	Approved.
			LEADER	-	Approved.
			FLUIDELINE	-	Approved.
			AV VALES	-	Approved.
			KISRLOSKER	-	Approved.
			MICON VALVES	-	Not Approved
			GM ENIGNEERING	-	Not Approved
			VENUS PUMPSAND ENGINEERING WORKS	-	Approved.



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SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
			CRESCENT VAVLES MFG.CO.PVT.LTD.	-	Approved.
			HAWA ENGINEERS	-	Approved.
			FOURESS ENGG. INDIA LTD.	-	Approved.
12	SS DIAPHRAGM VALVE	CAT-II	WEIR BDK	HUBLI	Approved.
			CRANE FLOW PROCESS	SATARA	Approved.
			PROCON VALES	MUMBAI	Approved.
			HAWA ENGINEERS	AHMEDABAD	Approved.
			ADVANCE VALVES PVT. LTD.	-	Approved.
			TECHNO VALVE	-	Approved.
			INSTRUMENTATION LTD.	-	Approved.
			LEADER	-	Approved.
			AV VALES	-	Approved.
			KISRLOSKER	-	Approved.
			VENUS PUMPS AND ENGINEERING WORKS	-	Approved.
			CRESCENT VAVLES MFG.CO.PVT.LTD.	-	Approved.
13	PRESSURE GAUGE	CAT-III	PYRO ELECTRIC	-	Approved.
			AN INSTRUMENT	-	Approved.
			GIC	-	Approved.
			GLUCK	-	Approved.
			INDFOSS	-	Approved.
			WAREE	-	Approved.
			WIKA	-	Approved.
			H GURU	-	Approved.
			KRONE MARSHALL PVT LTD	PUNE	Approved.

2x660 MW ENNORE SEZ STPP

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SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
14	CHAIN PULLEY BLOCK	CAT-III	UNIVERSAL HOIST	-	Approved.
			HERCULES HOISTS LTD.	RAIGAD	Approved.
			LIFTING EQUIPMENTS AND ACCESSORIES	DELHI	Approved.
			AVON CRANE	-	Approved.
			WMI	-	Approved.
			CONSOLIDATED HOISTS PVT LTD	PUNE	Approved.
			REVA INDUSTRIES LTD	-	Approved.
			GRIP ENGG	FARIDABAD	Approved.
15	ELECTRIC HOIST	CAT-III	AVON CRANES PVT.LTD	-	Approved.
			HERCULES HOISTS LTD	-	Approved.
			LIFTING EQUIPMENT & ACCESSORIES	-	Approved.
			REVA INDUSTRIES LTD	-	Approved.
			CONSOLIDATED HOIST PVT LTD	-	Approved.
			GRIP ENGRS	-	Approved.
			UNIVERSAL HOIST,	-	Approved.
			16	PRESSURE SWITCH	CAT-III
INDFOSS	-	Approved.			
PYRO ELECTRIC	-	Approved.			
E&H	-	Approved.			
ABB	-	Approved.			
GIC	-	Approved.			
ABB	-	Approved.			
YOKOGAWA	-	Approved.			

2x660 MW ENNORE SEZ STPP

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SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
17	PRESSURE TRANSMITTER	CAT-II	V AUTOMAT	-	Not approved
			HONEYWELL	-	Approved.
			EMERSON PROCESS MANAGEMENT	-	Approved.
			SCIENTIFIC DEVICES	-	Not approved
			FUJI ELECTRIC	-	Approved.
18	LEVEL GAUGE	CAT-III	SBEM	-	Approved.
			CHEMTROL	-	Approved.
			PUNE TECHTROL	-	Approved.
			LEVCON	-	Approved.
			MAGNETROL	-	Approved.
			E&H	-	Approved.
19	LEVEL TRANSMITTER	CAT-II	PUNE TECHTROL	-	Not approved
			SIEMENS	-	Approved.
			EMERSON PROCESS MANAGEMENT (I) LTD	-	Approved.
			ABB	-	Approved.
			SCIENTIFIC DEVICES	-	Not approved
			V AUTOMAT	-	Not approved
20	FLOW TRANSMITTERS	CAT-II	E & H	-	Approved.
			KHRONE MARSHALL	-	Approved.
			EMERSON	-	Approved.
			ABB	-	Approved.
			HONEYWELL	-	Approved.
			YOKOGAWA	-	Approved.

2x660 MW ENNORE SEZ STPP

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SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
			YIL	BANGALORE	Approved.
			SIEMENS	THANE	Approved.
			FUJI	CHINA	Approved.
			HONEYWELL	USA/PUNE	Approved.
21	ANALYSERS (pH, TURBIDITY, TDS, RESIDUAL CHLORINE ,OIL.	CAT-II	ABB	-	Approved.
			DKK	-	Approved.
			ROSEMOUNT	-	Approved.
			HACH INDIA	-	Approved.
22	JUNCTION BOX	CAT-III	FLEXPRO ELECTRICALS PVT. LTD.	GUJARAT	Approved.
			K.S.INSTRUMENTS PVT.LTD.	BANGALORE	Approved.
			SUCHITRA INDUSTRIES	BANGALORE	Approved.
			OTOKLIN GLOBAL BUSINESS LTD.	-	Approved.
			BALIGA LIGHTING EQUIPMENT PVT. LTD		Approved.
			CONTROLWELL INDIA PVT LTD.		Approved.
			SHRENIK & COMPANY	AHMEDABAD	Approved.
23	MS PLATES	CAT-III	SAIL	-	Approved.
			ESSAR STEEL	-	Approved.
			TISCO	-	Approved.
			RINL	-	Approved.
			JINDAL	-	Approved.
			LLOYD	-	Approved.
			ISPAT	-	Approved.
			JSW	-	Approved.
			INDIAN IRON & STEEL CO. LTD	-	Approved.

2x660 MW ENNORE SEZ STPP

Sub vendor Items and Inspection Category approval to BHEL/PEM for Pre Treatment Plant - Vendor Name
- M/s Otaklin Global Business Limited

This is Annexure to Lr.No.CE/P I /SE/E/T & H (P)/EE6/E/P/AEE/M/F/Ennore SEZ STPP/D762/19 dt 07.01.19

SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
24	MS PIPES (IS: 1239 & 3589)	CAT-III	ITC	-	Approved.
			SURYA ROSHNI	-	Approved.
			INDUS	-	Approved.
			MAHARASHTRA TUBES	-	Approved.
			JINDAL	-	Approved.
			SAIL	-	Approved.
			AJANTA	-	Approved.
			BST	-	Approved.
			JAIN TUBES	-	Approved.
			TATA	-	Approved.
			SAIL - ROURKELA	-	Approved.
			TISCO	JAMSHEDPUR	Approved.
			RATNAMANI	-	Approved.
25	SAFETY SHOWER	CAT-III	UNICARE	-	Approved.
			MOHAN INDUSTRIES	-	Approved.
			SUPER SAFETY SERVICES	-	Approved.
			TOBIT ENGINEERS	-	Approved.
			SAFETY UMBRELLA	-	Approved.
			HIREN INDUSTRIAL CORPORATION	-	Approved.
			NATIONAL SAFETY SOLUTION	-	Approved.
			UNIQUE SAFETY SERVICES	-	Approved.
OTOKLIN GLOBAL BUSINESS LTD.	-	Approved.			

2x660 MW ENNORE SEZ STPP

**Sub vendor Items and Inspection Category approval to BHEL/PEM for Pre Treatment Plant - Vendor Name
- M/s Otaklin Global Business Limited**

This is Annexure to Lr.No.CE/P I /SE/E/T & H (P)/EE6/E/P/AEE/M/F/Ennore SEZ STPP/D762/19 dt 07.01.19

SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
26	TANK & FITTINGS (FRP)	CAT-III	INDUSTRIAL SERVICE	KOLKATA	Approved.
			SUNRISE	BARODA	Approved.
			GANDHI & ASSOCIATES	AHMEDABAD	Approved.
			MODERN EQUIPMENTS	CHENNAI	Approved.
			EAGLE PLAST	PUNE	Approved.
			OMEGA PLAST	MUMBAI	Approved.
			GLOBAL COMPOSITE	-	Approved.
			EPP	-	Approved.
			CHEMICAL PROCESS & EQUIPMENT PVT LTD	-	Approved.
			J.R FIBRE INDUSTRIES	-	Approved.
			DENCIL	-	Approved.
			WTE INFRA PROJECTS PVT LTD	-	Approved.
			METAL FABRICATORS	-	Approved.
			THERMOSET POLYPRODUCTS	-	Approved.
BSF FRP INDUSTRIES	-	Approved.			
OTOKLIN GLOBAL BUSINESS LTD.	-	Approved.			
27	SLUICE GATE	CAT-II	JASH ENGINEERING	KOLKATA	Approved.
			YASHWANT INDUSTRIES	-	Approved.
28	PLUG VALVE	CAT-II	AUDCO	-	Approved.
			LEADER	-	Approved.
			DEZURIK	-	Not approved
			MICON VALVES (INDIA) PVT.LTD	MUMBAI	Approved.
			LEADER	-	Approved.

2x660 MW ENNORE SEZ STPP

Sub vendor Items and Inspection Category approval to BHEL/PEM for Pre Treatment Plant - Vendor Name
- M/s Otaklin Global Business Limited

This is Annexure to Lr.No.CE/P I /SE/E/T & H (P)/EE6/E/P/AEE/M/F/Ennore SEZ STPP/D 762/19 dt 07.01.19

SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
29	PAINT	CAT-III	ASIAN PAINTS (I) LTD.	-	Approved.
			BERGER PAINTS INDIA LTD	-	Approved.
			GOODLASS NEROLAC	-	Approved.
			JENSON & NICHOLSON (I) LTD	-	Approved.
			CDC CARBOLINE	-	Approved.
			SHALIMAR PAINTS LTD.	-	Approved.
30	MOTORISED ACTUATOR	CAT-II	ROTARK	-	Approved.
			AUMA	-	Approved.
			LIMITORK	-	Approved.
31	RUBBER LINING	CAT-III	TEMSEC	KOLKATA	Approved.
			RISHI INDUSTRIES		Approved.
32	Y-TYPE STRAINER/STRAINER	CAT-III	OTOKLIN GLOBAL BUSINESS LTD.	MUMBAI	Not approved
			GRAND PRIX	NEW DELHI	Approved.
			JAYPEE	NEW DELHI	Approved.
			GREAVES COTTON	MUMBAI	Approved.
			FILTRATION ENGINEERS	MUMBAI	Approved.
			BHATIA ENGINEERING CO.	DELHI	Approved.

2x660 MW ENNORE SEZ STPP

**Sub vendor Items and Inspection Category approval to BHEL/PEM for Pre Treatment Plant - Vendor Name
- M/s Otaklin Global Business Limited**

This is Annexure to Lr.No.CE/P I /SE/E/T & H (P)/EE6/E/P/AEE/M/F/Ennore SEZ STPP/D762/19 dt 07.01.19

SUB VENDOR LIST AND INSPECTION CATEGORY (Document No: PE-V0-412-158-A006- R1)

SR. NO.	ITEM	Inspn Cat	SUPPLIERS	PLACE	TANGEDCO approval for Ennore SEZ
33	DUPLEX STRAINER	CAT-III	JAYPEE INDUSTRIES PVT LTD	NEW DELHI	Approved.
			MULTITEX FILTRATION ENGINEERS LTD	NEW DELHI	Approved.
			OTOKLIN GLOBAL BUSINESS LTD.	MUMBAI	Approved.

Note:

Category I – Quality Plan approval & Physical Inspection by TANGEDCO as agreed in the Quality Plan are envisaged. Based on Inspection/Inspection Test Report approval, TANGEDCO will issue MDCC.

Category II – Quality Plan approval & Physical Inspection by BHEL as agreed in the Quality Plan are envisaged. Test Reports to be submitted by BHEL & got it approved by TANGEDCO before the issuance of MDCC by TANGEDCO.

Category III - Quality Plan approval & Physical Inspection by TANGEDCO are not envisaged. MDCC to be obtained from TANGEDCO Based on submission of Certificate of Compliance (COC) by BHEL.


CHIEF ENGINEER/PROJECTS I

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.



TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)



CONSULTANT: DESEIN PVT LTD, NEW DELHI.



BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NEW DELHI



OTOKLIN GLOBAL BUSINESS LTD.
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-


CONTROL PHILOSOPHY OF PRE TREATMENT PLANT

	NAME	SIGN	DATE
PREP	BILAL S	BS	14-10-19
CHKD	MUAZZAM I MI		14-10-19
APPD	ASLAM A	AA	14-10-19

BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

DEPT.					CARD CODE	BHEL DRAWING NO.	REV 02
SIGN		N.A.				PE-VO-412-158-A007	
DATE						OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/CP/PTP/18/308	
						NO. OF SHEETS	10 EXCLUDING COVER PAGE

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI

		<h2>CONTROL PHILOSOPHY</h2>		
LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A007		
CLIENT	M/s. BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/CP/PTP/18/306	Rev No:- 02	
PROJECT	2X660 MW ENNORE SEZ STPP PRE TREATMENT PLANT	MADE BY BS	CHKD BY MI	APPD BY AA

The Control Philosophy for the Pre Treatment has following sections listed below

- Reference Drawings.
- General Description of Pre treatment Plant
- Control & Monitoring philosophy for Pre Treatment Plant
- Drive Details

REFERANCE DRAWINGS:

P & I diagrams & Layouts for the reference are listed below.

Sr.No	Drawing Title	P & ID Number	Revision No
01	P & ID for Pretreatment Plant	PE-V0-412-158-A001	Rev-04
02	Control System for Mechanical Auxiliary Packages	PE-DM-412-145-I900	
03	Drive Control Philosophy	PE-DM-412-145-I002	

General Description

The Pre-Treatment Plant (PTP) shall be operated and controlled from DDCMIS (Bhel Scope) Control System, 2 Nos. OWS, 1 No. Operating cum engineering station with 1 No. A3/A4 size colour LJP shall be provided by Contractor. Control desk with coloured Mimic with the status of drives including ON, OFF, TRIP indication of respective motors/pumps , H.W. Annunciator, P.B. Ammeters, parameters Indicators, recorders and indication Lamps, Ammeters shall also be provided by Contractor .

The plant / unit will have 2 modes of operation to be selected from the HMI:

1. **Service:** The plant will operate as per the pre-set flows till the occurrence of some abnormal condition / achievement of desired output as detailed elsewhere specific to individual units. The respective unit will be stopped only if so required by the operator.

1 (a) **In Semi auto mode:** Particular equipment chemical dosing system, valves and pumps can be selected in sequence and initiated by the operator depending upon the requirement comprising safety interlocks.

1 (b) **In Manual mode:** Selection of equipment's, chemical dosing system, drives, valves for the operation can be selected & operated manually by the operator from the OWS.

2. **Plant Shutdown:** In case plant shut down is required in certain situations, the plant control will be done to ensure safe shutdown of the plant. Similarly, for plant start-up, the pumps / valves will be operated sequentially to ensure that the plant operates smoothly and the outlet quality is not affected.

PRE-TREATMENT SYSTEM:-

Incoming water is treated by Pre-treatment system to produce clarified water suitable for various application. A brief description of Pre-treatment plant is as below.

STILLING CHAMBER (SC):-

Raw water shall be first passed through a Stilling chamber through cascade aeration at inlet flow control station turbulence of water will be dampened out. Stilling chamber shall be in RCC construction with suitable detention time. The flow of water entering stilling chamber is measured through flow transmitter (90GBD01CF001). The Raw water is supplied to the cascade aerator (CA) through motorized valve (90GBD01AA001 & 90GBD01AA002). The motorized valve is provided limit switches for valve ON/OFF feedback. Hand wheel is also provided to (90GBD01AA001). to operate the valve manually, if required. By pass line with manual valve is provided. Manual valve is provided with limit switches for valve ON/OFF feedback. Bypass line will be selected manually if main line is in maintenance mode.

Chlorine solution is dosed in the stilling chamber for disinfection purpose.

PARSHALL FLUME (PF):-

The water from the stilling chamber is passed through the parshall flume. Parshall flume is a flow measurement device with measurement strips on the side wall of the RCC parshall flume. Flow transmitter (90GBD02CF001) is also provided in the parshall flume for monitoring the feed flow rate at OWS.

Flash Mixer (FM):-

The water from the Parshall Flume is passed through the Flash Mixer where the water is distributed to the Clarifiers. The pretreatment chemicals like PE, FeCl₃ & Lime are dosed in Flash Mixer.

CLARIFIER:-

Pre-conditioned water from distribution chamber is fed to Clarifier. A RCC constructed open tank of specific volume is provided. In the Clarifier mixing, flocculation and sedimentation is done in a single tank.

The rotating scrapper of clarifier moves the settled solids or sludge to the center of the clarifier for removal. The clarified water flow rises to the upward and water is removed by collection launder and into the clarified water storage tank by gravity.

A portion of the settled sludge is periodically drawn off by opening the bleed valve or telescopic valve in the telescopic sludge arrangement.

CLARIFIED WATER STORAGE TANK (CWST):-

This is a RCC tank of suitable capacity to store clarified water from the Clarifier. Level transmitter (90GBD10CL001) is provided in Compartment –I and Level Transmitter (90GBD10CL002) is provided in Compartment –II of Clarified water storage tank.

DOSING SYSTEM:-

Raw water contains turbid and suspended particles in varying proportion, which can be coagulated and flocculated by dosing suitable Coagulant FeCl₃ and flocculants. After coagulant dosing; pH of feed water may reduce. For effective coagulation; pH of water is required to be raised, for which lime dosing system is provided.

Dosage rate of pretreatment chemicals shall be decided based on the jar test at site.

FeCl₃ Dosing System:-

FeCl₃ Dosing tank is provided with two numbers of level transmitter for Level measurement (90GBN61CL001, 90GBN62CL001 and 90GBN63CL001) indicating continuous flow. The FeCl₃ Dosing pumps 90GBN64AP001/002 (1W+1S) in interlocked with continuous level of 3 Nos dosing tanks. Operator will initiate FeCl₃ dosing tank-filling step. Agitator operation will be manually but it will not “RUN” at Low-level in the Dosing tank. There will be facility for tank selection on OWS. At a time, only one tank can be selected.

FeCl₃ will be dosed from the FeCl₃ measuring Tank as supplied by FeCl₃ Dosing Pump for clarifier A/B Dosing rate of FeCl₃ will be manually. The stroke shall be continuously adjustable to give a capacity variation 10-100% range while the Pumps along with electric motor drive are running. Adjustment of capacity shall be done by manually (micrometric adjusting type) locally.

Pumps and the Agitators can be operated in the following modes

Semi Auto

Manual

Motorized Agitators:

For each agitator, first selection is LOCAL/REMOTE and same is available in OWS

Two PBs – START & STOP are available on OWS

For each pump, first selection is LOCAL/REMOTE and same is available on OWS

Two PBs – START & STOP are available on OWS

Start permissive for the FeCl₃ Dosing pumps (90GBN64AP001/90GBN64AP002) are:

Level of the selected tank sensed by LT (90GBN61CL001, 90GBN62CL001 and 90GBN63CL001) is not low.

Start permissive for the FeCl₃ Dosing tank Agitator (90GBN61AM001/90GBN62AM001/90GBN63AM001) are: Level of the selected tank sensed by LT (90GBN61CL001, 90GBN62CL001 and 90GBN63CL001) is not low.

Trip permissive for the FeCl₃ Dosing pumps (90GBN64AP001/90GBN64AP002) are:

Level of the selected tank sensed by LT 90GBN610CL001, 90GBN62CL001 and 90GBN63CL001 is low.

Trip permissive for the FeCl₃ Dosing tank Agitator (90GBN61AM001/90GBN62AM001/90GBN63AM001) are:

Level of the selected tank sensed by LT 90GBN610CL001, 90GBN62CL001 and 90GBN63CL001 is low.

Pressure of pump at discharge header is low sensed by PT (90GBN65CP001) Pump will trip and alarm will be raised

Pressure Transmitter (90GBN65CP001) is provided on common discharge for Transmitting Signal to DDCMIS.

Tank level not low shall be permissive for starting pumps. Standby pump auto starts when working pump trips and discharge header pressure is low . Running pump will stop in case of tank level low low. Standby Pump shall not start if the running pump trips because of low-low level.

Lime Dosing System:-

Lime Dosing tank is provided with two numbers of level transmitter for Level measurement (90GBN71CL001, 90GBN72CL001) indicating continuous flow. The Lime Dosing pumps 90GBN73AP001/002 (1W+1S) in interlocked with continuous level of 2 Nos dosing tanks. Operator will initiate Lime dosing tank-filling step. Agitator operation will be manually but it will not "RUN" at Low-level in the Dosing tank. There will be facility for tank selection on OWS. At a time, only one tank can be selected.

Lime will be dosed from the Lime measuring Tank as supplied by Lime Dosing Pump for clarifier A/B Dosing rate of Lime will be manually. The stroke shall be continuously adjustable to give a capacity variation 10-100% range while the Pumps along with electric motor drive are running. Adjustment of capacity shall be done by manually (micrometric adjusting type) locally.

Pumps and the Agitators can be operated in the following modes:

Semi Auto

Manual

Motorized Agitators:

For each agitator, first selection is LOCAL/REMOTE and same is available in OWS Two PBs – START & STOP are available on OWS

For each pump, first selection is LOCAL/REMOTE and same is available on OWS Two PBs – START & STOP are available on OWS

Start permissive for the Lime Dosing pumps (90GBN73AP001/002) are: Level of the selected tank sensed by LT (90GBN71CL001, 90GBN72CL001) is not low.

Start permissive for the Lime Dosing tank Agitator (90GBAA01AM004/90GBAA01M005) are: Level of the selected tank sensed by LT (90GBN71CL001, 90GBN72CL001) is not low.

Trip permissive for the Lime Dosing pumps (90GBN73AP001/90GBN73AP002) are: Level of the selected tank sensed by LT (90GBN71CL001, 90GBN72CL001) is low.

Trip permissive for the Lime Dosing Agitator (90GBAA01AM004/90GBAA01M005) are: Level of the selected tank sensed by LT (90GBN71CL001, 90GBN72CL001) is low.

Pressure of pump at discharge header is low sensed by PT (90GBN75CP001) pump will trip and alarm will be generated

Pressure Transmitter (90GBN75CP001) is provided on common discharge for Transmitting Signal to DDCMIS.

Tank level not low shall be permissive for starting pumps. Standby pump auto starts when working pump trips and discharge header pressure is low. Running pump will stop in case of tank level low low. Standby Pump shall not start if the running pump trips because of low-low level.

Polyelectrolyte Dosing System:-

Poly Electrolyte Dosing tank is provided with two numbers of level transmitter for Level measurement (90GBN81CL001, 90GBN82CL001) indicating continuous flow. The Poly Electrolyte Dosing pumps 90GBN83AP001/002 (1W+1S) in interlocked with continuous level of 2 Nos dosing tanks. Operator will initiate Poly Electrolyte dosing tank-filling step. Agitator operation will be manually but it will not “RUN” at Low-level in the Dosing tank. There will be facility for tank selection on OWS. At a time, only one tank can be selected.

Poly Electrolyte will be dosed from the Poly Electrolyte measuring Tank as supplied by Poly Electrolyte Dosing Pump for clarifier A/B Dosing rate of Poly Electrolyte will be manually. The stroke shall be continuously adjustable to give a capacity variation 10-100% range while the Pumps along with electric motor drive are running. Adjustment of capacity shall be done by manually (micrometric adjusting type) locally.

Pumps and the Agitators can be operated in the following modes:
Semi Auto

Manual

Motorized Agitators:

For each agitator, first selection is LOCAL/REMOTE and same is available in OWS Two PBs – START & STOP are available on OWS

For each pump, first selection is LOCAL/REMOTE and same is available on OWS Two PBs – START & STOP are available on OWS

Start permissive for the Poly Electrolyte Dosing pumps (90GBN83AP001/002) are: Level of the selected tank sensed by LT (90GBN81CL001, 90GBN82CL001) is not low.

Start permissive for the Poly Electrolyte Dosing tank Agitator (90GBN81AM001/90GBN82M001) are: Level of the selected tank sensed by LT (90GBN81CL001, 90GBN82CL001) is not low.

Trip permissive for the Poly Electrolyte Dosing pumps (90GBN83AP001/90GBN83AP002) are: Level of the selected tank sensed by LT (90GBN81CL001, 90GBN82CL001) is low.

Trip permissive for the Poly Electrolyte Dosing tank Agitator (90GBN81AM001/90GBN82M001) are: Level of the selected tank sensed by LT (90GBN81CL001, 90GBN82CL001) is low.

Pressure of pump at discharge header is low sensed by PT (90GBN85CP001) pump will trip and alarm will be generated

Pressure Transmitter (90GBN85CP001) is provided on common discharge for Transmitting Signal to DDCMIS.

Tank level not low shall be permissive for starting pumps. Standby pump auto starts when working pump trips and discharge header pressure is low. Running pump will stop in case of tank level low low. Standby Pump shall not start if the running pump trips because of low-low level.

Sodium Hypochlorite (NaOCL) Dosing System:

NaOCL Dosing tank is provided with two numbers of level transmitter for Level measurement (90GBN91CL001) indicating continuous flow. The NaOCL Dosing pumps 90GBN92AP001/002 (1W+1S) in interlocked with continuous level of 1 Nos dosing tanks. Operator will initiate NaOCL Dosing tank-filling step. Agitator operation will be manually but it will not “RUN” at Low-level in the Dosing tank. There will be facility for tank selection on OWS. At a time, only one tank can be selected.

NaOCL will be dosed from the NaOCL measuring Tank as supplied by NaOCL Dosing Pump for Potable water system dosing will be done manually. The stroke shall be continuously adjustable to give a capacity variation 10-100% range while the Pumps along with electric motor drive are running. Adjustment of capacity shall be done by manually (micrometric adjusting type) locally.

Pumps and the Agitators can be operated in the following modes:

Semi Auto
Manual

Motorized Agitators:

For each agitator, first selection is LOCAL/REMOTE and same is available in OWS Two PBs – START & STOP are available on OWS

For each pump, first selection is LOCAL/REMOTE and same is available on OWS Two PBs – START & STOP are available on OWS

Start permissive for the NaOCL Dosing pumps (90GBN92AP001/002) are: Level of the selected tank sensed by LT (90GBN91CL001) is not low.

Start permissive for the NaOCL Dosing tank Agitator (90GBN91AM001) are: Level of the selected tank sensed by LT (90GBN91CL001) is not low.

Trip permissive for the NaOCL Dosing pumps (90GBN92AP001/90GBN92AP002) are: Level of the selected tank sensed by LT (90GBN91CL001) is low.

Trip permissive for the NaOCL Dosing tank Agitator (90GBN91AM001) are: Level of the selected tank sensed by LT (90GBN91CL001) is low.

Pressure of pump at discharge header is low sensed by PT (90GBN95CP001) pump will trip and alarm will be generated

Pressure Transmitter (90GBN95CP001) is provided on common discharge for Transmitting Signal to DDCMIS.

Tank level not low shall be permissive for starting pumps. Standby pump auto starts when working pump trips and discharge header pressure is low . Running pump will stop in case of tank level low low. Standby Pump shall not start if the running pump trips because of low-low level.

OVERHEAD CLARIFIED WATER STORAGE TANK:-

One no Clarified water overhead tank has been provided to store Clarified water from Service Water upto High level of the tank, as the valve being the float type, hence it will automatically Open and Close. Further, Tank level can be monitored through level transmitter 90GBN60CL001.

SLUDGE HANDLING SYSTEM:-

Clarifier Sludge Sump:-

Sludge Drain/overflow (i.e. from Clarifier, Recirculation line etc.) has been collected in Clarifier sludge sump for further Treatment process. Sludge disposal pumps (90GBS41AP001/90GBS42AP001/90GBS43AP001) provided for disposal of sludge. Manual

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI

type recirculation valve is provided in order to bypass some flow back to sludge sump if needed. Level transmitter (90GBS50CL001&90GBS50CL002) provided for continuous measuring the level of clarifier sludge sump. For air agitation of sludge 2 nos air blowers (90GBS31AN001&90GBS32AN001) are provided.

Sludge sump is provided with Level Transmitters (LT) for high level alarm and low level tripping of Sludge Disposal pumps. The common header of sludge transfer pumps are provided with Pressure Transmitter (GBS42CP001). During running condition when the pressure in the common discharge drops, the running pump (GBS41/42/43AP001) is tripped with alarm and the stand by pump is started.

There will be facility for pump selection on OWS. At a time, only one pump can be selected

Sludge transfer pumps (P1-A/B/C) are to be operated from:

1. Local.
2. Remote

First selection is remote or local.

For remote operation, there are two PBs available on the OWS – START and STOP.

Sludge Transfer Pumps (2W + 1S) discharge valve (90GBS41AA001/90GBS42AA001/90GBS43AA001) shall open when pump is in start status and individual pump discharge pressure (90GBS41CP101/90GBS42CP101/90GBS43CP101) is high

Pump discharge valve (90GBS41AA001/90GBS42AA001/90GBS43AA001) shall close when pump is in stop status and individual pump discharge pressure (90GBS41CP101/90GBS42CP101/90GBS43CP101) is low

A) The start permissive for this pump is

1. Level not LOW in sludge pit (90GBS50CL001 & 90GBS50CL002)

B) Pumps will trip in case

1. Level LOW in sludge pit (LT- 90GBS50CL001&90GBS50CL002)
2. Pressure of pump at discharge header is low sensed by PT (90GBS45CP001) and alarm will be generated.

Tank level not low shall be permissive for starting pumps. Standby pump auto starts when working pump trips and discharge header pressure is low. Running pump will stop in case of tank level low low. Standby Pump shall not start if the running pump trips because of low-low level.

Air Blower

Two no. of air blowers (GBD31AN001/GBD32AN001) (1w+ 1S) have been provided for to keep sludge in sludge sump in suspension. The Pressure Switch (GBS40CP101) provided at

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI

common Header of Sludge Transfer Pump. If Pressure exceed beyond set point Blower will "TRIP". The operation of these air blowers shall be manual.

Standby blower starts when working blower trips and discharge pressure is low. Running Blower will trip in case pressure of the common discharge header is sensed high by PS (90GBS40CP101)

B. Control Philosophy for Motorized Valve –

Motorized valve with Integral starters will be suitable for open/close operation locally. Auto/manual operation (start/stop) shall be performed from DDCMIS at control room. Permissive & trip condition will be displayed on operator screen. Remote control commands (start/stop) will be generated in DDCMIS and issued as per requirement.

Following signal exchange will take place between actuator &DDCMIS.

1. Valve Open command.
2. Valve Close command.
3. Actuator Disturbance
4. Valve position feedback (4-20 mA.) for control valve only.
5. Valve status feedback -Open.
6. Valve status feedback – Close.

The DDCMIS based system considered in the philosophy mentioned above identifies control of some drives as an interlock feature (indicated in the P & ID) and rest will be manual-based only. Indications like on/off, trip and instrument high, low alarm or trip is considered and will be available in the Local control panel.

DRIVE DETAILS:-

The list of such drives is given in a table below.

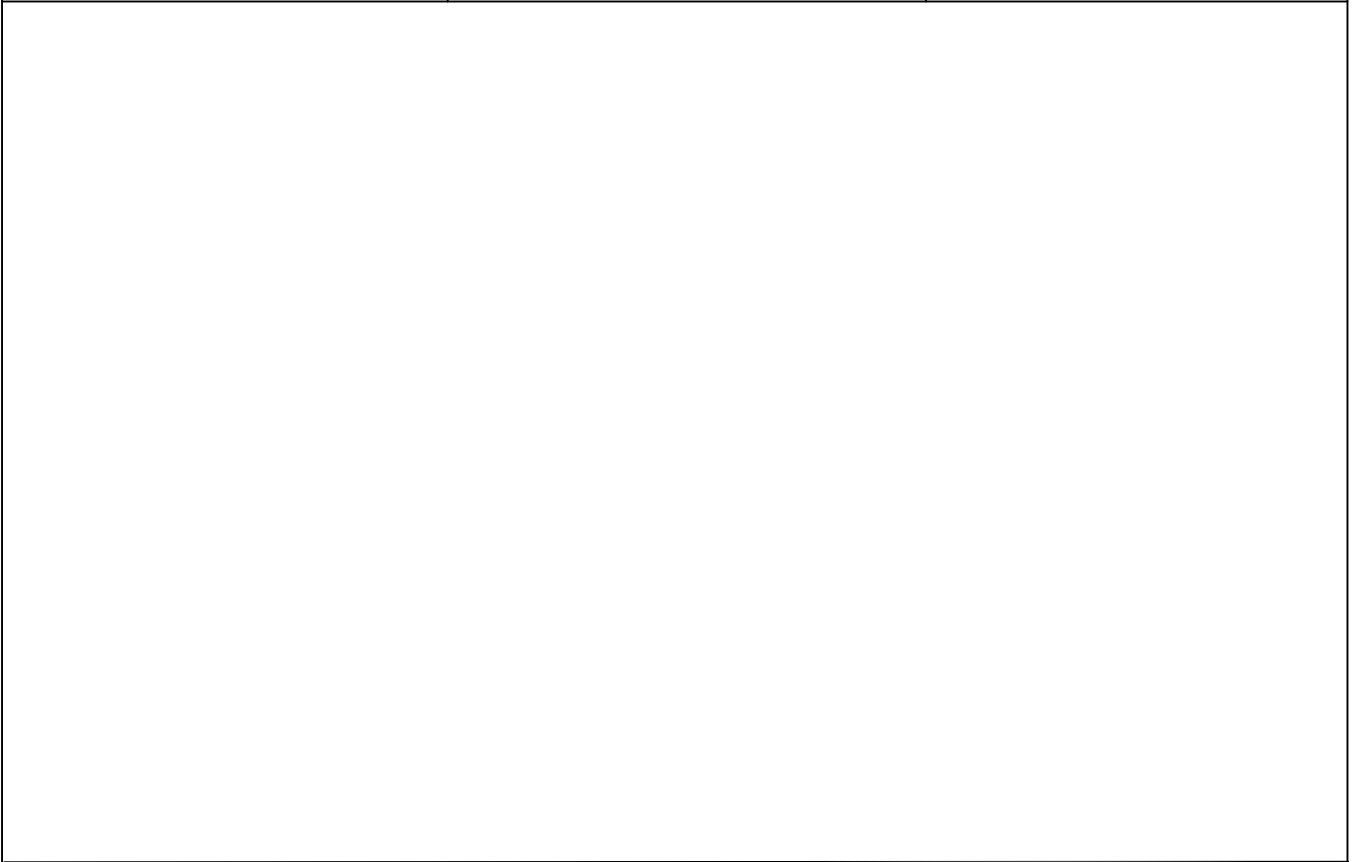
Sr.No	Tag.No	Description
1	90GBD01AA001	Raw WTR Inlet to AERATOR
2	90GBD01AA002	Raw WTR Inlet to AERATOR
3	90GBS41AA001	Sludge Transfer PMP-A Discharge Valve
4	90GBS42AA001	Sludge Transfer PMP-B Discharge Valve
5	90GBS43AA001	Sludge Transfer PMP-C Discharge Valve
6	90GBN61AM001	FeCl3- Dosing Tank-A Agitator Motor
7	90GBD02AM001	Flash Mixer Motor
8	90GBN62AM001	FeCl3- Dosing Tank-B Agitator Motor
9	90GBN63AM001	FeCl3- Dosing Tank-C Agitator Motor

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI





10	90GAA01AM004	Lime- Dosing Tank-A Agitator Motor
11	90GAA01AM005	Lime- Dosing Tank-B Agitator Motor
12	90GBN81AM001	PE- Dosing Tank-A Agitator Motor
13	90GBN82AM001	PE- Dosing Tank-B Agitator Motor
14	90GBN91AM001	NaOCl- Dosing Tank Agitator Motor
15	90GBS41AP001	Sludge Transfer PMP-A
16	90GBS42AP001	Sludge Transfer PMP-B
17	90GBS43AP001	Sludge Transfer PMP-C
18	90GBN64AP001	FeCl ₃ - Dosing Pump-A
19	90GBN64AP002	FeCl ₃ - Dosing Pump-B
20	90GBN73AP001	Lime- Dosing Pump-A
21	90GBN73AP002	Lime- Dosing Pump-B
22	90GBN83AP001	PE- Dosing Pump-A
23	90GBN83AP002	PE- Dosing Pump-B
24	90GBN92AP001	NaOCl- Dosing Pump-A
25	90GBN92AP002	NaOCl- Dosing Pump-B
26	90GBS31AN001	Air Blower -A
27	90GBS32AN001	Air Blower -B

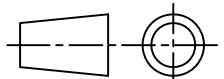
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

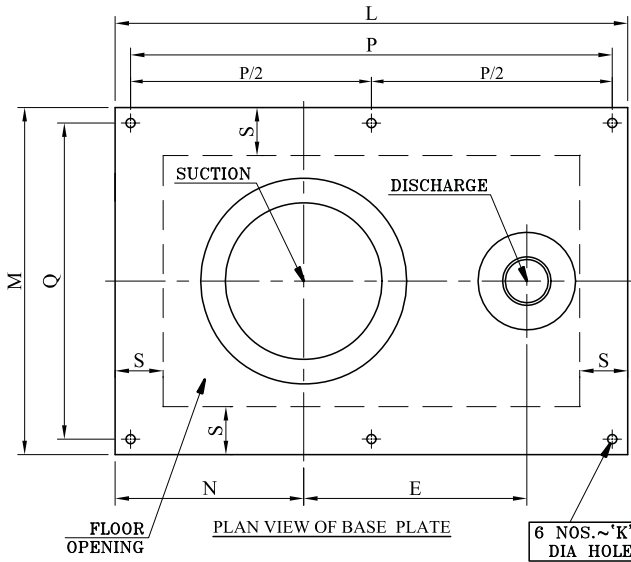
	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

TECHNICAL DATASHEET FOR VERTICAL CENTRIFUGAL PUMPS OF PRE TREATMENT PLANT		NAME	SIGN	DATE
	PREP	ALOYSIUS	AF	22-02-19
	CHKD	MUAZZAM I	MI	22-02-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	22-02-19

DEPT.					CARD CODE	BHEL DRAWING NO.	REV	
SIGN		N.A.				PE-V0-412-158-A008		2
DATE						OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/CF/PTP/18/307		
						NO. OF SHEETS	5	EXCLUDING COVER PAGE

CLIENT	BHARAT HEAVY ELECTRICALS LIMITED		BHEL DOC NO.: PE-V0-412-158-A008	REV NO:- 2
PROJECT	PRE TREATMENT PLANT		OTOKLIN DOC NO:- OGBL/OC-983/TDS/CP/PTP/18/307	
			MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			PROJECT: 2x660 MW ENNORE SEZ STPP	
Sr No.	Description			
1	Service		Sludge Transfer Pumps	
2	KKS REF No		90GBS41AA001/ 90GBS42AA001 / 90GBS43AA001	
3	Discharge (m3/ hr.)		500 m3/hr	
4	Head Required At Delivery Flange in Mtrs		12 Mtrs	
5	Total Bowl Head In Mtrs		16.25 Mtrs. (R1)	
6	Qty. Required		3 Nos. (2W + 1S)	
7	Type of Pump		Vertical Centrifugal Non clog Sump pump (Non clog type Impeller)	
8	Shut off Head.		30.50 Mtrs. (R1)	
9	Pump Speed RPM		1450 RPM(Nominal)	
10	Bowl Efficiency		74% (R1)	
11	Specific Gravity.		1.03	
12	NPSHR		5.5 Mtrs	
13	Bowl Input		30.79 KW	
14	Maximum Kw in full range		31.14 KW (R1)	
15	Motor recommended (VSS) - TEFC - IE 2 - Vertical Flange Mounted		37 KW / 50 HP / 1450 RPM (Rated) IE2 -S1-TEFC	
16	Sump Depth		4.35 Mtrs	
17	Minimum Submergence		550 MM (R1)	
18	Type of Lubrication		Oil Lubrication	
19	Design Code / Testing Code		IS5120 / IS 9137 / HIS	
20	Suction Condition		Submerged & Flooded	
21	Motor - VSS		Vertical Flange Mounted , amb 45 Deg C , Continuous Rating (s1) , Power Supply 415 V / 3P / 50 HZ - As per TANGEDCO Approved Vendor List	
	M O C			
22	Suction Bell /Casing / St Box		ASTMA 890 Gr 4A (Duplex SS) (R2)	
23	Impeller		ASTMA 890 Gr 4A (Duplex SS) (R2)	
24	Wearing Ring (If Applicable)		Duplex SS 2205 UNS 31803	
25	Column Pipe /Delivery Pipe		Duplex SS	
26	Pump shaft /Line Shaft / Head Shaft		UNS S 31803 Duplex SS ASTMA 276 (R2)	
27	Shaft sleeve		UNS S 31803 Duplex SS ASTMA 276 (R2)	
28	Line Shaft Couplings		UNS S 32750 Duplex SS (R2)	
29	Shaft Sealing		Impregnated Teflon Gland Packing	
30	Fasteners		SS 316 L	
31	Strainer		SS 316 L	
32	Painting		As per approved painting specification	
33	Make		Flowmore	



PUMP PARTICULARS

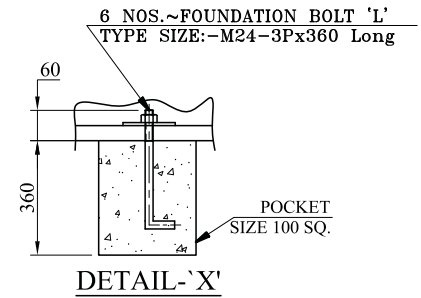
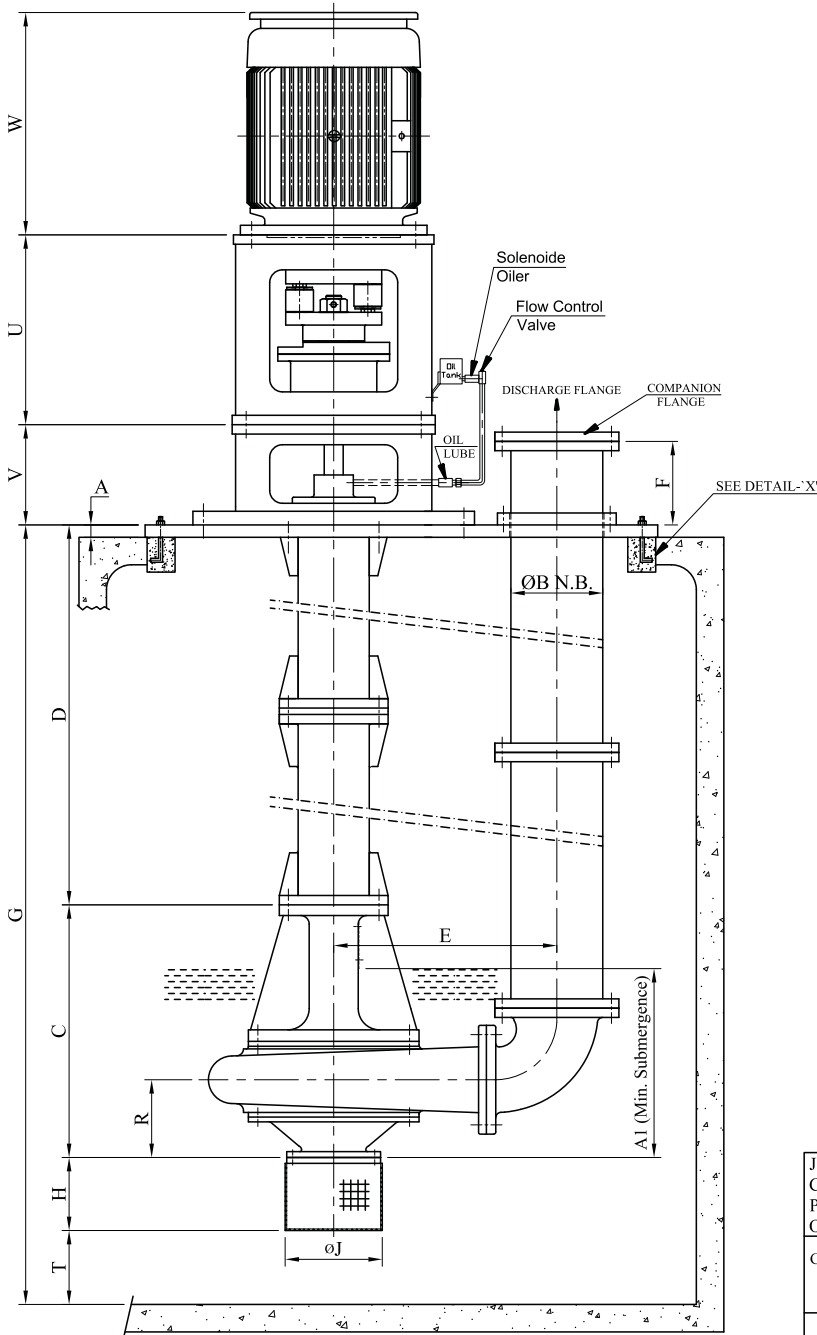
QTY.	FIGURE	SIZE	STAGE	SPEED
03 Nos.	5414B AWS	200x200 (8"x8") DEL.-250 (10")	SINGLE	1470 R.P.M.
CAPACITY OF EACH PUMPS	HEAD	PUMP INPUT (Sp. Gr. 1.03)	EFFICIENCY	
500 M ³ /hr.	16.25 Mtrs	30.79 K.W.	74%	

MOTOR PARTICULARS

MAKE	POWER	SPEED	FRAME
CGL	37 K.W	1470 R.P.M.	ND 225 S
VOLTS	PHASES	FREQUENCY	TYPE OF CONSTRUCTION
415±10%	THREE	50 HZ.	V.S.S.

- NOTE:-
 1. DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
 2. DIRECTION OF PUMP ROTATION:- **COUNTER CLOCKWISE** WHEN LOOKING FROM TOP.
 3. STATIC LOAD (PUMP SET WITH MOTOR) = 2100 KGS. (APPROX.)
 4. DYNAMIC LOAD (PUMP SET WITH MOTOR) = 2600 KGS. (APPROX.)

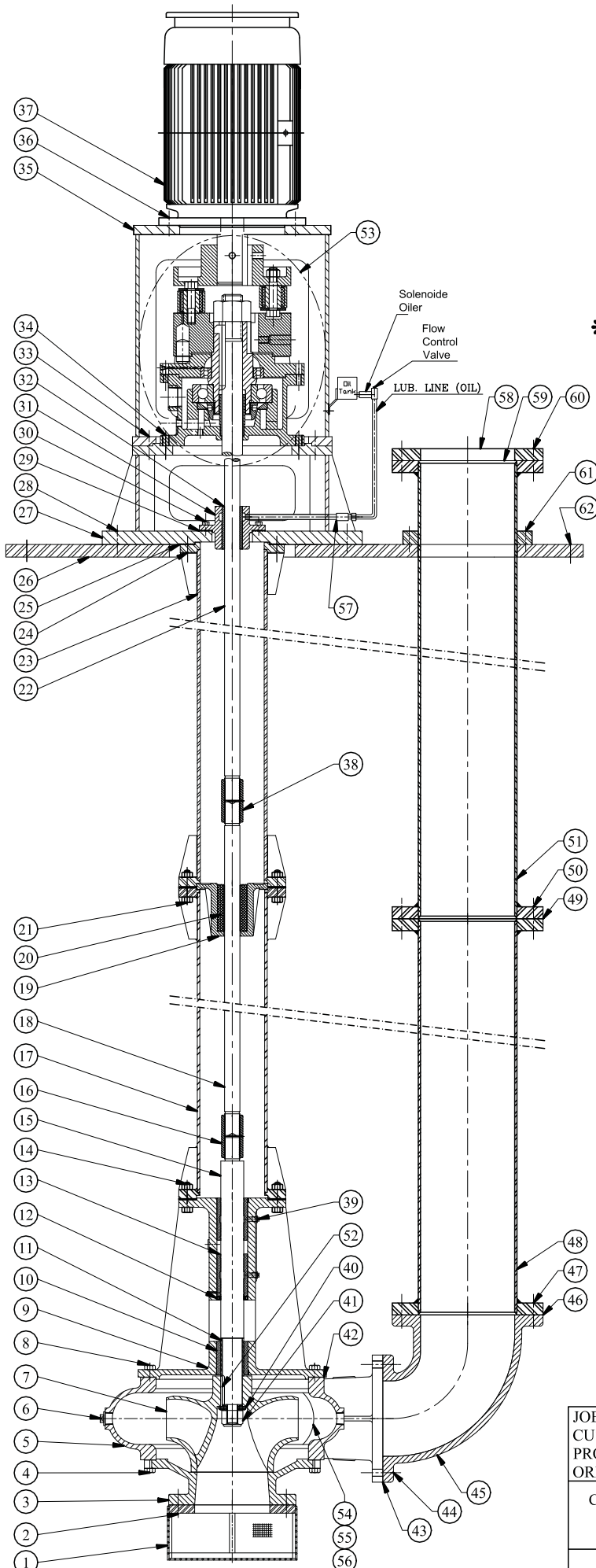
DISCHARGE FLANGE DETAILS AS PER ANSI B16.5, 150 LBS	
DISCHARGE FLANGE :-	250 N.B.
FLANGE O.D.	:- 406.4
P.C.D.	:- 362
NO. OF HOLES	:- 12
DIA. OF HOLES	:- 25.4



A	36	P	1650
B	250	Q	1050
C	823	R	233
D	3028	S	200
E	692	T	300
F	250	U	480
G	4386	V	250
H	235	W	790
J	355	A1	550
K	28		
L	1800		
M	1200		
N	580		

JOB NAME :- SLUDGE TRANSFER PUMPS.,
 CUSTOMER :- M/s. OTOKLINE GLOBAL BUSINESS LIMITED.,
 PROJECT :- A/c. TANGEDCO - ENNORE STPP.
 ORDER NO. :- 004A/OC-983/18-19., Dt.:-10.12.2018.

GENERAL ARRANGEMENT DRAWING FOR VERTICAL SUMP PUMP	SCALE N.T.S.	DRN.	NAME	DATE
		CHD.	D.K.S.	HEMANT
		APPD.	P.K.S.	09.02.2019
DRAWING NO.			REV.	
FLOWMORE LIMITED NEW DELHI			GA-SALE19013938 10	0



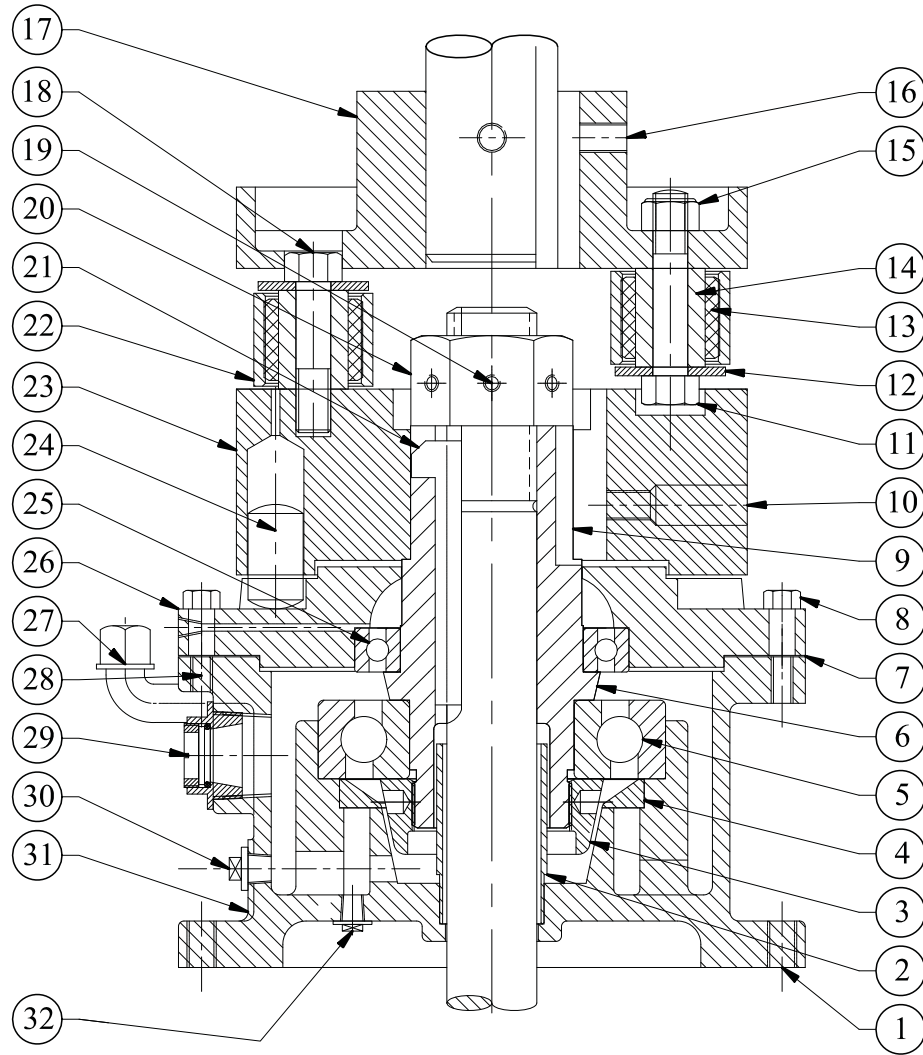
62	L-TYPE FOUNDATION BOLT WITH NUT	6	M.S.
61	HEX. HD. CAP SCREW	4	S.S.-316 L
60	HEX. HD. BOLT WITH NUT	12	S.S.-316 L
59	GASKET	1	RUBBER
58	COMPANION FLANGE	1	DUPLEX S.S.
57	LUBRICATION PIPE ASSY.	1	S.S.-316+ALUM.
56	HEX. HD. BOLT WITH NUT	6	S.S.-316 L
55	GASKET	1	RUBBER
54	VOLUTE HAND HOLE COVER	1	ASTM A890, Gr-4A (DUPLEX S.S.)
53	T. S. ASSY.	1	REFER DRG. NO.- TSA-SALE19013938-10
52	KEY FOR IMPELLER	1	S.S.-316 L
51	DISCHARGE PIPE (Top)	1	DUPLEX S.S.
50	HEX. HD. BOLT WITH NUT	12	S.S.-316 L
49	GASKET	2	RUBBER
48	DISCHARGE PIPE (Bottom)	1	DUPLEX S.S.
47	HEX. HD. BOLT WITH NUT	8	S.S.-316 L
46	GASKET	1	RUBBER
45	DISCHARGE ELBOW (200x250) 8"x10"	1	DUPLEX S.S.
44	HEX. HD. BOLT WITH NUT	8	S.S.-316 L
43	GASKET	1	RUBBER
42	GASKET	2	RUBBER
41	IMP. NUT (Nylock)	1	S.S.-316 L
40	IMP. WASHER	1	S.S.-316 L
39	PIPE PLUG	1	S.S.-316 L
38	SHAFT COUPLING	2	UNS S 32750 DUPLEX S.S.
37	MOTOR	1	CGL
36	HEX. HD. BOLT WITH NUT	8	S.S.-316 L
35	MOTOR STOOL	1	M.S. FAB. (IS:2062)
34	HEX. HD. BOLT WITH NUT	4	S.S.-316 L
33	HEX. HD. BOLT WITH NUT	8	S.S.-316 L
32	BRG. BUSH (For Top Tube)	1	GFT
31	TOP TUBE BRG. HOUSING	1	ASTM A890, Gr-4A (DUPLEX S.S.)
30	HEX. HD. CAP SCREW	6	S.S.-316 L
29	GASKET	1	RUBBER
28	STUD BOLT WITH NUT	4	S.S.-316 L
27	MOTOR STAND	1	M.S. FAB. (IS:2062)
26	BASE PLATE	1	M.S. (IS:2062)
25	GASKET	1	RUBBER
24	HEX. HD. CAP SCREW	12	S.S.-316 L
23	TOP COL. PIPE	1	DUPLEX S.S.
22	TOP SHAFT	1	UNS S 31803 DUPLEX S.S. ASTM A276
21	HEX. HD. BOLT WITH NUT	16	S.S.-316 L
20	COL. BRG. BUSHING	2	GFT
19	COL. BRG. HOUSING	2	ASTM A890, Gr-4A (DUPLEX S.S.)
18	LINE SHAFT	2	UNS S 31803 DUPLEX S.S. ASTM A276
17	COL. PIPE	2	DUPLEX S.S.
16	SHAFT COUPLING (PUMP)	1	UNS S 32750 DUPLEX S.S.
15	PUMP SHAFT	1	UNS S 31803 DUPLEX S.S. ASTM A276
14	HEX. HD. BOLT WITH NUT	12	S.S.-316 L
13	BRG. BUSHING FOR FRAME	1	GFT
12	OIL SEAL	1	NITRILE RUBBER
11	SHAFT SLEEVE	1	UNS S 31803 DUPLEX S.S. ASTM A276
10	PRESSURE REDUCING BUSH	1	BRONZE (ASTM B62)
9	FRAME	1	ASTM A890, Gr-4A (DUPLEX S.S.)
8	HEX. HD. CAP SCREW	8	S.S.-316 L
7	IMPELLER	1	ASTM A890, Gr-4A (DUPLEX S.S.)
6	PIPE PLUG	1	S.S.-316 L
5	VOLUTE	1	ASTM A890, Gr-4A (DUPLEX S.S.)
4	HEX. HD. CAP SCREW	8	S.S.-316 L
3	SUCTION HEAD	1	ASTM A890, Gr-4A (DUPLEX S.S.)
2	STUD BOLT WITH NUT	4	S.S.-316 L
1	STRAINER	1	S.S.-316 L
S.NO.	DESCRIPTION	QTY.	MATERIAL

NOTE: - +VE WIRE OF SOLENOIDE TO BE CONNECTED ANY OF THE PHASE OF MAIN MOTOR AND -VE IS TO BE CONNECTED TO EARTH TERMINAL OF MOTOR

* THESE ITEM ARE NOT SHOW IN THIS DRAWING.

PUMP PARTICULARS		(QTY.:- 03 Nos.)
FIG.	-	5414B AWS
SIZE	-	200x200 (8"x8"), Del.:- 250 (10")
STAGE	-	SINGLE
TYPE OF LUB.	-	OIL

JOB NAME :- SLUDGE TRANSFER PUMPS.,				
CUSTOMER :- M/s. OTOKLINE GLOBAL BUSINESS LIMITED.,				
PROJECT :- A/c. TANGEDCO - ENNORE STPP.				
ORDER NO. :- 004A/OC-983/18-19., Dt.:-10.12.2018.				
CROSS SECTIONAL DRAWING FOR VERTICAL SUMP PUMP	SCALE N.T.S.	DRN.	NAME HEMANT	DATE 09.02.2019
		CHD.	D.K.S.	09.02.2019
		APPD.	P.K.S.	09.02.2019
FLOWMORE LIMITED NEW DELHI	DRAWING NO.	CSD-SALE19013938 10	REV.	0

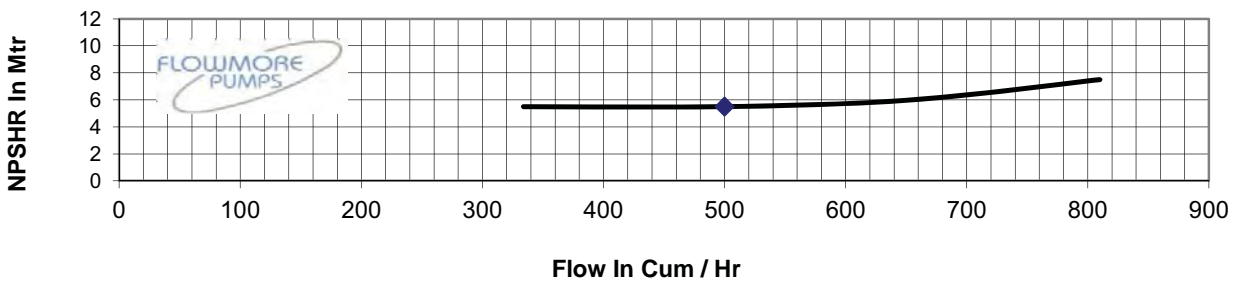
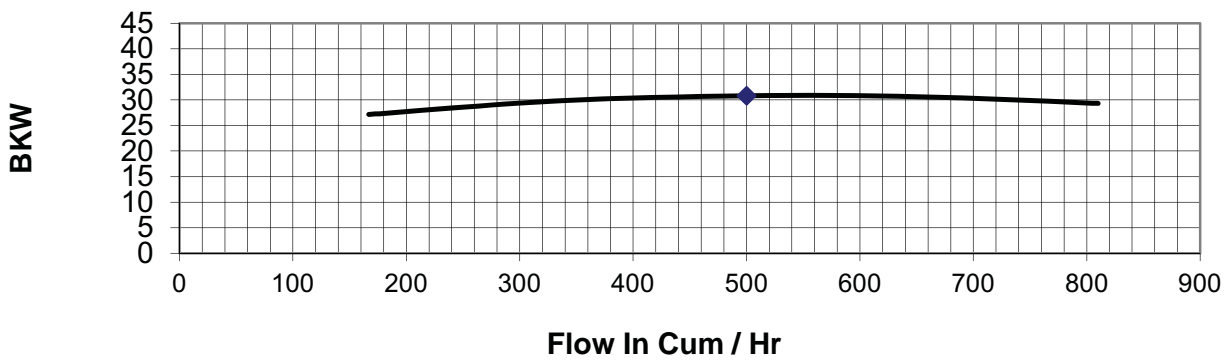
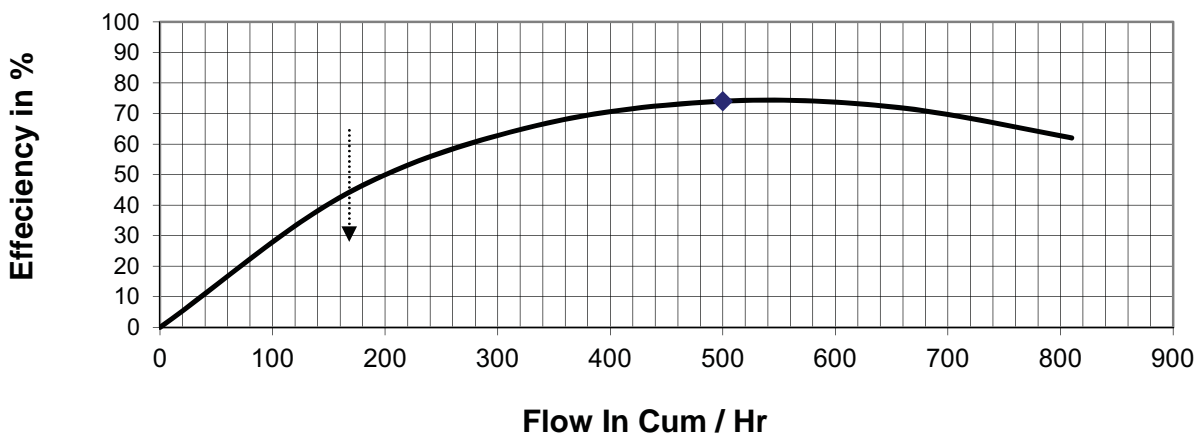
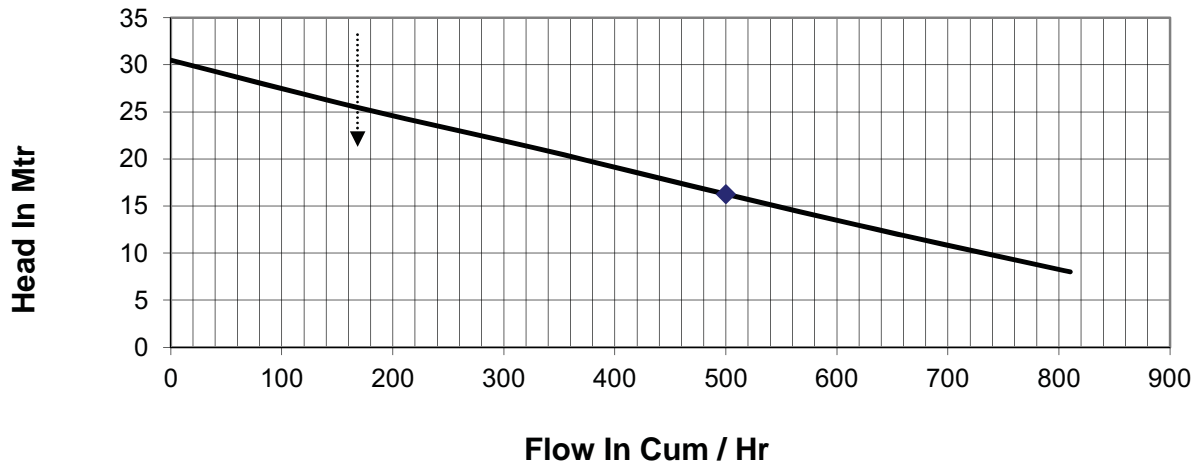


THRUST STAND ASSY. FOR VERTICAL SUMP PUMP

32	PIPE PLUG	1	MAL. IRON
31	THRUST BEARING HOUSING	1	C.I. (IS-210, FG-260)
30	PIPE PLUG	1	MAL. IRON
29	OIL SIGHT WINDOW ASSY.	1	—
28	DOWEL PIN	2	En-8/En-9
27	OIL FILL PORT	1	MAL. IRON
26	MOUNTING COVER (RATCHET PLATE)	1	CAST STEEL (IS-1030)
25	RADIAL BEARING (6020 2Z)	1	BRG. STEEL (SKF/FAG)
24	RATCHET PIN	4	STEEL
23	LOWER COUPLING HALF	1	CAST STEEL (IS-1030)
22	LINK	3	MAL. IRON
21	GIB KEY	1	EN-8
20	ADJUSTING NUT	1	MILD STEEL
19	ALLEN SET SCREW	1	S.S.-316 L
18	HX. HD. BOLT(3/4"NF x 3-1/4"Lg.)	3	H.T. STEEL (Gr. 8.8)
17	UPPER COUPLING HALF	1	CAST STEEL (IS-1030)
16	ALLEN SET SCREW	2	S.S.-316 L
15	NYLOCK NUT	3	H.T. STEEL (Gr. 8.8)
14	PIN BLOCK	6	ALUMINIUM
13	RUBBER BUSH	6	RUBBER
12	RETAINING WASHER	6	MILD STEEL
11	HX. HD. BOLT (3/4" NF X 4"Lg.)	3	H.T. STEEL (Gr. 8.8)
10	ALLEN SET SCREW	1	S.S.-316 L
9	STRAIGHT KEY	1	EN-8
8	HX. HD. CAP SCREW	8	S.S.-316 L
7	MOUNTING COVER GASKET	1	CHAMPION STYLE NO.-59
6	THRUST HUB	1	CAST STEEL (IS-1030)
5	ANGULAR CONTACT THRUST BEARING (7318E)	1	BRG. STEEL (SKF/FAG)
4	OIL RETAINER RING	1	C.I. (IS-210, FG-260)
3	OIL RETAINER SLEEVE	1	BRONZE (IS-318, LTB-II)
2	BELTED OIL SLEEVE	1	MILD STEEL
1	HX. HD. CAP SCREW	4	S.S.-316 L
S. NO.	DESCRIPTION	QTY.	MATERIAL

JOB NAME :- SLUDGE TRANSFER PUMPS.,
 CUSTOMER :- M/s. OTOKLINE GLOBAL BUSINESS LIMITED.,
 PROJECT :- A/c. TANGEDCO - ENNORE STPP.
 ORDER NO. :- 004A/OC-983/18-19., Dt.:-10.12.2018.

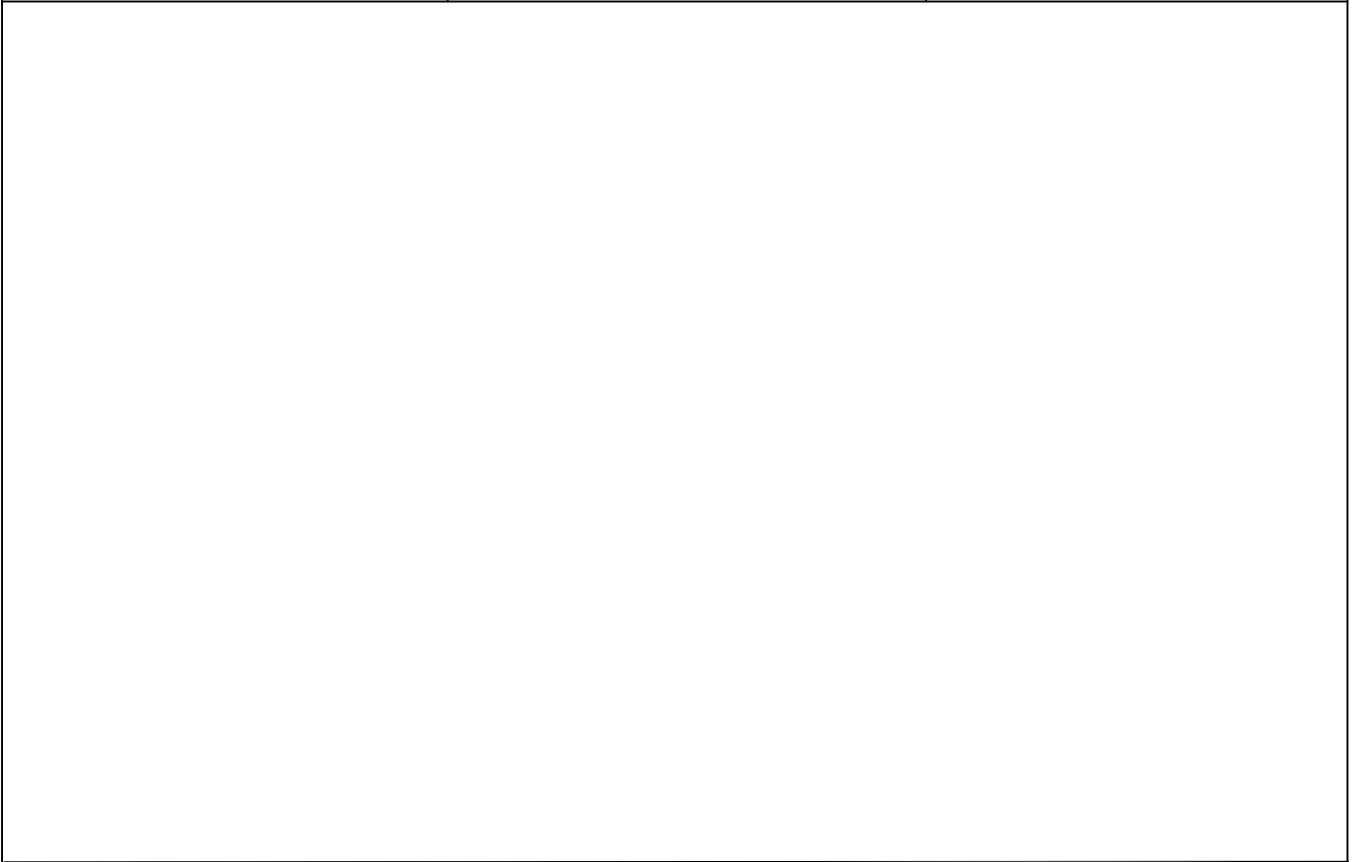
CROSS SECTIONAL DRAWING FOR T.S. ASSY. V.T. SUMP PUMP		DPPT	NAME	DATE	
		CODE	DRN.	HEMANT	09.02.2019
			DGN.		
			CHD.	D.K.S.	09.02.2019
		APPD.	P.K.S.	09.02.2019	
FLOWMORE LIMITED NEW DELHI		DRG. NO.	REV.		
		TSA-SALE19013938 10	0		







Duty Point 500 Cum / Hr 16.25 Mtr BH 74 % Bowl Eff Sp Gr 1.03.	Customer M/S.OTOKLIN G Business Ltd- A/C.BHEL ENNORE PROJECT.					
	Suction 200 MM		Delivery 10 " - 250 MM		Speed 1470 RPM	
	FLOWMORE LIMITED., MUMBAI				PUMP MODEL	
	SLUDGE TRANSFER PUMP				AWS 5414B-8"	
OUR W O REF NO : SALE 19013938 10				NC-4-0B 8/4.		

