CATALOGUE 1

SPRAY WATER NOZZLES FOR AMMONIA TANK COOLING AT AMMONIA FARM AREA IN SCR SYSTEM AS PER THE SPECIFICATION AND DATASHEET – TSR:015/REV 00.

THE FOLLOWING ARE THE TECHNICAL DOCUMENTS.

1. SPECIFICATION AND DATASHEET – TSR:015/REV 00
2. REFERENCE P & ID –AMMONIA AREA WATER SPRAY SYSTEM DRG NO: 0-SR-056-00052
3. FOUNDATION & TP DETAILS OF AMMONIA STORAGE FARM YARD DRG. 0-SR-056-00061
4. ANNEXURE S
5. VENDOR SHALL SUBMIT THE DIMENSIONAL DRAWINGS AND FILLED IN DATA SHEETS.
6. VENDOR TO SUPPLY NOZZLES ALONG WITH THE PROVISION TO WELD THEM TO SPRAY WATER PIPE – NB 15
7. THE NOZZLE QUANTITY INDICATED IN SPECIFICATION & DATA SHEET ARE TENTATIVE AND THE SAME TO BE CONFIRMED/REVISED BY VENDOR.
8. THE VENDOR SHALL SUBMIT ALL THE SUPPORTING DOCUMENTS FOR OUR PQR REQUIREMENT.
9. VENDOR QUALITY PLAN SHALL BE SUBMITTED
10. ALL THE DOCUMENTS SHALL BE SUBMITTED AS PER OUR SPECIFICATION REQUIREMENT.
11. VENDOR SHALL OFFER GUARANTEE FOR THE PRODUCTS SUPPLIED FOR A PERIOD OF 12 MONTHS FROM THE DATE OF COMMISSIONING OR 18 MONTHS FROM THE DATE OF SUPPLY, WHICHEVER IS EARLIER.

Technical Pre-Qualification Requirement (PQR) for

Spray Nozzle

1. The vendor shall be an established **spray nozzle** supplier and having adequate Engineering, Manufacturing, testing and servicing facilities and shall furnish technical backup documents in proof for above requirements.
2. The vendor shall have experience of having supplied **spray nozzle** as per the technical specification for SCR/Process plants or application of similar severity. Supply reference list with details of PO, PO date, customer name for Capacity.
3. The **spray nozzle** offered shall be from the existing regular supply range of the vendor. Vendor shall provide the product catalogue.
4. Proven track record is required. Minimum One end user certificate for the satisfactory operational performance of their product supplied.
   (or)
   successfully executed two POs for same item, meeting the subject technical specification requirement mentioned in the enquiry.
5. In case of ordering, the Vendor shall have the responsibility for the following and same to be confirmed point wise.
   i) Vendor should have the replacement responsibility in case of defect / failure.
   ii) Experts from Vendor's side shall associate in commissioning activities at site, if required.
   iii) Vendor should ensure the product performance during erection & commissioning and ensure performance guarantee.

6. Backup document checklist to meet PQR:

S. No	Document description	Check list
1	Documents to meet clause(1)	☐
2	Supply reference document (General reference list) to meet clause (2)	☐
3	Product Catalogues to meet clause (3)	☐
4	Min. one end user certificate (or) Two POs to meet clause (4)	☐
5	Confirmation to clause meet clause (5)	☐

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPPALLI-620 014

Fuel Systems/PE(FB)

Title Sheet

Technical Purchase Specification for

WATER SPRAY NOZZLES FOR TANK COOLING AT AMMONIA FARM AREA

Specification No.: **TSR: 015** Revision No.: 00

Rev. No.	***Rev. Date***	***Clause***	***Description***	***Chd. & Appd.***

	Name	***Signature***	***Date***
Prepared	**M Noorul Fazil**	***Sd.,***	***30.04.2019***
Checked	***M CH Gangadhar***	***Sd.,***	***02.05.2019***
Approved	***G Saravanakumar***	***Sd.,***	***03.05.2019***

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PART I - TECHNICAL SPECIFICATION

1.0 INTENT

The function of the spray nozzle for ammonia Spray system is to cool the **Ammonia storage tank** in the event that the pressure within the tank approaches the set pressure of the tank relief valve due to higher ambient storage temperature or overheating. The Water Spray Nozzle for tank cooling at Ammonia Area Spray system is connected to the fire protection water source with a pressure regulating valve set to 5 kg/cm^2 (71 PSIG) for optimum nozzle performance. Refer attached Foundation & TP details of Ammonia storage farm yard drawing.

2.0 SCOPE

This specification defines the minimum requirements for the design, manufacture, testing, preparation for shipment and delivery of materials, engineering documentation, technical direction for construction/ installation and start up service for this equipment. Equipment furnished shall be the Seller's standard design and proven.

3.1 EQUIPMENT, MATERIALS AND SERVICES BY SELLER

The Seller's scope of supply includes, but is not necessarily limited to:

- Spray nozzles to be located in ammonia tank area for cooling the ammonia tanks.
- Special tools if required.
- Manuals and instructions for storage, installation, commissioning, operating and maintenance.
- Freight from fabrication site(s) to the job site, including customs duties, if applicable.
- Installation and/or start-up service by a qualified engineer quoted on a per diem basis, with an estimate of required time.

4.1 EQUIPMENT, MATERIALS AND SERVICES BY OTHERS

The scope of supply by others shall be:

- Receiving, unloading and storage at the job site.
- Installation.
- Utility systems piping.
- Process piping external to the Seller's supplied equipment.
- Structural support steel.
- Electrical wiring, conduits, trays, push buttons and starters external to Seller supplied skid-mounted equipment.
- DCS interface and remote alarms.

5.1 PERFORMANCE GUARANTEES

The equipment provided by the Seller shall operate in accordance with the performance data in the datasheet and noise requirements for a period as determined by the terms and conditions of purchase.

The equipment shall meet all applicable code requirements so that all required inspections are passed and permits obtained.

The Buyer and/or Owner may conduct Field tests during start up and after commercial operation of the installation for a period determined by the terms and conditions of purchase.

The Seller shall guarantee the following:

- Spray angle 90 degrees (maximum)
- Maximum droplet diameter ***100-500 microns*** for 100% of the volume of all drops

6.0 DETAILED REQUIREMENTS OF EQUIPMENT

6.1 General

- The Spray system is connected to the fire protection water source with a self-pressure regulating valve located at upstream and set to **5 kg/cm^2 (71 PSIG)** for optimum spray nozzle performance. The nozzles should be ***solid cone, 90-degree spray angle, deflector type nozzles***.
- The nozzle manufacturer shall furnish all components required for installing the nozzle to mentioned spray water pipe.
- The fluid nozzles installed in site shall be fabricated from ***stainless steel***.
- ***The nozzle shall be with threaded connection so as to remove easily for maintenance, but shall be provided with matching socket using which the nozzle can be welded to NB 15 pipe at terminal point.***

6.2 Terminal Points

The Seller shall furnish all equipment and services necessary to connect the equipment to the Buyer's system. Connections will include, but are not limited to the following as required by this specification:

- Line size of the Fire Protection Water is NB 50 with **NB15 terminal point.**

6.3 Industry Reference Documents (Codes and Standards)

At a minimum, all work performed and materials provided by the Seller must be in accordance with all applicable Federal, State and local laws, ordinances, and regulations.

The equipment will comply with the applicable portions of the following Codes and Standards. The applicable revision of each of these Codes and Standards will be the current edition with addenda or the edition adopted by the controlling jurisdiction at the time of the purchase order. In the event of a conflict between these documents and the specification, the Seller shall submit a written request for an interpretation by Buyer. In general, the most stringent requirement shall govern.

- American National Standard Institute (ANSI)
- American Society of Testing and Materials (ASTM)
- American Society of Mechanical Engineers (ASME)
- American Society of Civil Engineers (ASCE)
- American Petroleum Institute (API)

- Air Moving & Control Association (AMCA)
- American Gear Manufacturers Association (AGMA)
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- Environmental Protection Agency (EPA)
- Institute of Electrical and Electronic Engineers (IEEE)
- Insulated Power Cable Engineers Association (IPCEA)
- International Organization for Standardization (ISO)
- Steel Structures Painting Council (SSPC)
- Standards of Hydraulics Institute (SHI)
- National Electrical Code (NEC)
- National Electrical Safety Codes (NESC)
- National Electrical Manufacturer's Association (NEMA)
- National Fire Protection Agency (NFPA)
- American Welding Society (AWS)
- American Institute of Steel Construction (AISC)
- Occupational Safety and Health Administration (OSHA)
- Joint Industrial Conference (JIC)
- Instrument Society of America (ISA)
- Underwriters' Laboratories (UL)
- International Building Codes (IBC)

6.4 Noise Requirements

The Seller shall provide silencers and/or acoustic insulation for equipment to operate with a maximum noise emission level of ***85 dB at 1 (one) meter*** from source.

6.5 Operating Sequences / Duration

Intermittent Operation at Outdoors

6.6 Instrumentation and Controls

N/A

6.7 Pipe, Valves, and Fittings

N/A

6.8 Surface Preparation and Painting

Note: Materials not subject to rusting shall be provided unpainted.

6.9 Spare Parts

Seller shall provide a list of recommended spare parts including start-up and commissioning spares and special tools, with separate pricing, and a schedule of part replacements based on the operation and service conditions specified.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA & QC)

7.1 Quality Control

The supplier must include in the supply a proven quality control and quality assurance system that will ensure the quality of the Spray Nozzle for Ammonia Area Spray system. The quality control system must follow ISO 9001 guidelines.

