

# **TELANGANA STATE POWER GENERATION CORPORATION LTD**

**5X800 MW YADADRI TPS**

## ***TECHNICAL SPECIFICATION FOR FUEL OIL HANDLING SYSTEM***

**SPECIFICATION NO.: PE-TS-417-166-A002**



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT  
NOIDA (INDIA)**

177950/2021/PS-PEM-MAX



TITLE FUEL OIL HANDLING SYSTEM

5 X 800MW YADADRI TPS

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REV 00

Date: JAN 2021

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**SECTION- I**

**INTENT OF SPECIFICATION**



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## 1.0 INTENT OF SPECIFICATION

- 1.1 This specification includes, but not limited to Supply part, Services part and Mandatory spares comprising of design (i.e. Preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants, and consumables required for pre-commissioning, commissioning, performance testing and till one year of operation after handing over,, mandatory spares along with spares for erection, start up and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling, transportation & storage at site, in-site transportation, assembly, erection & commissioning, final painting at site, obtaining CCOE approval, minor civil work, trial run at site, and carrying out Performance guarantee / Functional / Demonstration tests at site (As applicable), training of customer/client O&M staff and handing over in flawless condition of the package to the end customer complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification as specified above, amendment & agreements till placement of order for **5X800 MW YADADRI TPS**.
- 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 the contractor of the responsibility of providing such facilities to complete the supply, erection and commissioning, demonstration testing of **Fuel Oil Handling System**.
- 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 highest 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 judgement 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. Similarly, the extent of supply also includes all items required for completion of the system and not withstanding that they may have been omitted in drawings / specifications or schedules.
- 1.5 The general term and conditions, instructions to tenderers and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is 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 SECTION-III of the specification **within 10 days of receipt of tender documents**. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser / 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 Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.
- 1.8 Deviations, if any, should be very clearly brought out clause by clause along with cost of withdrawal in the enclosed schedule (in SECTION – III); otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification. If no cost of withdrawal is given against the deviation, it will be presumed that deviation can be withdrawn without any cost to BHEL/its customer.
- 1.9 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, more stringent requirement as per the interpretation of the owner shall apply.
- 1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.11 For definition of word like Contractor, bidder, supplier, vendor, Customer/ Purchaser / Employer, consultant, please referred relevant clause(s) of GCC.



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## SECTION: I

### PROJECT INFORMATION WITH WIND AND SEISMIC DESIGN CRITERIA

## YADADRI THERMAL POWER STATION

## PROJECT INFORMATION

|    |                                           |                                                                         |
|----|-------------------------------------------|-------------------------------------------------------------------------|
| 1  | Name of the Project                       | YADADRI Thermal Power Station                                           |
| 2  | Station Capacity                          | 5X800 MW ( Coal based )                                                 |
| 3  | Owner                                     | Telangana State Power Generation Corporation Limited ( <b>TSGENCO</b> ) |
| 4  | Site Location                             | Site is located 7 km from the NH5.                                      |
| 5  | Latitude                                  | 16° 42'20.40 N                                                          |
| 6  | Longitude                                 | 79° 34'41.56 E                                                          |
| 7  | Nearest Town                              | 30 Km Miryalaguda                                                       |
| 8  | Nearest Railway Station                   | 6.5 Km Damercherla                                                      |
| 9  | Nearest Airport                           | 130 Kms (Vijayawada)                                                    |
| 10 | <b>Site Conditions</b>                    |                                                                         |
|    | Ambient Temperature                       |                                                                         |
|    | Daily minimum ( average)                  | 10°C                                                                    |
|    | Daily maximum ( average)                  | 47°C                                                                    |
|    | Design Ambient Temperature                | 50°C                                                                    |
|    | Ambient temperature ( performance)        | 38°C                                                                    |
|    | Relative Humidity for design / efficiency | 48-84 %                                                                 |
|    | Annual rainfall, mm                       | 600 mm                                                                  |
|    | Plant Elevation above MSL                 | 85 m above MSL                                                          |
|    | Wind Pressure                             | As per the latest revision of IS 875/1987                               |

TELANGANA STATE POWER GENERATION CORPORATION LIMITED

From  
Chief Engineer/Civil/ Thermal  
TSGENCO, Vidyut Soudha,  
Hyderabad – 500082

To  
✓ The Dy.General Manager,  
M/s.BHEL Camp Office,  
Vidyut Soudha,  
Khairtabad,  
Hyderabad – 500082

Lr.No.CE/C/Thermal/KTPSD/E1/F.YTPS-M/s.BHEL/D.No. 247 /2015-16.Dt. 29.08.2015

Sir,

Sub:- YTPS – 5x800MW- Wind load & Seismic zone details - Reg

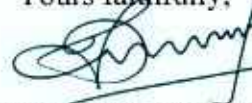
Ref: email: dated.11.08.2015 from M/s.BHEL.

...

With reference to the email cited,the details of wind load & seismic zone pertaining to proposed Yadradri Thermal Power Station (5x800MW) are herewith furnished for taking further action.

| Wind load  |                  | Seismic zone                 |                                                                                                  |
|------------|------------------|------------------------------|--------------------------------------------------------------------------------------------------|
| Wind Speed | Terrain category | Seismic zone                 | Type of soil                                                                                     |
| 44m/Sec    | Category-2       | Zone-III as per IS 1893:2002 | Type of soil may be confirmed at your end after conducting soil investigation in the plant area. |

Yours faithfully,



CHIEF ENGINEER/CIVIL/THERMAL

19/8/2015

Copy to the:

Chief Engineer/TPC/TSGENCO/Vidyut Soudha/Hyderabad.

A.S to Director/Projects/ TSGENCO/Vidyut Soudha/Hyderabad

M/s.DESEIN Private Limited, 102, First floor, My Home Sarovar Plaza, Secretariat Road, Hyderabad-500063.

# जलवायवी सारणी

## CLIMATOLOGICAL TABLE

BACK

स्टेशन : नलगोंदा  
STATION : Nalgonda

अक्षांश  
LAT. 17°03'  
देशांतर  
LONG. 79°16'

समुद्री तल माध्य से ऊंचाई  
HEIGHT ABOVE M.S.L. 227  
मीटर  
METRES

प्रक्षेपों पर आधारित  
BASED ON OBSERVATIONS 1975-2000

|                                           |                        | वायु तापमान     |           |            |             |                      |                     |           |                |           |                |                   |                 |                               |            |               |                          | BASED ON OBSERVATIONS            |                                 |                             |                |                      |  | 1975-2000       |
|-------------------------------------------|------------------------|-----------------|-----------|------------|-------------|----------------------|---------------------|-----------|----------------|-----------|----------------|-------------------|-----------------|-------------------------------|------------|---------------|--------------------------|----------------------------------|---------------------------------|-----------------------------|----------------|----------------------|--|-----------------|
| माह                                       | स्टेशन का सतह दाब      | माध्य           |           |            |             |                      |                     | चरम       |                |           |                | आर्द्रता          |                 | मेघ की मात्रा                 |            | मासिक योग     | वर्षा के दिनों की संख्या | वर्षा                            |                                 |                             |                |                      |  | माध्य पवन गति   |
|                                           |                        | शुष्क बल्व      | नम बल्व   | दैनिक अधिक | दैनिक न्यून | माह में उच्चतम       | माह में निम्नतम     | उच्चतम    | दिनांक और वर्ष | निम्नतम   | दिनांक और वर्ष | सापेक्ष आर्द्रता  | वाष्प दाब       | समस्त मेघ                     | निम्न मेघ  |               |                          | वर्षा सहित सबसे नम महीने का योग  | वर्षा सहित शुष्कतम महीने का योग | 24 घंटों की सबसे भारी वर्षा | दिनांक और वर्ष |                      |  |                 |
|                                           |                        |                 |           |            |             |                      |                     |           |                |           |                |                   |                 |                               |            |               |                          |                                  |                                 |                             |                |                      |  |                 |
| MONTH                                     | STATION LEVEL PRESSURE | AIR TEMPERATURE |           |            |             |                      |                     |           |                |           |                |                   |                 |                               |            |               |                          | RAINFALL                         |                                 |                             |                |                      |  | MEAN WIND SPEED |
|                                           |                        | MEAN            |           |            |             |                      |                     | EXTREMES  |                |           |                | HUMIDITY          |                 | CLOUD AMOUNTS                 |            | MONTHLY TOTAL | NO. OF RAINY DAYS        | TOTAL IN WETTEST MONTH WITH YEAR | TOTAL IN DRIEST MONTH WITH YEAR | HEAVIEST FALL IN 24 HOURS   | DATE AND YEAR  |                      |  |                 |
|                                           |                        | DRY BULB        | WET BULB  | DAILY MAX  | DAILY MIN   | HIGHEST IN THE MONTH | LOWEST IN THE MONTH | HIGHEST   | DATE AND YEAR  | LOWEST    | DATE AND YEAR  | RELATIVE HUMIDITY | VAPOUR PRESSURE | ALL CLOUDS                    | LOW CLOUDS |               |                          |                                  |                                 |                             |                |                      |  |                 |
|                                           |                        | एच.पी.ए. hPa    | डि. से °C | डि. से °C  | डि. से °C   | डि. से °C            | डि. से °C           | डि. से °C | डि. से °C      | डि. से °C | डि. से °C      | प्रतिशत %         | एच.पी.ए. hPa    | आकाश के अष्टमांश Oktas of sky | मि.मि. mm  |               | मि.मि. mm                | मि.मि. mm                        | मि.मि. mm                       | मि.मि. mm                   |                | कि.मी. प्र. घं. Km/h |  |                 |
| जनवरी JAN                                 | I II                   | 989.9           | 21.3      | 19.3       | 30.8        | 18.4                 | 33.8                | 16.1      | 36.0           | 17 1998   | 14.4 1992      | 82                | 21.2            | 2.0 1.8                       | 13.5       | 0.4           | 155.7 1978               | 0.0                              | 55.4                            | 11 1978                     |                |                      |  |                 |
| फरवरी FEB                                 | I II                   | 988.0           | 23.6      | 21.5       | 33.5        | 20.7                 | 36.5                | 18.0      | 39.0           | 26 1980   | 15.4 1988      | 82                | 24.1            | 3.0 2.5                       | 7.2        | 0.5           | 14.0 1999                | 0.0                              | 49.2                            | 20 2000                     |                |                      |  |                 |
| मार्च MAR                                 | I II                   | 985.8           | 26.2      | 23.7       | 37.3        | 22.8                 | 40.9                | 19.9      | 42.0           | 14 1983   |                | 80                | 27.4            | 1.7 1.4                       | 6.5        | 0.4           | 88.5 1981                | 0.0                              | 43.6                            | 13 1981                     |                |                      |  |                 |
| अप्रैल APR                                | I II                   | 983.6           | 29.2      | 25.5       | 39.6        | 25.5                 | 43.0                | 22.4      | 44.5           | 30 1991   | 14.6 1987      | 73                | 29.7            | 2.1 2.0                       | 17.6       | 1.0           | 65.6 1981                | 0.0                              | 40.6                            | 24 1981                     |                |                      |  |                 |
| मई MAY                                    | I II                   | 980.8           | 31.9      | 26.3       | 41.2        | 28.2                 | 44.8                | 23.5      | 46.1           | 26 1984   |                | 63                | 29.7            | 2.7 2.5                       | 27.0       | 1.4           | 94.3 1991                | 0.0                              | 49.0                            | 5 1981                      |                |                      |  |                 |
| जून JUN                                   | I II                   | 978.2           | 29.8      | 25.7       | 37.6        | 27.2                 | 42.6                | 23.4      | 46.3           | 2 1998    | 21.8 1991      | 71                | 29.9            | 5.1 4.4                       | 65.9       | 3.5           | 48.2 2000                | 0.0                              | 81.7                            | 12 1991                     |                |                      |  |                 |
| जुलाई JUL                                 | I II                   | 978.8           | 27.7      | 24.7       | 33.9        | 25.5                 | 37.3                | 23.2      | 39.2           | 7 1992    | 22.0 1992      | 77                | 28.6            | 6.3 5.8                       | 124.6      | 6.0           | 176.7 1977               | 36.8 1979                        | 99.2                            | 24 1977                     |                |                      |  |                 |
| अगस्त AUG                                 | I II                   | 979.6           | 27.1      | 24.3       | 32.8        | 25.0                 | 35.4                | 22.8      | 37.5           | 25 1979   | 22.0 1981      | 78                | 28.2            | 6.1 6.0                       | 133.0      | 6.7           | 189.0 1998               | 33.2 1979                        | 88.2                            | 14 1977                     |                |                      |  |                 |
| सितम्बर SEP                               | I II                   | 982.0           | 27.4      | 24.4       | 33.6        | 24.9                 | 36.4                | 22.8      | 38.5           | 23 1987   | 21.6 1989      | 77                | 28.3            | 4.9 4.2                       | 145.5      | 5.8           | 393.1 1991               | 20.3 1984                        | 152.2                           | 21 1991                     |                |                      |  |                 |
| अक्टूबर OCT                               | I II                   | 985.3           | 26.6      | 23.8       | 33.1        | 23.7                 | 36.2                | 21.4      | 36.5           | 1 1987    | 19.2 1980      | 78                | 27.2            | 4.0 3.7                       | 104.3      | 3.8           | 333.1 1981               | 4.2 1984                         | 109.2                           | 6 1987                      |                |                      |  |                 |
| नवम्बर NOV                                | I II                   | 987.9           | 24.2      | 21.0       | 31.1        | 21.2                 | 33.5                | 17.9      | 35.5           | 7 1996    | 14.6 1981      | 75                | 22.6            | 3.2 2.6                       | 48.1       | 2.8           | 66.8 1991                | 1.1 1981                         | 163.5                           | 4 1987                      |                |                      |  |                 |
| दिसम्बर DEC                               | I II                   | 990.3           | 21.7      | 18.6       | 30.0        | 18.6                 | 32.2                | 15.7      |                |           | 12.6 1993      | 73                | 19.4            | 2.7 2.3                       | 3.8        | 0.3           | 3.1 1987                 | 0.0                              | 3.1                             | 10 1987                     |                |                      |  |                 |
| वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN | I II                   | 983.9           | 26.7      | 23.4       | 34.8        | 23.7                 | 44.3                | 15.9      | 46.3           | 2 1998    | 12.6 1993      | 75                | 26.6            | 3.7 3.2                       | 696.8      | 32.5          | 631.7 1982               | 631.7 1982                       | 163.5                           | 4 1987                      |                |                      |  |                 |
| वर्षों की सं NUMBER OF YEARS              | I II                   | 19              | 19        | 19         | 19          | 21                   | 22                  |           | 19             | 19        |                | 19                | 19              | 18 17                         | 20         | 20            | 16                       | 16                               | 23                              |                             |                |                      |  |                 |