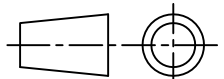
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412





2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -		
QAP FOR HORIZONTAL / VERTICAL CENTRIFUGAL PUMPS /SCREW PUMP WITH MOTOR OF PRE TREATMENT PLANT					NAME	SIGN	DATE	
					PREP	ALOYSIUS	AF	16-07-18
					CHKD	MUAZZAM I	MI	16-07-18
					APPD	ASLAM A	AA	16-07-18

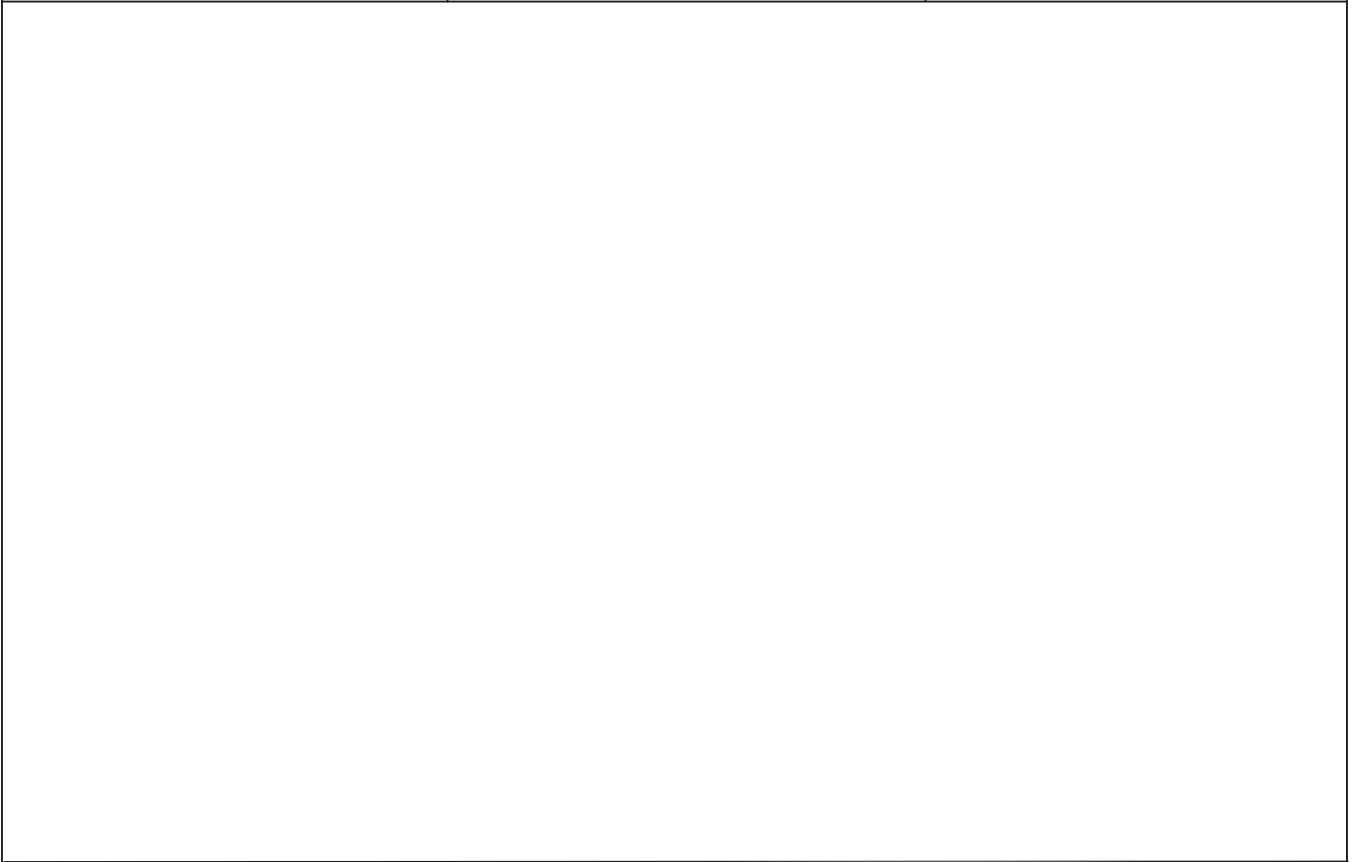
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018					APPD			ASLAM A	AA	16-07-18
DEPT.					CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A009				REV 0
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/QAP/CP/PTP/18/348				
DATE						NO. OF SHEETS 2 EXCLUDING COVER PAGE				

S.NO		COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1		2	3	4	5	6	7	8	9	D	M	C	N	11
[1]		RAW MATERIAL AND BOUGHT OUT COMPONENTS.												
1.1	CASING	Visual, Dimensional, and Leak Proofness	Major	Visual, Measurement, Hydro Test, MFG. TC.	100% One/Heat	Approved Drawing. / Documents	Approved Drawing. / Documents	Mfg. Insp. Report. MFG. TC	✓		P	R	R	
[2]		IN PROCESS CONTROLS												
2.1	IMPELLER	Visual, Dimensional, and AND Dynamic Balancing	Major	Visual, Measurement, Dynamic, Balancing. MFG. TC.	100% One/Heat	Approved Drawing. / Documents	Approved Drawing. / Documents	Mfg. Insp. Report. MFG. TC	✓		P	R	R	
2.2	SHAFT & SLEEVES	Visual, Dimensional and Soundness of Shaft DIA >50 mm	Major	Visual, Measurement, Ultrasonic Test of Shaft MFG. TC.	100% One/Heat	Approved Drawing. / Documents	Approved Drawing. / Documents	Mfg. Insp. Report. MFG. TC	✓		P	R	R	
[3]		FINAL INSPECTION												
3.1	COMPLETE ARRANGEMENT	Overall Dimension	Major	Measurement	100%	Approved Drawing. / Documents	Approved Drawing. / Documents	Mfg. Insp. Report. MFG. TC	✓		P	W	R	
	PERFORMANCE TEST	Capacity VS Power, Capacity VS Efficiency, Capacity VS Total Head,	Major	Witness	100%	Approved Drawing. / Documents	Approved Drawing. / Documents	Mfg. Insp. Report. MFG. TC	✓		P	W	R	Mfgr. To check all the pumps of each model selected randomly shall be offered for testing by job motor.
3.2	Pump & Accessories with Base Frame	Visual & Dimensional	Measurement	Witness	100%	Approved GAD	Approved GAD	Insp. Report	✓		P	W	R	Manufacturer Compliance Report
3.3	Painting	Visual	Major			As per Appd Doc	As per Appd Doc	I R	✓		P	R	R	Compliance Report
	Packing													Compliance Report
 MANUFACTURER / SUBCONTRACTOR		 CONTRACTOR		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: SUPPLIER/NOMINATED INSPECTION AGENCY N: THE OWNER					DOC. NO.: REV..... CAT.....			FOR THE		





S.NO		COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
										D	M	C	N	
1	2	3	4	5	6	7	8	9		10			11	
[1]		RAW MATERIAL AND BOUGHT OUT COMPONENTS												
1.1	Pump Casing	Physical Properties	Critical	Test & Analysis	One / Heat	Approved Drawing /Documents	Approved Drawing /Documents	Material test certificate	✓	P	R	R	Physical, Chemical test certificate for shafts per batch and ultrasonic test (for dia ≥ 50 mm) report to be submitted for review.	
1.2	Rotor	Chemical Properties	Critical	Test & Analysis	One / Heat	Approved Drawing /Documents	Approved Drawing /Documents	Material test certificate	✓	P	R	R		
1.3	Shaft	Chemical Properties	Critical	Test & Analysis	One / Heat	Approved Drawing /Documents	Approved Drawing /Documents	Material test certificate	✓	P	R	R		
1.4	Stator	Dimension	Critical	Visual Measurement	1	Mfr's Drg.	Mfr's Drg.	Certificate of conformance	✓	P	R	R		
1.5	Bearing	Size, Make & No.	Major	Visual Measurement	100%	Mfr's Std.	Mfr's Std.	Certificate of conformance	✓	P	R	R		
[2]		IN PROCESS CONTROLS												
2.1	Pump Casing	Dimension, Completeness	Major	Visual Measurement	100%	Mfr's Drg.	Mfr's Drg.	Certificate of conformance	✓	P	R	R	Manufacturer Compliance Report	
		Leak Tightness	Critical	Hydrostatic Test	100%	hydro test at 1.5 x Discharge pr. for 30 min.	No Leakage	Insp. Report	✓	P	R	R		
	Machined area of casing & Rotor	Surface Quality	Major	DPT/Visual	100%	ASTM E165	No Visual	Certificate of Compliance	✓	P	R	R		
	All Components	Completeness, Workmanship, Dimension	Major	Visual Measurement	100%	Mfrs. Std./Drg.	Mfrs. Std./Drg.	Certificate of Compliance	✓	P	R	R		
[3]		FINAL INSPECTION												
3.1	Pump with job motor	Head Vs Power Head Vs Capacity Head Vs Efficiency	Major	Performance Check	100%	Appd. Data Sheet	VDMA 24284 Gr II CLII	Insp. Report	✓	P	W	R	1. Only one pump/model to be witness. 2. Pump shall be tested at rated speed with Job Motor using water + oil emulsion.	
3.2	Pump with accessories mounted on base frame	Overall Dimensions & Orientation	Major	Visual	100%	App. GAD	App. GAD	Insp. Report	✓	P	W	R		Only one set to be witness
3.2	Painting	Surface Preparation, Paint shade & DFT	Major	Visual & Measurement	100%	As per Appd Doc	As per Appd Doc	Cert. of Conformance	✓	P	W	R	Compliance Report	
3.3	Packing	-	-	-	-	Std.	Std.	Cert. of Conformance	✓	P	R	R	Compliance Report	
 								LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER P - Performing the Test C: SUPPLIER/NOMINATED INSPECTION AGENCY W - Witnessing the Test N: THE OWNER R - Review the Test		DOC. NO.: REV..... CAT.....			FOR THE	
MANUFACTURER / SUB-CONTRACTOR			CONTRACTOR			SIGNATURE								

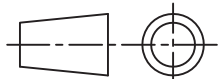
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REV	DATE	ALTERED: FN	REV	DATE	ALTERED:	
0	16.07.2018	CHECKED: MI			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

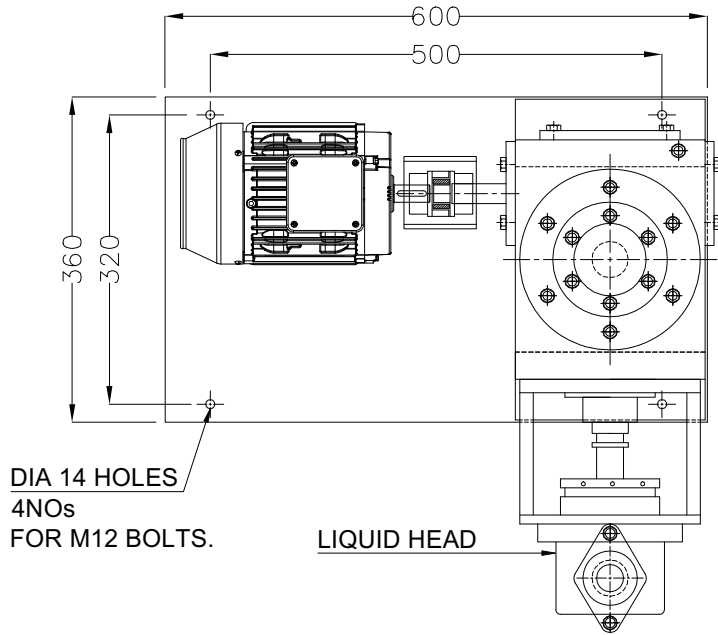
TECHNICAL DATASHEET FOR METERING PUMPS OF PRE TREATMENT PLANT		NAME	SIGN	DATE
	PREP	FAISAL	FN	12-07-19
	CHKD	MUAZZAM I	MI	12-07-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	12-07-19

DEPT.					CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A010	REV 01
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/CF/PTP/18/308	
DATE						NO. OF SHEETS 16 EXCLUDING COVER PAGE	

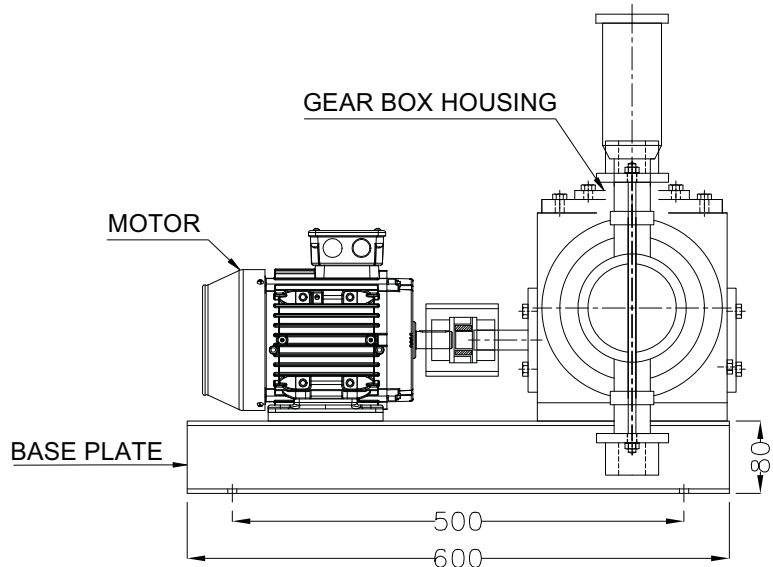
DATA SHEET OF PE METERING PUMPS

LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A010		
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/MP/PTP/18/308	Rev No:- 01	
PROJECT	2X660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT	MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED				
Sr. No.	Parameters	Description		
A	TECHNICAL SPECIFICATION			
1	Quantity	2 Nos. (1W+1S)		
2	KKS TAG No.	90GBN83AP001 & 90GBN83AP002 (R1)		
3	Location#	First floor Chemical House Ref Drg. No. PE-V0-412-158-A035		
4	Type	Plunger Type (Positive Displacement)		
5	Application	Poly Electrolyte dosing in Flash mixer.(R1)		
6	Rated capacity in LPH	0-1000 LPH		
7	Total Head in 'm'	10 m		
8	RPM	1500		
9	Recommended Motor/Engine HP	1 (R1)		
10	Discharge Pressure Kg/cm2	1.0		
11	Hydro test Pressure Kg/cm2	1.5		
B	MATERIAL OF CONSTRUCTION			
1	Liquid Head	SS 316		
2	Plunger	SS 316		
3	Valve seat / Cage	SS 316		
4	Ball/Cone/Plate	SS 316		
5	Pressure Relief Valve	SS 316		
6	End Connection	1" BSP (FM)		
7	Painting	As per approved painting specification.		
8	Make	Positive Metering Pumps. (R1)		
9	Model no	PL 3530 (R1)		
C	MOTOR DETAILS			
1	Type	Pump Enclosed		
2	Enclosure = TEFC	IP – 55/B-3		
3	Speed in RPM / HP	1500 / 1 (R1)		
4	Rated Voltage / Phase / Frequency	415V / 3 / 50 HZ		
5	Make / Model	ABB / 80		
REV NO : 01		PREPARED BY: FN	CHKD. & APPD. BY: MI & AA	DATE: 12.07.2019

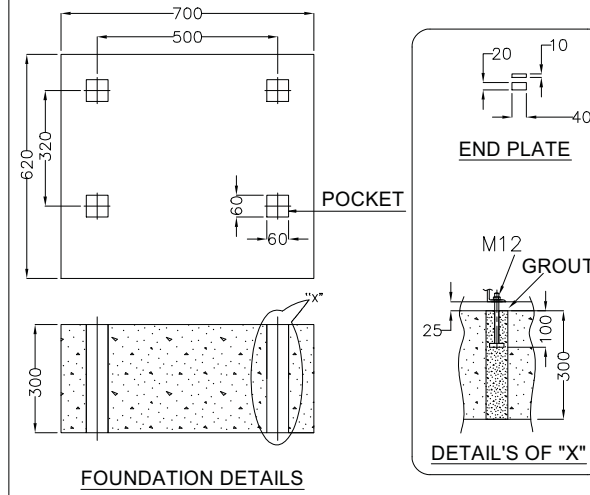
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TOP VIEW

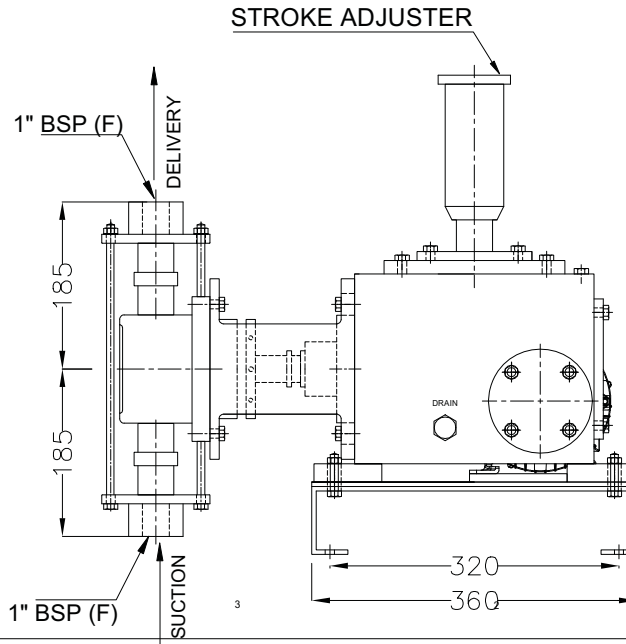


FRONT VIEW



FOUNDATION DETAILS

DETAIL'S OF "X"



SIDE VIEW

NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. TOLERANCE FOR ALL DIMENSIONS ARE ± 10 mm
3. FOUNDATION BOLT SIZE M12mmX150mm

TECHNICAL SPECIFICATIONS

CUSTOMER NAME	OTOKLIN GLOBAL BUSINESS LTD. MUMBAI		
PO NO	008A / OC -983 / 18-19		
OFFER NO.	BFMP / OFF / DP / 18-19 / 02 / 2137 / R2		
LIQUID	0.1% POLY SOLUTION		
PUMP TYPE	PLUNGER TYPE PUMP	COUPLING TYPE	FLEXIBLE SPIDER
PUMP MODEL	PL3530	QTY.	2 No.
PUMP WETTED PART MOC	SS316 / CF8M		
FLOW RATE	0-1000 LPH		
DISCHARGE PRESSURE	1 KG/CM ²		
STROKE RANGE	0-100% (MANUAL)		
MOTOR DESCRIPTION	1 HP, 3PH, 415V $\pm 10\%$, 50HZ $\pm 5\%$, 4-POLE, FOOT MOUNTED, STD TEFC, IP55, IE2, NON FLAME PROOF, S1 DUTY, DOL START.		
END CONNECTION	1" BSP (F) CONNECTION ON SUCTION SIDE & DISCHARGE SIDE.		

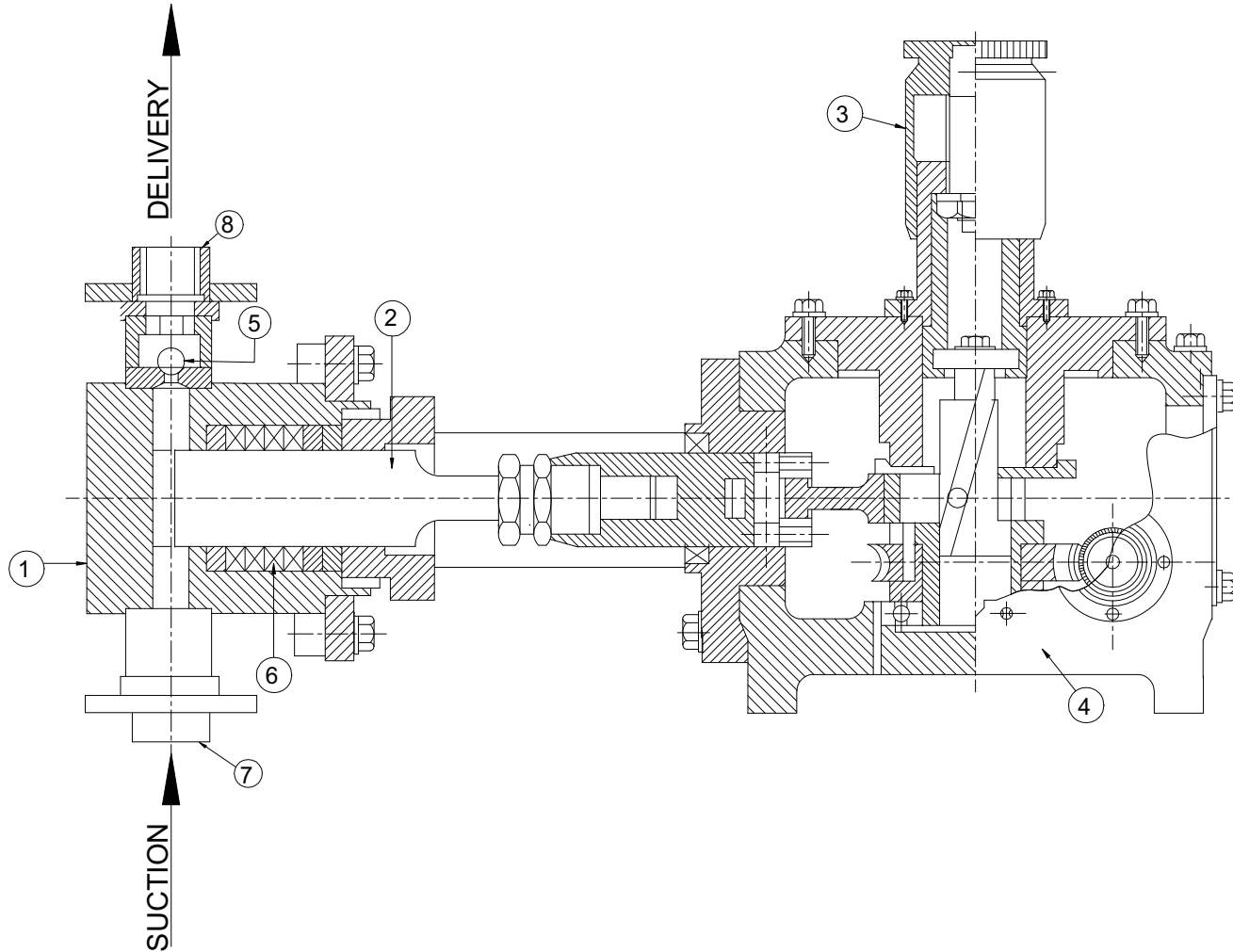
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FINAL	ACCEPTED WITH COMMENTS	NOT ACCEPTABLE	FOR INFORMATION
1			

POSITIVE METERING PUMPS (I) PVT.LTD.
PLOT NO. M8, AMBAD M.I.D.C., NASIK

DRAWING TITLE :-	GA DRAWING	SCALE	SHEET	REV.
DRAWING NO. :-	PMPPL-GA-PL3530-R9566-2	NTS	01	R1

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.2019	ISSUED FOR APPROVAL	SBN	SBN	TSN
R1	27.06.2019	ISSUED FOR APPROVAL	SPK	SBN	TSN

1. LIQUID HEAD	SS316/CF8M
2. PLUNGER	SS316
3. STROKE CONTROLLER	C.I.
4. HOUSING	C.I.
5. NRV	SS316
6. GLAND PACKING.	PTFE
7. SUCTION Connection	SS316/CF8M
8. DISCHARGE Connection	SS316/CF8M



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TECHNICAL SPECIFICATIONS

CUSTOMER NAME	>	OTOKLIN GLOBLE BUSINESS LTD. MUMBAI
PO NO	>	008A / OC -983 / 18-19
OFFER NO.	>	BPMP / OFR / DP / 18-19 / 02 / 2137 / R2
LIQUID	>	0.1% POLY SOLUTION

Z FINAL	A ACCEPTED WITH COMMENTS	N NOT ACCEPTABLE	I FOR INFORMATION
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POSITIVE METERING PUMPS (I) PVT.LTD.

PLOT NO. M8, AMBAD M.I.D.C., , NASIK

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.2019	ISSUED FOR APPROVAL	SBN	SBN	TSN
R1	27.06.2019	ISSUED FOR APPROVAL	SPK	SBN	TSN

DRAWING TITLE :-	CS DRAWING	SCALE	SHEET	REV.
DRAWING NO.:-	PMPPL-CS-PL3530-R9566-2	NTS	02	RO



POSITIVE METERING PUMPS (I) PVT. LTD.

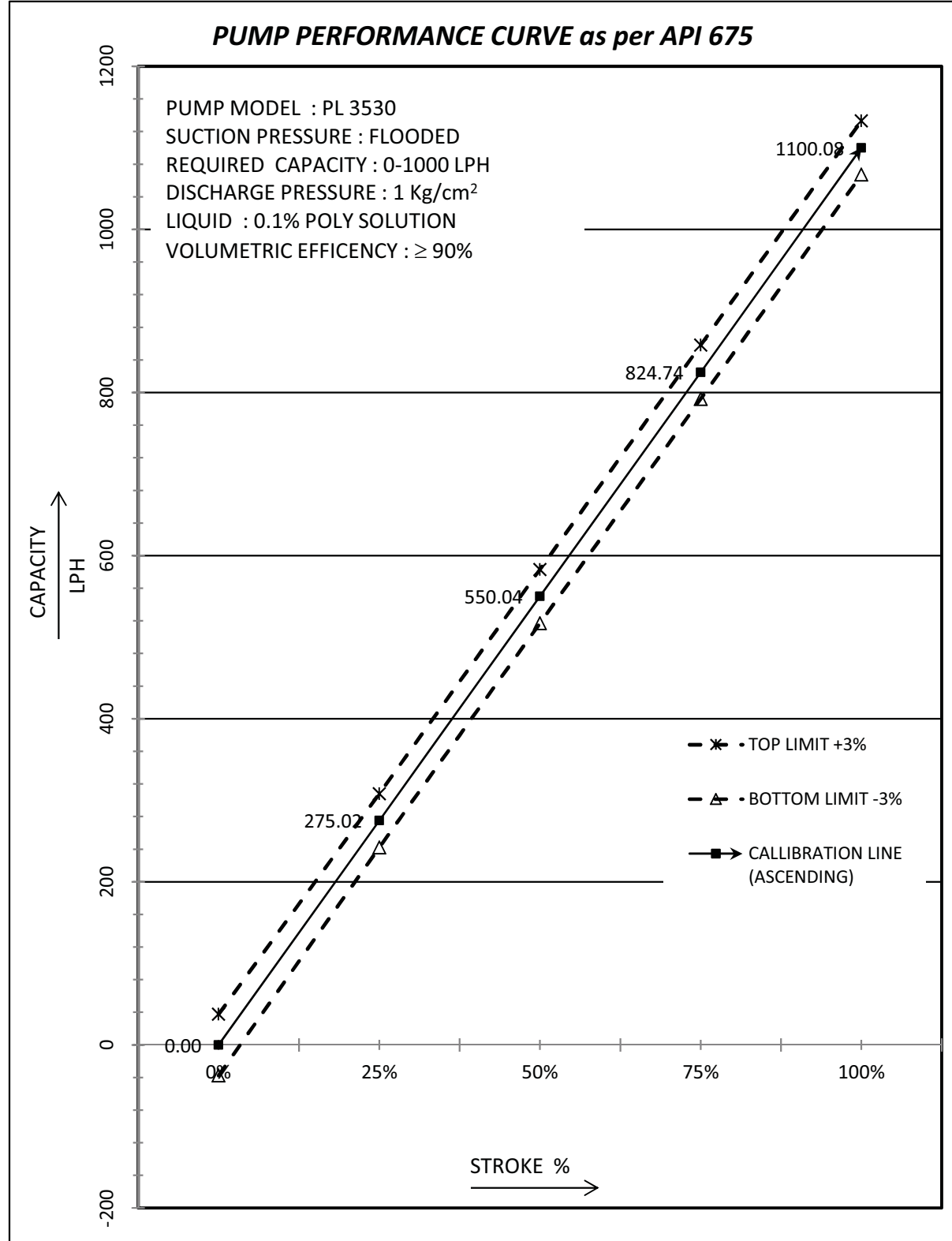
M-8, MIDC, AMBAD, NASIK - 422 010

Email : sales@positivemetering.com Web: www.positivemetering.com



CUSTOMER : OTOKLIN GLOBAL BUSINESS LTD. MUMBAI

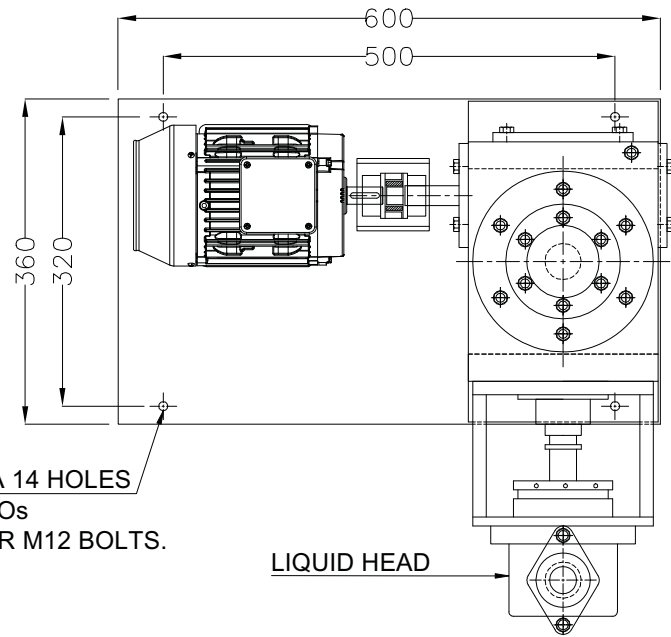
PROJECT NAME : BHEL



DATA SHEET OF FECL3 METERING PUMPS

LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A010		
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/MP/PTP/18/308		Rev No:- 01
PROJECT	2X660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT	MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED				
Sr. No.	Parameters	Description		
A	TECHNICAL SPECIFICATION			
1	Quantity	2 Nos. (1W+1S)		
2	KKS TAG No.	90GBN64AP001 & 90GBN64AP002 (R1)		
3	Location#	First floor Chemical House Ref Drg No. PE-V0-412-158-A035		
4	Type	Plunger Type (Positive Displacement)		
5	Application	FECL3 dosing in Flash mixer. (R1)		
6	Rated capacity in LPH	0-2000 LPH		
7	Total Head in 'm'	10 m		
8	RPM	1500		
9	Recommended Motor/Engine HP	1.5 (R1)		
10	Discharge Pressure Kg/cm2	1.0		
11	Hydro test Pressure Kg/cm2	1.5		
B	MATERIAL OF CONSTRUCTION			
1	Liquid Head	Duplex SS		
2	Plunger	Duplex SS		
3	Valve seat / Cage	Duplex SS		
4	Ball/Cone/Plate	Duplex SS		
5	Pressure Relief Valve	Duplex SS		
6	End Connection	1 ½" BSP (FM)		
7	Painting	As per approved painting specification		
8	Make	Positive Metering Pumps(R1)		
9	Model no	PL 3530 (R1)		
C	MOTOR DETAILS			
1	Type	Pump Enclosed		
2	Enclosure = TEFC	IP – 55/B-3		
3	Speed in RPM / HP	1500 / 1.5 (R1)		
4	Rated Voltage / Phase / Frequency	415V / 3 / 50 HZ		
5	Make / Model	ABB/ 90S		
REV NO : 01		PREPARED BY: FN	CHKD. & APPD. BY: MI & AA	DATE: 12.07.2019

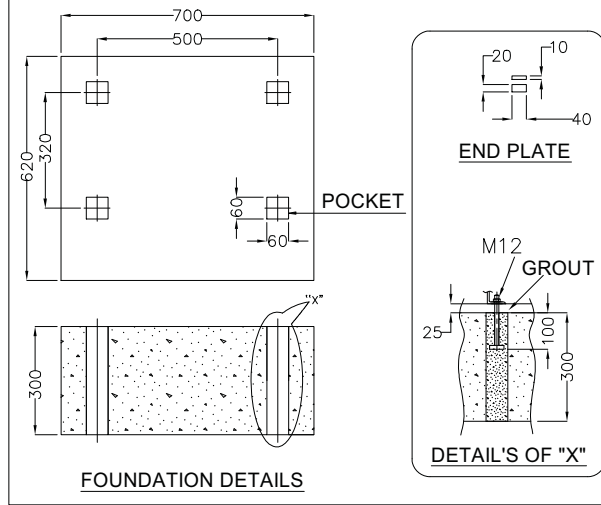
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DIA 14 HOLES
4NOs
FOR M12 BOLTS.

LIQUID HEAD

TOP VIEW



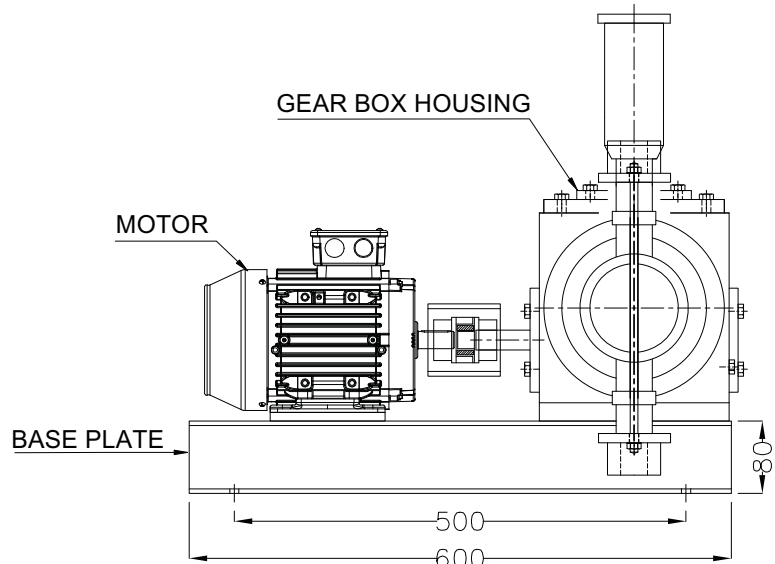
FOUNDATION DETAILS

END PLATE

M12
GROUT

DETAIL'S OF "X"

NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. TOLERANCE FOR ALL DIMENSIONS ARE ±10mm
3. FOUNDATION BOLT SIZE M12mmX150mm

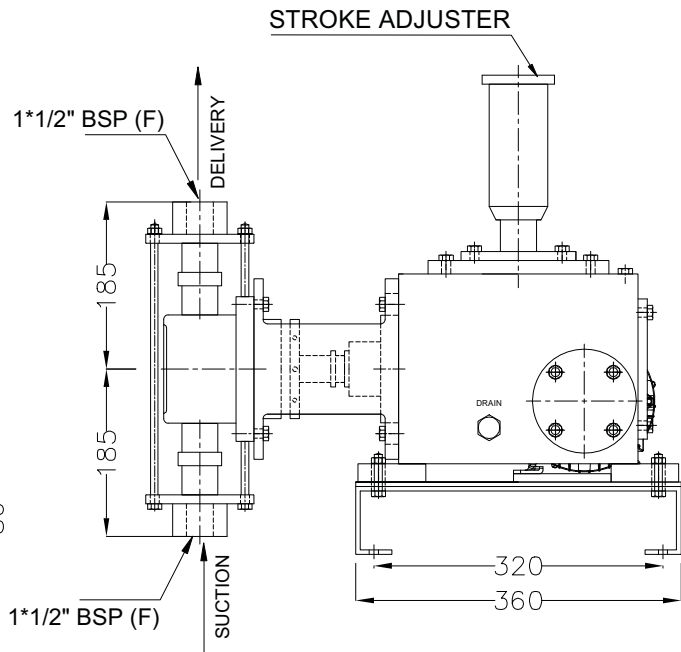


MOTOR

GEAR BOX HOUSING

BASE PLATE

FRONT VIEW



STROKE ADJUSTER

1 1/2" BSP (F)

DELIVERY

1 1/2" BSP (F)

SUCTION

SIDE VIEW

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.2019	ISSUED FOR APPROVAL	SBN	SBN	TSN
R1	27.06.2019	ISSUED FOR APPROVAL	SPK	SBN	TSN

TECHNICAL SPECIFICATIONS

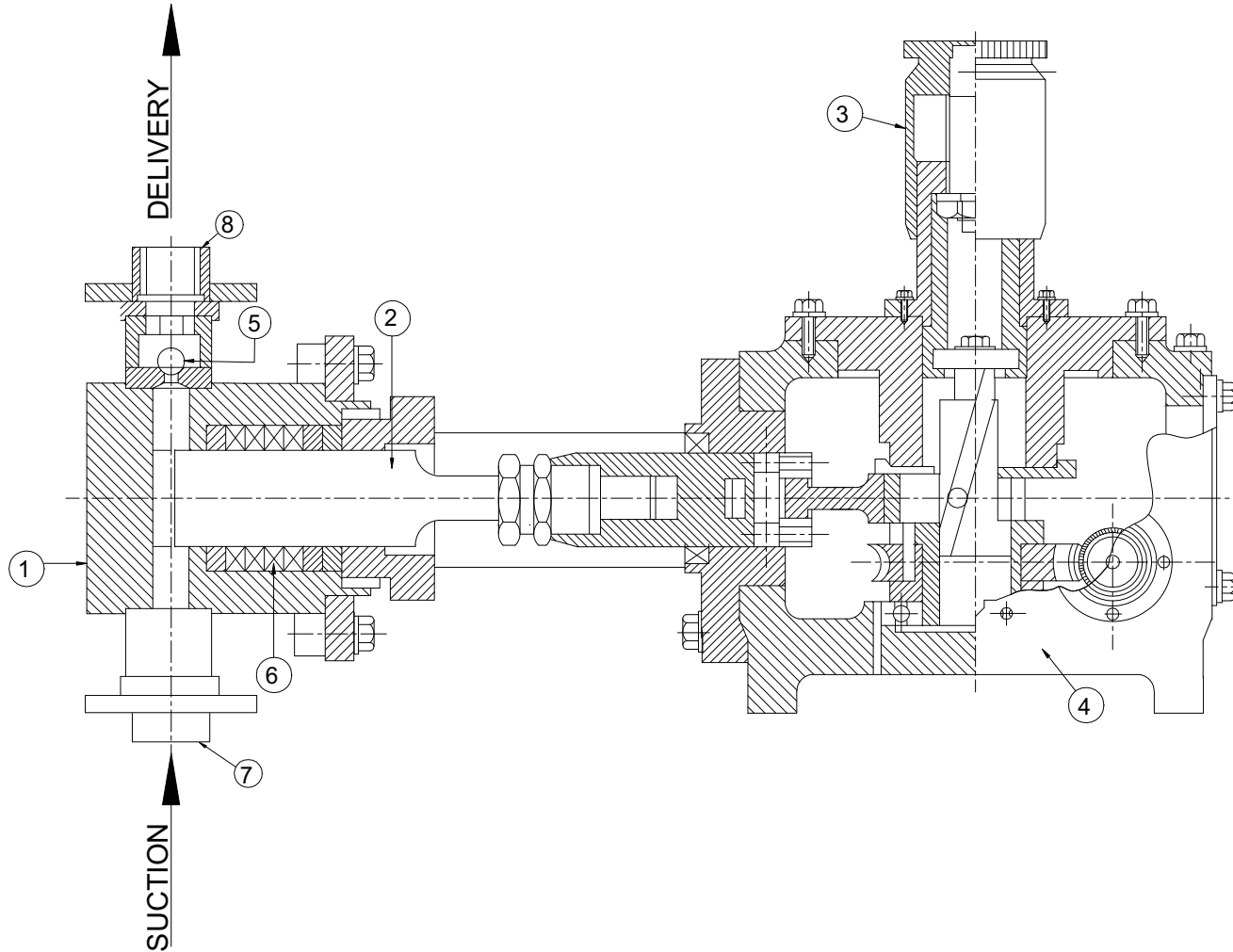
CUSTOMER NAME	OTOKLIN GLOBAL BUSINESS LTD. MUMBAI		
PO NO	008A / OC -983 / 18-19		
OFFER NO.	BFMP / OFR / DP / 18-19 / 02 / 2137 / R2		
LIQUID	FECL3		
PUMP TYPE	PLUNGER TYPE PUMP	COUPLING TYPE	FLEXIBLE SPIDER
PUMP MODEL	PL3530	QTY.	2 No.
PUMP WETTED PART MOC	DUPLEX SS		
FLOW RATE	0-2000 LPH		
DISCHARGE PRESSURE	1 KG/CM2		
STROKE RANGE	0-100% (MANUAL)		
MOTOR DESCRIPTION	1.5 HP, 3Ph, 415V±10%, 50Hz±5%, 4-POLE, FOOT MOUNTED, STD TEFC, IP55, IE2, NON FLAME PROOF, S1 DUTY, DOL START.		
END CONNECTION	1 1/2" BSP (F) CONNECTION ON SUCTION SIDE & DISCHARGE SIDE.		

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FINAL	ACCEPTED WITH COMMENTS	NOT ACCEPTABLE	FOR INFORMATION

POSITIVE METERING PUMPS (I) PVT.LTD.
PLOT NO. M8, AMBAD M.I.D.C., NASIK

DRAWING TITLE :-	GA DRAWING	SCALE	SHEET	REV.
DRAWING NO. :-	PMPPL-GA-PL3530-R9566-3	NTS	01	R1

1. LIQUID HEAD	DUPLEX SS
2. PLUNGER	DUPLEX SS
3. STROKE CONTROLLER	C.I.
4. HOUSING	C.I.
5. NRV	DUPLEX SS
6. GLAND PACKING.	PTFE
7. SUCTION Connection	DUPLEX SS
8. DISCHARGE Connection	DUPLEX SS



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TECHNICAL SPECIFICATIONS	
CUSTOMER NAME	> OTOKLIN GLOBAL BUSINESS LTD. MUMBAI
PO NO	> 008A / OC -983 / 18-19
OFFER NO.	> BPMP / OFR / DP / 18-19 / 02 / 2137 / R2
LIQUID	> FECL3

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.2019	ISSUED FOR APPROVAL	SBN	SBN	TSN
R1	27.06.2019	ISSUED FOR APPROVAL	SPK	SBN	TSN

TECHNICAL SPECIFICATIONS

CUSTOMER NAME	>	OTOKLIN GLOBAL BUSINESS LTD. MUMBAI
PO NO	>	008A / OC -983 / 18-19
OFFER NO.	>	BPMP / OFR / DP / 18-19 / 02 / 2137 / R2
LIQUID	>	FECL3

Z	A	N	I
FINAL	ACCEPTED WITH COMMENTS	NOT ACCEPTABLE	FOR INFORMATION



POSITIVE METERING PUMPS (I) PVT.LTD.

PLOT NO. M8, AMBAD M.I.D.C., , NASIK

DRAWING TITLE :-	CS DRAWING	SCALE	SHEET	REV.
DRAWING NO.:-	PMPPL-CS-PL3530-R9566-3	NTS	02	R1



POSITIVE METERING PUMPS (I) PVT. LTD.

M-8, MIDC, AMBAD, NASIK - 422 010

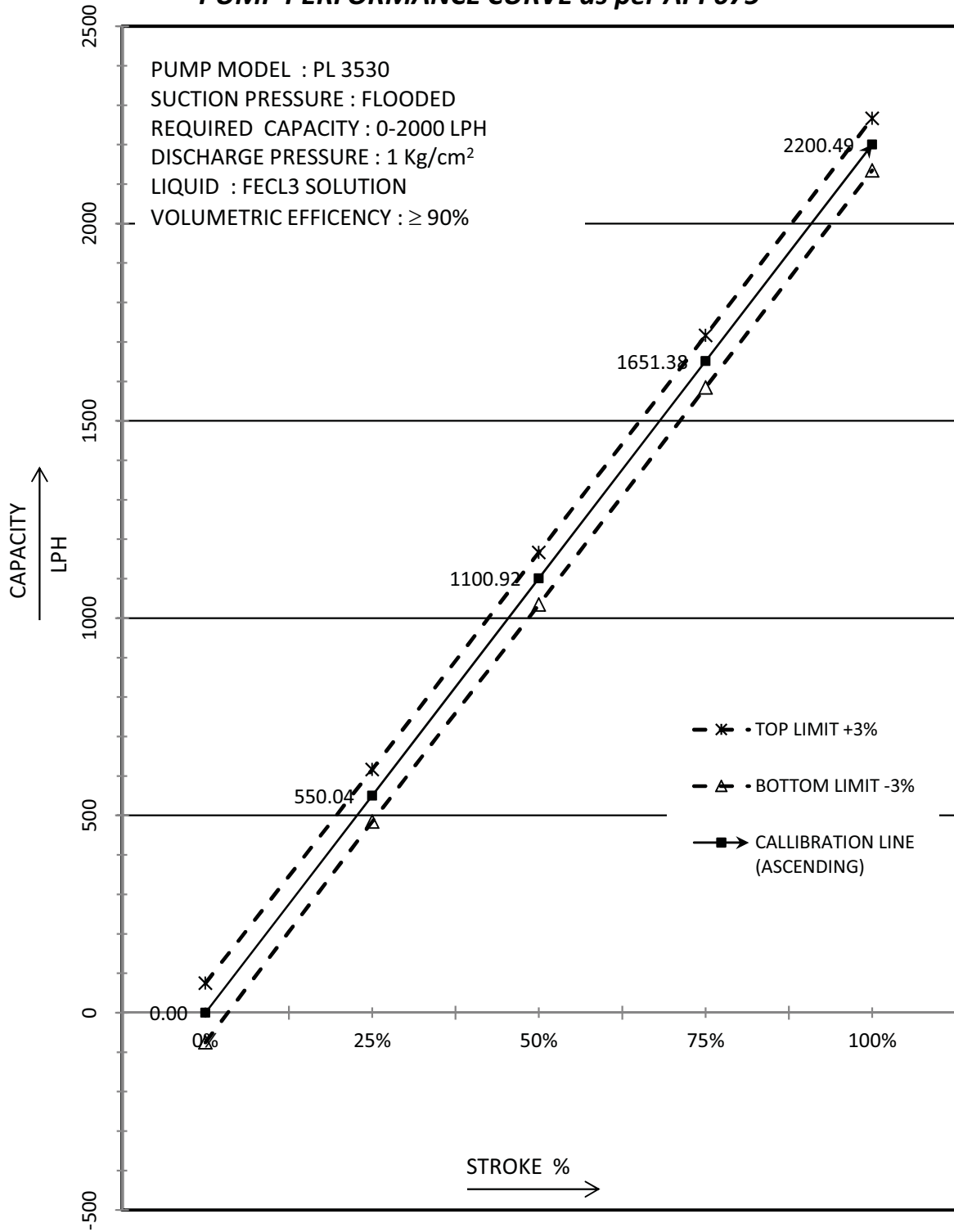
Email : sales@positivemetering.com Web: www.positivemetering.com



CUSTOMER : OTOKLIN GLOBAL BUSINESS LTD. MUMBAI

PROJECT NAME : BHEL

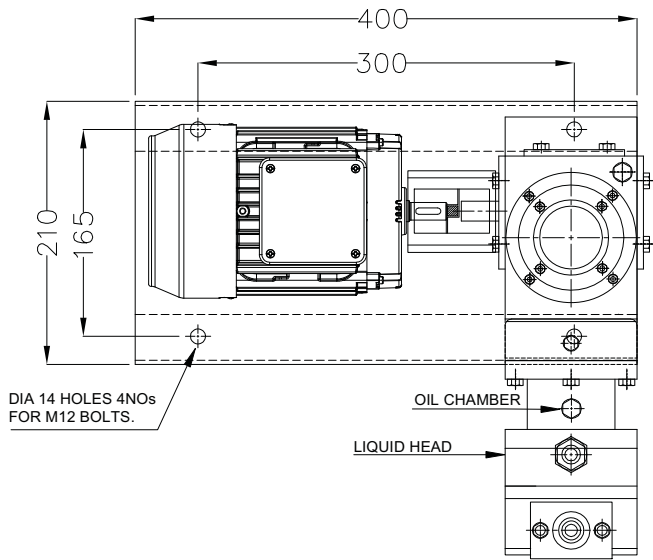
PUMP PERFORMANCE CURVE as per API 675



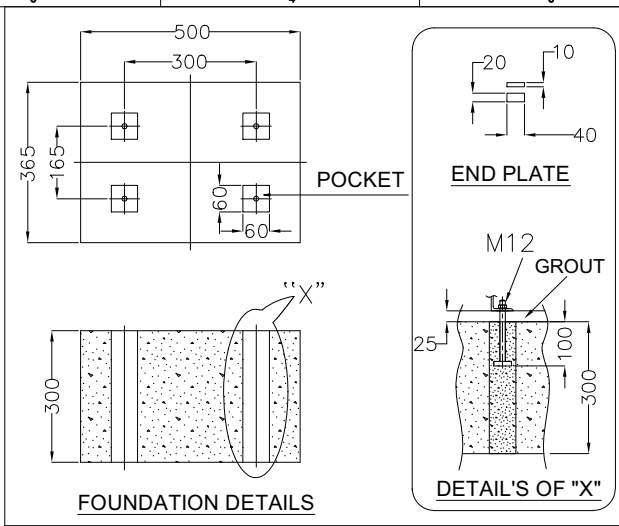
DATA SHEET OF NaOCl METERING PUMPS

LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A010		
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/MP/PTP/18/308		Rev No:- 01
PROJECT	2X660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT	MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED				
Sr. No.	Parameters	Description		
A	TECHNICAL SPECIFICATION			
1	Quantity	2 Nos. (1W+1S)		
2	KKS TAG No.	90GBN92AP001 & 90GBN92AP002 (R1)		
3	Location#	First floor Chemical House Ref Drg No. PE-V0-412-158-A035		
4	Type	Diaphragm Type (Positive Displacement)		
5	Application	NaOCl dosing to potable water system. (R1)		
6	Rated capacity in LPH	0-5 LPH (R1)		
7	Total Head in 'm'	10 m		
8	RPM	1500		
9	Recommended Motor/Engine HP	0.5		
10	Discharge Pressure Kg/cm2	1.0		
11	Hydro test Pressure Kg/cm2	1.5		
B	MATERIAL OF CONSTRUCTION			
1	Liquid Head	PTFE		
2	Diaphragm	PTFE		
3	Valve seat / Cage	PTFE		
4	Ball/Cone/Plate	TEFLON		
5	Pressure Relief Valve	SS 316		
6	End Connection	½ " BSP (FM)		
7	Painting	As per approved painting specification		
8	Make	Positive Metering Pumps(R1)		
9	Model no	HD 1011/ SZ0 (R1)		
C	MOTOR DETAILS			
1	Type	Pump Enclosed		
2	Enclosure = TEFC	IP – 55/B-3		
3	Speed in RPM / HP	1500 / 0.5 (R1)		
4	Rated Voltage / Phase / Frequency	415V / 3 / 50 HZ		
5	Make /Model	ABB / 71 (R1)		
REV NO : 01		PREPARED BY: FN	CHKD. & APPD. BY: MI & AA	DATE: 12.07.2019

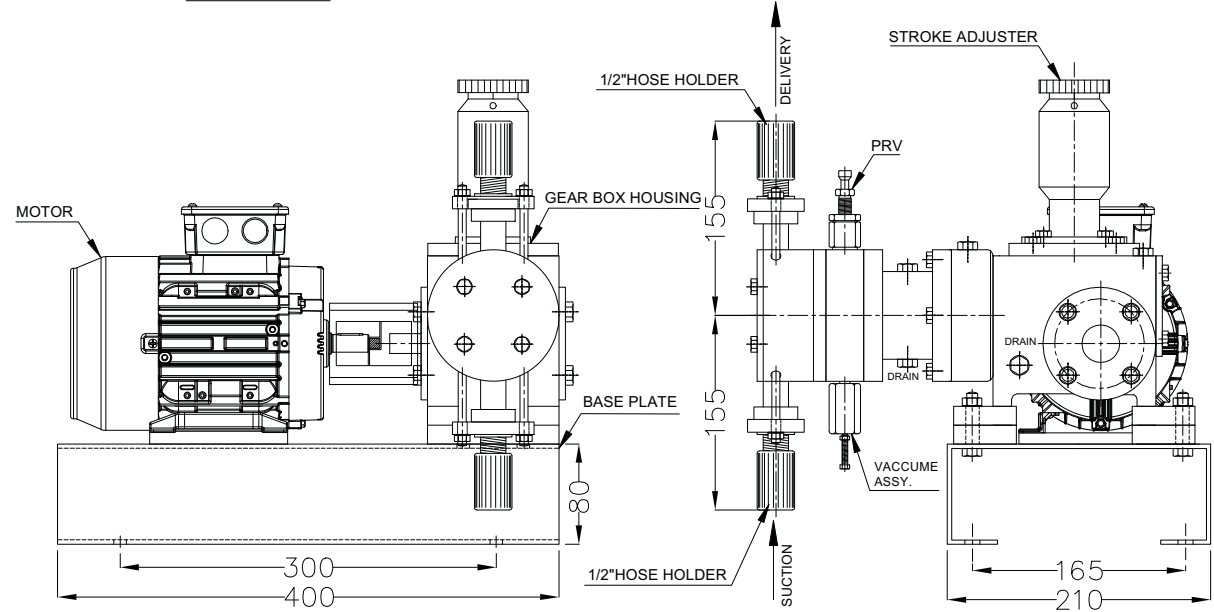
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TOP VIEW



NOTE:
 1. ALL DIMENSIONS ARE IN mm.
 2. TOLERANCE FOR ALL DIMENSIONS ARE ±10mm
 3. FOUNDATION BOLT SIZE M12mmX150mm



TECHNICAL SPECIFICATIONS

CUSTOMER NAME	>	OTOKLIN GLOBAL BUSINESS LTD. MUMBAI		
PO NO.	>	008A / OC -983 / 18-19		
OFFER NO.	>	8PMP / OFR / DP / 18-19 / 02 / 2137 / R2		
LIQUID	>	NAOCL.		
PUMP TYPE	>	HYDRAULIC DIAPHRAGM	COUPLING	FLEXIBLE SPIDER
PUMP MODEL	>	HD 1011/SZO	QTY.	2 No.
PUMP WETTED PART MOC	>	PTFE		
FLOW RATE	>	0-5 LPH		
DISCHARGE PRESSURE	>	1 KG/CM2		
STROKE RANGE	>	0-100% (MANUAL)		
MOTOR DESCRIPTION	>	0.5 H.P., 3PHASE, 415V±10%, 50HZ±5%, 4-POLE, FOOT MOUNTED, STD TEFC, IP55, IE2, NON FLAME PROOF, S1 DUTY, DOL START.		
END CONNECTION	>	1/2" HOSE HOLDER END ON SUCTION & DISCHARGE SIDE.		

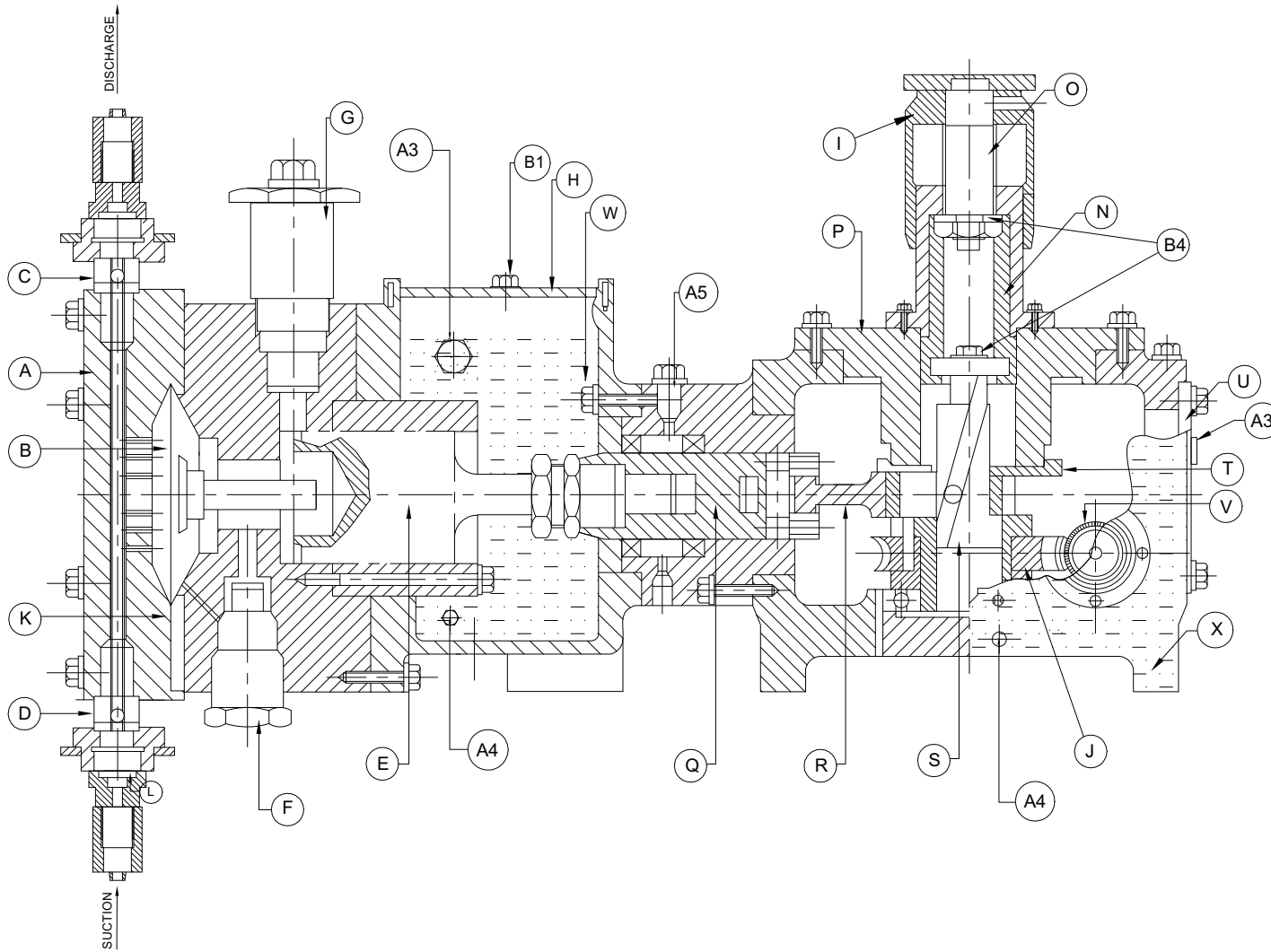
Z	A	N	I
FINAL	ACCEPTED WITH COMMENTS	NOT ACCEPTABLE	FOR INFORMATION

POSITIVE METERING PUMPS (I) PVT.LTD.
 PLOT NO. M8, AMBAD M.I.D.C., NASIK

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.19	ISSUED FOR APPROVAL	SBN	SBN	TSN
R1	27.06.19	ISSUED FOR APPROVAL	SPK	SBN	TSN

DRAWING TITLE :-	GA DRAWING	PUMP MODEL:-	HD1011_SZO_PP
DRAWING NO.:-	PMPPL-GA-HD1011-SZO-IR-9566-1	SCALE	SHEET
PO NO.:-	008A / OC -983 / 18-19	NTS	01
		R	1

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B4	CIRCLIPE	EN8	01 No.
B1	Oil Filler	--	01 No.
A5	Breather Assembly	--	01 No.
A4	Oil Drain Plug	--	02 Nos.
A3	Oil Level Indicator	--	02 Nos.
X	OIL 460 Grade	---	--
W	OIL 20W40	---	--
V	Worm Shaft	EN8	01 No.
U	Back Plate	PP	01 No.
T	Thrust Plate	CI	01 No.
S	Slider	MS	01 No.
R	Ecc. Strap	CI	01 No.
Q	Cross Head	EN8	01 No.
P	Top Cover	CI	01 No.
O	SL.SCREW	EN8	01 No.
N	Sl. Guide	MS	01 No.
L/ M	End Conne. Suction & Dis.	PTFE	01 No. Each
K	Center Ring	MS	01 No.
J	Worm Wheel	PB 2	01 No.
I	Stroke Adju.	CI	01 No.
H	Oil Chamber	CI	01 No.
G	Inbuilt Pre. Safety Valve	EN8	01 No.
F	Vaccume Assl.	EN8	01 No.
E	Plunger	EN8	01 No.
D	Non Return Valve (Suc.)	PTFE	01Set
C	Non Return Valve (Dis.)	PTFE	01Set
B	Oil Side Diaphragm	PTFE	01 No.
A.	Liquid Head	PTFE	01 No.
Sr. No.	Description	MOC	Qty.

TECHNICAL SPECIFICATIONS	
CUSTOMER NAME	OTOKLIN GLOBAL BUSINESS LTD. MUMBAI
PO NO.	008A / OC -983 / 18-19
OFFER NO.	8PMP / OFR / DP / 18-19 / 02 / 2137 / R2
LIQUID	NAOCL.

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.19	ISSUED FOR APPROVAL	SBN	SBN	TSN
R1	27.06.19	ISSUED FOR APPROVAL	SPK	SBN	TSN

Z	A	N	I
FINAL	ACCEPTED WITH COMMENTS	NOT ACCEPTABLE	FOR INFORMATION

POSITIVE METERING PUMPS (I) PVT.LTD.
 PLOT NO. M8, AMBAD M.I.D.C., NASIK

DRAWING TITLE :-	CS DRAWING	PUMP MODEL:-	HD1011_S20_PP
DRAWING NO.:-	PMP/PL-CS-HD1011-S20-R-9566-1	SCALE	SHEET
PO NO.:-	008A / OC -983 / 18-19	NTS	02



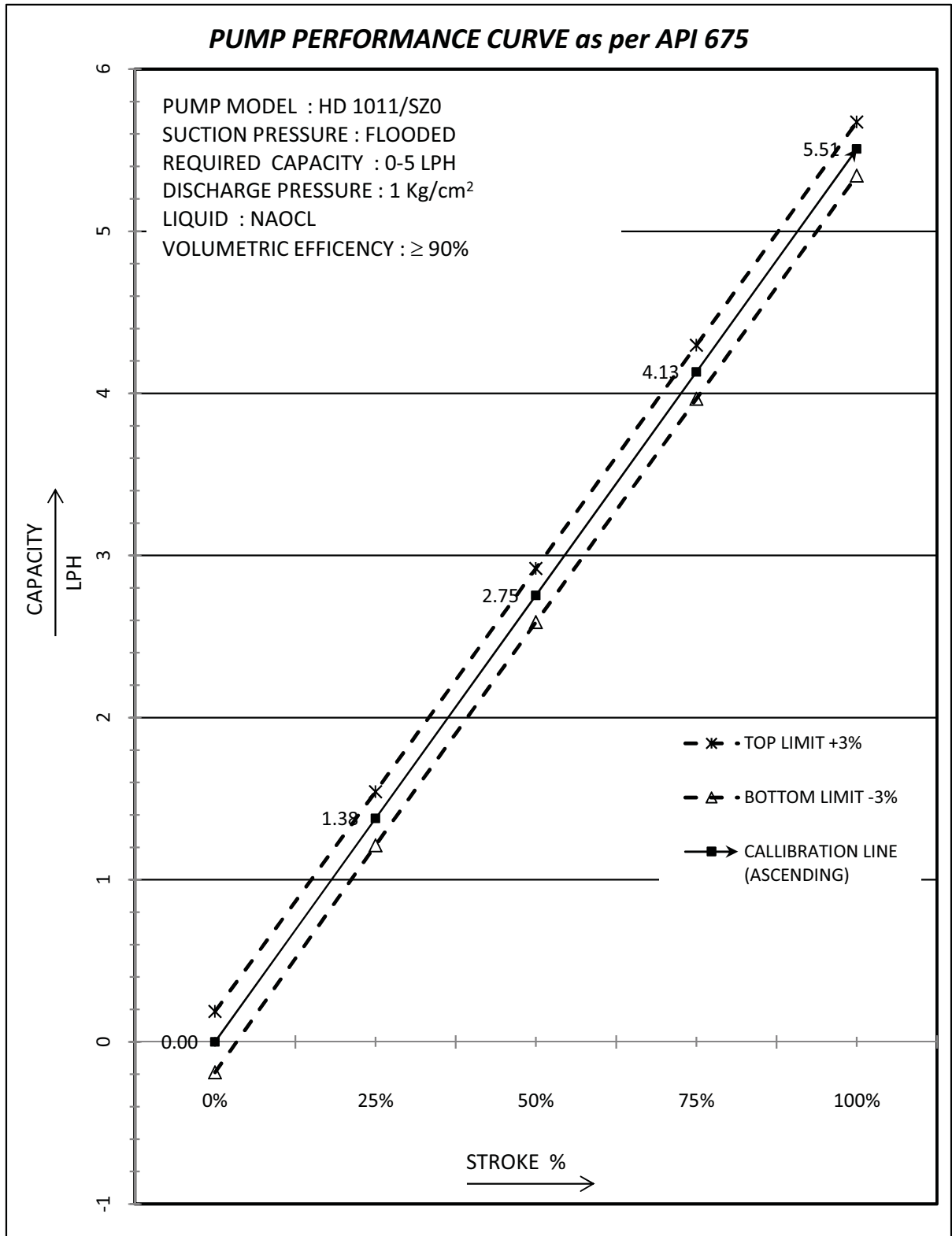
POSITIVE METERING PUMPS (I) PVT. LTD.

M-8, MIDC, AMBAD, NASIK - 422 010

Email : sales@positivemetering.com Web: www.positivemetering.com



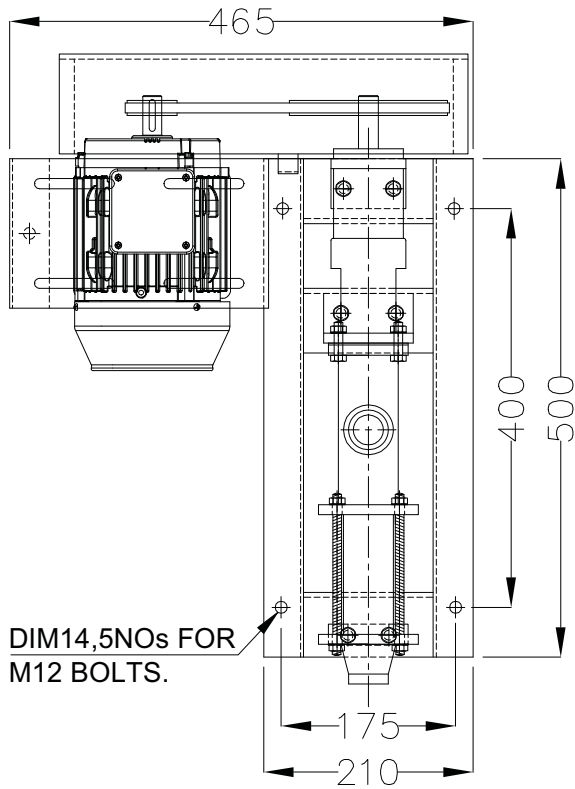
CUSTOMER : OTOKLIN GLOBAL BUSINESS LTD. MUMBAI
PROJECT NAME : BHEL



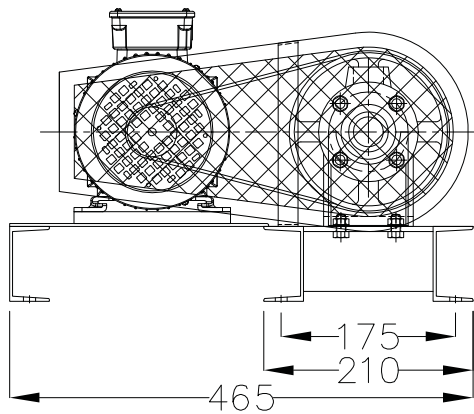
DATA SHEET OF LIME METERING PUMPS

LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A010		
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/MP/PTP/18/308		Rev No:- 01
PROJECT	2X660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT	MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED				
Sr. No.	Parameters	Description		
A	TECHNICAL SPECIFICATION			
1	Quantity	2 Nos. (1W+1S)		
2	KKS TAG No.	90GBN73AP001 & 90GBN73AP002 (R1)		
3	Location#	First floor Chemical House Ref Drg. No. PE-V0-412-158-A035		
4	Type	Screw type. (Positive displacement)		
5	Application	Lime dosing to Flash Mixer(R1)		
5	Rated capacity in LPH	0-1000 LPH		
6	Total Head in 'm'	10 m		
7	RPM	350-400 after belt and pulley arrangement(R1)		
8	Recommended Motor/Engine HP	1 (R1)		
9	Discharge Pressure Kg/cm2	1.0		
10	Hydro test Pressure Kg/cm2	1.5		
B	MATERIAL OF CONSTRUCTION			
1	Stator	Neoprene (R1)		
2	Rotor	SS316 (R1)		
3	Sealing Arrangement	PTFE Gland Packing (R1)		
5	Pressure Relief Valve	SS 316		
6	End Connection	1 " BSP (FM)		
7	Painting	As per approved painting specification		
8	Make	Positive Metering Pumps(R1)		
9	Model no	Sc-20 (R1)		
C	MOTOR DETAILS			
1	Type	Pump Enclosed		
2	Enclosure = TEFC	IP – 55/B-3		
3	Speed in RPM / HP	1500 / 1 (R1)		
4	Rated Voltage / Phase / Frequency	415V / 3 / 50 HZ		
5	Make/Model	ABB / 80 (R1)		
REV NO : 01		PREPARED BY: FN	CHKD. & APPD. BY: MI & AA	DATE: 12.07.2019

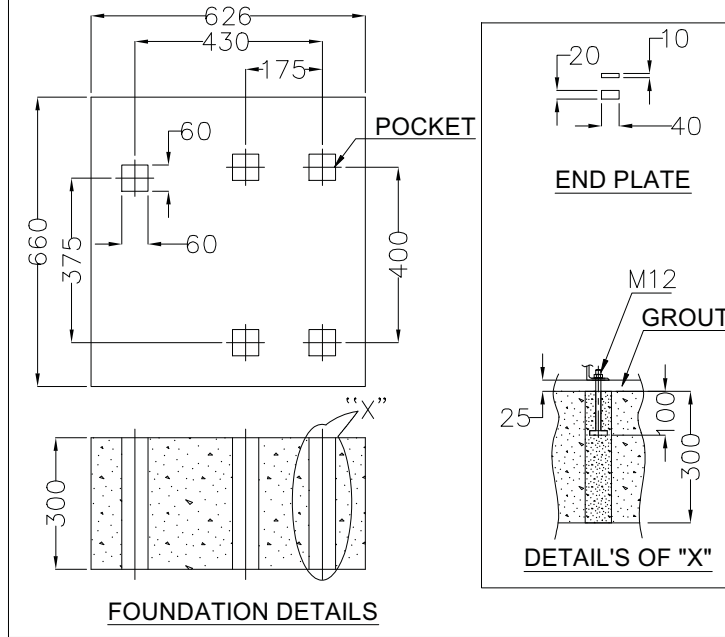
THIS DRAWING AND THE DESIGN IT COVERS ARE THE PROPERTY OF POSITIVE METERING PUMPS (I) PVT. LTD., IT IS TO BE USED ONLY FOR THE PURPOSE FOR WHICH IT WAS LENT AND MUST NOT BE USED IN ANY WAY DETRIMENTAL TO THE INTERESTS OF THIS COMPANY AND IS SUBJECT TO RETURN ON DEMAND



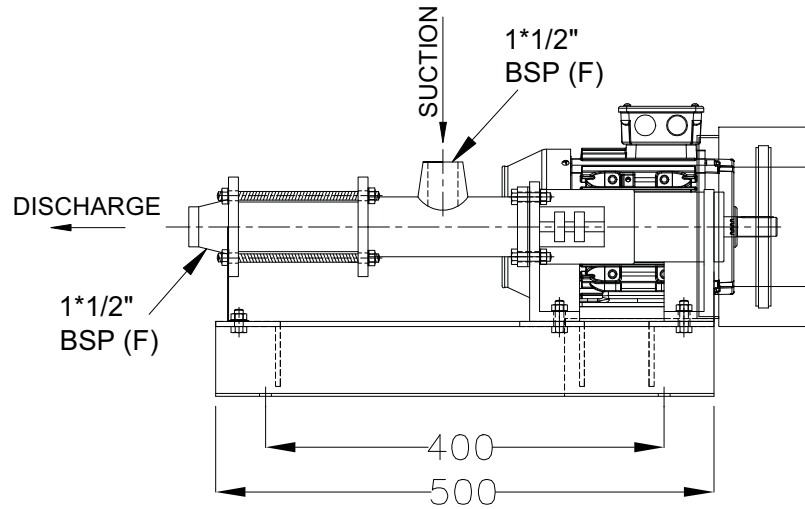
TOP VIEW



SIDE VIEW



FOUNDATION DETAILS



FRONT VIEW

- NOTE:**
 1.ALL DIMENSIONS ARE IN mm.
 2.TOLERANCE FOR ALL DIMENSIONS ARE ±10mm
 3.FOUNDATION BOLT SIZE M12mmX150mm

TECHNICAL SPECIFICATIONS

CUSTOMER NAME :-	OTOKLIN GLOBAL BUSINESS LTD.MUMBAI		
PO NO. :-	008A / OC -983 / 18-19		
OFFER NO. :-	8PMP / OFR / DP / 18-19 / 02 / 2137 / R2		
LIQUID :-	LIME SOLUTION		
PUMP MODEL :-	SC 20		
MOC :-	NEOPRENE	PUMP TYPE :-	PROGRESSIVE CAVITY SCREW TYPE
STATOR :-	SS316	CAPACITY :-	1000 LPH
ROTOR :-	SS316	PRESSURE :-	1 KG/CM ²
DRIVE TYPE :-	BELT PULLEY		
MOTOR DESCRIPTION :-	1. H.P. .3PHASE,415V±10%, 50HZ±5%, 4-POLE, FOOT MOUNTED, STD.TEFC,IP55, IE2,NON FLAME PROOF, S1 DUTY, DOL START.		
END CONNECTION :-	1" BSP(F).ON SUCTION & DISCHARGE SIDE.		
QTY. :-	02 No.		

Z FINAL	A ACCEPTED WITH COMMENTS	N NOT ACCEPTABLE	I FOR INFORMATION
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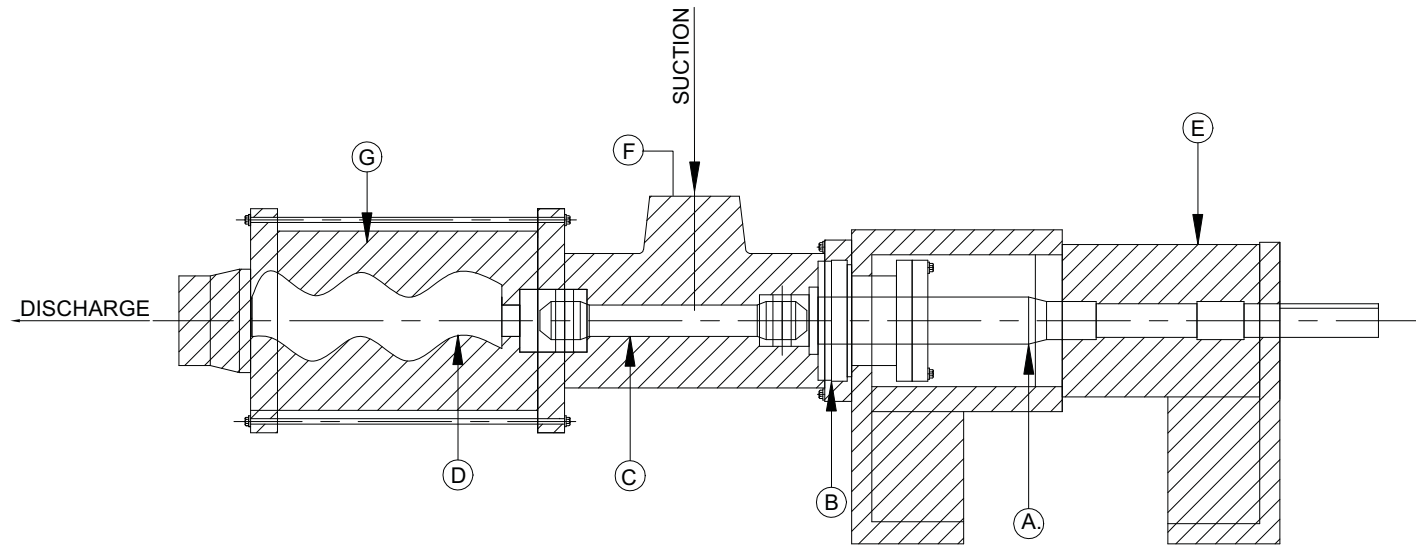
POSITIVE METERING PUMPS (I) PVT.LTD.
 PLOT NO. M8, AMBAD M.I.D.C., , NASIK

DRAWING TITLE :-	GA DRAWING	MODEL NO:-	SC20
DRAWING NO.:-	PMP/PL-GA-SC-20-IR-9566-4	SCALE	SHEET
		NTS	1
			R 1

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.19	ISSUE FOR APPROVAL	SBN	SBN	TSN
R1	27.06.19	ISSUE FOR APPROVAL	SPK	SBN	TSN

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G.	STATOR	NITRILE / NEOPRENE	02 No.
F.	SUC. PIPE	SS316 / CF8M	02 No.
E.	HOUSING	CAST IRON	02 No.
D.	SCREW	SS316 / CF8M	02 SET
C.	CONNECTING ROD	SS316 / CF8M	02 SET
B.	STUFFING BOX	SS316 / CF8M	02 No.
A.	SHAFT	SS316 / CF8M	02 No.
Sr. No.	DESCRIPTION	MOC	Qty.



TECHNICAL SPECIFICATIONS

CUSTOMER NAME :-	OTOKLIN GLOBAL BUSINESS LTD.MUMBAI
PO NO. :-	008A /OC -983 / 18-19
OFFER NO. :-	8PMP / OFR / DP / 18-19 / 02 / 2137 /R2
LIQUID :-	LIME SOLUTION

Z FINAL	A ACCEPTED WITH COMMENTS	N NOT ACCEPTABLE	I FOR INFORMATION
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POSITIVE METERING PUMPS (I) PVT.LTD.
PLOT NO. M8, AMBAD M.I.D.C., , NASIK

DRAWING TITLE :-	CS DRAWING	MODEL NO:-	SC2
DRAWING NO.:-	PMPIPL-CS-SC-20-IR-9566-4	SCALE	SHEET
		NTS	2
			RI

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY
R2	11.07.19	ISSUE FOR APPROVAL	SBN	SBN	TSN
R1	27.06.19	ISSUE FOR APPROVAL	SPK	SBN	TSN

POSITIVE METERING PUMP (I) PVT LTD.

M-8 MIDC AMBAD ,NASHIK-424010

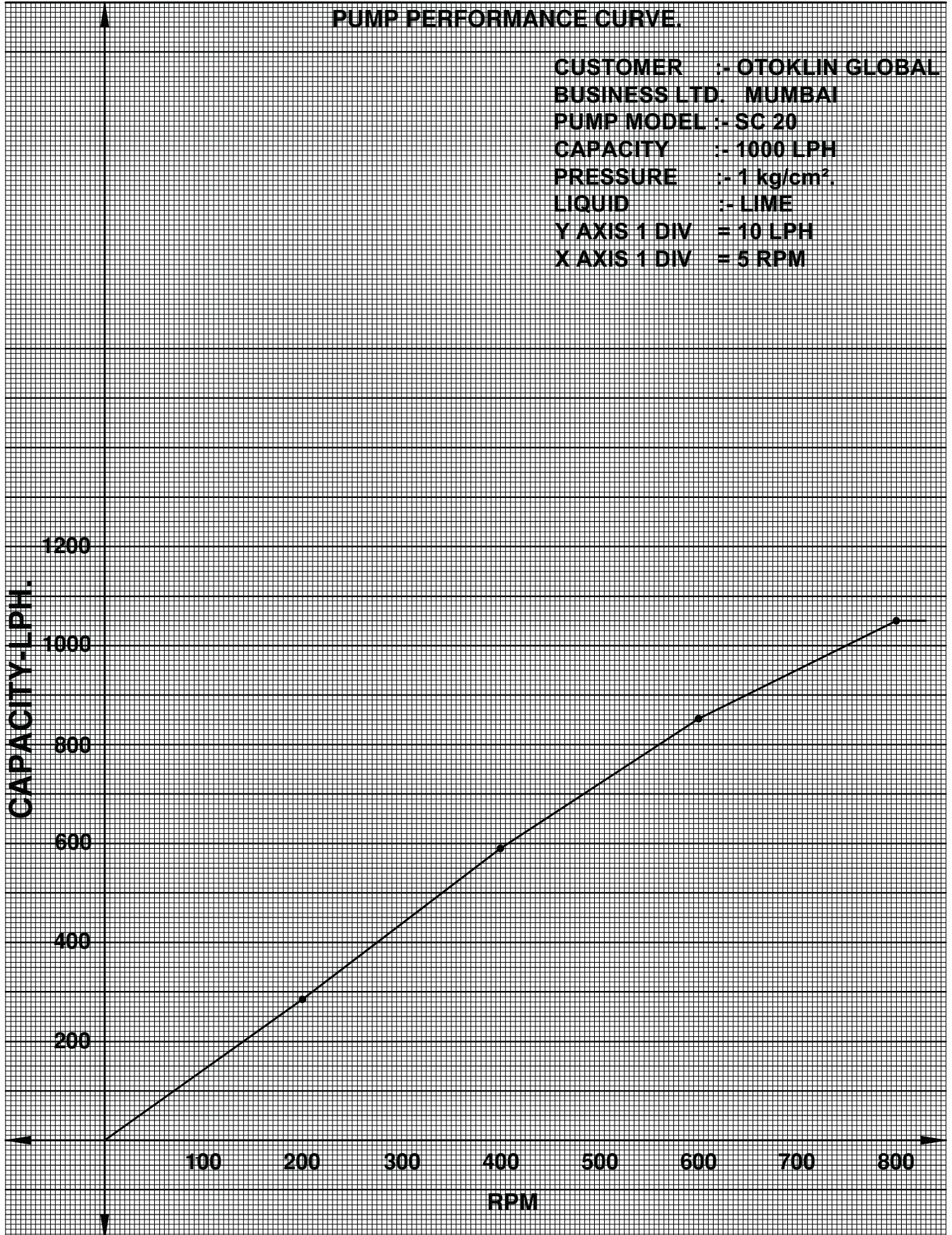
PH-0253-2381993,2381994(FAX-0253-5601441)

Email-sales@positivemetering.com

Web-www.positivemetering.com

PUMP PERFORMANCE CURVE.