7.2 Quality assurance

The supplier shall be responsible for providing the necessary Quality Assurance and Quality Control procedures, maintaining continual surveillance and inspection activities during the entire periods of the Fabrication and Testing. Inspections report and tests to be provided to the BHEL during the fabrication period and before shipment of the Spray Nozzle for Ammonia Area Spray system.

8.1 TECHNICAL DOCUMENTATION

The following technical manuals shall be provided. Total of two (2) hard copies and one (1) copy on magnetic media (USB memory stick or CD-ROM) shall be provided sixty (60) days after issue of purchase order.

(a) Operation manual.
(b) Safety instruction.
(c) Maintenance manual.
(d) Repair and overhaul manual.
(e) Complete and comprehensive Parts Catalogue (including pictures if applicable) manufacturer P/N and OEM P/N.

Note: The above listed documents can be combined & supplied as Operation & Maintenance (O&M) Manual.

(f) Supplier shall submit a quoted (including prices) recommended spare parts list. The list should be cover all spare parts consumption for 3 years' operation.

9.0 DOCUMENTS TO BE FURNISHED WITH THE PROPOSAL

9.1 Product literature and drawings in support of the offer shall be submitted with the quotation to evaluate the offer.
9.2 The supplier shall return a copy of this specification and note at the end of each paragraph if the offered equipment complies or not with this specification with supplier sign and seal.
9.3 Operation manual.
9.4 Safety instruction.
9.5 Parts Catalogue with detailed Bill of material (BOM) and weight particulars.
9.6 Recommended spare parts list.
9.7 G.A drawing of spray nozzle with BOM

10.0 DOCUMENTS TO BE FURNISHED AFTER AWARD OF CONTRACT

10.1 Packaging procedure detailing the list of components shall be dispatched individually with identification and with details of preservation and storage.

10.2 Water Spray Nozzle at Ammonia Area spray system – Filled in Data sheets including drawings and design information shall be submitted to get approval from End user/owner of the boiler.

10.3 **Warranty certificate** shall be furnished by the vendor.

10.4 Operation & Maintenance (O & M) Manual

10.4.1 O & M manuals should be submitted to BHEL/Tiruchirappalli prior to despatch of the equipment.

11.0 INSPECTION

11.1 All test certificates shall be furnished for buyer's reference and records.

11.2 Spray Nozzle for Ammonia Area Spray System Equipment shall be inspected and tested as per approved quality plan. The certificates and documents generated during inspection of above shall be furnished to BHEL.

12.0 FINAL TESTS AND ACCEPTANCE

The Spray Nozzle at Ammonia Area spray system shall be tested in the site together with BHEL's representative to demonstrate conformance to the specification and functioning. The following tests shall be performed:

12.1 Checking and repairing of voyage damages.

12.2 Visual test and Complete equipment check-up.

12.3 Functional test.

Acceptance certificate will be issued after successful completion of the acceptance tests and submission of all relevant documentation.

13.0 WARRANTY

13.1 Warranty Period

The warranty period shall be twelve (12) months from the date of commissioning or eighteen (18) months from the date of supply whichever is earlier. This warranty includes structural electrical, hydraulic and mechanical defects, fatigue failure etc.

14.0 ATTACHMENTS AND REFERENCE DOCUMENTS

Drg. No.	Description	No. of Pages	Revision Number
--	Data Sheets – Water Spray Nozzle for tank cooling at Ammonia Area spray system	2	00
0-SR-056-00052	Reference P & IDs of SCR system-Ammonia Area Water Spray System	1	00
0-SR-056-00061	Foundation & TP details of Ammonia storage farm yard	1	00
--	Annexure-S	1	00

PART-II

Data Sheets – Water Spray Nozzle for Tank Cooling at Ammonia Area Spray System

Qty : Vendor to calculate based on Nozzle covering area

DATA SHEET CUM VENDOR CHECKLIST FOR SPRAY NOZZLE FOR AMMONIA STORAGE TANK COOLING AT AMMONIA FARM AREA

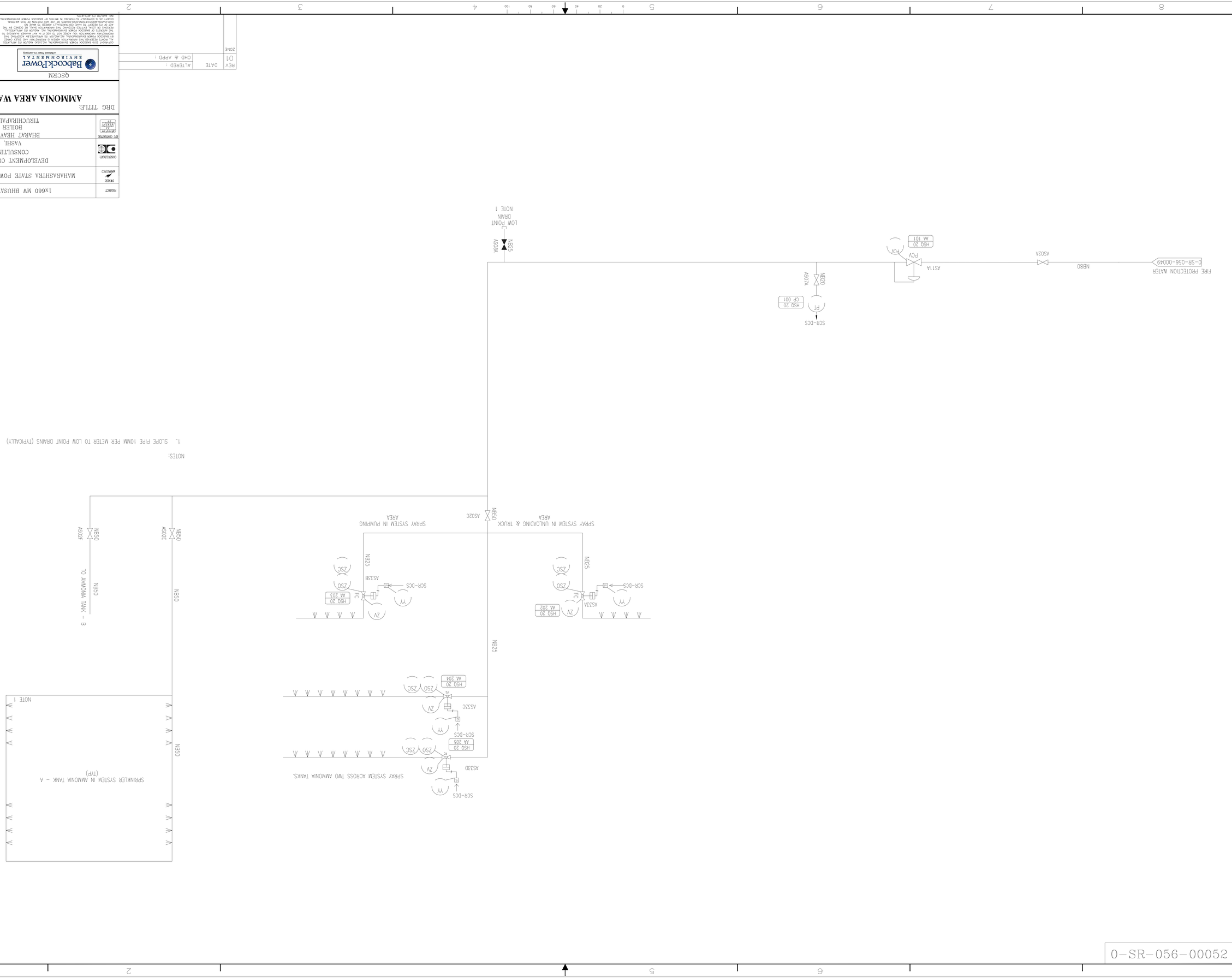
BHEL Material Code: **L17271SR18001001**

TSR: 015/Rev.00

Enquiry No.

	DESCRIPTION	BHEL REQUIREMENT	VENDOR CONFIRMATION
1.0	Nozzle Quantity (Qty. Installed / Qty. Spare):	64 * + 10 Nos. spare	
1.1	Sockets for welding nozzle to pipe as specified in 4.11	64 * + 10 Nos. spare	
1.2	Dimensions of ammonia storage tank	Refer Annexure-S	
1.3	Nozzle provision on the tank	On both sides	
2.0	**Flow Parameters**		
2.1	Fluid Type	Fire Protection Water	
2.2	Total water Flow available	45000 kg/hr	
2.3	Temperature °C	27	
2.4	Pressure kg/cm2	Vendor to specify	
3.0	**Fluid through the Spray Nozzles**	Fire protection Water	
3.1	Temperature (Operating / Max) °C	27/35	
3.2	Pressure at nozzle inlet (Operating / Max) kg/cm2	4/5	
3.3	Density @ Operating Temperature kg/m³	995.7	
3.4	Viscosity @ Operating Temperature Ns/m2	-	
3.5	Chloride Concentration PPM	-	
3.6	pH -	-	
4.0	**Spray Nozzle Details**		
4.1	Nozzle Service	Ammonia farm area water spray system	
4.2	Total Nozzles Required (Refer Annexure-S)	Vendor to specify	
4.3	No of Ammonia Tank	2	
4.4	Nozzle Type (Unidirectional; Split Up & Down)	Unidirectional Spray	
4.5	Spray Pattern (Hollow Cone, Full Cone, Flat)	Solid Cone	
4.6	Process Capacity at Pressure kg/cm²	Vendor to specify	
4.7	Spray Angle at Pressure Degrees @ °C	Vendor to specify	
4.8	Drop Size Range Microns	100-500	
4.9	Materials of Construction	303 SS	
4.10	Pipe Line size [ODxT (mmxmm) / NB]	**NB 15**	
4.11	Nozzle Connection to socket (Flange, NPT, Victaulic, Other)	Male NPT(vendor to specify size)	
4.12	Socket connection to NB15 pipe	Weldable	
4.13	Spray Nozzle Make and Model	Vendor to specify	
4.14	Body material	SS	
4.15	Nozzle Type & Model	Vendor to specify	
4.16	Nozzle inlet connection size (mm)	Vendor to specify	
4.17	Capacity at Pressure (Supplier Guarantee) - LPM @ kg/cm2	Vendor to specify	
4.18	Spray Angle at Pressure (Supplier Guarantee)- Degrees @ kg/cm2	Vendor to specify	
4.19	Nozzle Weight with Socket- kg	Vendor to specify	
5.0	**Special Requirements**		
	NA		
		BHEL	**VENDOR**
	Prepared	N. Fazil	
	N. Fazil	Shankar Naik	

* Based on experience and selected spray nozzle model, vendor to finalize the number of spray nozzles required to cool the tank effectively. Refer Annexure-S.