# जलवायवी सारणी

## CLIMATOLOGICAL TABLE

स्टेशन : नलन्दा  
STATION : Nalgonda

| मौसम परिघटना                                          |                                  |      |             |       |                    |            | पवन                                                  |           |          |    |                                           |     |    |     |   |    |    |    |      |     | मेघ                                                  |     |     |    |     |                                                        |     |     |    |            | दृश्यता                      |               |                |                 |                            |
|-------------------------------------------------------|----------------------------------|------|-------------|-------|--------------------|------------|------------------------------------------------------|-----------|----------|----|-------------------------------------------|-----|----|-----|---|----|----|----|------|-----|------------------------------------------------------|-----|-----|----|-----|--------------------------------------------------------|-----|-----|----|------------|------------------------------|---------------|----------------|-----------------|----------------------------|
| के साथ दिनों की संख्या                                |                                  |      |             |       |                    |            | पवन की गती के साथ दिनों की संख्या (कि. मी. प्र. घं.) |           |          |    | पवन की दिशा के दिनों की संख्या का प्रतिशत |     |    |     |   |    |    |    |      |     | मेघ मात्रा (सभी मेघ) सहित दिनों की संख्या - अष्टमांश |     |     |    |     | निम्न स्तरी मेघ मात्रा सहित दिनों की संख्या - अष्टमांश |     |     |    |            | दृश्यता सहित दिनों की संख्या |               |                |                 |                            |
| माह                                                   | वर्षा<br>0.3<br>मि.मि.या<br>अधिक | ओले  | गर्जन       | कुहरा | धूल<br>भरी<br>आंधी | चंड<br>वात | 62<br>या<br>अधिक                                     | 20-<br>61 | 1-<br>19 | 0  | उ                                         | उपू | पू | दपू | द | दप | प  | उप | शांत | 0   | ले-2                                                 | 3-5 | 6-7 | 8  | 0   | ले-2                                                   | 3-5 | 6-7 | 8  | कुहरा<br>8 | 1<br>कि.मी.<br>तक            | 1-4<br>कि.मी. | 4-10<br>कि.मी. | 10-20<br>कि.मी. | 20<br>कि.मी.<br>से<br>अधिक |
| WEATHER PHENOMENA                                     |                                  |      |             |       |                    |            | WIND                                                 |           |          |    |                                           |     |    |     |   |    |    |    |      |     | CLOUD                                                |     |     |    |     |                                                        |     |     |    |            | VISIBILITY                   |               |                |                 |                            |
| No. OF DAYS WITH                                      |                                  |      |             |       |                    |            | No. OF DAYS WITH WIND SPEED (Km. p. h.)              |           |          |    | PERCENTAGE No. OF DAYS WIND FROM          |     |    |     |   |    |    |    |      |     | No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) OKTAS     |     |     |    |     | No. OF DAYS WITH LOW CLOUD AMOUNT OKTAS                |     |     |    |            | No. OF DAYS WITH VISIBILITY  |               |                |                 |                            |
| MONTH                                                 | PFT<br>0.3 mm<br>Or more         | HAIL | THUN<br>DER | FOG   | DUST<br>STORM      | SQU<br>ALL | 52<br>Or<br>more                                     | 20-61     | 1-19     | 0  | N                                         | NE  | E  | SE  | S | SW | W  | NW | CALM | 0   | T-2                                                  | 3-5 | 6-7 | 8  | 0   | T-2                                                    | 3-5 | 6-7 | 8  | FOG<br>8   | UP TO<br>1 Km.               | 1-4<br>Kms    | 4-10<br>Kms.   | 10-20<br>Kms    | OVER<br>20<br>Kms.         |
| जनवरी<br>JAN                                          | 0.5                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 29       | 2  | 0                                         | 30  | 3  | 39  | 3 | 4  | 0  | 11 | 10   | 25  | 0                                                    | 2   | 1   | 3  | 25  | 0                                                      | 2   | 1   | 3  | 0          | 0.6                          | 6.7           | 21.3           | 2.3             | 0.1                        |
| फरवरी<br>FEB                                          | 0.6                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 28       | 0  | 1                                         | 26  | 1  | 55  | 3 | 5  | 0  | 7  | 2    | 25  | 2                                                    | 3   | 0   | 1  | 27  | 1                                                      | 2   | 0   | 1  | 0          | 0.0                          | 1.8           | 3.1            | 24.1            | 1.9                        |
| मार्च<br>MAR                                          | 0.7                              | 0.0  | 0.1         | 0.0   | 0.0                | 0.0        | 0                                                    | 1         | 30       | 0  | 1                                         | 25  | 1  | 55  | 3 | 5  | 0  | 9  | 1    | 23  | 2                                                    | 3   | 1   | 2  | 23  | 1                                                      | 2   | 1   | 0  | 0          | 0.1                          | 7.8           | 18.0           | 1.7             | 0.5                        |
| अप्रैल<br>APR                                         | 1.1                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 29       | 1  | 0                                         | 20  | 1  | 46  | 4 | 18 | 0  | 8  | 3    | 20  | 2                                                    | 4   | 2   | 2  | 21  | 1                                                      | 4   | 2   | 2  | 0          | 0.0                          | 3.0           | 21.5           | 4.3             | 1.1                        |
| मई<br>MAY                                             | 1.8                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 31       | 0  | 1                                         | 14  | 0  | 27  | 3 | 21 | 3  | 30 | 1    | 21  | 1                                                    | 5   | 2   | 1  | 22  | 1                                                      | 4   | 2   | 1  | 0          | 0.0                          | 0.4           | 3.8            | 24.3            | 1.5                        |
| जून<br>JUN                                            | 4.5                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 1         | 29       | 0  | 1                                         | 2   | 0  | 6   | 0 | 36 | 8  | 47 | 0    | 19  | 2                                                    | 5   | 2   | 3  | 21  | 2                                                      | 4   | 1   | 3  | 0          | 0.0                          | 3.1           | 22.5           | 3.4             | 1.9                        |
| जुलाई<br>JUL                                          | 7.1                              | 0.0  | 0.1         | 0.0   | 0.0                | 0.0        | 0                                                    | 1         | 30       | 0  | 1                                         | 1   | 0  | 1   | 0 | 43 | 10 | 44 | 0    | 6   | 2                                                    | 18  | 3   | 2  | 20  | 2                                                      | 5   | 2   | 2  | 0          | 0.0                          | 0.6           | 3.6            | 24.4            | 2.4                        |
| अगस्त<br>AUG                                          | 7.7                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 1         | 30       | 0  | 1                                         | 1   | 0  | 2   | 0 | 32 | 8  | 55 | 1    | 2   | 1                                                    | 5   | 3   | 20 | 3   | 1                                                      | 4   | 2   | 21 | 0          | 0.0                          | 4.1           | 22.8           | 2.5             | 1.6                        |
| सितम्बर<br>SEP                                        | 6.6                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 29       | 1  | 1                                         | 6   | 0  | 11  | 1 | 29 | 4  | 42 | 6    | 0   | 0                                                    | 1   | 2   | 28 | 1   | 0                                                      | 1   | 2   | 27 | 0          | 0.0                          | 2.8           | 3.9            | 22.7            | 1.6                        |
| अक्टूबर<br>OCT                                        | 3.9                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 29       | 2  | 1                                         | 29  | 4  | 16  | 1 | 15 | 2  | 23 | 9    | 4   | 1                                                    | 5   | 2   | 5  | 21  | 0                                                      | 3   | 2   | 5  | 0          | 0.1                          | 3.7           | 22.4           | 3.8             | 1.1                        |
| नवम्बर<br>NOV                                         | 3.3                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 26       | 4  | 3                                         | 33  | 7  | 18  | 2 | 4  | 0  | 19 | 14   | 22  | 1                                                    | 3   | 2   | 4  | 23  | 1                                                      | 3   | 1   | 3  | 0          | 0.1                          | 1.5           | 3.9            | 23.6            | 2.0                        |
| दिसम्बर<br>DEC                                        | 0.4                              | 0.0  | 0.0         | 0.0   | 0.0                | 0.0        | 0                                                    | 0         | 29       | 2  | 3                                         | 46  | 3  | 22  | 1 | 2  | 1  | 14 | 8    | 21  | 1                                                    | 4   | 1   | 4  | 23  | 1                                                      | 3   | 1   | 3  | 0          | 0.1                          | 6.8           | 20.8           | 3.3             | 0.0                        |
| वार्षिक योग<br>या माध्य<br>ANNUAL<br>TOTAL<br>OR MEAN | 33.3                             | 0.0  | 0.1         | 0.0   | 0.0                | 0.0        | 1                                                    | 5         | 346      | 13 | 1                                         | 19  | 2  | 24  | 2 | 18 | 3  | 26 | 5    | 205 | 13                                                   | 46  | 29  | 70 | 238 | 11                                                     | 37  | 22  | 57 | 0          | 0.8                          | 60.1          | 255.4          | 35.6            | 13.0                       |
| वर्षों की सं<br>ख्या<br>OF<br>YEARS                   | 22                               |      |             |       |                    |            | 22                                                   |           |          |    | 22                                        |     |    |     |   |    |    |    |      | 21  |                                                      |     |     |    | 21  |                                                        |     |     |    |            | 22                           |               |                |                 |                            |

5 X 800MW YADADRI TPS

TECHNICAL SPECIFICATION  
FOR  
FUEL OIL UNLOADING & STORAGE SYSTEM

SECTION I-A  
(SPECIFIC TECHNICAL EQUIREMENT-MECHANICAL)



BHARAT HEAVY ELECTRICALS LTD  
POWER SECTOR PROJECT ENGINEERING MANAGEMENT  
PPEI, NOIDA-INDIA

|                                                                                  |                                     |                                      |             |
|----------------------------------------------------------------------------------|-------------------------------------|--------------------------------------|-------------|
| 7950/2021/PS-PEM-MAX                                                             |                                     | SPECIFICATION NO. PE-TS-417-166-A002 |             |
|  | TECHNICAL SPECIFICATION FOR         |                                      | SECTION IA  |
|                                                                                  | FUEL OIL UNLOADING & STORAGE SYSTEM |                                      |             |
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### 1.0.0 SCOPE OF WORK

This specification includes, but not limited to Supply part, Services part and Mandatory spares (if applicable) comprising of design (i.e. Preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants and consumables required for pre-commissioning, commissioning, performance testing and till one year of operation after handing over, mandatory spares along with spares for erection, start up and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling, transportation & storage at site, in-site transportation, assembly, erection & commissioning, final painting at site, obtaining CCOE approval, minor civil work, trial run at site, and carrying out Performance guarantee / Functional / Demonstration tests at site (As applicable), training of customer/client O&M staff and handing over in flawless condition of the package to the end customer complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification as specified above, amendment & agreements till placement of order

### 1.1.0 SCOPE OF SUPPLY

Scope of supply by bidder shall comprise of but not necessarily be limited to the following. P&I Diagrams given with this specification may pls. be referred.