**CUSTOMER :- OTOKLIN GLOBAL
BUSINESS LTD. MUMBAI
PUMP MODEL :- SC 20
CAPACITY :- 1000 LPH
PRESSURE :- 1 kg/cm².
LIQUID :- LIME
Y AXIS 1 DIV = 10 LPH
X AXIS 1 DIV = 5 RPM**







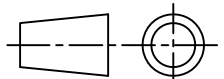
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -		
QAP FOR METERING PUMPS WITH MOTOR OF PRE TREATMENT PLANT					NAME	SIGN	DATE	
					PREP	ALOYSIUS	AF	18-07-19
					CHKD	MUAZZAM I	MI	18-07-19
					APPD	ASLAM A	AA	18-07-19

BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018					APPD			ASLAM A	AA	18-07-19
DEPT.					CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A011				REV 01
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/QAP/MP/PTP/18/349				
DATE						NO. OF SHEETS <input type="text" value="1"/> EXCLUDING COVER PAGE				

S.NO		COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1		RAW MATERIAL AND BOUGHT OUT COMPONENTS			5	6	7	8	9	D	M	C	N	11
1		Raw Material (Wetted Parts: Liquid Head, NRV, Plunger & Diaphragm.)	Chemical / Physical Properties		Chemical and Mechanical test	One/Batch	Approved Drawing. /Documents	Approved Drawing. / Documents	Mfg. Insp. Report. MFG. TC	✓	P	R	R	For Plastic/ Rubber/pp/pfe non metallic MTC will be provided
		(for Disp. Chamber Housing, worm gear)	Physical properties	Major	Tesile Strength	One/Batch	Approved Drawing. /Documents	Approved Drawing. / Documents	Mfg. Insp. Report. MFG. TC	✓	P	R	R	
[2] FINAL INSPECTION														
2.1		Pump	Overall Dimension	Major	Measure	One/Model	DO	DO	IR/TC	✓	P	W	W	
2.2		Performance of pump with Shop / Job motors.	Performance test for pressure, capacity, noise, stroke, power etc.	Critical	At Stroke 100%, 75%, 50%, 25% & (Vice Versa) a) Rated capacity b) Linearity ±3% c) Repeatability ±3% d) Steady state accuracy ± 1%	One/Model	DO	DO	PTR	✓	P	W	W	Mfg. Internal test will be conducted 100%
2.3		Motor	No Leakage & No Pressure drop		Hydro test	One/Model	DO	1.5 times max. allowable operating pressure	PTR	✓	P	W	W	Hydrotest hold time 30 mins
2.4		Painting	Manufactures Test Certificate	Major	Motor routine test	100%	DO	Approved Drawing. / Documents	MFG. TC	✓	P	W	W	
2.5		Packaging	Surface Preparation	Major	Visual & DFT	100%	As per std.	As per Appd Doc i.e painting specs	IR	✓	P	R	R	Compliance Report
LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: FOR SUB VENDOR OF OTOKLIN. P - Performing the Test W - Witnessing the Test C: FOR VENDOR (OTOKLIN). N: FOR BHEL QOS (OR BHEL NOMINATED INSPECTION AGENCY) / TANGEDCO R - Review the Test														
MANUFACTURER/ SUBCONTRACTOR		CONTRACTOR		SIGNATURE										



PROJECT: 1X660MW ENNORE SEZ SSCTPP AT ASH DYKE OF NCTPS, CHENNAI			Package: Pre Treatment Plant		
Document Title: TDS of Blowers of PT Plant					
Drawing/Document No. PE-V0-412-158-A012					
Sr. No.	TANGEDCO comments	Reply	TANGEDCO comments dated 08.10.18	OTOKLIN / BHEL reply	
1	Shaft MOC shall be EN 8 in line with DBR, Revise accordingly	Kindly note that shaft MOC offered is EN 19 which is better grade than EN 8 for longevity of blower as shown by the specifications/ material properties, attached in R1. Please accept EN19, being better material as compared to EN8	Noted.	-	
2	-	-	BHEL to incorporate the package name in the document title.	Noted and incorporated	
3	-	-	BHEL to incorporate the make & model.	Noted and incorporated	
4	-	-	BHEL to submit the blower GADs & curves.	Noted and incorporated	

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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412

PACKAGE NAME: PRE-TREATMENT PLANT

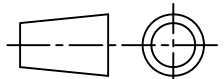
2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

 **TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

 **CONSULTANT: DESEIN PVT LTD, NEW DELHI.**

 **BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NEW DELHI**

 **OTOKLIN GLOBAL BUSINESS LTD.
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135**

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -
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TECHNICAL DATA SHEET FOR BLOWERS	NAME	SIGN	DATE
	PREP	AQEEL K	AK 25-06-19
	CHKD	MUAZZAM I	MI 25-06-19

BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018 APPD ASLAM A AA 25-06-19

DEPT.						CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A012	REV 2
SIGN		N.A.					OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/B/PTP/18/309	
DATE							NO. OF SHEETS 3 EXCLUDING COVER PAGE	

DATA SHEET OF AIR BLOWER

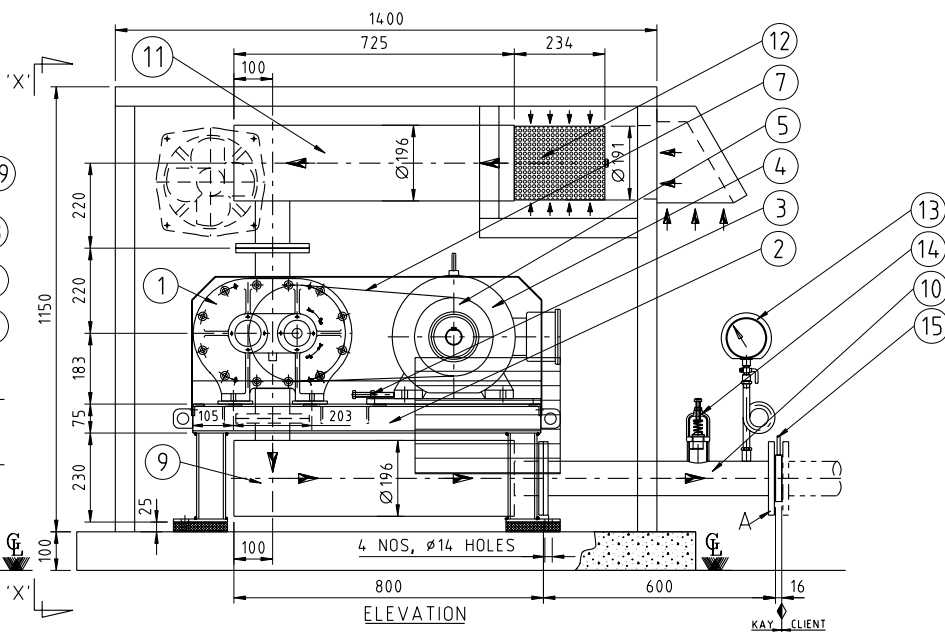
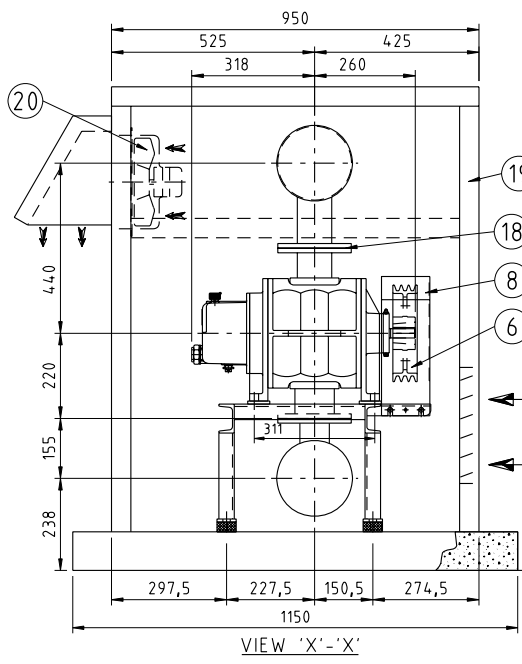
LOA NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A012	REV.: 02
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TD/SB/PTP/18/309	
PROJECT	2X660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT	MADE BY AK	CHKD BY MI
APPD BY AA			

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED

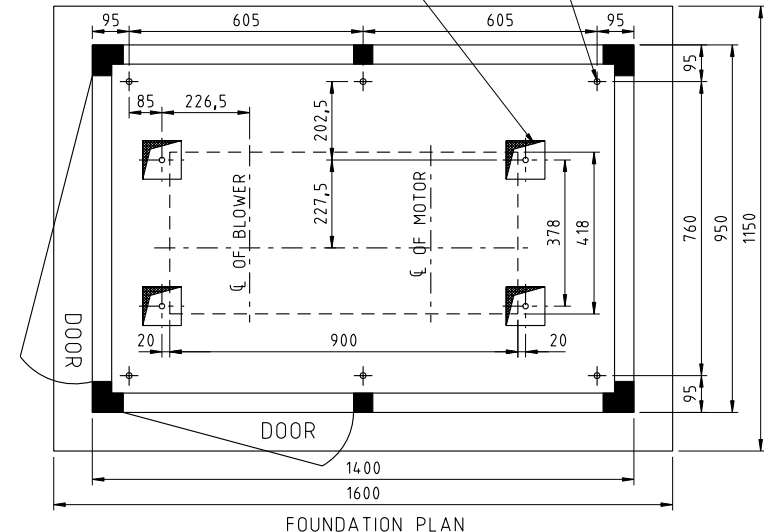
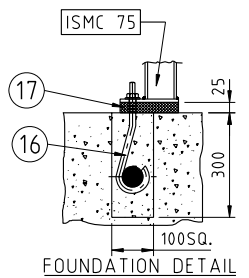
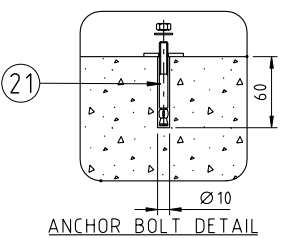
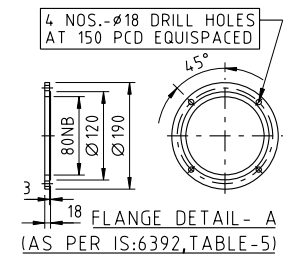
A	TECHNICAL SPECIFICATIONS	
1	TYPE	Rotary Twin Lobe Blower
2	QTY	2 (1W+1S) Sludge sump & Sludge transfer pumps sump
3	CAPACITY	300 Nm ³ /Hr
4	DISCHARGE PRESSURE	0.4 KG/CM ²
5	MOTOR SPEED(RPM)	1500
6	FLUID TO BE HANDLED	AIR
7	APPLICATION	SLUDGE MIXING
8	BHP AT DUTY POINT	7.41 BHP
9	DRIVE MOTOR	10 HP
10	DRIVE	V BELT DRIVEN
11	PULLEY AND BEARING	GREASE PACKED

B	MATERIAL OF CONSTRUCTION	
1	CASING	CI Gr. FG 260: IS: 210
2	SHAFT	EN19 (BS970:1955)
3	BASE FRAME	MS FABRICATED
4	SIDE PLATE AND ROTOR	CI Gr. FG 260: IS: 210
5	BEARING	ANTI-FRICTION
6	SEAL	LIP SEALS
7	PAINTING	AS PER APPROVED PAINTING SPECIFICATIONS
8	MAKE	Kay International Private Limited

PREPARED BY:AK	CHKD. & APPD. BY: AA	DATE: 11/09/2018	SHEET NO:- 1 OF 1
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6 NOS. OF $\phi 10 \times 60$ DEEP DRILL HOLES FOR M10 ANCHOR BOLTS
 4 NOS. OF 100SQ.X300 DEEP POCKETS



Sl. No.	DESCRIPTION	QTY.	MAKE	SCOPE OF SUPPLY	SIZE
1.	T.L. BLOWER	01	KAY	KAY	59AC
2.	COMMON BASE FRAME	01	KAY	KAY	---
3.	MOTOR SLIDE RAIL	02	KAY	KAY	---
4.	MOTOR TEFC STD 50 CAGE ELECT. IND. IE2 MOTOR CONFORMING TO PROTECTION IP55, SUITABLE FOR OPERATION ON 415V/-10%, 50/-5%Hz, 3 PHASE AC SUPPLY, WITH CLASS F INSULATION & TEMP. RISE LIMITED TO CLASS 'B', MOUNTING-B3, AMBIENT 45°C	01	CGL/ABB/KIRLOSKAR/SIEMENS/BBL	KAY	ND132M
5.	MOTOR PULLEY	01	TRANSINDIA/EQUI.	KAY	6.5"x3B
6.	BLOWER PULLEY	01	TRANSINDIA/EQUI.	KAY	10"x3B
7.	V-BELT	1 SET	HINDALCO/TURBOFLEX/EQUI.	KAY	B-56
8.	V-BELT GUARD	01	KAY	KAY	---
9.	DISCHARGE SILENCER	01	KAY	KAY	80 NB
10.	INTERCONNECTING PIPE LINE	01	KAY	KAY	80 NB
11.	SUCTION SILENCER	01	KAY	KAY	80 NB
12.	SUCTION FILTER	01	ABSOLUTE/EQUI.	KAY	HO-10
13.	PRESSURE GAUGE WITH ISOLATION VALVE & SYPHON	01	AKVALO	KAY	RANGE 0-1 Kg./cm2
14.	SAFETY VALVE (SPRING LOADED TYPE)	01	KAY	KAY	SIZE-1.5"
15.	NON RETURN VALVE	01	KAY	KAY	80 NB
16.	FOUNDATION BOLT	04	---	KAY	M12x250 lg.
17.	ANTI-VIBRATION PAD	04	BRIGHT/EQUI.	KAY	5"x2.5"x1"
18.	GASKET	1 SET	---	KAY	---
19.	ACOUSTIC HOOD	01	---	KAY	---
20.	EXHAUST FAN	01	MARATHON/EQUI.	KAY	9"
21.	ANCHOR BOLTS WITH NUTS	06	---	KAY	M10x75LG.
--	ALL FIXING BOLTS & NUTS	1 SET	---	KAY	---

STATIC LOAD			
BARE SHAFT WT.	ACCESSORIES WT.	MOTOR WT.	TOTAL WT.
110 KG.	105 KG.	79 KG.	294 KG.

NOTE :-
 1. QUANTITY MENTIONED FOR ONE BLOWER ONLY.
 2. MOTOR SHOULD HAVE SIDE MOUNTED TERMINAL BOX.
 3. MOTOR PULLEY WILL BE SUPPLIED WITH FINISH BORE.
 4. 480 ml SP-320 INDIAN OIL & 60 gm CASTROL AP-3 GREASE IS USED AS LUBRICANT.
 5. DISTANCE PIECE OF 150mm LENGTH SHOULD BE ADDED AFTER NRV.
 6. IF CLIENT DESIRE TO ADD EXPANSION BELLOW IN DISCHARGE LINE.
 7. CLIENT MUST SUPPORT THE DISCHARGE PIPELINE AT 300 mm FROM SS EXPANSION BELLOW.
 8. CLIENT IF DESIRE TO ADD BEND IN DISCHARGE LINE, IT CAN BE ADDED AFTER 1000mm DISTANCE FROM EXPANSION BELLOW.
 9. NOISE LEVEL AT 1.8 M. DISTANCE FROM EQUIPMENT WITH ACOUSTIC HOOD, WHEN CONNECTED TO THE SYSTEM AT SITE, WILL BE 72-78 dBA.
 10. EXHAUST FAN DETAIL:

SWEEP DIA. (mm)	PHASE	SPEED (IRPM)	VOLTAGE (V)	INPUT CURRENT (AMP)	FREE AIR FLOW (m3/hr.)
230	SINGLE	1400	230	60	435

DESIGN PARAMETERS OF BLOWER
 CAPACITY :----- 345 M3/HR. (300 NM3/HR.)
 DIFF. PRESS :----- 4000 MMWG
 R.P.M. :----- 927
 B.H.P. :----- 7.71
 QUANTITY :----- 02 NOS.

MOTOR DATA
 MAKE :----- CGL/ABB/KIRLOSKAR/SIEMENS/BBL
 FRAME SIZE :----- ND132M (IE2)
 R.P.M. :----- 1440
 H.P./K.W.:----- 10/7.5
 NET WEIGHT :----- 79 KG.

3	STATIC LOAD = 294 Kg. APPROX.	WITH ALL ACCESSORIES INCLUDING MOTOR
2	DYNAMIC LOAD = 1.5 x STATIC LOAD	
1	GD SQ. VALUE = 0.118 Kg m2	
f	BEARING	SKF/FAG/TIMKEN
e	FABRICATED ITEMS	M.S./IS:2062
d	GEAR (CASE HARDENED & GROUND)	EN-353, BS:970
c	SHAFT	EN-191 709 M40, BS:970A
b	LOBE	CIFG-260, IS:210
a	CASING	CIFG-260, IS:210
S.NO.	DESCRIPTION	MATERIAL

CLIENT:- M/s. OTOKLIN GLOBAL BUSINESS LTD.
 ORDER SHEET NO.:- KI-49682

INCORPORATED CLIENT'S COMMENTS	SIGN.	CHD.	APPD.	DATE
	SHAMSHER			21/04/19

SYM.	DESCRIPTION OF REVISION	SIGN.	CHD.	APPD.	DATE
DRN.	SHAMSHER 10.06.19				
CHD.					
APPD.					



SCALE : N.T.S.		G.A. AND F.P. DRAWING FOR MODEL 59AC WITH ALL ACCESSORIES T.L. BLOWER	
MATL.	---	DRG.NO.	K-GA-0059AH2646A3
All dimensions are in mm. unless otherwise shown on drawing.		REV.	SHEET
		2	1 OF 1

KAY POSITIVE DISPLACEMENT T.L. BLOWER

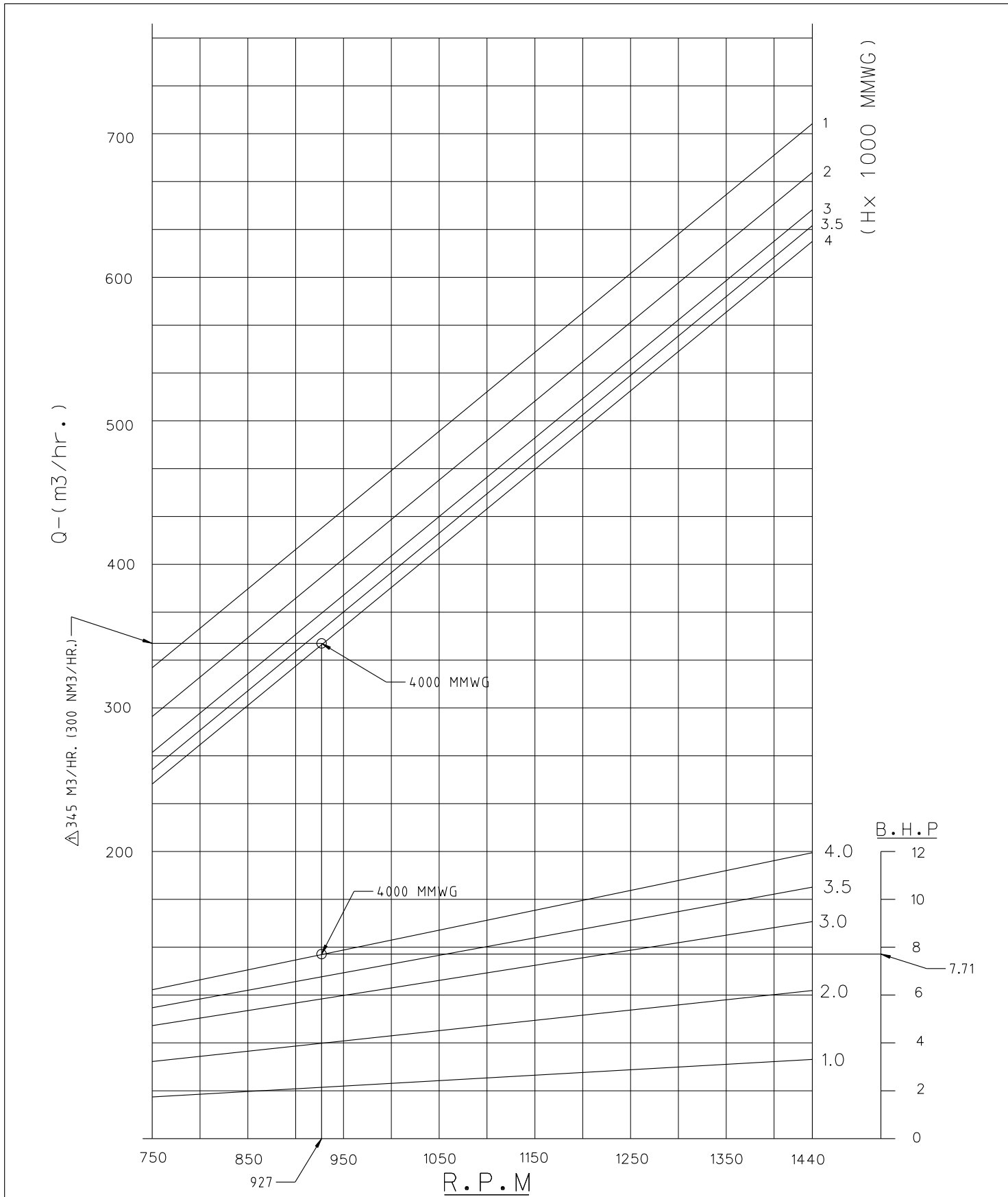
PERFORMANCE CURVE FOR 59AC O.S.NO.:- KI-49682

Q- CAPACITY

B.H.P.- ABSORBED POWER AT SHAFT

H-PRESSURE RISE

R.P.M.-BLOWER SPEED



Plot No. 64, Phase-5, Sector-53, HSIIDC,
 Kundli Industrial Area, Dist. Sonapat (Haryana) -131 028
 Phones: +91-130-4091061, 4091062, 4091063
 e-mail: design@kayblowers.com
 Website: www.kayblowers.com





REV.	PREP.	CHKD.	APPD.	DATE
0	SS			10.06.19
△	SS			21.06.19

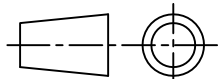
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		CHECKED:			CHECKED:		
<table border="1" style="width: 100%;"> <tr> <td>STATUS : CONTRACT</td> </tr> <tr> <td>JOB NO.: 412</td> </tr> </table>							STATUS : CONTRACT
STATUS : CONTRACT							
JOB NO.: 412							




2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -	
QAP FOR BLOWERS WITH MOTOR OF PRE TREATMENT PLANT					NAME	SIGN	DATE
					PREP	ALOYSIUS	AF 18-07-19
					CHKD	MUAZZAM I	MI 18-07-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018					APPD	ASLAM A	AA 18-07-19

DEPT.					CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A013	REV 01
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/QAP/B/PTP/18/350	
DATE						NO. OF SHEETS <input type="text" value="1"/> EXCLUDING COVER PAGE	





S.NO	COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6	7	8	9	M	C	N	11	
RAW MATERIAL AND BOUGHT OUT COMPONENTS													
[1]	1.1	CI Casting for Casing, Lobes / Rotor & End covers	Major	Test & Analysis	One / Heat	Approved Drawing / Documents	Approved Drawing / Documents	Insp. Report. MFG. TC	✓	P	R	R	
	1.2	Rotor Shafts	Major	Test & Analysis	One / Heat	Approved Drawing / Documents	As per IS/BS Stnd.	Insp. Report. MFG. TC	✓	P	R	R	
	1.3	Trining Gears	Critical	Test & Analysis	One/Lot	Approved Drawing / Documents	As per IS/BS Stnd.	Insp. Report. MFG. TC	✓	P	R	R	
	1.4	Rotor Assembly	Critical	Balancing	100%	App. Drg.	App. Drg.	Insp. Report	✓	P	R	R	
	1.5	Casing Hydrotest	Critical	Testing	100%	Mfg. Stnd.	No Leakage	App. Drg.	✓	P	R	R	
[2]	FINAL INSPECTION (Performance Test)												
2.1	Blower with job motor	Performance Test Head VS Capacity Capacity VS Power Capacity VS Efficiency	Major	Test with job motor	100%	As per IS / BS Code	As per IS / BS Code	Insp. Report	✓	P	W	R	Only one Blower/model to be witness
2.2	Blower with accessories mounted on base frame	Overall Dimensions & Orientation	Major	Visual	100%	App. GAD	App. GAD	Insp. Report	✓	P	W	R	Only one set to be witness
2.3	Painting	Visual	Major	Visual		As per Appd Doc	As per Appd Doc	I R	✓	P	R	R	Compliance Report
2.4	Packaging									P	R	R	Compliance Report
<p>MANUFACTURER / SUBCONTRACTOR  CONTRACTOR</p> <p>SIGNATURE</p> <p>N: THE OWNER R - Review the Test</p> <p>LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER P - Performing the Test C: SUPPLIER/NOMINATED INSPECTION AGENCY W - Witnessing the Test</p>													

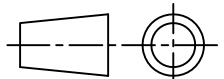
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

TECHNICAL DATASHEET FOR BALL VALVES OF PRE TREATMENT PLANT		NAME	SIGN	DATE
	PREP	ALOYSIUS	AF	06-05-19
	CHKD	MUAZZAM I	MI	06-05-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	06-05-19

DEPT.					CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A014	REV 02
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/BV/PTP/18/310	
DATE						NO. OF SHEETS 4 EXCLUDING COVER PAGE	

TECHNICAL DATA SHEET OF BALL VALVES

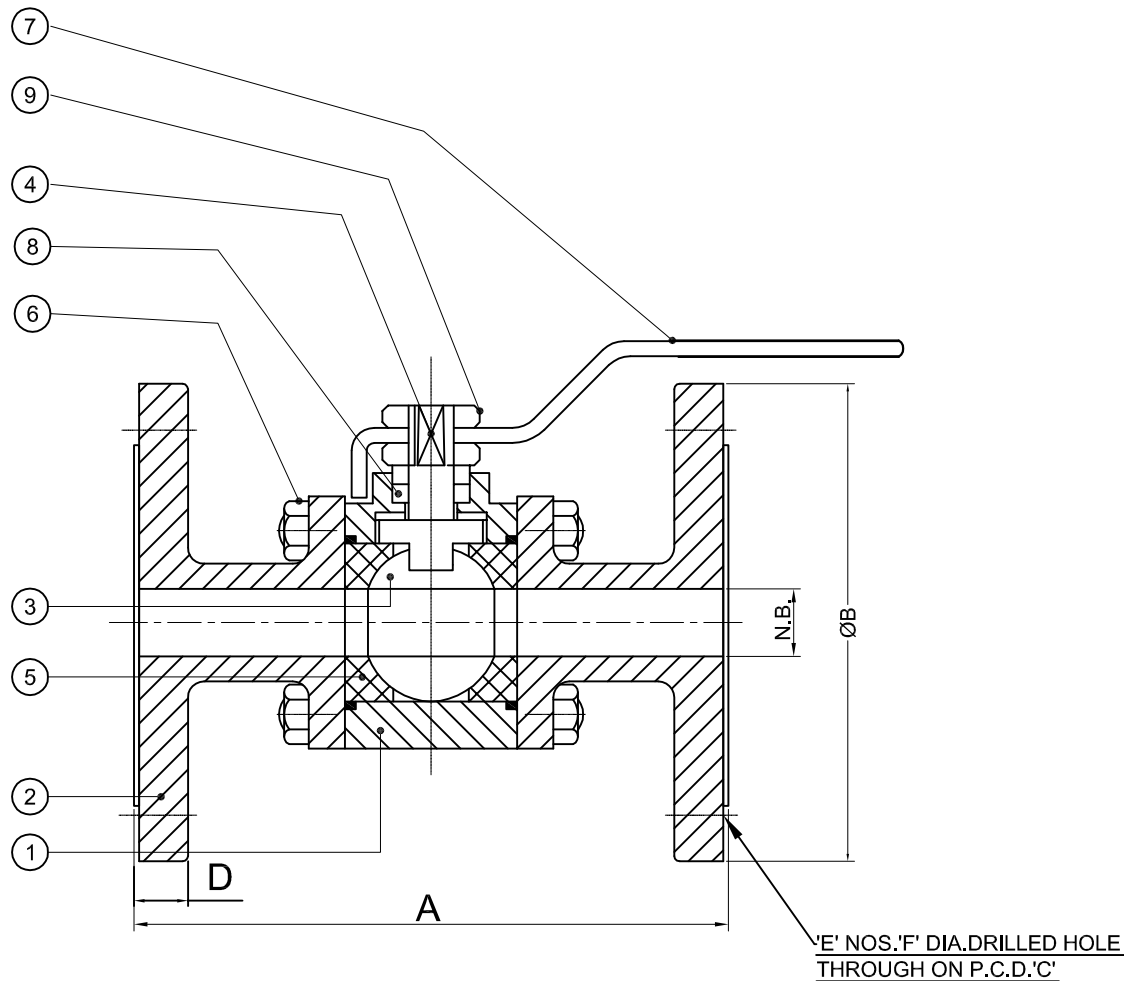
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A014	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/BV/PTP/18/310	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Ball Valve	
2	Valve Design	BS 5352 or equivalent of Required rating/class	
3	Flange Standard	ASME B 16.5 RF Serreted Finish150 AARH	
	<u>Material Specification</u>		
1	Service	Lime Dosing System	
2	Body	SS 316	
3	Spindle/Stem	SS 316	
4	Ball	ASTM A351 CF8M	
5	Insert	SS 316	
6	Seat	PTFE	
7	Gland Packing	PTFE	
8	Gland flange/Nut	ASTM A351 CF8M	
9	Hand bar	Cast Iron IS 210 Gr. FG 260	
10	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316	
11	End Connection	ASME B 16.5 RF Serreted Finish150 AARH	
12	Size & Quantity	40NB - 8 Nos.	KKS No. - 90GAA01AA600 / 90GAA01AA602 90GAA01AA604 / 90GAA01AA607 90GAA01AA576 / 90GAA01AA577 90GAA01AA584 / 90GAA01AA585
13	Operation Type	Manual	
14	Leakage Class	IV	
15	Range of Flow Control	0-100%	
16	Valve Rating	PN 10	
17	Test duration	Body: 1 min	Seat: 1 min
18	Design Pressure	22 kg/sq.cm	
19	Test Pressure:	PN 10	
20	Testing standard	API 598	
21	Face to Face Distance	ASME B 16.10	
22	Set Testing Pressure	Body: 15 Bar	Seat: 11 Bar
23	Painting	As per approved painting specification	
24	MAKE	Venus Pump and Engineering works	

S.S BALL VALVE

VALVE SIZE	FACE TO FACE	FLANGE DETAILS					QTY.
		O.D.	P.C.D.	THICK.	HOLE NO.	HOLE DIA.	
N.B.	A ±2	B	C	D	E	F	NOS.
40	165	127	98.4	14.3	4	15.9	08

NOTES :-

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE STATED.
2. STANDARD TOLERANCES ARE APPLICABLE
3. FLANGE DRILLED AS PER ASA B 16.5 CL.150# R/F .
4. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.



9	GLAND NUT	S.S	AISI:316
8	GLAND PACKING	PTFE	-
7	HAND LEVER	M.S.	WITH PVC SLEEVES
6	BOLTS & NUTS	S.S.	AISI:316
5	BALL SEAT	PTFE	-
4	STEM	S.S	AISI:316
3	BALL	S.S	ASTM A 351 GR.CF8M
2	BODY CONNECTOR	S.S	ASTM A 351 GR.CF8M (SS 316)
1	BODY	S.S	ASTM A 351 GR.CF8M (SS 316)

SL.NO	DESCRIPTION	MATERIAL	SPECIFICATION
-------	-------------	----------	---------------

BILL OF MATERIAL

VALVE	BALL	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG. NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).	
TYPE	THREE PIECE		
MFG. STD.	BS : 5351		
RATING	CL.150#		
PARENT MATLS.	S.S	ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED.	
TRIM MATLS.	S.S / PTFE	SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
SERVICE	LIME DOSING SYSTEM		
HYDROSTATIC TEST PRESSURE IN BAR			
TESTING PARAMETER	BODY	SEAT	
	15 (1 MIN.)	11 (1 MIN.)	

TITLE	PROJECTION	TITLE
		STAINLESS STEEL, THREE PIECE DESIGN, FLANGED END BALL VALVE

MAIN REF.			VENUS PUMP & ENGINEERING WORKS		
			BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL		
	REV	DATE	DRN.	A.GHOSH	DRG. NO.
	01	00	CHD.	C.HAZRA	VP-RK-BV-19-5665
		APP.	R. AGARWAL	REV:00	DATE:01.02.2019
					SCALE
					N.T.S.

TECHNICAL DATA SHEET OF BALL VALVES

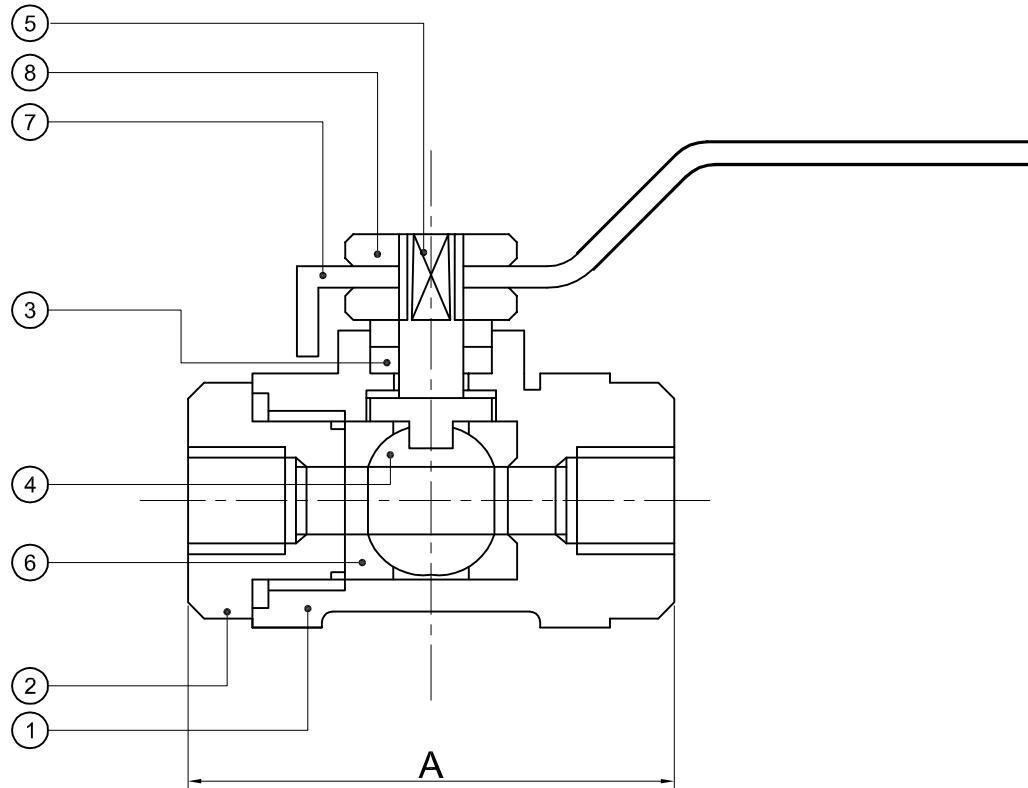
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A014	REV NO:-02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/BV/PTP/18/310	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Ball Valve	
2	Valve Design	BS 5351 or equivalent of Required rating/class	
	<u>Material Specification</u>		
1	Service	Air	
2	Body	SS 316	
3	Spindle/Stem	SS 316	
4	Ball	ASTM A351 CF8M	
5	Insert	SS 316	
6	Seat	PTFE	
7	Gland Packing	PTFE	
8	Gland flange/Nut	ASTM A351 CF8M	
9	Hand bar	Cast Iron IS 210 Gr. FG 260	
10	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316	
11	End Connection	Screwed End	
12	Size & Quantity	80NB - 5 Nos.	KKS No. - 90GAA01AA540 / 90GAA01AA543 90GAA01AA647 / 90GAA01AA648 90GAA01AA649
13	Operation Type	Manual	
14	Leakage Class	IV	
15	Range of Flow Control	0-100%	
16	Valve Rating	PN 10	
17	Test duration	Body: 1 min	Seat: 1 min
18	Design Pressure	22 kg/sq.cm	
19	Test Pressure:	PN 10	
20	Testing standard	API 598	
21	Face to Face Distance	ASME B 16.10	
22	Set Testing Pressure	Body: 15 Bar	Seat: 11 Bar
23	Painting	As per approved painting specification	
24	MAKE	Venus Pump and Engineering works	

VALVE SIZE	FACE TO FACE	QTY.
N.B.	A±2	NOS.
80	158	05

BALL VALVE

NOTES :-

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE STATED.
2. VALVE STANDARD AS PER BS: 5351
3. END CONNECTION AS PER BSP FEMALE THREAD.
4. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.



8	GLAND NUT	S.S	AISI : 316
7	HAND LEVER	M.S.	WITH PVC SLEEVES
6	BALL SEAT	PTFE	-
5	STEM	S.S	AISI : 316
4	BALL	S.S	ASTM A351 CF8M
3	GLAND PACKING	PTFE	-
2	BODY CONNECTOR	S.S	ASTM A351 CF8M (SS 316)
1	BODY	S.S	ASTM A351 CF8M (SS 316)
SL.NO	DESCRIPTION	MATERIAL	SPECIFICATION

BILL OF MATERIAL

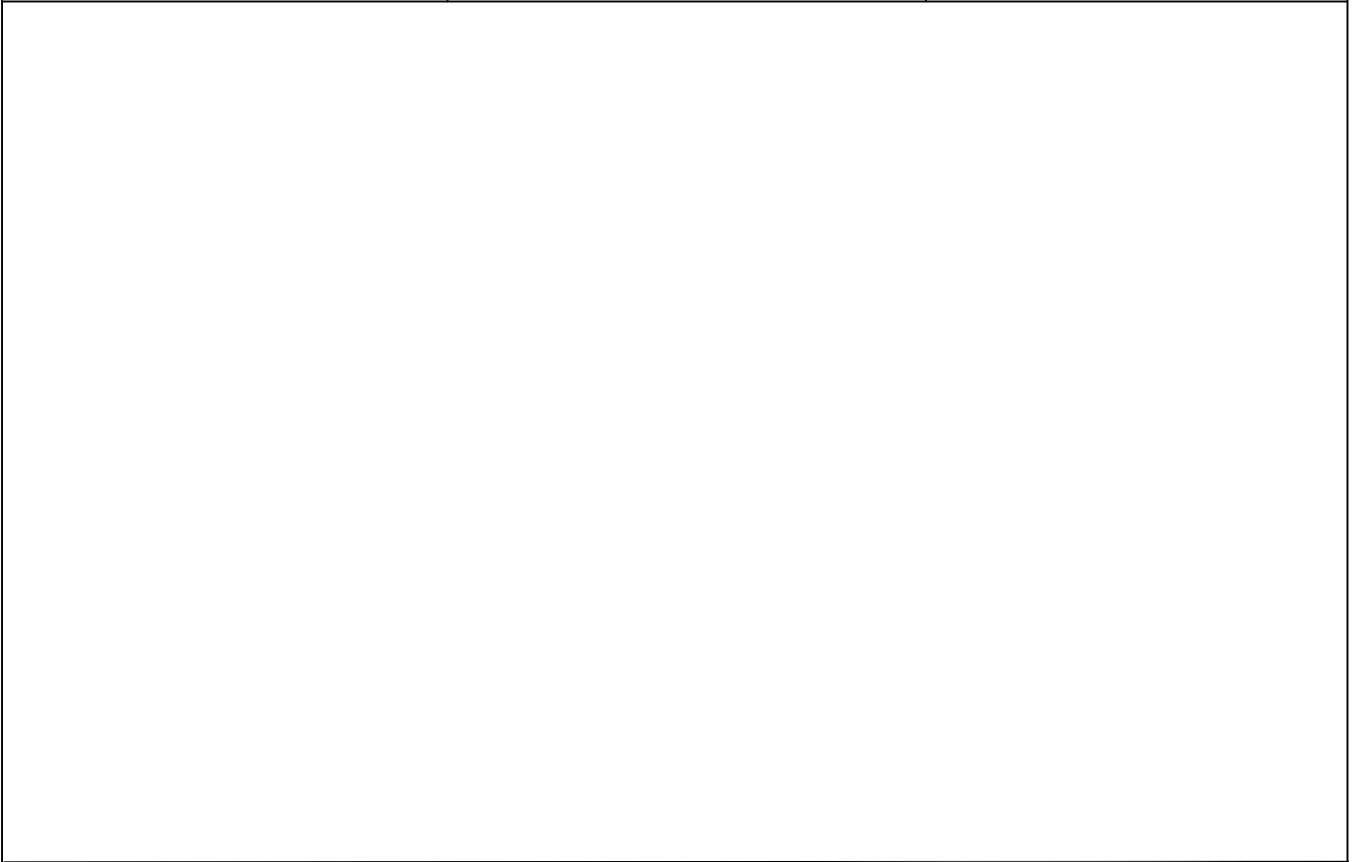
VALVE	BALL	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG. NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).	
TYPE	FULL PORT	ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
MFG. STD.	BS : 5351		
RATING	CLASS - 150#		
PARENT MATLS.	S.S		
TRIM MATLS.	PTFE		
SERVICE	AIR		
HYDROSTATIC TEST PRESSURE IN BAR.			
TESTING PARAMETER	BODY	SEAT	
	15 (1MIN.)	11 (1MIN.)	

PROJECTION	TITLE
	S.S, SINGLE PIECE DESIGN, FEMALE SCREWED END BALL VALVE.





		VENUS PUMP & ENGINEERING WORKS BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL			
REV	DATE	DRN.	A.GHOSH	DRG. NO.	SCALE N.T.S.
01	00	CHD.	C.HAZRA	VP-RK-BV-19-5666	
02	00	APP.	R.AGARWAL	REV:00 DATE:01.02.2019	
03	00				

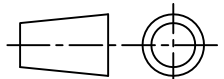
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -		
TECHNICAL DATASHEET FOR BUTTERFLY VALVES OF PRE TREATMENT PLANT					NAME	SIGN	DATE	
					PREP	ALOYSIUS	AF	06-05-19
					CHKD	MUAZZAM I	MI	06-05-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018					APPD	ASLAM A	AA	06-05-19

DEPT.					CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A015	REV 02
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/BFV/PTP/18/311	
DATE						NO. OF SHEETS 9 EXCLUDING COVER PAGE	

TECHNICAL DATA SHEET OF BUTTERFLY VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A015	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/BFV/PTP/18/311	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Butterfly Valve	
2	Valve Design	BS5155	
3	Flange Standard	ASME B 16.5 RF for 400NB END FLANGED TO AWWA C207 for 800NB PN-10	
	<u>Material Specification</u>		
1	Service	Sludge for 400NB and Sea water for 800NB	
2	Body	ASTM A 995 GR 5A-CE3MN (Duplex Stainless Steel)	
3	Disc	ASTM A 995 GR 5A-CE3MN (Duplex Stainless Steel)	
4	Shaft/Spindle	ASTM A276 S31803 (Duplex Stainless Steel) / F51	
5	Seat rings	Nitrile rubber / EPDM	
6	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316L	
7	Hand Wheel	MS to IS:2062 / Cast Iron	
8	End Connection	ASME B 16.5 RF for 400NB END FLANGED TO AWWA C207 for 800NB PN-10	
9	Size & Quantity	KKS No. - 90GBS41AA001 90GBS42AA001 90GBS43AA001	400NB - 3 Nos. Location-Sludge Transfer pump outlet pipeline
		KKS No. - 90GBD01AA001 90GBD01AA002	800NB - 2 Nos. Location-Sea Water Inlet valve station
10	Operation Type	Electrical Actuated	
11	Leakage Class	VI	
12	Range of Flow Control	0-100%	
13	Valve Rating	PN 10	
14	Test duration	Body: 5 min	Seat: 2 min
15	Design Pressure	11 Bar	
16	Test Pressure:	PN 10	
17	Testing standard	API 598	
18	Face to Face Distance	AWWA-C-504 / BS 5155 / API 609	
19	Set Testing Pressure	Body: 15 Bar	Seat: 11 Bar
20	Accessories	Limit switches to indicate full open/closed position of valve	
21	Painting	As per approved painting specification	
22	MAKE	Venus Pump and Engineering works	

DOUBLE FLANGED BUTTERFLY VALVE

VALVE SIZE	FACE TO FACE	FLANGE DETAILS					DRILLING STD.	SERVICE	QTY.
		O.D.	P.C.D.	THICK.	HOLE NO.	HOLE DIA.			
N.B.	A±5	B	C	D	E	F	--	--	NOS.
400	216	596.9	539.8	30	16	28.6	ASME B-16.5 R/F	SLUDGE	03
800	318	1060	977.9	38	28	41.2	AWWA C207	SEA WATER	02

A

A

B

B

C

C

D

D

E

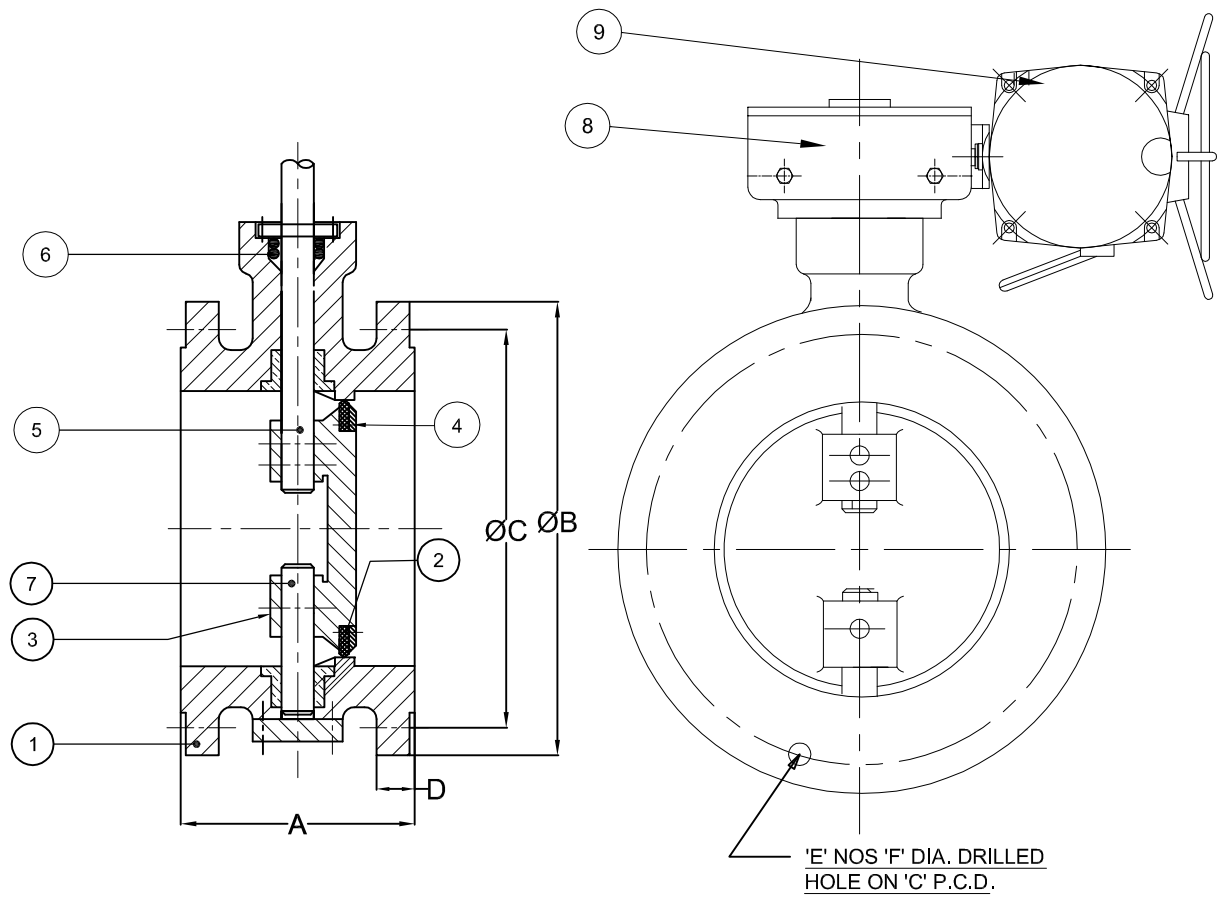
E

F

F

NOTES :

1. ALL DIMENSIONS ARE IN M.M.
2. STANDARD TOLERANCES ARE APPLICABLE.
3. WE RESERVE OUR RIGHT FOR MINOR DESIGN CHANGES.



SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
9	ACTUATOR	1	ROTORK	
8	WORM GEAR BOX	1	INDIGINOUS	
7	STUB SHAFT	1	D.S.S.	ASTM A276
6	PACKING O-RING	As reqd.	RUBBER	NITRILE/EPDM
5	DRIVE SHAFT	1	D.S.S.	ASTM A276
4	RETAINER BOLT	As reqd.	D.S.S.	AISI:316L
3	DISC	1	D.S.S.	ASTM A995 GR.5A CE3MN
2	DISC SEAT RING	1	RUBBER	NITRILE / EPDM
1	BODY	1	D.S.S.	ASTM A995 GR.5A CE3MN

BILL OF MATERIAL

DETAILS	VALVE	BUTTERFLY	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG. NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).	
	TYPE	FLANGE	ALL DIMENSIONS IN MM, UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 MM SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
	MFG. STD.	BS:5155		
	RATING	PN -10		
	PARENT MATLS.	D.S.S.		
	TRIM MATLS.	RUBBER / D.S.S.		
	SERVICE	SEE ABOVE TABLE		
	HYDROSTATIC TEST PRESSURE IN BAR			
	TESTING PARAMETER	BODY	SEAT	-
		15 (5MIN.)	11 (2MIN.)	-

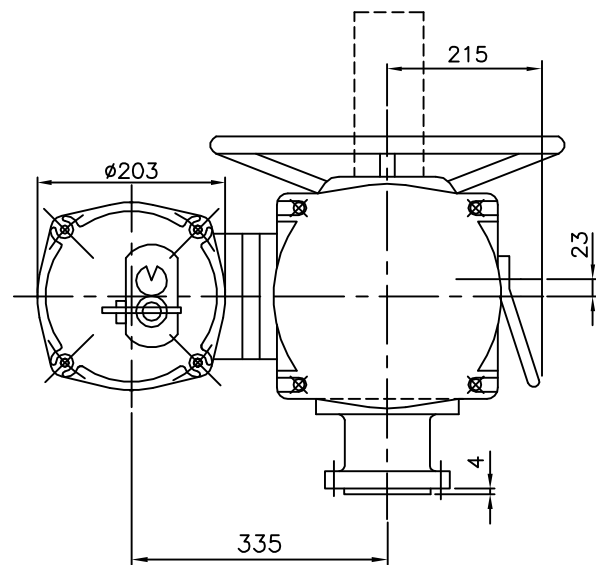
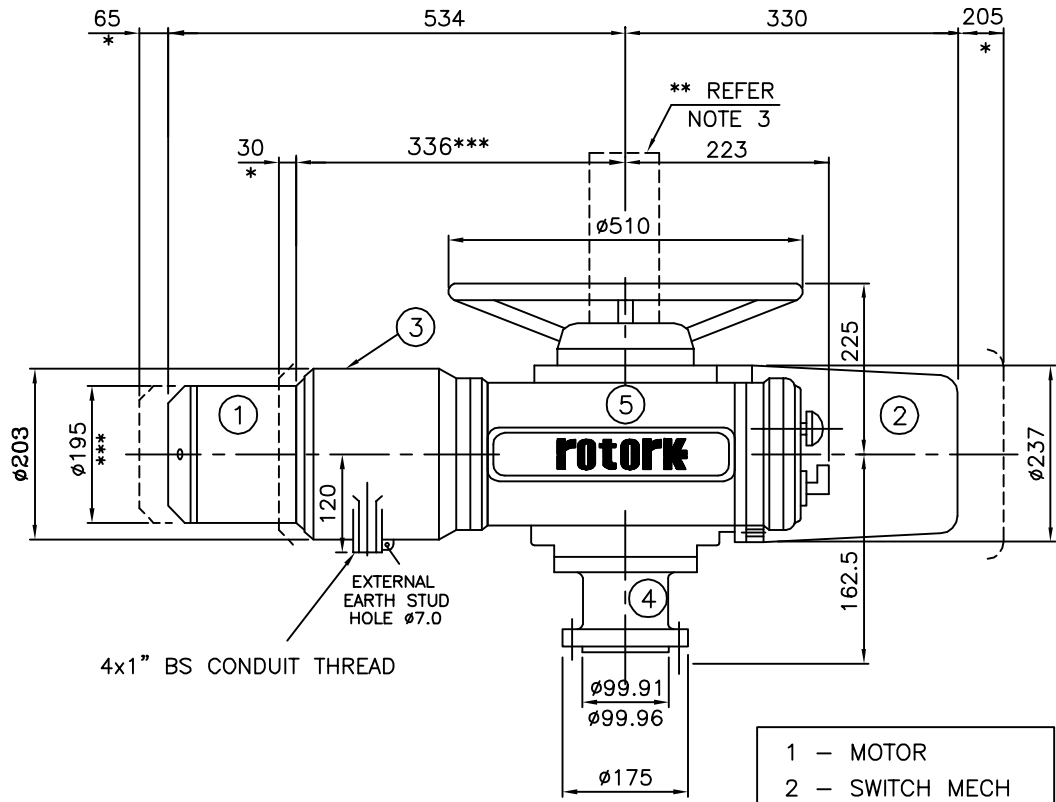
PROJECTION	TITLE
	D.S.S. DOUBLE FLANGED BUTTERFLY VALVE ACTUATOR OPERATED.

Venus VENUS PUMP & ENGINEERING WORKS
BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL

REV	DATE	DRN.	A.GHOSH	DRG. NO.	SCALE
01	00	CHD.	C.HAZRA	VP-RK-DFBV-19-5664	N.T.S.
02	00	APP.	R. AGARWAL	REV:00	DATE:01.02.2019
03	00				

MATERIAL	-	UNSPECIFIED DIMENSIONAL TOLERANCES	THREAD TOLERANCES	SURFACE FINISH	GAUGING POINTS (G.P.)	PART NUMBER	LETTERING AND LAYOUT	Drawing Number	BR/MISC-9014	
SPECIFICATION	-	MACHINED ± 0.25mm 010" CAST ± 0.8mm 1/32" ANGULAR ± 1/2"	METRIC TO BS 3643 CLASS 6H & 6G UNIFIED TO BS 1580 CLASS 2A & 2B	▽250 MICRO INCH ▽125 MICRO INCH ▽63 MICRO INCH ▽32 MICRO INCH REMOVE ALL BURRS AND SHARP EDGES	REFERENCE SHOULD BE MADE TO BEACON ROTORK QUALITY CONTROL DEPT. PRIOR TO PURCHASE OR MANUFACTURE OF GAUGES.	⊗ INDICATES POSITION WHERE PART NUMBERS ARE TO BE MARKED.	DO NOT PREPARE NEW OR REVISE EXISTING ARTWORK POSITIVES OR NEGATIVES	Manufacturing dimensions specified in millimeters precise inch conversions for reference	Do not Scale	
TREATMENT	-	ISO GEOMETRICAL TOLERANCING SYSTEM TO BS 308 PART 3 1972						Third angle projection	Scale	NTS

**(For 800 NB)
Butterfly Valve**



- | | | |
|---|---|---------------|
| 1 | - | MOTOR |
| 2 | - | SWITCH MECH |
| 3 | - | TERMINAL HSG. |
| 4 | - | ACTUATOR BASE |
| 5 | - | SYNCRPAK |

- NOTE :-**
- APPROX. WEIGHT OF ACTUATOR - 81 Kgs.
 - * INDICATES COVER REMOVAL ALLOWANCE
 - ** COVER TUBE WHEN FITTED - 3" NPT THREAD (LENGTH - AS REQUIRED BY CUSTOMER)
 - *** DIMENSION SHOWN FOR MAX.RPM

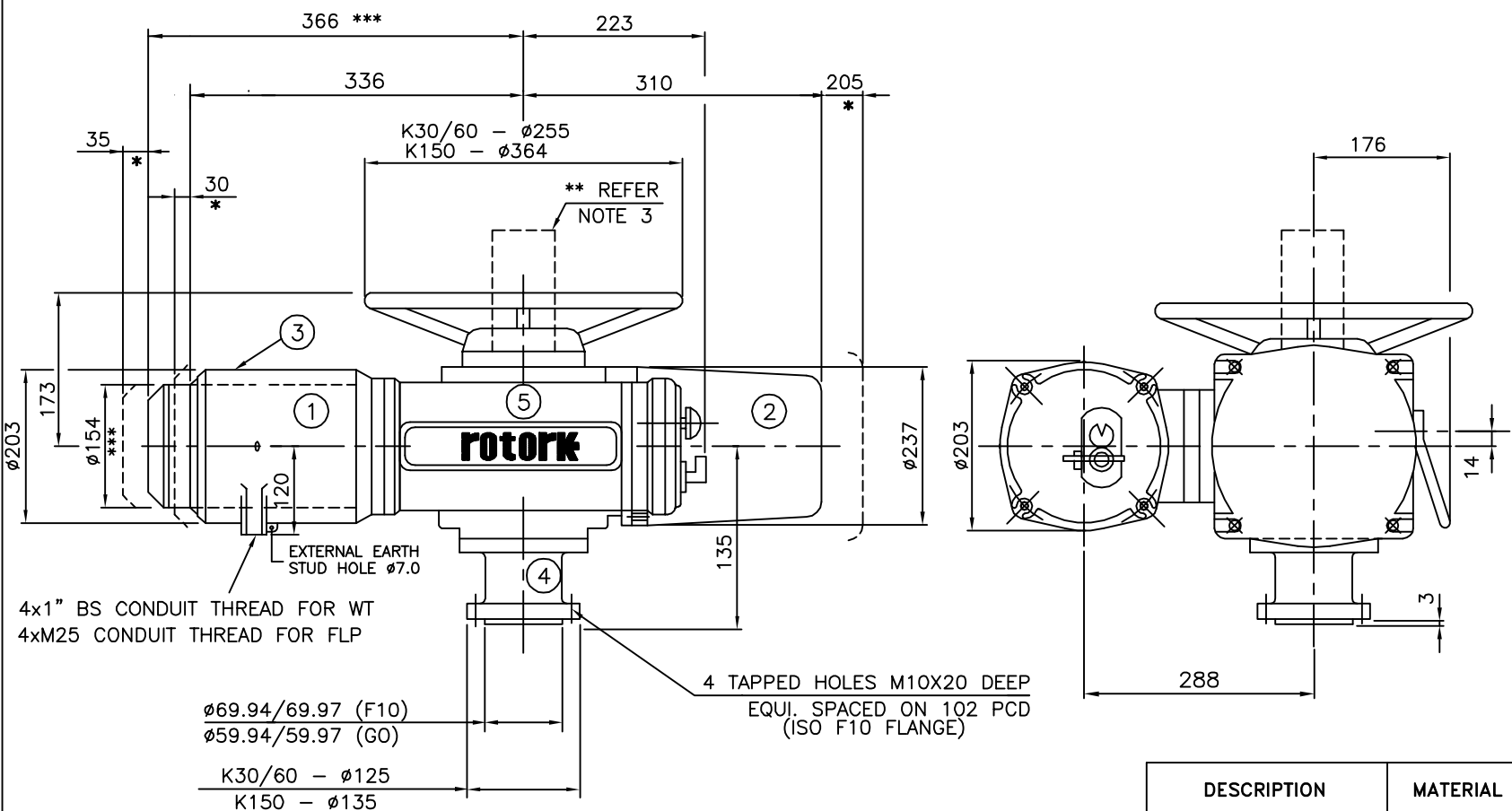
DESCRIPTION	MATERIAL
MOTOR HSG.	AL. ALLOY
S/MECH COVER	AL. ALLOY
TERMINAL HSG.	AL. ALLOY
BASE	CAST IRON
SYN.PAK HSG.	AL. ALLOY
HAND WHEEL HUB	S.G. IRON
PUSH BUTTON COVER	AL. ALLOY
GEAR CASE	AL. ALLOY
HAND AUTO LEVER	AL. ALLOY

Pre production issue indicated with letter production issue indicate with numeral	
Issue	Modifications

Title	DIMN.CHART FOR K300 & KM300 F14E SYNCRPAK ACTUATOR	
Drawn	<i>Ksk</i>	8.2.2008
Checked		
Approved	<i>Nsm</i>	8.2.2008
Used on	K300&KM300 F14E SYN.PAK ACTR. G1/2 & F14 'E' BASE	
Assembly drawing no.	-	
List of part no.	-	Sht.No. 1 OF 1
Drawing number	BR/MISC-9014	
rotork	Rotork Controls (India) Pvt, Limited 28 B, Ambattur Industrial Estate (North) Chennai-600 098	

MATERIAL	UNSPECIFIED DIMENSIONAL TOLERANCES	THREAD TOLERANCES	SURFACE FINISH	GAUGING POINTS (G.P.)	PART NUMBER	LETTERING AND LAYOUT	Drawing Number
SPECIFICATION	MACHINED ± 0.25mm 010" CAST ± 0.8mm 1/32" ANGULAR ± 1/2'	METRIC TO BS 3643 CLASS 6H & 6G	▽250 MICRO INCH ▽125 MICRO INCH ▽63 MICRO INCH ▽32 MICRO INCH	REFERENCE SHOULD BE MADE TO BEACON ROTORK QUALITY CONTROL DEPT. PRIOR TO PURCHASE OR MANUFACTURE OF GAUGES.	INDICATES POSITION WHERE PART NUMBERS ARE TO BE MARKED.	DO NOT PREPARE NEW OR REVISE EXISTING ARTWORK POSITIVES OR NEGATIVES	BR/MISC-10444
TREATMENT	ISO GEOMETRICAL TOLERANCING SYSTEM TO BS 308 PART 3 1972	UNIFIED TO BS 1580 CLASS 2A & 2B	REMOVE ALL BURRS AND SHARP EDGES				Manufacturing dimensions specified in millimeters precise inch conversions for reference
							Do not Scale

**(For 400 NB)
Butterfly Valve**



Third angle projection Scale NTS

Pre production issue indicated with letter
production issue indicate with numeral

Issue	Modifications:

Title DIMN.CHART FOR K30/60/150
& KM30/60/150 F10E
SYNCRPAK ACTR. (WT&FLP)

Drawn MAHI 18.07.2016
Approved DAB 18.07.2016

Used on K & KM30/60/150
GO/F10E BASE

Assembly drawing no. -
List of part no. - Sht.No. 1 OF 1

Drawing Number BR/MISC-10444

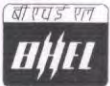
rotork Rotork Controls (India) Pvt, Limited
28 B, Ambattur Industrial Estate (North)
Chennai-600 098

- 1-MOTOR
- 2-SWITCH MECH
- 3-TERMINAL HSG.
- 4-ACTUATOR BASE
- 5-SYNCRPAK

- NOTE :-**
1. APPROX. WEIGHT OF ACTUATOR - 63 Kgs.
 2. * INDICATES COVER REMOVAL ALLOWANCE
 3. ** COVER TUBE WHEN FITTED - 2" NPT THREAD (LENGTH - AS REQUIRED BY CUSTOMER)
 4. *** DIMENSION SHOWN FOR MAX. RPM.

DESCRIPTION	MATERIAL
MOTOR HSG.	AL. ALLOY
S/MECH COVER	AL. ALLOY
TERMINAL HSG.	AL. ALLOY
BASE	CAST IRON
SYN.PAK HSG.	AL. ALLOY
HAND WHEEL	S.G. IRON
PUSH BUTTON COVER	AL. ALLOY
GEAR CASE	AL. ALLOY
HAND AUTO LEVER	AL. ALLOY

FORM NO. PEM-6686-Q

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-DG-412-145-1902	
			VOLUME	II B
			SECTION	D
	REV. NO.	02	DATE:	28.03.17
	SHEET	1	OF	3

Data Sheet A & B

DATA SHEET-A (TO BE FILLED BY PURCHASER)	DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
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GENERAL*	* PROJECT	2x 660 MW ENNORE SUPERCRITICAL TPP		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	<input checked="" type="checkbox"/> ON / OFF	<input checked="" type="checkbox"/> INCHING	Inching
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY		
	* OPENING / CLOSING TIME			
	* WORKING PRESSURE			
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		Comply
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		-
REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		-	
ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		305 Nm (K300F14E) / 152 Nm (K150F10E)	
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:68		Comply
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL		Comply
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		Comply
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		Comply
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM.		Inching Duty (150 starts per hour) based on a S2 type duty cycle - 15 mins.
HANDWHEEL	* REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Provided	
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED	Top Mounted	
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		ROTORK/K300F14E/K150F10E,
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		ROTORK/K300F14E - 1.2 kW, 48 rpm K150F10E - 0.85 kW / Sincropak.
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT-INCLUSIVE OF I.S. TOLERANCE		Comply.
	ACTUATOR APPLICABLE WIRING DIAGRAM	<input type="checkbox"/> ENCLOSED (BIDDER TO CONFIRM) A: <input type="checkbox"/> DRG. NO. 3-V-MISC-24227 R00 B: <input type="checkbox"/> DRG. NO. 3-V-MISC-24550 R00 C: <input type="checkbox"/> DRG. NO. 3-V-MISC-24283 R00 D: <input type="checkbox"/> DRG. NO. 4-V-MISC-90271 R11 E: <input type="checkbox"/> For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram		BH 97 Z 50 JV
	COLOUR SHADE	<input type="checkbox"/> BLUE (RAL 5012) <input type="checkbox"/>	RAL 5012	
	PAINT TYPE (## Refer Notes)	<input type="checkbox"/> ENAMEL <input checked="" type="checkbox"/> EPOXY <input type="checkbox"/>	Epoxy	
	SHAFT RPM	BIDDER TO SPECIFY		48 rpm
	OLR SET VALUE	BIDDER TO SPECIFY		K300F14E - 4.5 / K150F10E - 3.6.
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		K300F14E - 25A / K300F14E - 6A. K150F10E - 20A / K150F10E - 5.4A.
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		
	@ PWR SUPP TO MTR / STARTER	415V, 3PH, AC		Comply
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER <input type="checkbox"/> 230 V <input type="checkbox"/> 110 V		24 V DC





SPECIFICATION FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.: PE-DG-412-145-1902

VOLUME II B

SECTION D

REV. NO. 02

DATE: 28.03.17

SHEET 2

OF 3

Data Sheet A & B

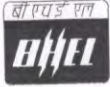
DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

	@ ENCLOSURE CLASS OF MOTOR	<input checked="" type="checkbox"/> IP 68 <input type="checkbox"/> FLAME PROOF	Comply Comply Comply (1 in each winding) Comply
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B	
	@ WINDING TEMP PROTECTION	<input checked="" type="checkbox"/> THERMOSTAT (3 Nos., 1 IN EACH PHASE) <input type="checkbox"/>	
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED	
INTEGRAL STARTER	INTEGRAL STARTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	Comply Provided Comply Comply Comply Comply Comply Comply Comply Comply Comply Comply
	TYPE OF SWITCHING DEVICE	<input checked="" type="checkbox"/> CONTACTORS <input type="checkbox"/> THYRISTORS	
	TYPE	<input checked="" type="checkbox"/> CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)	
	STEP DOWN CONT. TRANSFORMER	<input checked="" type="checkbox"/> REQUIRED	
	OPEN / CLOSE PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STOP PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INDICATING LAMPS	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	LOCAL REMOTE S/S	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STATUS CONTACTS FOR MONITORING	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (MOTOR THERMOSTAT TRIP, O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, PHASE LOSS, S/S IN LOCAL or OFF MODE, STOP PB OPTD. TORQUE OPEN/CLOSE CUTOFF)	
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	<input type="checkbox"/> INTERPOSING RELAY <input type="checkbox"/> OPTO COUPLER <input type="checkbox"/> EITHER	Interposing Relay 3 nos. (Inching operation) Comply
	QUANTITY	<input checked="" type="checkbox"/> 2 Nos. <input type="checkbox"/> 3 Nos.*	
	DRIVING VOLTAGE	<input checked="" type="checkbox"/> 20.5 - 24V DC <input type="checkbox"/> _____ V DC	
	DRIVING CURRENT	<input checked="" type="checkbox"/> 125mA MAX <input type="checkbox"/> _____ mA MAX	
	LOAD RESISTANCE	<input checked="" type="checkbox"/> > 192 ohms - <25 k ohms <input type="checkbox"/> > _____ ohms - < _____ ohms	
TORQUE SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY	ROTORK Comply Comply Comply Comply Comply Comply
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos	
	CONTACT TYPE	2 NO + 2 NC	
	RATING	5A 240V AC AND 0.5A 220V DC	
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE	
	ACCURACY	+3% OF SET VALUE	
		BIDDER TO SPECIFY	
LIMIT SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY	ROTORK Comply Comply Comply
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No <input checked="" type="checkbox"/> 2 Nos. 2 Nos. (ADJ.) <input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2Nos.	
	CONTACT TYPE	2 NO + 2 NC	
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC	

*For inching type drives IPR 3 Nos. to be considered for inching operation.





**SPECIFICATION
FOR
MOTORISED VALVE ACTUATOR**

SPECIFICATION NO.: PE-DG-412-145-1902		
VOLUME	II B	
SECTION	D	
REV. NO.	02	DATE: 28.03.17
SHEET	3	OF 3

Data Sheet A & B

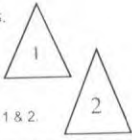
DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty & other specific applications)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	Provided
	MFR & MODEL NO.	BIDDER TO SPECIFY	Rotork
	TYPE	<input type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER <input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) CONTACTLESS	Comply
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/>	Comply
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA	Comply
	ACCURACY	± 1% FS	Comply
SPACE HEATER	@SPACE HEATER	REQUIRED	Provided
	@ POWER SUPPLY (NON INTEGRAL)	230V AC, 1 PH., 50 Hz	Not Applicable.
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	160VAC, 1ph, 50Hz Internally Fed.
	@ RATING		8-10 watt
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	Provided (Common Terminal Box)
	ENCL CLASS ACTUATOR/MOTOR T.B.	@ <input checked="" type="checkbox"/> IP 68 @ <input type="checkbox"/>	Comply
	@ EARTHING TERMINAL	REQUIRED	Provided
	PLUG & SOCKET (9 PIN) (FOR COMM, LS/TS FEED BACK, PoT)	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED <input type="checkbox"/> 2 NOS. <input type="checkbox"/>	Comply
CABLE GLANDS	@ POWER CABLE GLAND	SIZE: suitable for 3Cx2.5sq mm Cu	Cable OD required
	@ SPACE HEATER CABLE GLAND	SIZE:-	Cable OD required
	OTHER CONTROL CABLE GLANDS	QUANTITY & SIZE: Cable gland suitable for 8Px0.5 sq mm & 2P x 0.5 sq mm cable.	Cable OD required
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	K300F14E-81 Kg. K150F10E - 63 kg.

NOTES:

- SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
- CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH:
IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722
- ACTUATOR SHALL HAVE HARDWIRED CONTACTS FOR FOLLOWING SIGNALS (a) ACTUATOR IN LOCAL MODE (b) ACTUATOR IN REMOTE MODE
- BIDDER TO ENSURE AVAILABILITY OF SPARE 1NO + 1NC LIMIT SWITCH & TORQUE SWITCH.
- SS TAG NAME PLATE SHALL BE PROVIDED.
- TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
- CABLE GLANDS OF DOUBLE COMPRESSION TYPE, NI PLATED BRASS MATERIAL SHALL BE PROVIDED.
- THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
- THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
- THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.
- LOCAL DIGITAL POSITION INDICATOR SHALL BE PROVIDED FOR INCHING DUTY DRIVES.
- COMMANDS SHALL BE LATCHED AT INTEGRAL STARTER END.
- SWITCHES SHALL BE TERMINATED IN JB MOUNTED ON ACTUATOR.
- ACTUATORS FOR HAZARDOUS AREA SHALL BE CERTIFIED FLAME PROOF FOR ZONES 1 & 2.
- TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.
- EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.



NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ = TO BE FILLED BY ES

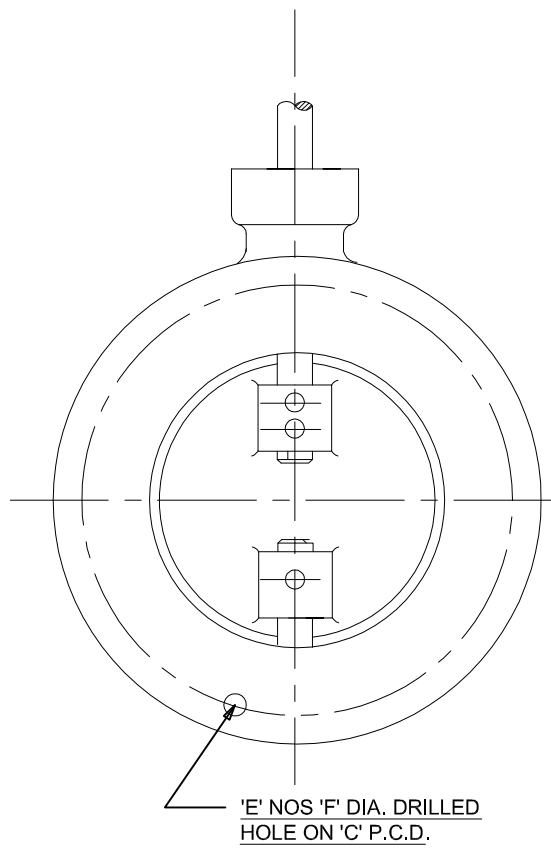
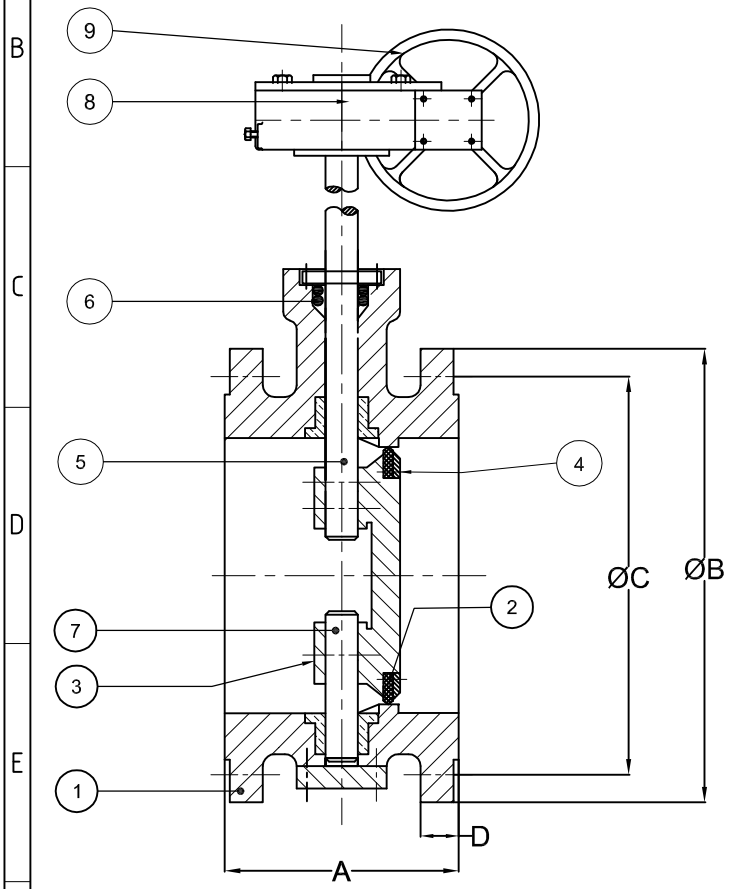


TECHNICAL DATA SHEET OF BUTTERFLY VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A015	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/BFV/PTP/18/311	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Butterfly Valve	
2	Valve Design	BS5155	
3	Flange Standard	ASME B 16.5 RF for 400NB END FLANGED TO AWWA C207 for 800NB PN-10	
	<u>Material Specification</u>		
1	Service	Sludge for 400NB and Sea water for 800NB	
2	Body	ASTM A 995 GR 5A-CE3MN	
3	Disc	ASTM A 995 GR 5A-CE3MN	
4	Shaft/Spindle	ASTM A 995 GR 5A-CE3MN	
5	Seat rings	Nitrile rubber / EPDM	
6	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316L	
7	Hand Wheel	MS to IS:2062 / Cast Iron	
8	End Connection	ASME B 16.5 RF for 400NB END FLANGED TO AWWA C207 for 800NB PN-10	
9	Size & Quantity	KKS No. - 90GAA01AA651 90GAA01AA652	400NB - 2 Nos. Location: Sludge Transfer Pump outlet recirculation/guard pond pipeline
		KKS No. - 90GBD01AA502 90GBD01AA503 90GBD01AA504 90GBD01AA505 90GBD01AA509	800NB - 5 Nos. Location-Sea Water Inlet valve station
10	Operation Type	GEAR BOX OPERATED	
11	Leakage Class	VI	
12	Range of Flow Control	0-100%	
13	Valve Rating	PN 10	
14	Test duration	Body: 5 min	Seat: 2 min
15	Design Pressure	11 Bar	
16	Test Pressure:	PN 10	
17	Testing standard	API 598	
18	Face to Face Distance	AWWA-C-504 / BS 5155 / API 609	
19	Set Testing Pressure	Body: 15 Bar	Seat: 11 Bar
20	Accessories	Limit switches to indicate full open/closed position of valve	
21	Painting	As per approved painting specification	
22	MAKE	Venus Pump and Engineering works	

DOUBLE FLANGED BUTTERFLY VALVE

VALVE SIZE	FACE TO FACE	FLANGE DETAILS					DRILLING STD.	SERVICE	QTY.
		O.D.	P.C.D.	THICK.	HOLE NO.	HOLE DIA.			
N.B.	A±5	B	C	D	E	F	--	--	NOS.
400	216	596.9	539.8	30	16	28.6	ASME B-16.5 R/F	SLUDGE	02
800	318	1060	977.9	38	28	41.2	AWWA C207	SEA WATER	05



- NOTES :
1. ALL DIMENSIONS ARE IN M.M.
 2. STANDARD TOLERANCES ARE APPLICABLE.
 3. WE RESERVE OUR RIGHT FOR MINOR DESIGN CHANGES.

SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
9	HAND WHEEL	1	C.I.	IS:210 FG-260
8	WORM GEAR BOX	1	INDIGINOUS	
7	STUB SHAFT	1	D.S.S.	ASTM A276
6	PACKING O-RING	As reqd.	RUBBER	NITRILE/EPDM
5	DRIVE SHAFT	1	D.S.S.	ASTM A276
4	RETAINER BOLT	As reqd.	S.S.	AISI:316L
3	DISC	1	D.S.S.	ASTM A995 GR.5A CE3MN
2	DISC SEAT RING	1	RUBBER	NITRILE / EPDM
1	BODY	1	D.S.S.	ASTM A995 GR.5A CE3MN

BILL OF MATERIAL				
VALVE	BUTTERFLY	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG. NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).		
TYPE	FLANGE			
MFG. STD.	BS:5155			
RATING	PN -10			
PARENT MATLS.	D.S.S.	ALL DIMENSIONS IN MM, UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 MM SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.		
TRIM MATLS.	RUBBER / D.S.S.			
SERVICE	SEE ABOVE TABLE			
HYDROSTATIC TEST PRESSURE IN BAR.				
TESTING PARAMETER	BODY	SEAT		
	15 (5 MIN.)	11 (2 MIN.)		

PROJECTION		TITLE		
		D.S.S. DOUBLE FLANGED BUTTERFLY VALVE WORM GEAR BOX OPERATED.		
		VENUS PUMP & ENGINEERING WORKS BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL		
MAIN REF.	REV	DATE	DRN.	A.GHOSH
	01	00	CHD.	C.HAZRA
	02	00	APP.	R. AGARWAL
	03	00	DRG. NO.	VP-RK-DFBV-19-5663
			SCALE	N.T.S.
			REV:00	DATE:01.02.2019

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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.



TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)



CONSULTANT: DESEIN PVT LTD, NEW DELHI.



BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NEW DELHI



OTOKLIN GLOBAL BUSINESS LTD.
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -		
TECHNICAL DATASHEET FOR DIAPHRAGM VALVES OF PRE TREATMENT PLANT					NAME	SIGN	DATE	
					PREP	ALOYSIUS	AF	31-05-19
					CHKD	MUAZZAM I	MI	31-05-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018					APPD	ASLAM A	AA	31-05-19

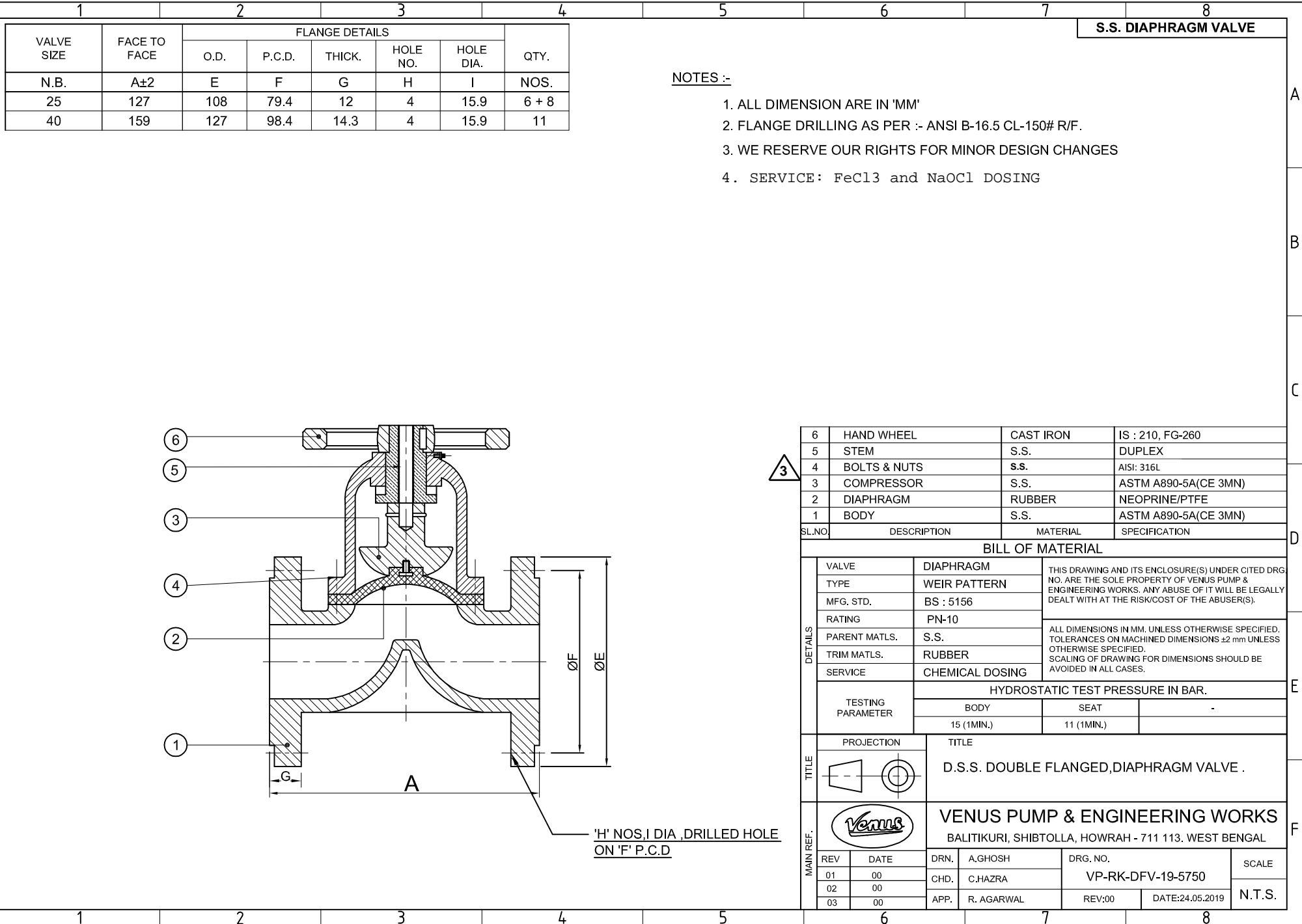
DEPT.						CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A016	REV 03
SIGN		N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/DV/PTP/18/312	
DATE							NO. OF SHEETS <input type="text" value="6"/> EXCLUDING COVER PAGE	

TECHNICAL DATA SHEET OF DIAPHRAGM VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A016	REV NO:- 03
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBl/OC-983/TDS/DV/PTP/18/312	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Diaphragm Valve	
2	Valve Design	BS:5156 or equivalent of required rating/class	
3	Flange Standard	ANSI B 16.5, 150#	
	<u>Material Specification</u>		
1	Service (R2)	FeCl3 and NaOCl dosing (Instrument Isolation Purpose)	
2	Body (R2)	Duplex Stainless steel.	
3	Diaphragm	Neoprene / PTFE	
4	Stem (R2)	Duplex Stainless steel.	
5	Compressor & Bush (R2)	Duplex Stainless steel.	
6	Hand wheel	Cast Iron IS 210 Gr. FG 260	
7	End Connection	FLANGED ENDS, DRILLED TO B 16.5, 150#-SOFF	
8	Bolts and Nuts / Fasteners (R3)	SS 316	
9	Size & Quantity (R2)	25NB - 8 Nos.	KKS No. - 90GAA01AA545 / 90GAA01AA546 90GAA01AA548 / 90GAA01AA549 90GAA01AA551 / 90GAA01AA552 90GAA01AA566 / 90GAA01AA567
10	Operation Type	Manual	
11	Leakage Class	VI	
12	Range of Flow Control	0-100%	
13	Valve Rating	PN 10	
14	Test duration	Body: 1 min	Seat: 1 min
15	Design Pressure	11 Bar	
16	Test Pressure:	PN 10	
17	Testing standard	API 598	
18	Face to Face Distance	BS 5156	
19	Set Testing Pressure	Body: 15 Bar	Seat: 10 Bar
20	Painting	As per approved painting specification	
21	MAKE	Venus Pump & Engineering Works	

TECHNICAL DATA SHEET OF DIAPHRAGM VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A016	REV NO:- 03
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/DV/PTP/18/312	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Diaphragm Valve	
2	Valve Design	BS:5156 or equivalent of required rating/class	
3	Flange Standard	ANSI B 16.5, 150#	
	<u>Material Specification</u>		
1	Service (R2)	FeCl3 and NaOCl dosing	
2	Body (R2)	Duplex Stainless steel.	
3	Diaphragm	Neoprene / PTFE	
4	Stem (R2)	Duplex Stainless steel.	
5	Compressor & Bush (R2)	Duplex Stainless steel.	
6	Hand wheel	Cast Iron IS 210 Gr. FG 260	
7	End Connection	FLANGED ENDS, DRILLED TO B 16.5, 150#-SOFF	
8	Bolts and Nuts / Fasteners (R3)	SS 316L	
9	Size & Quantity (R2)	25NB - 6 Nos.	KKS No. - 90GAA01AA568 / 90GAA01AA588 90GAA01AA620 / 90GAA01AA623 90GAA01AA625 / 90GAA01AA628
		40NB - 11 Nos.	KKS No. - 90GAA01AA573 / 90GAA01AA574 90GAA01AA575 / 90GAA01AA580 90GAA01AA581 / 90GAA01AA582 90GAA01AA583 / 90GAA01AA590 90GAA01AA592 / 90GAA01AA595 90GAA01AA598
10	Operation Type	Manual	
11	Leakage Class	VI	
12	Range of Flow Control	0-100%	
13	Valve Rating	PN 10	
14	Test duration	Body: 1 min	Seat: 1 min
15	Design Pressure	11 Bar	
16	Test Pressure:	PN 10	
17	Testing standard	API 598	
18	Face to Face Distance	BS 5156	
19	Set Testing Pressure	Body: 15 Bar	Seat: 10 Bar
20	Painting	As per approved painting specification	
21	MAKE	Venus Pump & Engineering Works	



VALVE SIZE	FACE TO FACE	FLANGE DETAILS					QTY.
		O.D.	P.C.D.	THICK.	HOLE NO.	HOLE DIA.	
N.B.	A±2	E	F	G	H	I	NOS.
25	127	108	79.4	12	4	15.9	6 + 8
40	159	127	98.4	14.3	4	15.9	11

S.S. DIAPHRAGM VALVE

NOTES :-

1. ALL DIMENSION ARE IN 'MM'
2. FLANGE DRILLING AS PER :- ANSI B-16.5 CL-150# R/F.
3. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES
4. SERVICE: FeCl3 and NaOCl DOSING

6	HAND WHEEL	CAST IRON	IS : 210, FG-260
5	STEM	S.S.	DUPLEX
4	BOLTS & NUTS	S.S.	AISI: 316L
3	COMPRESSOR	S.S.	ASTM A890-5A(CE 3MN)
2	DIAPHRAGM	RUBBER	NEOPRINE/PTFE
1	BODY	S.S.	ASTM A890-5A(CE 3MN)
SL.NO.	DESCRIPTION	MATERIAL	SPECIFICATION
BILL OF MATERIAL			
VALVE	DIAPHRAGM	<small>THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).</small> <small>ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ±2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.</small>	
TYPE	WEIR PATTERN		
MFG. STD.	BS : 5156		
RATING	PN-10		
PARENT MATLS.	S.S.		
TRIM MATLS.	RUBBER		
SERVICE	CHEMICAL DOSING	HYDROSTATIC TEST PRESSURE IN BAR.	
TESTING PARAMETER	BODY	SEAT	-
	15 (1MIN.)	11 (1MIN.)	
PROJECTION	TITLE		
	D.S.S. DOUBLE FLANGED, DIAPHRAGM VALVE .		
MAIN REF.	VENUS PUMP & ENGINEERING WORKS		
	BALITIKURI, SHIBTOLLA, HOWRAH - 711 113, WEST BENGAL		
	REV	DATE	DRN.
	01	00	A.GHOSH
02	00	CHD.	
03	00	APP.	
A.GHOSH		DRG. NO.	
C.HAZRA		VP-RK-DFV-19-5750	
R. AGARWAL		REV:00	SCALE
		DATE:24.05.2019	N.T.S.

TECHNICAL DATA SHEET OF DIAPHRAGM VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A016	REV NO:- 03
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/DV/PTP/18/312	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Diaphragm Valve	
2	Valve Design	BS:5156 or equivalent of required rating/class	
3	Flange Standard	ANSI B 16.5, 150#	
	<u>Material Specification</u>		
1	Service (R2)	Lime and PE dosing (Instrument Isolation Purpose)	
2	Body	SS 316	
3	Diaphragm	Neoprene / PTFE	
4	Stem	SS 316	
5	Compressor & Bush	SS 316	
6	Hand wheel	Cast Iron IS 210 Gr. FG 260	
7	End Connection	FLANGED ENDS, DRILLED TO B 16.5, 150#-SOFF	
8	Bolts and Nuts / Fasteners (R3)	SS 316	
9	Size & Quantity (R2)	25NB - 10 Nos.	KKS No. - 90GAA01AA554 / 90GAA01AA555 90GAA01AA557 / 90GAA01AA558 90GAA01AA560 / 90GAA01AA561 90GAA01AA563 / 90GAA01AA564 90GAA01AA569 / 90GAA01AA570
10	Operation Type	Manual	
11	Leakage Class	VI	
12	Range of Flow Control	0-100%	
13	Valve Rating	PN 10	
14	Test duration	Body: 1 min	Seat: 1 min
15	Design Pressure	11 Bar	
16	Test Pressure:	PN 10	
17	Testing standard	API 598	
18	Face to Face Distance	BS 5156	
19	Set Testing Pressure	Body: 15 Bar	Seat: 10 Bar
20	Painting	As per approved painting specification	
21	MAKE	Venus Pump & Engineering Works	

TECHNICAL DATA SHEET OF DIAPHRAGM VALVES

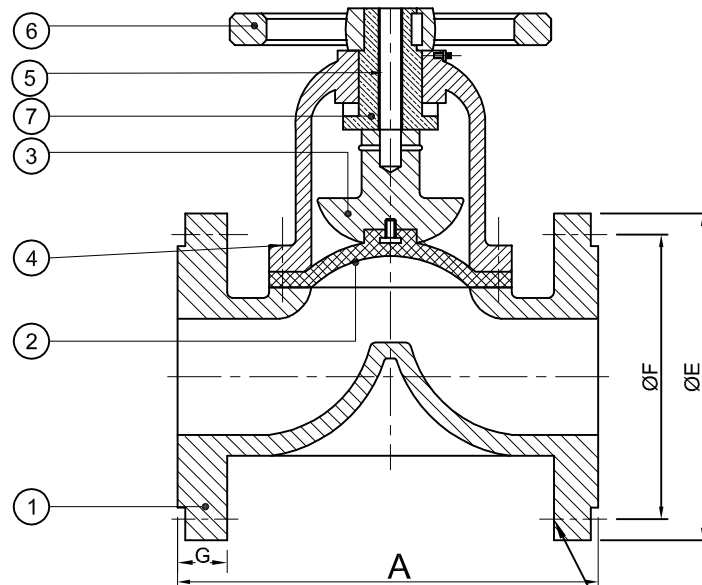
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A016	REV NO:- 03
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/DV/PTP/18/312	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Diaphragm Valve	
2	Valve Design	BS:5156 or equivalent of required rating/class	
3	Flange Standard	ANSI B 16.5, 150#	
	<u>Material Specification</u>		
1	Service (R2)	Lime and PE dosing	
2	Body	SS 316	
3	Diaphragm	Neoprene / PTFE	
4	Stem	SS 316	
5	Compressor & Bush	SS 316	
6	Hand wheel	Cast Iron IS 210 Gr. FG 260	
7	End Connection	FLANGED ENDS, DRILLED TO B 16.5, 150#-SOFF	
8	Bolts and Nuts / Fasteners (R3)	SS 316	
9	Size & Quantity (R2)	25NB - 6 Nos.	KKS No. - 90GAA01AA587 / 90GAA01AA586 90GAA01AA610 / 90GAA01AA612 90GAA01AA615 / 90GAA01AA618
		40NB - 3 Nos.	KKS No. - 90GAA01AA579 / 90GAA01AA578 90GAA01AA572
10	Operation Type	Manual	
11	Leakage Class	VI	
12	Range of Flow Control	0-100%	
13	Valve Rating	PN 10	
14	Test duration	Body: 1 min	Seat: 1 min
15	Design Pressure	11 Bar	
16	Test Pressure:	PN 10	
17	Testing standard	API 598	
18	Face to Face Distance	BS 5156	
19	Set Testing Pressure	Body: 15 Bar	Seat: 10 Bar
20	Painting	As per approved painting specification	
21	MAKE	Venus Pump & Engineering Works	

S.S. DIAPHRAGM VALVE

VALVE SIZE	FACE TO FACE	FLANGE DETAILS					QTY.
		O.D.	P.C.D.	THICK.	HOLE NO.	HOLE DIA.	
N.B.	A±2	E	F	G	H	I	NOS.
25	127	108	79.4	12	4	15.9	6 + 10
40	159	127	98.4	14.3	4	15.9	3

NOTES :-

1. ALL DIMENSION ARE IN 'MM'
2. FLANGE DRILLING AS PER :- ANSI B-16.5 CL-150# R/F.
3. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES
4. SERVICE: LIME PE DOSING



'H' NOS, I DIA, DRILLED HOLE ON 'F' P.C.D



7	BUSH	S.S.	AISI:316
6	HAND WHEEL	CAST IRON	IS : 210, FG-260
5	STEM	S.S.	AISI:316
4	BOLTS & NUTS	S.S.	AISI:316
3	COMPRESSOR	S.S.	AISI:316
2	DIAPHRAGM	RUBBER	NEOPRINE/PTFE
1	BODY	S.S.	ASTM A351 CF8M (SS316)

SL.NO.	DESCRIPTION	MATERIAL	SPECIFICATION
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BILL OF MATERIAL

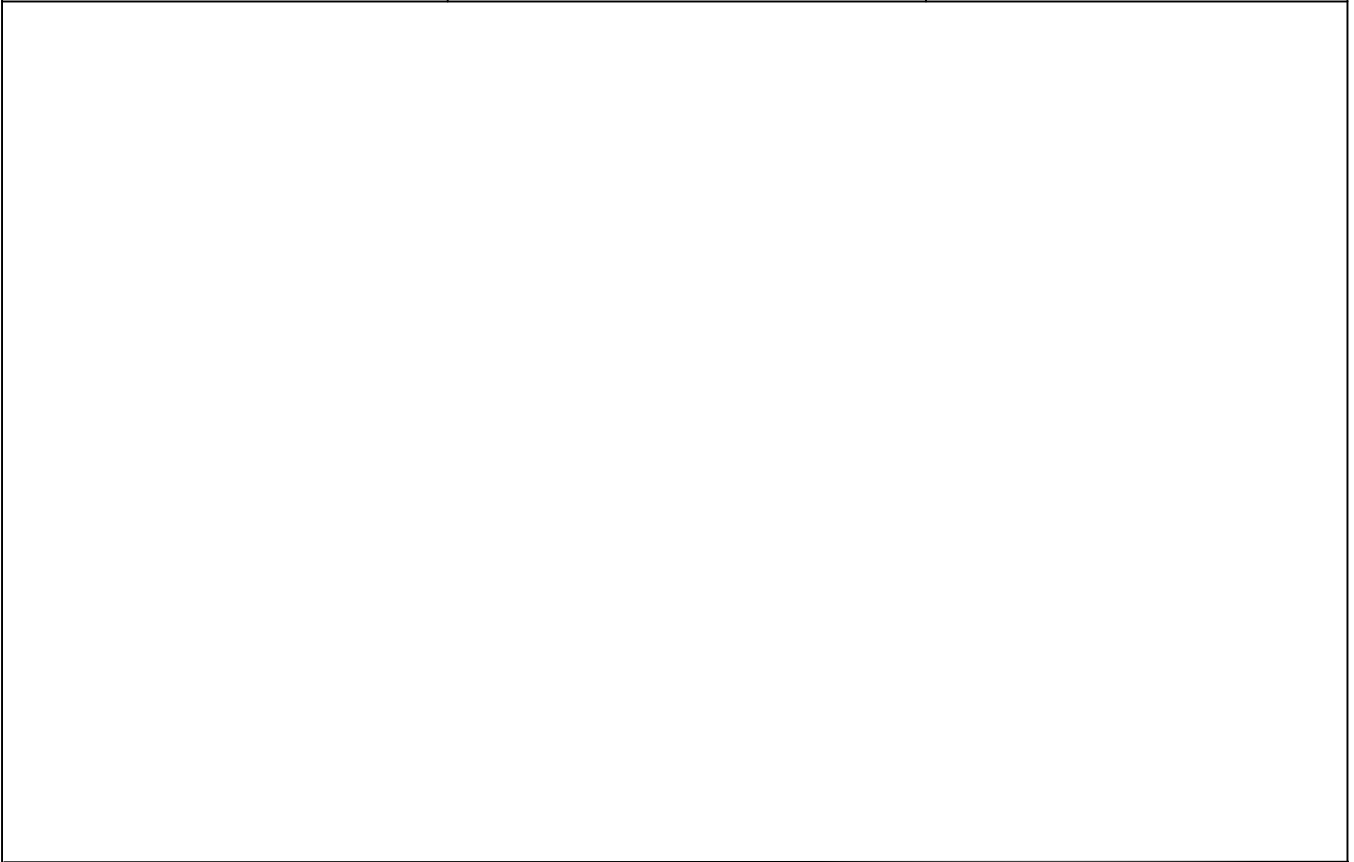
VALVE	DIAPHRAGM	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG. NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).	
TYPE	WEIR PATTERN	ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ±2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
MFG. STD.	BS : 5156		
RATING	PN-10		
PARENT MATLS.	S.S.		
TRIM MATLS.	RUBBER		
SERVICE	CHEMICAL DOSING		
HYDROSTATIC TEST PRESSURE IN BAR.			
TESTING PARAMETER	BODY	SEAT	-
	15 (1MIN.)	11 (1MIN.)	

PROJECTION	TITLE
	S.S. DOUBLE FLANGED, DIAPHRAGM VALVE .





		VENUS PUMP & ENGINEERING WORKS		
		BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL		
REV	DATE	DRN.	A.GHOSH	DRG. NO.
01	24.05.19	CHD.	C.HAZRA	VP-RK-DFV-19-5670
02	00	APP.	R. AGARWAL	REV:00
03	00			DATE:02.02.2019
				SCALE
				N.T.S.

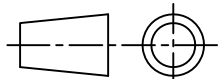
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -
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TECHNICAL DATASHEET FOR GATE VALVES & GLOBE VALVES OF PRE TREATMENT PLANT		NAME	SIGN	DATE
	PREP	ALOYSIUS	AF	27-05-19
	CHKD	MUAZZAM I	MI	27-05-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	27-05-19

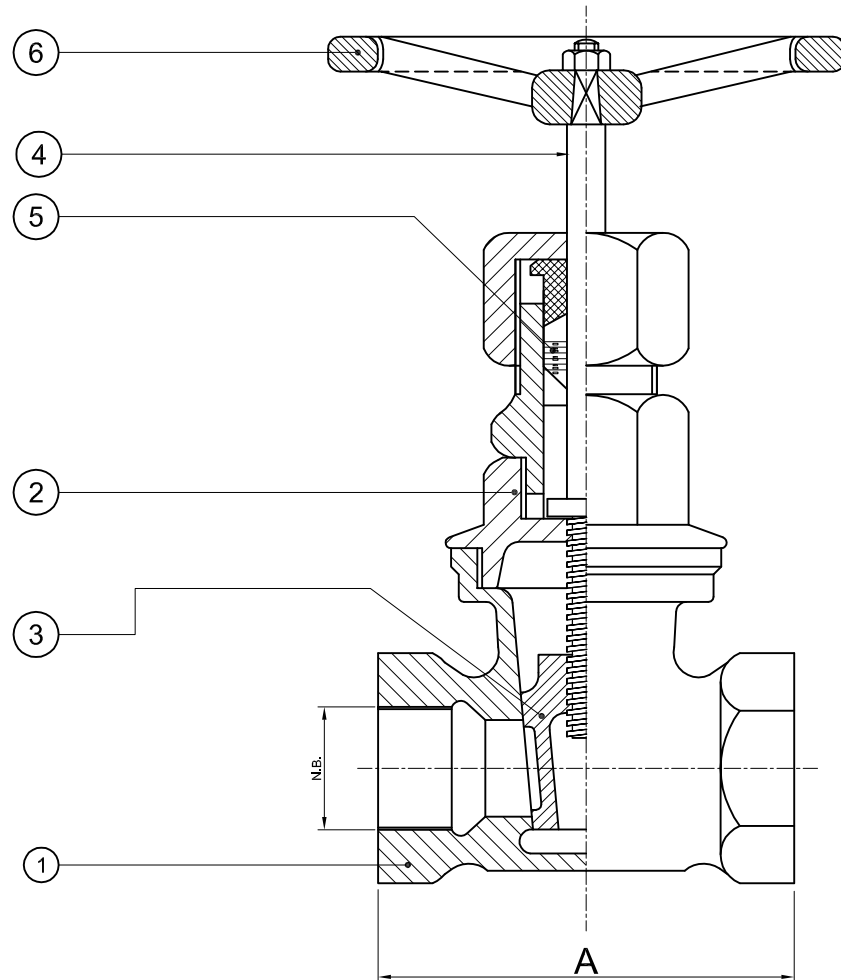
DEPT.					CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A017	REV 02
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/GV/PTP/18/313	
DATE						NO. OF SHEETS 10 EXCLUDING COVER PAGE	

TECHNICAL DATA SHEET OF GATE VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A017	REV NO:-02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/GV/PTP/18/313	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Gate Valve	
2	Valve Design	BS 5352 or equivalent of Required rating/class	
	<u>Material Specification</u>		
1	Service	Sea water and clarified water	
2	Body	ASTM A890-5A (CE3MN)	
3	Spindle/Stem	Duplex Stainless Steel.	
4	Body face ring	Intergral	
5	Wedge face ring	Intergral	
6	Bonnet & Disc	ASTM A890-5A (CE3MN)	
7	Seat & seat rings	Integral	
8	Gland Packing	PTFE	
9	Gland Nut	Duplex Stainless Steel.	
10	Hand wheel	Cast Iron IS 210 Gr. FG 260	
11	End Connection	Female Screwed ends NPT	
12	Size & Quantity	15NB - 9 Nos	KKS No. - 90GAA01AA501 / 90GAA01AA512 90GAA01AA513 / 90GAA01AA514 90GAA01AA515 / 90GAA01AA516 90GAA01AA518 / 90GAA01AA521 90GAA01AA642
13	Operation Type	Manual	
14	Leakage Class	VI	
15	Range of Flow Control	0-100%	
16	Valve Rating	PN 10	
17	Test duration	Body: 1 min	Seat: 1 min
18	Design Pressure	22 kg/sq.cm	
19	Test Pressure:	PN 10	
20	Testing standard	API 598	
21	Face to Face Distance	ASME B 16.10	
22	Set Testing Pressure	Body: 15 Bar	Seat: 11 Bar
23	Painting	As per approved painting specification	
24	MAKE	Venus Pump and Engineering works	

GATE VALVE

VALVE SIZE	FACE TO FACE	QTY.
N.B.	A ±2	NOS.
15	57	09



NOTE

1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
2. STANDARD TOLERANCES ARE APPLICABLE.
3. VALVE SHALL BE NPT FEMALE SCREWED END.
4. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.

SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
6	HAND WHEEL	1	C.I.	IS:210 GR. FG 260
5	PACKING	1 ^{As reqd.}	PTFE	--
4	STEM / SPINDLE	1	D.S.S	ASTM A276
3	WEDGE WITH INTEGRAL SEAT	1	D.S.S	ASTM A890-5A (CE 3MN)
2	BONNET	1	D.S.S	ASTM A890-5A (CE 3MN)
1	BODY WITH INTEGRAL SEAT	1	D.S.S	ASTM A890-5A (CE 3MN)

BILL OF MATERIAL

DETAILS	VALVE	GATE		THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).
	TYPE	NON-RISING		
	MFG. STD.	BS:5352		
	RATING	PN-10		
	PARENT MATLS.	D.S.S		
	TRIM MATLS.	D.S.S		
SERVICE	SEA WATER AND CLARIFIED WATER		ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ±2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
HYDROSTATIC TEST PRESSURE BAR.				
HYDROSTATIC TEST PRESSURE	BODY	SEAT		---
	15 (1 MIN.)	11 (1 MIN.)		

TITLE	PROJECTION	TITLE
		D.S.S. SCREWED END NON-RISING SPINDLE GATE VALVE.

MAIN REF.			VENUS PUMP & ENGINEERING WORKS		
	BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL				
	REV	DATE	DRN.	A.GHOSH	DRG. NO.
	01	00	CHD.	C.HAZRA	VP-RK-FSGV-19-5671
02	00			SCALE	
03	00	APP.	R.AGARWAL	REV:00	DATE:02.02.2019
					N.T.S.

TECHNICAL DATA SHEET OF GATE VALVES

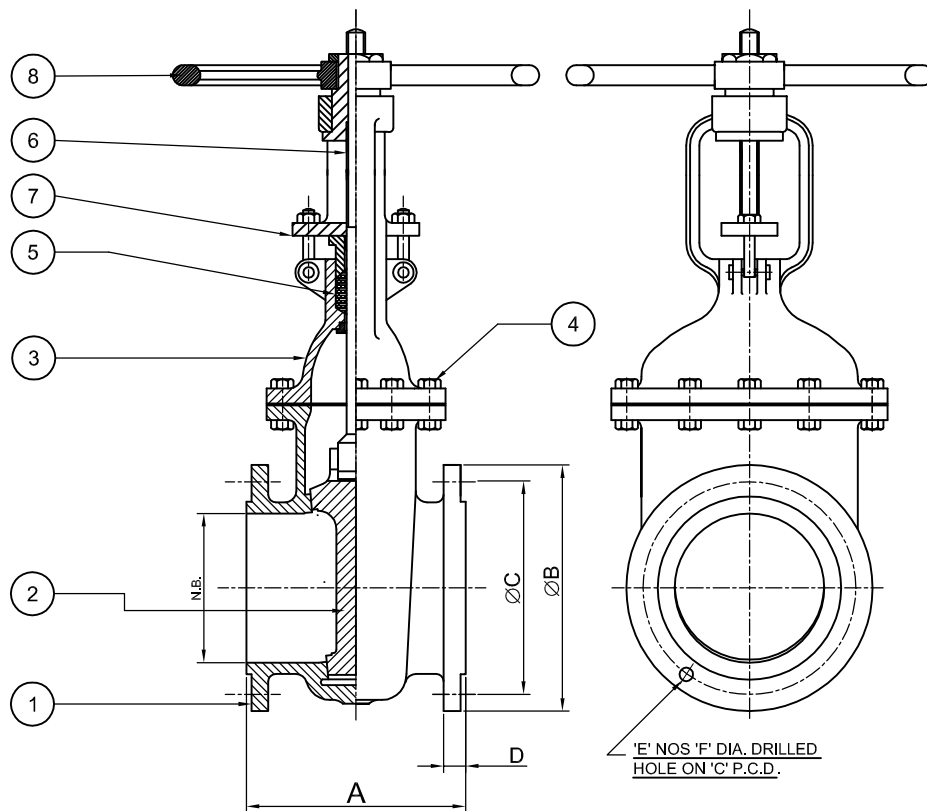
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A017	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/GV/PTP/18/313	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Gate Valve	
2	Valve Design	API 600 or equivalent of Required rating/class	
3	Flange Standard	ASME B 16.5 RF Serreted Finish150 AARH	
	<u>Material Specification</u>		
1	Service	Sea water sludge	
2	Body	ASTM A890-5A (CE3MN)	
3	Spindle/Stem	Duplex Stainless Steel.	
4	Body face ring	Duplex Stainless Steel.	
5	Wedge face ring	Duplex Stainless Steel.	
6	Bonnet & Disc	ASTM A890-5A (CE3MN)	
7	Seat & seat rings	Duplex Stainless Steel.	
8	Gland Packing	GRAPHITE RING/PTFE	
9	Gland flange	Duplex Stainless Steel.	
10	Hand wheel	Cast Iron IS 210 Gr. FG 260	
11	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316L	
12	End Connection	ASME B 16.5 RF Serreted Finish150 AARH	
13	Size & Quantity	80NB - 2 Nos.	KKS No. - 90GAA01AA510 / 90GAA01AA511
14	Operation Type	Manual	
15	Leakage Class	IV	
16	Range of Flow Control	0-100%	
17	Valve Rating	PN 10	
18	Test duration	Body: 1 min	Seat: 1 min
19	Design Pressure	22 kg/sq.cm	
20	Test Pressure:	PN 10	
21	Testing standard	API 598	
22	Face to Face Distance	ASME B 16.10	
23	Set Testing Pressure	Body: 15 Bar	Seat: 11 Bar
24	Painting	As per approved painting specification	
25	MAKE	Venus Pump and Engineering works	

D.S.S GATE VALVE

VALVE SIZE	FACE TO FACE	FLANGE DETAILS					QTY.
		O.D.	P.C.D.	THICK.	HOLE NO.	HOLE DIA.	
N.B.	A±2	B	C	D	E	F	NOS.
80	203	190.5	152.4	19.1	04	19	02

NOTE

1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
2. STANDARD TOLERANCES ARE APPLICABLE.
3. FLANGED END DRILLED TO ANSI B 16.5 CL-150#R/F.
4. WE RESEVE OUR RIGHTS FOR MINOR DESIGN CHANGES.



SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
8	HAND WHEEL	1	C.I.	IS:210 GR.FG-260
7	GLAND FLANGE	1	D.S.S.	ASTM A890-5A(CE 3MN)
6	SPINDLE	1	D.S.S.	ASTM A276
5	GLAND PACKING	1	GRAPHITE RING/PTFE	--
4	STUDS & NUTS	As reqd.	S.S.	AISI:316L
3	BONNET	1	D.S.S.	ASTM A890-5A(CE 3MN)
2	WEDGE WITH INTEGRAL SEAT	1	D.S.S.	ASTM A890-5A(CE 3MN)
1	BODY WITH INTEGRAL SEAT	1	D.S.S.	ASTM A890-5A(CE 3MN)

BILL OF MATERIAL

VALVE	GATE		THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG. NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).
TYPE	OS & Y		
MFG. STD.	API : 600		
RATING	PN-10		
PARENT MATLS.	D.S.S.		
TRIM MATLS.	D.S.S.		
SERVICE	SEA WATER /SLUDGE		ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.
TESTING PARAMETER	HYDROSTATIC TEST PRESSURE IN BAR.		
	BODY	SEAT	--
	15 (1 MIN.)	11 (1 MIN.)	--

PROJECTION	TITLE
	D.S.S. DOUBLE FLANGED, RISING SPINDLE TAPER WEDGE GATE VALVE

MAIN REF.		VENUS PUMP & ENGINEERING WORKS BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL			
REV	DATE	DRN.	A.GHOSH	DRG. NO.	SCALE
01	00	CHD.	C.HAZRA	VP-RK-DSSGV-19-5672	
02	00	APP.	R. AGARWAL	REV:00	
03	00			DATE: 02.02.2019	N.T.S.

TECHNICAL DATA SHEET OF GLOBE VALVES

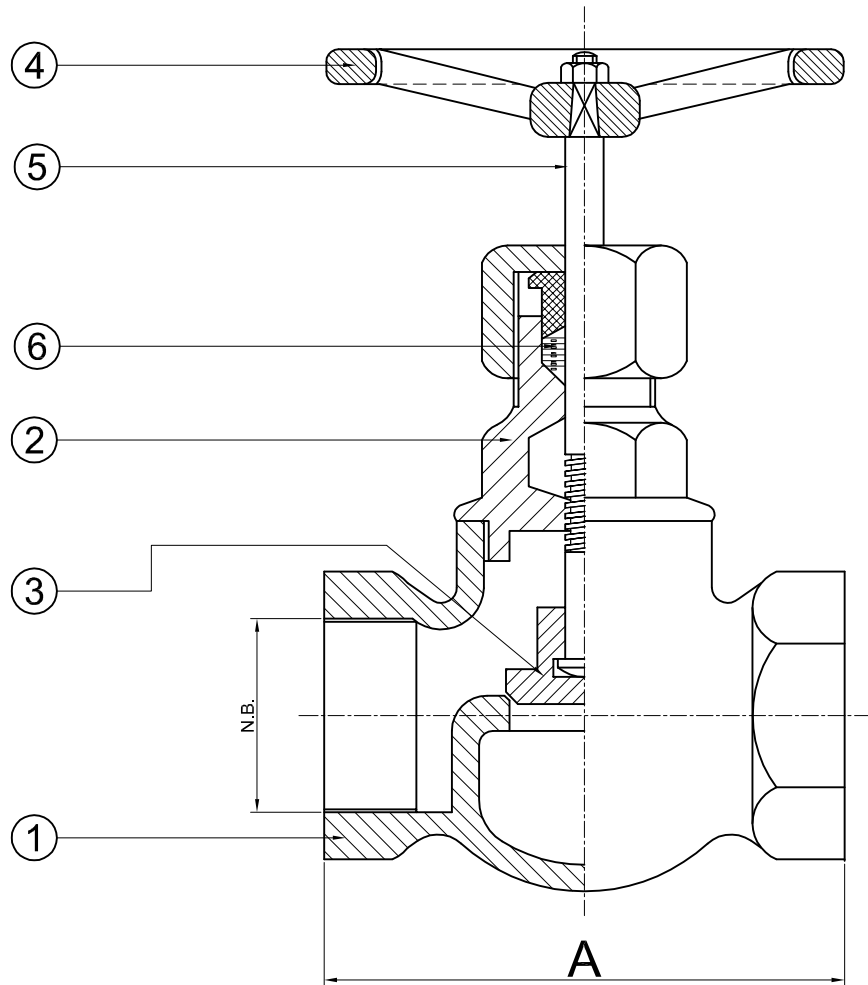
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A017	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/GV/PTP/18/313	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Globe Valve	
2	Valve Design	BS 5352 or equivalent of Required rating/class	
	<u>Material Specification</u>		
1	Service (R2)	Sea water / Sludge / FeCl ₃ and NaOCl dosing (Instrument Isolation Purpose)	
2	Body	ASTM A890-5A (CE3MN)	
3	Spindle/Stem	Duplex SS	
4	Seat Ring	ASTM A890-5A (CE3MN)	
5	Stem Packing	Graphite / PTFE	
6	Disc	ASTM A890-5A (CE3MN)	
7	Bonnet	ASTM A890-5A (CE3MN)	
8	Bonnet Gasket	GRAPHITE RING / PTFE RING	
9	Gland Packing	GRAPHITE RING / PTFE RING	
10	Gland flange	ASTM A890-5A (CE3MN)	
11	Yoke Bush	SS 316 /D2	
12	Hand wheel	Carbon Steel ASTM A216 Gr WCB	
13	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316L	
14	End Connection	Female Screwed ends NPT	
15	Size & Quantity (R2)	15NB - 18 Nos	KKS No. - 90GAA01AA530 / 90GAA01AA531 90GAA01AA533 / 90GAA01AA534 90GAA01AA536 / 90GAA01AA537 90GAA01AA637 / 90GAA01AA640 90GAA01AA641 / 90GAA01AA650 90GAA01AA593 / 90GAA01AA596 90GAA01AA629 / 90GAA01AA630 90GAA01AA621 / 90GAA01AA626 90GAA01AA635 / 90GAA01AA636
16	Operation Type	Manual	
17	Leakage Class	VI	
18	Range of Flow Control	0-100%	
19	Valve Rating	PN 10	
20	Test duration	Body: 15 sec	Seat: 15 sec
21	Design Pressure	22 kg/sq.cm	
22	Test Pressure:	PN 10	
23	Testing standard	API 598	
24	Face to Face Distance	ASME B 16.10	
25	Set Testing Pressure (PSIG)	Body: 15 Bar	Seat: 11 Bar
26	Painting	As per approved painting specification	
27	MAKE	Venus Pump & Engineering Works	

TECHNICAL DATA SHEET OF GLOBE VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A017	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/GV/PTP/18/313	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			
Sr No.	Description		
1	Valve Type	Globe Valve	
2	Valve Design (R2)	BS 5352 or equivalent of Required rating/class	
<u>Material Specification</u>			
1	Service (R2)	FeCl3 and NaOCl dosing	
2	Body	ASTM A890-5A (CE3MN)	
3	Spindle/Stem	Duplex SS	
4	Seat Ring	ASTM A890-5A (CE3MN)	
5	Stem Packing	Graphite / PTFE	
6	Plug Disc	ASTM A890-5A (CE3MN)	
7	Bonnet	ASTM A890-5A (CE3MN)	
8	Bonnet Gasket	GRAPHITE RING / PTFE RING	
9	Gland Packing	GRAPHITE RING / PTFE RING	
10	Gland flange	ASTM A890-5A (CE3MN)	
11	Yoke Bush	SS 316 /D2	
12	Hand wheel	Carbon Steel ASTM A216 Gr WCB	
13	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316L	
14	End Connection	Female Screwed ends NPT	
15	Size & Quantity (R2)	25NB - 4 Nos	KKS No. - 90GAA01AA589 / 90GAA01AA591 90GAA01AA619 / 90GAA01AA624
16	Operation Type	Manual	
17	Leakage Class	VI	
18	Range of Flow Control	0-100%	
19	Valve Rating	PN 10	
20	Test duration	Body: 15 sec	Seat: 15 sec
21	Design Pressure	22 kg/sq.cm	
22	Test Pressure:	PN 10	
23	Testing standard	API 598	
24	Face to Face Distance	ASME B 16.10	
25	Set Testing Pressure	Body: 15 Bar	Seat: 11 Bar
26	Painting	As per approved painting specification	
27	MAKE	Venus Pump & Engineering Works	

GLOBE VALVE

VALVE SIZE	FACE TO FACE	QTY.
N.B.	A±5	NOS.
15	57	18
25	82	04



NOTE :-

1. ALL DIMENSIONS ARE IN M.M. UNLESS OTHERWISE STATED.
2. STANDARD TOLERANCES APPLICABLE.
3. END CONNECTION : FEMALE SCREWED NPT.
4. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.

SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
6	GLAND PACKING	AS REQD	GRAPHITE / PTFE	
5	STEM	1	D.S.S.	-
4	HAND WHEEL		C.S.	ASTM A216 GR. WCB
3	DISC WITH INTEGRAL SEAT	1	D.S.S.	ASTM A890-5A(CE 3MN)
2	BONNET	1	D.S.S.	ASTM A890-5A(CE 3MN)
1	BODY WITH INTEGRAL SEAT	1	D.S.S.	ASTM A890-5A(CE 3MN)

BILL OF MATERIAL

DETAILS	VALVE	GLOBE		THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).
	TYPE	O.S. & Y		
	MFG. STD.	BS:5352		
	RATING	--		
	PARENT MATLS.	D.S.S.		
	TRIM MATLS.	D.S.S.		
SERVICE	SEA WATER/SLUDGE		ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
HYDROSTATIC TEST PRESSURE	HYDROSTATIC TEST PRESSURE IN BAR			
	BODY	SEAT		
	15 (15 SEC)	11 (15 SEC)		

TITLE	PROJECTION	TITLE		
		D.S.S. SCREWED END NON-RISING SPINDLE GLOBE VALVE		

MAIN REF.			VENUS PUMP & ENGINEERING WORKS		
			BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL		
	REV	DATE	DRN.	A.GHOSH	DRG. NO.
	01	24.05.19	CHD.	C.HAZRA	VP-RK-FSGLV-19-5674
	02	00			SCALE
	03	00	APP.	R. AGARWAL	N.T.S.
				REV:01	DATE:02.02.2019

TECHNICAL DATA SHEET OF GLOBE VALVES

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A017	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/GV/PTP/18/313	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Globe Valve	
2	Valve Design	API 602 or equivalent of Required rating/class	
	<u>Material Specification</u>		
1	Service (R2)	Lime and PE dosing / Air (Instrument Isolation Purpose)	
2	Body	FSS ASTM A 182 Gr F316	
3	Spindle/Stem	SS AISI:316	
4	Seat Ring	SS AISI:316	
5	Stem Packing	Graphite / PTFE	
6	Plug Disc	SS AISI:316	
7	Bonnet	FSS ASTM A 182 Gr F316	
8	Bonnet Gasket	GRAPHITE RING / PTFE RING	
9	Gland Packing	GRAPHITE RING / PTFE RING	
10	Gland flange	ASTM A105/ SS 316	
11	Yoke Bush	FSS ASTM A 182 Gr F316/D2	
12	Hand wheel	Carbon Steel ASTM A216 Gr WCB	
13	Stud, Stud Nut, Eye Bolt Nut / Fasteners	SS 316	
14	End Connection	Female Screwed ends NPT	
15	Size & Quantity (R2)	15NB - 10 Nos	KKS No. - 90GAA01AA605 / 90GAA01AA608 90GAA01AA631 / 90GAA01AA632 90GAA01AA613 / 90GAA01AA616 90GAA01AA633 / 90GAA01AA634 90GAA01AA539 / 90GAA01AA542
16	Operation Type	Manual	
17	Leakage Class	VI	
18	Range of Flow Control	0-100%	
19	Valve Rating	PN 10	
20	Test duration	Body: 15 sec	Seat: 15 sec
21	Design Pressure	22 kg/sq.cm	
22	Test Pressure:	PN 10	
23	Testing standard	API 598	
24	Face to Face Distance	ASME B 16.10	
25	Set Testing Pressure (PSIG)	Body: 15 Bar	Seat: 11 Bar
26	Painting	As per approved painting specification	
27	MAKE	Venus Pump & Engineering Works	

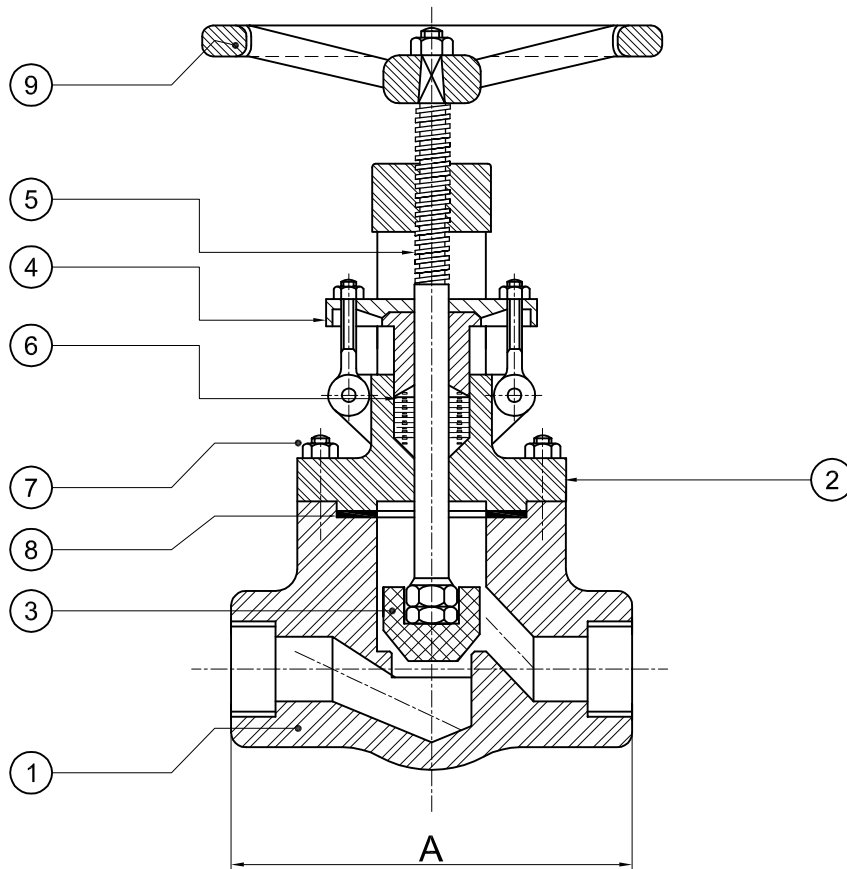
CLIENT	BHARAT HEAVY ELECTRICALS LTD.		BHEL DOC NO.: PE-V0-412-158-A017	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP		OTOKLIN DOC NO:- OGBL/OC-983/TDS/GV/PTP/18/313	
			MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED				
Sr No.	Description			
1	Valve Type		Globe Valve	
2	Valve Design		API 602 or equivalent of Required rating/class	
	<u>Material Specification</u>			
1	Service (R2)		Service water from overhead tank to chemical dosing / Overhead clarified water	
2	Body		FSS ASTM A 182 Gr F316	
3	Spindle/Stem		SS 316	
4	Seat Ring		SS 316	
5	Stem Packing		Graphite / PTFE	
6	Plug Disc		SS 316	
7	Bonnet		FSS ASTM A 182 Gr F316	
8	Bonnet Gasket		GRAPHITE RING / PTFE RING	
9	Gland Packing		GRAPHITE RING / PTFE RING	
10	Gland flange		ASTM A105/ SS 316	
11	Yoke Bush		FSS ASTM A 182 Gr F316/ D2	
12	Hand wheel		Carbon Steel ASTM A216 Gr WCB	
13	Stud, Stud Nut, Eye Bolt Nut / Fasteners		ASTM A193 B7 & ASTM A194-2H	
14	End Connection		Female Screwed ends NPT	
15	Size & Quantity (R2)		25NB - 13 Nos	KKS No. -90GAA01AA544 /90GAA01AA547 90GAA01AA550 / 90GAA01AA599 90GAA01AA601 / 90GAA01AA553 90GAA01AA556 / 90GAA01AA565 90GAA01AA572 / 90GAA01AA609 90GAA01AA611 / 90GAA01AA559 90GAA01AA562
16	Operation Type		Manual	
17	Leakage Class		VI	
18	Range of Flow Control		0-100%	
19	Valve Rating		PN 10	
20	Test duration		Body: 15 sec	Seat: 15 sec
21	Design Pressure		22 kg/sq.cm	
22	Test Pressure:		PN 10	
23	Testing standard		API 598	
24	Face to Face Distance		ASME B 16.10	
25	Set Testing Pressure		Body: 15 Bar	Seat: 11 Bar
26	Painting		As per approved painting specification	
27	MAKE		Venus Pump & Engineering Works	

GLOBE VALVE

VALVE SIZE	FACE TO FACE	QTY.	SERVICE
N.B.	A±5	NOS.	--
15	82	02	AIR
15	82	08	CHEMICAL DOSING
25	102	13	WATER TO CHEMICAL DOSING OVERHEAD CLARIFIED WATER

NOTE :-

1. ALL DIMENSIONS ARE IN M.M. UNLESS OTHERWISE STATED.
2. STANDARD TOLERANCES APPLICABLE.
3. END CONNECTION : FEMALE SCREWED NPT.
4. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.



SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
9	HAND WHEEL	1	C.S.	ASTM A216 GR. WCB
8	GASKET	TO SUIT		GRAPHITE / PTFE
7	BOLTS & NUTS	AS RECD	S.S.	AISI : 316
6	GLAND PACKING	AS RECD		GRAPHITE / PTFE
5	STEM	1	S.S.	AISI : 316
4	GLAND FLANGE	1	S.S.	AISI:316
3	PLUG DISC WITH INTEGRAL SEAT	1	S.S.	AISI : 316
2	BONNET	1	F.S.S.	ASTM A 182 GR F316
1	BODY WITH INTEGRAL SEAT	1	F.S.S.	ASTM A 182 GR F316

BILL OF MATERIAL

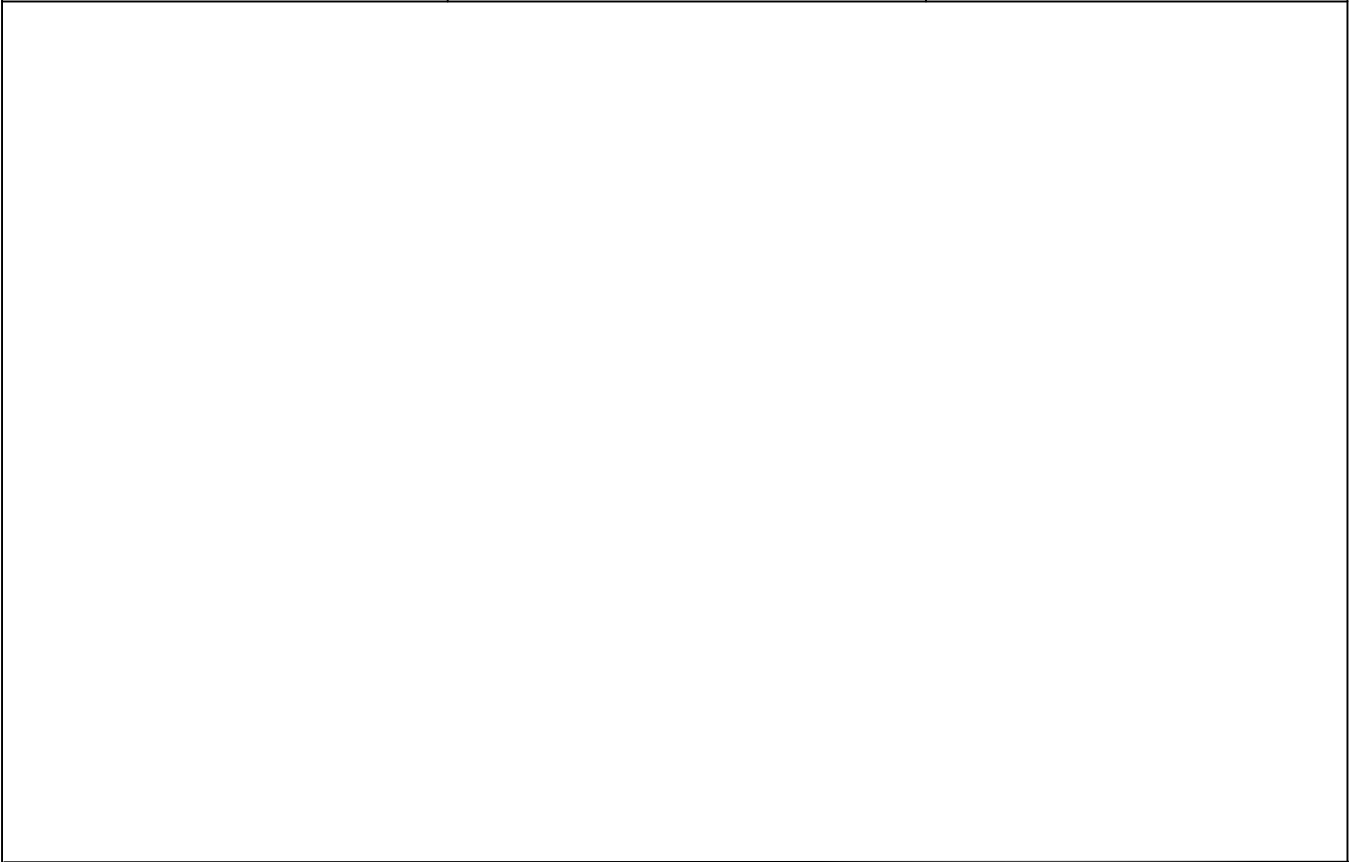
DETAILS	VALVE	GLOBE	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).	
	TYPE	O.S. & Y		
	MFG. STD.	API : 602		
	RATING	CLASS - 800#		
	PARENT MATLS.	F.S.S.	ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
	TRIM MATLS.	S.S.		
SERVICE	SEE ABOVE TABLE			
HYDROSTATIC TEST PRESSURE	HYDROSTATIC TEST PRESSURE IN BAR.			
	BODY	SEAT		
	15 (15 SEC)	11 (15 SEC)		

TITLE	PROJECTION	TITLE
		F.S.S. SCREWED END RISING SPINDLE GLOBE VALVE





MAIN REF.			VENUS PUMP & ENGINEERING WORKS		
			BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL		
	REV	DATE	DRN.	A.GHOSH	DRG. NO.
	01	00	CHD.	C.HAZRA	VP-RK-FSGLV-19-5673
		APP.	R. AGARWAL	SCALE	
				N.T.S.	
			REV:01	DATE:02.02.2019	

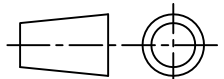
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

TECHNICAL DATASHEET FOR NON RETURN VALVES & ISOLATION GATE OF PRE TREATMENT PLANT		NAME	SIGN	DATE
	PREP	ALOYSIUS	AF	24-05-19
	CHKD	MUAZZAM I	MI	24-05-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	24-05-19

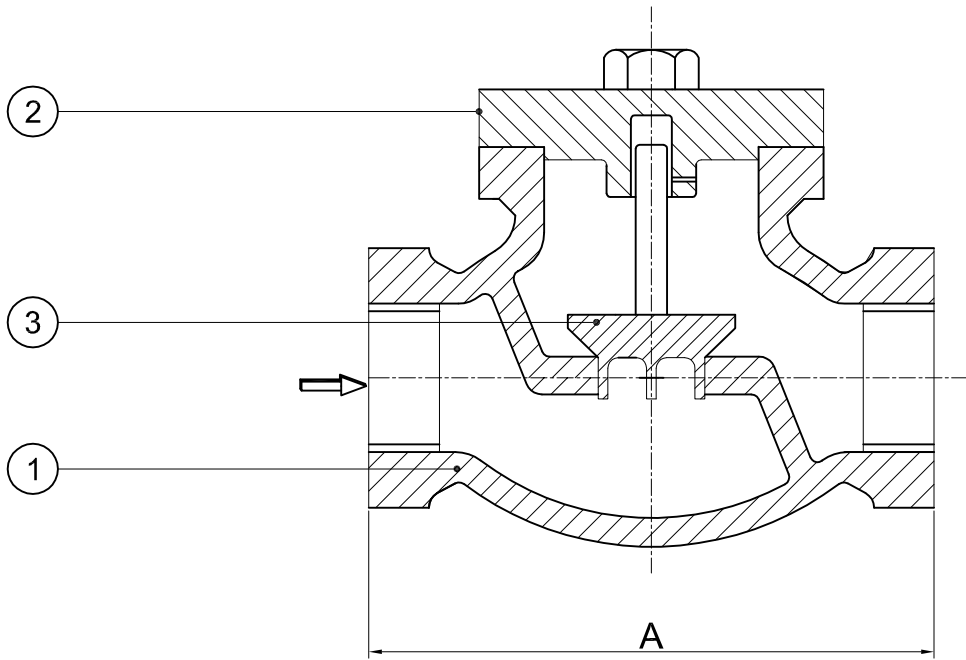
DEPT.					CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A018	REV 02
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/NRV/PTP/18/314	
DATE						NO. OF SHEETS 9 EXCLUDING COVER PAGE	

TECHNICAL DATA SHEET OF NON RETURN VALVE

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A018	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/NRV/PTP/18/314	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Non Return valve	
2	Valve Design (R2)	BS:5352	
	<u>Material Specification</u>		
1	SERVICE (APPLICATION)	Chemical Dosing System	
2	Type	Piston type	
3	Body (R2)	Cast duplex stainless steel	
4	Piston (R2)	Cast duplex stainless steel	
5	Bolts & Nuts / Fasteners (R2)	SS 316 L	
6	End Connection	Screwed End	
7	Size & Quantity (R2)	KKS No. - 90GAA01AA622 90GAA01AA627	25NB - 2 Nos Location- NaOCl Dosing Pump
		KKS No. - 90GAA01AA594 90GAA01AA597	40NB - 2 Nos Location- FeCl3 Dosing Pump
8	Leakage Class	VI	
9	Range of Flow Control	0-100%	
10	Valve Rating	PN 10	
11	Test duration	Body: 1 min	Seat: 1 min
12	Design Pressure	11 Bar	
13	Test Pressure:	PN 10	
14	Testing standard	BS 6755	
15	Face to Face Distance	ASME B 16.10	
16	Set Testing Pressure	Body: 15 bar	Seat: 11 bar
17	Painting	As per approved painting specification	
18	MAKE	Venus Pump & Engineering Works	

D.S.S CHECK VALVE

VALVE SIZE	FACE TO FACE	QTY.
N.B.	A±5	NOS.
25	82	02
40	102	02



NOTE :-

1. ALL DIMENSIONS ARE IN M.M.
2. STANDARD TOLERANCES APPLICABLE.
3. END CONNECTION : BSP SCREWED END.
4. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.

SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
3	DISC	1	S.S	ASTM A890 GR.5A-CE3MN
2	COVER	1	S.S	ASTM A890 GR.5A-CE3MN
1	BODY	1	S.S	ASTM A890 GR.5A-CE3MN

BILL OF MATERIAL

DETAILS	VALVE	CHECK	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S). ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
	TYPE	LIFT		
	MFG. STD.	BS : 5352		
	RATING	PN - 10		
	PARENT MATLS.	S.S		
TRIM MATLS.	S.S.	HYDROSTATIC TEST PRESSURE IN BAR.		
SERVICE	AIR	TESTING PARAMETER	BODY	SEAT
			15 (1 MIN.)	11 (1 MIN.)

TITLE	PROJECTION	TITLE
		DSS LIFT TYPE CHECK VALVE, SCREWED END.

MAIN REF.			VENUS PUMP & ENGINEERING WORKS		
			BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL		
	REV	DATE	DRN.	A.GHOSH	DRG. NO.
	01	00	CHD.	C. HAZRA	VP-RK-CV-19-5751
02	00	APP.	R. AGARWAL	SCALE	
03	00			N.T.S.	
				REV : 00	DATE :24.05.2019

TECHNICAL DATA SHEET OF NON RETURN VALVE

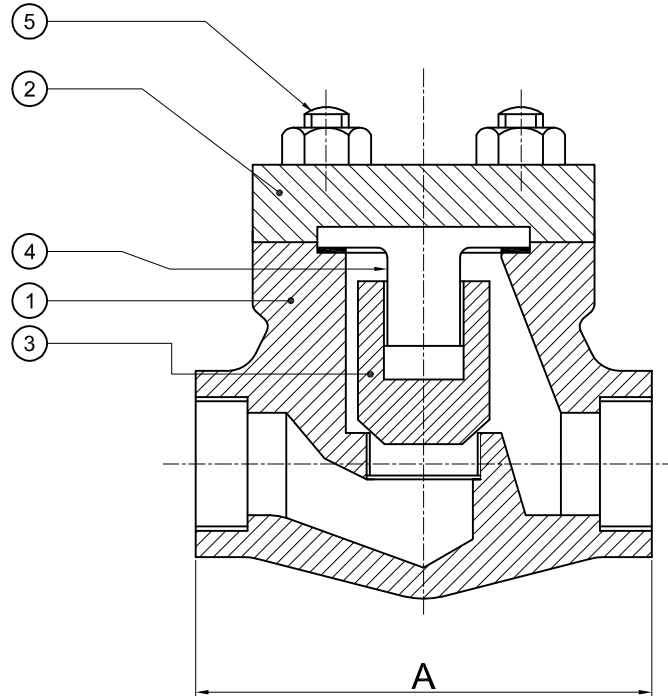
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A018	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/NRV/PTP/18/314	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Non Return valve	
2	Valve Design	API 602 or equivalent of Required rating/class	
	<u>Material Specification</u>		
1	SERVICE (APPLICATION)	Chemical Dosing System	
2	Type	Piston type	
3	Body	SS 316	
4	Piston	SS 316	
5	Bolts & Nuts / Fasteners	SS 316	
6	End Connection	Screwed End	
7	Size & Quantity (R2)	KKS No. - 90GAA01AA614 90GAA01AA617	25NB - 2 Nos Location- PE Dosing Pump
		KKS No. - 90GAA01AA603 90GAA01AA606	40NB - 2 Nos Location- Lime Dosing Pump
8	Leakage Class	VI	
9	Range of Flow Control	0-100%	
10	Valve Rating	PN 10	
11	Test duration	Body: 1 min	Seat: 1 min
12	Design Pressure	11 Bar	
13	Test Pressure:	PN 10	
14	Testing standard	BS 6755	
15	Face to Face Distance	ASME B 16.10	
16	Set Testing Pressure	Body: 15 bar	Seat: 11 bar
17	Painting	As per approved painting specification	
18	MAKE	Venus Pump & Engineering Works	

LIFT TYPE CHECK VALVE

VALVE SIZE	FACE TO FACE	REQD QNTY
N.B.	A±5	NOS.
25	108	02
40	125	02

NOTE :-

1. ALL DIMENSIONS ARE IN M.M. UNLESS OTHERWISE STATED.
2. STANDARD TOLERANCES APPLICABLE.
3. END CONNECTION -: SCREWED END.
4. Seervice:Lime/polyelectrolyte dosing



SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
5	STUDS & NUTS	As Reqd.	S.S.	AISI:316
4	PISTON GUIDE	1	S.S.	AISI:316
3	DISC	1	S.S.	AISI:316
2	COVER	1	S.S.	ASTM A182 GR F316
1	BODY	1	S.S.	ASTM A182 GR F316

BILL OF MATERIAL

DETAILS	VALVE	CHECK	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).	
	TYPE	LIFT		
	MFG. STD.	API:602		
	RATING	PN-10		
	PARENT MATLS.	S.S.	ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
	TRIM MATLS.	S.S.		
SERVICE	CHEMICAL DOSING			
HYDROSTATIC TEST PRESSURE	HYDRO STATIC TEST PRESSURE IN BAR			
	BODY	SEAT	-	
	15 (1 MIN.)	11 (1 MIN.)		

TITLE	PROJECTION	TITLE
		S.S. LIFT TYPE PISTON CHECK VALVE SCREWED END

MAIN REF.			VENUS PUMP & ENGINEERING WORKS		
	BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL				
	REV	DATE	DRN.	A.GHOSH	DRG. NO.
	1	00	CHD.	C.HAZRA	VP-RK-FSCV(LT)-19-5667
2	00	APP.	R. AGARWAL	REV:00	DATE:01.02.2019
3	00				SCALE
					N.T.S.

TECHNICAL DATA SHEET OF NON RETURN VALVE

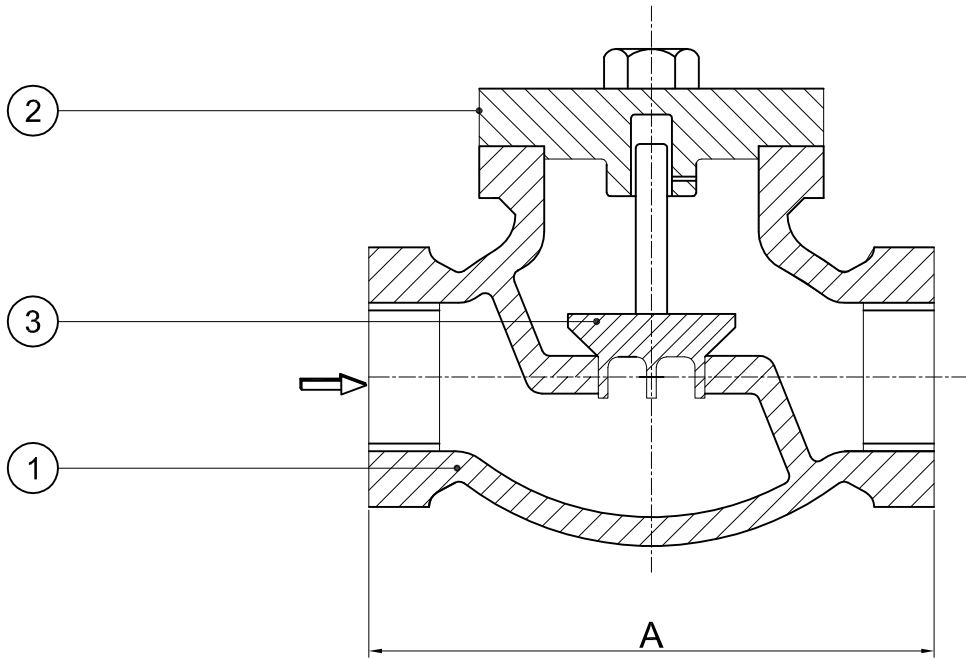
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A018	REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/NRV/PTP/18/314	
		MADE BY AF	CHKD BY MI
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA	
Sr No.	Description		
1	Valve Type	Non Return valve	
2	Valve Design	BS 5352 or equivalent of Required rating/class	
	<u>Material Specification</u>		
1	SERVICE (APPLICATION)	Air	
2	Type	Lift type	
3	Body	SS 316	
4	Disc	SS 316	
5	Hinged pin	SS 316	
6	Bolts & Nuts / Fasteners	SS 316	
7	End Connection	Screwed End	
8	Size & Quantity	KKS No. - 90GAA01AA538 90GAA01AA541	80NB - 2 Nos. Location-Air Blower
9	Leakage Class	VI	
10	Range of Flow Control	0-100%	
11	Valve Rating	PN 10	
12	Test duration	Body: 1 min	Seat: 1 min
13	Design Pressure	11 Bar	
14	Test Pressure:	PN 10	
15	Testing standard	BS 6755	
16	Face to Face Distance	ASME B 16.10	
17	Set Testing Pressure	Body: 15 bar	Seat: 11 bar
18	Painting	As per approved painting specification	
19	MAKE	Venus Pump and Engineering works	

S.S CHECK VALVE

VALVE SIZE	FACE TO FACE	QTY.
N.B.	A±5	NOS.
80	127	02

NOTE :-

1. ALL DIMENSIONS ARE IN M.M.
2. STANDARD TOLERANCES APPLICABLE.
3. END CONNECTION : BSP SCREWED END.
4. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.



SL.NO	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION
3	DISC	1	S.S	ASTM A351 CF8M
2	COVER	1	S.S	ASTM A351 CF8M
1	BODY	1	S.S	ASTM A351 CF8M

BILL OF MATERIAL

VALVE	CHECK	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).		
TYPE	LIFT	ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.		
MFG. STD.	BS : 5352			
RATING	PN - 10			
PARENT MATLS.	S.S			
TRIM MATLS.	S.S.			
SERVICE	AIR			
HYDROSTATIC TEST PRESSURE IN BAR.				
TESTING PARAMETER	BODY	SEAT		
	15 (1 MIN.)	11 (1 MIN.)		

PROJECTION	TITLE
	STAINLESS STEEL LIFT TYPE CHECK VALVE, SCREWED END.

VENUS		VENUS PUMP & ENGINEERING WORKS			
BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL					
REV	DATE	DRN.	A.GHOSH	DRG. NO.	SCALE
01	00	CHD.	C. HAZRA	VP-RK-CV-19-5675	N.T.S.
02	00	APP.	R. AGARWAL	REV : 00	DATE : 02.02.2019
03	00				

TECHNICAL DATA SHEET OF NON RETURN VALVE

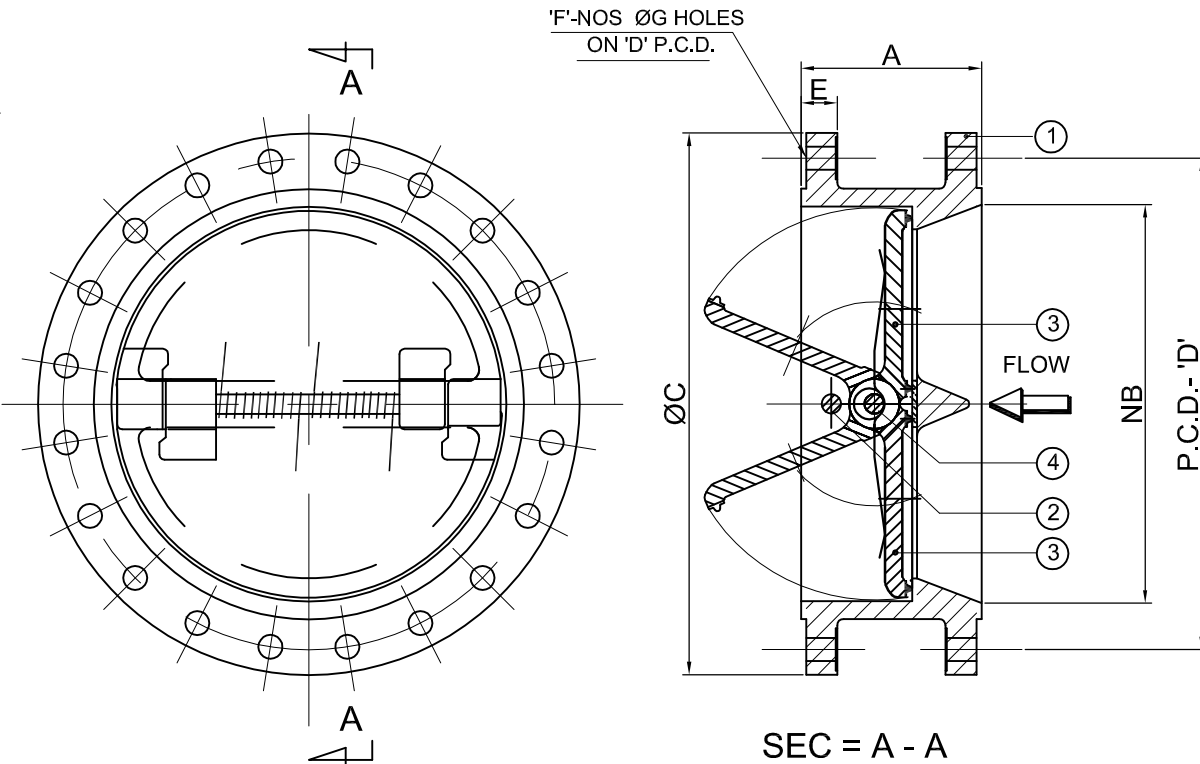
CLIENT	BHARAT HEAVY ELECTRICALS LTD.		BHEL DOC NO.: PE-V0-412-158-A018		REV NO:- 02
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP		OTOKLIN DOC NO:- OGBL/OC-983/TDS/NRV/PTP/18/314		
			MADE BY AF	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED					
Sr No.	Description				
1	Valve Type		Non Return valve		
2	Valve Design		BS 1868 or equivalent of Required rating/class		
3	Flange Standard		ENDS FLANGED TO ASME B 16.5 RF		
<u>Material Specification</u>					
1	SERVICE (APPLICATION)		Sea Water Sludge		
2	Type		Double Flanged Dual Plate Check Valve		
3	Body		Super duplex stainless steel, ASTM A890-5A (CE3MN)		
4	Disc/door		Super duplex stainless steel, ASTM A890-5A (CE3MN)		
5	Hinged pin		Duplex Stainless Steel		
6	Bolts & Nuts / Fasteners		SS 316L		
7	End Connection		ENDS FLANGED TO ASME B 16.5 RF		
8	Size & Quantity	KKS No. - 90GAA01AA529 90GAA01AA532 90GAA01AA535	400NB - 3 Nos.	Location-Sludge Transfer Pump	
9	Leakage Class		IV		
10	Range of Flow Control		0-100%		
11	Valve Rating		PN 10		
12	Test duration		Body: 5 min	Seat: 2 min	
13	Design Pressure		11 Bar		
14	Test Pressure:		PN 10		
15	Testing standard		API 598		
16	Face to Face Distance		ASME B 16.10		
17	Set Testing Pressure		Body: 15 bar	Seat: 11 bar	
18	Painting		As per approved painting specification		
19	MAKE		Venus Pump and Engineering works		

DUAL DISC CHECK VALVE

VALVE SIZE	FACE TO FACE	FLANGE DETAILS					QTY.
		O.D.	P.C.D.	THICK.	HOLE NO.	HOLE DIA.	
N.B.	A±3	C	D	E	F	G	NOS.
400	191	596.9	539.8	36.5	16	28.6	03

NOTES

1. ALL DIMENSION ARE IN 'MM', UNLESS OTHER WISE SPECIFIED
2. STANDARD TOLLERENCE ARE APPLICABLE.
- 3) FLANGE END DRILLING AS PER ANSI B 16.5 R/F.
- 4.. WE RESERVE OUR RIGHTS FOR MINOR DESIGN CHANGES.



SL.NO	DESCRIPTION	MATERIAL	SPECIFICATION
4	HINGE PIN	D.S.S.	ASTM A276
3	DISC WITH RUBBER MOULDED SEAT	D.S.S.	ASTM A890 GR. 5A-CE3MN
2	STOPPER ROD	D.S.S.	ASTM A276
1	BODY	D.S.S.	ASTM A890 GR. 5A-CE3MN

BILL OF MATERIAL

VALVE	DUAL DISC CHECK	THIS DRAWING AND ITS ENCLOSURE(S) UNDER CITED DRG NO. ARE THE SOLE PROPERTY OF VENUS PUMP & ENGINEERING WORKS. ANY ABUSE OF IT WILL BE LEGALLY DEALT WITH AT THE RISK/COST OF THE ABUSER(S).	
TYPE	FLANGED	ALL DIMENSIONS IN MM. UNLESS OTHERWISE SPECIFIED. TOLERANCES ON MACHINED DIMENSIONS ± 2 mm UNLESS OTHERWISE SPECIFIED. SCALING OF DRAWING FOR DIMENSIONS SHOULD BE AVOIDED IN ALL CASES.	
MFG. STD.	API : 594		
RATING	CLASS-150#		
PARENT MATLS.	D.S.S.		
TRIM MATLS.	D.S.S.		
SERVICE	SEA WATER SLUDGE		
HYDROSTATIC TEST PRESSURE IN BAR			
TESTING PARAMETER	BODY	SEAT	
			15 (5 MIN.) 11 (2 MIN.)

PROJECTION	TITLE
	D.S.S. DOUBLE FLANGED DUAL DISC SPRING LOADED CHECK VALVE

VENUS PUMP & ENGINEERING WORKS		BALITIKURI, SHIBTOLLA, HOWRAH - 711 113. WEST BENGAL					
REV	DATE	DRN.	A.GHOSH	DRG. NO.	VP-RK-DDCV-19-5668	SCALE	N.T.S.
01	00	CHD.	C.HAZRA	REV:00	DATE:01.02.2019		
02	00	APP.	R. AGARWAL				
03	00						

TECHNICAL DATA SHEET OF ISOLATION GATE





CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A018	REV NO:- 02	
PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/TDS/NRV/PTP/18/314		
		MADE BY AF	CHKD BY MI	
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		APPD BY AA		
A	Technical description			
1	Quantity (Nos.)	8 nos.		
2	Design standard	IS: 3042 or Equivalent.		
3	Spindle Type	Rising		
4	Operation	Headstock with Geared Handle		
5	Gear Box Arrangement	Open/Closed type		
6	Type of Closure	Flush Bottom		
B	Mechanical Construction			
1	Standard	Manufacturer Standard		
2	Design	Designed for seating and unseating water head pressure		
3	Mounting	Face Wall mounted		
4	Differential pressure	1 kg/sq.cm minimum		
5	Suction pressure	1 kg/sq.cm max		
6	Ambient temperature	45° c max		
7	Range of operation	10 - 100%		
C	List of Isolation Gate			
	Size	Tag No.	Quantity	Location
1	800 X 800	90GAA01AA523 / 90GAAA01AA524	2	Outlet channel from clarifier
2	800 X 800	90GAA01AA526 / 90GAAA01AA527	2	Inlet channel to clarified water storage tank
3	300 X 300	90GAA01AA643 / 90GAAA01AA644 90GAA01AA645 / 90GAAA01AA646	4	Sludge Sump Area
D	Material of Construction			
1	Head Stock, Wedge	C.I IS 210 FG 200		
2	Shutter , Gate Frame	MS+FRP lining		
3	Stem	MS+FRP lining		
4	Seat Facing / Sealing Face	Brass / SS Duplex		
5	Bottom Rubber seal	EPDM / Natureal		
6	Stem Guide Bracket	C.I IS 210 FG 200 / MS+FRP lining		
7	Fasteners and Studs	SS Duplex		
8	Anchor Bolts	SS Duplex		
9	Painting	As per painting specification		
10	MAKE	As per approved make		

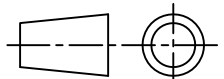
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412




2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

QAP FOR VALVES AND ISOLATION GATE OF PRE TREATMENT PLANT		NAME	SIGN	DATE
	PREP	ALOYSIUS	AF	12-07-19
	CHKD	MUAZZAM I	MI	12-07-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	12-07-19

DEPT.						CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A020	REV 01
SIGN		N.A.					OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/QAP/V/PTP/18/351	
DATE							NO. OF SHEETS 2 EXCLUDING COVER PAGE	

S.NO		COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
										D	M	C	N	
1	2	3	4	5	6	7	8	9	D	10			11	
[1] RAW MATERIAL														
1.1	Gate frame, Gate Plate, stiffeners	Mechanical / Chemical	MAJOR	Chemical & Mechanical	1 Sample/ Lot	Approved Drawing /Data sheet	Approved Drawing /Data sheet	TC	✓	P	R	R		
1.2	Spindle	Mechanical / Chemical	MAJOR	Chemical	1 Sample/ Lot	Approved Drawing /Data sheet	Approved Drawing /Data sheet	TC	✓	P	R	R		
1.3	Operating Nut	Mechanical / Chemical	MAJOR	Chemical & Mechanical	1 Sample/ Lot	As per Approved Drg./Data sheet	GM. LTB-2.	T.C.	✓	P	R	R		
1.4	Seating faces	Mechanical / Chemical	MAJOR	Mechanical / Chemical	1 Sample/ Lot	Approved Drawing	Approved Drawing /Data sheet	T.C.	✓	P	R	R		
[2] INPROCESS INSPECTION														
2.1	Machining of MS Spindle, Nut, & Fitting of Stem , Seating faces.	Acceptance	MAJOR	VISUAL	Minor	Approved Drawing	Approved Drawing /Data sheet	Works Internal Inspection report	✓	P	R	R		
[3] FINAL INSPECTION														
3.1	Dimensional verification	Overall dimensions	MAJOR	VISUAL	100%	Approved Drawing	Approved Drawing /Data sheet	Inspection report	✓	P,W	R	R		
3.2	Movement	Full open and Close movement of shutter mounting assy. In horizontal position.	MAJOR	VISUAL	1Sample/lot	Approved Drawing	Approved Drawing /Data sheet	Inspection report	✓	P,W	R	R		
 MANUFACTURER / SUBCONTRACTOR		CONTRACTOR		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (ü) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER P - Performing the Test C: SUPPLIER/NOMINATED INSPECTION AGENCY W - Witnessing the Test N: THE OWNER R - Review the Test										
				SIGNATURE										

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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.



TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)



CONSULTANT: DESEIN PVT LTD, NEW DELHI.



BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NEW DELHI



OTOKLIN GLOBAL BUSINESS LTD.
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -		
VALVE SCHEDULE OF PRE TREATMENT PLANT					NAME	SIGN	DATE	
					PREP	ALOYSIUS	AF	02-10-18
					CHKD	MUAZZAM I	MI	02-10-18
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018					APPD	ASLAM A	AA	02-10-18

DEPT.						CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A021	REV 01
SIGN		N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/VS/PTP/18/316	
DATE							NO. OF SHEETS <input type="text" value="4"/> EXCLUDING COVER PAGE	

VALVE SCHEDULE

CLIENT: BHARAT HEAVY ELECTRICALS LIMITED

PROJECT: 2 X 660 MW ENNORE SEZ STPP

PACKAGE: PRE TREATMENT PLANT

BHEL DOC NO-PE-V0-412-158-A021

REV NO

1

OTOKLIN DOC NO- OGBL/OC-983/VS/PTP/18/316

REF P&ID DRAWING NO

PE-V0-412-158-A001

SL NO	SERVICE DESCRIPTION/LOCATION	Valve Tag No.	SIZE IN MM/NB	QTY IN NOS	TYPE	OPERATION	BODY MATERIAL	VALVE CLASS/RATING	END CONNECTION	MAKE	REMARKS
1	Air Blower	90GAA01AA540	80	1	BALL	MANUAL	SS	BS 5351 PN10	SCREWED		
2	Air Blower	90GAA01AA543	80	1	BALL	MANUAL	SS	BS 5351 PN10	SCREWED		
3	Lime Dosing Tank	90GAA01AA576	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
4	Lime Dosing Tank	90GAA01AA577	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
5	Lime Dosing Tank	90GAA01AA584	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
6	Lime Dosing Tank	90GAA01AA585	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
7	Lime Dosing Pump	90GAA01AA600	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
8	Lime Dosing Pump	90GAA01AA602	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
9	Lime Dosing Pump	90GAA01AA604	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
10	Lime Dosing Pump	90GAA01AA607	40	1	BALL	MANUAL	SS	BS 5352 PN10	FLANGED		
11	Air Blower	90GAA01AA647	80	1	BALL	MANUAL	SS	BS 5351 PN10	SCREWED		To Sludge Tank
12	Air Blower	90GAA01AA648	80	1	BALL	MANUAL	SS	BS 5351 PN10	SCREWED		To Sludge Tank
13	Air Blower	90GAA01AA649	80	1	BALL	MANUAL	SS	BS 5351 PN10	SCREWED		To Sludge Tank
14	Sea water inlet	90GBD01AA502	800	1	BUTTERFLY	MANUAL	DUPLEX SS	BS:5155 PN 10	FLANGED		
15	Sea water inlet	90GBD01AA503	800	1	BUTTERFLY	MANUAL	DUPLEX SS	BS:5155 PN 10	FLANGED		
16	Sea water inlet	90GBD01AA504	800	1	BUTTERFLY	MANUAL	DUPLEX SS	BS:5155 PN 10	FLANGED		
17	Sea water inlet	90GBD01AA505	800	1	BUTTERFLY	MANUAL	DUPLEX SS	BS:5155 PN 10	FLANGED		
18	Sea water inlet	90GBD01AA509	800	1	BUTTERFLY	MANUAL	DUPLEX SS	BS:5155 PN 10	FLANGED		
19	Sludge Transfer Pump	90GAA01AA651	400	1	BUTTERFLY	MANUAL	DUPLEX SS	BS:5155 PN 10	FLANGED		To Guard Pond
20	Sludge Transfer Pump	90GAA01AA652	400	1	BUTTERFLY	MANUAL	DUPLEX SS	BS:5155 PN 10	FLANGED		Recirculation
21	Sea water inlet	90GBD01AA001	800	1	BUTTERFLY	MOTORIZED	DUPLEX SS	BS:5155 PN 10	FLANGED		
22	Sea water inlet	90GBD01AA002	800	1	BUTTERFLY	MOTORIZED	DUPLEX SS	BS:5155 PN 10	FLANGED		
23	Sludge Transfer Pump	90GBS41AA001	400	1	BUTTERFLY	MOTORIZED	DUPLEX SS	BS:5155 PN 10	FLANGED		
24	Sludge Transfer Pump	90GBS42AA001	400	1	BUTTERFLY	MOTORIZED	DUPLEX SS	BS:5155 PN 10	FLANGED		
25	Sludge Transfer Pump	90GBS43AA001	400	1	BUTTERFLY	MOTORIZED	DUPLEX SS	BS:5155 PN 10	FLANGED		
26	FeCl3 Dosing Tank	90GAA01AA545	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
27	FeCl3 Dosing Tank	90GAA01AA546	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
28	FeCl3 Dosing Tank	90GAA01AA548	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
29	FeCl3 Dosing Tank	90GAA01AA549	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
30	FeCl3 Dosing Tank	90GAA01AA551	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
31	FeCl3 Dosing Tank	90GAA01AA552	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
32	Lime Dosing Tank	90GAA01AA554	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
33	Lime Dosing Tank	90GAA01AA555	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
34	Lime Dosing Tank	90GAA01AA557	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
35	Lime Dosing Tank	90GAA01AA558	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
36	PE Dosing Tank	90GAA01AA560	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
37	PE Dosing Tank	90GAA01AA561	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
38	PE Dosing Tank	90GAA01AA563	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
39	PE Dosing Tank	90GAA01AA564	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
40	NaOCl Dosing Tank	90GAA01AA566	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
41	NaOCl Dosing Tank	90GAA01AA567	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT

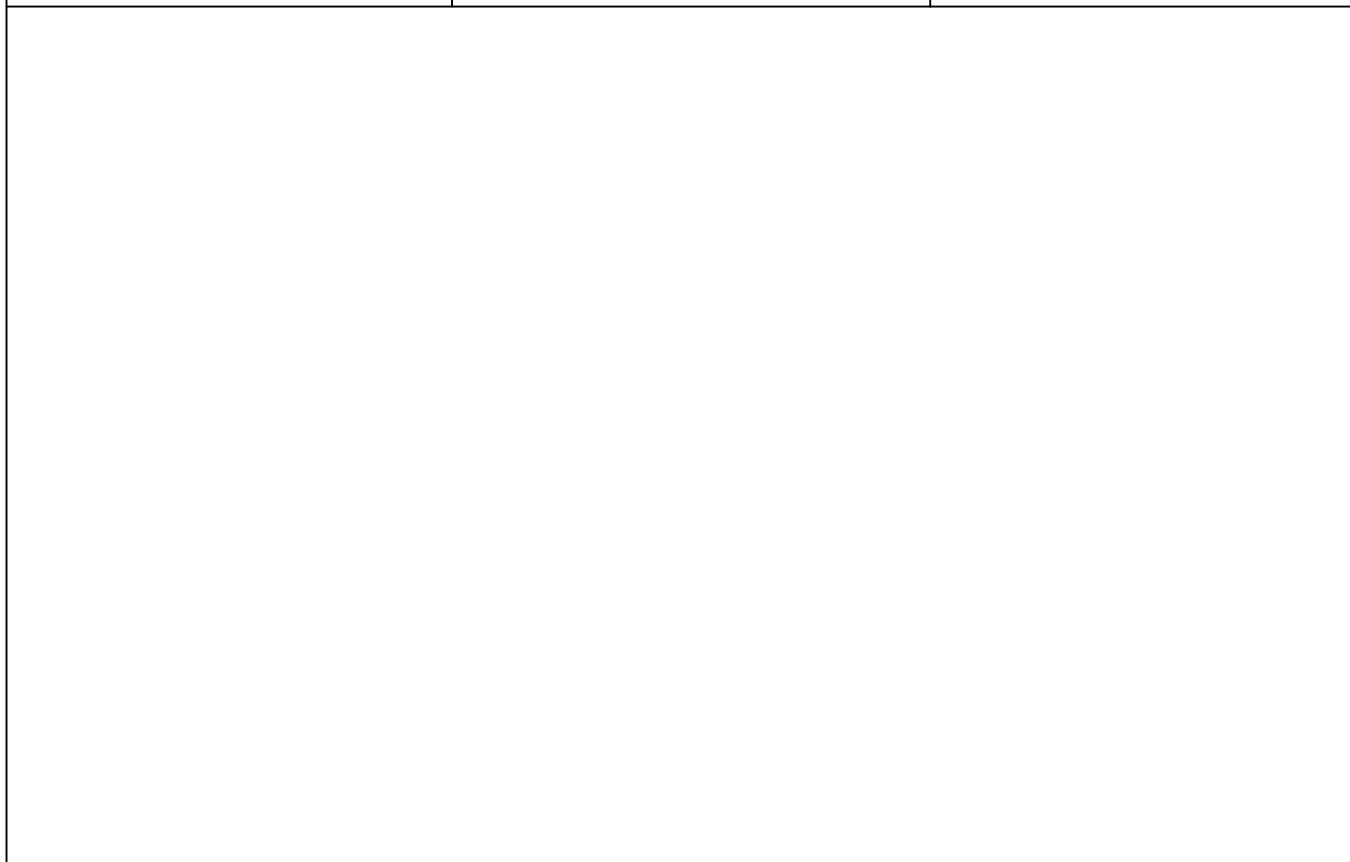
SL NO	SERVICE DESCRIPTION/LOCATION	Valve Tag No.	SIZE IN MM/NB	QTY IN NOS	TYPE	OPERATION	BODY MATERIAL	VALVE CLASS/RATING	END CONNECTION	MAKE	REMARKS
42	NaOCl Dosing Tank	90GAA01AA568	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
43	Overhead Clarified Water Storage Tank above chemical house	90GAA01AA569	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
44	Overhead Clarified Water Storage Tank above chemical house	90GAA01AA570	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		INSTRUMENT
45	Overhead Clarified Water Storage Tank above chemical house	90GAA01AA572	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
46	FeCl3 Dosing Tank	90GAA01AA573	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
47	FeCl3 Dosing Tank	90GAA01AA574	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
48	FeCl3 Dosing Tank	90GAA01AA575	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
49	PE Dosing Tank	90GAA01AA578	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
50	PE Dosing Tank	90GAA01AA579	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
51	NaOCl Dosing Tank	90GAA01AA580	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
52	FeCl3 Dosing Tank	90GAA01AA581	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
53	FeCl3 Dosing Tank	90GAA01AA582	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
54	FeCl3 Dosing Tank	90GAA01AA583	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
55	PE Dosing Tank	90GAA01AA586	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
56	PE Dosing Tank	90GAA01AA587	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
57	NaOCl Dosing Tank	90GAA01AA588	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
58	FeCl3 Dosing Pump	90GAA01AA590	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
59	FeCl3 Dosing Pump	90GAA01AA592	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
60	FeCl3 Dosing Pump	90GAA01AA595	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
61	FeCl3 Dosing Pump	90GAA01AA598	40	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
62	PE Dosing Pump	90GAA01AA610	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
63	PE Dosing Pump	90GAA01AA612	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
64	PE Dosing Pump	90GAA01AA615	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
65	PE Dosing Pump	90GAA01AA618	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
66	NaOCl Dosing Pump	90GAA01AA620	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
67	NaOCl Dosing Pump	90GAA01AA623	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
68	NaOCl Dosing Pump	90GAA01AA625	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
69	NaOCl Dosing Pump	90GAA01AA628	25	1	DIAPHRAGM	MANUAL	SS	BS:5156 PN10	FLANGED		
70	Overhead Clarified Water Storage Tank above chemical house	90GAA01AA571	40	1	FLOAT	AUTOMATIC	SS 316 L				
71	Sea water inlet	90GBD01AA501	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
72	Stilling Chamber	90GAA01AA510	80	1	GATE	MANUAL	DUPLEX SS	API-600 PN10	FLANGED		
73	Flash Mixer	90GAA01AA511	80	1	GATE	MANUAL	DUPLEX SS	API-600 PN10	FLANGED		
74	Clarifier A	90GAA01AA512	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
75	Clarifier A	90GAA01AA642	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
76	Clarifier A	90GAA01AA513	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
77	Clarifier B	90GAA01AA514	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
78	Clarifier B	90GAA01AA515	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
79	Clarifier B	90GAA01AA516	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
80	Clarifier A	90GAA01AA518	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
81	Clarifier B	90GAA01AA521	15	1	GATE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		sampling
82	Sludge Transfer Pump	90GAA01AA530	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
83	Sludge Transfer Pump	90GAA01AA531	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
84	Sludge Transfer Pump	90GAA01AA533	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
85	Sludge Transfer Pump	90GAA01AA534	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
86	Sludge Transfer Pump	90GAA01AA536	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
87	Sludge Transfer Pump	90GAA01AA537	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
88	Air Blower	90GAA01AA539	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT

SL NO	SERVICE DESCRIPTION/LOCATION	Valve Tag No.	SIZE IN MM/NB	QTY IN NOS	TYPE	OPERATION	BODY MATERIAL	VALVE CLASS/RATING	END CONNECIOM	MAKE	REMARKS
89	Air Blower	90GAA01AA542	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT
90	FeCl3 Dosing Tank	90GAA01AA544	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
91	FeCl3 Dosing Tank	90GAA01AA547	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
92	FeCl3 Dosing Tank	90GAA01AA550	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
93	Lime Dosing Tank	90GAA01AA553	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
94	Lime Dosing Tank	90GAA01AA556	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
95	PE Dosing Tank	90GAA01AA559	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
96	PE Dosing Tank	90GAA01AA562	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
97	NaOCI Dosing Tank	90GAA01AA565	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
98	Overhead Clarified Water Storage Tank above chemical house	90GAA01AA572	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
99	FeCl3 Dosing Pump	90GAA01AA589	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
100	FeCl3 Dosing Pump	90GAA01AA591	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
101	FeCl3 Dosing Pump	90GAA01AA593	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
102	FeCl3 Dosing Pump	90GAA01AA596	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
103	Lime Dosing Pump	90GAA01AA599	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
104	Lime Dosing Pump	90GAA01AA601	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
105	Lime Dosing Pump	90GAA01AA605	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
106	Lime Dosing Pump	90GAA01AA608	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
107	PE Dosing Pump	90GAA01AA609	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
108	PE Dosing Pump	90GAA01AA611	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
109	PE Dosing Pump	90GAA01AA613	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
110	PE Dosing Pump	90GAA01AA616	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
111	NaOCI Dosing Pump	90GAA01AA619	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
112	NaOCI Dosing Pump	90GAA01AA621	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
113	NaOCI Dosing Pump	90GAA01AA624	25	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		
114	NaOCI Dosing Pump	90GAA01AA626	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
115	FeCl3 Dosing Pump	90GAA01AA629	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
116	FeCl3 Dosing Pump	90GAA01AA630	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
117	Lime Dosing Pump	90GAA01AA631	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
118	Lime Dosing Pump	90GAA01AA632	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
119	PE Dosing Pump	90GAA01AA633	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
120	PE Dosing Pump	90GAA01AA634	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
121	NaOCI Dosing Pump	90GAA01AA635	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
122	NaOCI Dosing Pump	90GAA01AA636	15	1	GLOBE	MANUAL	SS	API 602 PN10	SCREWED		INSTRUMENT (Chemical)
123	Sludge Transfer Pump	90GAA01AA637	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
124	Sludge Transfer Pump	90GAA01AA640	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
125	Sludge Transfer Pump	90GAA01AA641	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
126	Sea water inlet	90GAA01AA650	15	1	GLOBE	MANUAL	DUPLEX SS	BS 5352 PN10	SCREWED		INSTRUMENT
127	Air Blower	90GAA01AA538	80	1	NRV-LIFT TYPE	AUTOMATIC	SS	BS 5352 PN10	SCREWED		
128	Air Blower	90GAA01AA541	80	1	NRV-LIFT TYPE	AUTOMATIC	SS	BS 5352 PN10	SCREWED		
129	FeCl3 Dosing Pump	90GAA01AA594	40	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		
130	FeCl3 Dosing Pump	90GAA01AA597	40	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		
131	Lime Dosing Pump	90GAA01AA603	40	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		
132	Lime Dosing Pump	90GAA01AA606	40	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		
133	PE Dosing Pump	90GAA01AA614	25	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		
134	PE Dosing Pump	90GAA01AA617	25	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		
135	NaOCI Dosing Pump	90GAA01AA622	25	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		





SL NO	SERVICE DESCRIPTION/LOCATION	Valve Tag No.	SIZE IN MM/NB	QTY IN NOS	TYPE	OPERATION	BODY MATERIAL	VALVE CLASS/RATING	END CONNECTION	MAKE	REMARKS
136	NaOCl Dosing Pump	90GAA01AA627	25	1	NRV-PISTON	AUTOMATIC	SS	API 602 PN10	SCREWED		
137	Sludge Transfer Pump	90GAA01AA529	400	1	NRV-SWING	AUTOMATIC	DUPLEX SS	BS 1868 PN10	FLANGED		
138	Sludge Transfer Pump	90GAA01AA532	400	1	NRV-SWING	AUTOMATIC	DUPLEX SS	BS 1868 PN10	FLANGED		
139	Sludge Transfer Pump	90GAA01AA535	400	1	NRV-SWING	AUTOMATIC	DUPLEX SS	BS 1868 PN10	FLANGED		
140	Clarifier A	90GBD03AA523	800 x 800	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			Outlet
141	Clarifier B	90GBD03AA524	800 x 800	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			Outlet
142	Clarified water storage tank	90GAA01AA526	800 x 800	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			
143	Clarified water storage tank	90GAA01AA527	800 x 800	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			
144	Sludge Sump Inlet of Compartment-1	90GAA01AA643	300 x 300	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			
145	Sludge Sump Inlet of Compartment-2	90GAA01AA644	300 x 300	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			
146	Sludge Transfer Pump Sump	90GAA01AA645	300 x 300	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			
147	Sludge Transfer Pump Sump	90GAA01AA646	300 x 300	1	SLUICE GATE	MANUAL	MS+FRP	IS:3042 PN10			
148	Clarifier A	90GAA01AA519	150	1	TELESCOPIC GATE	MANUAL	MS	As per mfg standard	FLANGED		Telescopic Sludge Bleed
149	Clarifier B	90GAA01AA522	150	1	TELESCOPIC GATE	MANUAL	MS	As per mfg standard	FLANGED		Telescopic Sludge Bleed

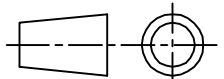
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REV	DATE	ALTERED:FN	REV	DATE	ALTERED:FN	
0	04.09.18	CHECKED:MI	01	09.01.2019	CHECKED:MI	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

PIPING SPECIFICATION FOR PT PLANT		NAME	SIGN	DATE
	PREP	FAISAL N	FN	14.05.2019
	CHKD	MUAZZAM I	MI	14.05.2019
	BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA

DEPT.					CARD CODE	BHEL DRAWING NO.	REV	
SIGN		N.A.				PE-V0-412-158-A024		03
DATE						OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/PS/PTP/18/318		
						NO. OF SHEETS	1	EXCLUDING COVER PAGE

PIPING SPECIFICATION FOR PT PLANT

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	BHEL DOC NO.: PE-V0-412-158-A024	REV NO:- 03
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PROJECT	PRE TREATMENT PLANT, 2X660 MW ENNORE STPP	OTOKLIN DOC NO:- OGBL/OC-983/PS/PTP/18/318		
		MADE BY FN	CHKD BY MI	APPD BY AA

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED	SUB-CONTRACTOR: WTE INFRA PROJECT PVT LTD.
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Sr No.	Description	Material MOC /Standard
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FOR SEA WATER TRANSFER (R1)		
1	Upto 150NB and below	UPVC IS 4985. (R2)
2	800 NB SEA WATER INLET	800 NB line upto valve control station will be provided as CS pipe with corrocoat and the rest Bypass line and buried piping will be provided in GRP MOC (R3)

FOR DOSING PUROPSE & SERVICE WATER		
1	25NB & 40 NB (DOSING)	CPVC SCH 10 (Except for NaOCl SCH 80)
2	25 NB (SERVICE WATER)	GI/ IS1239

FOR SLUDGE TRANSFER LINE PUROPSE AND AIR BLOWER LINE.		
1	400 NB	UPVC IS 4985/HDPE
2	80 NB & 50NB	UPVC IS 4985.

FOR SLUDGE TRANSFER LINE FROM STILLING CHAMBER & FLASH MIXER		
1	80 NB	CPVC SCH 10 (R3)

PIPE WALL THICKNESS

In case of carbon steel materials, the nominal wall thickness of pipeline shall not be less than the minimum acceptable values given below:

NB mm (inch)	15 (1/2)	30 (3/4)	25 (1)	32 (1¼)	40 (1.5)	50 (2)	65 (2.5)	80 (3)	100 (4)	125 (5)
Min. thickness, mm	3.2	3.2	3.6	3.6	3.6	3.6	3.6	4.0	4.5	5.4
NB mm (inch)	150 (6)	200 (8)	250 (10)	300 (12)	350 (14)	400 (16)	450 (18)	500 (20)	600 (24)	
Min. thickness, mm	5.4	6.35	6.35	6.35	7.1	7.1	7.1	8.0	8.0	

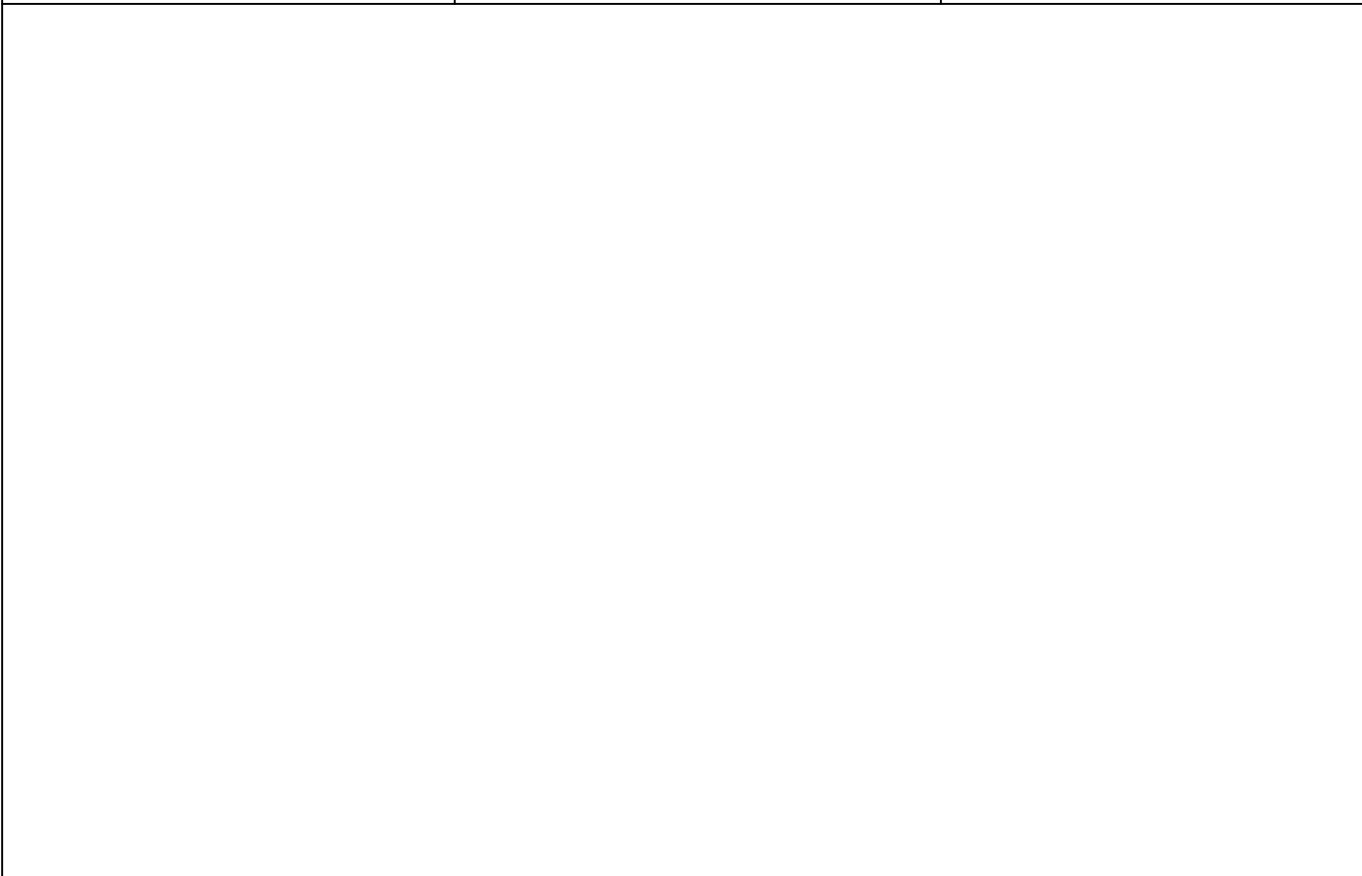
- > NB 600 mm to NB 900 mm - 8.0 mm
- > NB 900 mm to NB 1200 mm - 10.0 mm
- > NB 1200 mm to 1400 mm - 12.0 mm
- > NB 1400 mm to 1600 mm - 14.0 mm
- > NB 1600 mm to NB 2200 mm - 16.0 mm
- > NB 2200 mm - 18.0 mm

PIPE JOINTS

In general all water lines 50 mm NB and above, are to be joined generally by butt welding except the locations where valves/fittings are to be installed with flanged connections and below 50mm NB by socket welding unless mentioned otherwise specifically.

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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.



TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)



CONSULTANT: DESEIN PVT LTD, NEW DELHI.



BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NEW DELHI



OTOKLIN GLOBAL BUSINESS LTD.
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

TECHNICAL DATA SHEET FOR AGITATOR		NAME	SIGN	DATE
	PREP	FAISAL N	FN	27-03-19
	CHKD	MUAZZAM I	MI	27-03-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	27-03-19

DEPT.						CARD CODE	BHEL DRAWING NO.	REV 0	
SIGN		N.A.					PE-V0-412-158-A026		
DATE							OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/AGR/PTP/18/320		
							NO. OF SHEETS	9	EXCLUDING COVER PAGE

DATA SHEET OF AGITATORS

LOI NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A026		REV : 00	
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED		OTOKLIN DOC NO:- OGBL/OC-983/TDS/AGR/PTP/18/320		
PROJECT	PRE TREATMENT PLANT ENNORE		MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			SUB-CONTRACTOR: WTE INFRA PROJECTS PVT LTD.		
A	TECHNICAL SPECIFICATIONS				
	Material Of Construction				
1	Impeller		Duplex SS		
2	Bottom Shaft		Duplex SS		
3	Mounting flange		Cast Iron, IS210, FG260		
4	Motor Type		TEFC 3 Phase ,415 V		
5	Motor RPM		1440		
B	LIST OF AGITATORS				
SL NO	DESCRIPTION	Tank Size / MOC	Quantity	RPM	Motor Rating
1	FeCl3 dosing Tank	2.83 X2.83 X1.43 SWD+0.3FB (L X W X H)/RCC	3 No	100	0.75 KW
PREPARED BY: FN		CHKD BY/ APPD. BY:MI/AA	DATE: 31/08/2018		SHEET NO:- 1 OF 5

DATA SHEET OF AGITATORS

LOI NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A026		REV : 00	
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED		OTOKLIN DOC NO:- OGBL/OC-983/TDS/AGR/PTP/18/320		
PROJECT	PRE TREATMENT PLANT ENNORE		MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			SUB-CONTRACTOR: WTE INFRA PROJECTS PVT LTD.		
A	TECHNICAL SPECIFICATIONS				
	Material Of Construction				
1	Impeller		SS-316		
2	Bottom Shaft		SS-316		
3	Mounting flange		Cast Iron, IS210, FG260		
4	Motor Type		TEFC 3 Phase ,415 V		
5	Motor RPM		1440		
B	LIST OF AGITATORS				
SL NO	DESCRIPTION	Tank Size / MOC	Quantity	RPM	Motor Rating
1	Lime dosing Tank	2X2X1.43 SWD+0.3FB (L X W X H)/RCC	2 No	100	0.75 KW
PREPARED BY: FN		CHKD BY/ APPD. BY:MI/AA	DATE: 31/08/2018		SHEET NO:- 2 OF 5

DATA SHEET OF AGITATORS

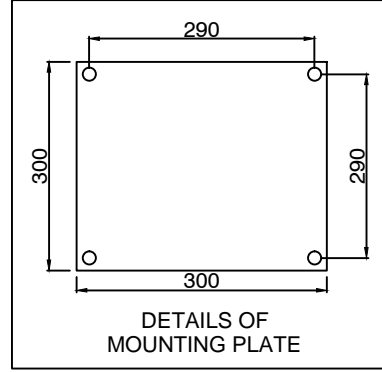
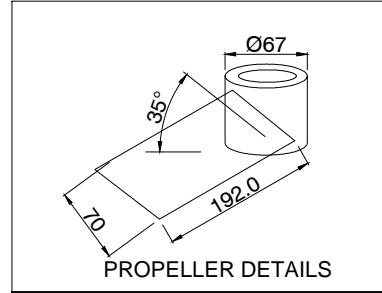
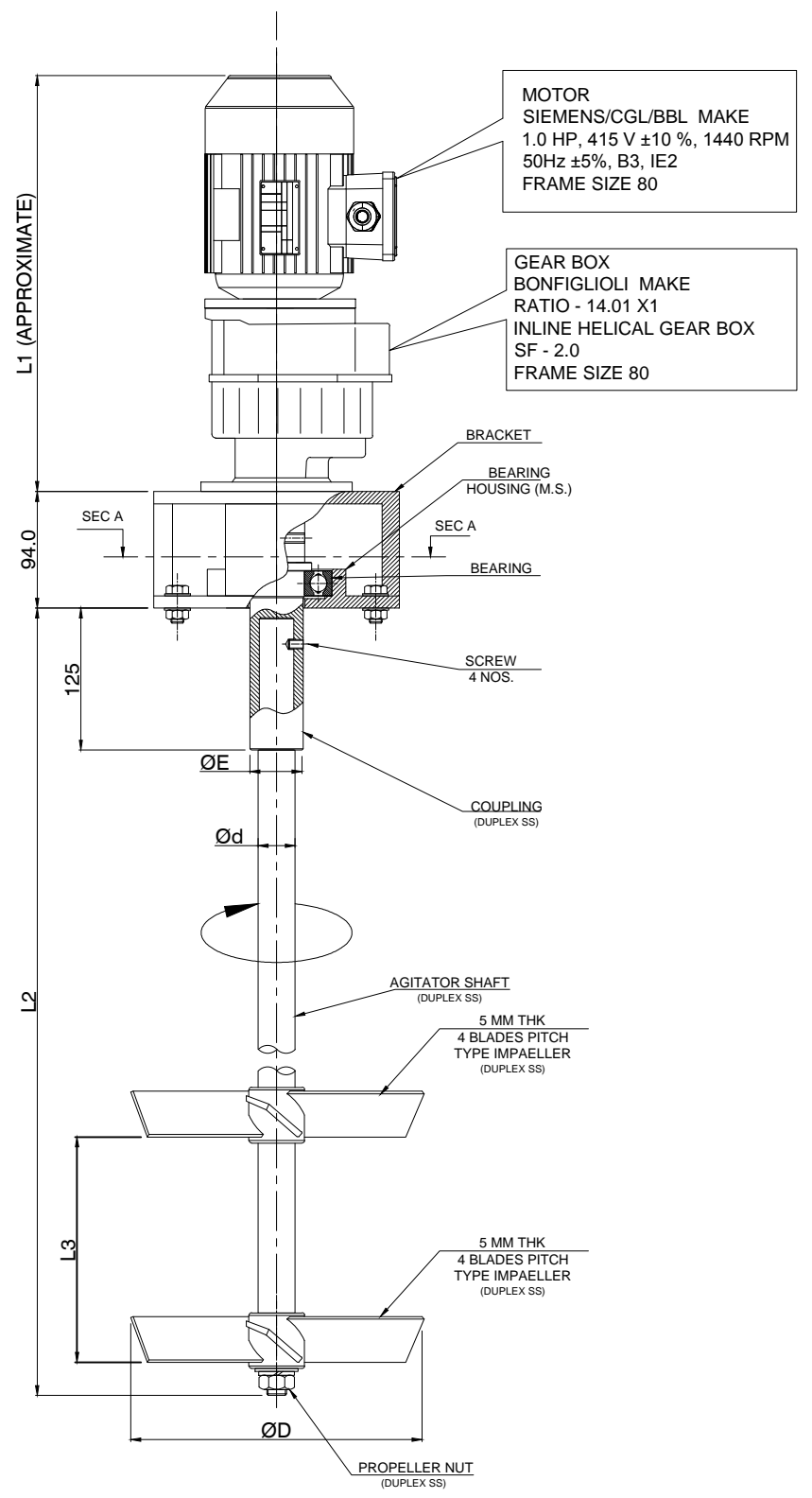
LOI NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A026		REV : 00	
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED		OTOKLIN DOC NO:- OGBL/OC-983/TDS/AGR/PTP/18/320		
PROJECT	PRE TREATMENT PLANT ENNORE		MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			SUB-CONTRACTOR: WTE INFRA PROJECTS PVT LTD.		
A	TECHNICAL SPECIFICATIONS				
	Material Of Construction				
1	Impeller		SS-316		
2	Bottom Shaft		SS-316		
3	Mounting flange		Cast Iron, IS210, FG260		
4	Motor Type		TEFC 3 Phase ,415 V		
5	Motor RPM		1440		
B	LIST OF AGITATORS				
SL. NO	DESCRIPTION	Tank Size / MOC	Quantity	RPM	Motor Rating
1	PE dosing Tank	2 X 2 X 1.43 SWD+0.3FB (L X W X H) /RCC	2 No	100	0.75 KW
PREPARED BY: FN		CHKD BY/ APPD. BY:MI/AA	DATE: 31/08/2018		SHEET NO:- 3 OF 5

DATA SHEET OF AGITATORS

LOI NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A026		REV : 00	
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED		OTOKLIN DOC NO:- OGBL/OC-983/TDS/AGR/PTP/18/320		
PROJECT	PRE TREATMENT PLANT ENNORE		MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			SUB-CONTRACTOR: WTE INFRA PROJECTS PVT LTD.		
A	TECHNICAL SPECIFICATIONS				
	Material Of Construction				
1	Impeller		SS-316		
2	Bottom Shaft		SS-316		
3	Mounting flange		Cast Iron, IS210, FG260		
4	Motor Type		TEFC 3 Phase ,415 V		
5	Motor RPM		1440		
B	LIST OF AGITATORS				
SL. NO	DESCRIPTION	Tank Size / MOC	Quantity	RPM	Motor Rating
1	NaOCl dosing Tank	0.8x(1.0 SWD+0.3 FB) (D X H) / FRP	1 No	100	0.37 KW
PREPARED BY: FN		CHKD BY/ APPD. BY:MI/AA	DATE: 31/08/2018		SHEET NO:- 4 OF 5

DATA SHEET OF AGITATORS

LOI NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		PROJECT DOC NO:- PE-V0-412-158-A026		REV : 00	
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED		OTOKLIN DOC NO:- OGBL/OC-983/TDS/AGR/PTP/18/320		
PROJECT	PRE TREATMENT PLANT ENNORE		MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			SUB-CONTRACTOR: WTE INFRA PROJECTS PVT LTD.		
A	TECHNICAL SPECIFICATIONS				
	Material Of Construction				
1	Impeller		Duplex SS		
2	Bottom Shaft		Duplex SS		
3	Mounting flange		Cast Iron, IS210, FG260		
4	Motor Type		TEFC 3 Phase ,415 V		
5	Motor RPM		1440		
B	LIST OF AGITATORS				
SL. NO	DESCRIPTION	Tank Size / MOC	Quantity	RPM	Motor Rating
1	Flash Mixer Tank	4.4 X 4.4 X 4 SWD+0.5 FB (L X W X H) /RCC	1 No	200	3.7 KW
PREPARED BY: FN		CHKD BY/ APPD. BY:MI/AA	DATE: 31/08/2018		SHEET NO:- 5 OF 5



S.R. NO	ITEM	SIZE
1	VESSEL SIZE	2830X2830X1730
2	MOTOR RPM	1440 RPM
3	AGITATOR SHAFT RPM	100 RPM
4	ØD	Ø450mm
5	Ød	Ø40mm
6	L1	500mm
7	L2	1680mm
8	L3	600mm

MAKE: OTOKLIN GLOBAL BUSINESS LIMITED

- NOTE:
- 1) IMPELLER ALONG WITH SHAFT TO BE INSERT THROUGH OPEN VESSEL.
 - 2) ALL PAINTING TO BE DONE AS PER APPROVED PE-V0-412-158-A092 PAINTING SPECIFICATION
 - 3) NO LOAD TEST IN AIR AT OUR WORK

ANGULAR TOLERANCE IN PLAN ±1°
OPEN DIAMETER MACHINE TOLERANCE ±0.5

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL,
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel.No.022-26732135

BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

BHEL DOC NO. PE-V0-412-158-A026

OGBL DOC NO. OGBL/OC-983/TDS/AGR/PTP/18/320

SHEET 6 OF 9 REV 0

JOB NO. 412

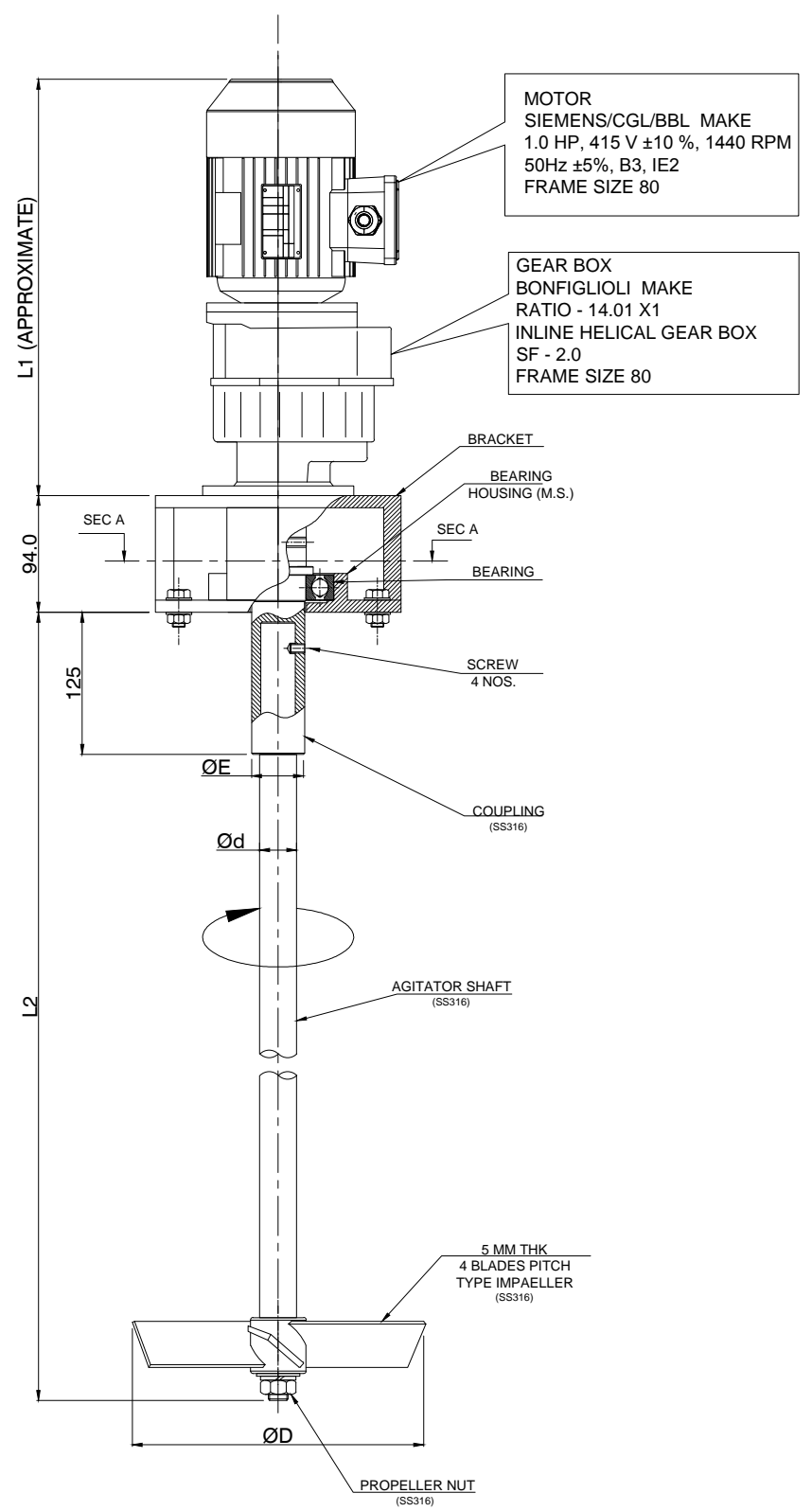
STATUS CONTRACT

DISTRIBUTION

TO									
No.OFF									
REV	DATE	ALTD	CHD	APPD					

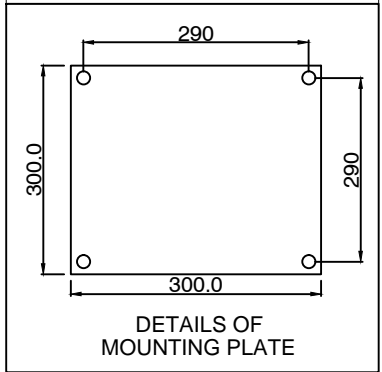
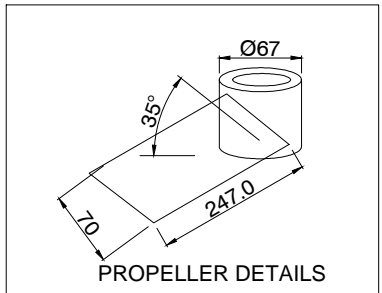
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MOTOR
SIEMENS/CGL/BBL MAKE
1.0 HP, 415 V ±10 %, 1440 RPM
50Hz ±5%, B3, IE2
FRAME SIZE 80

GEAR BOX
BONFIGLIOLI MAKE
RATIO - 14.01 X1
INLINE HELICAL GEAR BOX
SF - 2.0
FRAME SIZE 80



SR. NO	ITEM	SIZE
1	VESSEL SIZE	2000X2000X 1730
2	MOTOR RPM	1440 RPM
3	AGITATOR SHAFT RPM	100 RPM
4	ØD	Ø560mm
5	Ød	Ø35 mm
6	L1	500mm
7	L2	1680mm

MAKE: OTOKLIN GLOBAL BUSINESS LIMITED

NOTE:
1) IMPELLER ALONG WITH SHAFT TO BE INSERT THROUGH OPEN VESSEL.
2) ALL PAINTING TO BE DONE AS PER APPROVED PE-V0-412-158-A092 PAINTING SPECIFICATION
3) NO LOAD TEST IN AIR AT OUR WORK

ANGULAR TOLERANCE IN PLAN ±1°
OPEN DIAMETER MACHINE TOLERANCE ±0.5

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL,
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel.No.022-26732135

BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

TITLE: **GAD FOR AGITATOR LIME/PE DOSING TANK**

DEPT. CODE: ORN, DESN, CHD, APPD
NAME: FAISAL N, FAISAL N, MUAZZAM I, ASLAM A
SIGN: FN, FN, MI, AA
DATE: 27-03-19, 27-03-19, 27-03-19, 27-03-19

BHEL DOC NO. **PE-V0-412-158-A026**

OGBL DOC NO. **OGBL/OC-983/TDS/AGR/PTP/18/320**

SHEET 7 OF 9 REV 0

JOB NO. 412

STATUS CONTRACT

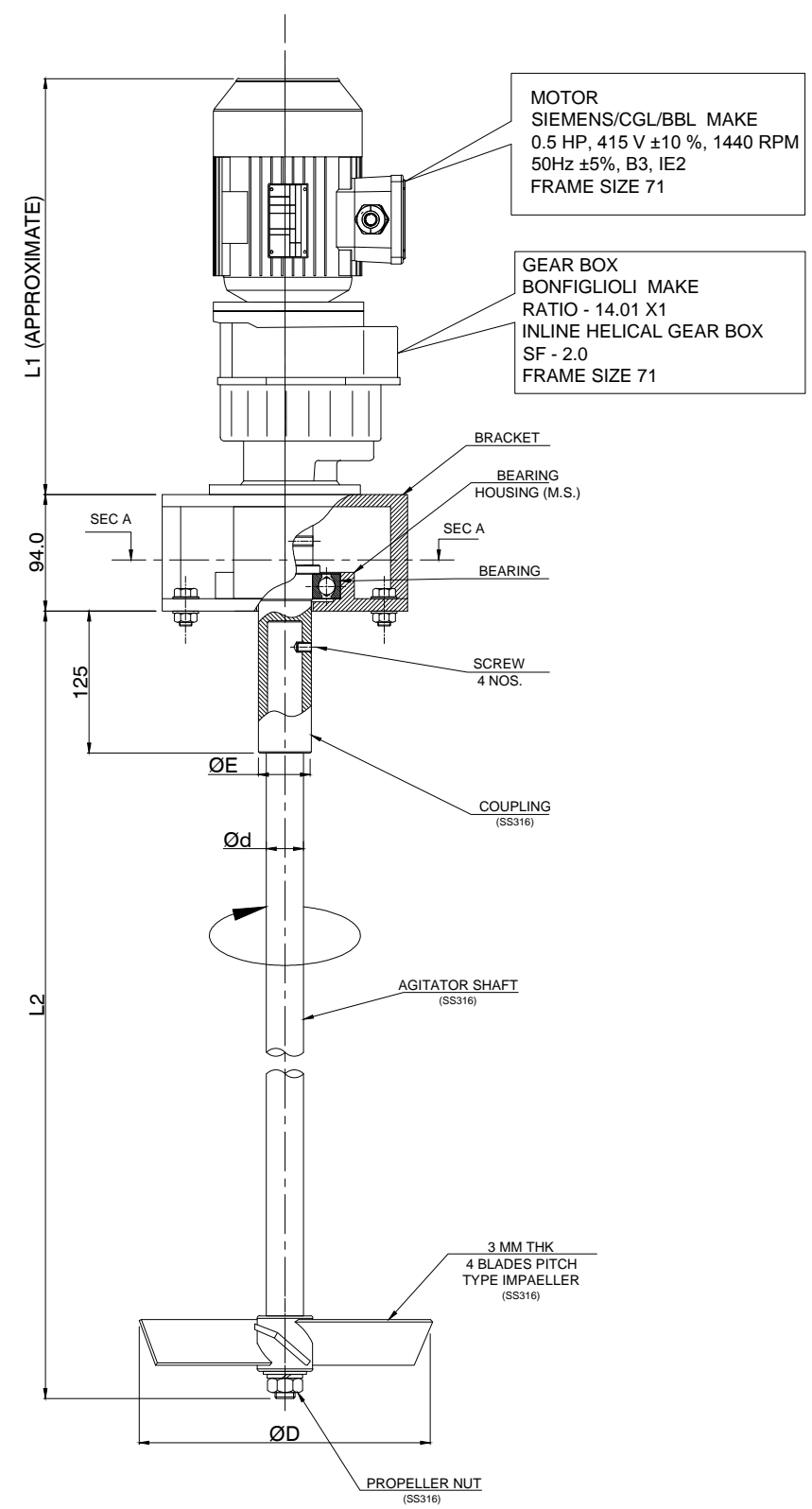
DISTRIBUTION

TO	NO.OFF	DATE	ALTD	CHD	APPD

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD

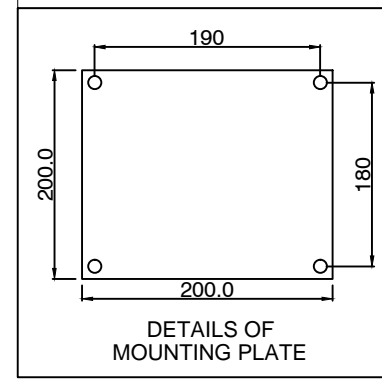
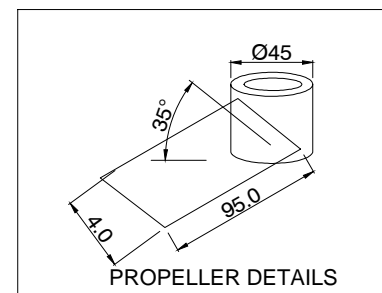
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MOTOR
SIEMENS/CGL/BBL MAKE
0.5 HP, 415 V ±10 %, 1440 RPM
50Hz ±5%, B3, IE2
FRAME SIZE 71

GEAR BOX
BONFIGLIOLI MAKE
RATIO - 14.01 X1
INLINE HELICAL GEAR BOX
SF - 2.0
FRAME SIZE 71



SR. NO	ITEM	SIZE
1	VESSEL SIZE	Ø800X1300
2	MOTOR RPM	1440 RPM
3	AGITATOR SHAFT RPM	100 RPM
4	ØD	Ø240 mm
5	Ød	Ø28 mm
6	L1	450 mm
7	L2	1320 mm

MAKE: OTOKLIN GLOBAL BUSINESS LIMITED

NOTE:
1) IMPELLER ALONG WITH SHAFT TO BE INSERT THROUGH OPEN VESSEL.
2) ALL PAINTING TO BE DONE AS PER APPROVED PE-V0-412-158-A092 PAINTING SPECIFICATION
3) NO LOAD TEST IN AIR AT OUR WORK

ANGULAR TOLERANCE IN PLAN ±1°
OPEN DIAMETER MACHINE TOLERANCE ±0.5

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD

JOB NO. 412	
STATUS CONTRACT	
DISTRIBUTION	
TO	
No.OFF	
REV	
DATE	
ALTD	
CHD	
APPD	

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel.No.022-26732135

DEPT	CODE	NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	27-03-19
	DES	FAISAL N	FN	27-03-19
	CHD	MUZZAM I	MI	27-03-19
	APPD	ASLAM A	AA	27-03-19

BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

TITLE: **GAD FOR AGITATOR NoOCL DOSING TANK**

BHEL DOC NO. **PE-V0-412-158-A026**

OGBL DOC NO.

SCALE

SIGN

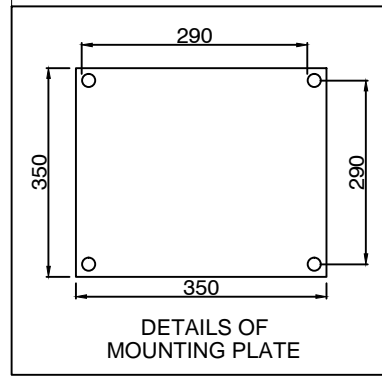
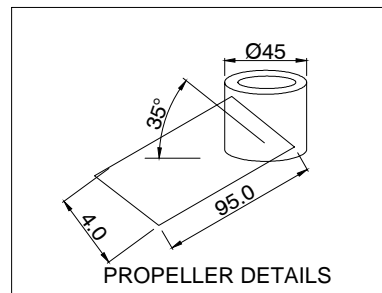
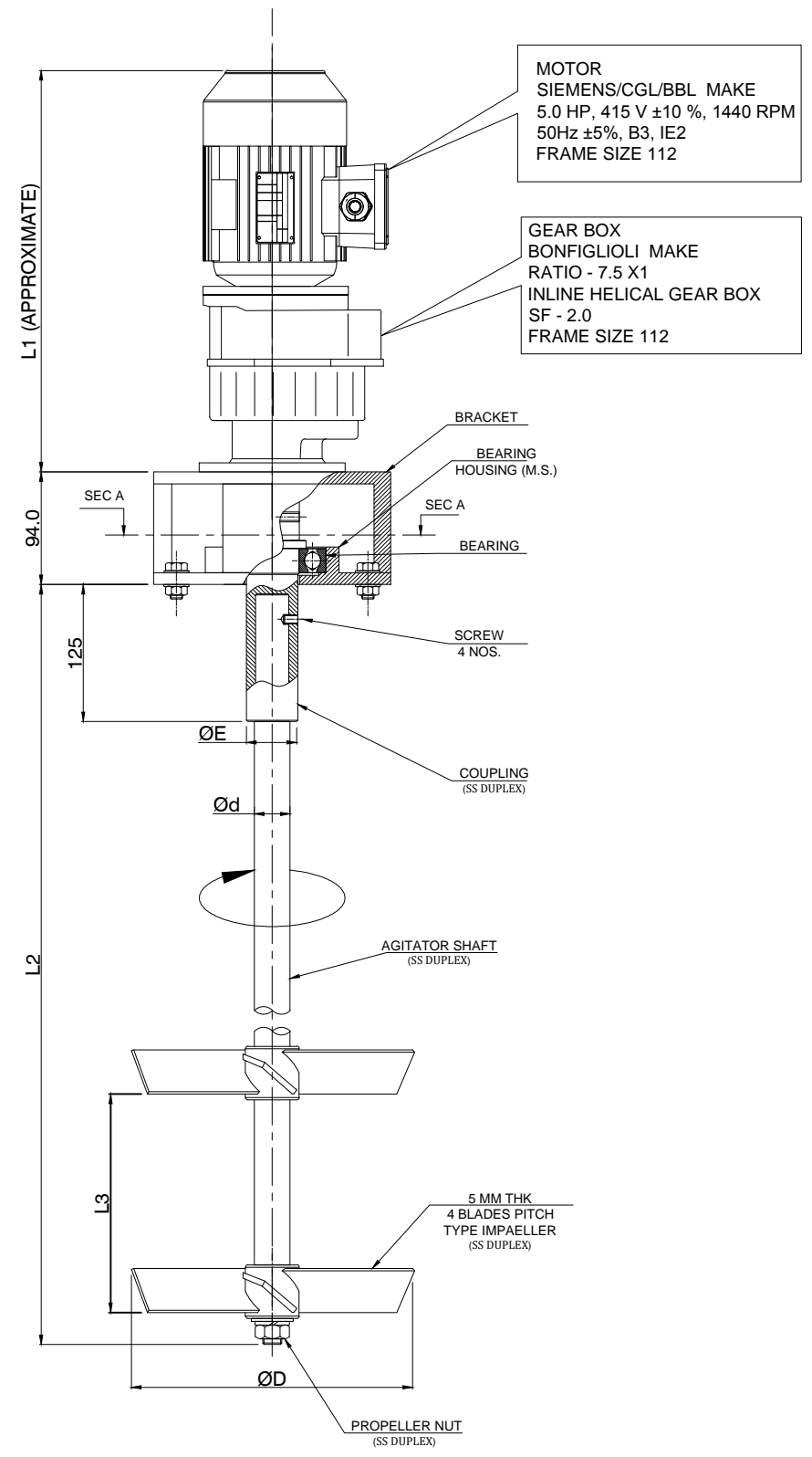
DATE

OGBL/OC-888/TDS/AGR/PTP/18/380

SHEET 8 OF 9 REV 0

DRAWING NO.

CUSTOMERS DRAWING NO.



SR. NO	ITEM	SIZE
1	VESSEL SIZE	4400X4400X 4500
2	MOTOR RPM	1440 RPM
3	AGITATOR SHAFT RPM	200 RPM
4	ØD	Ø550 mm
5	Ød	Ø65 mm
6	L1	650 mm
7	L2	4450 mm
8	L3	1200mm

MAKE: OTOKLIN GLOBAL BUSINESS LIMITED

NOTE:
1) IMPELLER ALONG WITH SHAFT TO BE INSERT THROUGH OPEN VESSEL.
2) ALL PAINTING TO BE DONE AS PER APPROVED PE-V0-412-158-A092 PAINTING SPECIFICATION
3) NO LOAD TEST IN AIR AT OUR WORKS

ANGULAR TOLERANCE IN PLAN ±1°
OPEN DIAMETER MACHINE TOLERANCE ±0.5

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL,
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel.No.022-26732135

BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

TITLE: **GAD FOR AGITATOR FLASH MIXER TANK**

BHEL DOC NO. **PE-V0-412-158-A026**

OGBL DOC NO.
OGBL/OC-983/TDS/AGR/PTP/18/320

SHEET 9 OF 9 REV 0

JOB NO. 412	STATUS CONTRACT
DISTRIBUTION	
TO	
No.OFF	
REV	DATE
ALTD	CHD
APPD	

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.



TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)



CONSULTANT: DESEIN PVT LTD, NEW DELHI.



BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT, NEW DELHI



OTOKLIN GLOBAL BUSINESS LTD.
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

TECHNICAL DATA SHEET OF HOIST	NAME	SIGN	DATE
	PREP	FAISAL N	FN 05-11-18
	CHKD	MUAZZAM I	MI 05-11-18
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		APPD	ASLAM A AA 05-11-18

DEPT.						CARD CODE	BHEL DRAWING NO.	REV 01	
SIGN		N.A.				-	PE-VO-412-158-A027		
DATE							OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDS/HWTC/PTP/18/321		
							NO. OF SHEETS	6	EXCLUDING COVER PAGE

DATA SHEET OF ELECTRIC HOIST

LOA NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018.		PROJECT DOC NO:- PE-V0-412-158-A027	Rev No:- 01
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/HWTC/PTP/18/321	
PROJECT	Pre Treatment Plant, Ennore	MADE BY FN	CHKD BY MI APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			

TECHNICAL SPECIFICATION OF ELECTRIC WIRE ROPE HOISTS

Sr. No	Description			
1	Description Of Equipment	Electric Wire Rope Hoists		
2	Capacity	1 Tonnes		
3	Quantity	1 No.		
4	Height of Lift	2.5-4 Mtrs.		
5	Length of Travel	24 Mtrs.		
6	Location	Chemical House Ground floor (Indoor) (R1)		
7	Ambient Temperature	50°C. (R1)		
8	Area classification	Safe (Non-Hazardous) Area.		
9	Duty	Class II Duty as per IS:3938-1983		
10	Operation	From floor, by means of Pendant Push Button Controller suspended from Hoist.		
12	Type of Trolley	Motorized Trolley		
13	Hoisting Speed	3.0 Mtrs/min		
14	CT Speed	16.0 Mtrs/min		
15	Hoisting Motor HP	3.0HP		
16	CT Motor HP	0.03HP		
PREPARED BY: FN		CHKD.& APPD.BY:-MI & AA	DATE: 05/11/2018	SHEET NO:- 1 OF 6

DATA SHEET OF ELECTRIC HOIST

LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018.		PROJECT DOC NO:- PE-V0-412-158-A027	Rev No:- 01
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/HWTC/PTP/18/321	
PROJECT	Pre Treatment Plant, Ennore	MADE BY FN	CHKD BY MI APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			
<u>TECHNICAL SPECIFICATION OF ELECTRIC WIRE ROPE HOISTS</u>			
17	Motors	Hoist Motor, High Torque, crane Duty, 40%CDF, TEFC, 416 pole Class; F; insulated suitable for 150 starts/hour Sq. Cage.	
18	Wire Rope	8 mm. Dia.	
19	Construction	6x36 Construction, fiber core, Galvanized, as per IS2266	
20	No. of Falls	4 Nos.	
21	Factor of Safety	As per IS: 3938.	
22	Limit Switches	MH: Snap Action, CT: Two lever Type.	
23	Brakes	DC-DISC Brake in MH and CT Motion.	
24	Control Panel	Provided on Hoist consisting of Main Contactors, Motor Contactors, Single Phase Preventers with overload relay, fuses, connectors, etc.	
25	Power Supply to the Hoist	Through Trailing Cable Arrangement running On Taught wire.	
26	Hook	Single Shank Forged as per IS: 15560 with spring latch.	
27	Weight of the Hoist	250 Kgs. Approx.	
28	Power Supply	415 + 6%V. 3 Phase: 50 + 3% HZ: A.C.	
29	Control Voltage	110 Volts: Single Phase: 50 H.Z.: A.C.	
PREPARED BY: FN		CHKD.& APPD.BY:-MI & AA	DATE: 05/11/2018 SHEET NO:- 2 OF 6

DATA SHEET OF ELECTRIC HOIST

LOA NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018.		PROJECT DOC NO:- PE-V0-412-158-A027	Rev No:- 01
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/HWTC/PTP/18/321	
PROJECT	Pre Treatment Plant, Ennore	MADE BY FN	CHKD BY MI APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			

TECHNICAL SPECIFICATION OF ELECTRIC WIRE ROPE HOISTS

Sr. No	Description			
1	Description Of Equipment	Electric Wire Rope Hoists		
2	Capacity	1 Tonnes		
3	Quantity	1 No.		
4	Height of Lift	2.5-4 Mtrs.		
5	Length of Travel	28 Mtrs.		
6	Location	Chemical House 1 st floor (Indoor) (R1)		
7	Ambient Temperature	50°C. (R1)		
8	Area classification	Safe (Non-Hazardous) Area.		
9	Duty	Class II Duty as per IS:3938-1983		
10	Operation	From floor, by means of Pendant Push Button Controller suspended from Hoist.		
12	Type of Trolley	Motorized Trolley		
13	Hoisting Speed	3.0 Mtrs/min		
14	CT Speed	16.0Mtrs/min		
15	Hoisting Motor HP	3.0HP		
16	CT Motor HP	0.03HP		
PREPARED BY: FN		CHKD.& APPD.BY:-MI & AA	DATE: 05/11/2018	SHEET NO:- 3 OF 6

DATA SHEET OF ELECTRIC HOIST

LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018.		PROJECT DOC NO:- PE-V0-412-158-A027		Rev No:- 01
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED		OTOKLIN DOC NO:- OGBL/OC-983/TDS/HWTC/PTP/18/321	
PROJECT	Pre Treatment Plant, Ennore	MADE BY FN	CHKD BY MI	APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED				
<u>TECHNICAL SPECIFICATION OF ELECTRIC WIRE ROPE HOISTS</u>				
17	Motors	Hoist Motor, High Torque, crane Duty,40%CDF,TEFC,416 pole Class ;F; insulated suitable for 150 starts/hour Sq. Cage.		
18	Wire Rope	8 mm. Dia.		
19	Construction	6x36 Construction, fiber core, Galvanized, as per IS2266		
20	No. of Falls	4 Nos.		
21	Factor of Safety	As per IS: 3938.		
22	Limit Switches	MH: Snap Action, CT: Two lever Type.		
23	Brakes	DC-DISC Brake in MH and CT Motion.		
24	Control Panel	Provided on Hoist consisting of Main Contactors, Motor Contactors, Single Phase Preventers with overload relay, fuses, connectors, etc.		
25	Power Supply to the Hoist	Through Trailing Cable Arrangement running On Taught wire.		
26	Hook	Single Shank Forged as per IS: 15560 with spring latch.		
27	Weight of the Hoist	250 Kgs. Approx		
28	Power Supply	415 + 6%V. 3 Phase: 50 + 3% HZ: A.C.		
29	Control Voltage	110 Volts: Single Phase: 50 H.Z.: A.C.		
PREPARED BY: FN		CHKD.& APPD.BY:-MI & AA		DATE: 05/11/2018
				SHEET NO:- 4 OF 6

DATA SHEET OF ELECTRIC HOIST

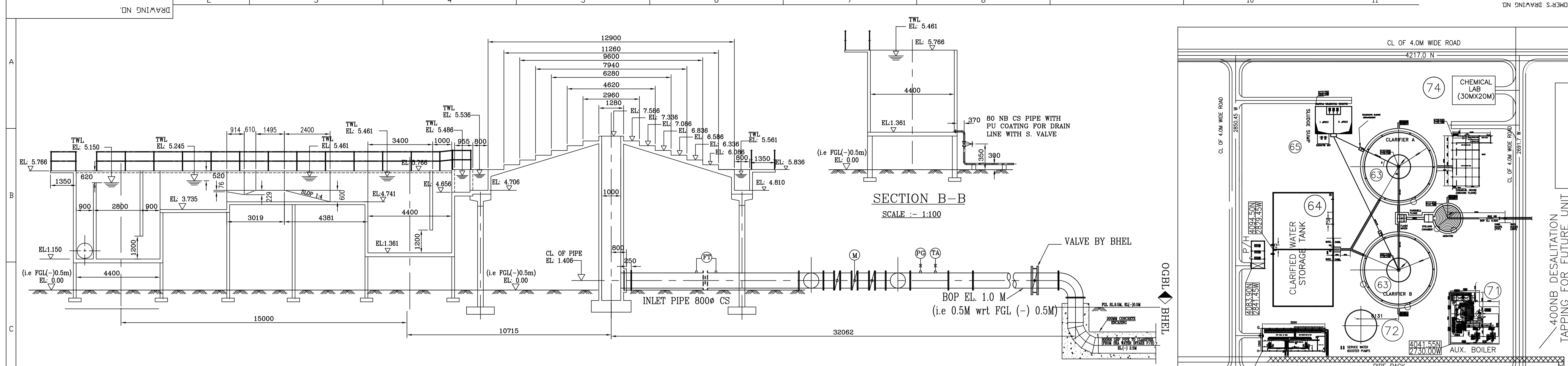
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CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/HWTC/PTP/18/321	
PROJECT	Pre Treatment Plant, Ennore	MADE BY FN	CHKD BY MI APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			

TECHNICAL SPECIFICATION OF ELECTRIC WIRE ROPE HOISTS

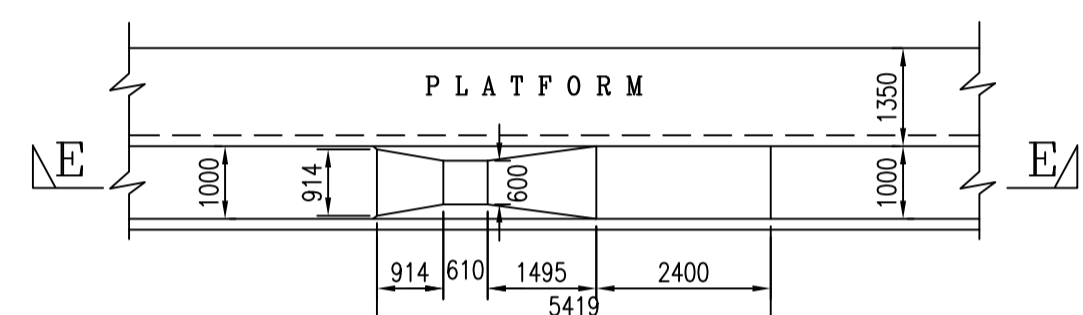
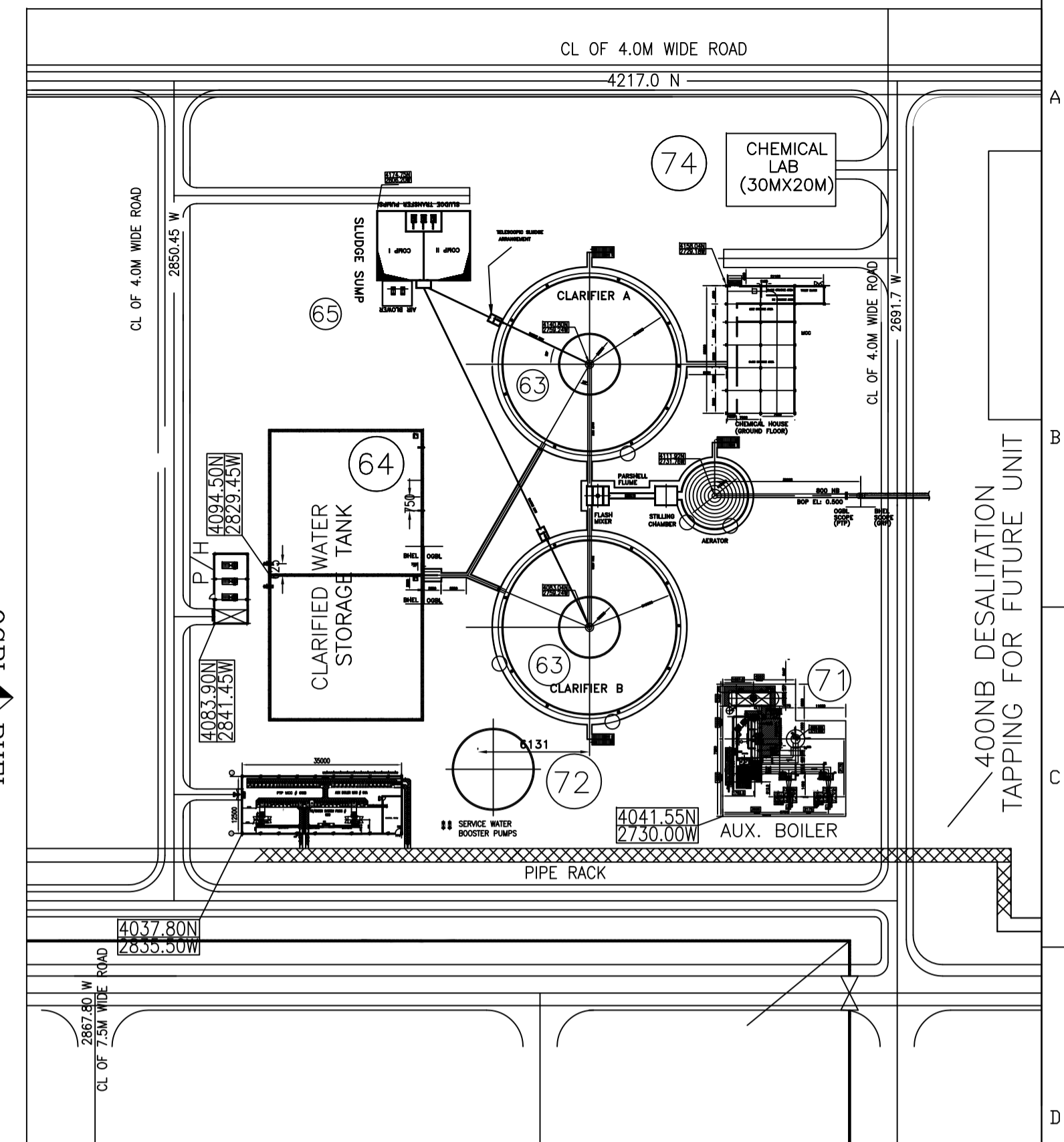
Sr. No	Description			
1	Description Of Equipment	Electric Wire Rope Hoists		
2	Capacity	1 Tonnes		
3	Quantity	1 No.		
4	Height of Lift	5 Mtrs.		
5	Length of Travel	6.5 Mtrs.		
6	Location	Sludge Transfer Sump (Outside). (R1)		
7	Ambient Temperature	50°C. (R1)		
8	Area classification	Safe (Non-Hazardous) Area.		
9	Duty	Class II Duty as per IS:3938-1983		
10	Operation	From floor, by means of Pendant Push Button Controller suspended from Hoist.		
12	Type of Trolley	Motorized Trolley		
13	Hoisting Speed	3.0 Mtrs/min		
14	CT Speed	16.0Mtrs/min		
15	Hoisting Motor HP	3.0HP		
16	CT Motor HP	0.03HP		
PREPARED BY: FN		CHKD.& APPD.BY:-MI & AA	DATE: 05/11/2018	SHEET NO:- 5 OF 6

DATA SHEET OF ELECTRIC HOIST

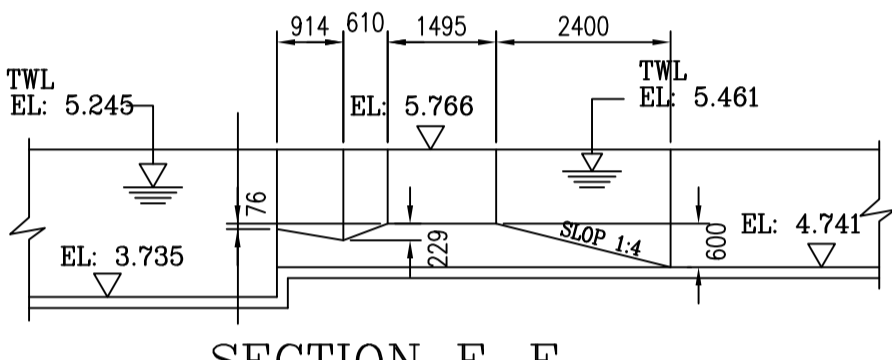
LOI NO: - PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018.		PROJECT DOC NO:- PE-V0-412-158-A027	Rev No:- 01
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	OTOKLIN DOC NO:- OGBL/OC-983/TDS/HWTC/PTP/18/321	
PROJECT	Pre Treatment Plant, Ennore	MADE BY FN	CHKD BY MI APPD BY AA
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED			
<u>TECHNICAL SPECIFICATION OF ELECTRIC WIRE ROPE HOISTS</u>			
17	Motors	Hoist Motor, High Torque, crane Duty,40%CDF,TEFC,416 pole Class ;F; insulated suitable for 150 starts/hour Sq. Cage.	
18	Wire Rope	8 mm. Dia.	
19	Construction	6x36 Construction, fiber core, Galvanized, as per IS2266	
20	No. of Falls	4 Nos.	
21	Factor of Safety	As per IS: 3938.	
22	Limit Switches	MH: Snap Action, CT: Two lever Type.	
23	Brakes	DC-DISC Brake in MH and CT Motion.	
24	Control Panel	Provided on Hoist consisting of Main Contactors, Motor Contactors, Single Phase Preventers with overload relay, fuses, connectors, etc.	
25	Power Supply to the Hoist	Through Trailing Cable Arrangement running On Taught wire.	
26	Hook	Single Shank Forged as per IS: 15560 with spring latch.	
27	Weight of the Hoist	250 Kgs. Approx.	
28	Power Supply	415 + 6%V. 3 Phase: 50 + 3% HZ: A.C.	
29	Control Voltage	110 Volts: Single Phase: 50 H.Z.: A.C.	
PREPARED BY: FN		CHKD.& APPD.BY:-MI & AA	DATE: 05/11/2018 SHEET NO:- 6 OF 6