NOTES:

1. SLOPE PIPE 10MM PER METER TO LOW POINT DRAINS (TYPICALLY)

CUSTOMER NO.: 1727

PROJECT:	1x660 MW BHUSAWAL TPS UNIT-6
OWNER: MAHAGENCO	MAHARASHTRA STATE POWER GENERATION CO. LTD.
CONSULTANT	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI, NAVI MUMBAI
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD BOILER PLANT UNIT: TIRUCHIRAPALLI-620014, INDIA.

DRG TITLE:

AMMONIA AREA WATER SPRAY SYSTEM

DRAWN BY : VKAS_SETH	DATE : 30.05.2019	ALL DIMENSIONS IN MILLIMETERS
CHECKED BY : SAHAYAJ_KAMAK	DATE : 30.05.2019	PROJECTION
APPROVED BY :SAHAYAJ_KAMAK	DATE : 30.05.2019	SCALE NTS
CHECKED BY : BPP	DATE : 30.05.2019	
VETTED BY : BPP	DATE	

REV	DATE	ALTERED :
01		CHD & APPD :

ZONE	REV	DESCRIPTION
	00	ISSUED FOR CONSTRUCTION

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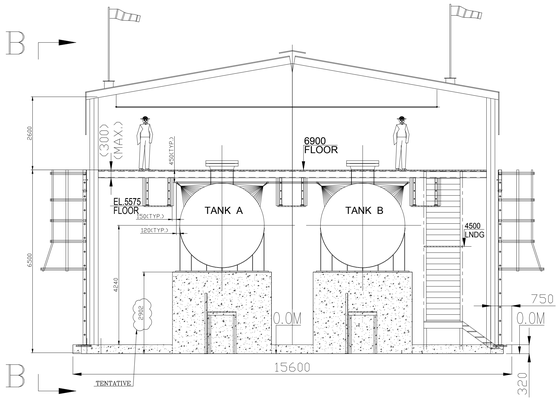
Babcock Power ENVIRONMENTAL
a business from inc. company

QSCRM

DRAWING NO. 0-SR-056-00052 REV. 00

0-SR-056-00052



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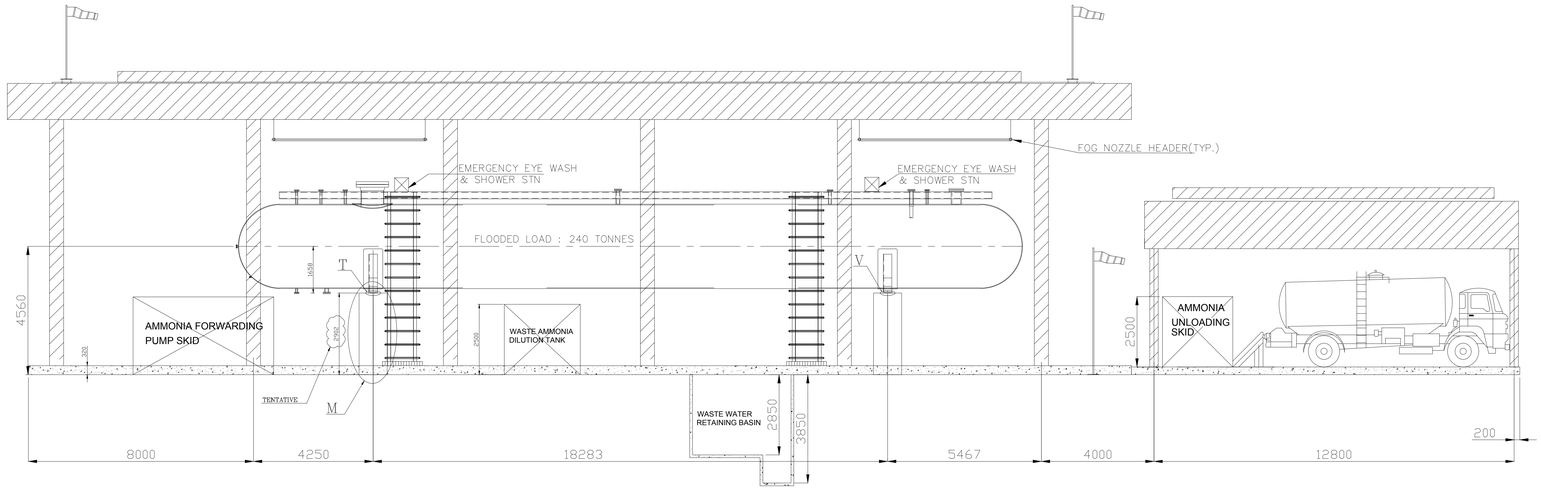

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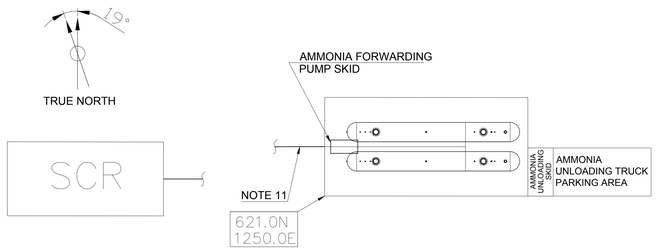
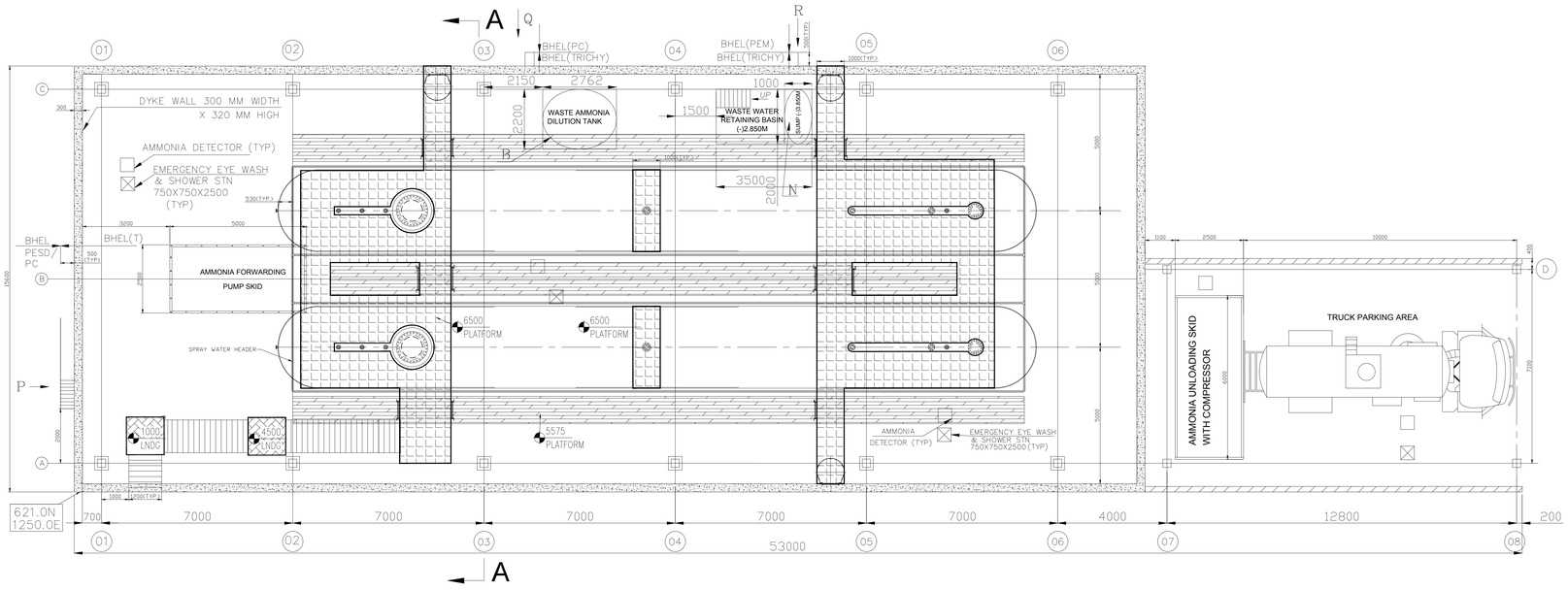
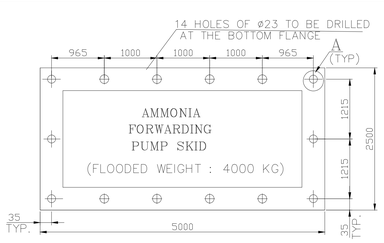
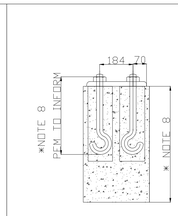
KEY PLAN