- Two (2) nos. of vertical cylindrical, fixed roof type HFO storage tanks each of net capacity 4000 cum dully fitted with steam heated floor coil heaters and other appurtenances, accessories, instrumentation, controls and fittings etc. Plates for Tank Shell, Bottom (including Water Draw off sump) and Roof is excluded from bidder's scope. However, plates as required for all appurtenances and mountings/ attachments (other than water draw off sump), anchor chair for foundation bolt, all pad plates for any pipe support are included in bidder's scope of supply.
- Two (2) nos. of vertical cylindrical, fixed roof type LDO storage tank of net capacity 1000 cum dully fitted with appurtenances, accessories, instrumentation, controls and fittings etc. Plates for Tank Shell, Bottom (including Water Draw off sump) and Roof is excluded from bidder's scope. However, plates as required for all appurtenances and mountings/ attachments (other than water draw off sump), anchor chair for foundation bolt, all pad plates for any pipe support are included in bidder's scope of supply.
- One (1) no drain oil tank (with steam heating coils) of 20 m<sup>3</sup> capacity to be located in the fuel oil unloading pump house, including its all the accessories.
- Three (3) (2W+1S) nos. LDO twin screw unloading pump motor set each of capacity 50 cum/hr. with simplex type strainers of matching capacity at the suction of each pump.
- Five (5) (4W+1S) nos. HFO twin screw unloading pump motor set each of capacity 150 cum/hr. with simplex type strainers of matching capacity at the suction of each pump.
- Two (2) (1W+1S) nos. HFO twin screw unloading pump motor set each of capacity 25 cum/hr. with simplex type strainers of matching capacity at the suction of each pump.
- Three (3) (2W+1S) nos. HFO twin screw unloading pump motor set each of capacity 50 cum/hr. with simplex type strainers of matching capacity at the suction of each pump.
- 105 Nos. HFO unloading flexible neoprene/ metallic hoses. Ten (10) nos. LDO unloading flexible neoprene/ metallic hoses. Five (5) nos. metallic flexible hoses each for Steam heating & receiving condensate respectively. Length of each hose shall be to suit the layout in unloading area. However minimum length shall be 8 m.
- Four (4) nos. suction heater on HFO tanks of required size.
- Floor coil heater for the tank (pipe for floor coil heater of drain oil tank and main storage tank shall be in vendor scope).

|                                                                                  |                                     |                                      |                |
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- 11) Control valves for controlling steam flow to Floor coil heating and Suction heater installed on FO storage tank and Drain oil tank inside FO unloading pump house.
- 12) Pressure reducing and De-Superheating station of required size (No heating of Rail wagons to be considered).
- 13) Traps for separating condensate from steam.
- 14) Coriolis type mass flowmeter in HFO and LDO discharge header as per P & ID.
- 15) One (1) no. single chamber gravity type oil water separator pit along with its accessories. The Civil work of OWS pit shall be in BHEL scope. However, all the equipments, accessories, supporting arrangements etc. for the OWS pit shall be in bidder's scope.
- 16) One (1) no. Condensate Flask Tank near railway unloading area of capacity 2.0m<sup>3</sup> duly insulated and cladded.
- 17) Instrumentation & control System including instruments, interlocking & protection devices complete in all respects required for safe, efficient and reliable operation of the plant and to be read in conjunction with C&I portion of specification. Instrument and control system requirement mentioned in the P&ID is minimum.
- 18) Two (2) nos. (1W+1S) Vertical Single screw type Drain oil pump motor set of capacity 5 m<sup>3</sup>/hr. in Drain oil tank.
- 19) Two (2) nos. (1W+1S) Vertical Single screw type recovery oil pump motor set of Capacity 5 m<sup>3</sup>/hr. in Oil pit of Oil Water Separator.
- 20) Two (2) nos. (1W+1S) sump pump motor set in of capacity 10 m<sup>3</sup>/hr. in Oil unloading area.
- 21) Two (2) nos. (1W+1S) sump pump motor set in of capacity 10 m<sup>3</sup>/hr. in Unloading Pump House.
- 22) Complete steam tracing, Insulation and cladding material along with all accessories for HFO tanks, HFO lines, pumps, strainers etc.
- 23) Drain and vent connection in lines along with isolation valve at every low and high point as per layout requirement of FOHS.
- 24) All foundation bolts/ anchor bolts required for any equipment foundation under the package. For HFO tank minimum 40 nos. anchor bolts (M42 grade) and for LDO tank minimum 24 nos. anchors bolts (M33 grade) to be considered irrespective of calculation.
- 25) **Pipes (without edge preparation) for fuel oil system including steam pipes, DM water pipes, service air & instrument air piping and pipes for steam tracing will be free issued to bidder. However complete Pipe fitting, valves, flanges, counter flanges, traps, fasteners, hoses, gaskets with suitable hangers, supports, pipe trestle within dyke and pump house, as required etc. as applicable within the terminal point will be in bidder scope.**
- 26) **Plates for tank Shell, Bottom (including Water Draw off sump) & roof for HFO and LDO tanks is excluded from bidder's scope. These Plates shall be free issued to the bidder. Further the plates for Drain oil tank shall be in bidder's scope.**
- 27) Pipe-supporting structures over the insert plates for pedestal supported pipes and also on pipe rack supported pipe.
- 28) Pipes required for tank nozzles (HFO and LDO, Drain Oil Tank etc.), manholes, pipe support etc. shall be in bidder scope. Further, all pipe inside tanks shall be in bidder 'scope.
- 29) Nozzle for foam pourer, heat detector on tank roof & pad plates welded to the tanks as per details to be furnished to the successful bidder for welding supports for water piping and hydrant piping.
- 30) Platform and approach ladder to the platform for foam pourer.

|                                       |                                     |                                      |                |
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- 31) Wrapping and coating of any buried MS pipes as required.
- 32) All MS structures for cross overs, valve / instruments / equipment/tanks operating & maintenance platforms, approach ladders for access to platforms, trench/pit.
- 33) Painting of equipment along with their accessories within battery limit including the free issue items such as Plates, Pipes etc.
- 34) Electrical scope as per enclosure elsewhere in the specification.
- 35) C&I Scope as per enclosure elsewhere in the specification.
- 36) For the scope of supply and E & C for DCS/RIO/Back-up panel/LCP/OWS/EWS, refer section-IC, TECHNICAL SPECIFICATION - C & I PORTION, However, all logic for implementation of control and monitoring from DCS shall be provided by successful bidder during detail engineering.
- 37) Erection & commissioning spares as required for the complete system.
- 38) One set of special maintenance tools & tackles, if any. These tools shall not be used for erection/ commissioning purposes and shall be in an unused and new condition when they are handed over to the customer at site. Each tool shall be stamped so as to be identified easily for its use. The tools shall be supplied in a steel toolbox. This list shall be reviewed during detail engineering.
- 39) Mandatory spares as per enclosure elsewhere in the specification.
- 40) Initial charge of all lubricants and fluids except LDO / HFO
- 41) All valves, counter- flange with nuts, bolts and gaskets at all the terminal points.
- 42) Flow able non- shrink grout of one grade higher than concrete used for civil work grouting below base plate for all structure/ equipment & for grouting of foundation / anchor bolts.
- 43) Any other item covered elsewhere in this specification.
- 44) Relevant scope of supply as per GTR, GCC & SCC.
- 45) Valves in pit outside dyke as required as per latest OISD recommendation complying with requirement whichever is more stringent.
- 46) Any other instrument, equipment / item required for making the installation complete in all respect and for satisfactory operation of the system meeting layout, accessibility, operability and man movement requirements for the scope within the terminal point, as well as to meet any statutory requirement relevant to the package, unless specifically EXCLUDED from scope of supply.
- 47) All mechanical items for oil water separator pit including skimmer pipe, butterfly valve, heating arrangement, rung ladder etc. for OWS.
- 48) Any other items mentioned in the price format.

### 1.2.0 SCOPE OF SERVICES

Scope of services by bidder will include but not necessarily limited to the following:

- 1) Unloading, Storage, handling and transportation at site, handling & transportation of pipes and plates from storage yard. Bidder to note that Site storage yard-1 is within plant premises and the second one is adjacent to plant boundary which is away by 1KM approx. from plant Main gate.
- 2) Minor civil work like chipping of foundation, grouting below base plate for all structures, equipment, grouting of anchor bolts wherever these are not placed in the foundation during casting of foundation itself, excavation & filling of earth for buried MS pipes if and as required. To the extent possible, vendor shall ensure to supply all foundation bolts timely so as to facilitate placement of these bolts while casting the foundation.

|                                                                                  |                                     |                                      |             |
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- 3) Pre-Commissioning work such as flushing, hydraulic testing etc. Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost.
- 4) Erection & Commissioning of Fuel Oil System **(including pipes and plates free issued to bidder)**
- 5) Erection of all foundation bolts/ anchor bolts etc. as required for any equipment. In case these are not erected when foundation is being cast refer point no 2 above.
- 6) Inspection & testing, Performance Requirements and Performance Guarantees.
- 7) Painting of tank and all other items within scope of supply including free issued items.
- 8) Making Good/Repairing/replacement of and damaged done by bidder to adjacent structure, pipes etc. while erecting equipment's related to Fuel Oil system
- 9) Electrical scope as per enclosure elsewhere in the specification.
- 10) Preparation of drawing showing common facilities, if any, between BHEL & Vendor supplied equipment.
- 11) Preparation of civil assignment drawings i.e. pedestals details; insert plates / embedment's plates required for supporting pipes and equipment etc. and review of civil drawing prepared by customer based on civil assignment drawing of bidder. In case any modification is required in the civil work already done based on civil inputs given by vendor, rework shall be done at the cost and risk of the vendor.
- 12) Preparation of all drawings as per list enclosed under Annexure -D.
- 13) Preparation of all necessary drawings/data/ documents for obtaining necessary Approval of statutory authorities like PESO, IBR, Weight & Measures Department and any other agency/ competent authority related to installation of Fuel Oil Handling System on behalf of the customer. All expenses required to obtain the approval shall also be borne by the successful bidder. Successful bidder shall inform customer well in advance requirement of authority letter along with format for the same. After issuance of authority letter by customer, it will be vendor's responsibility to regularly follow up with the concerned authorities to obtain timely approval from these authorities. Any delay on account of the same, unless any specific information related to above approval to be furnished by customer is delayed by customer, shall be to vendor's account and shall not be used as a reason for extension in contract completion.
- 14) Layout drawing to be prepared for statutory approval apart from showing the technical requirements shall necessarily show key plan showing approach to site with mile stone, Survey No., Khesra No, Plot No. etc.
- 15) Supply of temporary equipment and services for chemical cleaning, steam blowing, energization, testing etc. as applicable.
- 16) Training of plant Owner's personnel on plant operation and maintenance.
- 17) All other facilities/ services as described in section on site services in specification and related to Fuel Oil Handling System scope of work within terminal point.
- 18) Relevant requirements as per GTR, GCC & SCC.
- 19) Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system as well as to meet any statutory requirement relevant to the package, unless specifically EXCLUDED from scope of services.

|                                                                                  |                                     |                                      |                |
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## 2.0.0 EXCLUSION

- a) Pipes (without edge preparation) for fuel oil system including steam pipes, DM water pipes, service air & instrument air piping and pipes for steam tracing will be free issued to bidder. However complete Pipe fitting, valves, flanges, counter flanges, traps, fasteners, hoses, gaskets with suitable hangers, supports, pipe trestle within dyke and pump house, as required etc. as applicable within the terminal point will be in bidder scope.

Plates (Straight Flat plate) for tank Shell, Bottom (including Water Draw off sump) & roof for HFO and LDO tanks is excluded from bidder's scope. These Plates shall be free issued to the bidder. However, plates as required for all appurtenances and mountings/ attachments (other than water draw off sump), anchor chair for foundation bolt, all pad plates for any pipe support and all plates for Drain oil tank shall be in bidder's scope. The condition for supply of plates as free issue shall be as per the TECHNICAL CONDITIONS OF CONTRACT (TCC) attached as Annexure-H.

However, E&C of the same including supporting arrangement shall be in bidder's scope of work/supply.