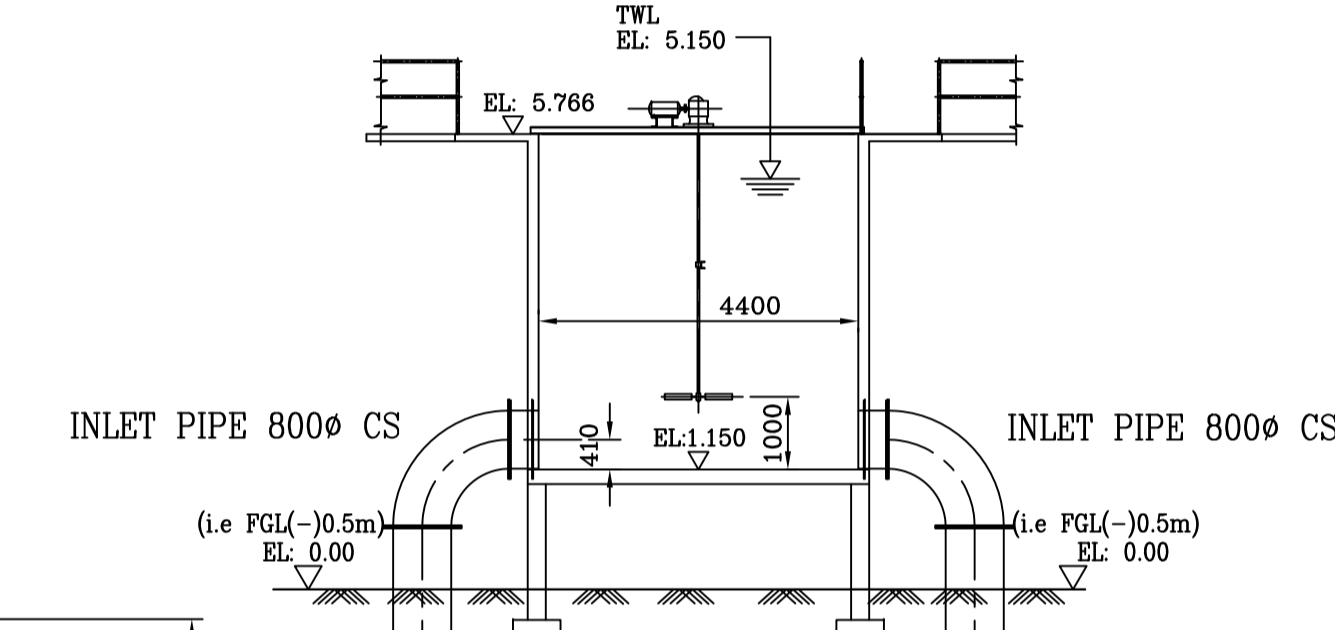
SECTION B-B
SCALE :- 1:100



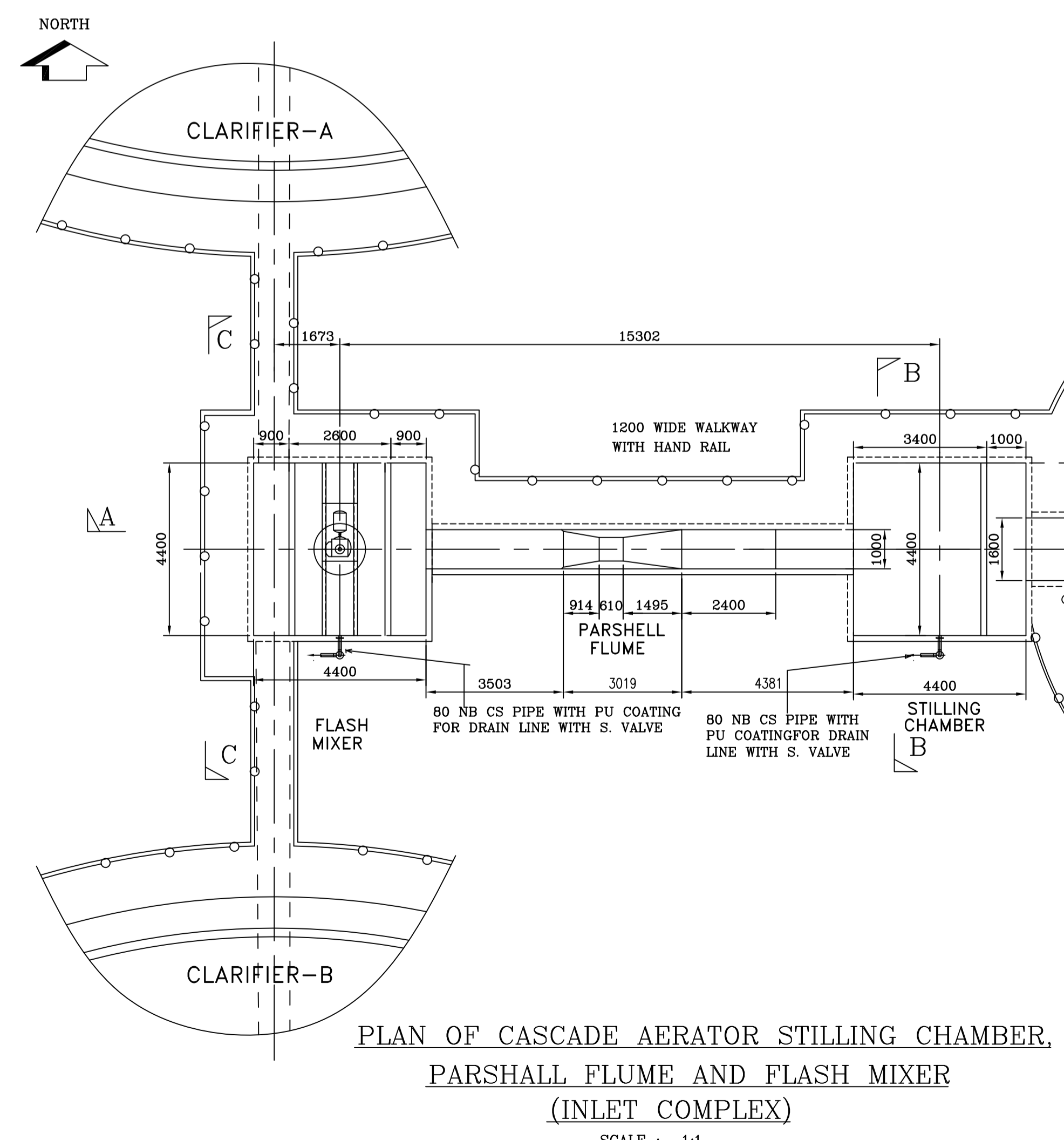
ENLARGED DETAIL OF PARSHALL FLUME



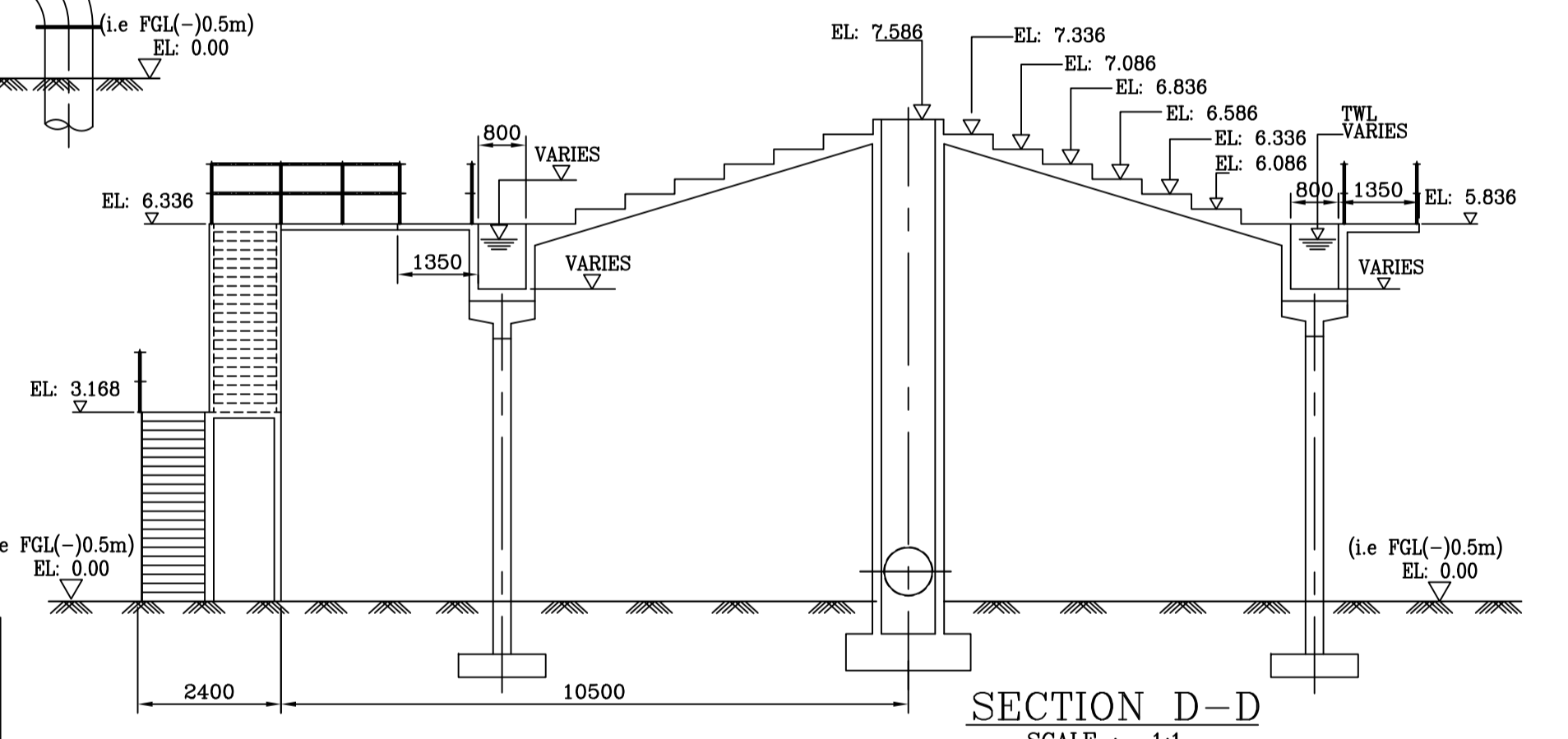
SECTION E-E



SECTION C-C
SCALE :- 1:1



PLAN OF CASCADE AERATOR STILLING CHAMBER,
PARSHALL FLUME AND FLASH MIXER
(INLET COMPLEX)
SCALE :- 1:1



SECTION D-D
SCALE :- 1:1

- NOTE:-
1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METRE UNLESS OTHERWISE STATED.
 2. DIMENSIONS OF COLUMN, COLUMN FOUNDATION, STAIR CASE, HANDRAILING ETC SHALL BE SHOWN IN CIVIL G.A. OF INLET COMPLEX
 3. PUDDLE PIPES & INSERT PLATE DETAIL SHALL BE SHOWN IN THE CIVIL DRAWING OF INLET COMPLEX
 4. ELEVATION 0.0 M CORRESPONDS TO FGL(-) 0.5M/RL 9.5M

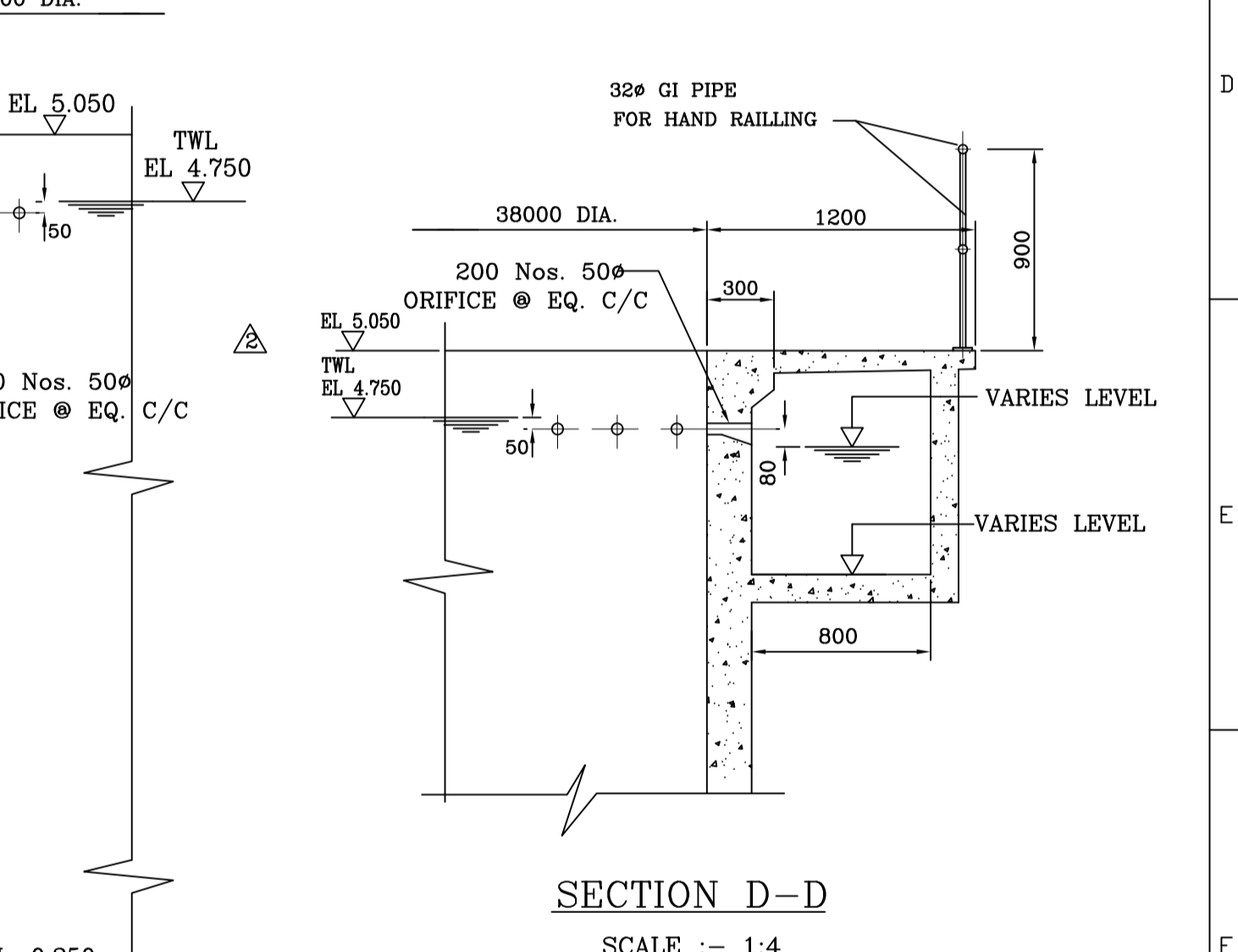
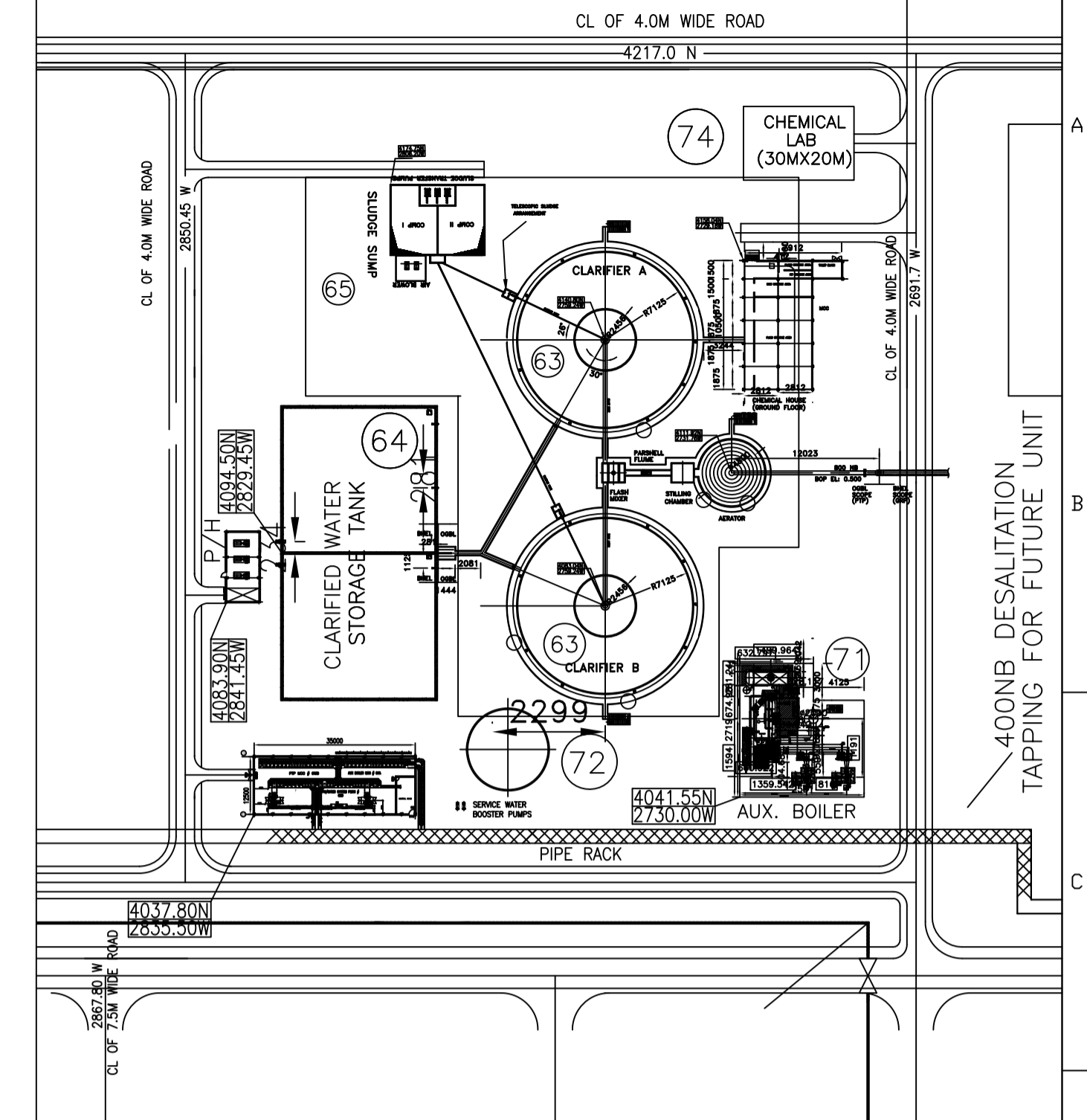
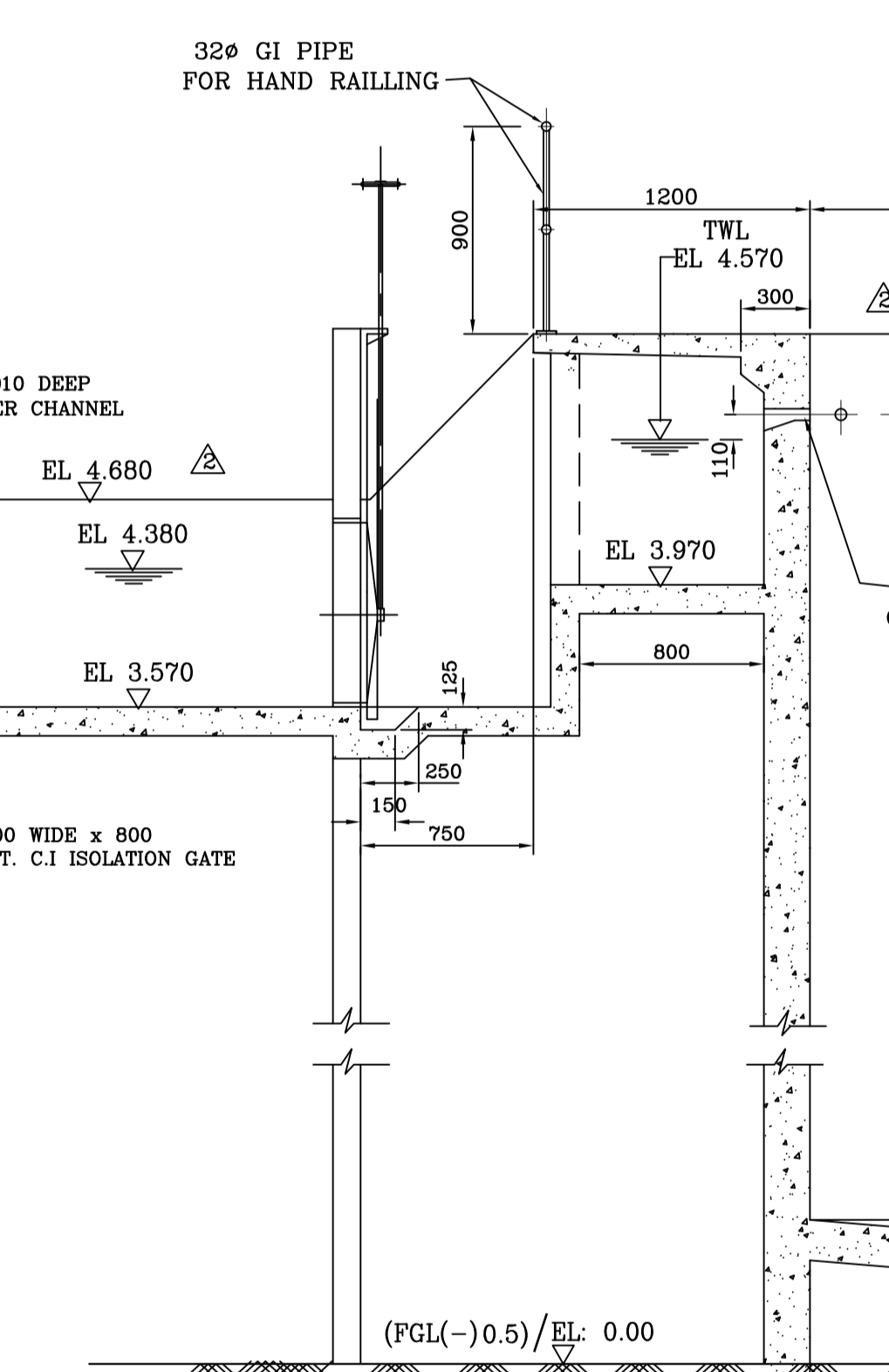
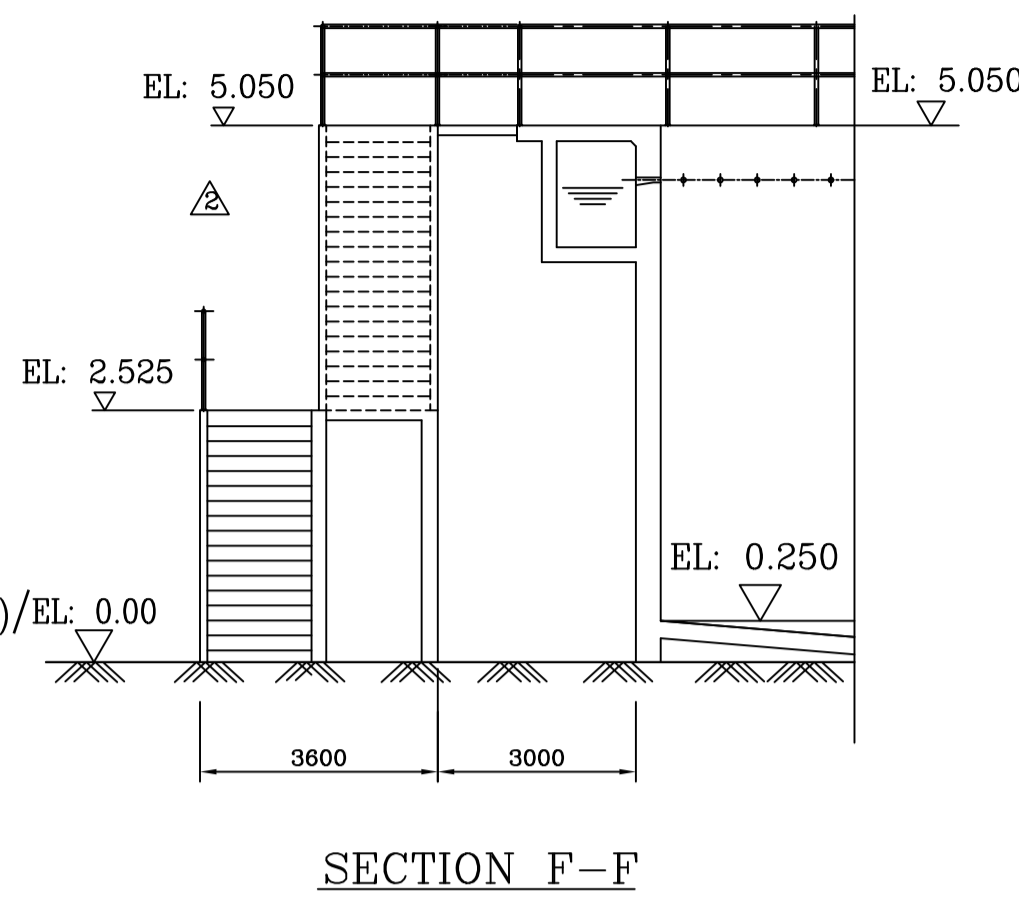
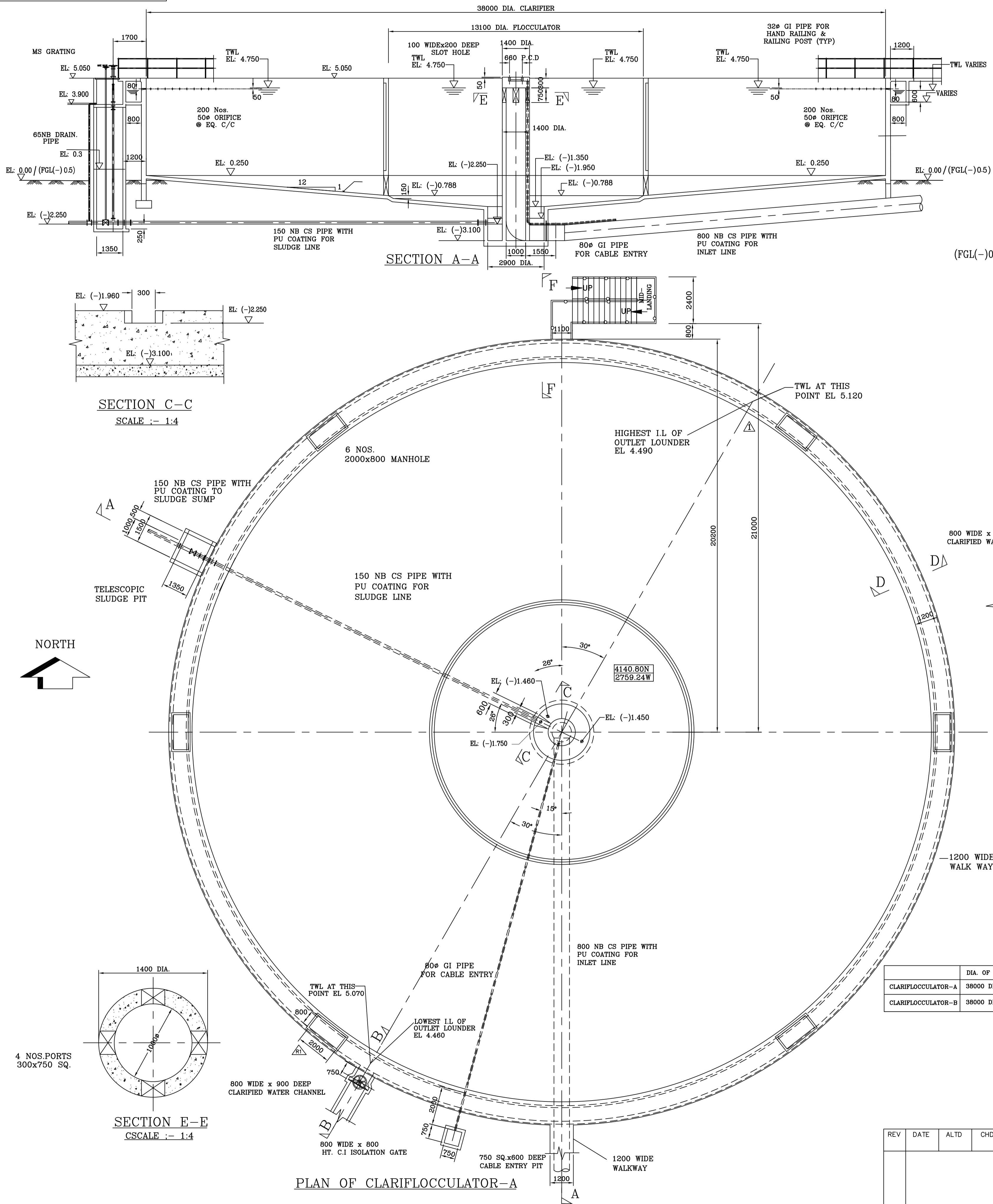
2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.	
TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)	
CONSULTANT: DESEIN PVT LTD, NEW DELHI.	
BHARAT HEAVY ELECTRICALS LTD POWER GROUP PROJECTS ENGINEERING MANAGEMENT NEW DELHI	
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135	DEPT CODE DRN FAISAL N FN 12-12-18 DESIGN FAISAL N FN 12-12-18 CHD MUAZZAM I MI 12-12-18 APPD ASLAM A AA 12-12-18
BHEL LOA NO: PW/PE/PG/EN1/P-310/17 TITLE MECH. G.A FOR CASCADE AERATOR, STILLING CHAMBER, FLASH MIXER AND PARSHALL FLUME FOR CLARIFIER	BHEL DOC NO. PE-V0-112-158-A028
DEPT. SCALE SIGN DATE	OGBL DOC NO. OGBL/OC-983/GA/ASFMPL/PTP/18/322 SHEET 1 OF 1 REV 0

JOB NO. 412	STATUS CONTRACT DISTRIBUTION
TO	
No.OFF	
REV	DATE ALTD CHD APPD

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD
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- NOTES:-**
- ALL DIMENSIONS ARE IN MM & LEVELS ARE IN METER UNLESS OTHERWISE STATED.
 - THIS DRAWING IS PREPARED BASED ON HYDRAULIC DIAGRAM (BHEL DRG. NO. PE-V0-412-158-A003)
 - INVERT LEVEL OF VARIOUS CHANNELS HAS BEEN INDICATED IN THE DIAGRAM. WHEREVER FEASIBLE, OTHER LEVELS SHALL BE INDICATED IN THE RESPECTIVE G.A DRAWING OF VARIOUS UNITS/STRUCTURES.
 - FOR SIZING & LOCATION OF GATES/VALVES PL. REFER P&ID. OF PRE-TREATMENT PLANT (BHEL DRG. NO. PE-V0-412-158-A001)
 - THE DETAILS OF CLARIFLOCCULATOR-A HAS BEEN SHOWN IN THIS DRAWING. DIMENSIONS AND LEVELS OF CLARIFLOCCULATOR-B WILL BE SAME AS CLF-A. THE LOCATION & ORIENTATION OF CLF-A AND CLF-B HAVE BEEN INDICATED IN KEY PLAN.
 - EL. 0.0M CORRESPONDS TO FGL(-) 0.5/RL-9.5M.

	DIA. OF CLF.	SWD	F.B	DIA. OF FLOCC.	STATIC LOAD (MT)	DYNAMIC LOAD (MT)	FLOCCULATOR DRIVE (KW)	END CARRIAGE DRIVE (KW)
CLARIFLOCCULATOR-A	38000 DIA.	4500	300	13100 DIA.	X	X	4x0.37	0.75
CLARIFLOCCULATOR-B	38000 DIA.	4500	300	13100 DIA.	X	X	4x0.37	0.75

JOB NO. 412
STATUS CONTRACT DISTRIBUTION

TO	NO.OFF	DATE	ALTD	CHD	APPD

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

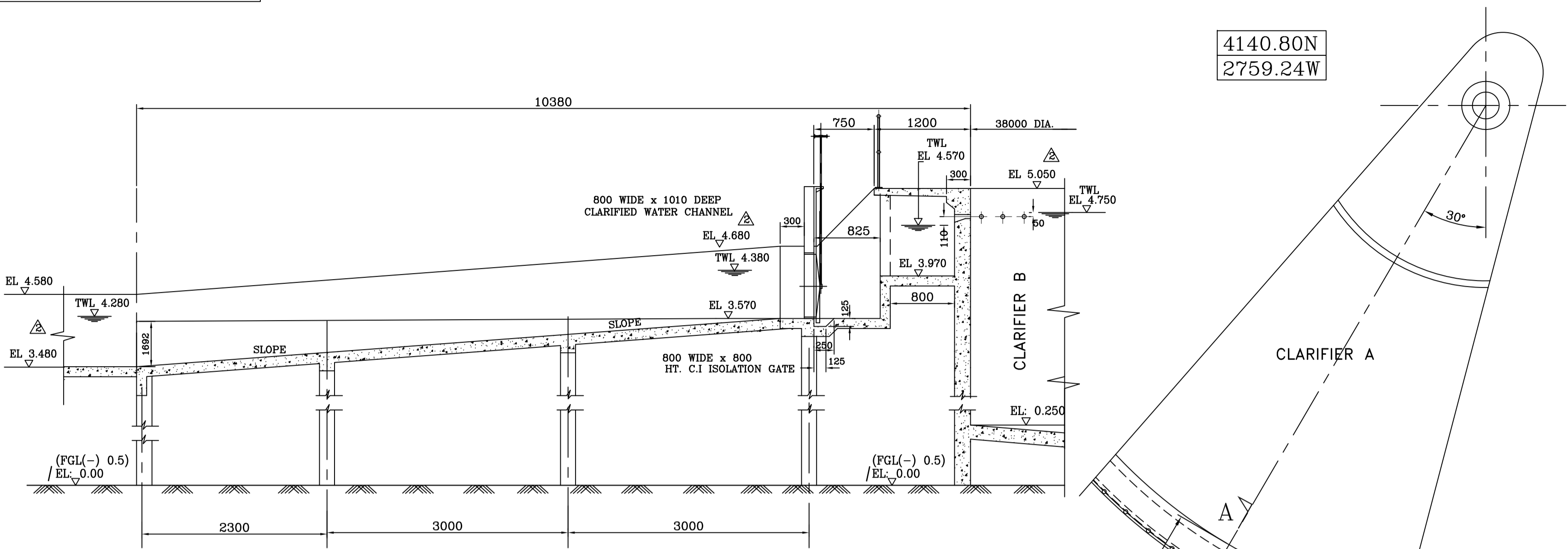
DEPT	NAME	SIGN	DATE
DRN	FAISAL N	FN	14-12-18
DES	FAISAL N	FN	14-12-18
CHD	MUAZZAM I	MI	14-12-18
APPD	ASLAM A	AA	14-12-18

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

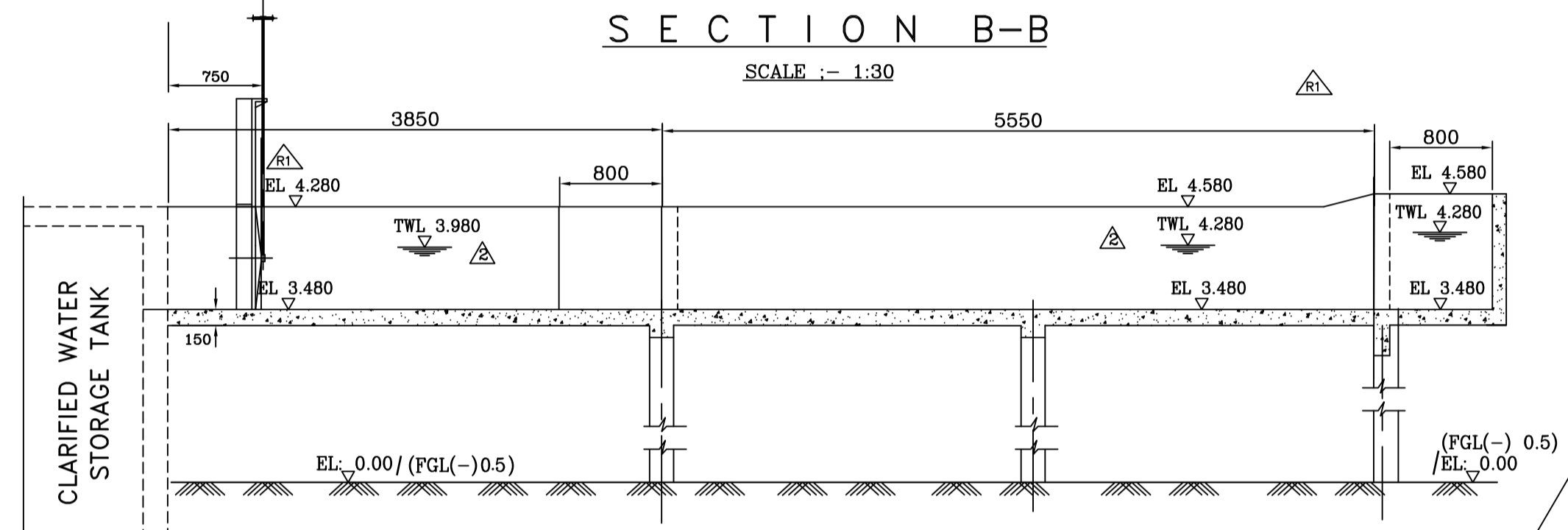
BHEL LOA NO: PW/PE/PG/EN1/P-310/17
TITLE: MECH. GA FOR CLARIFIER & CONNECTING CHANNEL
BHEL DOC NO. PE-V0-412-158-A030

DEPT. SCALE: 1:1
SIGN OGBL DOC NO. OGBL/OC-983/GA/CLA/PTP/18/323
DATE SHEET 1 OF 2 REV 02

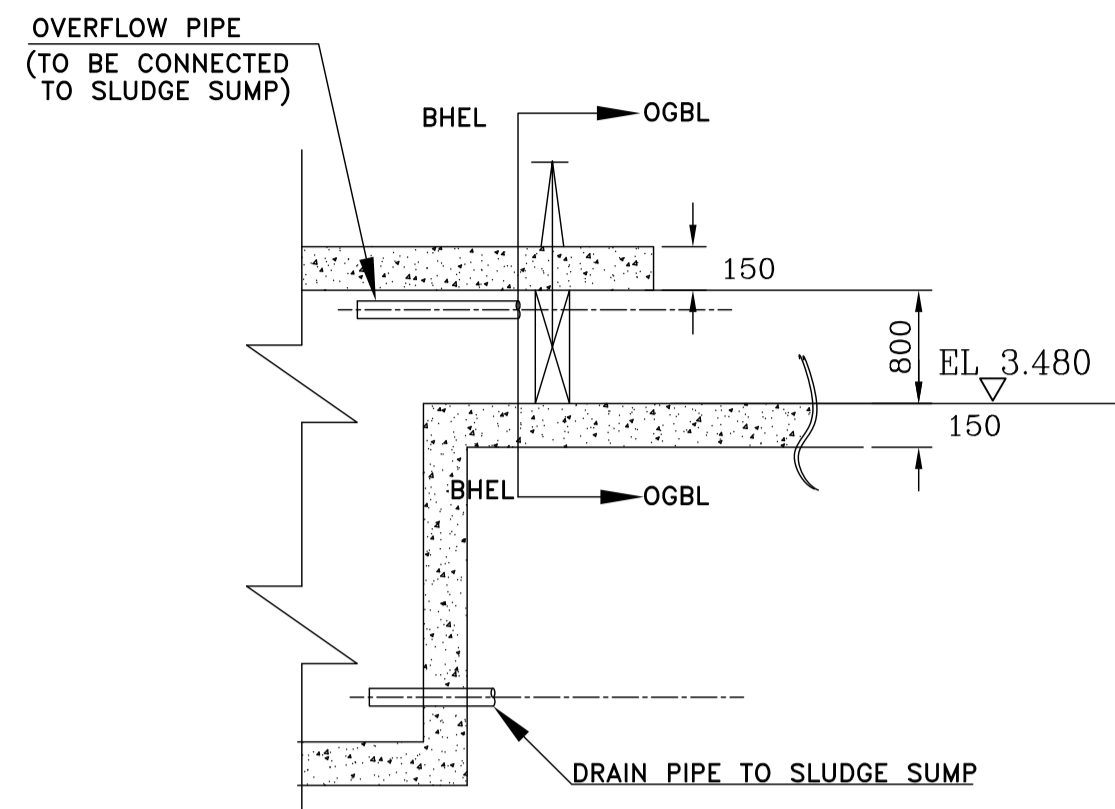
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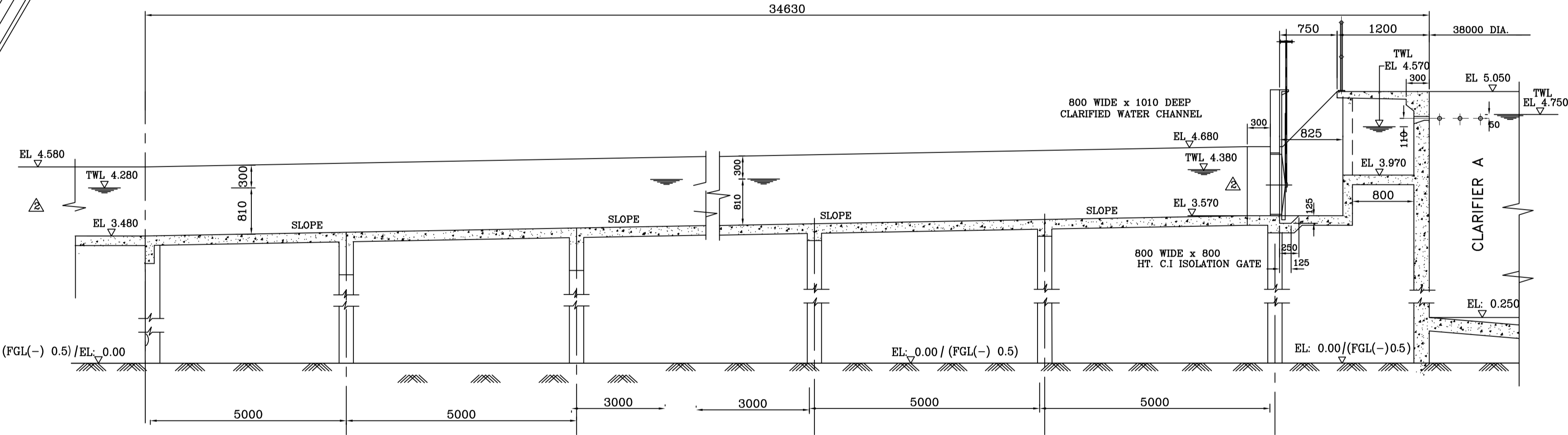
SECTION B-B
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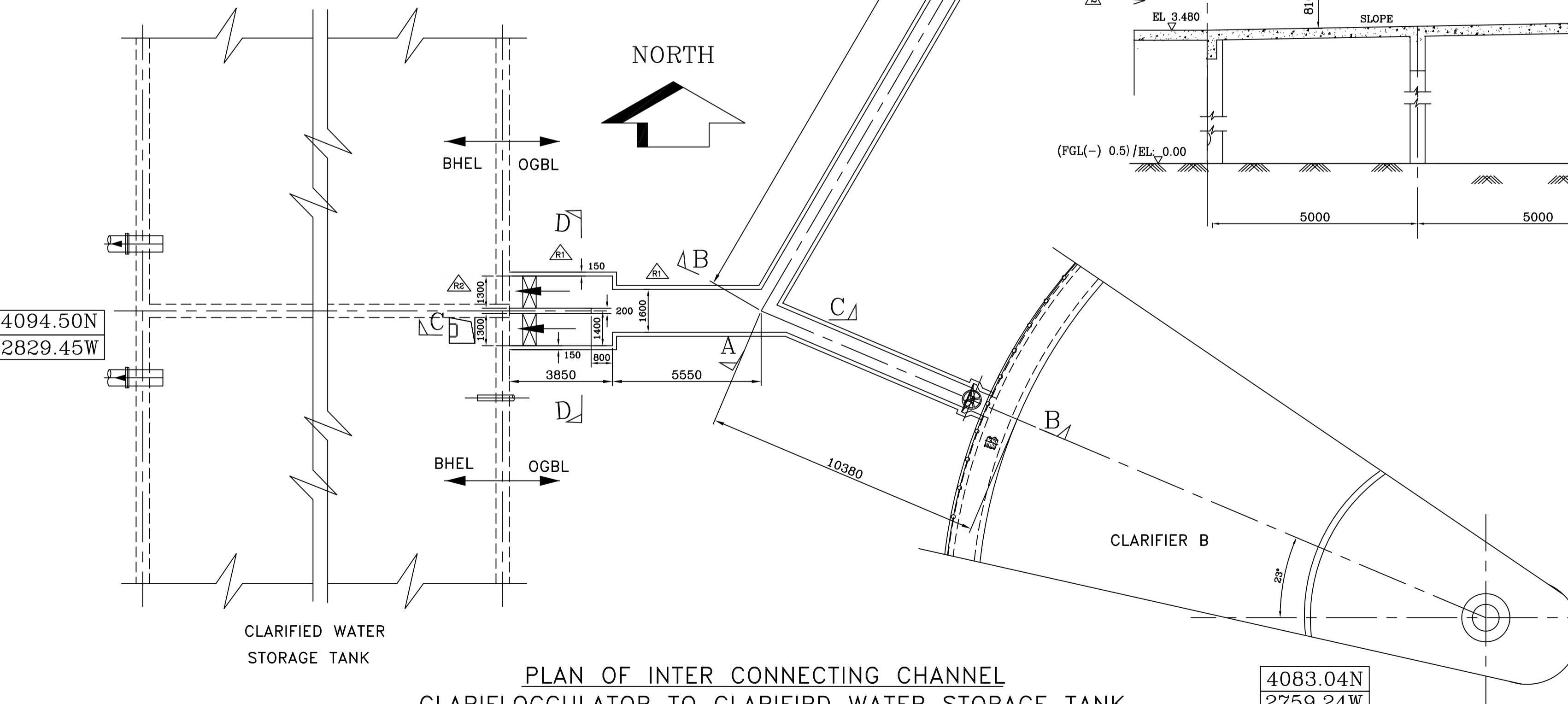
SECTION C-C
 SCALE :- 1:30



SECTION D-D



SECTION A-A
 SCALE :- 1:30



PLAN OF INTER CONNECTING CHANNEL
 CLARIFLOCCULATOR TO CLARIFIED WATER STORAGE TANK
 SCALE :- 1:100

1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METER UNLESS OTHERWISE STATED.
2. THIS DRAWING IS PREPARED BASED ON HYDRAULIC FLOW DIAGRAM (BHEL DRG. NO. PE-V0-412-158-A003)
3. INVERT LEVEL OF VARIOUS CHANNELS HAS BEEN INDICATED IN THE DIAGRAM. WHEREVER FEASIBLE. OTHER LEVELS SHALL BE INDICATED IN THE RESPECTIVE G.A DRAWING OF VARIOUS UNITS/STRUCTURES.
4. FOR SIZING & LOCATION OF GATES/VALVES PL REFER P&ID. OF PRE-TREATMENT PLANT (BHEL DRG. NO. PE-V0-412-158-A001)
5. THE DETAILS OF CLARIFLOCCULATOR-A HAS BEEN SHOWN IN THIS DRAWING. DIMENSIONS AND LEVELS OF CLARIFLOCCULATOR-B WILL BE SAME AS CLF.-1. THE LOCATION & ORIENTATION OF CLF.-A AND CLF.-B HAVE BEEN INDICATED IN KEY PLAN.
6. EL. 0.0M CORRESPONDS TO FGL(-) 0.5/RL-9.5M.

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
 POWER GROUP
 PROJECTS ENGINEERING MANAGEMENT
 NEW DELHI

DEPT	NAME	SIGN	DATE
DRN	FAISAL N FN		14-12-18
DESN	FAISAL N FN		14-12-18
CHD	MUAZZAM I MI		14-12-18
APPD	ASLAM A AA		14-12-18

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
 E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
 LOKHANDWALA LINK ROAD, ANDHERI WEST,
 MUMBAI 400 053. Tel No.022-26732135

BHEL LOA NO: PW/PE/PG/EN1/P-310/17
 TITLE: MECH. GA FOR CLARIFIER & CONNECTING CHANNEL

BHEL DOC NO. PE-V0-412-158-A003

DEPT. SCALE 1:100
 SIGN OGBL/OC-983/HFDLC/PTP/18/302
 DATE SHEET 2 OF 2 REV 02

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD





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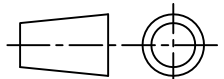
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REV	DATE	ALTERED:	REV	DATE	ALTERED:		
		CHECKED:			CHECKED:		
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STATUS : CONTRACT							
JOB NO.: 412							



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -
-------------	-----------	---	------------	-----------------	---------------	-----------

MECH. GA AND DATA SHEET FOR CLARIFIER BRIDGE MECHANISM		NAME	SIGN	DATE	
	PREP	FAISAL N	FN	08-01-19	
	CHKD	MUAZZAM I	MI	08-01-19	
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		APPD	ASLAM A	AA	08-01-19

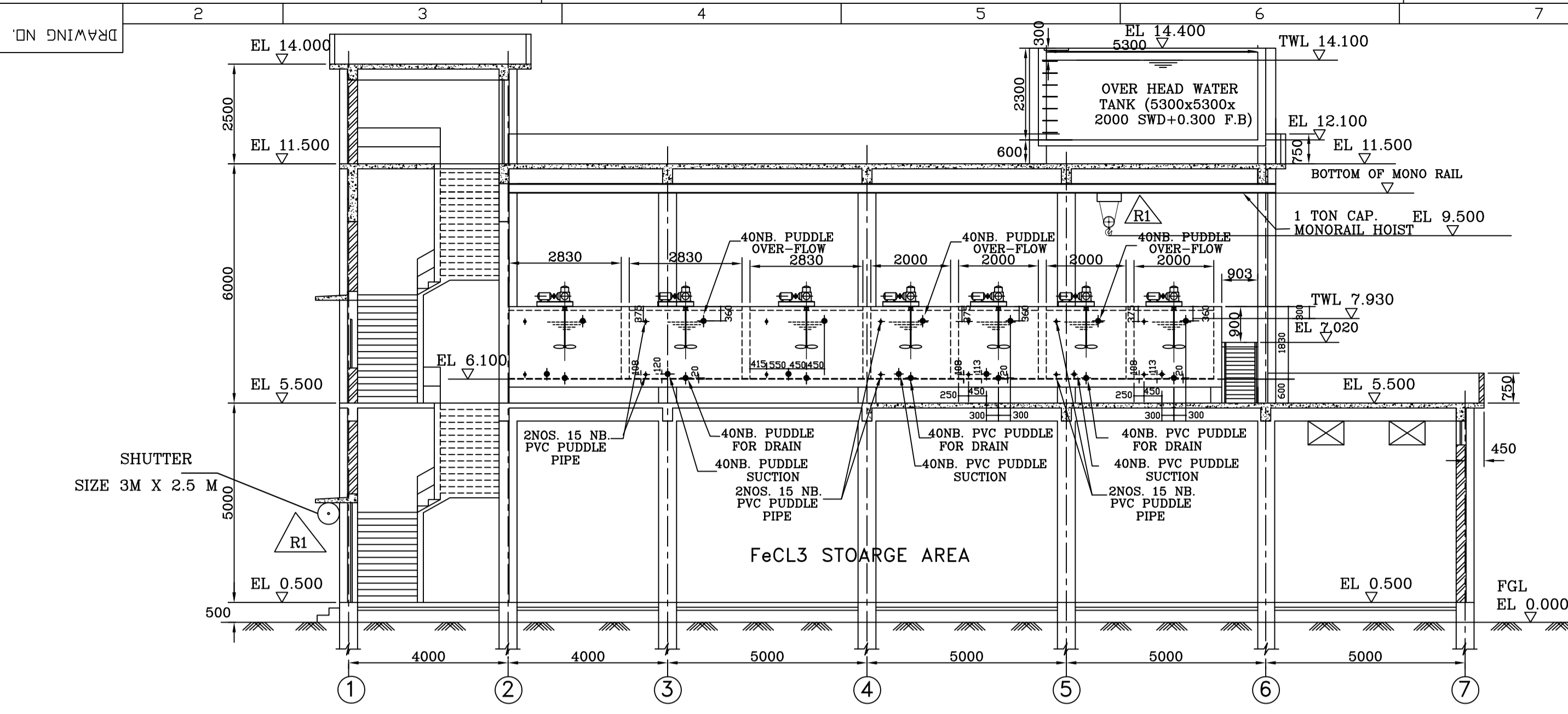
DEPT.					CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A033	REV 01
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/GA/CBM/PTP/18/324	
DATE						NO. OF SHEETS 3 EXCLUDING COVER PAGE	

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	Project Doc No.:	PE-V0-412-158-A033	Rev :	01
PROJECT	Pre Treatment Plant Ennore	OTOKLIN DOC NO:- OGBL/OC-983/GA/CBM/PTP/18/324			
		MADE BY	CHKD BY	APPD BY	
		FN	MI	AA	
Sr.no	Component /Parameter	UNIT	Supplier data		
1	Fluid		Sea Water		
2	Temperature	°C	Ambient		
3	Flow	m ³ /h	1160		
	Operating data				
4	Running time	h/d	continuous		
5	Diameter of Clarifier	m	38.00		
6	SWD	m	4.50		
7	Free Board	m	0.30		
8	Laundry Location		Outside		
9	Diameter of Flocculation Zone	m	13.10		
10	Water Depth of Flocculation Zone	m	4.50		
	Clariflocculator				
11	Type		Down flow		
12	Tank bottom slope	°	1:12		
13	Peripheral speed	m/min	3 to4 m/min		
14	Thickness of scrapper blade	mm	min 5.0		
15	Bridge Width	m	1.2		
16	No. of Rings of current collector		9		
17	Walkway	mm	Chequered plates (5mm)		
18	Rating of Drive Head of Motor & RPM		1.5 KW X 1440 rpm		
19	Telescopic Bleed Arrangement		Yes - 80mm dia each		
20	Steps to approach Clarifier Bridge		Yes		
	Flocculator				
21	No. of flocculator per Clarifier	nos	4		
22	Type of Flocculators		Paddle type		
	Base Frame		built on Bridge		
23	Motor KW & RPM	rpm	0.75 KW, 1440 rpm		
24	Gear Box Type		Flocc 'A' & End 'U' Type		
25	Gear Box Ratio		60:1 (R1)		
	Material of Construction				
26	Scrapper Assembly		MS FRP		
27	Walkway Bridge		MS+CORROCOAT/FRP RESIN LINING		
28	Centre Stilling Cage		MS FRP		
29	Central bearing housing		MS/CI		
30	Scraper blades		MS FRP		

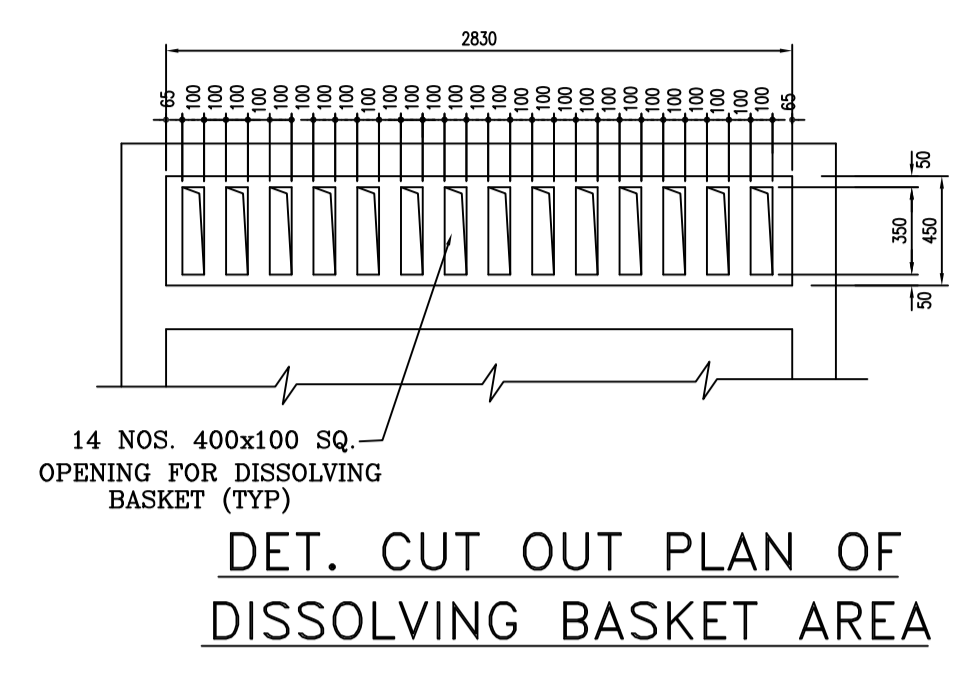


TECHNICAL DATASHEET OF CLARIFIER BRIDGE MECHANISM

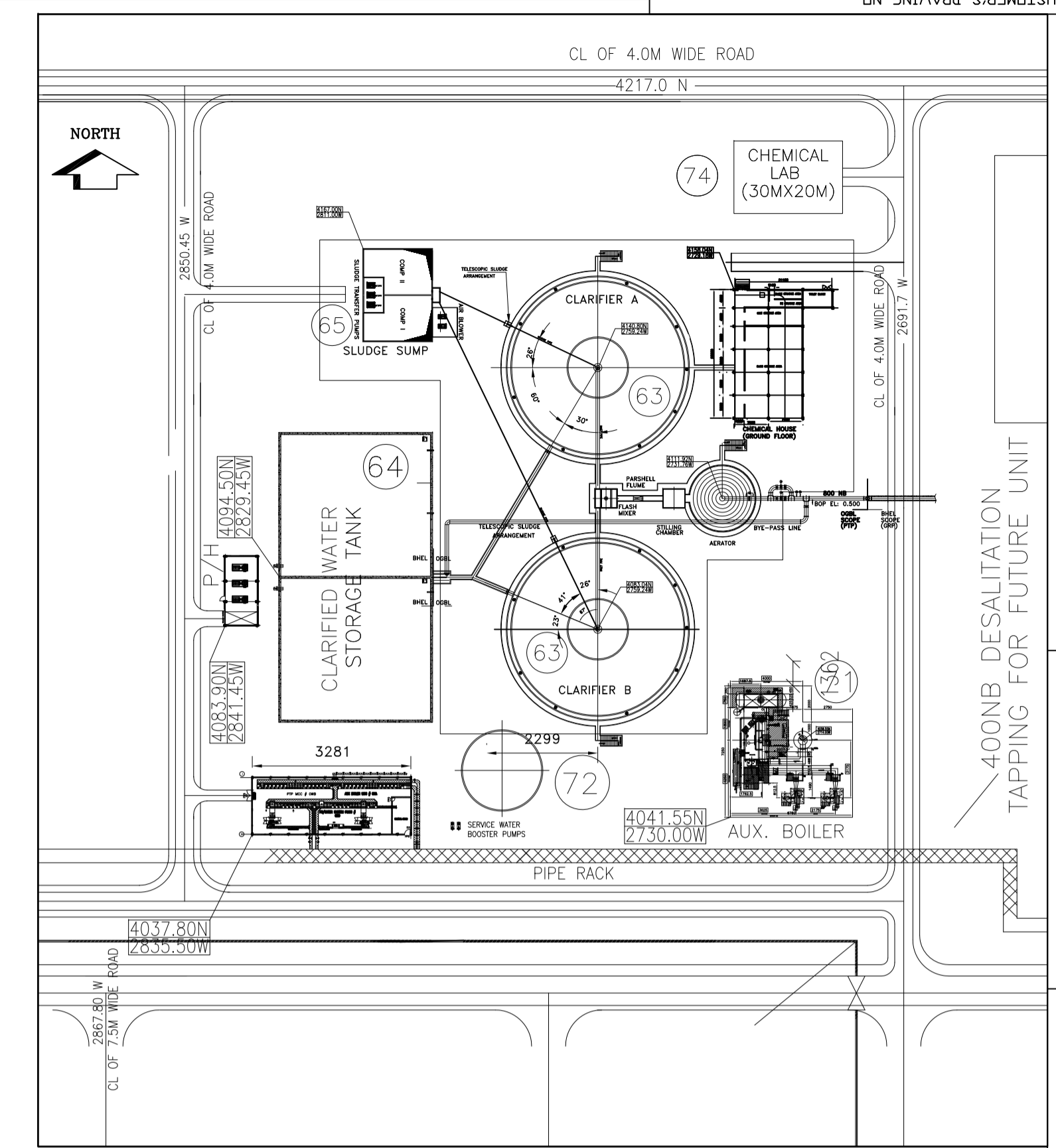
CLIENT	BHARAT HEAVY ELECTRICALS LTD.	Project Doc No.: PE-V0-412-158-A033	Rev : 01	
PROJECT	Pre Treatment Plant Ennore	OTOKLIN DOC NO:- OGBL/OC-983/GA/CBM/PTP/18/324		
		MADE BY	CHKD BY	APPD BY
		FN	MI	AA
31	Flocculator paddle		Duplex SS	
32	Hanger frame		MSFRP	
33	MOC of Squeezer		Natural Rubber (8-10mmthk)	
34	MOC of Wheel		CI with PU/Rubber Lining wheel	
35	Bolts and Nuts		SS316L (R1)	
	General			
36	Const bleed of Dia		CI 80 mm Dia	
37	Painting		As per Approved painting Specification	



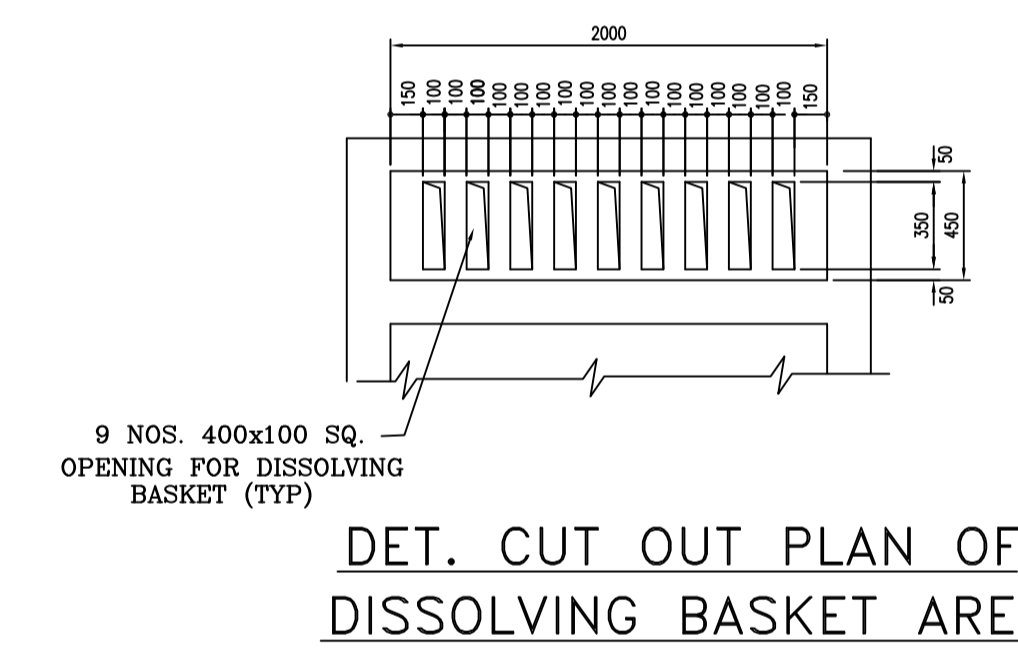
SECTION D-D



DET. CUT OUT PLAN OF DISSOLVING BASKET AREA



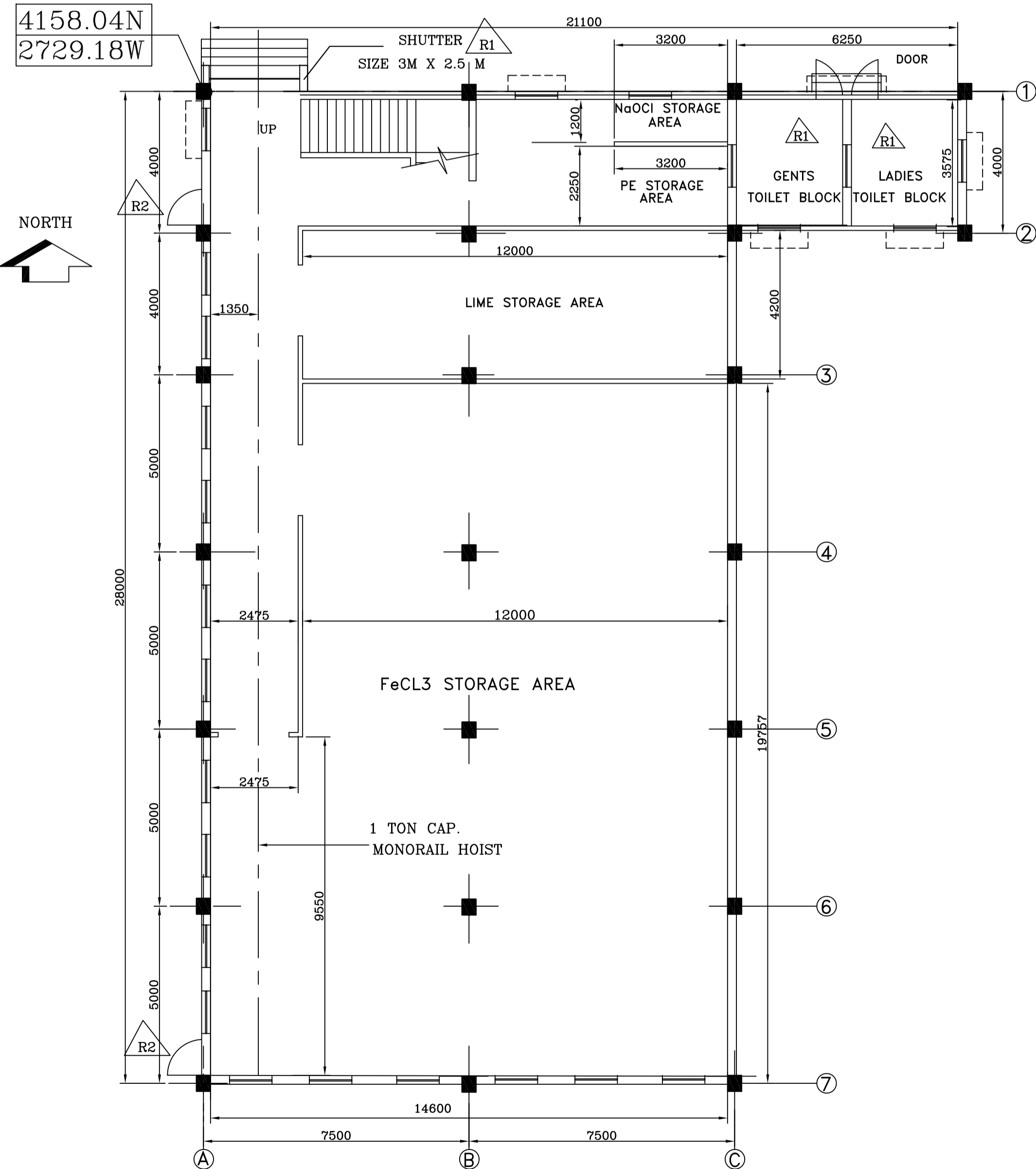
KEY PLAN



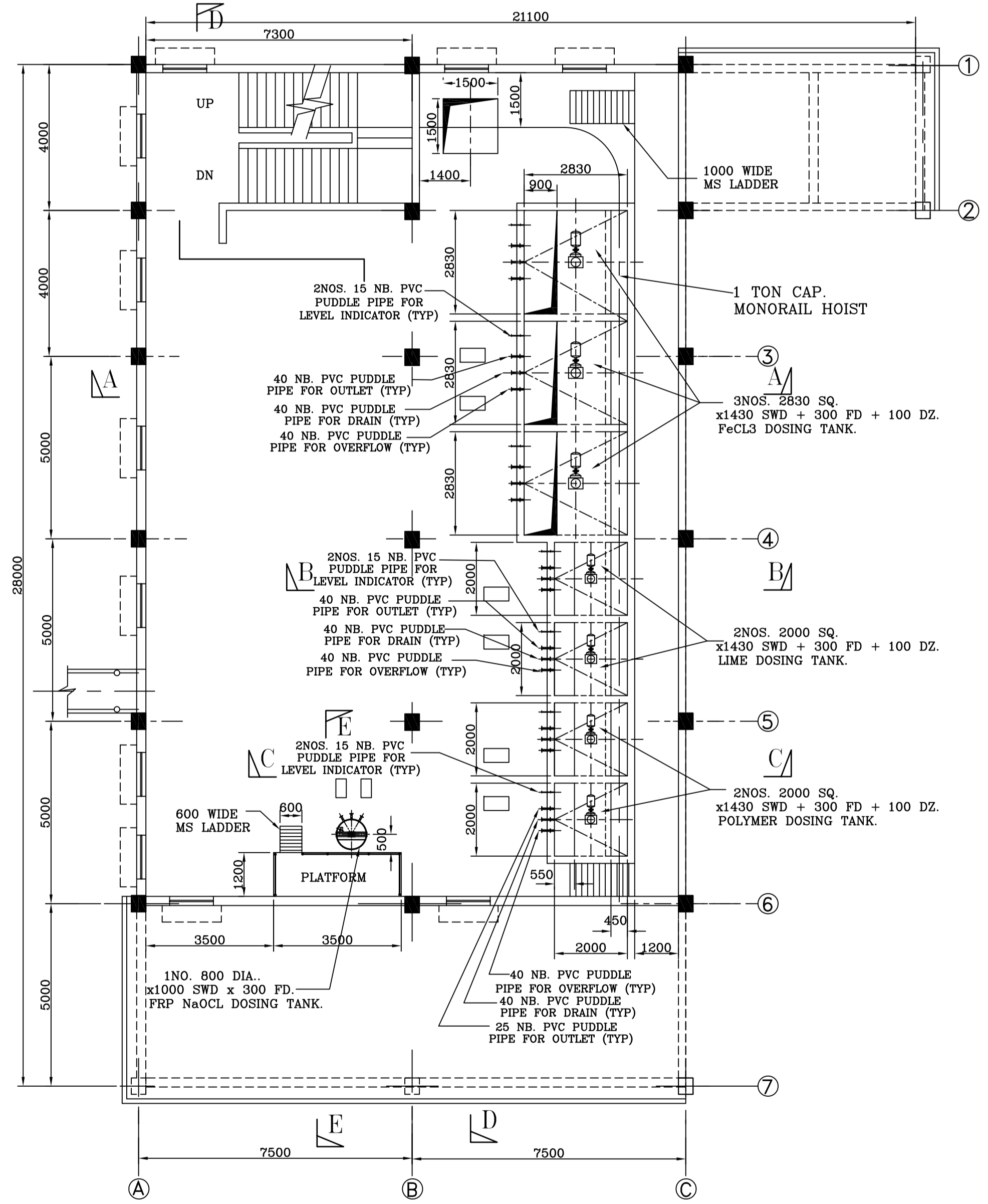
DET. CUT OUT PLAN OF DISSOLVING BASKET AREA

NOTE:-

1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METRE UNLESS OTHERWISE STATED.
2. DIMENSIONS OF COLUMN, COLUMN FOUNDATION, STAIR CASE, HANDRAILING ETC SHALL BE SHOWN IN CIVIL G.A. OF CHEMICAL HOUSE
3. PUDDLE PIPES & INSERT PLATE DETAIL SHALL BE SHOWN IN THE CIVIL DRAWING OF CHEMICAL HOUSE
4. ALL ELEVATIONS MARKED ARE W.R.T. TG HALL FINISHED FLOOR LEVEL AS 0.0M WHICH CORRESPONDS TO EL 10.0M.