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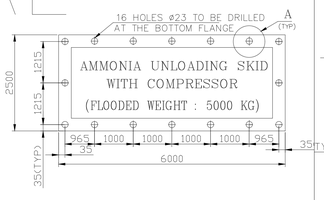

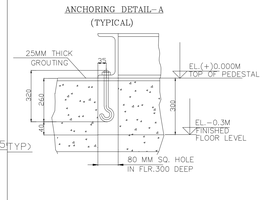

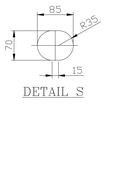

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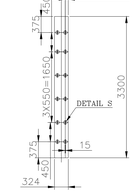

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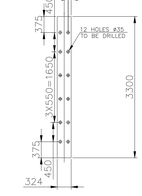

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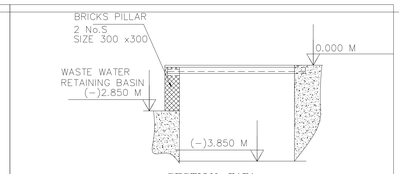

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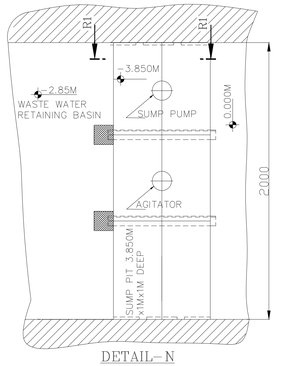

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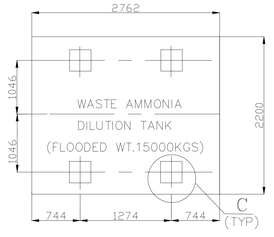

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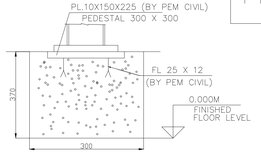
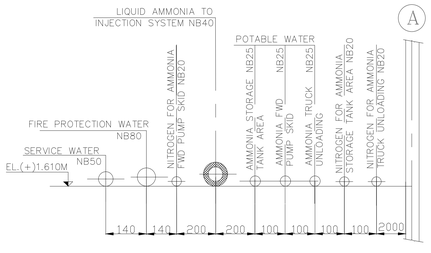
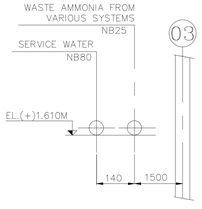


DETAIL–C
(TYPICAL)



VIEW P



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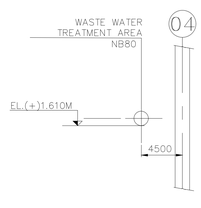


VIEW R

NOTE:–

1. ALL ELEVATIONS ARE WITH RESPECT TO EL. (+)0.00M, FINISHED GROUND FLOOR LEVEL OF TG BUILDING AND MILL BAY, WHICH CORRESPONDS TO RL 208.5M.
2. PLOT PLAN REF DRAWING PE–DG–415–100–M001 REV 2P
3. REFERENCE DRAWING: –0–SR–056–00049 :P&ID OF SCR SYSTEM–KEY DIAGRAM
4. COLUMNS 01,02,03,04,05,06,07,08 & ROWS A,B &C ARE TENTATIVE REPRESENTATION FOR EQUIPMENT LOCATION REFERENCE, FOR FINAL LOCATION OF COLUMNS PLEASE REFER CIVIL DRG. OF PEM/DELHI.
5. PEM/CIVIL TO TAKE CARE THE CIVIL FOUNDATION DESIGN & EXECUTION.
6. NECESSARY APPROVAL OF AMMONIA TANK FARM SHALL BE ARRANGED BY PEM/DELHI.
7. FOUNDATION DETAILS ARE TENTATIVE.
8. * PEM TO INDICATE THE DIMENSION.
10. EXACT LOCATION AND POSITION OF AMMONIA DETECTORS AND EMERGENCY EYE WASH STATION WILL SUITABLY DECIDED DURING ERECTION.
11. PIPE RACK ROUTING BETWEEN AMMONIA STORAGE TANK FARM YARD TO SCR IS PRELIMINARY, FINAL ROUTING WILL BE DECIDED BY BHEL/PC/CHENNAI DURING DETAIL ENGG.
12. AGITATOR AND SUMP PUMP FOUNDATION DETAILS ARE PRELIMINARY.
13. FINAL LOCATION OF WIND INDICATOR TO BE DECIDED DURING ERECTION.
14. FLOODED LOAD INDICATED IS PER TANK CONSIDERING DEAD LOAD ONLY. THE OTHER LOADS SUCH AS WIND, SEISMIC ETC MAY BE SUITABLY TAKEN CARE BY PEM/CIVIL.

PRELIMINARY

REV	DATE	ALTERED : BALAJI D
01	21.09.120	CHD & APPD SHANKAR NAIK
ZONE		PLATFORM DETAILS ADDED.

CUSTOMER NO. 1727

CUSTOMER: MAHAGENCO (MAHARASTRA) CO.LIMITED BHUSAWAL, INDIA

CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS ; MUMBAI

PROJECT: MSPGCL BHUSAWAL (1 X 660MW) unit # 6 BHUSAWAL,JALGAON, MAHARASHTRA

BHARAT HEAVY ELECTRICALS LTD
BOILER PLANT, TIRUCHIRAPALLI –620014

	NAME	SIGN	DATE
DRAWN	BALAJI/PREETAM	Sd...	03.06.2020
CHECKED	SHANKAR NAIK	Sd...	12.06.2020
APPROVED	SARAVANA KUMAR	Sd...	20.07.2020

DEPT CODE: FS 129

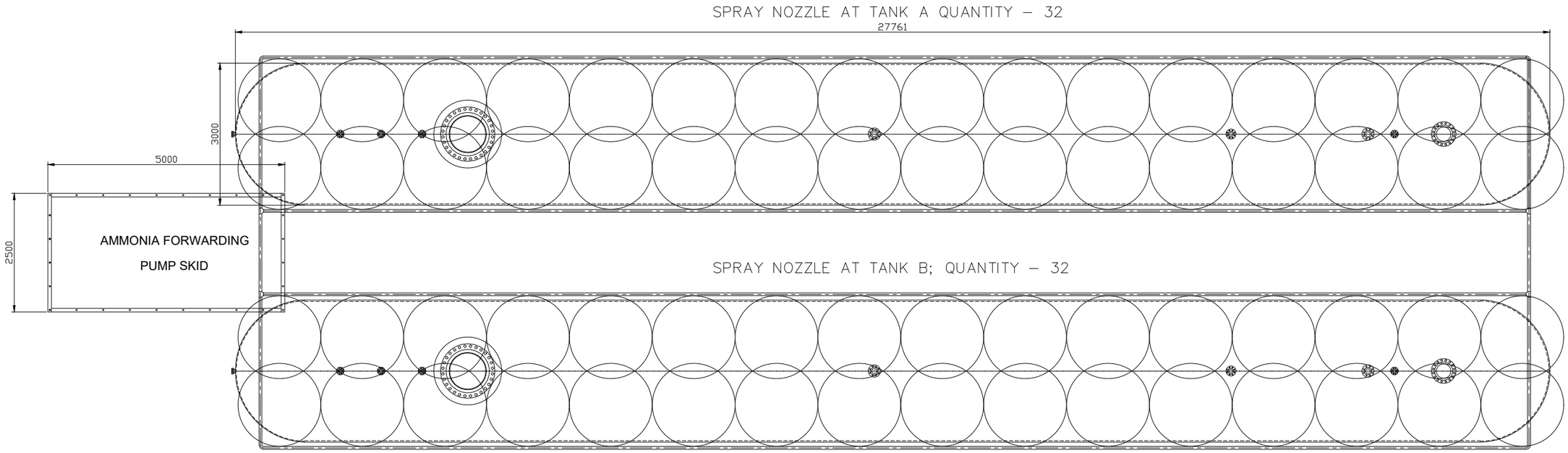
ALL DIMENSIONS IN MILLIMETRE

TITLE: FOUNDATION AND TP DETAILS OF AMMONIA STORAGE FARM YARD

PROJECTION | SCALE: – | DRG No. 0–SR–056–00061 | REV. 01

ANNEXURE–S ; SPRAY NOZZLE ARRANGEMENT

TOTAL SPRAY NOZZLE QUANTITY ARRIVED TENTATIVELY AS 64 NOs FOR TWO TANKS.
SPRAY NOZZLE COVERAGE RADIUS ASSUMED AS 875mm.



NOTE: THIS DRAWING IS FOR VENDOR REFERENCE TO ARRIVE AT SPRAY NOZZLE QTY AS PER NOZZLE COVERAGE TO BE SELECTED BY VENDOR. FINAL SPRAY NOZZLE QTY FOR EFFECTIVE TANK COOLING TO BE ARRIVED BY VENDOR ONLY.

CATALOGUE 2

FOGGING WATER NOZZLES FOR LEAK SUPPRESSION AT AMMONIA FARM AREA IN SCR SYSTEM AS PER THE SPECIFICATION AND DATA SHEET - TSR:017/ REV 00.

THE FOLLOWING ARE THE TECHNICAL DOCUMENTS.