- b) Civil work for fuel oil unloading & storage system including
- i. Civil work in Railway wagons unloading area
  - ii. Road tanker unloading platform
  - iii. Tank & Pump foundations
  - iv. Unloading Pump House, Oil water separator pit.
  - v. Dyke wall and barbed fencing
  - vi. Encasing of buried pipes, providing culvert for the same, if required.
  - vii. Hume Pipes, if any
  - viii. Civil works like pits, wherever required.
  - ix. Handrails other than those on the storage tanks.
  - x. Various cable & pipe trenches, pipe pedestals, drains, sumps, insert plates for pedestals for pipe supports.
  - xi. Pipe rack/trestle (refer definition of pipe rack/ trestle elsewhere in the specification) outside pump house and dyke area.
  - xii. Supply and laying of railway track for HFO unloading.
- However, location, sizing and loads, top of concrete elevations, top of grout elevations etc. including site supports during commissioning and any other input related to above as applicable for above shall be given by the vendor.
- c) Fire Protection system for fuel oil storage tanks.
- d) Local control panel/Back up panel shall be in BHEL scope.
- e) Air Conditioning / ventilation of Fuel Oil pump houses.
- f) Lifting equipment (electric operated hoist) for unloading pump house for maintenance purpose of these pumps. Capacity of lifting equipment is envisaged as 2 T with lift as 7.0 m. Bidder to confirm adequacy of the same.
- g) Exclusion as indicated in Electrical & C&I portion of technical specification.
- h) Relevant exclusion as per GTR, GCC, & SCC.

## 3.0.0 SERVICES TO BE PROVIDED BY THE CUSTOMER

|                                                  |                                     |                                      |                |
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a) Relevant services as per GTR, GCC, & SCC.

#### 4.0.0 TERMINAL POINT

##### LDO

: **Near oil unloading area:**

LDO Road Tanker nozzle connections towards LDO U/L Pump suction side.

##### **Near fuel oil unloading & pressurizing pump house:**

Up to 2000 mm outside Pump house wall for suction & return line of LDO. Further routing shall be in BHEL-Try scope. For the location of terminal point, refer drawing no. PE-DG-417-166-A003-LAYOUT DRAWING FOR FUEL OIL COMBINED PUMP

Bidder to plan the layout and size the pipe between storage tank and P&H unit in a manner so as to ensure availability of above TP pressure 1.0 Kg/cm<sup>2</sup> (a) limiting the tank foundation height for storage tanks to 1 m and the P&H unit FFL approx. 500 mm above ground level

##### HFO

: **Near oil unloading area:**

HFO Railway wagons nozzle connections towards HFO U/L Pump suction side.

##### **Near fuel oil unloading & pressurizing pump house:**

2000 mm outside pump house towards suction of HFO pressurizing pumps. Further, routing shall be in BHEL-Try scope. For the location of terminal point, refer drawing no. PE-DG-417-166-A003-LAYOUT DRAWING FOR FUEL OIL COMBINED PUMP

Bidder to plan the layout and size the pipe between storage tank and P&H unit in a manner so as to ensure availability of above TP pressure 1.0 Kg/cm<sup>2</sup> (a) limiting the tank foundation height for storage tanks to 1 m and the P&H unit FFL approx. 500 mm above ground level.

##### **Aux. Steam, DM water, Instrument air & service Air**

: **Steam header at 16 kg/cm<sup>2</sup>, 290 degC** by BHEL at 2000 mm from FO pressurizing building.

At the TP BHEL shall supply 16 MT/hr of steam. Bidder shall check the adequacy of the same. In case this is not adequate, bidder to inform the maximum aux. steam requirement at this TP along with manual calculation for the same.

Terminal Point for Steam, Spray Water (DM water @37 kg/cm<sup>2</sup> (a) & 43 deg. C) and Instrument air & service air shall be as per drawing attached in Annexure-E (drawing no. PE-DG-417-100-M056 -YARD PIPING LAYOUT- 5). Bidder to note that Service water is not in bidder scope.

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**Effluent from Oil Water Separators** : Water pit of OWS. Further, pumps and piping up to CMB shall be under ETP scope.

**Drain from dyke area** : To OWS during normal condition & to plant drain during rainy season through two-way valve pit. Valves in the valve pit along with limit switch for the same are included in bidder's scope. In case the tanks are provided with intermediate dyke wall of height 0.6m, separate draining arrangement for dykes independent of each other shall be provided.

**Condensate from FO U/L : area** : Condensate from condensate flash tanks shall be terminated at oil water separator near tank farm area.

Change in location of terminal points by up to 50 meters in plan view and 10 m in elevation view shall have no price implication. Isolation valves at the terminal points shall be in the scope of the bidder.

Wherever exact coordinate of TP is not given, bidder to consider location at specified distance from the respective facilities from where distance in bidder's scope will be maximum.

#### 5.0.0 PERFORMACE REQUIREMENTS

This will comprise of:

##### 5.0.1 PERFORMANCE requirement at shop:

- Capacity, total dynamic head, noise & vibration level of all pumps in isolation.
- Noise level for safety valve to be limited to 105 dBA

##### 5.0.2 Functional Guarantees at site:

- Unloading pump vibration and noise within limit at site.
- Drain oil pump and sump pump noise and vibration under limit at site.
- Water filled test on tank and other test as indicated in IS803 / API650 for tank leakage etc. will be carried out for tank stability.
- Tank temperature and suction heater outlet temperature measurement.
- Entire piping and support for smooth operation: Hydro test shall be carried out for checking the weld tightness and support checking.
- Operation of the complete system as per Control philosophy.
- All other machines / components / system shall be acoustically designed for a surface sound pressure level of  $L_p < 85$  dB (A), measured in accordance with ISO 3746 / IEC 651 / BS: 5969 / IS:9779 respectively at a distance of 1.0 m from equipment surface and at a height of 1.5m above ground level. The surface sound pressure level ( $L_p$ ) shall be averaged over the measurement surface and corrected for effect of background noise and the influence of reflected sound at measurement surface (environmental correction). With sound pressure levels of 85 dB (A) or less according ISO it shall be ensured that maximum surface noise levels of any item of plant of less than 85 dB (A) at 1.0 m from outline and a height of 1.5m from the floor shall be met during normal operating conditions.

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- h. In case during test it is found that the equipment/system has failed to meet the guarantees, the contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer. However, if the contractor is not able to demonstrate the guarantees, even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by BHEL, after the tests have been completed, BHEL will have the right to Reject the equipment / system / plant and recover the payments already made or accept the equipment / system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by BHEL.
- i. The successful bidder will prepare a document titled "HANDLING OVER PROTOCOL" consisting various activities to be demonstrated by them for handing over of the package.

#### 6.0.0 LAYOUT REQUIREMENTS

- System layout shall conform to the requirements of the Petroleum Act 1934 & Petroleum Rules 2002, OISD 118 latest edition whichever is more stringent. The layout shall also conform to all other relevant OISD specifications
- All established engineering practices with regard to layout of various equipment & piping shall be followed and the same shall be subject to customer approval during detail engineering without any commercial implication.
- Fire escape plan layout drawing shall be submitted by bidder during detail engg.
- The pipes between storage tank, fuel oil unloading area shall be running on Pipe rack or pedestal as applicable.
- Tentative Location of items related to Fuel Oil Handling System is shown in enclosed **PLOT PLANS**. This will be finalized during detail engineering based on equipment dimensions and other layout related requirements. There will however be no cost implication on account of the same.
- For railway wagons unloading of fuel oil, LDO/HFO pumps will be located as per attached drg.
- While selecting pipe size, velocity inside the pipe shall not overshoot the velocity criteria indicated elsewhere in the specification.
- To the extent possible, all valves shall be located at grade level for easy operation & maintenance. Where location at grade level is not possible, suitable operating and maintenance platform made of MS grating and access ladder/ staircase/walkways to the same shall be given by the bidder. The platform and walkways will be designed by considering load of at least 750Kg/M<sup>2</sup>.
- All piping shall be arranged to provide clearance for removal of equipment requiring maintenance.
- Where pipes are routed in a manner that it hampers man movement in any area, suitable no. of cross overs made of MS gratings shall be given across such pipes to facilitate easy man movement. Further suitable access ladder of MS construction shall be given for access to equipment/ pipes located in pit/ trench. Such structures shall be designed by considering a load of at least 750Kg/M<sup>2</sup>.
- Expansion bellows / pipe loops shall be provided in the steam line and HFO lines to accommodate pipe expansions at suitable distances as per calculation to be furnished by the successful bidder during detail engineering.

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- l) For all pedestal supported pipes, BHEL scope will be limited to pedestal with insert plates. Maximum height of pedestal to be provided by BHEL shall be 300 mm from FGL/FFL in the corresponding area. Structures required above these pedestals for supporting the pipes are included in the scope of the bidder. However, inside the pump house, no pedestals / insert plate shall be provided for fixing. Bidder shall support the pipes using pipe supports and anchor fasteners inside the pump house.
- m) Layout shall be prepared in a way to avoid the buried piping to the maximum possible extent.
- n) Oily water collected in storage tank area, oil unloading area will normally be collected in OWS pit by gravity either through trench (limited to a depth of 0.5 m) or through buried pipe (limited to a depth of 1.0 m). However, in case depth of pipe between the pit and OWS pit exceeds 1 m or gravity flow is not possible due to layout constraints (which can be reviewed during detail engineering), the oily water waste shall be collected by pumping to OWS pit. Necessary pumps, valves, pipes, pipe supports, and instruments etc. for the same shall be in the bidder's scope.
- o) Straight length required before and after control valve s, flow element/ flow meters, shall be provided as per latest standard/ applicable codes.
- p) Rainwater collected inside the dyke shall be diverted to storm water drain while contaminated oily waste shall be sent to OWS. All valves required in pits outside the dyke are included in bidder's scope of supply.
- q) Instruments to be mounted on tank shall be suitably located so as to have easy access from the staircase without interfering with man movement on the staircase. Wherever this is not possible, suitable platform along with access to the same shall be provided by FO System bidder.
- r) Signals from all field instruments shall be first terminated in Junction boxes before transmitting this signal either to Control panel or to I/O rack or to DCS. Junction box is included in bidder's scope. Erection of cable between field instruments to Junction Box is also included in bidder's scope. Scope of cable supply shall be as per project specific scope split sheet given under electrical portion of this specification.
- s) All piping shall be arranged to provide clearance for removal of equipment requiring maintenance and easy access to valve and other piping accessories required for operation and maintenance. The layout drawing to be submitted by the successful bidder will necessarily show the valve orientation and access to valve and accessories.
- t) Instrument/ LIE/LIR shall not be located in space meant for walkway & maintenance space across the equipment, maintenance bay of building. Location of all instruments shall be marked in layout drawing to ensure correct location of the same.

#### 7.0.0 EQUIPMENT SELECTION & DESIGN CRITERIA

The minimum design criteria/ technical details to be followed for various equipment shall be as per Data Sheets / Design criteria under given under SECTION-I. Any contradictory requirement for specification of particular equipment, and clarifications not having been sought by the bidders, the most stringent requirement as per interpretation of the BHEL will prevail. Successful bidder will furnish detailed data sheets/ specifications / design calculations for various equipment for customer's/ consultant's approval during detail engineering. For items for which specific technical specification is not enclosed, data sheet / dwgs / design calculations for such items shall be subject to customer/ consultant approval during detail engineering. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

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#### 8.0.0 SYSTEM WRITE UP & CONTROL

For system write up and control requirement of fuel oil unloading and storage system, pls. refer **Section-IA**.

#### 9.0.0 PAINTING / CORROSION PROTECTION REQUIREMENT

This will be as per specification given under **Annexure-G**. During detailed engineering stage, successful bidder shall prepare and submit the painting schedule for FOHS in line with customer specification for each equipment pipe, tanks, structure etc. for customer approval and changes suggested shall be taken care without any commercial implication.

#### 10.0.0 QUALITY ASSURANCE, QUALITY PLANS, INSPECTION & TESTING PROCEDURE:

- The Quality plans / checklist for the previous executed jobs for the equipment's / instruments are attached under **Section IA**.
- The successful bidder shall furnish Quality Plans/ Inspection Check Lists for various item for the package in line with minimum requirement indicated in specification during detail engineering for Customer's approval.
- For other items for which any specific inspection requirement is not indicated in the specification but the same included in scope of work, vendor specific QPs/ CLs shall be furnished by the successful bidder for Customer/Consultant's review and approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.
- The Field Quality Plan of bidder shall also be submitted by the successful bidder during detail engineering for customer's / consultant's approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.
- For flame proof actuator, motors, junction boxes, instruments etc. as per specification requirement, valid test/Type test certificate for the same shall be submitted by the vendor as part of QC documentation. In case valid test/Type test certificates are not available, necessary test shall be conducted in line with applicable standard in presence of customer and cost of such test shall be deemed to be included in the contract price

#### 11.0.0 SUB-VENDOR ITEMS

The tentative make of Sub-vendor items shall be generally as per **Annexure-B** enclosed which is subject to customer approval during detail engineering. Make of any unlisted items shall also be subject to customer approval during detail engineering. For such items, bidder to furnish list of sub-vendors during detail engineering stage for BHEL's review and approval. Bidder shall furnish along with his proposal the following supporting documentation within 1 month of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained.