PLAN OF CHEMICAL HOUSE (GROUND FLOOR)



PLAN OF CHEMICAL HOUSE (1st. FLOOR)

JOB NO. 412	STATUS CONTRACT DISTRIBUTION			
TO	NO OFF			
REV	DATE	ALTD	CHD	APPD

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE	NAME	SIGN	DATE
DRN	FAISAL N	FN	26-09-18
DESN	FAISAL N	FN	26-09-18
CHD	MUJAZZAM I	MI	26-09-18
APPD	ASLAM A	AA	26-09-18

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

TITLE: MECH. GA FOR CHEMICAL HOUSE INCLUDING ALL DOSING TANKS

BHEL DOC NO. PE-V0-412-158-A035

OGBL DOC NO. OGHL/OC-983/GA/CH/PTP/18/325

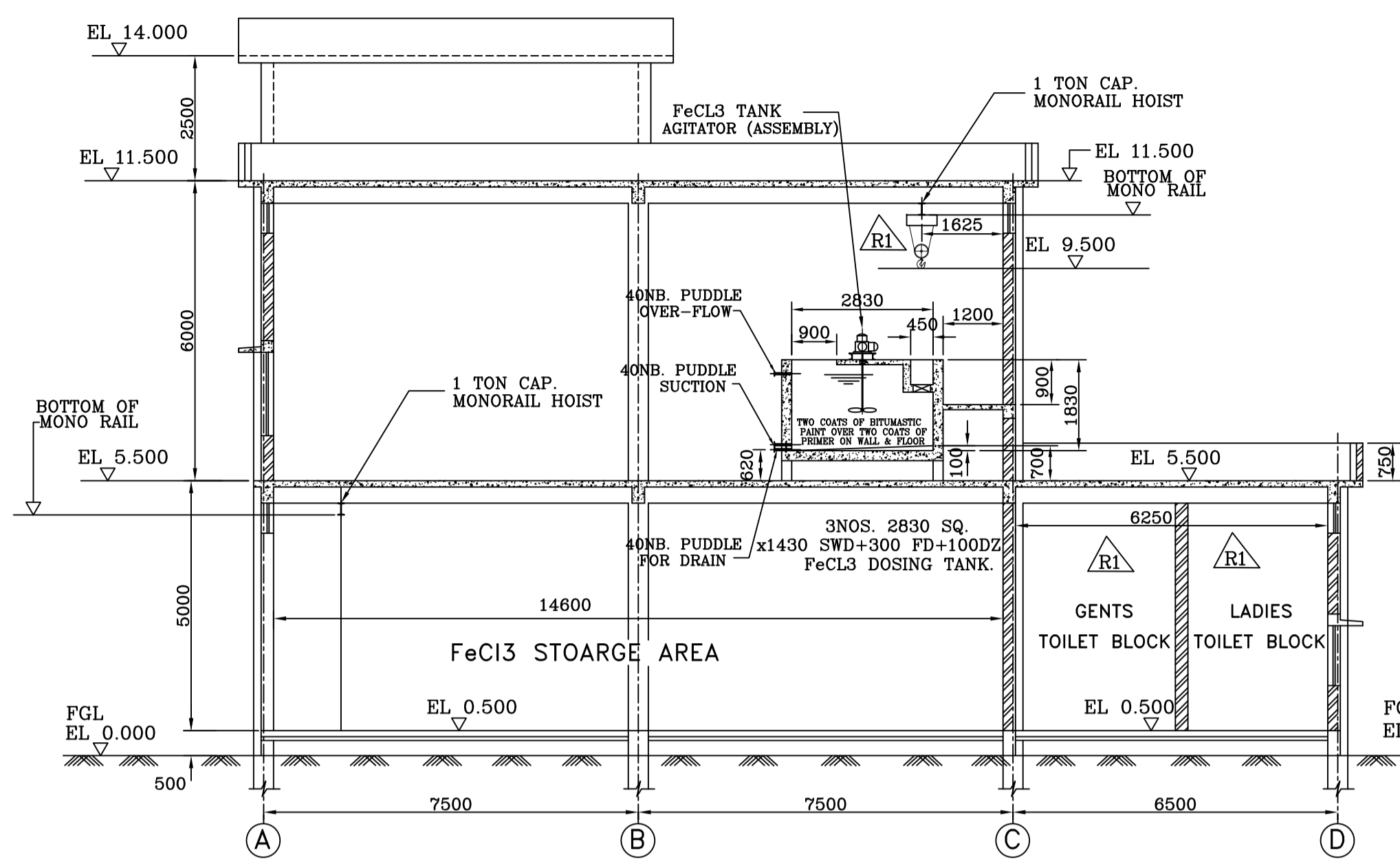
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SIGN

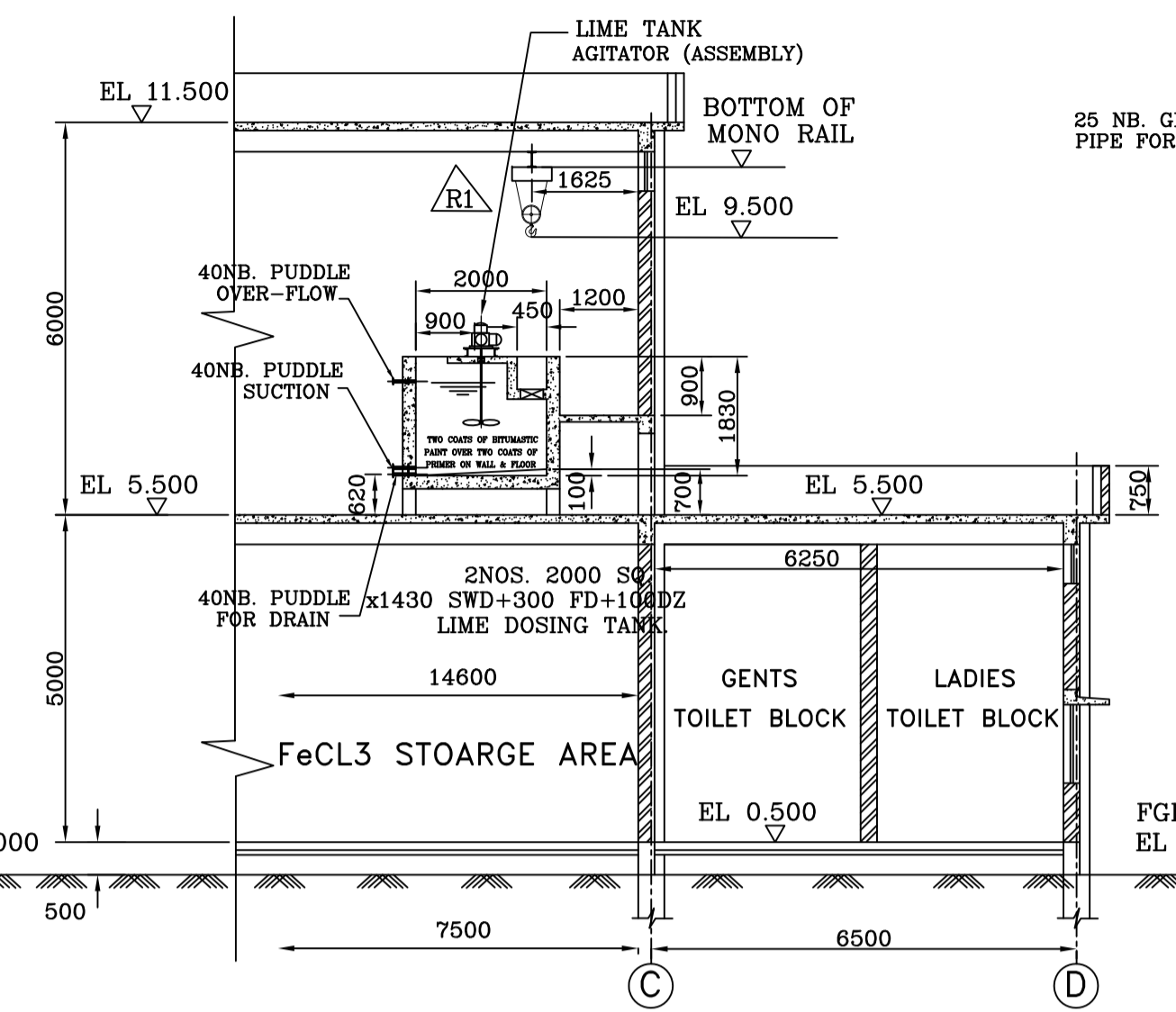
DATE

SHEET 1 OF 2 REV 02

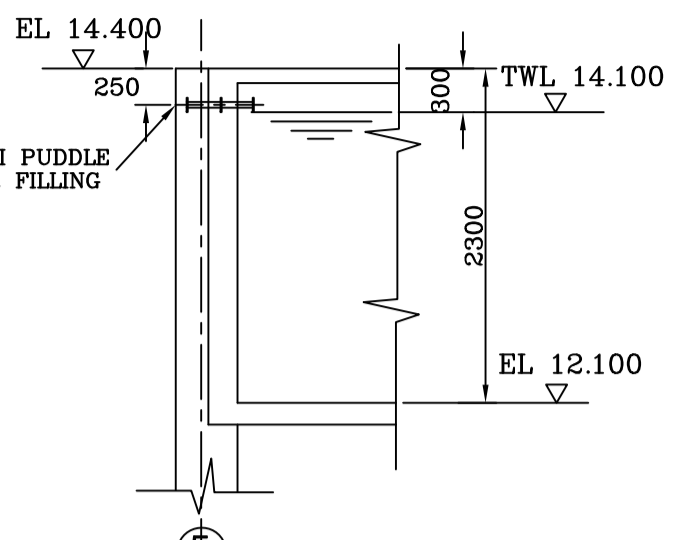
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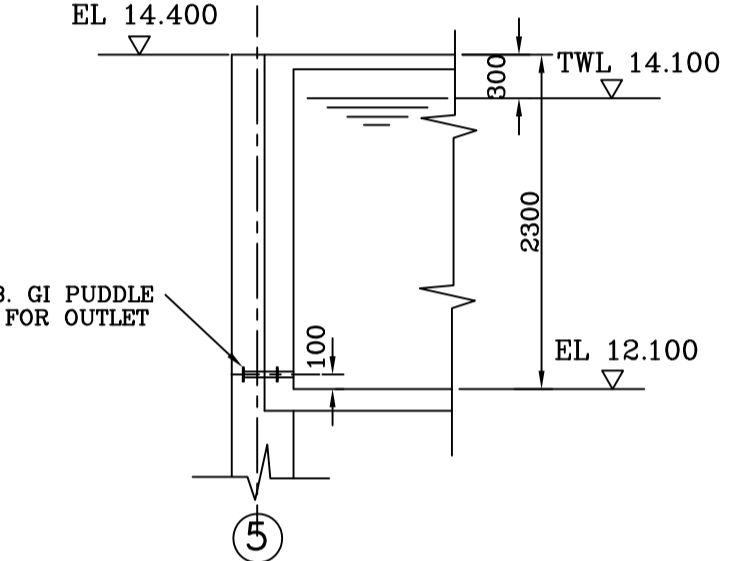
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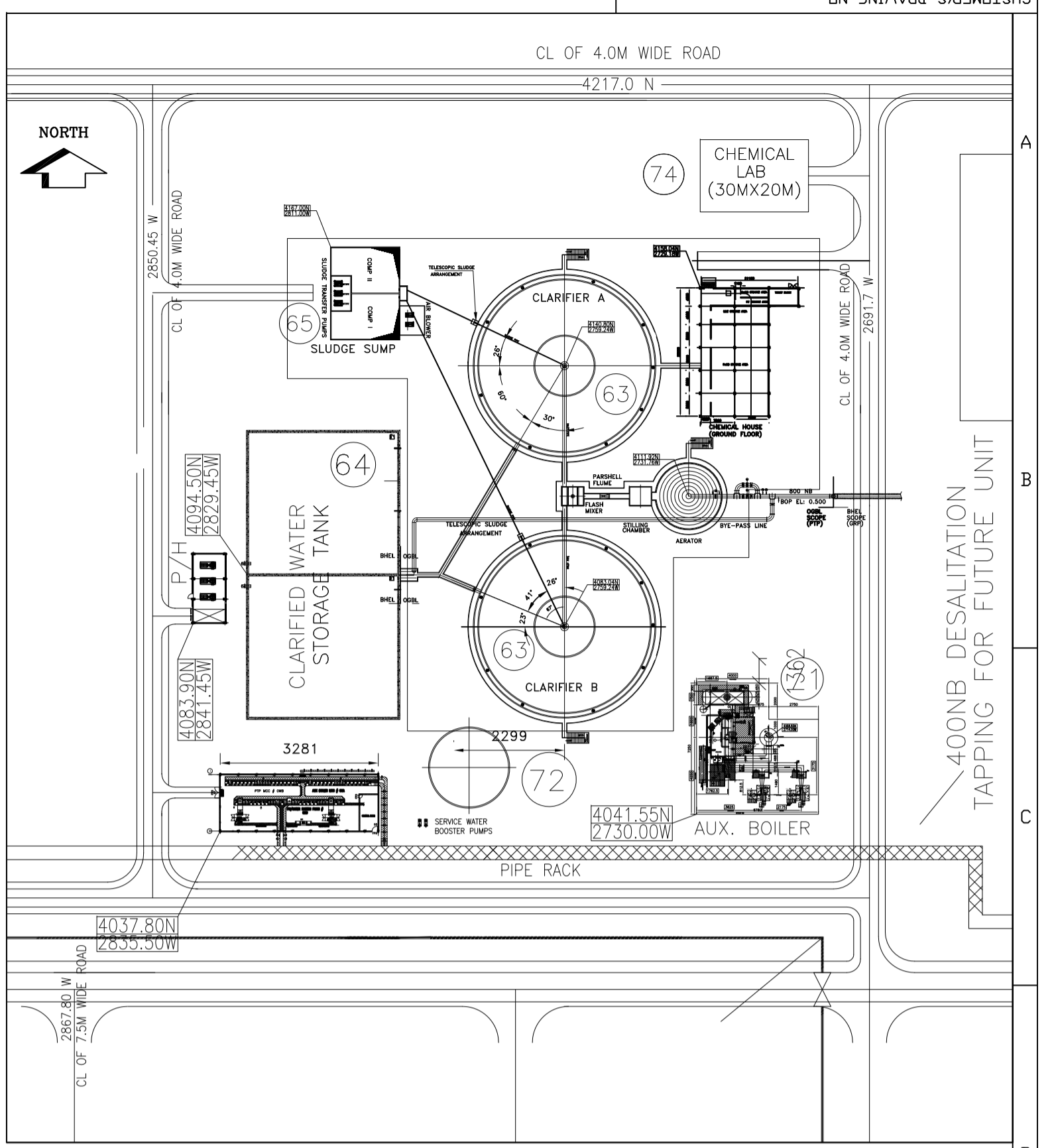
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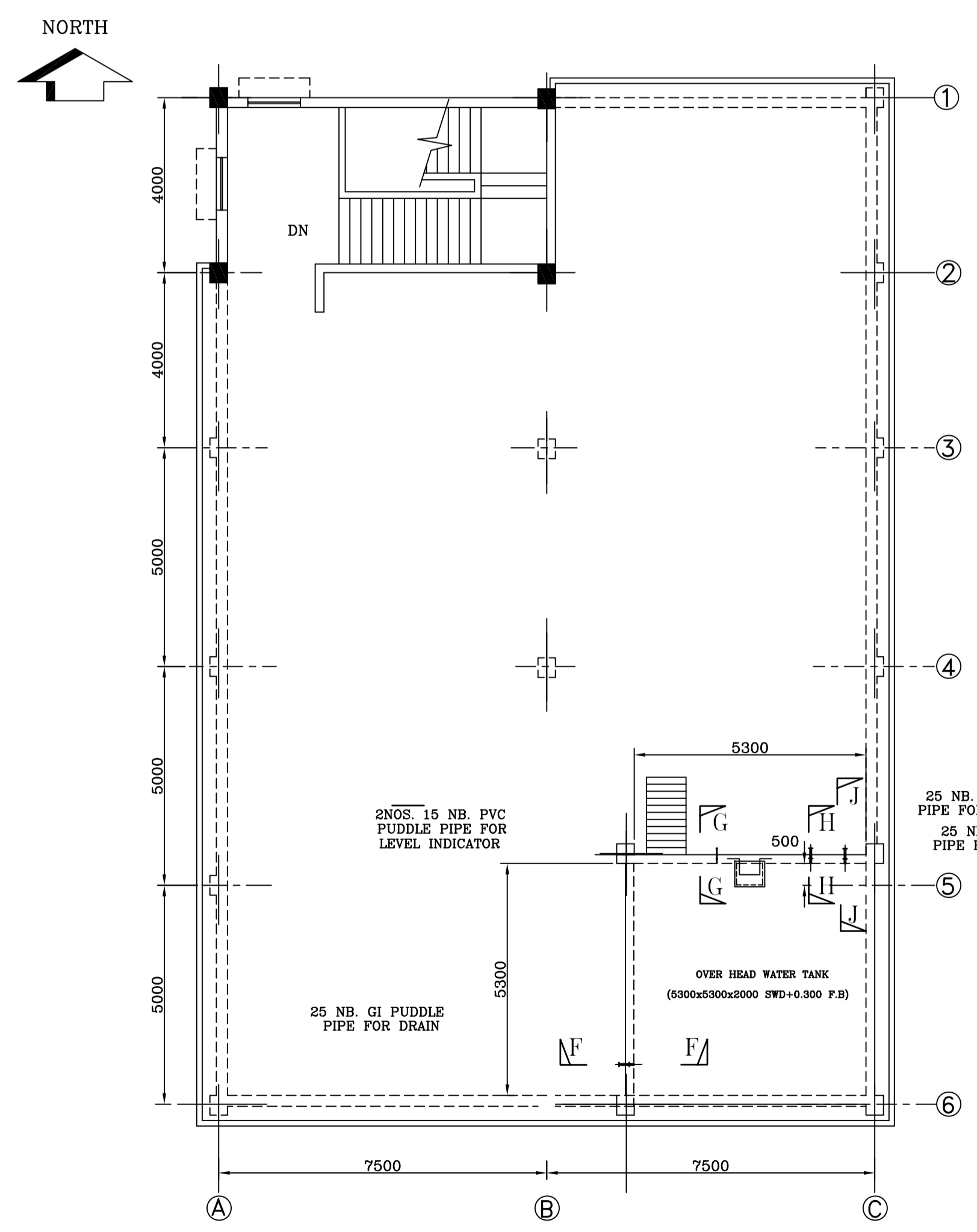
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SCALE :- 1:2



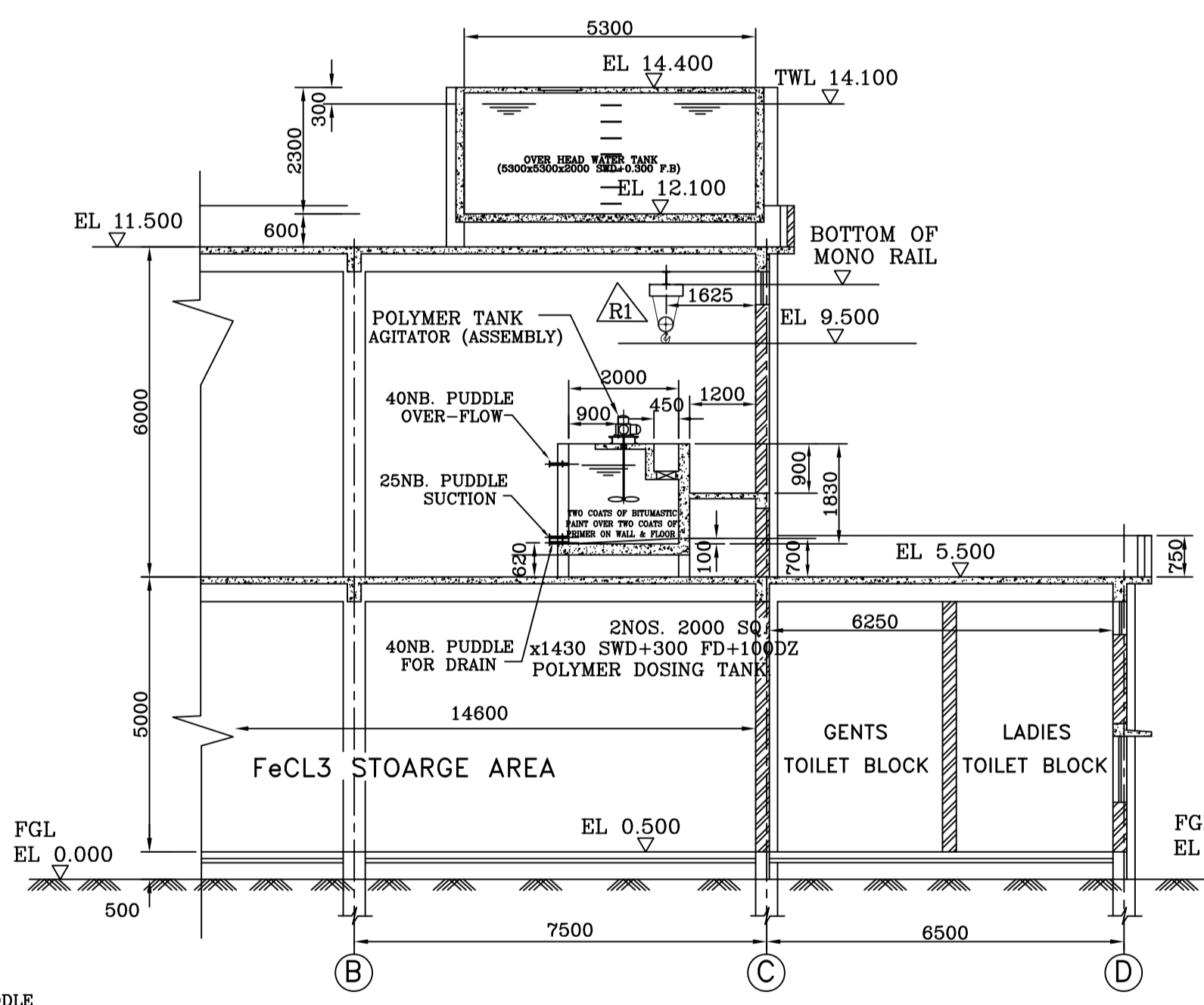
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SCALE :- 1:2



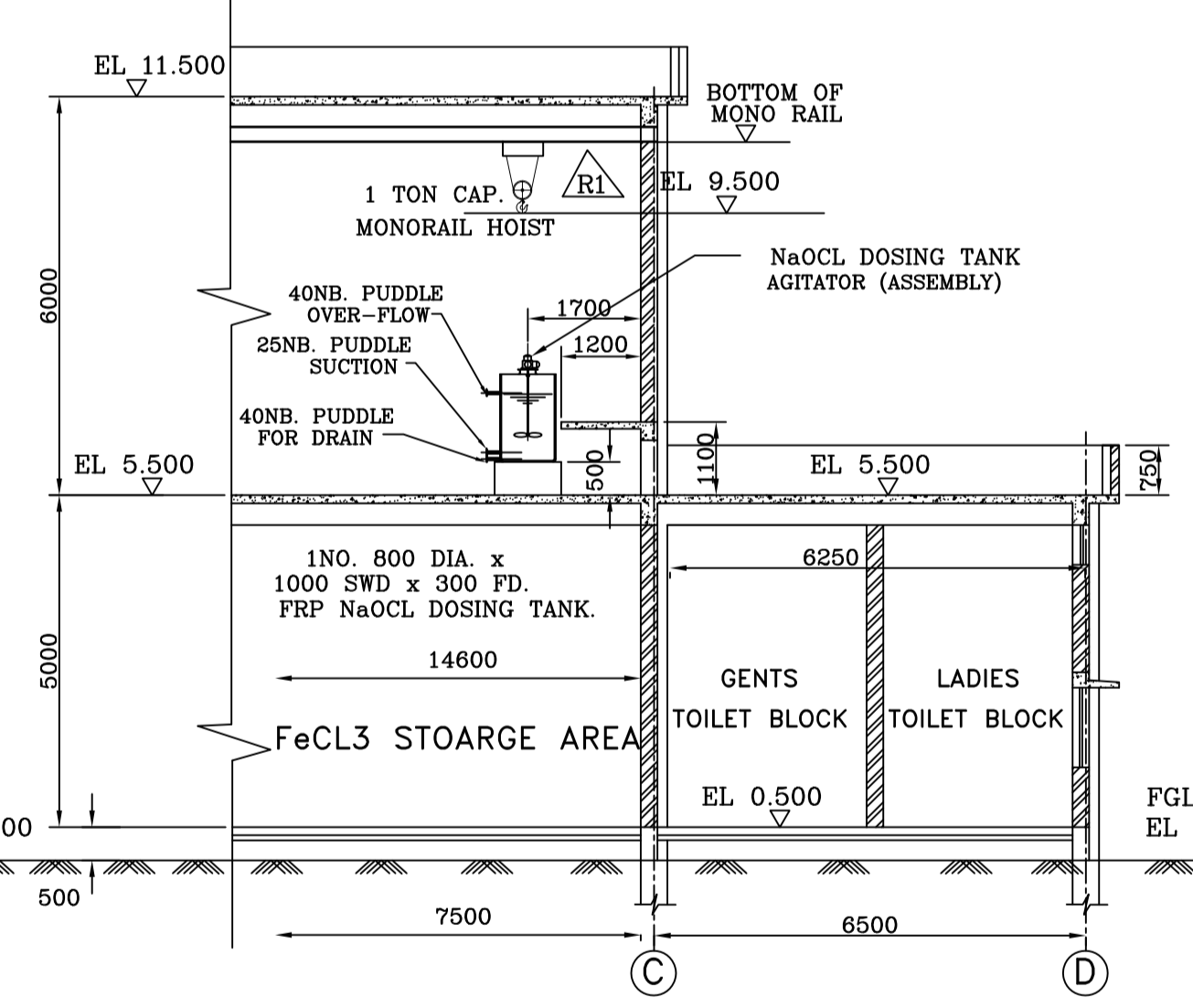
KEY PLAN



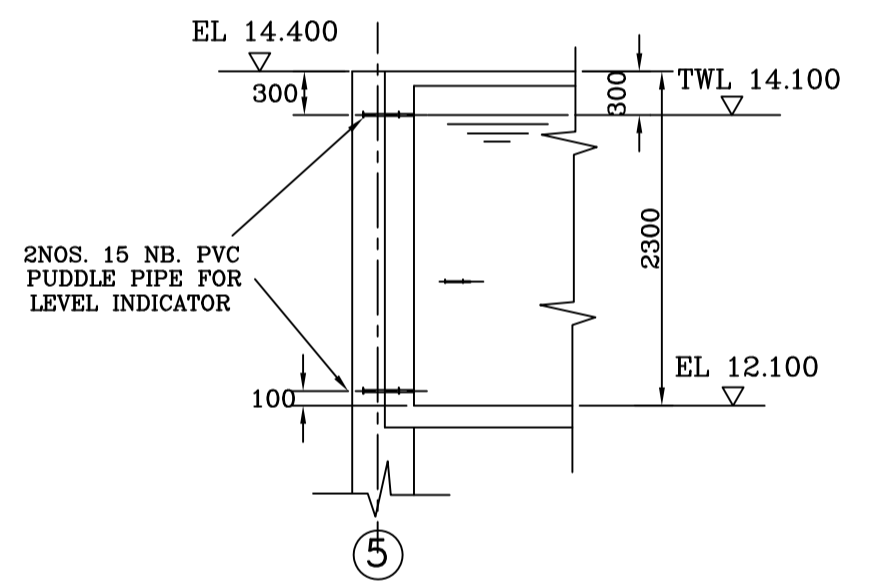
PLAN OF CHEMICAL HOUSE
(ROOF PLAN)



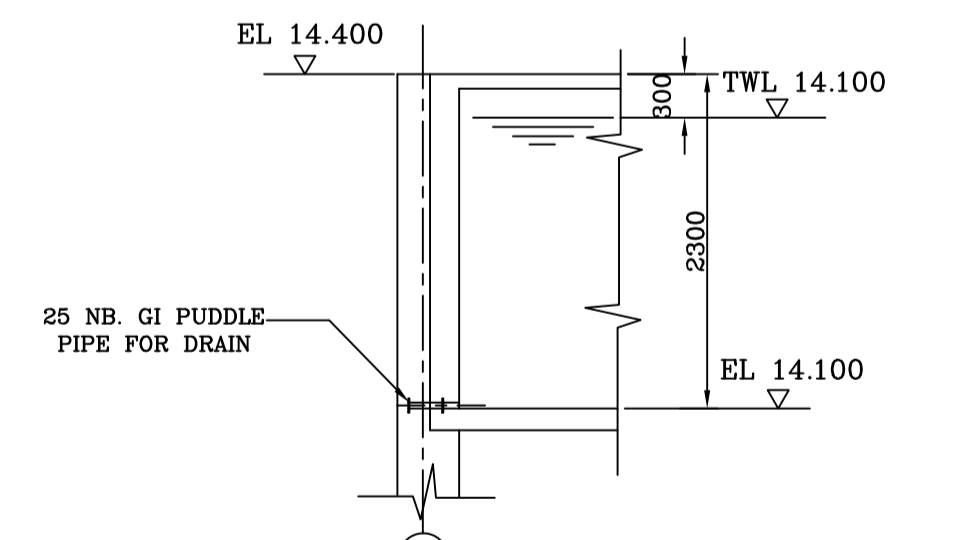
SECTION C-C



SECTION E-E



SECTION G-G
SCALE :- 1:2



SECTION F-F
SCALE :- 1:2

NOTE:-

1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METRE UNLESS OTHERWISE STATED.
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REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD

JOB NO.	412
STATUS	CONTRACT DISTRIBUTION
TO	
No.OFF	
REV	
DATE	
ALTD	
CHD	
APPO	

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

BHCL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018
TITLE: MECH. GA FOR CHEMICAL HOUSE INCLUDING ALL DOSING TANKS

DEPT. CODE: DRN FAISAL N FN
DESN FAISAL N FN
CHD MUAZZAM I MI
APPO ASLAM A AA

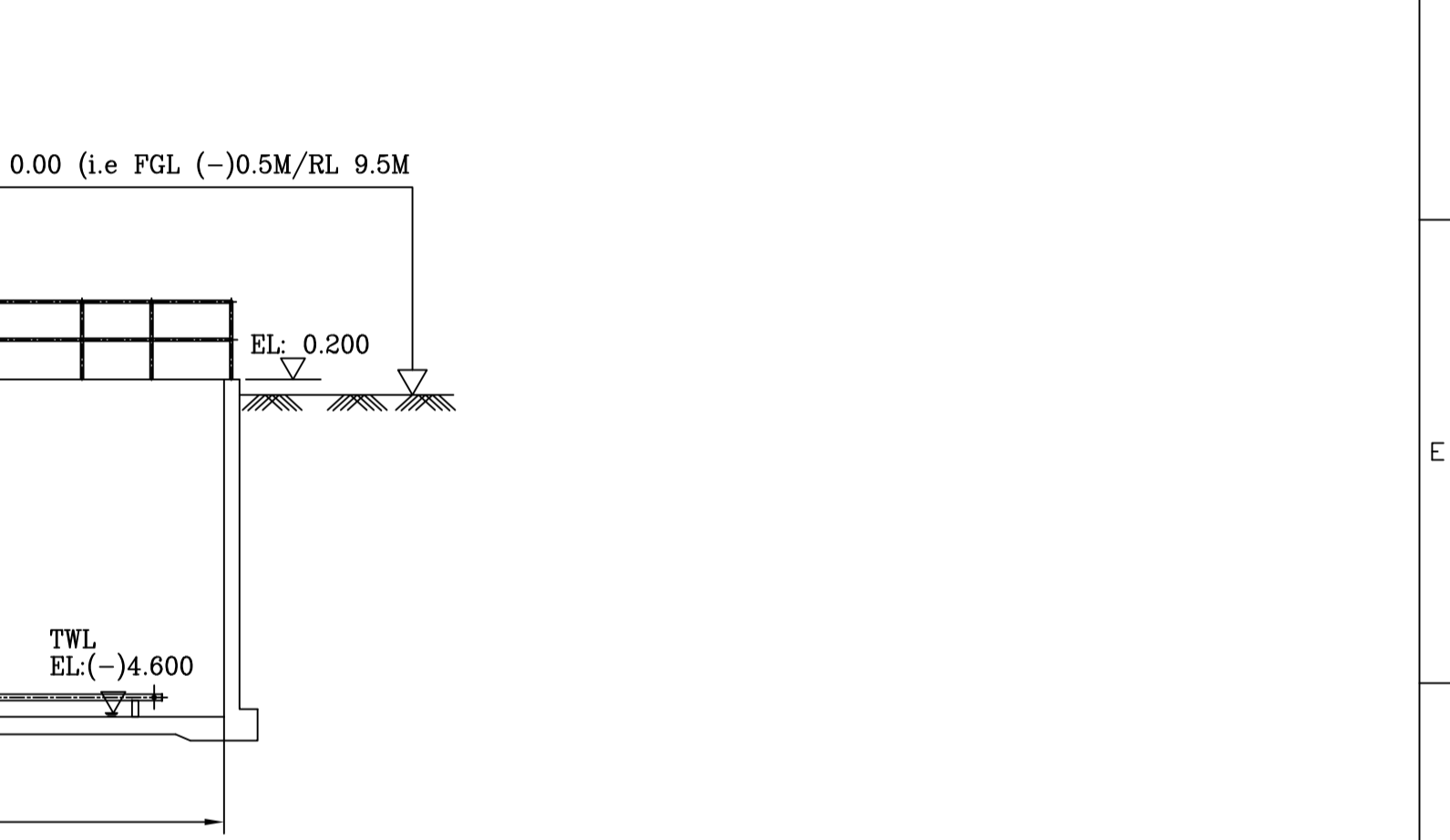
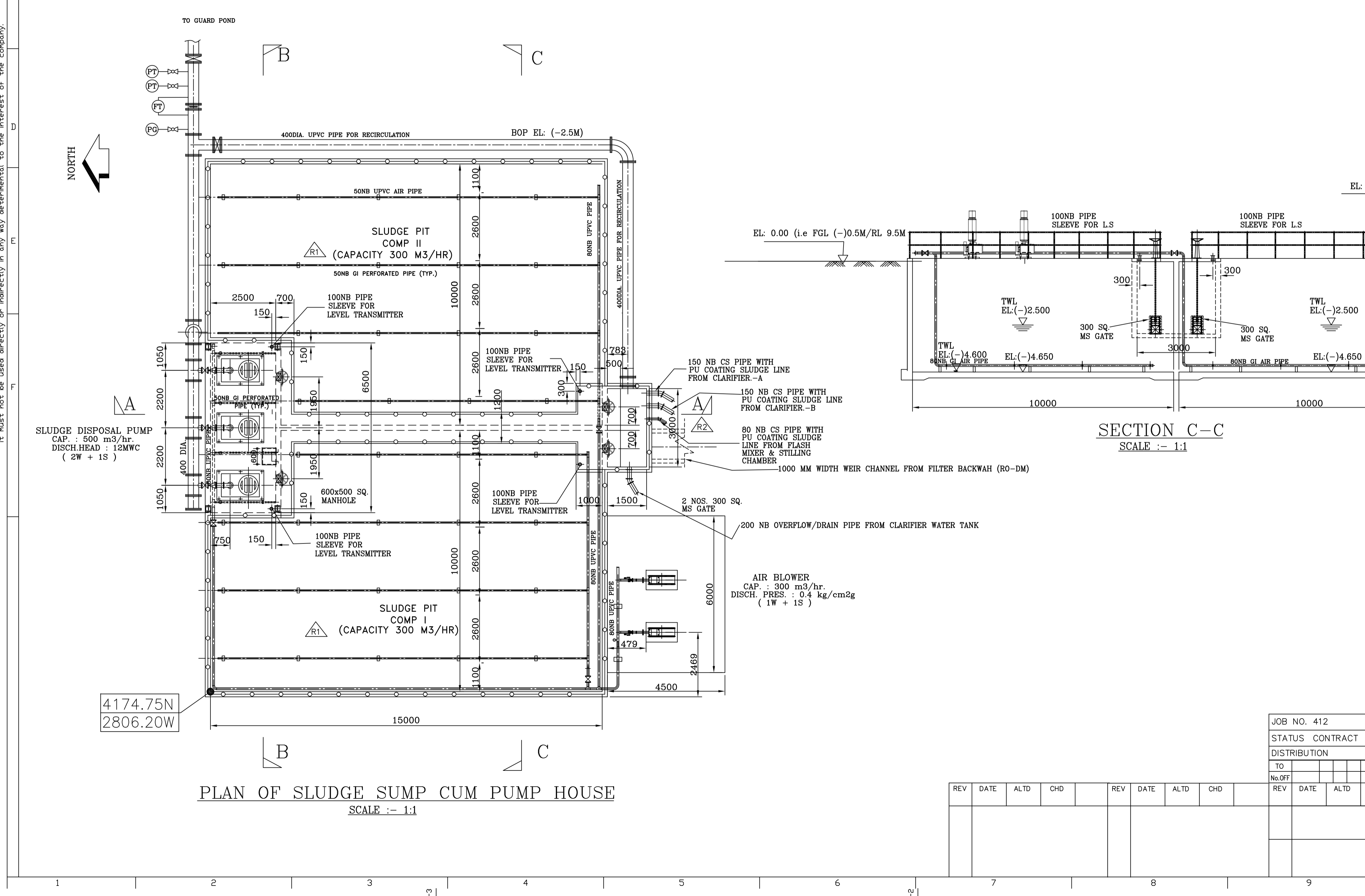
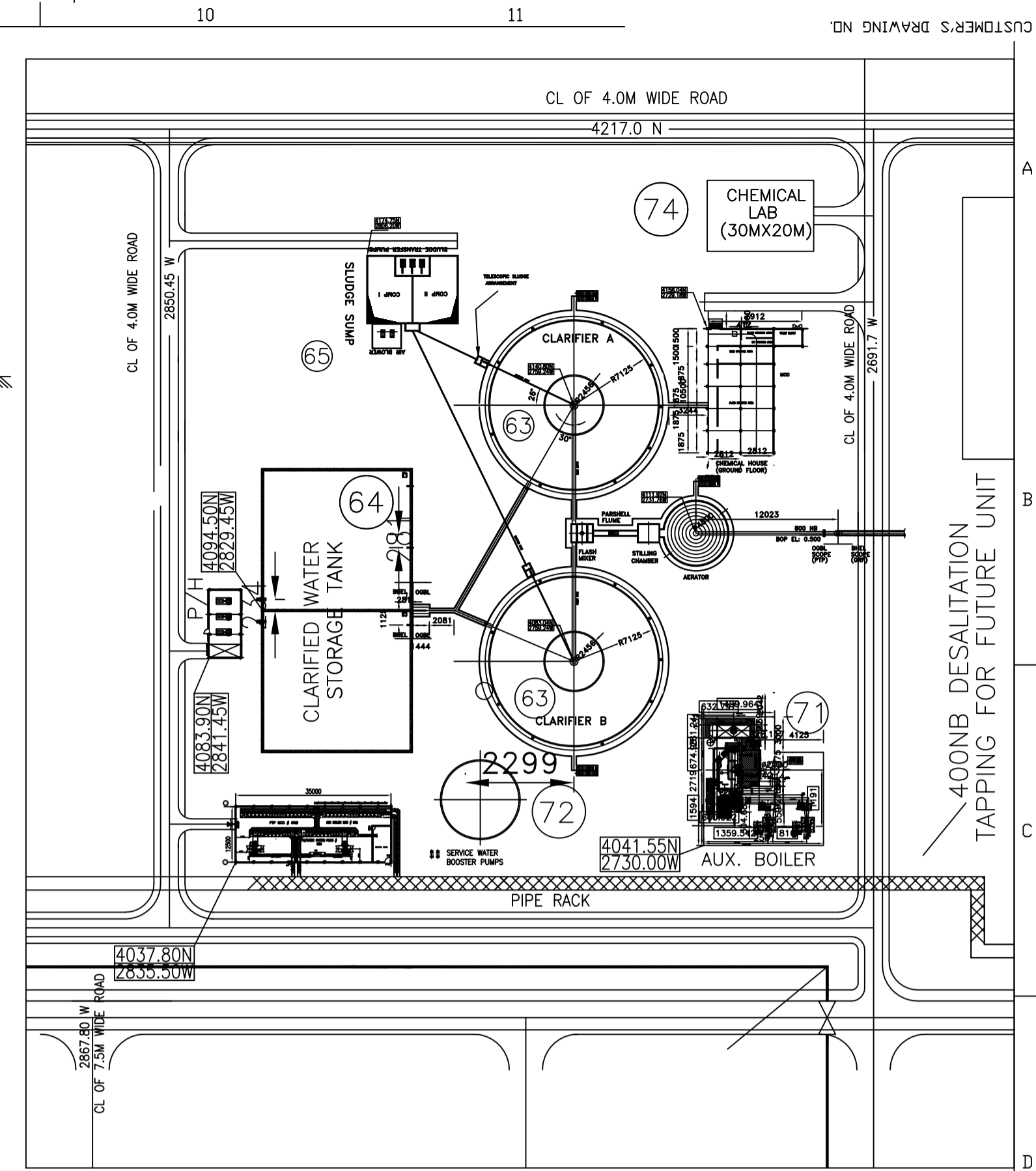
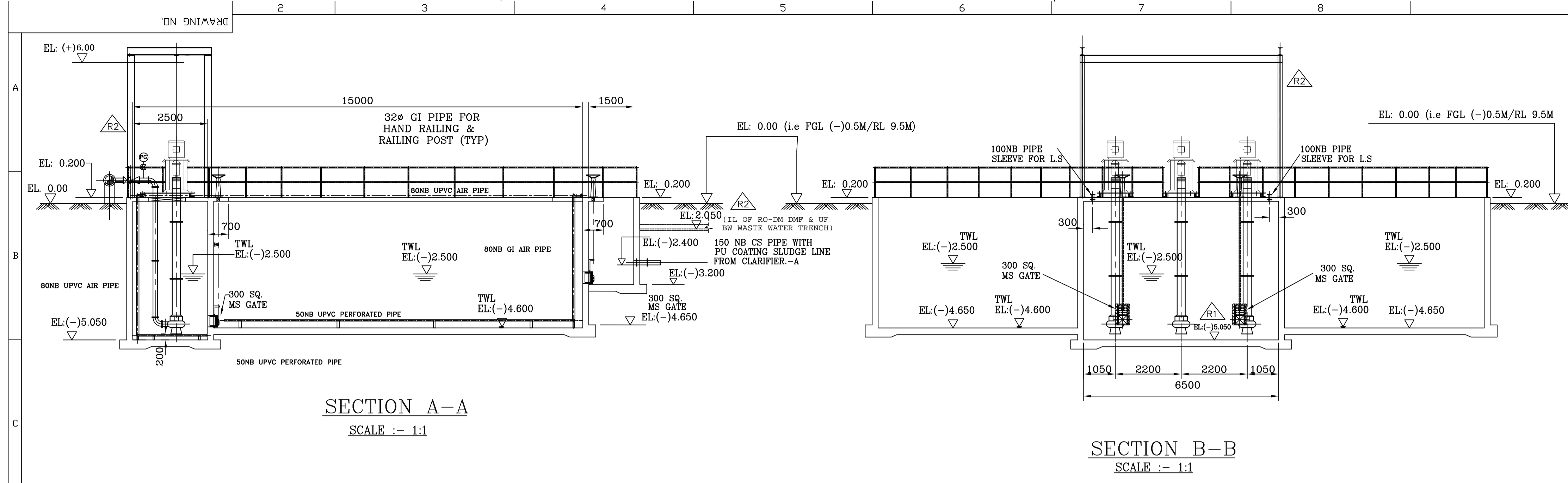
DATE: 26-09-18
26-09-18
26-09-18
26-09-18

BHCL DOC NO. PE-V0-412-158-A035

OGBL DOC NO. OGBL/OC-983/GA/CH/PTP/18/325

SHEET 2 OF 2 REV 02

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- NOTE:-**
1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METRE UNLESS OTHERWISE STATED.
 2. DIMENSIONS OF COLUMN, COLUMN FOUNDATION, STAIR CASE, HANDRAILING ETC SHALL BE SHOWN IN CIVIL G.A. OF SLUDGE SUMP CUM PUMP HOUSE
 3. PUDDLE PIPES & INSERT PLATE DETAIL SHALL BE SHOWN IN THE CIVIL DRAWING OF SLUDGE SUMP CUM PUMP HOUSE
 4. EL. 0.00M CORRESPONDS TO FGL(-) 0.5M/ RL 9.5M

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.		TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)	
CONSULTANT: DESEIN PVT LTD, NEW DELHI.		BHARAT HEAVY ELECTRICALS LTD POWER GROUP PROJECTS ENGINEERING MANAGEMENT NEW DELHI	
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135		DEPT CODE DRN FAISAL N FN 12-12-18 MAX DESN FAISAL N FN 12-12-18 CHD MUAZZAM I MI 12-12-18 APPD ASLAM A AA 12-12-18	
BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		BHEL DOC NO.	
TITLE G.A OF SLUDGE SUMP CUM PUMP HOUSE		PE-V0-412-158-A036	
DEPT. SCALE OGBL DOC NO.		OGBL/OC-983/GA/SS/PTP/18/326	
SIGN		SHEET 1 OF 1	
DATE		REV 02	

JOB NO. 412	STATUS CONTRACT	DISTRIBUTION
TO	No.OFF	APPD
REV	DATE	ALTD
CHD	APPD	

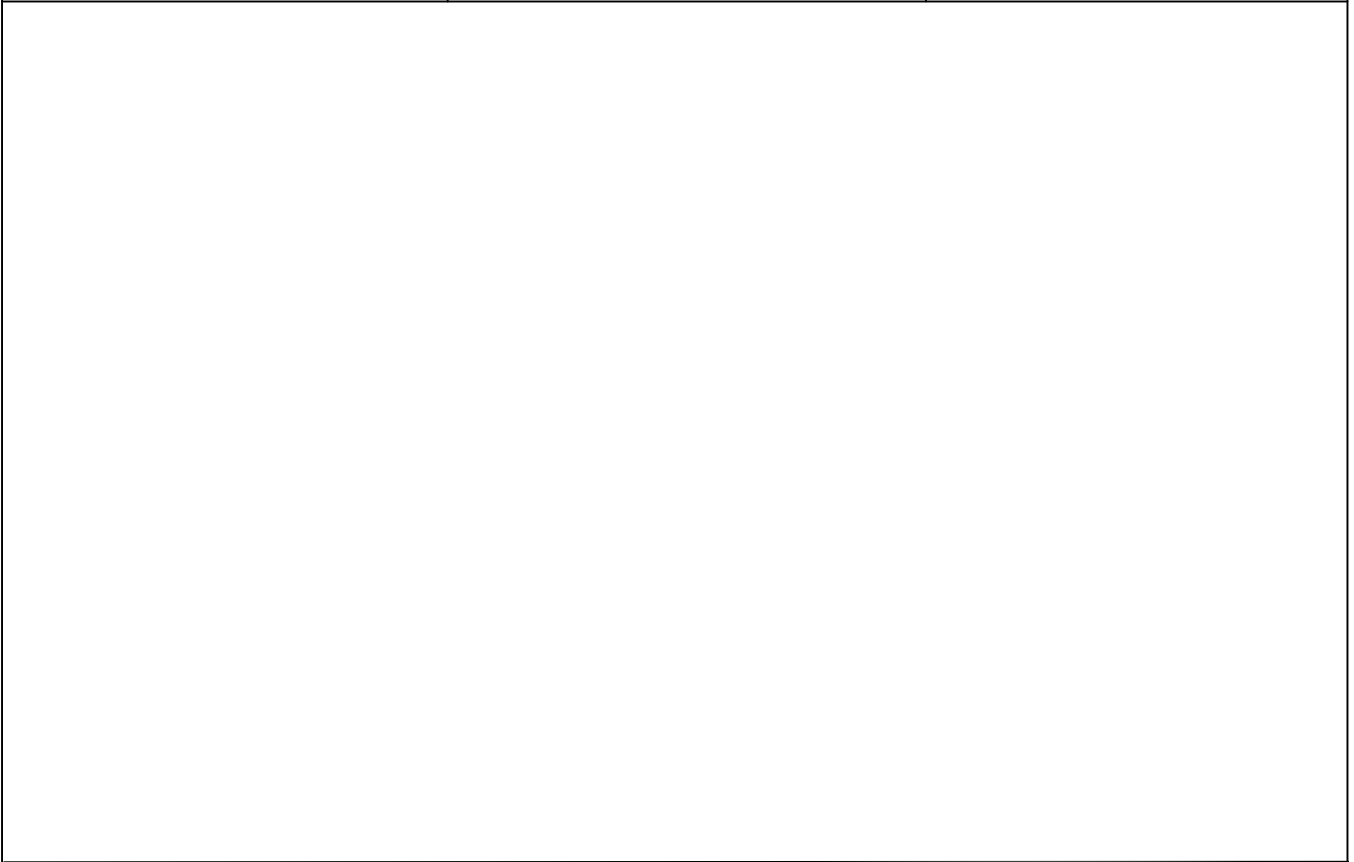
REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD
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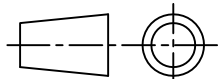
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412



2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.


	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	-

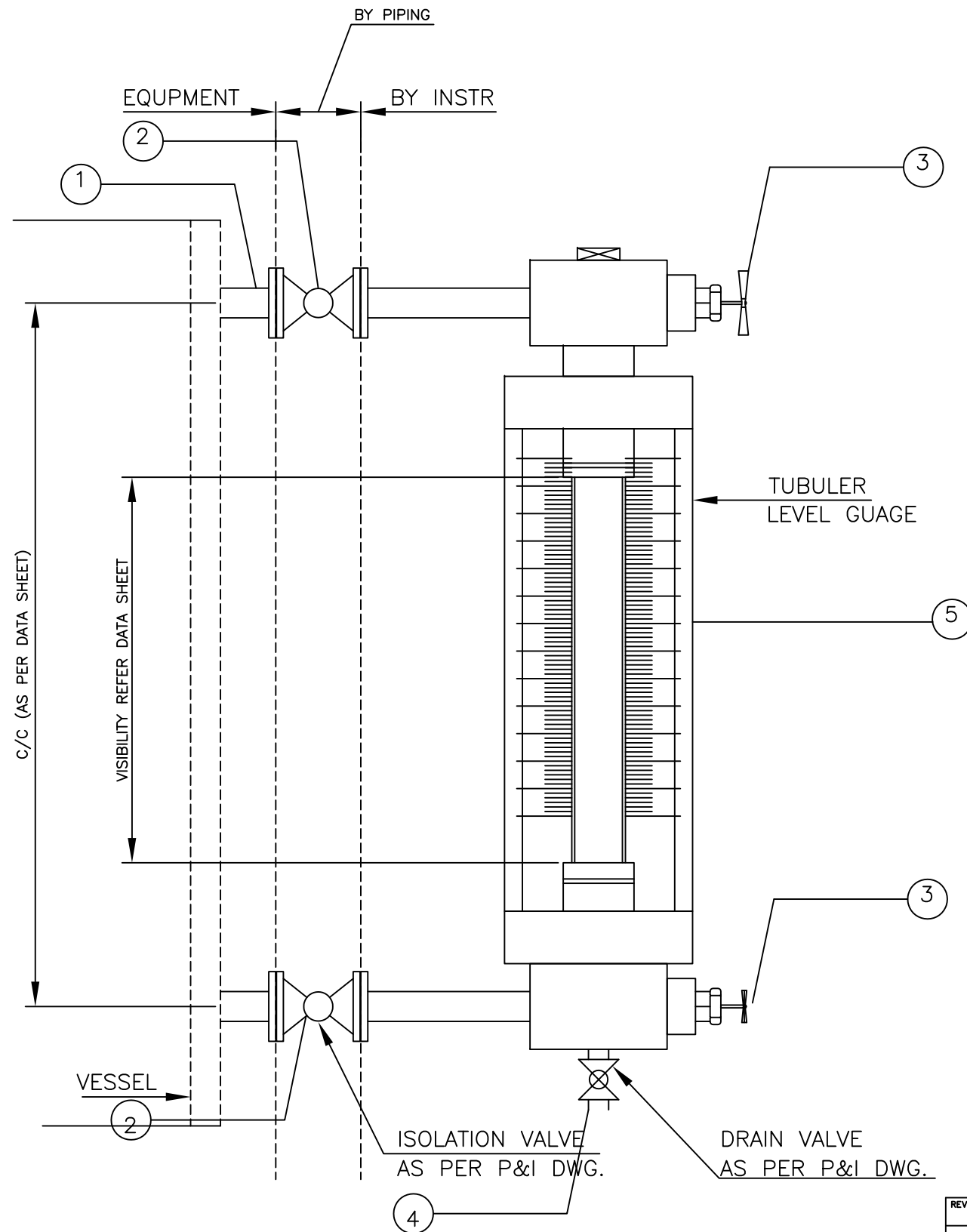
TECHNICAL DATSHEET AND HOOK UP DRAWING FOR LOCAL INSTRUMENTS		NAME	SIGN	DATE
	PREP	FAISAL N	FN	19-03-19
	CHKD	MUAZZAM I	MI	19-03-19
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018	APPD	ASLAM A	AA	19-03-19

DEPT.					CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A046	REV 02
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDSHKUP/INS/PTP/18/329	
DATE						NO. OF SHEETS 32 EXCLUDING COVER PAGE	

INDEX		
Sr no.	Description	Page No.
1	Technical Datasheet of Tubular Level guage & Staff Gauge	1
2	Hookup drawing of Tubular level Gauge	2
3	Hookup drawing of Staff Gauge	3
4	Technical Datasheet of Pressure gauge & Pressure Switches.	4
5	Hookup drawing of Pressure Gauge	5
6	Hookup drawing of Pressure Switch	6
7	Vendor Catalouge for Level gauge	7-8
8	Vendor Catalouge for Pressure gauge	9-14
8	Vendor Catalouge for Pressure Switch	15-32

		TECHNICAL DATASHEET AND HOOK UP DRAWING FOR LOCAL INSTRUMENTS			
CLIENT	BHARAT HEAVY ELECTRICALS LTD.			Project Doc No.: PE-V0-412-158-A046	
PROJECT	PRE TREATMENT PLANT ENNORE			OTOKLIN DOC NO:- OGBL/OC-983/TDSHKUP/INS/PTP/18/329	
				MADE BY FN	CHKD BY MI
SR. NO.	DISCRPTION				REMARK
1.0	DATA SHEET FOR LEVEL INDICATOR				
1.1	Type	Tubular Transparent			
1.2	Glass Material	Tempered Borosilicate			
1.3	Calibrated Scale	Aluminium			
1.4	Tag plate	SS304			
1.5	Process Connection Type	Flanged			
1.6	Enclosure IP rating	IP 65 (R1)			
1.7	Process connection Size	25 NB			
1.8	Wetted Parts MOC	Polypropylene (PP)		SS 316	
1.9	Accessories	Integral cocks, drain valves, bolts, nuts and gaskets			
1.10	Tag no	90GBN60CL501	90GBN61CL501 90GBN62CL501 90GBN63CL501 90GBN81CL501 90GBN82CL501	90GBN91CL501	90GBN71CL501 90GBN72CL501
1.11	Range in MTR.	0-2.3 m	0-1.73 m	0-1.3 m	0-1.73 m
1.12	Qty.	1	5	1	2
1.13	Accuracy	±2 mm			
1.14	Max. Temperature	70° C			
1.15	Make (Place)	Pune Techtrol (India). (R1)			
2.0	DATA SHEET FOR LEVEL GAUGE				
2.1	Type	Staff Gauge			
2.2	Calibrated Scale	PVC			
2.3	Tag plate	NA			
2.4	Process Connection Type	Anchor Fastener			
2.5	Wetted Parts MOC	PVC (25mm thk)			
2.6	Tag no (R1)	90GBD10CL501 90GBD10CL502	90GBS50CL501	90GBS50CL502 90GBS50CL503	
2.7	Range in MTR.	0-4.3 m	0-4.5 m	0-4.5 m	
2.8	Qty.	2	1	2	
2.9	Accuracy	±2 mm			
2.10	Max. Temperature	70° C			
2.11	Make (Place)	Pune Techtrol (India). (R1)			

LEVEL GAUGE- TUBULAR (REFLEX TYPE)



TAG NO	LOCATION
90GBN91CL501	NaOCl Dosing tank
90GBN61CL501	FECL3 DOSING TANK
90GBN62CL501	FECL3 DOSING TANK
90GBN63CL501	FECL3 DOSING TANK
90GBN71CL501	LIME DOSING TANK
90GBN72CL501	LIME DOSING TANK
90GBN81CL501	PE DOSING TANK
90GBN82CL501	PE DOSING TANK
90GBN60CL501	OVERHEAD CLARIFIED WATER TANK

TAG.NO.	DESCRIPTION	A	B
5	LEVEL GAUGES SS316 / PP	1	-
4	1/2"SW,SS 316 , BALL VALVE FOR DRAIN	1	-
3	SS316 / PP ISOLATING GAUGE COCK INTEGRAL	2	-
2	1/2" SCREWED CPVC ISOLATING GLOBE VALVE	2	-
1	1/2"/3/4"/1" CPVC SCH 80 NIPPLE OF MTL. SAME AS THAT OF MAIN PIPE(AS PER PROCESS REQD.)	AS REQD.	
BILL OF MATERIAL		QTY	

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JOB NO. 412	
STATUS CONTRACT	
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TO	
No.OFF	

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA, OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

DEPT CODE	NAME	SIGN	DATE
DRN	FAISAL N	FN	19-03-19
DESN	FAISAL N	FN	19-03-19
CHD	MUJAZZAM I	MI	19-03-19
APPD	ASLAM A	AA	19-03-19

BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

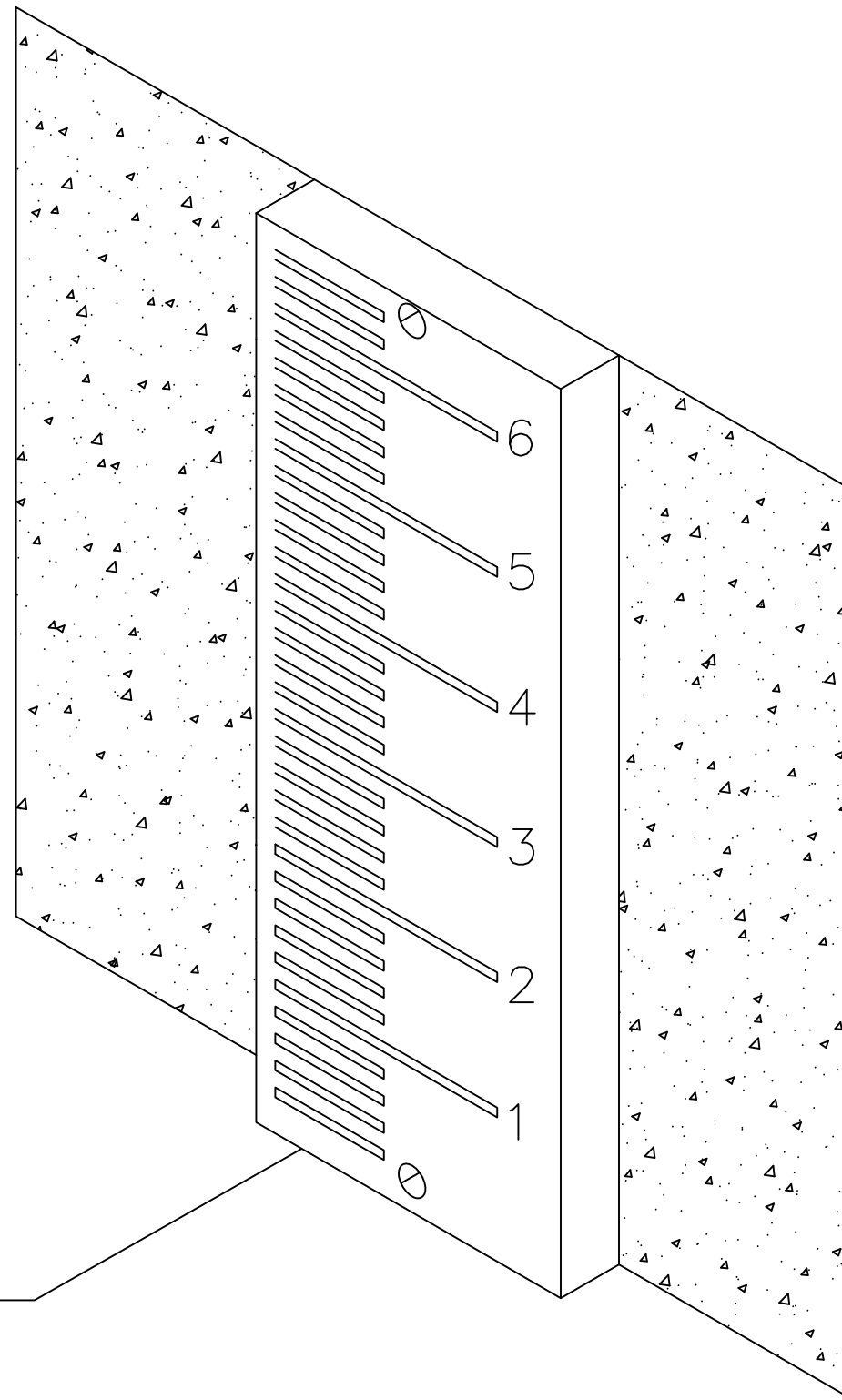
BHEL DOC NO. PE-V0-412-158-A046

TITLE: INSTRUMENT HOOK-UP DRAWING OF LEVEL GAUGE

OGBL DOC NO. OGBL/OC-985/TDSHEUP/DNS/PTT/18/829

SHEET 2 OF 32 REV 2

LEVEL GAUGE-STAFF TYPE



PVC PLATE

TAG NO	LOCATION
90GBN10CL501	CLARIFIED WATER STORAGE TANK
90GBN11CL501	CLARIFIED WATER STORAGE TANK
90GBN50CL501	SLUDGE SUMP
90GBN51CL501	SLUDGE SUMP
90GBN52CL501	SLUDGE TRANSFER SUMP

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JOB NO. 412	
STATUS CONTRACT	
DISTRIBUTION	
TO	
No.OFF	

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI			
TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)			
CONSULTANT: DESEIN PVT LTD, NEW DELHI.			
BHARAT HEAVY ELECTRICALS LTD POWER GROUP PROJECTS ENGINEERING MANAGEMENT NEW DELHI		CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135	
DEPT CODE	DRN	NAME	SIGN
MAX	FAISAL N	FN	19-03-19
	FAISAL N	FN	19-03-19
	MUJAZZAM I	MI	19-03-19
	ASLAM A	AA	19-03-19
BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018		BHEL DOC NO.	
TITLE INSTRUMENT HOOK-UP DRAWING OF LEVEL GAUGE		PE-V0-412-158-A046	
DEPT.	SCALE	OGBL DOC NO.	
SIGN		OGBL/OC-985/TDSHEUP/DRS/PTT/18/229	
DATE		SHEET 3 OF 32 REV 2	

Transparent Tubular Level Gauge - TTG

Simple low cost and reliable for direct reading of clean liquid levels at low pressure & temperature conditions.

Construction & Operation :

Gauge is fitted between two end blocks through gland packings. The gauge is mounted parallel to tank so as to form a close loop causing tank liquid to seek its level in the gauge. 'C' channels / Tie rods are provided to protect gauge from accidental blows. End blocks are provided with vent plug, drain valve & integral offset valves.

Salient Features :

- 360° visibility with Tie-rod guards.
- Offset valves permit cleaning of gauge glass & its removal on line.
- IBR certified gauge for steam service (on demand)
- Rubber lined gauge for corrosive liquids (on demand)

Specifications :

Gauge	: Tempered Borosilicate Glass (HW) x 16 mm OD (25mm OD for viscous liquids)
End Block MOC	: CS / SS 304 / SS 316 / PP / PVDF
End Block Type	: w/o Valve/with Integral Offset Valve/with Integral Offset Valve + Autoball check
Guards	: 'C' Channel (CS/SS304/FRP); Tie Rods (CS/SS304)
Gland MOC	: CI / SS 316 / PP
Packing	: PTFE
Process conn.	: 1" Flanged (ANSI 150#) or BSP Screwed (M)
Vent / Drain	: Plug / Ball valve
Calibrated Scale	: Polycarbonate (LC=2mm) / SS(LC=10mm)
CC Dist.	: 300 to 1500mm (single gauge) 1500 to 3000mm (2 gauges) through coupler
Visibility	: CC Dist - 150mm
Maximum Temp.	: 200°C (Metallic)/100°C (PVDF)/70°C(PP)
Test Pressure	: Vacuum to 10 Kg/cm ² (Metallic)
(at amb temp)	: Vacuum to 2 Kg/cm ² (PVDF/PP)

Special Features (Optional) :

Glass Protector	: 3mm thk perspex shield to protect gauge glass & personnel safety
Auto Ball Check	: SS316 or PTFE Ball to minimise liquid loss during glass breakage
Frostfree	: 20mm thk x 35mm extension Perspex Shield to prevent frost formation on outer surface of glass for clear visual reading of liquid at low temp.
Illuminator	: To provide uniform light along the length of gauge glass. It consists of Perspex Reflector, illuminated through a LED Bulb (80 to 250VAC)with AI Enclosure IP65/Ex-p Gr IIB or IIC. The length of single illuminator is 1200mm (max). For length beyond 1200mm, two illuminators are joined together.
Jacketing	: For prevention of process liquid solidification. It consists of a ss pipe with "NPT(F)" inlet & outlet at bottom & top end blocks for heating/cooling agent.

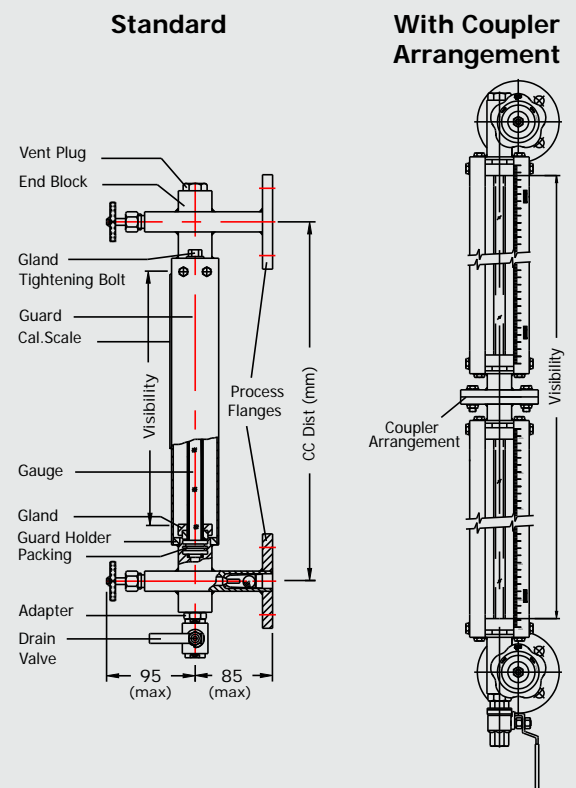


Metallic Flanged



PP Flanged

Schematic Diagram :

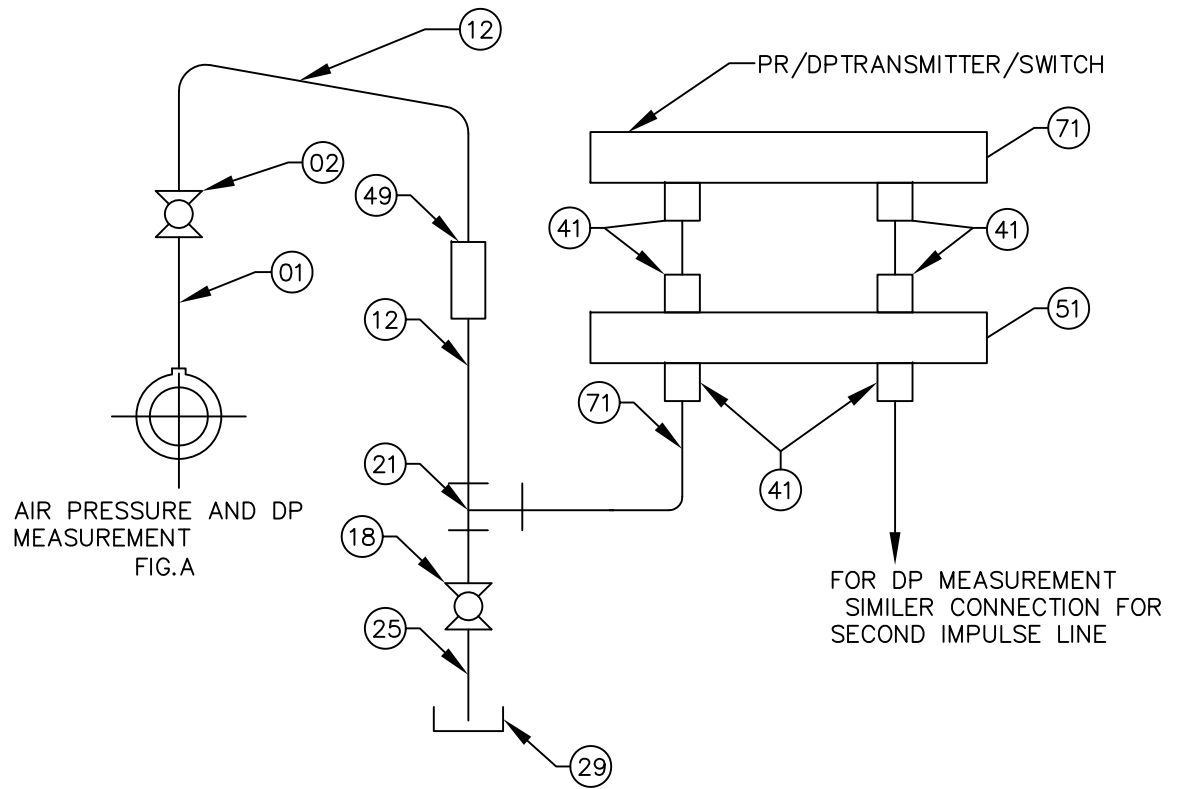
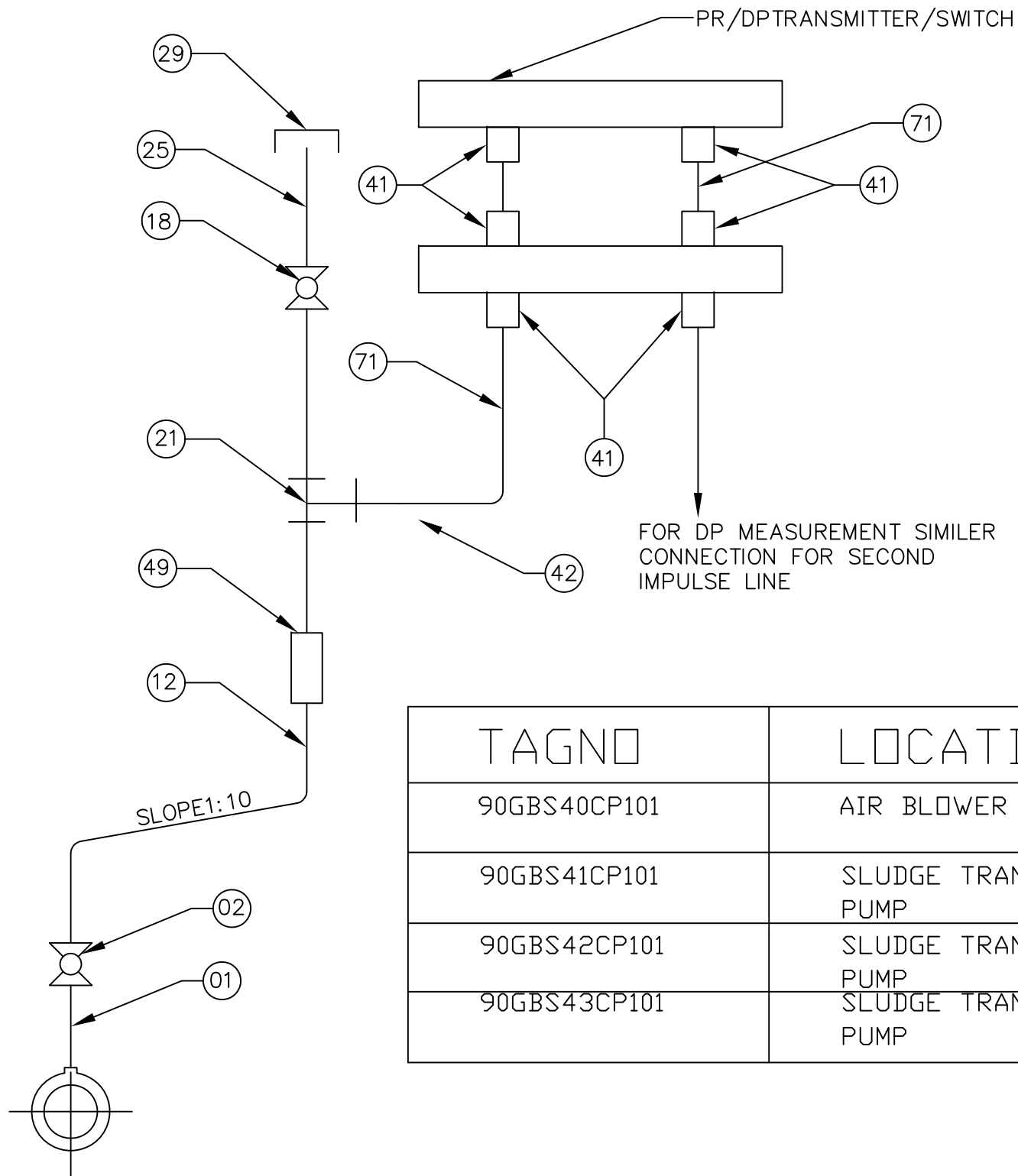


Accessories (Optional) :

- 1) Tank Isolation Valves (1 pair) with nuts, bolts & gaskets for gauge removal.
- 2) Counter flanges with nuts, bolts & gaskets.

Note 1 - All CI/CS components are epoxy powder coated

Note 2 - Separate Datasheets are available for IBR & Rubber Lined Gauges



TAGNO	LOCATION
90GBS40CP101	AIR BLOWER LINE
90GBS41CP101	SLUDGE TRANSFER PUMP
90GBS42CP101	SLUDGE TRANSFER PUMP
90GBS43CP101	SLUDGE TRANSFER PUMP

71	3/4"OD IMPULSE TUBE,CPVC	AS	REQD.
51	5/3/2 -VALVE MANIFOLDS,SS-316	1	1
49	3/4"SW,CPVC BULK HEAD PIPE UNION	1	1
41	1/2"NPT(M) X 1/2"OO TUBE COMPRESSION FITTING,SS-316	6	6
29	3/4"NPT(F) CPVC CAP	1	1
25	3/4"NPS,SCH-80 X 3/4"NPS(M)CPVC NIPPLE	1	1
21	3/4" EQUAL TEE,CPVC	1	1
18	3/4" SW,CPVC, GLOBE VALVE	-	1
12	3/4" NPS. SCH-80 CPVC PIPE	AS	REQD.
2	1/2"/3/4"/1" ROOT VALVE -SW GLOBE VALVE	1	1
1	1/2"/3"/4"/1" CPVC SCH 80 NIPPLE SAME AS THAT OF MAIN PIPE(AS PER PROCESS REQD.) AS per ASTM D1784	AS	REQD.
TAG.NO.	DESCRIPTION	A	B
	BILL OF MATERIAL		QTY

AIR PRESSURE AND DP MEASUREMENT FIG.B

AIR PRESSURE AND DP MEASUREMENT FIG.A

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
ENGINEERING MANAGEMENT
NEW DELHI

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA,OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

BHEL DOC NO. PE-V0-412-158-A046

OTOKLIN
GLOBAL BUSINESS LIMITED

REV	DATE	ALTD	CHD	APPD

DEPT. SCALE

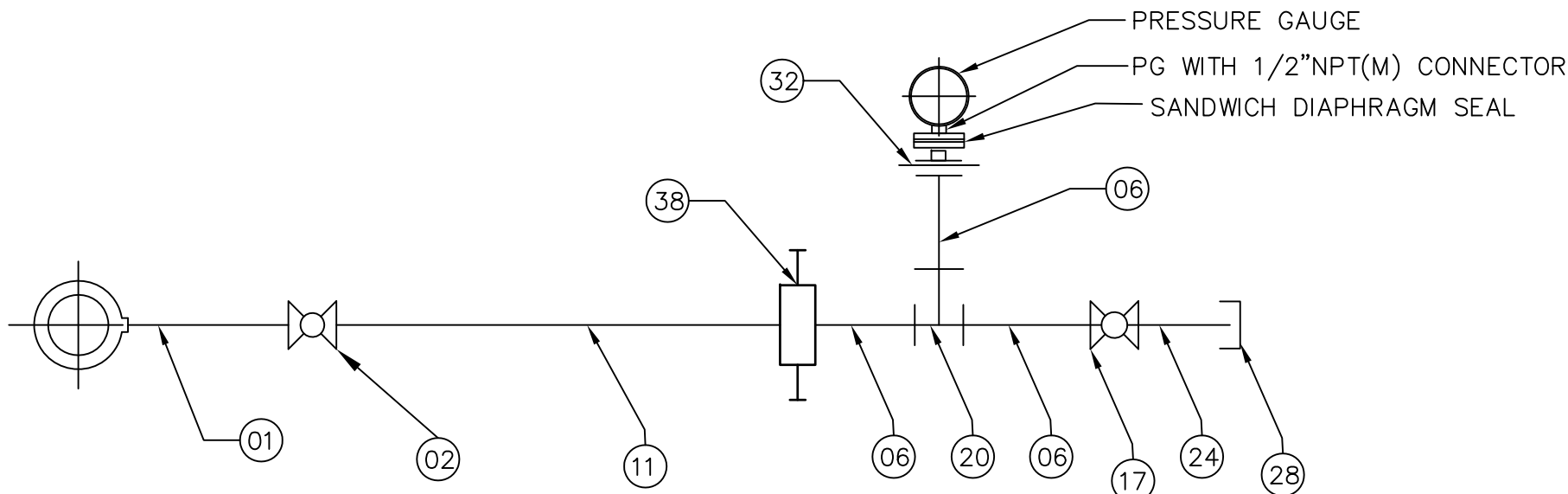
SIGN

DATE

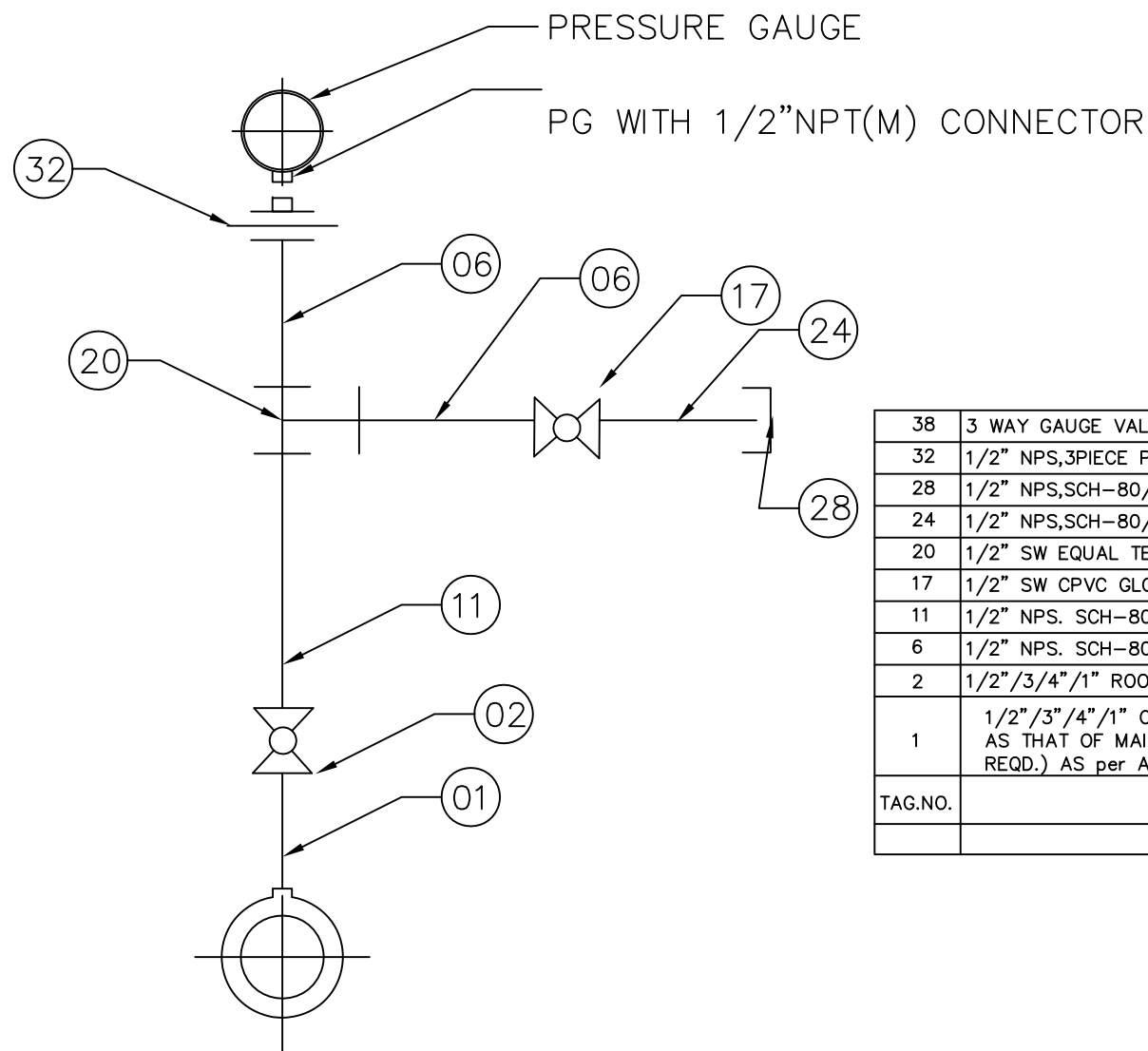
OGBL/OC-985/TDSHEUP/DNS/PTT/18/229

SHEET 6 OF 32 REV 2

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TAG NO	LOCATION
90GBD01CP501	RAW WATER LINE
90GBS41CP501	SLUDGE TRANSFER PUMP
90GBS42CP501	SLUDGE TRANSFER PUMP
90GBS43CP501	SLUDGE TRANSFER PUMP
90GBS45CP501	SLUDGE TRANSFER PUMP COMMON HEADER LINE
90GBN83CP501	PE DOSING PUMP
90GBN83CP502	PE DOSING PUMP
90GBN85CP501	PE DOSING PUMP
90GBN64CP501	FECL3 DOSING PUMP
90GBN64CP502	FECL3 DOSING PUMP
90GBN65CP501	FECL3 DOSING PUMP
90GBN73CP501	LIME DOSING PUMP
90GBN73CP502	LIME DOSING PUMP
90GBN75CP501	LIME DOSING PUMP
90GBN92CP501	NAOCL DOSING PUMP
90GBN92CP502	NAOCL DOSING PUMP
90GBN95CP501	NAOCL DOSING PUMP
90GBS31CP501	AIR BLOWER LINE
90GBS32CP501	AIR BLOWER LINE



TAG.NO.	DESCRIPTION	A	B
38	3 WAY GAUGE VALVE 1/2" NB SW	1	-
32	1/2" NPS,3PIECE PIPE UNION WITH 1/2"NPT(F)SCREWED	1	1
28	1/2" NPS,SCH-80/160X1/2"NPT(M)CPVC NIPPLE	1	1
24	1/2" NPS,SCH-80/160X1/2"NPT(M)CPVC NIPPLE	1	1
20	1/2" SW EQUAL TEE, CPVC	1	1
17	1/2" SW CPVC GLOBE VALVE	1	1
11	1/2" NPS. SCH-80 CPVC NIPPLE	1	1
6	1/2" NPS. SCH-80/160 CPVC PIPE	AS REQD.	
2	1/2"/3/4"/1" ROOT VALVE -SW GLOBE VALVE	1	1
1	1/2"/3"/4"/1" CPVC SCH 80 NIPPLE SAME AS THAT OF MAIN PIPE(AS PER PROCESS REQD.) AS per ASTM D1784	AS REQD.	
TAG.NO. DESCRIPTION		A	B
BILL OF MATERIAL		QTY	

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JOB NO. 412
STATUS CONTRACT
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TO
No.OFF

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE	NAME	SIGN	DATE
DRN	FAISAL N	FN	19-03-19
DES	FAISAL N	FN	19-03-19
CHD	MUJAZZAM I	MI	19-03-19
APPD	ASLAM A	AA	19-03-19

CONTRACTOR: OTOKLIN GLOBAL BUSINESS LTD
E-410, CRYSTAL PLAZA,OPP. INFINITI MALL
LOKHANDWALA LINK ROAD, ANDHERI WEST,
MUMBAI 400 053. Tel No.022-26732135

BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

BHEL DOC NO. PE-V0-412-158-A046

OGBL DOC NO. OGBL/OC-985/TDSHEUP/DNS/PTT/18/829

SHEET 5 OF 32 REV 2

REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD	REV	DATE	ALTD	CHD	APPD

OTOKLIN® GLOBAL BUSINESS LIMITED		TECHNICAL DATSHEET AND HOOK UP DRAWING FOR LOCAL INSTRUMENTS				
CLIENT	BHARAT HEAVY ELECTRICALS LTD.				Project Doc No.: PE-V0-412-158-A046	
PROJECT	PRE TREATMENT PLANT ENNORE				OTOKLIN DOC NO:- OGBL/OC-983/TDSHKUP/INS/PTP/18/329	
					MADE BY	CHKD BY
SR. NO.	DISCRPTION				REMARK	
3.0	DATA SHEET FOR PRESSURE GAUGE					
3.1	TYPE	Bourdon Diaphragm seal type (R2)		Bourdon tube type		
3.2	Reference Standard	EN-837 (R1)				
3.3	MOC Sensing & Socket	SS-316				
3.4	Movement Material	SS-316				
3.5	Case Material	SS316 / Die-cast aluminium with stoved enamel black finish. Epoxy coating shall be provided for corrosive atmosphere.				
3.6	Dial Size	150 mm				
3.7	Window material	Shatterproof Glass				
3.8	Over-range Protection	150 % of FSD				
3.9	Scale Detail	270 degree dial rotation/deflection. Graduations in black lines on white dial provided with glass cover and pointer stopper(R2)				
3.10	Zero Adjustment	Micrometer Pointer				
3.11	Process Connection	½" NPT (M) Bottom connection for local mounting				
3.12	Performance	Accuracy of ± 1.0 % of span or better.				
3.13	Tag plate	SS304				
3.14	Operating ambient temperature	0 – 50° C				
3.15	Accessories	3 Way 2 Valve Manifold, External Zero Adjustment,pulsation dampener/snubber wherever required. (R2)				
3.16	Range of pressure	0-2.5 kg/cm2			0-1 kg/cm2	
3.17	Enclosure IP rating	IP-65 or better (R1)				
3.17	Tag no.	90GBD01CP501	90GBS41CP501 90GBS42CP501 90GBS43CP501 90GBS45CP501	90GBN83CP501 90GBN83CP502 90GBN85CP501 90GBN92CP501 90GBN92CP502 90GBN95CP501	90GBN64CP501 90GBN64CP502 90GBN65CP501 90GBN73CP501 90GBN73CP502 90GBN75CP501	90GBS31CP501 90GBS32CP501
3.18	Line size	800 NB	400 NB	25 NB	40 NB	80 NB
3.19	Qty.	1	4	6	6	2
3.20	Make (Place)	GIC (India). (R1)				
4.0	DATA SHEET FOR PRESSURE SWITCH					
4.1	TYPE	Diaphragm Seal type (R2)				
4.2	Reference Standard	BS-6134 (R1)				
4.3	Sensing Element material	SS-316L.				
4.4	Diaphragm /Movement material	SS316 (R2)				
4.5	Case Material	Die-Cast Aluminum, epoxy painted				
4.6	Over range	150 % of FSD				
4.7	Auto Reset	Internal Adjustable snap action micro switch (R2)				
4.8	Switch configuration	2 SPDT (Equivalent to 1DPDT)				
4.9	End Connection	¾" NPT(M)				
4.10	Electrical Connection	7 pin type connector (R2)				
4.11	Enclosure Class	IP-65 or better				
4.12	Accessories	3 Way 2 Valve Manifold ,pulsation dampener/snubber wherever required,free standing cabinet /panel (R2)				
4.13	Tag plate	SS304				
4.14	Repeat Accuracy	±1% FSR				
4.15	Repetability	±0.5% FSR (R2)				
4.16	Tag no.	90GBS40CP101		90GBS41CP101 90GBS42CP101 90GBS43CP101		
4.17	Range in kg/cm2	0 - 1 kg/cm2			0 - 2.5 kg/cm2	
4.18	Line size	80 NB			400 NB	
4.19	Qty.	1			3	
4.20	Make (Place)	GIC (India). (R1)				

Bourdon Sensing Pressure Gauges

MODEL : BSPG (Dry Case)

LFBSPG (Liquid Filled Case)

Features

- Compliance to latest EN-837 standard
- Range : (-)1 to 1600 kg/cm²
- Bourdon in SS316 Ti as standard providing better mechanical properties guaranteeing repeatability and accuracy
- Accuracy ±1% FSD (Standard), ± 0.5% FSD on request
- Unit of measurement - kg/cm², bar, psi, kPa, MPa

- Pressure Gauges intended for Process Industries such as Chemicals, Petro-chemicals, Energy or Gas industry, Food processing, Nuclear etc.
- These pressure gauges have been designed to satisfy requirements to operate in aggressive environment.