1. SPECIFICATION AND DATASHEET – TSR:017/REV 00.
2. REFERENCE P&ID - AMMONIA AREA WATER SPRAY SYSTEM DRG. No. 0-SR-056-00052.
3. FOUNDATION & TP DETAILS OF AMMONIA STORAGE FARM YARD DRG. No. 0-SR-056-00061.
4. ANNEXURE-F.
5. VENDOR SHALL SUBMIT THE DIMENSIONAL DRAWINGS AND FILLED IN DATA SHEETS.
6. VENDOR TO SUPPLY FOGGING NOZZLES ALONG WITH THE PROVISION TO WELD THEM TO SPRAY WATER PIPE – NB 15
7. THE NOZZLE QUANTITY INDICATED IN SPECIFICATION & DATA SHEET ARE TENTATIVE AND THE SAME TO BE CONFIRMED/REVISED BY VENDOR.
8. VENDOR SHALL INFORM THE NUMBER OF SPRAY NOZZLES REQUIRED TO COOL THE TANK. EACH SPRAY NOZZLE SHALL BE PROVIDED WITH SOCKET SUITABLE TO BE WELDED TO NB15 PIPE.
9. THE VENDOR SHALL SUBMIT ALL THE SUPPORTING DOCUMENTS FOR OUR PQR REQUIREMENT.
10. VENDOR QUALITY PLAN SHALL BE SUBMITTED
11. VENDOR SHALL OFFER GUARANTEE FOR THE PRODUCTS SUPPLIED FOR A PERIOD OF 12 MONTHS FROM THE DATE OF COMMISSIONING OR 18 MONTHS FROM THE DATE OF SUPPLY, WHICHEVER IS EARLIER.

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPPALLI-620 014

Fuel Systems/PE(FB)

Title Sheet

Technical Purchase Specification for

WATER FOGGING NOZZLE FOR LEAK SUPPRESSION AT AMMONIA TANK FARM AREA

Specification No.: **TSR: 017** Revision No.: 00

Rev. No.	***Rev. Date***	***Clause***	***Description***	***Chd. & Appd.***

	Name	***Signature***	***Date***
Prepared	**M Noorul Fazil**	***Sd.,***	***30.04.2019***
Checked	***M CH Gangadhar***	***Sd.,***	***02.05.2019***
Approved	***GSaravanakumar***	***Sd.,***	***03.05.2019***

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PART I - TECHNICAL SPECIFICATION

1.0 INTENT

The function of the Fogging nozzle for ammonia fogging system is to suppress the leakage in the event of a large vapour release by spraying the fire protection water as fine droplets. The Water Fogging Nozzle for leak suppression at Ammonia Tank, Unloading system and forwarding system is connected to the fire protection water source with a pressure regulating valve set to 5 kg/cm^2 for optimum nozzle performance. Upon activation, service water is sprayed through nozzles located around the Ammonia tank farm area to create a fog and suppress the anhydrous ammonia. Refer attached Foundation & TP details of Ammonia storage farm yard drawing.

2.0 SCOPE

This specification defines the minimum requirements for the design, manufacture, testing, preparation for shipment and delivery of materials, engineering documentation, technical direction for construction/ installation, and start up service for this Equipment-Fogging Nozzle for Fogging System in Ammonia Tank farm area. Equipment furnished shall be the Seller's standard design and proven.

3.1 EQUIPMENT, MATERIALS AND SERVICES BY SELLER

The Seller's scope of supply includes, but is not necessarily limited to:

- Fogging nozzles (refer data sheet for qty) to be located in ammonia tank area farm for leak mitigation.
- Special tools if required.
- Manuals and instructions for storage, installation, commissioning, operating and maintenance.
- Freight from fabrication site(s) to the job site, including customs duties, if applicable.
- Installation and/or start-up service by a qualified engineer quoted on a per diem basis, with an estimate of required time.

4.1 EQUIPMENT, MATERIALS AND SERVICES BY OTHERS

The scope of supply by others shall be:

- Receiving, unloading and storage at the job site.
- Installation.
- Utility systems piping.
- Process piping external to the Seller's supplied equipment.
- Structural support steel.
- Electrical wiring, conduits, trays, push buttons and starters external to Seller supplied skid-mounted equipment.
- DCS interface and remote alarms.

5.1 PERFORMANCE GUARANTEES

The equipment provided by the Seller shall operate in accordance with the performance data in the Data sheet and Noise Requirements for a period as determined by the terms and conditions of purchase.

The equipment shall meet all applicable code requirements so that all required inspections are passed and permits obtained.

The Buyer and/or Owner may conduct Field tests during start up and after commercial operation of the installation for a period determined by the terms and conditions of purchase.

The Seller shall guarantee the following:

- Spray angle 90 degrees
- Maximum droplet diameter less than 50-300microns for 100% of the volume of all drops

6.0 DETAILED REQUIREMENTS OF EQUIPMENT

6.1 General

- The Fogging system is connected to the plant water source with a self-pressure regulating valve located at grade and set to ***5 kg/cm^2 (71 PSIG)*** for optimum fogging nozzle performance. The nozzles should be ***hollow cone, 90-degree spray angle, deflector type nozzles.*** They should be spaced one meter apart along the piping.
- The nozzle manufacturer shall furnish all components required for installing the nozzle to mentioned water pipe.
- The fluid nozzles installed in site shall be fabricated from stainless steel.
- ***The nozzle shall be with threaded connection so as to remove easily for maintenance, but shall be provided with matching socket using which the nozzle can be welded to NB 15 pipe at terminal point.***

6.2 Terminal Points

The Seller shall furnish all equipment and services necessary to connect the equipment to the Buyer's system. Connections will include, but are not limited to the following as required by this specification:

- Fire Protection Water pipe is NB 25 with **NB15 terminal point**.

6.3 Industry Reference Documents (Codes and Standards)

At a minimum, all work performed and materials provided by the Seller must be in accordance with all applicable Federal, State and local laws, ordinances, and regulations.

The equipment will comply with the applicable portions of the following Codes and Standards. The applicable revision of each of these Codes and Standards will be the current edition with addenda or the edition adopted by the controlling jurisdiction at the time of the purchase order. In the event of a conflict between these documents and the specification, the Seller shall submit a written request for an interpretation by Buyer. In general, the most stringent requirement shall govern.

- American National Standard Institute (ANSI)
- American Society of Testing and Materials (ASTM)
- American Society of Mechanical Engineers (ASME)
- American Society of Civil Engineers (ASCE)

- American Petroleum Institute (API)
- Air Moving & Control Association (AMCA)
- American Gear Manufacturers Association (AGMA)
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- Environmental Protection Agency (EPA)
- Institute of Electrical and Electronic Engineers (IEEE)
- Insulated Power Cable Engineers Association (IPCEA)
- International Organization for Standardization (ISO)
- Steel Structures Painting Council (SSPC)
- Standards of Hydraulics Institute (SHI)
- National Electrical Code (NEC)
- National Electrical Safety Codes (NESC)
- National Electrical Manufacturer's Association (NEMA)
- National Fire Protection Agency (NFPA)
- American Welding Society (AWS)
- American Institute of Steel Construction (AISC)
- Occupational Safety and Health Administration (OSHA)
- Joint Industrial Conference (JIC)
- Instrument Society of America (ISA)
- Underwriters' Laboratories (UL)
- International Building Codes (IBC)

6.4 Noise Requirements

The Seller shall provide silencers and/or acoustic insulation for equipment to operate with a maximum noise emission level of 85 dB at 1 (one) meter from source.

6.5 Operating Sequences / Duration

Intermittent Operation Outdoors

6.6 Instrumentation and Controls

N/A

6.7 Pipe, Valves, and Fittings

N/A

6.8 Surface Preparation and Painting

Note: Materials not subject to rusting shall be provided unpainted.

6.9 Spare Parts

Seller shall provide a list of recommended spare parts including start-up and commissioning spares and special tools, with separate pricing, and a schedule of part replacements based on the operation and service conditions specified.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA & QC)

7.1 Quality Control

The supplier must include in the supply a proven quality control and quality assurance system that will ensure the quality of the Water Fogging Nozzle for leak suppression at Ammonia Tank. The quality control system must follow ISO 9001 guidelines.

7.2 Quality assurance

The supplier shall be responsible for providing the necessary Quality Assurance and Quality Control procedures, maintaining continual surveillance and inspection activities during the entire periods of the Fabrication and Testing. Inspections report and tests to be provided to the BHEL during the fabrication period and before shipment of the Water Fogging Nozzle for leak suppression at Ammonia Tank farm area.

8.1 TECHNICAL DOCUMENTATION

The following technical manuals shall be provided. Total of two (2) hard copies and one (1) copy on magnetic media (USB memory stick or CD-ROM) shall be provided sixty (60) days after issue of purchase order.

(a) Operation manual.
(b) Safety instruction.
(c) Maintenance manual.
(d) Repair and overhaul manual.
(e) Complete and comprehensive Parts Catalogue (including pictures if applicable) manufacturer P/N and OEM P/N.

Note: The above listed documents can be combined & supplied as Operation & Maintenance (O&M) Manual.

(f) Supplier shall submit a quoted (including prices) recommended spare parts list. The list should be cover all spare parts consumption for 3 years' operation.

9.0 DOCUMENTS TO BE FURNISHED WITH THE PROPOSAL

9.1 Product literature and drawings in support of the offer shall be submitted with the quotation to evaluate the offer.
9.2 The supplier shall return a copy of this specification and note at the end of each paragraph if the offered equipment complies or not with this specification with supplier sign and seal.
9.3 Operation manual.
9.4 Safety instruction.
9.5 Parts Catalogue with detailed Bill of material (BOM) and weight particulars.
9.6 Recommended spare parts list.
9.7 G.A drawing of fogging nozzle with BOM

10.0 DOCUMENTS TO BE FURNISHED AFTER AWARD OF CONTRACT

10.1 Packaging procedure detailing the list of components shall be despatched individually with identification and with details of preservation and storage.

10.2 Water Fogging Nozzle at Fogging System in Ammonia Tank – Filled in Data sheets including drawings and design information shall be submitted to get approval from End user/owner of the boiler.