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- a) Documentation to show that the equipment /system have been supplied for a plant of similar or higher capacity.
- b) Documentation in the form of certificate that the equipment/system has been **operating satisfactorily for one year as on the scheduled date of bid opening.**

The successful bidder will get the makes of all items approved from Customer/ Consultant during detail engineering within two months of placement of LOI. The complete list will be necessarily be submitted within one month of placement of LOI to ensure timely placement of order for BOIs.

Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.

Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only.

#### 12.0.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The drawings and documents to be submitted with the bid shall strictly be as per list given under **SECTION-III**. Any documents other than those indicated in the list will not be reviewed and will not form part of contract.

#### 13.0.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

Tentative list of drawing / document required during detail engineering is attached in **Annexure –D**. Any other drawings and documents as required by BHEL / Customer / Consultant shall be furnished by the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL.

#### 14.0.0 DRAWINGS DISTRIBUTION SCHEDULE

Vendor needs to submit hard copies of each drawing/document during detail engineering along with editable soft copy of the same as per **Annexure-C**. However, exact no. of drawings / documents and submission/distribution procedure for the same shall be intimated to the successful bidder after award of contract and the same shall be complied by the successful bidder without any commercial implication.

#### 15.0.0 DRAWINGS ENCLOSED WITH THE SPECIFICATION

Input drawings for this package are given under **Annexure-E**:

- a) Plot plan, PE-DG-417-100-M001
- b) Process & Instrumentation Diagram (LEGEND), PE-DG-417-166-A001 (Sheet 1 of 4)
- c) Process & Instrumentation Diagram of LDO, PE-DG-417-166-A001 (Sheet 2 of 4)
- d) Process & Instrumentation Diagram of HFO, PE-DG-417-166-A001(Sheet 3 of 4)
- e) Process & Instrumentation Diagram of steam & condensate, PE-DG-417-166-A001 (Sheet 4 of 4)
- f) GA Drawing of HFO Tanks, PE-DG-417-166-A002 (Sheet 1 of 2)
- g) GA Drawing of LDO Tanks, PE-DG-417-166-A002 (Sheet 2 of 2)
- h) Layout Drawing for Fuel Oil Combined Pump house (LDO/HFO unloading thru Road tanker cum Pressuring & heating P/H), PE-DG-417-166-A003.
- i) LOCATION OF FUEL OIL TANKS IN DYKE AREA (PE-DG-417-166-A004)
- j) UNLOADING PUMP HOUSE NEAR RAILWAY UNLOADING FOR FOHS (PE-DG-417-166-A005)
- k) SITE GRADING SECTION (RAILWAY UNLOADING AREA) (PE-DG-417-603-C002)

The P & ID's are indicative and show the minimum requirement to be followed including minimum requirement of instruments. Any other item and instruments required (within the terminal points)

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to make the system complete in all respect and for satisfactory operation of the system shall also deemed to have been included by the bidder in their scope.

#### 16.0.0 OTHER REQUIREMENTS

##### i) Site Visit before submission of offer.

Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details wrt existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.

##### ii) Bidder shall submit detail erection manual for each of the equipment as well as complete system supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

##### iii) The O&M Manual to be submitted by the successful bidder should necessarily address "Checklist of O&M Manual" given under **SECTION-II.B**.

##### iv) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

##### v) In case vendor submits revised drawing/doc after approval of the corresponding drawing/doc, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion. However, in case changes are necessitated due to any constraints at customer end, delay in review/ approval of such revised drawing beyond one month will be to customer's account.

##### vi) Bidder to note that the successful bidder, during detail engineering, will submit the drg/doc through web based Document Management System in addition to hard copies to be submitted as per dwg/ document distribution schedule. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized after award of contract. Bidder to ensure following at their end

##### vii) Engineering for this project is being carried out in 3D environment at BHEL end. Name of engineering platform on which BHEL is doing the project is Smart Plant Suite. This is being done to have automated interface checking and thereby minimising rework at site. Hence bidder, in their own interest, is requested to prepare all layout drawings using 3D Modelling software. These drawings will also be made available to BHEL in soft for checking interface with other agencies in consolidated layout drawings. Bidder's inability to prepare drawing using 3D Modelling software will not be criterion for evaluation of their bid.

##### viii) Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule. Thereafter any change in the electrical load list shall be entertained only subject to its feasibility, and BHEL reserves the right to debit the vendor cost of any changes necessitated in the switch gear /MCC on account of changed loads.

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- ix) Wherever CIVIL works is excluded from the bidder's scope; successful bidder shall furnish civil assignment drawings. The corresponding CIVIL drawing prepared by BHEL / CIVIL agency, based on civil assignment drawing of bidder will be furnished to the successful bidder for concurrence. In case any modification is required in the civil work already carried out based on final civil inputs given by vendor, BHEL reserves the right to debit cost of such rework to vendor".
- i) Site storage and preservation manual has been placed under **SECTION-IIC**. Bidder to note down all the requirement of storage and preservation required for several items given under this manual. Bidder shall necessarily follow all the practices given in the manual as applicable for its items/ equipments under scope of supply.

5 X 800 MW YADADRI TPS

TECHNICAL SPECIFICATION  
FOR  
FUEL OIL UNLOADING & STORAGE SYSTEM

(SYSTEM WRITE UP)



BHARAT HEAVY ELECTRICALS LTD  
POWER SECTOR PROJECT ENGINEERING MANAGEMENT PPEI, NOIDA-  
INDIA

|                                                                                   |                                                                               |                                       |                 |
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## 1.0 SYSTEM DESCRIPTION

Light Diesel Oil (LDO) shall be used as initial start-up/ warm up fuel while heavy Fuel Oil (HFO Gr HV) shall be used for flame stabilization during low load operation. The Fuel Oil Handling System to be considered comprises unloading & storage of LDO and Heavy Fuel oil (HFO Gr HV). The basic operation & control philosophy of fuel oil unloading & storage system is described in succeeding sections. The bidder shall provide all the features as specified herein including other features as required for safe, efficient and trouble free operation of the system.

Fuel Oil Characteristics are provided at **Annexure-A, SECTION-IA** of specification

### 1.1 HEAVY FUEL OIL SYSTEM

- 1.1.1 Heavy Fuel Oil (HFO Gr HV) shall be delivered to power station by one (1) full rake of 50 nos. BTPN type railway wagons having capacity of approx. 55-65 cum per wagon. The railway wagons shall be unloaded through neoprene unloading hoses of **8.0m length** with fire safe type ball valve for isolation and a hose stand for each unloading hose. The Fuel Oil unloading header will have **hundred (100) Nos. unloading points**. The HFO unloading header shall be steam heat traced and insulated.

- 1.1.2 BTPN wagons are not equipped with heating facility. Hence, no heating of wagons is provided. Steam header in the unloading area shall be provided for Unloading header tracing only.

Fuel oil from wagons will be collected in unloading header (min. size 550NB) laid along with track. Oil from the unloading header shall be pumped to HFO storage tank with the help of unloading pumps as indicated in the P & ID. The Fuel Oil unloading pumps shall be rotary positive displacement, twin screw type, sump heated and provided with matching capacity simplex strainers (steam, sump heated) at their suction with interconnecting piping and valves as shown in the P&I diagram, Drwg No.- PE-DG-417-166-A001.

HFO shall be also delivered to power station by five (5) nos. road tankers having capacity of approx. 20 cum per Tanker (Road tanker located near Tank farm area). The road tankers shall be unloaded through flexible metallic / neoprene unloading hoses of min. 8.0m length with fire safe type ball valve for isolation and a hose stand for each unloading hose. The HFO unloading header will have 5 Nos. unloading points.

- 1.1.3 HFO from unloading header shall be pumped to HFO storage tank with the help of Three (3) Nos (2W+1S) unloading pumps as indicated in the HFO Unloading and Storage system flow diagram.

The HFO unloading pumps are of rotary positive displacement, twin screw type and provided with matching capacity simplex strainers at their suction with interconnecting piping and valves as shown in the P&I diagram for FO System, Drwg No. - PE-DG-417-166-A001

- 1.1.4 Two (2) nos. HFO storage tanks each of effective capacity 4000 m3 is envisaged. The tank shall be provided with steam floor coil heaters at the bottom of the tank to raise the temperature of oil from 5°C to the handling / tank maintenance temp. of 50 °C in 72 hrs. and maintaining the temperature inside the tank at 50°C. The floor coil heater for the Fuel oil storage tanks shall have adequate nos. of sections and shall be regulated through two no. pneumatically operated modulating type control valve provided on steam supply line (refer P& ID: PE-DG-417-166-A001). This shall be actuated from tank temperature.

- 1.1.5 Each HFO Storage Tank shall be insulated and cladded on the shell.

- 1.1.6 Interconnecting piping, valves and instruments as indicated in the Process & Instrumentation diagram of HFO System (Drwg.no. PE-DG-417-166-A001) shall be provided. Piping, valves and other equipment shall be steam traced and insulated.

- 1.1.7 Two (2) nos. shell and tube type suction heater (**one designed for three units oil supply and other designed for two units oil supply**) is also provided in each HFO tank to supply oil to pressurizing pump house at required temperature. Temperature will be regulated through one pneumatically operated modulating type control valve on each steam supply line. Initial and final temperature for suction heater shall be 50 deg. C and 60 deg. C respectively. However, suction

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heater will be designed for a temperature rise of 20 deg. C. All modulating control valves shall be of SMART type.

## 1.2 LIGHT DIESEL SYSTEM

- 1.2.1 LDO shall be delivered to power station by ten (10) nos. road tankers. The road tankers shall be unloaded through flexible metallic / neoprene unloading hoses of **min. 8.0m length** with fire safe type ball valve for isolation and a hose stand for each unloading hose. The LDO unloading header will have 10 Nos. unloading points.
- 1.2.2 LDO from unloading header shall be pumped to LDO storage tank with the help of Three (3) Nos (2W+1S) unloading pumps as indicated in the LDO Unloading and Storage system flow diagram. The LDO unloading pumps are of rotary positive displacement, twin screw type and provided with matching capacity simplex strainers at their suction with interconnecting piping and valves as shown in the P&I diagram for FO System, Drwg No. - PE-DG-417-166-A001.
- 1.2.3 Two (2) nos. LDO storage tanks, each of net capacity 1000 m3 are envisaged.
- 1.2.4 Interconnecting piping, valves and instruments as indicated in the Process & Instrumentation diagram for LDO system (Drwg.no. PE-DG-417-166-A001) shall be provided.

## 1.3 STEAM & CONDENSATE SYSTEM

- 1.3.1 One no. pressure reducing station shall be provided for reducing auxiliary steam available at 16 kg/cm2 (a) to 4.0 kg/ cm2 (a) and at 290 deg. C. De-superheated is also provided at downstream of PRS to bring steam temperature to saturated temperature. Reduced steam shall be used for unloading header heating, strainer and pump heating and tank heating and steam tracing of pipes
- 1.3.2 A condensate flash tank of capacity 2.0 m3 will also be provided in the unloading area for collecting condensate before discharging the same to oil water separator near tank farm area.
- 1.3.3 A condensate flash tank shall be provided by BHEL-Piping Centre in the tank farm for collecting condensate from tank (floor coil heater and Suction heater) before discharging it to Oil Water Separator pit. Condensate formed in Common unloading pump house i.e. pumps, strainers, drain oil tank shall be fed to sump in common FO unloading pump house.
- 1.3.4 Interconnecting piping, valves and instruments as indicated in the Process & Instrumentation diagram for STEAM & CONDENSATE system (Drwg.no. PE-DG-417-166-A001) shall be provided.

## 1.4 DRAIN OIL SYSTEM, SUMP WATER & OIL WATER SEPARATION

- 1.4.1 One no. drain oil tank of capacity 20 cum (4.5m x 2.5m x 2.0m (ht.)) shall be provided in the HFO unloading pump house to collect drain from HFO unloading pumps and Strainer inside U/L pumps, strainer by gravity.
- 1.4.2 The above drain oil tank in the unloading pump house shall be provided with a steam coil with isolation valve. The condensate formed shall be discharged through a trap in to the sump.
- 1.4.3 All oil drain headers will have a size not less than 25 NB and adequately sloped.
- 1.4.4 Two (2) no. (1W+1S) vertical single screw type drain oil pump of capacity 5 m3/hr. each shall be provided to transfer oil collected in the drain oil tank. Discharge from the pump shall be connected to HFO discharge header after flowmeter.
- 1.4.5 Two (2) nos. vertical centrifugal type pumps of capacity 10 cum/hr. is also envisaged in HFO unloading pump house to pump the oil water mixture collected in pump house to oil water separator pits provided in Tank farm area.
- 1.4.6 Two (2) nos. vertical centrifugal type pumps of capacity 10 cum/hr. is also envisaged in HFO unloading area to pump the oil water mixture in unloading area to oil water separator pits provided in Tank farm area.

|                                                                                   |                                                                                 |                                       |                 |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------|-----------------|
|  | <b>FUEL OIL UNLOADING &amp; STORAGE SYSTEM</b><br><b>5 X 800 MW YADADRI TPS</b> | SPECIFICATION. No: PE-TS-417-166-A002 |                 |
|                                                                                   |                                                                                 |                                       | SECTION-IA      |
|                                                                                   |                                                                                 | REVISION 00                           | DATE : JAN 2021 |
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1.4.7 Discharge of both sumps pumps (Inside HFO unloading pump house and HFO unloading area) shall be connected and a common line shall be taken to Oil Water Separator pit in the Tank Farm area.