Specifications

Ref. Standard	EN-837
Dial	100 mm / 150 mm in Aluminium, white background, black markings
Case	SS304 / SS316 with bayonet bezel Phenol with screwed bezel
Protection	IP-68 (IS:13947 part I / IEC:60529)
Window	Safety glass (Shatter proof / Toughened glass)
Bourdon	SS316, SS316 Ti, SS316L, Monel
Socket	22mm Square in SS316, SS316 Ti, SS316L, Monel
Movement	SS304, SS316
Range	As per EN 837 (refer table) minimum span 0.6 kg/cm ² , maximum 1600 kg/cm ²
Connection	1/2" NPT (M) as standard* (other optional)
Accuracy	±1% FSD (0.5% on request)
Over range	As per EN 837
Zero adjustment	Micrometer Pointer
Blow out disc	Provided (on top)
Temperature suitability	Ambient (-)20°C to 60°C, Media 200°C
Temperature Effect	Within ±0.4% FSD/10°C, when temperature changes from reference temperature of 20°C (as per EN-837 standard)
Optional	IBR certification Maxima pointer NACE compliance External Knob for zero setting Built in Snubber Built in Gauge Saver Liquid filled Case (SS case only) Vacuum Protection CE Atex

* For ranges above 1000 bar, connection shall be 1/2"BSP(M) with Bottom Entry only

Ranges

Gauge	bar, kg/cm ²	Least count
Vacuum	(-)1 to 0	0.02
	-760 to 0mmHg	20
Compound	(-)1 to 0.6	0.05
	(-)1 to 1.5	0.05
	(-)1 to 3	0.10
	(-) 1 to 5	0.10
	(-)1 to 9	0.20
	(-)1 to 15	0.50
	(-)1 to 24	0.50
Pressure Gauge ('C' shaped Bourdon)	(-)1 to 39	1.0
	0 to 0.6	0.01
	0 to 1	0.02
	0 to 1.6	0.05
	0 to 2.5	0.05
	0 to 4	0.10
	0 to 6	0.10
	0 to 10	0.20
	0 to 16	0.50
	0 to 25	0.50
Pressure Gauge (Bourdon)	0 to 40	1.0
	0 to 60	1.0
	0 to 100	2.0
	0 to 160	5.0
	0 to 250	5.0
	0 to 400	10.0
	0 to 600	10.0
	0 to 800	20.0
	0 to 1000	20.0
	0 to 1600	50.0

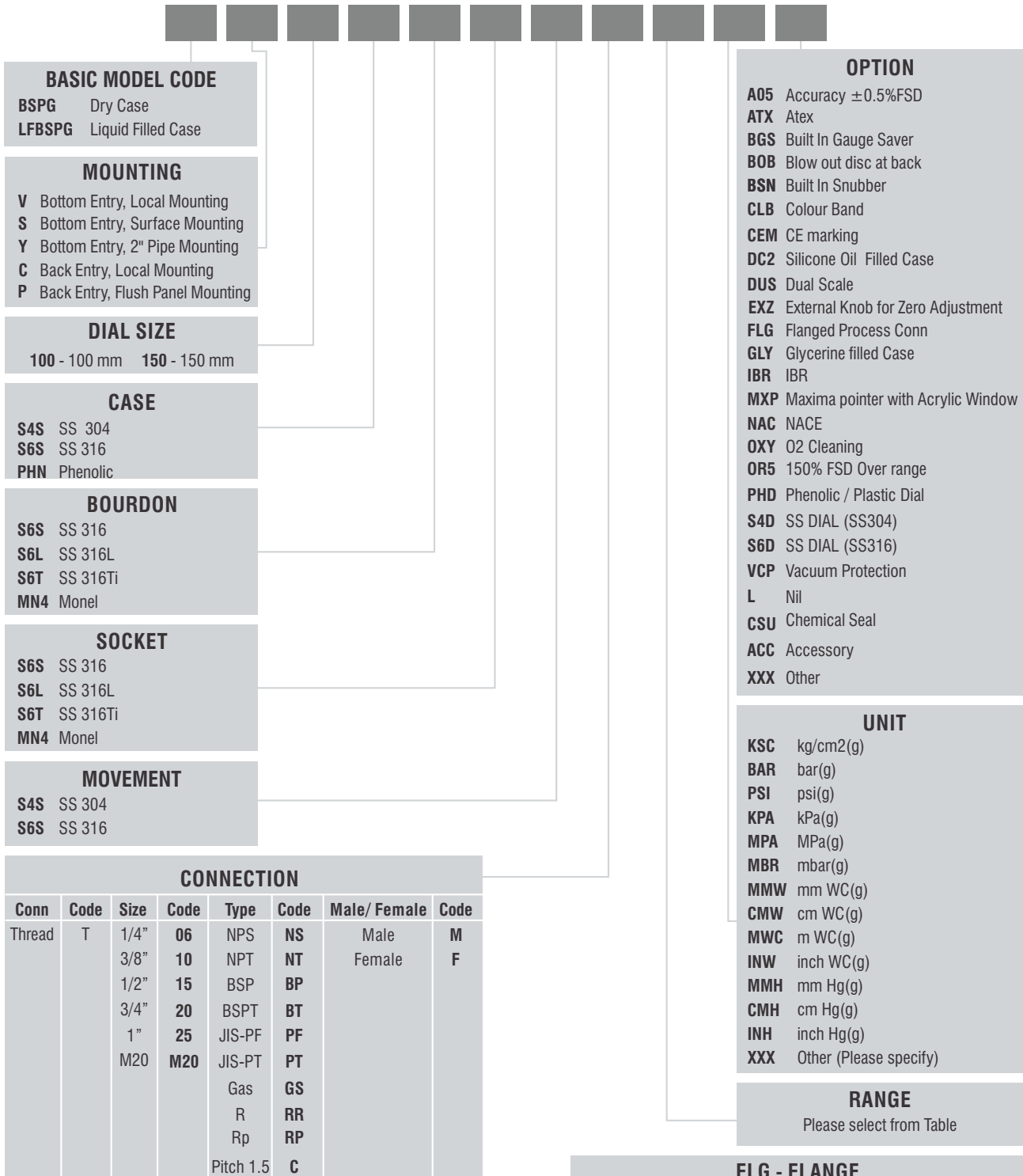
For range other than above please contact our design dept.

The parameters mentioned here are the standard specifications/ values generally used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement. For higher temperature services above 100°C, we recommend to provide suitable cooling arrangement (Syphon, Cooling Tower, Impulse Tubing, Diaphragm Seal etc.)

Under Technical Collaboration with M/s. Gauges Bourdon, France

Ordering Information

MODEL



BASIC MODEL CODE
BSPG Dry Case
LFBSPG Liquid Filled Case

MOUNTING
V Bottom Entry, Local Mounting
S Bottom Entry, Surface Mounting
Y Bottom Entry, 2" Pipe Mounting
C Back Entry, Local Mounting
P Back Entry, Flush Panel Mounting

DIAL SIZE
100 - 100 mm **150** - 150 mm

CASE
S4S SS 304
S6S SS 316
PHN Phenolic

BOURDON
S6S SS 316
S6L SS 316L
S6T SS 316Ti
MN4 Monel

SOCKET
S6S SS 316
S6L SS 316L
S6T SS 316Ti
MN4 Monel

MOVEMENT
S4S SS 304
S6S SS 316

CONNECTION

Conn	Code	Size	Code	Type	Code	Male/ Female	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
	M20	1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
		Rp	RP				
		Pitch 1.5	C				

OPTION

A05 Accuracy ±0.5%FSD
ATX Atex
BGS Built In Gauge Saver
BOB Blow out disc at back
BSN Built In Snubber
CLB Colour Band
CEM CE marking
DC2 Silicone Oil Filled Case
DUS Dual Scale
EXZ External Knob for Zero Adjustment
FLG Flanged Process Conn
GLY Glycerine filled Case
IBR IBR
MXP Maxima pointer with Acrylic Window
NAC NACE
OXY O2 Cleaning
OR5 150% FSD Over range
PHD Phenolic / Plastic Dial
S4D SS DIAL (SS304)
S6D SS DIAL (SS316)
VCP Vacuum Protection
L Nil
CSU Chemical Seal
ACC Accessory
XXX Other

UNIT

KSC kg/cm2(g)
BAR bar(g)
PSI psi(g)
KPA kPa(g)
MPA MPa(g)
MBR mbar(g)
MMW mm WC(g)
CMW cm WC(g)
MWC m WC(g)
INW inch WC(g)
MMH mm Hg(g)
CMH cm Hg(g)
INH inch Hg(g)
XXX Other (Please specify)

RANGE
 Please select from Table

e.g. For 1/2"NPT(M), Code: **T15NTM**
 For M20x1.5 (F), Code: **TM20CF**

FLG - FLANGE

Conn	Code	Size	Code	Rating#	Code	Facing	Code
Flange	F	1/2"	15	150	A	RF	RF
		3/4"	20	300	B	FF	FF
		1"	25	600	C	RTJ	RJ
		1-1/2"	40	900	D	LT	LT
		2"	50	1500	E	LG	LG
		3"	80	2500	F		

Sample Model Code: BSPG-V-150-S4S-S6S-S6S-S4S-T15NTM-(0-10)-BAR-BOB

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

Sandwich Type Diaphragm Seal

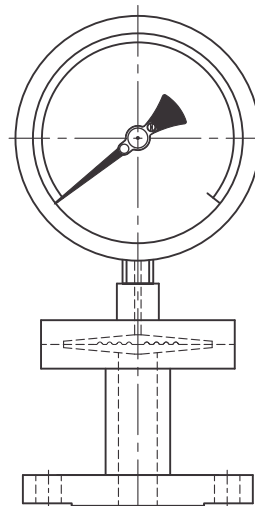
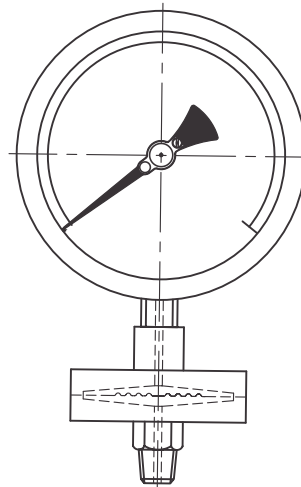
General

MODEL : CSU-SDT / CSU-SDF

Features

Sandwich type Diaphragm Seals are the most commonly used Diaphragm Seals. The Diaphragm is sandwiched between Top Chamber & Bottom Chamber / Flange. These are available Threaded as well as Flanged process Connection. For low Pressure Range & Smaller Flange Sizes, "I" section type Diaphragm Seals are used.

Optionally, Flushing connection of 1/4" NPT(F) or 1/2" NPT(F) can be provided which enables the user to flush out / clean the area below the diaphragm without removing the Seal from the process line. For Threaded Process Connection and Flange Connection with "I" section, Flushing connection shall be directly provided on the Bottom Chamber. For bigger Flange sizes, separate Flushing Rings (Spacer Rings) are usually provided.



Optional Feature

- **Cooling Tower**
- **Capillary** for Remote mounting of the Pressure Instrument
- **Integral Flushing Connection or Flushing Ring (Spacer Ring)** for purging / cleaning the area below the diaphragm without removing the Seal from the process line.
- **Stud / Nut & Gasket** (for Flanged Connection only), for assembling the Diaphragm Seal with Process Flange.

Note: This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

Under Technical Collaboration with M/s. Gauges Bourdon, France

Ordering Information

SANDWICH DIAPHRAGM SEAL (Threaded or Flanged)

MODEL: CSU- [] [] [] [] [] [] []

CONNECTION TYPE

SDT Sandwich type, Threaded Conn.
SDF Sandwich type, Flanged Conn.

TOP CHAMBER

CST CS
S4S SS304
S6S SS316
S6L SS316L
XXX Other (Please Specify)

DIAPHRAGM

S4S SS 304	HCC Hastelloy C
S4L SS 304L	TTM Titanium
S6S SS 316	TAN Tantalum
S6L SS 316L	N20 Nickel 200
321 SS 321	MN4 Monel 400
S6P SS 316+PTFE	800 Incoloy 800
6LP SS 316L+PTFE	SIL Silver
S6G SS 316+Gold Plated	GLD Gold
6LG SS 316L+Gold Plated	PTF PTFE
HCB Hastelloy B	XXX Other (Please Specify)

BOTTOM CHAMBER / FLANGE

S4S SS 304	HCC Hastelloy C
S4L SS 304L	TTM Titanium
S6S SS 316	N20 Nickel 200
S6L SS 316L	MN4 Monel 400
321 SS 321	800 Incoloy 800
S6P SS 316+PTFE	XXX Other (Please Specify)
6LP SS 316L+PTFE	
PTF PTFE*	
HCB Hastelloy B	

OPTION

4AR(*) SS316 Capillary, SS304 Armoured
4PV(*) SS316 Capillary, SS304 Armoured+PVC Covered
6AR(*) SS316 Capillary, SS316 Armoured
6PV(*) SS316 Capillary, SS316 Armoured+PVC Covered
CLT Cooling Tower
FC4 Integral Flushing Connection, 1/4" NPT(F)
FC2 Integral Flushing Connection, 1/2" NPT(F)
FR4()** Flushing Ring, 1/4" NPT(F)
FR2()** Flushing Ring, 1/2" NPT(F)
GSK Gasket
STN Stud & Nuts
L Nil
XXX Other (Please specify)

* Specify the length of Capillary in Meters.

** Specify Ring material (Refer Bottom Chamber / Flange table)

FILLING FLUID

DC1 DC-710
DC2 Silicone Oil (DC-200)
DC4 DC-704
DC5 DC-705
FLU Fluorolube
GLY Glycerine
HLC Halocarbon
VGO Food grade oil
XXX Other (Please specify)

PROCESS CONNECTION

THREADED

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

PROCESS CONNECTION

FLANGED

Conn	Code	Size	Code	Rating#	Code	Facing	Code	
Flange	F	1/2"	15	150	A	RF	RF	
		3/4"	20	300	B	FF	FF	
		1"	25	600	C	RTJ	RJ	
		1-1/2"	40	900	D	ST	ST	
		2"	50	1500	E	SG	SG	
		3"	80	2500	F	LT	LT	
							LG	LG
							SMF	SM
							SFF	SF
							LMF	LM
					LFF	LF		

e.g. For 40 NB 300# RF flange, Model Code: **F40BRF**

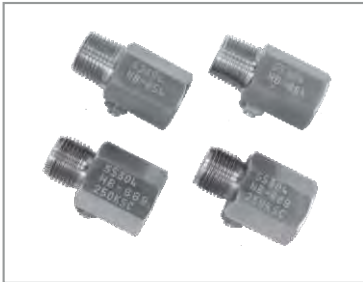
*PTFE Chamber / Flange:

Max Range 0 to 16 kg/cm2.g for Flanged connection

Max Range 0 to 6 kg/cm2.g for Threaded connection (1/2" BSPM / NPTM only)

Sample model Code: **CSU-SDF-S4S-S6S-S6S-F20ARF-DC2-4AR(3)**

Snubber



Snubber (Pulsation Dampener) protects the pressure instruments from pressure pulsations / rapid pressure fluctuation. Ideal for instruments which undergo severe pressure pulsations like those located at pump discharge. Available in materials like CS, SS304, SS316, Monel etc.

Standard connection is 1/2" NPT(F) x 1/2" NPT(M) (other connection can be offered as per customer requirement)

Pig tail Syphon



Syphons are used to protect pressure instruments from high temperature of the process fluid. It helps to reduce the service temperature so that the pressure instrument is exposed to lower temperature. Generally offered in 1/2" sch, 40 or 80 size (other sizes also can be offered on request). Standard connection is 1/2" NPT(F) x 1/2" NPT(M). Plain end suitable for Butt welding can also be offered. Available in material like CS (A106), SS304, SS316, P11 etc. IBR Certification can be offered as per customer requirement.

U Syphon



Gauge saver



Gauge Saver (Pressure Limit Valve) is used where the process pressure exceeds the over range limit of the pressure instrument. When the process pressure exceeds the pre-set pressure, Gauge Saver shuts off the pressure to the instrument and thereby prevents damage of the sensing element and protects the calibration. Generally minimum setting offered is 1 kg/cm²g (lower setting on request). Normally offered in SS316 & Monel with standard connection of 1/2" NPT(F) x 1/2" NPT(M) (other material / connection on request)

Gauge Adaptor



Gauge Adaptors are used for connecting instruments and accessories having different type of threads. Conversion from male to female threads and vice versa is possible by selecting suitable adaptors. Generally offered in material like SS304, SS316, Monel etc. (Other material on request).

Universal Adaptor or Gauge union



Universal Adaptor (Swivel Adaptor) facilitates the positioning of the Instrument during installation. Generally offered in material like SS304, SS316, Monel etc. (Other material on request). Standard connection is 1/2" NPT(F) x 1/2" NPT(M) (other connection on request)

Ordering Information

MODEL

ACC- [] [] [] [] []

ITEM DESCRIPTION

SNB Snubber
SYP Pig Tail Syphon
SYU "U" Syphon
GSV Gauge Saver
GAD Gauge Adaptor
SWA Swivel Adaptor

MATERIAL

CST Carbon Steel
S4S SS 304
S4L SS 304L
S6S SS 316
S6L SS 316L
321 SS 321
MN4 Monel
HCC Hastelloy-C
XXX Other (Please specify)

OPTION

IBR IBR*
NAC NACE
OXY O2 Cleaning
L Nil
XXX Other (Please specify)

PROCESS CONNECTION

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

* IBR certification shall be applicable for Syphon only

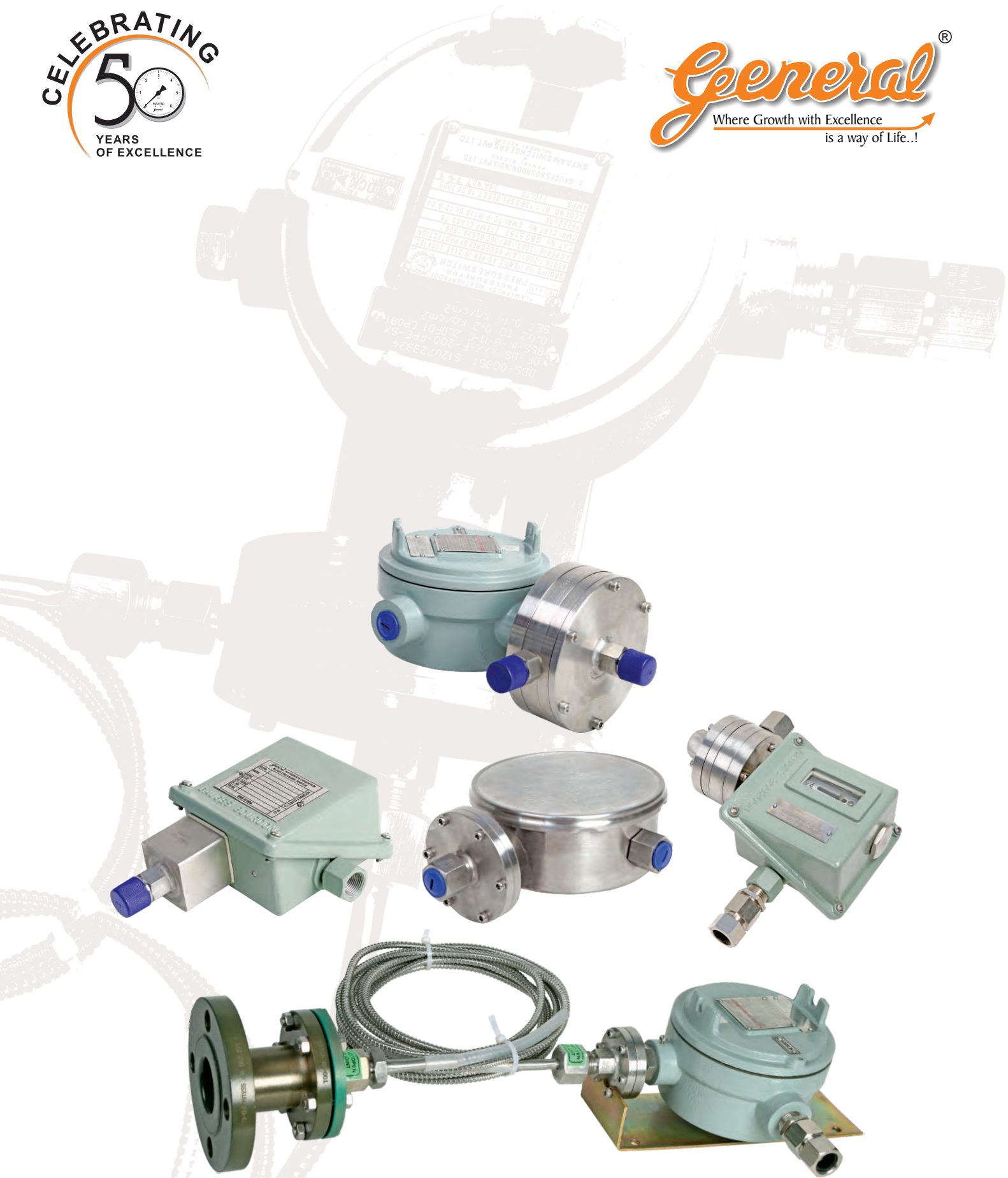
INSTRUMENT CONNECTION

Conn	Code	Size	Code	Type	Code	MALE / FEMALE	Code
Thread	T	1/4"	06	NPS	NS	Male	M
		3/8"	10	NPT	NT	Female	F
		1/2"	15	BSP	BP		
		3/4"	20	BSPT	BT		
		1"	25	JIS-PF	PF		
		M20	M20	JIS-PT	PT		
				Gas	GS		
				R	RR		
				Rp	RP		
				Pitch 1.5	C		

e.g. For 1/2"NPT(M), Code: **T15NTM** For M20x1.5 (F), Code: **TM20CF**

Note: This catalogue indicates the general specifications used for most of the process applications. Any other specification not appearing here also can be provided as per customer requirement.

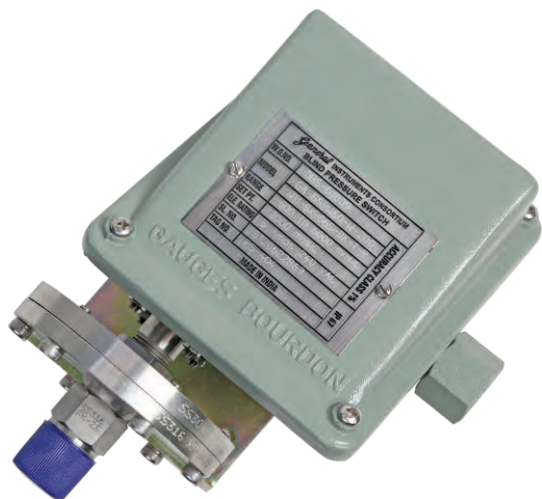
Sample model Code (for Gauge Saver): **ACC-GSV-S6L-T15NTF-T15NTM-NAC**



BLIND PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

Blind Pressure & Diff. Pressure Switches *General*

GENERAL has been designing and manufacturing reliable, high quality Pressure Switches and Differential Pressure Switches for accurate control of the process equipments to suit to most of the industrial applications in various process industries including Oil, Gas, Power, Steel, Chemical, Petrochemical, Soap, Cement, Paper, Sugar, pharmaceutical etc. Generally Pressure Switches are available with sensing element of Bellow, Diaphragm & Piston and Differential Pressure Switches with sensing element of Diaphragm. Rigorous and continuous tests are conducted for design and quality conformance.



Blind Pressure Switches

Application Area:

Safety, Alarming & Tripping of following systems

- Compressors, Pumps
- Turbines, Generators
- Boilers
- Fluid Power/ Hydraulics
- High/ Low Limit level staging functions.

Blind Differential Pressure Switches

Application Area:

Loss of pressure due to choking

- Across Filters
- Across Blowers
- Across Orifice Plates, Nozzle & Venturi
- Across water steam interface in boilers etc...



The recommendations made in this catalogue are to be used as intended guide. No guarantee of material can be undertaken since other factors may affect the performance. We reserve the right to change the specifications mentioned in this catalogue without any notice as improvements & development is a continuous process at "General". Responsibility of typographical errors is specifically disclaimed.

Blind Pressure & Diff. Pressure Switches *General*



Salient Features

Complete Product Range

Standard and customized special models covering pressure ranges from 1kg/cm2 (Vacuum) to high pressure 400kg/cm2(g)

Robust Construction

Robust Construction, Rugged, long life, non critical to vibration, high over range & and proof pressures, excellent resistance to corrosive process media / hostile environments.

Instrument Quality

High resolution of Set Points, high repeatability, fixed/adjustable dead band, negligible temperature effect

Wetted Parts & Process Connection

Wide selection of Materials depending upon the nature of process fluids. For highly corrosive / viscous fluids, Diaphragm Seals with suitable material & process connection can be provided

Snap Action Electrical Switching

Wide selection of UL listed and CSA Certified switching elements for AC and DC service. Optionally Gold Plated Contacts and Environmentally Sealed Switches available. Hermetically Sealed Microswitches can be provided for hazardous and hostile environments

Field Adjustment

All Switches are calibrated and set point pre-set at factory. The set point is field adjustable, without any special tools. Tamper proof locking arrangement is provided. For Switches with adjustable dead band, dead band also shall be field adjustable.

Additional Feature Cost Effectiveness

External Pressure Setting with externally visible Reference Scale (Optional)
Simple and fast installation without special tools, provides longer service life, periodic service or spare parts not required

Quality Control Testing

Rigid quality standards are maintained from raw material to finished product. "General" Pressure & Differential Pressure Switches have been tested as per BS-6134: 1991 Standard for all Routine as well as Type tests, certified by Third Party Inspection Agency

Under Technical Collaboration with M/s. Gauges Bourdon, U.K.

Blind Pressure Switches

Technical Specifications

Standard	BS-6134:1991
Enclosure	Weatherproof / Weatherproof with CE/ Flameproof IIA, IIB & IIC / Flameproof with ATEX (Refer Table-IV)
Cable Entry	Different types of Cable entries with or without Cable Glands (Refer Table – VI)
Type of Sensor	Bellow / Diaphragm / Piston (Refer Table – II)
Sensor & Wetted Parts Material	SS304 / SS316 / SS316L / Monel / Hastelloy-C (Refer Table – VII)
Process Connection	Threaded Connection as per Table-VIII Flanged Connection through Diaphragm Seal (Refer Page 20 & 22)
Mounting	Field (Direct) / Surface / Yoke (2” Pipe)
Type of Micro-switch	1SPDT/ 2SPDT Snap Action Microswitch / Gold Plated Contacts/ Environmentally Sealed Microswitches / Hermetically Sealed Microswitches (Refer Table – V). All switches are of potential free contacts.
Switching Differential	Fixed/ Adjustable (Refer Table-I) (For Switching Differential Values refer Table – XI to XVI)
Set Point	To be specified by Customer (Adjustable from 10 to 90% of the Maximum Range, with tamperproof locking arrangement)
Ranges	For different Ranges, Refer Table – III
Over Range	130% FSD as standard / higher on request
Repeatability	+/- 0.5% FSR
Switching Accuracy	+/- 0.5% FSR
Scale Accuracy	+/- 3% FSR
Ambient Temperature	(-)20°C to 70°C
Process Temperature	(-)20°C to 170°C (for SS wetted parts with Teflon Seal)
High Voltage Strength	Withstands 0.5 KV between open contact for 1 Sec & 2 KV between terminals and earth for one minute.
Insulation Resistance	Insulation Resistance > 10 M Ohms at 500VDC
Intrinsic Safety	Switches are classified as Simple Electrical Apparatus as per BS-5345 as they neither generate nor store energy. Hence Pressure switches are suitable to be used in intrinsically safe systems without certification, provided the power source is certified intrinsically Safe.
Accessories	For different Accessories, Refer Table – X

Blind Differential Pressure Switches

Technical Specifications

Standard	BS-6134:1991
Enclosure	Weatherproof / Weatherproof with CE/ Flameproof IIA, IIB & IIC / Flameproof with Atex (Refer Table-IV)
Cable Entry	Different types of Cable entries with or without Cable Glands (Refer Table – VI)
Type of Sensor	Diaphragm
Sensor & Wetted Parts Material	SS304 / SS316 / SS316L / Monel / Hastelloy-C (Refer Table – VII)
Process Connection	Threaded Connection as per Table-VIII Flanged Connection through Diaphragm Seal (Refer Page 20 & 22)
Mounting	Field (Direct) / Surface / Yoke (2" Pipe)
Type of Micro-switch	1SPDT/ 2SPDT Snap Action Microswitch / Gold Plated Contacts / Environmentally Sealed Microswitches / Hermetically Sealed Microswitches (Refer Table – V). All switches are of potential free contacts.
Switching Differential	Fixed / Adjustable (Refer Table-I) (For Switching Differential Values refer Table - XVII & XVIII)
Set Point	To be specified by Customer (Adjustable from 10 to 90% of the Maximum Range, with tamperproof locking arrangement)
Ranges	For different Ranges, Refer Table – III
Over Range	130% FSD as standard/ higher on request
Static pressure	Static Standard Pressure values as shown below
Repeatability	+/- 0.5% FSR
Switching Accuracy	+/- 0.5% FSR
Scale Accuracy	+/- 3% FSR
Ambient Temperature	(-)20°C to 70°C
Process Temperature	(-)20°C to 170°C (for SS wetted parts with Teflon Seal)
High Voltage Strength	Withstands 0.5 KV between open contact for 1 Sec & 2 KV between terminals and earth for one minute.
Insulation Resistance	Insulation Resistance > 10 M Ohms at 500VDC
Intrinsic Safety	Switches are classified as Simple Electrical Apparatus as per BS-5345 as they neither generate nor store energy. Hence Pressure switches are suitable to be used in intrinsically safe systems without certification, provided the power source is certified intrinsically Safe.
Accessories	For different Accessories, Refer Table – X

Static Pressure Values

DP Range	Static Pressure
DP Range up to 1000 mmWC	1 kg/cm ²
Above 1000 mm WC upto 6000 mm WC	10 kg/cm ²
Above 6000 mm WC upto 2 kg/cm ²	20 kg/cm ²
Above 2 kg/cm ² upto 10 kg/cm ²	40 kg/cm ²

Above shown are the standard values available. Higher Static Pressure on request.

Under Technical Collaboration with M/s. Gauges Bourdon, U.K.

Common Notes for Blind Pressure & Differential Pressure Switches

1. Weatherproof Enclosure, IP-68 as per IS/IEC-60529:2001
2. Weatherproof Enclosure, IP-68 as per IS/IEC-60529:2001, approved by CE
3. Flameproof Enclosure, Gr. IIA, IIB & IIC T6 as per IS 2148-2004 (IEC-60079:2001) & Weatherproof to IP 66 as per IS-12063:1987 (IEC-60529), approved by CMRI/CCOE/PESO
4. Flameproof Enclosure, Atex approved, (Ex) II 2G/D Ex d IIC T6, Ex tD A21 IP 66 T85°C
5. Weatherproof enclosure is effective only if all entries and joint faces are properly sealed.
6. Flameproof enclosure is weatherproof only if cover 'O' ring is retained in position; and flameproof only if suitable Flameproof Cable Gland is provided. It is highly recommended to procure Cable Glands along with flameproof instruments to avoid negligence of the same during installation.
7. Switch Accuracy & Repeatability are one and the same for all blind Pressure / Differential pressure switches. A shift of $\pm 2\%$ may be observed in set point when pressure falls from full static pressure. Settings may also shift with varying temperature.
8. The instrument is calibrated in vertical mounting position. Hence mounting in any other position may cause a minor range shift, especially in low and compound ranges.
9. A pressure switch is a switching device and not a measuring instrument, even though it is provided with a scale to assist setting. Therefore Test Certificates will not specify individual On-Off switching values at different scale readings. Maximum differential obtained alone will be declared, in addition to other specifications.
10. Switching differential (dead band) values furnished are nominal maximum values under test conditions at mid-scale, which may vary with range settings and operating conditions.
11. On-Off setting should not exceed the upper or lower range of the span.
12. Ambient temperature range: All models are suitable for operating within a range of ambient temperature from (-) 20°C to (+) 70°C provided the process fluid does not freeze within this range. Below 0°C, precautions should be taken in humid atmospheres to prevent frost formation inside the instrument from jamming the mechanism. Occasional excursions beyond this range are possible but accuracy might be impaired. The microswitch is the limiting factor which should never exceed the limits (-) 25°C to (+) 80°C.
13. Fluid Temperature: A pressure switch connected to the main pipe is not subjected to the flow and therefore is not fully exposed to the fluid temperature. Use of sufficient length of impulse tubing will greatly reduce excessive heating of the sensing element. For Steam / condensable vapours, a Syphon is recommended between the Process Line & Pressure Switch to reduce excess temperature.
14. Ensure that impulse pipe work applies no stress on sensing element housing and use spanners to hold pressure port / housing when connections are made.
15. It is recommended to select the range of the instrument such that the set value falls between 35% to 65% of the FSR.
16. Scale Markings are for guidance only. Set the correct set value against precision Master Gauge.
17. Pressure & Differential Pressure Switches with dual set points (2 distinct set points) also available on request

Blind Pressure & Diff. Pressure Switches *General*

Model Code / Ordering Information

A) Example for Model Selection:

GF	SS	010K	WA	103	W1E	SX	15NTM	IK	P
Type	Sensor	Range	Type of Enclosure	Type of Microswitch	Cable Entry	Wetted Parts	Process Connection	Mode of Calibration	Accessories

Code	Select from	Description
GF	Table-I	BPS with fixed switching differential
SS	Table-II	BPS with Sensor of Diaphragm
010K	Table-III	Range 1-10 kg/cm ²
WA	Table-IV	Weather proof, Aluminium Enclosure
103	Table-V	1 SPDT, 15A @230VAC, General purpose snap acting switch
W1E	Table-VI	1/2" NPT Brass Nickel plated DCCG
SX	Table-VII	SS316L Diaphragm with SS316 wetted parts & Teflon seal
15NTM	Table-VIII	1/2" NPT(M) Process Connection
IK	Table-IX	Calibration for increasing pressure in kg/cm ²
P	Table-X	2" Pipe mounting Bracket

B) How to select Model Code?

Please select one code from each of the following Tables (I to X), as shown in the above Example.

Table - I : Type of Instrument & Type of Switching Differential

DESCRIPTION	CODE
Blind Pressure Switch with Fixed Switching Differential	GF
Blind Pressure Switch with Adjustable Switching Differential	GA
Blind Differential Pressure Switch with Fixed Switching Differential	DF
Blind Differential Pressure Switch with Adjustable Switching Differential	DA

Table - II : Type of Sensor

DESCRIPTION	CODE
Pressure Switch Sensor of Bellow	SB
Pressure Switch Sensor of Piston	SP
Pressure Switch Sensor of Diaphragm	SS
Differential Pressure Switch Sensor of Diaphragm	DS

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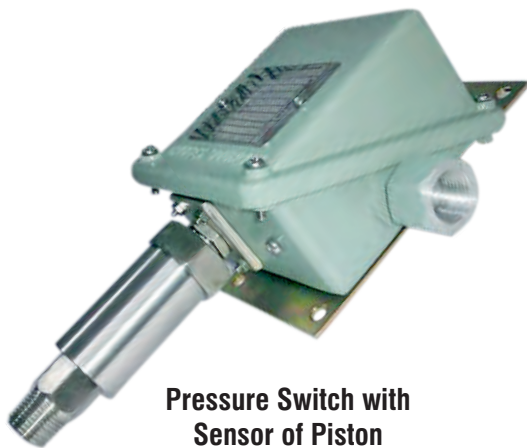
Blind Pressure & Diff. Pressure Switches *General*



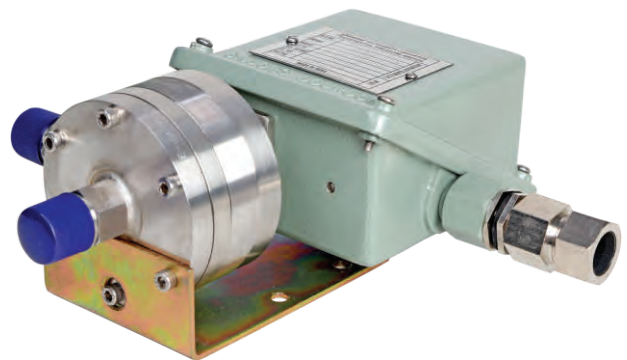
Pressure Switch with Sensor of Diaphragm



Pressure Switch with Sensor of Bellow



Pressure Switch with Sensor of Piston



Differential Pressure Switch with Sensor of Diaphragm

Blind Pressure & Diff. Pressure Switches



Table III : Ranges

Range	Unit	Code	Range	Unit	Code	Availability in Series
-600 to 0	mmWC	VW06	-60 to 0	mBar	VM06	SS
-1000 to 0	mmWC	VW10	-100 to 0	mBar	VM10	SS
-1600 to 0	mmWC	VW16	-160 to 0	mBar	VM16	SB, SS
-2500 to 0	mmWC	VW25	-250 to 0	mBar	VM25	SB, SS
-4000 to 0	mmWC	VW40	-400 to 0	mBar	VM40	SB, SS
-6000 to 0	mmWC	VW60	-600 to 0	mBar	VM60	SB, SS
-1 to 0	kg/cm ²	VP1K	-1 to 0	Bar	VP1B	SB, SS
-0.5 to 0.5	kg/cm ²	C50K	-0.5 to 0.5	Bar	C50B	SB, SS
-1 to 1.5	kg/cm ²	C15K	-1 to 1.5	Bar	C15B	SB, SS
-1 to 3	kg/cm ²	C30K	-1 to 3	Bar	C30B	SB, SS
-200 to 200	mmWC	CW02	-20 to 20	mBar	CM02	SS
-400 to 400	mmWC	CW04	-40 to 40	mBar	CM04	SS
-500 to 500	mmWC	CW05	-50 to 50	mBar	CM05	SS
20 to 200	mmWC	PW02	2 to 20	mBar	PM02	DS, SS
30 to 300	mmWC	PW03	3 to 30	mBar	PM03	DS, SS
40 to 400	mmWC	PW04	4 to 40	mBar	PM04	DS, SS
60 to 600	mmWC	PW06	6 to 60	mBar	PM06	DS, SS
100 to 1000	mmWC	PW10	10 to 100	mBar	PM10	DS, SB, SS
160 to 1600	mmWC	PW16	16 to 160	mBar	PM16	DS, SB, SS
200 to 2000	mmWC	PW20	20 to 200	mBar	PM20	DS, SB, SS
250 to 2500	mmWC	PW25	25 to 250	mBar	PM25	DS, SB, SS
400 to 4000	mmWC	PW40	40 to 400	mBar	PM40	DS, SB, SS
600 to 6000	mmWC	PW60	60 to 600	mBar	PM60	DS, SB, SS
0.1 to 1	kg/cm ²	001K	0.1 to 1	Bar	001B	DS, SB, SS
0.2 to 2	kg/cm ²	002K	0.2 to 2	Bar	002B	DS, SB, SS
0.3 to 3	kg/cm ²	003K	0.3 to 3	Bar	003B	DS, SB, SS
0.4 to 4	kg/cm ²	004K	0.4 to 4	Bar	004B	DS, SB, SS
0.5 to 5	kg/cm ²	005K	0.5 to 5	Bar	005B	DS, SB, SS
0.6 to 6	kg/cm ²	006K	0.6 to 6	Bar	006B	DS, SB, SS
0.7 to 7	kg/cm ²	007K	0.7 to 7	Bar	007B	DS, SB, SS
1 to 10	kg/cm ²	010K	1 to 10	Bar	010B	DS, SB, SS
1.6 to 16	kg/cm ²	016K	1.6 to 16	Bar	016B	SB, SS
2 to 20	kg/cm ²	020K	2 to 20	Bar	020B	SB, SS
2.5 to 25	kg/cm ²	025K	2.5 to 25	Bar	025B	SB, SS
4 to 40	kg/cm ²	040K	4 to 40	Bar	040B	SS
6 to 60	kg/cm ²	060K	6 to 60	Bar	060B	SS
10 to 100	kg/cm ²	100K	10 to 100	Bar	100B	SP
16 to 160	kg/cm ²	160K	16 to 160	Bar	160B	SP
20 to 200	kg/cm ²	200K	20 to 200	Bar	200B	SP
25 to 250	kg/cm ²	250K	25 to 250	Bar	250B	SP
35 to 350	kg/cm ²	350K	35 to 350	Bar	350B	SP
40 to 400	kg/cm ²	400K	40 to 400	Bar	400B	SP

Blind Pressure & Diff. Pressure Switches *General*

Table IV : Type of Enclosure

DESCRIPTION	CODE
Weather proof, Die-Cast Aluminium enclosure, epoxy powder coated, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001	WA
Weather proof, SS304 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001	W4
Weather proof, SS316 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001	W6
Weather proof, Die-Cast Aluminium enclosure, epoxy powder coated, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001, CE approved	CA
Weather proof, SS304 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001, CE approved	C4
Weather proof, SS316 enclosure, conforming to IP-68 protection, in accordance with IS/IEC-60529:2001, CE approved	C6
Flameproof Die Cast Aluminum Enclosure, epoxy powder coated, conforming to Gr. IIA, IIB & IIC T6 in accordance with IS 2148-2004 (IEC-60079:2001) & Weatherproof to IP 66 in accordance with IS-12063:1987 (IEC-60529), approved by CMRI/CCOE/PESO	FA
Flameproof Die Cast Aluminum epoxy powder coated Enclosure, Atex approved, Ex II 2G/D Ex d IIC T6, Ex tD A21 IP 66 T85°C	AA



Pressure Switch with Weather proof Aluminium Enclosure



Pressure Switch with Weather proof SS Enclosure



Pressure Switch with Flame proof Aluminium Enclosure



Differential Pressure Switch with Flame proof Aluminium Enclosure

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Blind Pressure & Diff. Pressure Switches



Table V : Type of Micro Switch

DESCRIPTION	CODE	AVAILABILITY IN TYPE	A.C.RATING		D.C.RATING	
			Current Voltage	Volt -	Current Resistive	Inductive
1-SPDT General Purpose	100	GF *	5A-250VAC	220	0.25A	0.03A
2-SPDT General Purpose	200	GF *		110	0.50A	0.07A
1-SPDT General Purpose				24	5.0A	3.00A
1-SPDT Low switching differential	101	GF/GA	15A-250 VAC	220	0.2 A	0.03 A
2-SPDT Low switching differential	201	GF		110	0.4 A	0.03 A
				24	2 A	1 A
1-SPDT-General Purpose	102	GF/DF/GA/DA	5A-250VAC	220	0.25 A	0.1 A
2-SPDT-General Purpose	202	GF/DF/GA/DA		110	0.5 A	0.2 A
				24	8 A	7 A
1-SPDT-General Purpose	103	GF/DF/GA/DA	15A-250VAC	220	0.25 A	0.1 A
2-SPDT-General Purpose	203	GF/DF/GA/DA		110	0.5 A	0.2 A
				24	8 A	7 A
1-SPDT- Very low switching differential	104	GF/DF/GA/DA	10A-250 VAC	220	0.2 A	0.03 A
1-SPDT- Very low switching differential	204	GF/DF		110	0.4 A	0.03 A
				24	2 A	1 A
1-SPDT, Gold Contact	105	GF/ DF/ GA/ DA	1A - 250 VAC	---	---	---
2-SPDT, Gold Contact	205	GF/ DF/ GA/ DA				
1-SPDT-General Purpose	106	GF/ DF/ GA/ DA	10A - 250 VAC	30	6A	6A
2-SPDT-General Purpose	206	GF/ DF/ GA/ DA				
1-SPDT, Environmentally Sealed	108	GF/ DF/ GA/ DA	5A - 250 VAC	30	3	---
2-SPDT, Environmentally Sealed	208	GF/ DF/ GA/ DA				
1-SPDT, Hermetically Sealed, Silver Contacts	109	GF/ DF/ GA/ DA	5A - 250 VAC	30	3	---
2-SPDT, Hermetically Sealed, Silver Contacts	209	GF/ DF/ GA/ DA				
1-SPDT, Hermetically Sealed, Gold Contacts	110	GF/ DF/ GA/ DA	1A - 250 VAC	---	---	---
2-SPDT, Hermetically Sealed, Gold Contacts	210	GF/ DF/ GA/ DA				
Any special requirement	XXX	---	---	---	---	---

NOTE : * Microswitch Codes 100 & 200 are not available in Piston type Pressure Switches

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Table VI: Type of Cable Entry

Cable Entry	Single Cable Entry				Double Cable Entries				Double Cable Entries, one plugged			
	W/P	FLP (IIA/ IIB IIC)	W/P CE	FLP Atex	W/P	FLP (IIA/ IIB) IIC)	W/P CE	FLP Atex	W/P	FLP (IIA/ IIB) IIC)	W/P CE	FLP Atex
3/4" ET(F)	W10	F10	C10	-	W20	F20	C20	-	WP0	FP0	CP0	-
3/8" BSP(F)	W11	F11	C11	-	W21	F21	C21	-	WP1	FP1	CP1	-
1/2" BSP(F)	W12	F12	C12	-	W22	F22	C22	-	WP2	FP2	CP2	-
1/2" NPT(F)	W13	F13	C13	A13	W23	F23	C23	A23	WP3	FP3	CP3	AP3
3/4" BSP(F)	W14	F14	C14	-	W24	F24	C24	-	WP4	FP4	CP4	-
3/4" NTP(F)	W15	F15	C15	A15	W25	F25	C25	A25	WP5	FP5	CP5	AP5
3/4"ET, DCCG - SS	W1B	F1B	C1B	-	W2B	F2B	C2B	-	WPB	FPB	CPB	-
1/2"BSP, DCCG - Brass	W1C	F1C	C1C	-	W2C	F2C	C2C	-	WPC	FPC	CPC	-
1/2"BSP, DCCG - SS	W1D	F1D	C1D	-	W2D	F2D	C2D	-	WPD	FPD	CPD	-
1/2"NPT, DCCG - Brass	W1E	F1E	C1E	A1E	W2E	F2E	C2E	A2E	WPE	FPE	CPE	APE
1/2"NPT, DCCG - SS	W1F	F1F	C1F	A1F	W2F	F2F	C2F	A2F	WPF	FPF	CPF	APF
3/4"NPT, DCCG - Brass	W1G	F1G	C1G	A1G	W2G	F2G	C2G	A2G	WPG	FPG	CPG	APG
3/4"NPT, DCCG - SS	W1H	F1H	C1H	A1H	W2H	F2H	C2H	A2H	WPH	FPH	CPH	APH
3/4"BSP, DCCG - Brass	W1J	F1J	C1J	-	W2J	F2J	C2J	-	WPJ	FPJ	CPJ	-
3/4"BSP, DCCG - SS	W1K	F1K	C1K	-	W2K	F2K	C2K	-	WPK	FPK	CPK	-
3/4" ET, SCCG - PVC	PVC	-	-	-	-	-	-	-	-	-	-	-
4 Pin Connector	4PC	-	-	-	-	-	-	-	-	-	-	-
7 Pin Connector	7PC	-	-	-	-	-	-	-	-	-	-	-

NOTE :

- a) SCCG: Single Compression Cable Gland
- b) DCCG: Double Compression Cable Gland
- c) Specify "99X" for any special requirement.

Table VII : Sensor System (Sensor & Wetted Parts)

DESCRIPTION	CODE
SS316L Sensor with SS304 wetted parts & Teflon seal	SS
SS316L Sensor with SS316 wetted parts & Teflon seal	SX
SS316L Sensor with SS316L wetted parts & Teflon seal	SL
Monel Sensor with Monel wetted parts & Teflon seal	MM
Hastelloy-C Sensor with Hastelloy-C wetted parts & Teflon seal	HC
Any other Material (Please specify the details separately)	XX

NOTE :

- a) Materials shown in the above Table are meant for Threaded Process Connection. Any other material shall be provided through Diaphragm Seal (Refer Page No: 18-22 for details of Diaphragm Seal)
- b) Flanged process connection of any material shall be provided through Diaphragm Seal (Refer Page No: 18-22 for details of Diaphragm Seal)
- c) Diaphragm Seals for Differential Pressure Switches shall be provided along with Capillary (suitable for Remote Mounting)
- d) Optionally, Wetted Parts with NACE conformance can be provided (Specify Code "N" in Accessory Column, Refer Table-X)

Blind Pressure & Diff. Pressure Switches *General*

Table VIII : Type of Process Connection

SIZE	CODE	TYPE	CODE	FORM	CODE
1/4"	06	NPT	NT	MALE	M
3/8"	10	BSP	BP	FEMALE	F
1/2"	15	BSPT	BT		
3/4"	20	PF	PF		
1"	25	GAS NPS	GS NS		
M18 x 1.5p M20 x 1.5p M24 x 1.5p M27 x 1.5p	18 20 24 27	Metric	M	MALE FEMALE	M F

For any other Connection, mention Code - XX

e.g, 1/2" NPT(MALE), Code: 15NTM
e.g, M20x1.5p (FEMALE), Code: 20MF

Table IX : Mode of Calibration / Units

DESCRIPTION	CODE
Calibration in Increasing Pressure in kg/cm2	IK
Calibration in Decreasing Pressure in kg/cm2	DK
Calibration in Increasing Pressure in Bar	IB
Calibration in Decreasing Pressure in Bar	DB
Calibration in Increasing Pressure in mmWC	IW
Calibration in Decreasing Pressure in mmWC	DW
Calibration in Increasing Pressure in mBar	IM
Calibration in Decreasing Pressure in mBar	DM
Calibration in Increasing Pressure in any other Unit	IX
Calibration in Decreasing Pressure in any other Unit	DX



Pressure Switch with External Setting

Table X : Options

DESCRIPTION	CODE
Surface Mounting bracket	B
2" Pipe mounting bracket	P
External Pressure Setting, with Reference Scale	E
NACE compliance for Wetted Parts	N
Diaphragm Seal (Chemical seal) *	U*
Accessories**	X**
No accessory	L

* Model Code for Diaphragm Seal to be mentioned separately (Refer Page 18 to 22)
** Model Code for Accessories to be mentioned separately (Refer Page 23 to 31)



Differential Pressure Switch with External Setting

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Blind Pressure & Diff. Pressure Switches



Table XI :
Pressure Switch With Diaphragm Sensor - Fixed Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
VW06	-600 to 0	mmWC	75	65	65	55	---	---
VW10	-1000 to 0	mmWC	75	65	65	55	---	---
VW16	-1600 to 0	mmWC	110	100	110	70	250	350
VW25	-2500 to 0	mmWC	160	140	160	120	300	400
VW40	-4000 to 0	mmWC	270	240	270	200	400	500
VW60	-6000 to 0	mmWC	430	400	430	300	500	600
VP1K/B	-1 to 0	kg/cm ² / Bar	0.20	0.10	0.20	0.06	0.20	0.30
C50K/B	-0.5 to 0.5	kg/cm ² / Bar	0.20	0.10	0.20	0.06	0.20	0.30
C15K/B	-1 to 1.5	kg/cm ² / Bar	0.35	0.20	0.30	0.16	0.30	0.35
C30K/B	-1 to 3	kg/cm ² / Bar	0.50	0.40	0.40	0.20	0.40	0.50
CW02	-200 to 200	mmWC	30	30	30	30	---	---
CW04	-400 to 400	mmWC	60	60	60	50	---	---
CW05	-500 to 500	mmWC	80	80	80	60	---	---
PW02	20 to 200	mmWC	30	30	30	30	---	---
PW03	30 to 300	mmWC	30	30	30	30	---	---
PW04	40 to 400	mmWC	40	40	40	40	---	---
PW06	60 to 600	mmWC	60	55	60	50	---	---
PW10	100 to 1000	mmWC	70	60	70	50	---	---
PW16	160 to 1600	mmWC	100	90	100	70	250	350
PW20	200 to 2000	mmWC	130	120	130	100	250	350
PW25	250 to 2500	mmWC	150	140	150	120	300	400
PW40	400 to 4000	mmWC	250	220	250	200	400	500
PW60	600 to 6000	mmWC	400	375	400	300	500	600
001K/B	0.1 to 1	kg/cm ² / Bar	0.15	0.10	0.20	0.08	0.20	0.20
002K/B	0.2 to 2	kg/cm ² / Bar	0.20	0.15	0.25	0.12	0.25	0.30
003K/B	0.3 to 3	kg/cm ² / Bar	0.30	0.22	0.35	0.20	0.35	0.40
004K/B	0.4 to 4	kg/cm ² / Bar	0.40	0.30	0.45	0.25	0.45	0.50
005K/B	0.5 to 5	kg/cm ² / Bar	0.45	0.40	0.50	0.30	0.50	0.60
006K/B	0.6 to 6	kg/cm ² / Bar	0.50	0.40	0.55	0.40	0.55	0.80
007K/B	0.7 to 7	kg/cm ² / Bar	0.60	0.50	0.65	0.40	0.65	0.90
010K/B	1 to 10	kg/cm ² / Bar	0.70	0.60	0.75	0.50	0.75	1.10
016K/B	1.6 to 16	kg/cm ² / Bar	1.00	0.90	1.20	0.70	1.20	2.00
020K/B	2 to 20	kg/cm ² / Bar	2.00	1.80	2.40	1.60	2.40	2.50
025K/B	2.5 to 25	kg/cm ² / Bar	2.50	2.20	3.00	2.00	3.00	3.00
040K/B	4 to 40	kg/cm ² / Bar	3.00	2.70	3.50	2.20	3.50	4.50
060K/B	6 to 60	kg/cm ² / Bar	5.00	4.50	5.50	3.00	5.50	7.50

NOTE :

- Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
- Switching differentials are nominal maximum values at mid-point and change along the set points
- For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g, for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

Under Technical Collaboration with M/s. Gauges Bourdon, U.K.

Table XII :
Pressure Switch With Bellow Sensor - Fixed Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW10	100 to 1000	mmWC	56	48	56	40	-	-
PW16	160 to 1600	mmWC	80	72	80	56	200	280
PW20	200 to 2000	mmWC	104	96	104	80	200	280
PW25	250 to 2500	mmWC	120	112	120	96	240	320
PW40	400 to 4000	mmWC	200	176	200	160	320	400
PW60	600 to 6000	mmWC	320	300	320	240	400	480
001K/B	0.1 to 1	kg/cm ² / Bar	0.12	0.08	0.16	0.06	0.16	0.16
002K/B	0.2 to 2	kg/cm ² / Bar	0.16	0.12	0.20	0.10	0.20	0.24
003K/B	0.3 to 3	kg/cm ² / Bar	0.24	0.18	0.28	0.16	0.28	0.32
004K/B	0.4 to 4	kg/cm ² / Bar	0.32	0.24	0.36	0.20	0.36	0.40
005K/B	0.5 to 5	kg/cm ² / Bar	0.36	0.32	0.40	0.24	0.40	0.48
006K/B	0.6 to 6	kg/cm ² / Bar	0.40	0.32	0.44	0.32	0.44	0.64
007K/B	0.7 to 7	kg/cm ² / Bar	0.48	0.40	0.52	0.32	0.52	0.72
010K/B	1 to 10	kg/cm ² / Bar	0.56	0.48	0.60	0.40	0.60	0.88
016K/B	1.6 to 16	kg/cm ² / Bar	0.80	0.72	0.96	0.56	0.96	1.60
020K/B	2 to 20	kg/cm ² / Bar	1.60	1.44	1.92	1.28	1.92	2.00
025K/B	2.5 to 25	kg/cm ² / Bar	2.00	1.76	2.40	1.60	2.40	2.40

Table XIII :
Pressure Switch with Piston sensor - Fixed Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
100K/B	10 to 100	kg/cm ² / Bar	---	7	8	6	8	10
160K/B	16 to 160	kg/cm ² / Bar	---	8	9	7	9	16
200K/B	20 to 200	kg/cm ² / Bar	---	9	11	8	12	20
250K/B	25 to 250	kg/cm ² / Bar	---	10	12	9	14	25
350K/B	35 to 350	kg/cm ² / Bar	---	16	20	12	22	35
400K/B	40 to 400	kg/cm ² / Bar	---	20	25	16	27	40

NOTE :

- Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
- Switching differentials are nominal maximum values at mid-point and change along the set points
- For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g, for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

Table XIV :
Pressure Switch With Diaphragm Sensor - Adjustable Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
C15K/B	-1 to 1.5	kg/cm ² / Bar	---	0.20 to 0.75	0.30 to 0.75	0.16 to 0.50	0.30 to 0.75	0.35 to 0.75
C30K/B	-1 to 3	kg/cm ² / Bar	---	0.40 to 1.20	0.40 to 1.20	0.20 to 0.80	0.40 to 1.20	0.50 to 1.20
PW10	100 to 1000	mmWC	---	60 to 250	70 to 300	---	---	---
PW16	160 to 1600	mmWC	---	90 to 400	100 to 480	70 to 320	250 to 480	350 to 480
PW20	200 to 2000	mmWC	---	120 to 500	130 to 600	100 to 400	250 to 600	350 to 600
PW25	250 to 2500	mmWC	---	140 to 625	150 to 750	120 to 500	300 to 750	400 to 750
PW40	400 to 4000	mmWC	---	220 to 1000	250 to 1200	200 to 800	400 to 1200	500 to 1200
PW60	600 to 6000	mmWC	---	375 to 1500	400 to 1800	300 to 1200	500 to 1800	600 to 1800
001K/B	0.1 to 1	kg/cm ² / Bar	---	0.10 to 0.25	0.20 to 0.30	0.08 to 0.20	0.20 to 0.35	0.20 to 0.35
002K/B	0.2 to 2	kg/cm ² / Bar	---	0.15 to 0.50	0.25 to 0.60	0.12 to 0.40	0.25 to 0.60	0.30 to 0.60
003K/B	0.3 to 3	kg/cm ² / Bar	---	0.22 to 0.75	0.35 to 0.90	0.20 to 0.60	0.35 to 0.90	0.40 to 0.90
004K/B	0.4 to 4	kg/cm ² / Bar	---	0.30 to 1.00	0.45 to 1.20	0.25 to 0.80	0.45 to 1.20	0.50 to 1.20
005K/B	0.5 to 5	kg/cm ² / Bar	---	0.40 to 1.25	0.50 to 1.50	0.30 to 1.00	0.50 to 1.50	0.60 to 1.50
006K/B	0.6 to 6	kg/cm ² / Bar	---	0.40 to 1.50	0.55 to 1.80	0.40 to 1.20	0.55 to 1.80	0.80 to 1.80
007K/B	0.7 to 7	kg/cm ² / Bar	---	0.50 to 1.75	0.65 to 2.10	0.40 to 1.40	0.65 to 2.10	0.90 to 2.10
010K/B	1 to 10	kg/cm ² / Bar	---	0.60 to 2.50	0.75 to 3.00	0.50 to 2.00	0.75 to 3.00	1.10 to 3.00
016K/B	1.6 to 16	kg/cm ² / Bar	---	0.9 to 4.0	1.2 to 4.8	0.7 to 3.2	1.2 to 4.8	2.0 to 4.8
020K/B	2 to 20	kg/cm ² / Bar	---	1.8 to 5.0	2.4 to 6.0	1.6 to 4.0	2.4 to 6.0	2.5 to 6.0
025K/B	2.5 to 25	kg/cm ² / Bar	---	2.2 to 6.0	3.0 to 7.5	2.0 to 5.0	3.0 to 7.5	3.0 to 7.5
040K/B	4 to 40	kg/cm ² / Bar	---	2.7 to 10.0	3.5 to 12.0	2.2 to 8.0	3.5 to 12.0	4.5 to 12.0
060K/B	6 to 60	kg/cm ² / Bar	---	4.5 to 15.0	5.5 to 18.0	3.0 to 12.0	5.5 to 18.0	7.5 to 18.0

NOTE :

1. Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
2. Switching differentials are nominal maximum values at mid-point and change along the set points
3. Microswitch Codes 201 & 204 are not available with Adjustable Differential
4. For Compound Ranges, Switching differential adjustment shall be applicable in pressure side only (not in vacuum side)
5. For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g. for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

Table XV :
Pressure Switch With Bellow Sensor - Adjustable Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW10	100 to 1000	mmWC	---	48 to 250	56 to 300	---	---	---
PW16	160 to 1600	mmWC	---	72 to 400	80 to 480	56 to 320	200 to 480	280 to 480
PW20	200 to 2000	mmWC	---	96 to 500	104 to 600	80 to 400	200 to 600	280 to 600
PW25	250 to 2500	mmWC	---	112 to 625	120 to 750	96 to 500	240 to 750	320 to 750
PW40	400 to 4000	mmWC	---	176 to 1000	200 to 1200	160 to 800	320 to 1200	400 to 1200
PW60	600 to 6000	mmWC	---	300 to 1500	320 to 1800	240 to 1200	400 to 1800	480 to 1800
001K/B	0.1 to 1	kg/cm ² / Bar	---	0.08 to 0.25	0.16 to 0.30	0.06 to 0.20	0.16 to 0.35	0.16 to 0.35
002K/B	0.2 to 2	kg/cm ² / Bar	---	0.12 to 0.50	0.20 to 0.60	0.10 to 0.40	0.20 to 0.60	0.24 to 0.60
003K/B	0.3 to 3	kg/cm ² / Bar	---	0.18 to 0.75	0.28 to 0.90	0.16 to 0.60	0.28 to 0.90	0.32 to 0.90
004K/B	0.4 to 4	kg/cm ² / Bar	---	0.24 to 1.00	0.36 to 1.20	0.20 to 0.80	0.36 to 1.20	0.40 to 1.20
005K/B	0.5 to 5	kg/cm ² / Bar	---	0.32 to 1.25	0.40 to 1.50	0.24 to 1.00	0.40 to 1.50	0.48 to 1.50
006K/B	0.6 to 6	kg/cm ² / Bar	---	0.32 to 1.50	0.44 to 1.80	0.32 to 1.20	0.44 to 1.80	0.64 to 1.80
007K/B	0.7 to 7	kg/cm ² / Bar	---	0.40 to 1.75	0.52 to 2.10	0.32 to 1.40	0.52 to 2.10	0.72 to 2.10
010K/B	1 to 10	kg/cm ² / Bar	---	0.48 to 2.50	0.60 to 3.00	0.40 to 2.00	0.60 to 3.00	0.88 to 3.00
016K/B	1.6 to 16	kg/cm ² / Bar	---	0.72 to 4.00	0.96 to 4.80	0.56 to 3.20	0.96 to 4.80	1.60 to 4.80
020K/B	2 to 20	kg/cm ² / Bar	---	1.44 to 5.00	1.44 to 6.00	1.28 to 4.00	1.92 to 6.00	2.50 to 6.00
025K/B	2.5 to 25	kg/cm ² / Bar	---	1.76 to 6.00	1.76 to 7.50	1.60 to 5.00	2.40 to 7.50	3.00 to 7.50

Table XVI :
Pressure Switch with Piston sensor - Adjustable Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
100K/B	10 to 100	kg/cm ² / Bar	---	7 to 25	8 to 30	6 to 20	8 to 30	10 to 30
160K/B	16 to 160	kg/cm ² / Bar	---	8 to 40	9 to 50	7 to 32	9 to 50	16 to 50
200K/B	20 to 200	kg/cm ² / Bar	---	9 to 50	11 to 60	8 to 40	12 to 60	20 to 60
250K/B	25 to 250	kg/cm ² / Bar	---	10 to 65	12 to 75	9 to 50	14 to 75	25 to 75
350K/B	35 to 350	kg/cm ² / Bar	---	16 to 85	20 to 105	12 to 70	22 to 105	35 to 105
400K/B	40 to 400	kg/cm ² / Bar	---	20 to 100	25 to 120	16 to 80	27 to 120	40 to 120

NOTE :

1. Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
2. Switching differentials are nominal maximum values at mid-point and change along the set points
3. Microswitch Codes 201 & 204 are not available with Adjustable Differential
4. For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g. for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)

Table XVII :
Differential Pressure Switch With Diaphragm Sensor - Fixed Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW02	20 to 200	mmWC	---	---	40	40	---	---
PW03	30 to 300	mmWC	---	---	60	60	---	---
PW04	40 to 400	mmWC	---	---	80	80	---	---
PW06	60 to 600	mmWC	---	---	100	100	---	---
PW10	100 to 1000	mmWC	---	---	150	150	---	---
PW16	160 to 1600	mmWC	---	---	250	230	250	320
PW20	200 to 2000	mmWC	---	---	350	330	350	350
PW25	250 to 2500	mmWC	---	---	400	375	400	400
PW40	400 to 4000	mmWC	---	---	450	425	450	500
PW60	600 to 6000	mmWC	---	---	500	470	500	600
001K/B	0.1 to 1	kg/cm ² / Bar	---	---	0.12	0.10	0.12	0.20
002K/B	0.2 to 2	kg/cm ² / Bar	---	---	0.25	0.20	0.25	0.30
003K/B	0.3 to 3	kg/cm ² / Bar	---	---	0.35	0.30	0.35	0.40
004K/B	0.4 to 4	kg/cm ² / Bar	---	---	0.50	0.40	0.50	0.60
005K/B	0.5 to 5	kg/cm ² / Bar	---	---	0.60	0.50	0.60	0.70
006K/B	0.6 to 6	kg/cm ² / Bar	---	---	0.70	0.60	0.70	0.80
007K/B	0.7 to 7	kg/cm ² / Bar	---	---	0.80	0.70	0.80	1.00
010K/B	1 to 10	kg/cm ² / Bar	---	---	1.35	1.00	1.35	1.50

Table XVIII :
Differential Pressure Switch with Diaphragm sensor - Adjustable Differential

RANGE CODE	RANGE	UNIT	Micro Switch Code					
			100	101	102/103	104	105/106	108/109/110
PW16	160 to 1600	mmWC	---	---	250 to 480	230 to 400	250 to 480	320 to 500
PW20	200 to 2000	mmWC	---	---	350 to 600	330 to 500	350 to 600	350 to 650
PW25	250 to 2500	mmWC	---	---	400 to 750	375 to 625	400 to 750	400 to 800
PW40	400 to 4000	mmWC	---	---	450 to 1200	425 to 1000	450 to 1200	500 to 1250
PW60	600 to 6000	mmWC	---	---	500 to 1800	470 to 1500	500 to 1800	600 to 1900
001K/B	0.1 to 1	kg/cm ² / Bar	---	---	0.12 to 0.30	0.10 to 0.25	0.12 to 0.30	0.20 to 0.32
002K/B	0.2 to 2	kg/cm ² / Bar	---	---	0.25 to 0.60	0.20 to 0.60	0.25 to 0.60	0.30 to 0.65
003K/B	0.3 to 3	kg/cm ² / Bar	---	---	0.35 to 0.90	0.30 to 0.75	0.35 to 0.90	0.40 to 1.00
004K/B	0.4 to 4	kg/cm ² / Bar	---	---	0.50 to 1.20	0.40 to 1.00	0.50 to 1.20	0.60 to 1.25
005K/B	0.5 to 5	kg/cm ² / Bar	---	---	0.60 to 1.50	0.50 to 1.25	0.60 to 1.50	0.70 to 1.60
006K/B	0.6 to 6	kg/cm ² / Bar	---	---	0.70 to 1.80	0.60 to 1.50	0.70 to 1.80	0.80 to 1.90
007K/B	0.7 to 7	kg/cm ² / Bar	---	---	0.80 to 2.10	0.70 to 1.75	0.80 to 2.10	1.00 to 2.25
010K/B	1 to 10	kg/cm ² / Bar	---	---	1.35 to 3.00	1.00 to 2.50	1.35 to 3.00	1.50 to 3.25

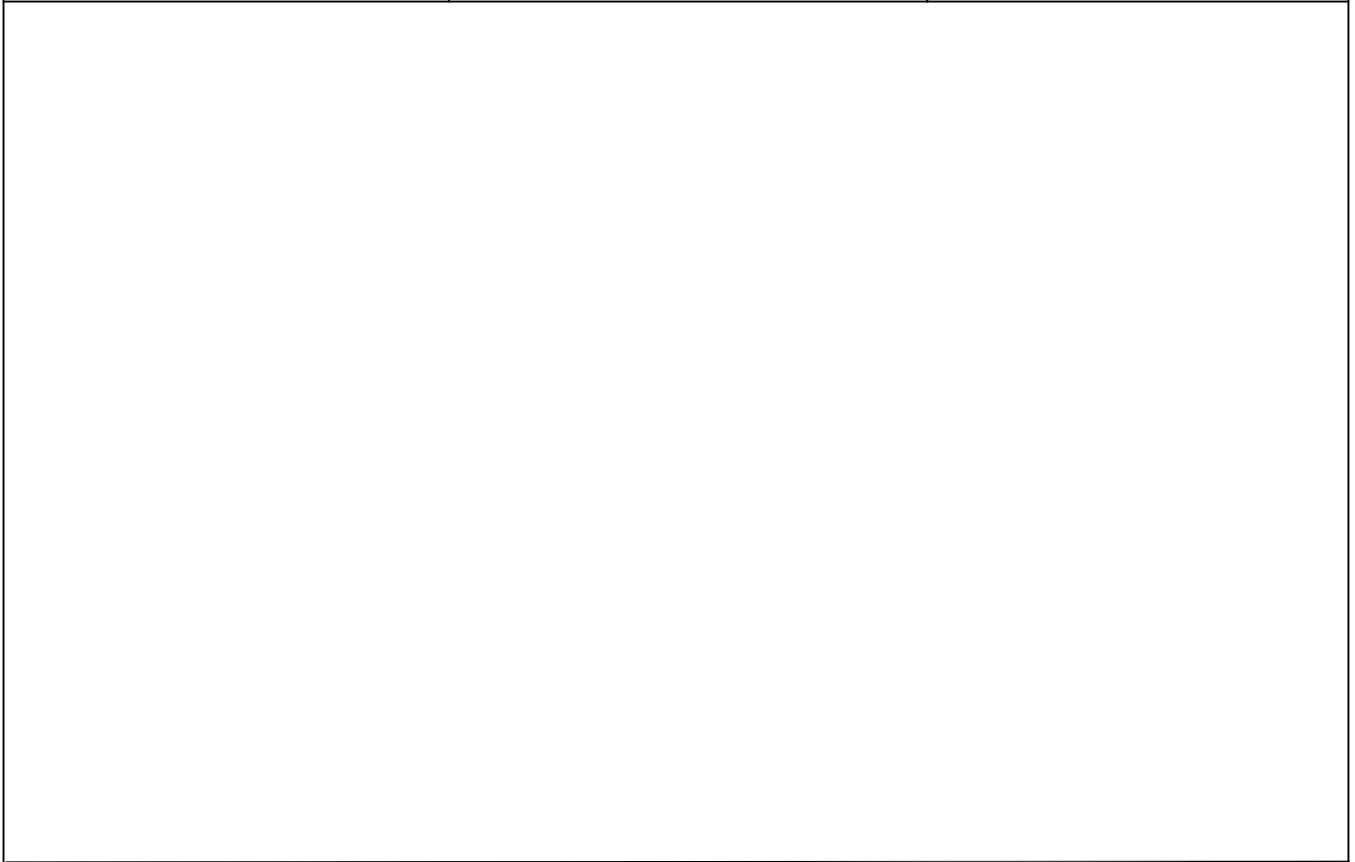
NOTE :

- Above values are applicable for 1SPDT Microswitch. For Switching differential of 2SPDT, multiply above values with 1.5
- Switching differentials are nominal maximum values at mid-point and change along the set points
- Microswitch Code 204 is not available with Adjustable Differential
- For switching Differential Value in mBar, please consider equivalent Range in mmWC, which will be 10 times the Range in mBar (e.g, for Range of 16 to 160 mBar consider the Range of 160 to 1600 mmWC). Take the Switching Differential value in mmWC and divide the same by 10, to get switching differential value in mBar (e.g. If the Switching differential value in the above Table is 150 mmWC, equivalent value in mBar shall be 15)





Under Technical Collaboration with M/s. Gauges Bourdon, U.K.

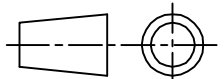
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REV	DATE	ALTERED:	REV	DATE	ALTERED:	
		CHECKED:			CHECKED:	
						STATUS : CONTRACT
						JOB NO.: 412




2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
	CONSULTANT: DESEIN PVT LTD, NEW DELHI.
	BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NEW DELHI
	OTOKLIN GLOBAL BUSINESS LTD. E-410, CRYSTAL PLAZA, OPP. INFINITI MALL LOKHANDWALA LINK ROAD, ANDHERI WEST, MUMBAI 400 053. Tel No.022-26732135

DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -		
TECHNICAL DATSHEET AND HOOK UP DRAWING FOR TRANSMITTERS					NAME	SIGN	DATE	
					PREP	BILAL S	BS	24.06.20
					CHKD	MUAZZAM I	MI	24.06.20
BHEL LOA NO:PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018					APPD	ASLAM A	AA	24.06.20

DEPT.					CARD CODE -	BHEL DRAWING NO. PE-V0-412-158-A047	REV 5
SIGN		N.A.				OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDSHKUP/TRA/PTP/18/330	
DATE						NO. OF SHEETS 83 EXCLUDING COVER PAGE	

CLIENT	BHARAT HEAVY ELECTRICALS LTD.	Project Doc No.: PE-V0-412-158-A047			
PROJECT	PreTreatment Plant Ennore	OTOKLIN DOC NO:- OGBL/OC-983/TDSHKUP/TRA/PTP/18/330			
		MADE BY FN	CHKD BY MI	APPD BY AA	Rev No:- 3
SR. NO.	INDEX				PAGE NO.
1	DATA SHEET FOR LEVEL TRANSMITTER				2
2	CATALOG FOR LEVEL TRANSMITTER				3-7
3	DATA SHEET FOR FLOW TRANSMITTER				8
4	CATALOG FOR FLOW TRANSMITTER				9-40
5	DATA SHEET FOR PRESSURE TRANSMITTER				41
6	CATALOG FOR PRESSURE TRANSMITTER				42-63
7	DATA SHEET FOR ADDITIONAL LOCAL LCD/LED DISPLAY				64
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		TECHNICAL DATSHEET AND HOOK UP DRAWING FOR TRANSMITTERS			
CLIENT	BHARAT HEAVY ELECTRICALS LTD.			Project Doc No.: PE-V0-412-158-A047	
PROJECT	PreTreatment Plant Ennore			OTOKLIN DOC NO.: OGBL/OC-983/TDSHKUP/TRA/PTP/18/330	
				MADE BY FN	CHKD BY MI
SR. NO.	DISCRIPTION			REMARK	
1.0	DATA SHEET FOR LEVEL TRANSMITTER				
1.01	TYPE	2 Wire Smart (HART Compatible)			
1.02	Principle	Non-Contact Ultrasonic Pulse			
1.03	Mounting	Top of the tank			
1.04	Enclosure	IP 67 Weather Proof Die Cast Aluminum Epoxy Coated (R1)			
1.05	MOC Sensor	PTFE			
1.06	Display	head mounted back lit Alphanumeric LCD Display with Keypad (R1)			
1.07	Power Supply	2 Wire, 24 VDC			
1.08	Operating Pressure	Atmospheric			
1.09	Operating Temp	50°C			
1.10	Operating Frequency	10 KHz to 50 KHz (R2)			
1.11	Process Connection	4" ANSI Polypropylene (Integral Transmitter and Sensor) – Remote output on PLC/ DCS			
1.12	Accuracy	± 0.2% of F.S.			
1.13	Resolution	± 0.1% of span			
1.14	Output Signal	2 Wire, 24 VDC Loop Powered 4-20mA / HART			
1.15	Cable Connection	M 20X 1.5 (R1)			
1.16	Diagnosis	On - Line			
1.17	Status Indication/ Output Contacts	Hi-Hi, Hi, Low, Low-Low Generated from PLC/ DCS through Level output provided by 4-20mA			
1.17	Calibration and configuration	Provided & is accessible from front of panel & HART calibrator. (R2)			
1.18	Diagnostic	Available online (R2)			
1.19	Temperature Compensation	Provided with Sensor (R2)			
1.20	Range MTR.	0.3-10 m			
1.21	Accessories	LCD Display with Keypad for Calibration , Companion Flange,double compression type Nickel plated brass cable gland, SS Name/ Tag Plate,All the outdoor field instruments such as analysers/transmitters/meters etc. shall be provided with suitable Free standing cabinet(s)/panel/rack so that the equipments are protected against rain/ sunlight etc,Each level transmitter mounted on the top of the tank shall be provided with additional separate local display unit with large Alphanumeric back light LCD/LED near the bottom side of the tank (R3)			
1.22	KKS No.	90GBN91CL001 90GBN61CL001 90GBN62CL001 90GBN63CL001 90GBN71CL001 90GBN72CL001 90GBN81CL001	90GBN82CL001 90GBN60CL001 90GBS50CL003 90GBS50CL004 90GBD10CL001 90GBD10CL002 90GBS50CL001	90GBS50CL002	
1.23	Model No.	UC-552-P-C-B-D-N-A (R3)			
1.24	Qty.	15			
1.25	Origin Country	Italy			
1.26	Make	BM TECHNOLOGIE INDUSTRIAL (R4)			