10.3 **Warranty certificate** shall be furnished by the vendor.

10.4 Operation & Maintenance (O & M) Manual

10.4.1 O & M manuals should be submitted to BHEL/Tiruchirappalli prior to despatch of the equipment.

11.0 INSPECTION

11.1 All test certificates shall be furnished for buyer's reference and records.

11.2 Water Fogging Nozzle at Fogging System in Ammonia Tank Equipment shall be inspected and tested as per approved quality plan. The certificates and documents generated during inspection of above shall be furnished to BHEL.

12.0 FINAL TESTS AND ACCEPTANCE

The Water Fogging Nozzle at Fogging System in Ammonia Tank shall be tested in the site together with BHEL's representative to demonstrate conformance to the specification and functioning. The following tests shall be performed:

12.1 Checking and repairing of voyage damages.

12.2 Visual test and Complete equipment check-up.

12.3 Functional test.

Acceptance certificate will be issued after successful completion of the acceptance tests and submission of all relevant documentation.

13.0 WARRANTY

13.1 Warranty Period

The warranty period shall be twelve (12) months from the date of commissioning or eighteen (18) months from the date of supply whichever is earlier. This warranty includes structural electrical, hydraulic and mechanical defects, fatigue failure etc.

14.0 ATTACHMENTS AND REFERENCE DOCUMENTS

Drg. No.	Description	No. of Pages	Revision Number
--	Data Sheets – Water Fogging Nozzle for leak suppression at Ammonia Tank	2	00
0-SR-056-00052	Reference P & IDs of SCR system-Ammonia Area Water Spray System	1	00
0-SR-059-00061	Foundation & TP details of Ammonia storage farm yard	1	00
--	Annexure-F	1	00

PART-II

Data Sheets – Water Fogging Nozzle for leak suppression at Ammonia Tank farm area

Qty : Vendor to calculate based on Nozzle covering area

DATA SHEET CUM VENDOR CHECKLIST FOR FOGGING NOZZLES AT AMMONIA TANK FARM AREA

BHEL Material Code: **L17271SR18002001**

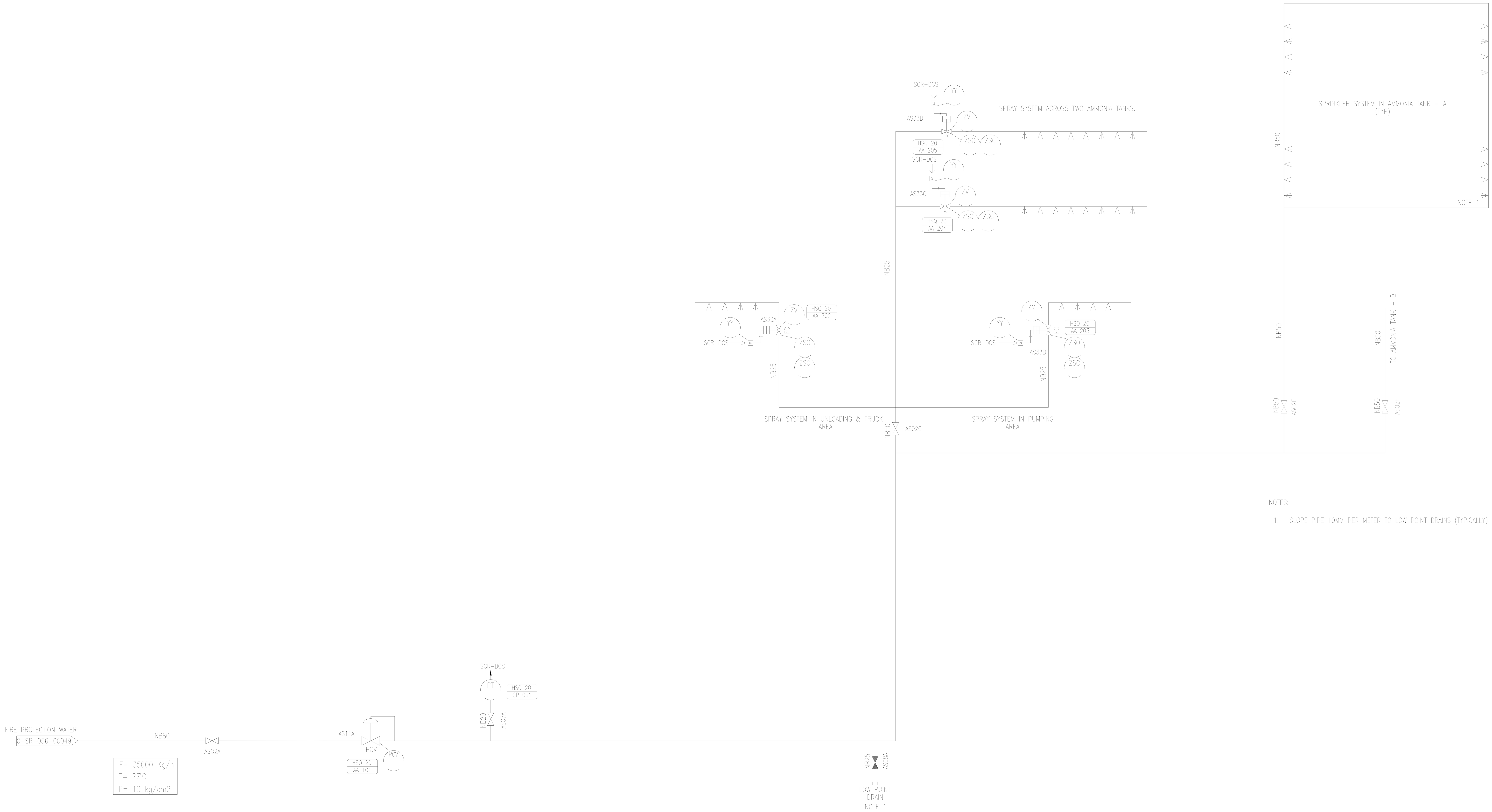
TSR:017/Rev.00

Enquiry No.

	DESCRIPTION	BHEL REQUIREMENT	VENDOR CONFIRMATION
1.0	Nozzle Quantity (Qty. Installed / Qty. Spare):	111* + 10 Nos spare	
1.1	Sockets for welding nozzle to pipe as specified in 4.10	111* + 10 Nos spare	
1.2	Dimensions of ammonia tank farm area	Refer Annexure - F	
2.0	**Flow Parameters**		
2.1	Fluid Type	Fire Protection Water	
2.4	Total water Flow available	45000 kg/hr.	
2.5	Temperature °C	27	
2.6	Pressure kg/cm2	Vendor to specify	
3.0	**Fluid through the Fogging Nozzles**	Fire protection Water	
3.1	Temperature (Operating / Max) °C	27/35	
3.2	Pressure at nozzle inlet (Operating / Max) kg/cm2	4 / 5	
3.3	Density @ Operating Temperature kg/m³	995.7	
3.4	Viscosity @ Operating Temperature Ns/m2	-	
3.5	Chloride Concentration PPM	-	
3.6	pH -	-	
4.0	**Fogging Nozzle Details**		
4.1	Nozzle Service	Water fogging at NH3 tank/Unloading skid /Forwarding skid	
4.2	Total Nozzles Required (Refer Annexure- F)	Vendor to specify	
4.3	Nozzle Type (Unidirectional; Split Up & Down)	Deflector Spray	
4.4	Spray Pattern (Hollow Cone, Full Cone, Flat)	Hollow Cone	
4.5	Process Capacity at Pressure kg/cm2	Vendor to specify	
4.6	Spray Angle at Pressure Degrees @ °C	Vendor to specify	
4.7	Drop Size Range Microns	50-200	
4.8	Materials of Construction	303 SS	
4.9	Pipe Line size [ODxT (mmxmm) / NB]	NB 15	
4.10	Nozzle Connection to Socket (Flange, NPT, Victaulic, Other)	Male NPT(vendor to specify size)	
4.11	Socket connection to NB15 pipe	Weldable	
4.12	Fogging Nozzle Make and Model	Vendor to specify	
4.13	Body material	SS	
4.14	Nozzle Type & Model	Vendor to specify	
4.15	Nozzle inlet connection size (mm)	Vendor to specify	
4.16	Capacity at Pressure (Supplier Guarantee) - LPM @ kg/cm2	Vendor to specify	
4.17	Spray Angle at Pressure (Supplier Guarantee)- Degrees @ kg/cm2	Vendor to specify	
4.18	Nozzle Weight with Socket - grams	Vendor to specify	
5.0	**Special Requirements**		
	NA		
		BHEL	**VENDOR**
	Prepared	N. Fazil	
	Checked & Approved	Shankar Naik	

* Based on experience and selected fogging nozzle model, vendor to finalize the number of fogging nozzles required to cover Tank Farm Area effectively. Refer Annexure- F.

0-SR-056-00052



NOTES:

1. SLOPE PIPE 10MM PER METER TO LOW POINT DRAINS (TYPICALLY)

	CUSTOMER NO.: 1727
PROJECT:	1x660 MW BHUSAWAL TPS UNIT-6
OWNER: MAHAGENCO	MAHARASHTRA STATE POWER GENERATION CO. LTD.
CONSULTANT:	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI, NAVI MUMBAI
EPC CONTRACTOR:	BHARAT HEAVY ELECTRICALS LTD BOILER PLANT UNIT; TIRUCHIRAPALLI-620014, INDIA.