1.4.8 A single chamber gravity type oil water separator of adequate capacity in tank farm area shall be provided for receiving oil water mixture during normal operation from the unloading area & unloading pump house and tank dyke area respectively. Separated oil collected in oil pit shall be pumped HFO storage tank. Two (2) no. (1W+1S) vertical single screw type oil recovery pump of capacity 5 m<sup>3</sup>/hr each shall be provided in oil pit of OWS to transfer collected oil to HFO storage tank.

1.4.9 Separated water from the oil water separator water pit shall be taken to CMB as per ETP philosophy. Pumps, instruments required for it are in ETP supplier scope.

1.4.10 During rainy season, water from unloading area drain trench and from tank dyke area having very little or no trace of oil shall be diverted to nearest plant drain without letting it go to the OWS facility. Two valves in catch pit will be provided. By opening one valve, water inside dyke area will be routed to Oil water separator pit and from other valve it will be channeled towards plant drain (rainy season).

**2.0 INSTRUMENTATION & CONTROL**

2.1 Operation and Control of Fuel Oil unloading and storage system will be from plant DCS (BHEL scope) as well as through local control panel. One (1) no. LCP is provided in HFO unloading pump house near Railway track and One (1) no. LCP is provided in HFO/LDO unloading Pump house near Tank farm area.

2.2 Local control panel will act as an interface between DCS and the field devices for commands & feedbacks. LCP shall have the provision of command (start/stop), annunciation & feedback interface with the plant DCS. (for details refer section-IC, Tech, spec. C & I portion)

2.3 Instrumentation shall be as shown in Process & Instrumentation Diagram for HFO, LDO, and Steam & Condensate system given under this specification.

2.4 Following functions shall be done through DCS:

2.4.1 Filling any of the HFO/LDO storage tanks by ensuring proper and safe selection of these tanks. Simultaneous filling and emptying of same HFO storage tanks will be avoided. Signals from Limit switches at the inlet and outlet valves of storage tanks shall be used for this purpose.

2.4.2 Start the HFO/LDO unloading /decanting pumps **through DCS/LCP** for filling the tanks after ensuring safe start permissive. The safe start permissive shall comprise of:

- MCC healthy
- Selected storage tank level not HI (high).
- Pump suction header inlet pressure not LO (low).
- Unloading header is completely filled with oil (signal from LS)
- DP across pump suction strainer not HI (high).
- Valve at tank inlet is open

2.5 Stop the running unloading pump(s) **through DCS/LCP** in case of annunciation for Level HI in corresponding tanks.

2.6 Stop/Trip the running HFO / LDO unloading pump(s) automatically in case of following:

- Level HI-HI in corresponding tanks.
- Pressure Hi in pump discharge header
- DP across corresponding suction strainer is HI.

2.7 Start standby unloading pump **through DCS/LCP** only in case running pumps trips either due to any mechanical or electrical failure

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                |                                       |                 |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------|
|  | <b>FUEL OIL UNLOADING &amp; STORAGE<br/>SYSTEM<br/>5 X 800 MW YADADRI TPS</b>                                                                                                                                                                                                                                                                                                  | SPECIFICATION. No: PE-TS-417-166-A002 |                 |
|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                |                                       | SECTION-IA      |
|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                | REVISION 00                           | DATE : JAN 2021 |
|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                | Page 5 of 6                           |                 |
| 2.8                                                                               | Start the drain pump through DCS/LCP on receipt of level alarm-HI or if physically the level is found to be high after ensuring safe start permissive. The safe start permissive shall comprise of: <ul style="list-style-type: none"><li>➤ MCC healthy</li><li>➤ Levels in DOT not low.</li><li>➤ Selected storage tank level for dumping of drained oil is not HI.</li></ul> |                                       |                 |
| 2.9                                                                               | Stop the running drain oil pump automatically in case of annunciation for Level LO in drain oil tank.                                                                                                                                                                                                                                                                          |                                       |                 |
| 2.10                                                                              | Start standby drain oil pump <b>through DCS/LCP</b> only in case running pumps trips either due to any mechanical or electrical failure                                                                                                                                                                                                                                        |                                       |                 |
| 2.11                                                                              | Start the sump pump in respective areas <b>through DCS/LCP</b> on receipt of level alarm HI or if physically the level is found to be high after ensuring safe start permissive. The safe start permissive shall comprise of: <ul style="list-style-type: none"><li>➤ MCC healthy</li></ul>                                                                                    |                                       |                 |
| 2.12                                                                              | Stop the running sump pump automatically in case of annunciation for Level LO in sump                                                                                                                                                                                                                                                                                          |                                       |                 |
| 2.13                                                                              | Start standby sump pump <b>through DCS/LCP</b> only in case running pump trips either due to any mechanical or electrical failure.                                                                                                                                                                                                                                             |                                       |                 |
| 2.14                                                                              | Signals (annunciation & indication) from various switches / transmitters.                                                                                                                                                                                                                                                                                                      |                                       |                 |
| 2.15                                                                              | Running status (on/off) of all pumps.                                                                                                                                                                                                                                                                                                                                          |                                       |                 |
| 2.16                                                                              | Control of steam flow to floor coil heater and suction heater of HFO storage tanks through pneumatically operated control valve as indicated in respective flow diagram.                                                                                                                                                                                                       |                                       |                 |
| 2.19                                                                              | All signals from the field instruments will be first terminated on a field mounted Junction box (JB) before transmitting the signals to DCS.                                                                                                                                                                                                                                   |                                       |                 |

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**TECHNICAL SPECIFICATION FOR  
FUEL OIL HANDLING SYSTEM  
5 X 800MW YADADRI TPS**

SPECIFICATION NO. PE-TS-417-166-A002

SECTION 'I A'

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## SECTION: I-A

### CUSTOMER SPECIFICATIONS

**TECHNICAL SPECIFICATION  
FOR  
FUEL OIL UNLOADING & TRANSFERRING SYSTEM**

## CONTENT

| CLAUSE NO. | DESCRIPTION                     |
|------------|---------------------------------|
| 1.00.00    | GENERAL INFORMATION             |
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| 3.00.00    | SHORT DESCRIPTION OF THE SYSTEM |
| 4.00.00    | SCOPE OR SUPPLY                 |
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| 7.00.00    | CONTROL & INSTRUMENTATION       |
| 8.00.00    | INSPECTION AND TESTING          |
| 9.00.00    | DRAWINGS, DATA AND MANUALS      |

## ATTACHMENTS

|             |                                                    |
|-------------|----------------------------------------------------|
| ANNEXURE-I  | HFO TANK HEATERS - DESIGN PARAMETERS               |
| ANNEXURE-II | DATA SHEET FOR FUEL OIL UNLOADING & TRANSFER PUMPS |

**VOLUME : IIB/3****SECTION-III B**

**TECHNICAL SPECIFICATION  
FOR  
FUEL OIL UNLOADING & TRANSFERRING SYSTEM**

**1.00.00 GENERAL INFORMATION**

1.01.00 The Fuel Oil Handling System shall include:

- a) Fuel Oil unloading and storage system meant for unloading of both Heavy Fuel Oil (HFO) and Light Diesel Oil (LDO)/ High Speed Diesel (HSD) from Rail Wagons and Storage of the same.
- b) Fuel oil pressurising system for both HFO and LDO/ HSD and heating of HFO meant for supply of oil at required atomising pressure and temperature from the storage tanks to the burners of the boiler.

1.02.00 For the design of the transferring and storage, the properties of HFO & LDO/ HSD shall be considered as indicated in Tables enclosed in Volume-IIA.

**2.00.00 CODES AND STANDARDS**

2.01.00 The design, manufacture and testing of the equipment or any item as specified in this section shall comply with the requirements of the latest revisions of one or more of the following standards as applicable :

2.01.01 IS-1593 : Code for Heavy fuel Oil (HFO)

2.02.00 IS-15770 : Code for Light Diesel Oil (LDO)

IS-1460 : Code for High Speed Diesel Oil (HSD)

2.03.00 IS-817 : Code of practice for training & testing of metal arc welders.

2.04.00 IS-823 : Code of procedure for manual metal arc welding of mild steel.

2.05.00 API- 620 : Recommended rules for design and construction of large welded low pressure storage tanks.

2.06.00 API- 650 : Welded steel tank for oil storage.

2.07.00 ASME Boiler & Pressure Vessel (B & PV) Code : Section VIII, Division I, Pressure Vessel.

|         |                                                                                                                                                                                                                                                                                                                                                                                                      |   |                                                                                                                            |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------|
| 2.08.00 | ASME Boiler & Pressure Vessel (B & PV) Code : Section IX, Welding & Brazing qualification.                                                                                                                                                                                                                                                                                                           |   |                                                                                                                            |
| 2.09.00 | API-12D                                                                                                                                                                                                                                                                                                                                                                                              | : | Large welded production tanks.                                                                                             |
| 2.10.00 | IS-803                                                                                                                                                                                                                                                                                                                                                                                               | : | Code of practice for design, fabrication and erection of vertical mild steel cylindrical welded oil storage tank.          |
| 2.11.00 | IS-816                                                                                                                                                                                                                                                                                                                                                                                               | : | Code of practice for use of metal arc welding for general construction in mild steel.                                      |
| 2.12.00 | IS-4503                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for design & manufacture of Heater                                                                                    |
| 2.13.00 | ANSI B31.1                                                                                                                                                                                                                                                                                                                                                                                           | : | Design of power piping system                                                                                              |
| 2.14.00 | API-600                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for design & construction of gate valve for sizes 50 NB or above                                                      |
| 2.15.00 | API-602                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for design & construction of gate valve for sizes below 50 NB                                                         |
| 2.16.00 | API-598                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for testing of gate valve                                                                                             |
| 2.17.00 | BS-1873                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for design & testing of globe valve                                                                                   |
| 2.18.00 | BS-1863                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for design & testing of check valve                                                                                   |
| 2.19.00 | BS-5351                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for design & testing of ball valve                                                                                    |
| 2.20.00 | API-599                                                                                                                                                                                                                                                                                                                                                                                              | : | Code for design & testing of plug valve                                                                                    |
| 2.21.00 | IS-8183                                                                                                                                                                                                                                                                                                                                                                                              | : | Specification for Bonded Mineral Wools Group 4                                                                             |
| 2.22.00 | IS-9842                                                                                                                                                                                                                                                                                                                                                                                              | : | Specification for Preformed Fibrous Pipe Insulation, Group 3                                                               |
| 2.23.00 | IS-277                                                                                                                                                                                                                                                                                                                                                                                               | : | Specification for Galvanized Steel Sheet                                                                                   |
| 2.24.00 | IS-7413                                                                                                                                                                                                                                                                                                                                                                                              | : | Code of practice for the Application and Finishing of Thermal Insulating Materials at temperatures between 40°C and 700°C. |
| 2.25.00 | If the equipment supplied does not conform to the above codes and standards, but is manufactured to the Bidder's own standard developed from his experience, it shall be clearly identified in the Bid, with sufficient data to support his design. The design shall be accepted by the Owner/Consultants only if the Owner is satisfied that sufficient experience exists with the design proposed. |   |                                                                                                                            |
| 2.26.00 | In addition to the above requirements, all equipment and procedure shall comply with applicable laws regulations and requirements of the State and Central Authorities.                                                                                                                                                                                                                              |   |                                                                                                                            |

### 3.00.00 SHORT DESCRIPTION OF THE SYSTEM

3.01.00 Oil both HFO and LDO shall be brought to plant site ~~AS INDICATED IN P & ID~~ ENCLOSED

3.02.00 Wagons shall be positioned by the side of the unloading manifold and unloading pumps shall be used for unloading of oil & storage of the same. Before unloading HFO, it shall be heated by steam, ~~in the wagon~~, to make it flowable, if necessary.

No heating is envisaged for HFO rail tankers

50 nos. BTPN

Heating of rail tankers considering ~~76 nos.~~ wagons to be provided for HFO. Adequate steam heating provision shall be kept for HFO tanker full rake heating to heat the HFO within specified time to avoid rake retention demurrage charge.

3.03.00 HFO shall be heated in the storage tank to maintain a suitable temperature by supplying steam through mat coil heaters. Tanks shall also be provided with suction heaters with steam as the heating source to heat the oil before sending it to heating and pressuring unit. No such heating is required for LDO.