DRG TITLE:

AMMONIA AREA WATER SPRAY SYSTEM

QSCRM

Babcock Power ENVIRONMENTAL a Babcock Power Inc. company

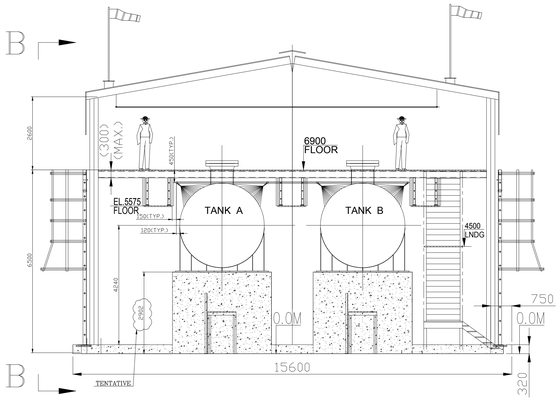
ALL DIMENSIONS IN MILLIMETERS

PROJECTION | SCALE NTS

DRAWN BY : VIKAS_SETHI	DATE : 30.05.2019
CHECKED BY : SHANKAR_NAIK	DATE : 30.05.2019
CHECKED BY : BPP	DATE : 30.05.2019
APPROVED BY :SARAVANA_KUMAR	DATE : 30.05.2019
VETTED BY : BPE	DATE :

DRAWING NO. 0-SR-056-00052 | REV. 00 | E

REV	DATE	ALTERED :
01		CHD & APPD :
ZONE		



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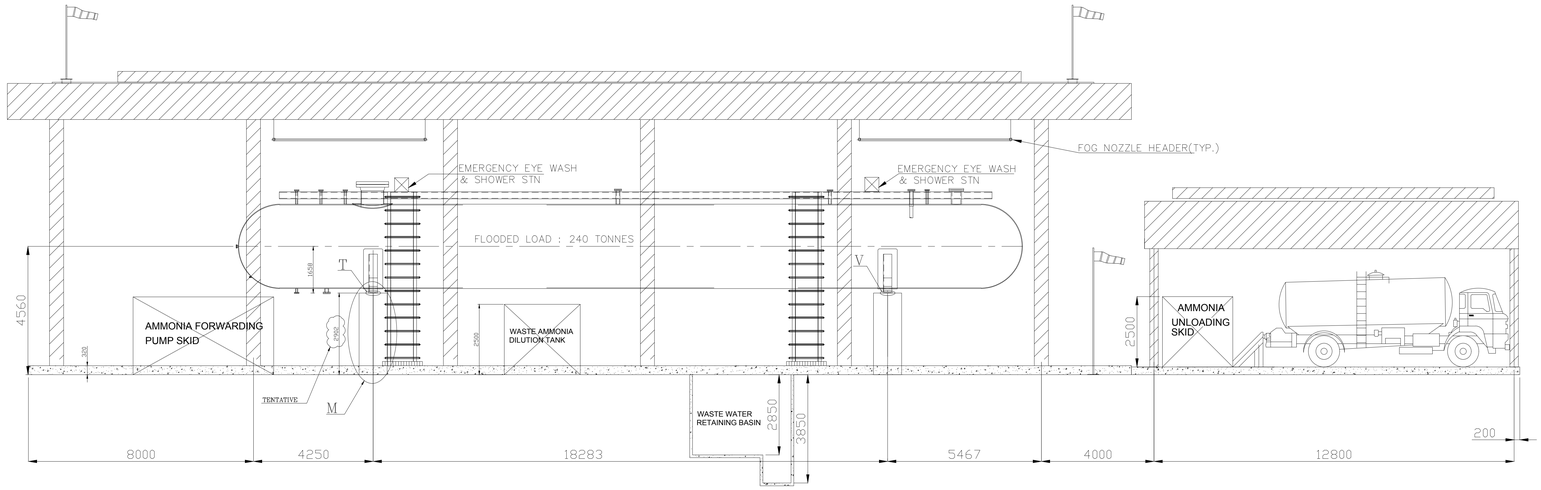
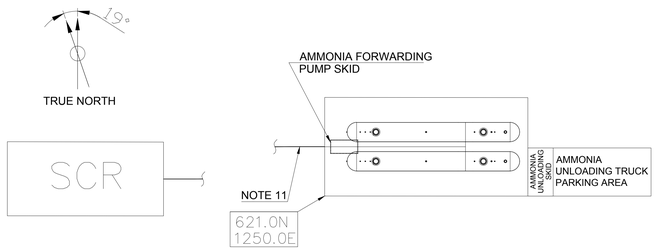
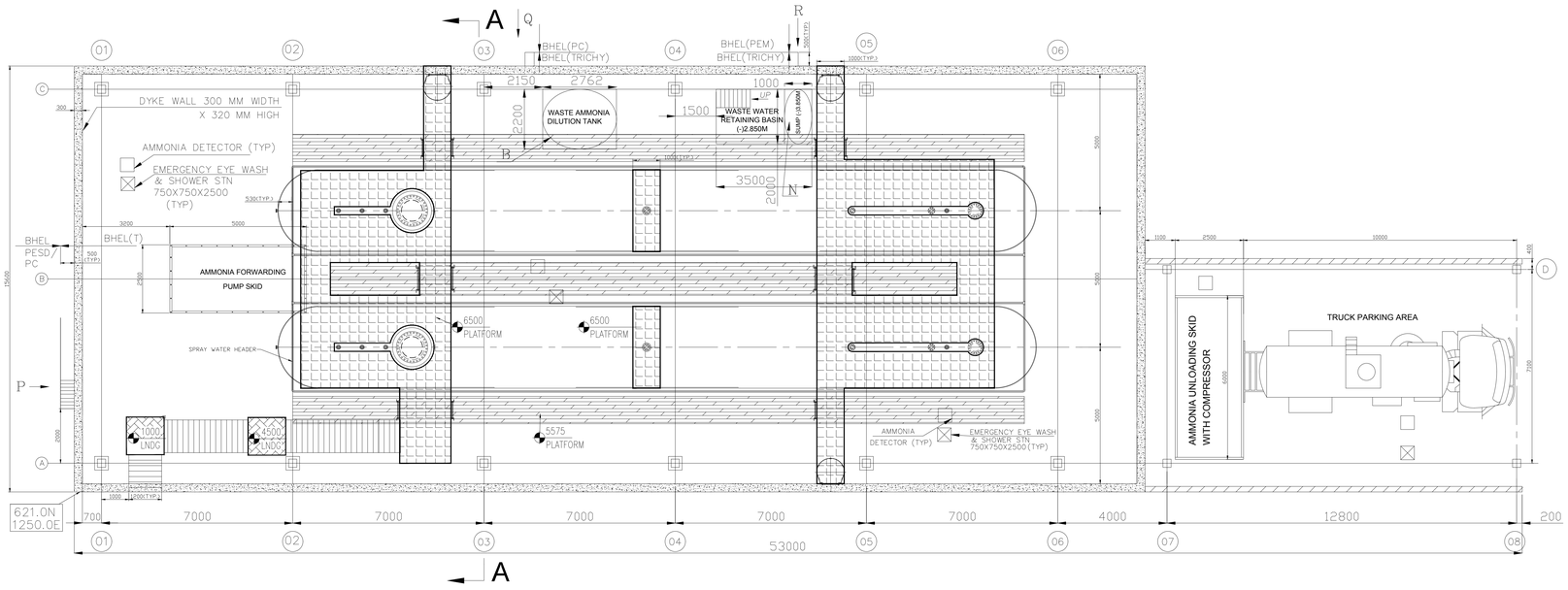
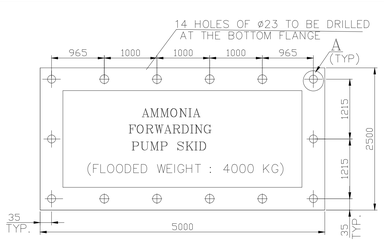


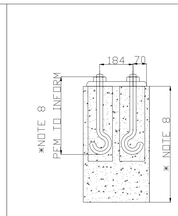
SECTION–BB

KEY PLAN









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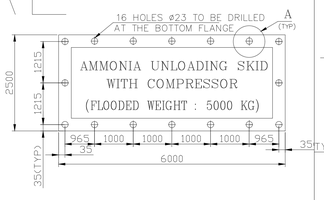
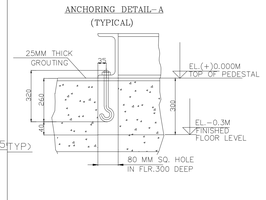
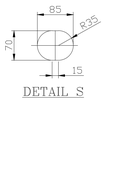
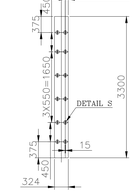


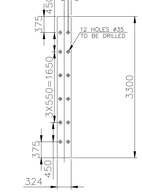




DETAIL S



DETAIL–T



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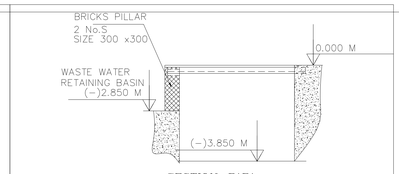

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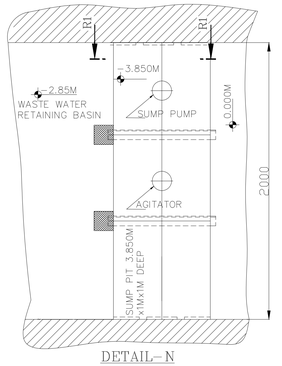
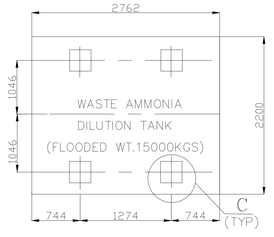
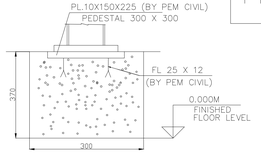


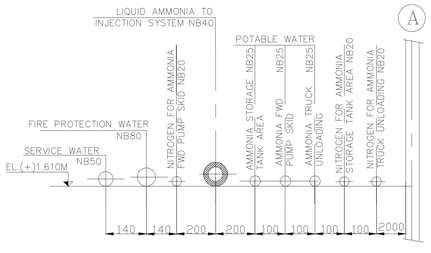
DETAIL–N



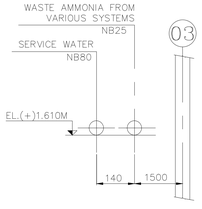
DETAIL–B



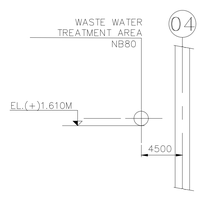
DETAIL–C
(TYPICAL)



VIEW P



VIEW Q



VIEW R

NOTE:–

1. ALL ELEVATIONS ARE WITH RESPECT TO EL. (+)0.00M, FINISHED GROUND FLOOR LEVEL OF TG BUILDING AND MILL BAY, WHICH CORRESPONDS TO RL 208.5M.
2. PLOT PLAN REF DRAWING PE–DG–415–100–M001 REV 2P
3. REFERENCE DRAWING: –0–SR–056–00049 :P&ID OF SCR SYSTEM–KEY DIAGRAM
4. COLUMNS 01,02,03,04,05,06,07,08 & ROWS A,B &C ARE TENTATIVE REPRESENTATION FOR EQUIPMENT LOCATION REFERENCE, FOR FINAL LOCATION OF COLUMNS PLEASE REFER CIVIL DRG. OF PEM/DELHI.
5. PEM/CIVIL TO TAKE CARE THE CIVIL FOUNDATION DESIGN & EXECUTION.
6. NECESSARY APPROVAL OF AMMONIA TANK FARM SHALL BE ARRANGED BY PEM/DELHI.
7. FOUNDATION DETAILS ARE TENTATIVE.
8. * PEM TO INDICATE THE DIMENSION.
10. EXACT LOCATION AND POSITION OF AMMONIA DETECTORS AND EMERGENCY EYE WASH STATION WILL SUITABLY DECIDED DURING ERECTION.
11. PIPE RACK ROUTING BETWEEN AMMONIA STORAGE TANK FARM YARD TO SCR IS PRELIMINARY, FINAL ROUTING WILL BE DECIDED BY BHEL/PC/CHENNAI DURING DETAIL ENGG.
12. AGITATOR AND SUMP PUMP FOUNDATION DETAILS ARE PRELIMINARY.
13. FINAL LOCATION OF WIND INDICATOR TO BE DECIDED DURING ERECTION.
14. FLOODED LOAD INDICATED IS PER TANK CONSIDERING DEAD LOAD ONLY. THE OTHER LOADS SUCH AS WIND, SEISMIC ETC MAY BE SUITABLY TAKEN CARE BY PEM/CIVIL.

PRELIMINARY

REV	DATE	ALTERED : BALAJI D
01	21.09.120	CHD & APPD SHANKAR NAIK
ZONE		PLATFORM DETAILS ADDED.

CUSTOMER NO. 1727

CUSTOMER: MAHAGENCO (MAHARASTRA) CO.LIMITED BHUSAWAL, INDIA

CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS ; MUMBAI

PROJECT: MSPGCL BHUSAWAL (1 X 660MW) unit # 6 BHUSAWAL,JALGAON, MAHARASHTRA

BHARAT HEAVY ELECTRICALS LTD
BOILER PLANT, TIRUCHIRAPALLI –620014

	NAME	SIGN	DATE
DRAWN	BALAJI/PREETAM	Sd...	03.06.2020
CHECKED	SHANKAR NAIK	Sd...	12.06.2020
APPROVED	SARAVANA KUMAR	Sd...	20.07.2020

DEPT CODE: FS 129

ALL DIMENSIONS IN MILLIMETRE

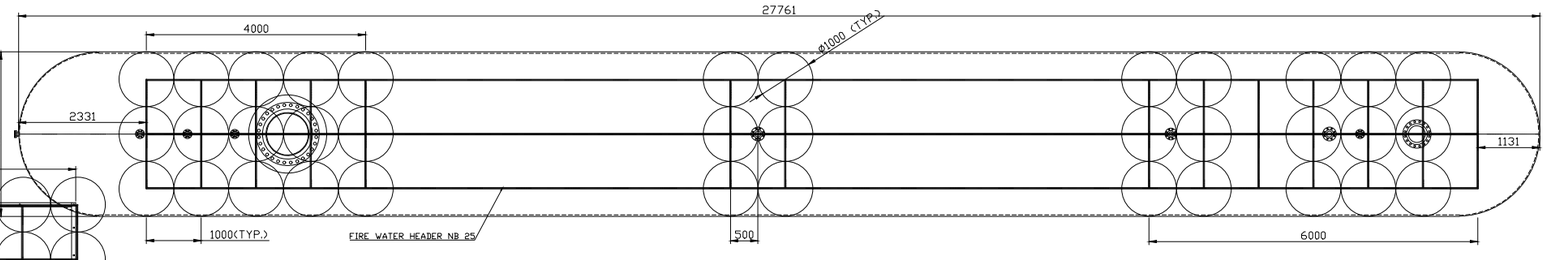
TITLE: FOUNDATION AND TP DETAILS OF AMMONIA STORAGE FARM YARD

PROJECTION | SCALE: – | DRG No. 0–SR–056–00061 | REV. 01

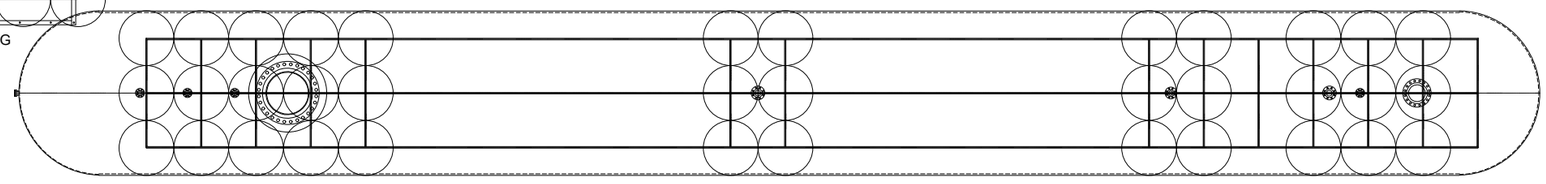
ANNEXURE–F ; FOGGING WATER NOZZLE ARRANGEMENT

TOTAL FOGGING WATER NOZZLE QUANTITY ARRIVED TENTATIVELY AS 111 NOs FOR TANK FARM AREA AS SHOWN BELOW.
FOGGING NOZZLE COVERAGE RADIUS ASSUMED AS 500mm.

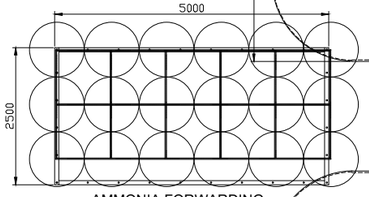
FOGGING NOZZLE AT TANK A QUANTITY – 36



FOGGING NOZZLE AT TANK B QUANTITY – 36

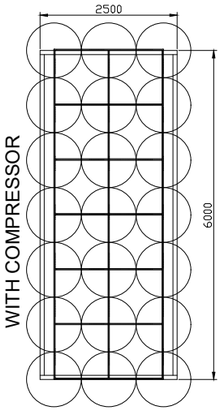


FOGGING NOZZLE AT PUMP AREA QUANTITY – 18



AMMONIA FORWARDING PUMP SKID

FOGGING NOZZLE AT UNLOADING AREA QUANTITY – 21



AMMONIA UNLOADING SKID WITH COMPRESSOR

NOTE: THIS DRAWING IS FOR VENDOR REFERENCE TO ARRIVE AT FOGGING WATER NOZZLE QTY AS PER NOZZLE COVERAGE TO BE SELECTED BY VENDOR FOR EFFECTIVE FOGGING. FINAL FOGGING NOZZLE QTY TO BE ARRIVED BY VENDOR ONLY.

Technical Pre-Qualification Requirement (PQR) for

Fogging Nozzle

1. The vendor shall be an established **fogging nozzle** supplier and having adequate Engineering, Manufacturing, testing and servicing facilities and shall furnish technical backup documents in proof for above requirements.
2. The vendor shall have experience of having supplied **fogging nozzle** as per the technical specification for SCR/Process plants or application of similar severity. Supply reference list with details of PO, PO date, customer name for Capacity.
3. The **fogging nozzle** offered shall be from the existing regular supply range of the vendor. Vendor shall provide the product catalogue.
4. Proven track record is required. Minimum One end user certificate for the satisfactory operational performance of their product's supplied.
   (or)
   successfully executed two POs for same item, meeting the subject technical specification requirement mentioned in the enquiry.
5. In case of ordering, the Vendor shall have the responsibility for the following and same to be confirmed point wise.
   i) Vendor should have the replacement responsibility in case of defect / failure.
   ii) Experts from Vendor's side shall associate in commissioning activities at site, if required.
   iii) Vendor should ensure the product performance during erection & commissioning and ensure performance guarantee.

6. Backup document checklist to meet PQR:

S. No	Document description	Check list
1	Documents to meet clause(1)	☐
2	Supply reference document (General reference list) to meet clause (2)	☐
3	Product Catalogues to meet clause (3)	☐
4	Min. one end user certificate (or) Two POs to meet clause (4)	☐
5	Confirmation to clause meet clause (5)	☐