~~3.04.00 Both HFO & LDO/ HSD shall be pumped from the storage tanks to day tanks by transfer pumps. HFO & LDO/ HSD transfer pumps along with strainers etc. will be located in the Fuel Oil Transfer Pump House adjacent to HFO and LDO/ HSD dyke area.~~

3.02.00 Suitable provision shall be provided for drainage of oil pumps, strainers, pipings, etc. There shall be a drain oil tank to receive the miscellaneous drains and wastes from the system, and this oil shall be returned to the HFO tanks by the help of drain oil pumps, provided the oil so collected is reasonably clean.

3.03.00 The HFO lines shall be steam traced. HFO pumps and strainers shall, however, be steam-jacketed type. Steam for tracing shall be arranged by the Bidder from auxiliary steam header.

3.04.00 Steam lines shall be provided with necessary control stations and traps as shown. Condensate drain from traps shall be disposed to the nearest station drain/pipe trench.

3.05.00 Suitable drainage shall be provided as required to get the approval of the Explosive Authority and Pollution Control Board.

3.06.00 ~~The scheme for Fuel Oil Handling is shown in Drawing No. 13A06-DWG-M-001T.~~

### 4.00.00 SCOPE OF SUPPLY

The scope of work under this section shall include the entire Fuel Oil transferring & storage system as detailed below, elsewhere in this section and in the tender drawing.

The list is by no means exhaustive and the items though not specifically mentioned but needed for safe, efficient, trouble-free and coordinated operation of the system shall be provided by the bidder under this section.

- 4.01.00 Unloading & Storage of HFO and LDO/ HSD
- 4.01.01 One (1) no. 550 NB (min) HFO unloading and another similar LDO/ HSD unloading manifold complete with Hundred (100) Nos. 80 NB stand pipes with isolation valves and caps, Hundred (100) Nos. 80 mm NB flexible hoses of sufficient length and each provided with universal type coupling and matching pieces as required for connecting to Indian Railway Oil Tanker Wagons. Tapping points on the oil headers shall be suitably located.
- 4.01.02 HFO and LDO pumps as mentioned in scope of supply shall be provided (Steam jacketed in case of HFO only), rotary positive displacement type unloading pumps complete with flame/explosion proof electric drive motors and all other accessories as required or specified in enclosed Annexure shall be provided, -one (1) set for HFO system and another for LDO/ HSD system.
- 4.01.03 Simplex type heavy duty oil suction strainers (one for each pump) each of capacity equal to that of the pump with isolating valves, drain valves, vent valves with goose neck piping and other accessories.
- 4.01.04 Two (2) no. HFO storage tank of 4000 m<sup>3</sup> capacity (minimum) complete with mat coil heater and suction heaters, each of capacity as per the guidelines explained in with accessories as specified in the Annexure enclosed and as required. Two (2) no LDO/ HSD storage tank 1000 m<sup>3</sup> capacity (minimum) along with necessary accessories as specified shall be provided.
- ~~4.02.00 HFO Transferring System~~
- ~~4.02.01 Two (2) (1 working + 1 standby) nos. positive displacement pumps with drives and other accessories as required and as specified in data sheets enclosed for transferring HFO from HFO storage tank to HFO day tank.~~
- ~~4.02.02 One (1) duplex heavy duty fuel oil pump suction strainer and one (1) duplex heavy duty fuel oil pump discharge strainer for pumps with isolating valves, drain valve and vent valve with pipe.~~
- ~~4.03.00 LDO/ HSD Transferring System~~
- ~~4.03.01 Two (2) nos. Light diesel oil (LDO)/ High Speed Diesel (HSD) pumps (1 working + 1 standby) with drives, base plates, support plates, grounding pads, lifting lugs, eye-bolts, anchor bolts & nuts and accessories for transferring LDO/ HSD from LDO storage LDO day tank.~~
- ~~4.03.02 One (1) duplex heavy duty LDO/ HSD pump suction strainer with isolating valves, drain valve and vent valve with piping.~~
- ~~4.04.00 One (1) no. HFO day tank of capacity suitable for one day consumption (minimum 500 m<sup>3</sup>) complete with mat coil heater and suction heaters, each of capacity as per the guidelines explained in with accessories as specified in the Annexure enclosed and as required. One (1) no. LDO/ HSD day tank of~~

4.05.00 **Tracing of HFO Pipe Lines**

4.05.01 For HFO pipelines complete steam tracing system and necessary equipment for tracing shall be provided.

4.05.02 For steam tracing necessary steam/condensate drain line, control stations and trap assembly as required shall be provided by the bidder.

4.06.00 One drain oil tank of adequate capacity (minimum 20 m<sup>3</sup>) for HFO & LDO/ HSD unloading and Transferring system with necessary heater (steam heated) shall be provided to receive the miscellaneous drains of HFO, LDO/ HSD system.

4.07.00 Two (2) nos. drain oil pumps shall be provided to recirculate oil from oil water drain oil tank to HFO tank.

~~4.08.00 Portable hand pumps of suitable design complete with discharge spout for removal of oil from the HFO day tank dyke area drain sumps.~~

4.09.00 **Pipe, Fittings, Specialties and Valves**

4.09.01 Pipes, fittings, specialties, traps, strainers, valves, supports/ hangers etc. as per the piping system design requirement for the system. For details, refer Cl. No. 4.05.00 of Sec. IIIA of Vol-IIB.

4.10.00 **Thermal Insulation**

Refer Cl. No. 4.06.00 of Sec. IIIA of Vol-IIB.

4.11.00 All access platforms for various valves & all pipe cross-over platforms, as required for necessary approach and crossings.

4.12.00 Anchor Bolts, Sleeves, Inserts, Foundation Plates, Lifting Lugs, Eye Bolts etc. shall be supplied.

~~4.13.00 **Control & Instrumentation**~~

~~4.13.01 Volume- VI of this specification shall be referred for detailed Control & Instrumentation requirements.~~

5.00.00 **SYSTEM DESIGN CRITERIA**

5.01.00 Fuel oil system and its facilities shall be designed as per Pollution Control/Petroleum/Explosive/Fire rules of Govt. of India.

5.01.01 The unloading capacity shall be suitable to unload at a time a maximum of 50 nos. BTPN nos. wagons for each of HFO & LDO/ HSD system.

5.01.02 Buffer to buffer dimension of HFO & LDO/ HSD wagons is 12.42 M. Therefore, a net railway track length of minimum 665 metres paved with RCC shall be

**DEVELOPMENT CONSULTANTS**

**V.IIB/S-3B : 5**

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**Telangana State Power Generation Corporation Ltd.**  
**1x800 MW Kothagudem TPS**

**EPC Bid Document**  
**e-PCT/TS/K/02/2014-15**

provided for oil unloading and shall be used for unloading both HFO and LDO/ HSD.

~~5.01.03 Unloading manifold (both HFO & LDO/ HSD) shall be suitable for connecting 76 nos. wagons. However, 80 nos. hoses shall be provided in the manifold.~~

Oil from wagons shall be unloaded to unloading manifold through flexible hoses.

For ease of maneuvering hose size of 80 NB is proposed.

~~5.01.04 In case of HFO, tanker wagons shall be fitted with steam heating coils so that oil may be heated to reduce its viscosity. Steam from boiler is taken and after reducing its pressure to 6 Kg/cm<sup>2</sup>(g) is used for HFO wagon heating.~~

Steam header in unloading area to be sized for HFO unloading header tracing only.

5.01.05 When the unloading header and the piping at the individual pump suction is filled up with oil and steady oil supply is ensured, the unloading pumps shall be started.

~~5.01.06 The capacity of each unloading pump shall not exceed 125 Cu.M/hr. Total number of pumps in each HFO & LDO system shall be so selected that they are capable of unloading 76 nos. of wagons (Max. Volume in each wagon for HFO & LDO are 23 Cu.M (excl. heating time) within 5 hours of operation (excluding heating time) within 5 hours of operation. Each pump shall have capacity 125 Cu.M/hr. (maximum) each pump shall meet the above requirement. Additionally, two (2) nos. pumps for each system shall also be installed for unloading oil from oil during start of unloading and also during finishing so as avoiding malfunction of pumps due to air entrapment in the oil.~~

5.02.00 Oil Storage System

While assessing the HFO and LDO/ HSD storage volume, following aspects have to be taken into consideration with the assumption that fresh supply of oil wagons shall be available at site within a month of its requisition.

5.02.01 HFO Storage Capacity : 4000 CUM EFFECTIVE CAPACITY EACH TANK

~~One (1) HFO storage tank of adequate capacity to be provided to store oil from one full rake (each rake having 76 nos. of wagon each of capacity 23 Cu.M) and also to meet the sum total of the following additional requirements for a month:~~

- a) One boiler is under coal firing with oil support (oil burners at 10% BMCR) for about 8 hours a day

- b) One of the boilers is under operation with oil only at 30% BMCR for approximately 40 hours a month.

Size of tank shall however, be not less than 2000 Cu.M.

5.02.02 LDO Storage Capacity : 1000 CUM EFFECTIVE CAPACITY EACH TANK

There shall be one (1) LDO storage tank of adequate capacity to meet one month's requirements for any one of the following events :

- a) Cold Start up of one boiler with all the LU burners operating at their maximum capacity at 10% BMCR for about six (6) hours per day.
- b) Steam Blowing Operation of any one of the boilers with all the LU burners operating at maximum capacity for about twelve (12) hours per day.
- c) TG rolling, Dry out Leading to Synchronisation of any one of the units with all the LU burners operating at maximum capacity round the clock. However, tank size shall not be less than 500 Cu.M.

#### 5.03.00 HFO Transferring System

5.03.01 Transfer pumps :

- a) Design flow capacity, each : To be decided by Bidder
- b) Normal inlet temperature : 60 Deg.C within  $\pm 5$  Deg.C

5.04.00 HFO Day Tank Capacity : 500 Cu.M (minimum)

#### 5.05.00 LDO/ HSD Transferring System

5.05.01 Transfer Pumps :

- a) Design flow capacity each : To be decided by Bidder
- b) Normal inlet temp : 8 - 45 Deg.C

5.05.02 LDO/ HSD Day Tank Capacity : 200 Cu.M (minimum)

#### 5.06.00 Pipe, Fittings & Specialities

5.06.01 Determination of diameters of various pipes in the F.O. Handling system shall be done based on the velocity indicated in Annexure-III of Sec. IIIA of Vol-IIB and the flow rates established by the system designer/ bidder.

5.06.02 Thickness calculation of the pipes shall be done based on the allowable stress of the pipe material (material for various pipe lines indicated in Annexure-III of Sec. IIIA of Vol-IIB ) at design temperature and the pressure determined by the system designer/bidder.

- 5.06.03 Piping system should withstand the maximum operating temperature and pressure. The forces & moments at terminal/equipment due to thermal expansion should be kept under permissible limit. Piping system shall meet other requirements of the relevant codes & standards.
- 5.06.04 All valves shall function smoothly without sticking rubbing vibrating etc. during operation.
- 5.06.05 Drain pipe size shall be 25mm NB as minimum.

## 6.00.00 DESIGN & CONSTRUCTION

### 6.01.00 Pumps

- 6.01.01 Refer Cl. No. 6.01.00 in Sec. IIIA of Vol-IIB.

### 6.02.00 HFO and LDO/ HSD Storage & Day Tanks (Steel Tanks)

The tanks shall be constructed to IS-803 and API-650 as applicable. The oil tanks shall be vertical cylindrical type, installed outdoors; site fabricated and welded construction type with butt-welded bottom plate. Steel shall conform to IS-2062. Oil shall be stored at atmospheric pressure. The tank foundation shall be high enough to reduce idle storage volume of tanks. The fuel oil tanks shall be located adjacent to the fuel oil pressurizing pump house in a common dyke.

- 6.02.01 Since the tanks are for storage of inflammable liquids they shall be in accordance with the requirement specified in Indian Petroleum and Explosive rules. Before commencing the erection/construction, the relevant drawings/ documents shall be got approved by Directorate of Explosive, Govt. of India.
- 6.02.02 For cylindrical tanks, the plates shall be cold rolled through plate bending machine by several number of passes to true curvature.
- 6.02.03 Vessel seams shall be so positioned that they do not pass through vessel connections. For cylindrical vessels consisting of more than two sections, longitudinal seams shall be offset.
- 6.02.04 Where possible, the inside seam weld shall be ground smooth, suitable for application of corrosion resistant primer.
- 6.02.05 Proper means shall be provided against the chance of over-turning effect of wind on an empty vertical cylindrical tank having a shell height greater than the diameter. Anchorage of tanks shall be done when 'C', a dimensionless figure exceeds 0.66 where :

$$C = \frac{2M}{dw}, \quad \text{for vertical cylindrical tank}$$

where, M = Overturning moment due to wind, kilogram - metre.

d = Diameter of shell, metre

w = Weight of Shell and portion of roof supported by shell, kilograms.

- 6.02.06 Due consideration for wind load and/or earthquake effect shall be given by the Contractor in the design of tanks. Data for wind load and earthquake shall be taken as indicated in Vol-IIA. Maximum allowable stresses for design loadings combined with wind or earthquake shall not exceed 133% of stress permitted for the design loading condition but in no case shall exceed 80% of specified minimum yield strength of the material.
- 6.02.07 For tanks of diameter 4.75 M and thickness less than 6 mm or of diameter larger than 4.75 M added structural supports in the form of rafters shall be provided.
- 6.02.08 Reinforcement pads in tank connections shall be provided as per applicable code & the reinforced connection shall be completely pre-assembled into a shell plate. The completed assembly including the connection shall be thermally stress-relieved as per API Standard 620.
- 6.02.09 The joint efficiency factor to be adopted for design calculation shall be in accordance with the applicable standard.
- 6.02.10 All welding shall be done as per IS:816, latest revision. All welds are to be continuous welds.
- 6.02.11 Sufficient air space is to be provided in the tank. Temperature expansion of oil shall be taken into account.
- 6.02.12 The supply and return pipes shall be extended well inside the tank and wear plates shall be provided.
- 6.02.13 **Tank Connections**
- Tanks shall be provided with necessary connections like-oil inlet and outlet, steam inlet & condensate outlet (in case of HFO tank only), different drains, vents and return oil lines water draw off etc. as indicated in drawing
- 6.02.14 **Tank Accessories**
- The tanks shall be provided with necessary accessories. All the accessories shall conform to relevant Indian Standard and as specified. The following broad guidelines are given for some of the accessories.
- a) **Heating Coils/Floor Heater**
- As specified, heating coils in one or more tiers shall be provided at the bottom of the HFO Storage tanks to maintain oil within the tank at specified temperature with steam as the heating medium.
- The tubes shall be seamless steel as per indicated standard. Arrangement for supporting the coil within the tank shall be made. Connections for steam inlet and condensate outlet shall be provided.

The floor heater shall be installed inside the tank such that oil is uniformly heated without possibility of local overheating and over-straining the tank body. All connection flanges shall be outside the tank. The coils shall be guaranteed to be submerged under sufficient level of oil to avoid flashing of oil.

The Bidder shall furnish with his proposal the design calculations for arriving at steam consumption, coil heat transfer area etc. The Bidder shall also indicate the maximum time required to liquefy the stored material and bring it to the storing temperature under the extreme condition when the heating coil is turned on after prolonged shutdown with material stored in the tank, at the lowest ambient temperature.

Refer Annexure II.

b) Suction Heater

As specified, suction heater of duty conditions as indicated in Annexure shall be furnished on the outlet of HFO day tank.

The heater shall be shell and tube construction. Material of shell and tube shall be as specified Annexure. Heaters shall be designed as per TEMA or equivalent code.

The heater shall be mounted on the sidewall of the tank and properly supported. The design shall be such as to allow inspection and/or maintenance of the heater with the tank completely filled.

All heaters shall have oil in the shell side and steam in the tube side.

Refer Annexure II.

c) Steam Trap

Steam trap shall be provided for floor coil heaters and suction heaters at the condensate outlet lines.

d) Flame Arrestor

Each vent connection on tanks shall be provided with a flame arrestor design of which shall meet the approval of the Inspector of Explosives. The Bidder shall furnish the materials of construction and detail cross-sectional drawing along with his proposal.

e) Conservation Vent Valve

Where continuous venting to atmosphere directly is not permitted for the stored liquid, a conservation vent valve or a breather of approved make and design shall be provided on each of the vent/ overflow connections of the tanks as specified. The conservation vent valves where provided, shall be designed to relieve the pressure or vacuum corresponding to plus or minus 65mm water gauge in the space above

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liquid in the tank. Detail cross-sectional drawing indicating materials of construction shall be submitted along with the proposal.

f) Instrumentations

Instrumentations as shown in P&I diagram shall be provided.

g) Level Transmitter

Each tank shall be provided with a radar type level transmitter to ensure safe and reliable operation.

h) Each tank shall be provided with spiral stairway with handrail and an internal vertical ladder.

i) Each tank shall have one roof manhole and one shell manhole of not less than 600mm diameter.

j) All other accessories, fittings and tank connections including level switches, etc. as required for sound engineering practice shall be provided.

**6.02.15 Installation of HFO & LDO/ HSD Storage & Day Tanks**

When installation of tank is specified, the recommendation regarding installation in IS:803 shall be followed in general. In addition to those recommendations, the following shall also be taken care of.

a) All fabricated part, before assembly, shall be transported by the Contractor by his own arrangement to the tank installation site. All preliminary work and fabrication in part or full shall be done at the Contractor's fabrication yard or shop as much as possible to suit his transportation arrangement subject to Purchaser's approval.

b) All material before final installation over the foundation at the respective locality shall be inspected and repaired as necessary to ensure that any damage received during transportation is corrected before erection to the satisfaction of the Owner. Particular attention shall be given towards removal of buckles and other form of distortion in shell and bottom plates. Irregularities and dirt, which would prevent metal-to-metal contact at the jointing faces, shall be removed.

c) The sloping factor shall be taken as 1 : 36 for the Cylindrical tank head. Sufficient number of plugged holes shall be provided in the bottom plate of the vertical tanks for bottom testing as specified in IS:803.

d) Welding

Welding sequence shall be adopted in such a way so as to minimize the distortion due to weld shrinkage. Bidder shall indicate in his drawing the sequence of welding proposed by him which should meet prior approval of Purchaser.

- e) During construction period, the tanks and the sections shall be suitably anchored and tied by guy-wires etc. to avoid blowing/ toppling/Sliding due to gusty wind.

#### 6.02.16 **Surface preparation and painting**

Primer for internal surface shall be double boiled Linseed oil and that for external shall be synthetic red lead. Finish coat for both internal and external surface shall be of synthetic enamel. For bottom surface protection, one coat of bituminastic paint shall be applied.

#### 6.03.00 **Pipes, Fittings, Valves and Specialities**

6.03.01 Refer Cl. No. 6.02.00 of Sec. IIIA of Vol-IIB.

#### ~~7.00.00~~ **CONTROL & INSTRUMENTATION**

~~7.01.00 Volume-VI of this specification shall be referred for detailed Control & Instrumentation requirements.~~

#### 8.00.00 **INSPECTION AND TESTING**

The manufacturer shall conduct all tests required to ensure that the equipment furnished shall conform to the requirements of this section of specification in compliance with requirements of applicable codes. In addition to the testing requirements spelt in Vol. IIA, for material, piping systems, pumps etc. the following tests are also to be done.

#### 8.01.00 **Fuel Oil Pump Performance Test**

8.01.01 Each pump shall have to be tested to determine the performance curves of the pumps. These tests are to be conducted in presence of Purchaser/Consultant's representative as per the requirements of the Hydraulic Institute Standards.

8.01.02 Test shall be conducted with actual drive motors being furnished.

8.01.03 After installation, pumps offered may be subjected to testing at field also by Purchaser. If the performance at field is found not to meet the requirement, then the equipment shall be rectified by the supplier without any extra cost.

#### 8.02.00 **Fuel Oil Storage & ~~Day~~ Tanks**

8.02.01 The supplier shall provide inspection to establish and maintain quality of workmanship to ensure the mechanical accuracy of components, compliance with drawings, identity and acceptability of all materials supplied by him.

8.02.02 Performance Tests

- a) Vertical Cylindrical Storage Tanks shall be tested generally as per IS:803 including the following :

- i) Spot radiography.
- ii) Bottom plate testing by air or vacuum box.
- iii) Shell testing by filling with water or by air as applicable.
- iv) Fixed roof testing by air.
- b) For all tanks tests shall be conducted to prevent uneven settlement of tanks on the foundation by initially filling the tanks to one third of its capacity and leaving in this condition for a period to be decided by the Purchaser. After checking for settlement another one third of the tank shall be filled up and the procedure as above shall be followed till the tank is fully filled up. After testing, the water shall be suitably drained off in the nearest drain without flooding or endangering the surrounding areas/equipment.

#### 8.03.00 **Valves**

Gate Valves shall be subjected to shop tests in accordance with API 598 including high-pressure closure test. Globe valve shall be tested in accordance with BS:1873 and Check valve shall be tested in accordance with BS:1868. Hydraulic test, fire safe etc. for ball valve shall be done as per relevant standard and code. For the items called for steam service IBR Certificate shall be furnished for the valves as well as the counter flanges.

#### 8.04.00 **Piping System**

Hydraulic test of pipelines shall be conducted at site after erection, at 150% design pressure. Subsequent steam blowing shall be done before commissioning.

#### 9.00.00 **DRAWINGS, DATA AND MANUALS**

9.01.00 Technical Information and Data to be submitted by the Bidder with the Proposal as indicated herein and elsewhere in this specification.

9.01.01 Single line schematic drawing of the entire system with all instrumentations showing sizes, capacities and rating of all equipment and accessories.

9.01.02 General layout of the entire Fuel Oil transferring system with emphasis on interconnection with existing facilities.

9.01.03 General arrangement drawings relevant Manufacturer's catalogues of HFO & LDO/ HSD storage & day tanks, pumps, strainers, different valves etc.

9.01.04 Calculations for capacity selection of HFO & LDO/ HSD pumps, tanks, mat coil and suction heaters of HFO storage & day tanks.

9.01.05 Characteristic curves of all pumps and motors.

- 9.02.00      Technical Data and Information to be submitted after award of Contract in addition to the requirements said in Vol.II-A
- 9.02.01      Final version of all schematic, layout, general arrangement and cross-sectional drawings and data enclosed with the proposal and as asked for against clause no.: 9.01.00 above.
- 9.02.02      Detail drawings of important units, assemblies, parts, etc. as deemed necessary.
- 9.02.03      Design calculations of pipe sizing, control valve sizing etc.

## ANNEXURE-I

## HFO TANK HEATERS - DESIGN PARAMETERS

1. FLOOR COIL HEATER IN HFO STORAGE & ~~DAY~~ TANKS

## Design Data

- |      |                                                                                  |   |                                                                                                       |
|------|----------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------|
| a)   | Heating medium at the inlet of control valve                                     | : | Steam from Auxiliary steam pipe                                                                       |
| b)   | Capacity of the floor coil heater shall be determined for following conditions : |   |                                                                                                       |
| i)   | Maximum capacity                                                                 | : | To raise the temperature of full tank capacity of HFO oil from 5°C to 50°C in not more than 72 hours. |
| ii)  | Normal capacity                                                                  | : | To compensate heat loss from the unlagged tank completely filled with oil at 50°C.                    |
| iii) | Wind Speed                                                                       | : | Refer Design data                                                                                     |
| iv)  | Margin to be provided on calculated surface area of floor coil                   | : | 10 %                                                                                                  |
| c)   | Tube side design pressure (Kg./Sq.cm) & temperature (Deg.C)                      | : | Bidder to indicate Pressure, 250°C                                                                    |
| d)   | Material Heating element                                                         | : | Seamless steel tubes to ASTM, A 106, Group B or equivalent                                            |

2. SUCTION HEATER IN HFO STORAGE & ~~DAY~~ TANKS

The heavy fuel oil ~~day storage & day~~ tanks shall be fitted with shell and tube type suction oil heaters for supplying oil at the pump suction. "U" type steel seamless tubes shall be used for the tube bundle.

The suction heaters shall be designed to the following parameters :

- |    |                                       |   |                                 |
|----|---------------------------------------|---|---------------------------------|
| a) | Oil flow rate for each suction heater | : | Shall be to two pump capacity   |
| b) | Heating medium                        | : | Steam from Auxiliary Steam Pipe |

- c) Initial temperature of oil :  $50 \pm 5^{\circ}\text{C}$
- d) Final temperature of oil :  $60 \pm 5^{\circ}\text{C}$
- e) Maximum range of temperature rise :  $20^{\circ}\text{C}$
- f) For establishing the area required for heat transfer, a fouling resistance of :

$$0.005 \frac{(\text{hr.}) (\text{Deg.F}) (\text{Sq.ft})}{\text{BTU}}$$

shall be assumed on the outside surface of heater tubes.

- g) Following material of construction shall be used :

- i) Shell : MS Plate to IS:2062
- ii) Shell head and tube sheets : Steel plates of IS-2002 Grade 2A
- iii) Heating elements : Seamless steel tubes to ASTM, A-106, Group-B or equivalent
- iv) Nozzles : Seamless steel tubes

**A. SUCTION HEATER#1**  
**DESIGN OIL FLOW: 145 CUM/HR**

**B SUCTION HEATER#2**  
**DESIGN OIL FLOW: 217 CUM/HR**