

Project : Kothagudem 1 x 800 M W Division : PESD (M DL)

Sl. No	Title
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5	P&ID For MVWS System
6	P&I Diagram For Fire Water Pump House
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8	Equipment Layout of Hydrant & Spray Booster Pump House
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DEVELOPMENT CONSULTANTS PVT. LIMITED.

Reviewed only for general conformance with contract drawings and specifications. Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents

ACTION **2** DATE **22.01.2016**

DISTRIBUTED BY. **SM**

1	Distributed	4	Approved except as noted. Resubmission required
2	Approved	5	Disapproved see accompanying letter
3	Approved except as noted. Forward final drawings	6	For information only

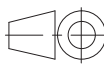
SEE COVERING LETTER

LETTER REF NO. **1115** DATE. **22.01.2016**

1 X 800 MW KOTHAGUDEM THERMAL POWER PLANT, STAGE VII, UNIT #12

05	12.01.16	REVISED AS PER DCPL/CUSTOMER COMMENTS
04	16.12.15	REVISED AS PER DCPL/CUSTOMER COMMENTS
03	19.11.15	REVISED AS PER DCPL/CUSTOMER COMMENTS
02	13.10.15	REVISED AS PER DCPL/CUSTOMER COMMENTS
01	18.09.15	REVISED AS PER DCPL/CUSTOMER COMMENTS
00	15.07.15	INITIAL SUBMISSION
REV	DATE	DESCRIPTION

CUSTOMER	 TELANGANA STATE POWER GENERATION CORPORATION LTD. (TSGENCO)
CONSULTANT	 DEVELOPMENT CONSULTANTS PVT. LTD.

ADDITIONAL INFORMATION	1 x 800 MW KOTHAGUDEM THERMAL POWER PLANT									
STATUS OF DRAWING										
DISTRIBUTION OF PRINTS										
MANUFACTURER :	 BHARAT HEAVY ELECTRICALS LTD. PE & SD HYDERABAD	DRN.	RTJ	SIGN.	—sd—	DATE	15.07.15	NO.OF VAR.		
		CHD.	K GUNJAN	SIGN.	—sd—	DATE	15.07.15			
		APPD.	MNSR	SIGN.	—sd—	DATE	15.07.15			
DEPT.	PESD	UNTOL. DIM. GR.	e/M/F		SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS	
CODE	450									
NAME	SIGN.	DATE	TITLE: DESIGN BASIS FOR FIRE PROTECTION & DETECTION SYSTEM				DOCUMENT NO		REV.	
DRN.										
CHD.										
APPD.							SHT No.	01	NO OF SHT. 27	

1. SCOPE

The scope of this design basis report covers the type of fire protection and detection systems to be provided for all buildings, equipment, fuel tanks, transformers, etc., as per contract, that are in the scope of BHEL with in power plant boundary of proposed **1 x 800 MW Sri Kothagudem Thermal Power Station (KTPS), Stage-VII, Unit-12** for Telangana State Power Generation Corporation Limited (TSGENCO) at Kothagudem, Telangana.

Fire Protection & Detection System of switchyard is excluded from the scope of this document as the same is covered by BHEL-TBEM separately.

The following is the matrix showing the type of fire protection & detection system provided for the facilities / equipment covered in this contract:

Table – 01

Sl. No.	Building / Equipment	Hydrant System	HVWS	MVWS	Foam System	Inert Gas System	FDA System	Portable
	Main Plant Area							
1.	Switchyard	(covered by BHEL-TBEM, excluded from PE&SD scope)						
2.	Transformer Yard	Yes	Yes	No	No	No	Yes	Yes
3.	Turbine Building							
4.	Cable galleries in TG building	No	No	Yes	No	No	Yes	Yes
5.	Switchgear rooms	No	No	No	No	No	Yes	Yes
6.	Central Control rooms along with control equipment room	No	No	No	No	Yes	Yes	Yes
7.	Boiler	Yes	Yes	No	No	No	Yes	Yes
8.	Auxiliary Boiler	Yes	Yes	No	No	No	No	No
9.	ESP	Yes	No	No	No	No	No	No
10.	ESP Control Room	Yes	No	No	No	No	Yes	Yes
11.	ESP Cable cellar	No	No	Yes	No	No	Yes	Yes
12.	Compressor house	Yes	No	No	No	No	Yes	Yes
13.	DG set building	Yes	No	Only Diesel Tank	No	No	Yes	Yes
14.	FGD Plant	Not Applicable						
15.	Clarifiers	Not Applicable						
	Water System							
16.	Raw Water Pump House	No	No	No	No	No	No	Yes
17.	PT Plant	Yes	No	No	No	No	Yes	Yes
18.	DM Plant	Yes	No	No	No	No	Yes	Yes



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19.	Cable gallery in DM building	No	No	Yes	No	No	Yes	No
20.	NDCT	Yes	No	No	No	No	No	No
21.	Cooling Water Pump House	Yes	No	No	No	No	Yes	Yes
22.	CW Chlorination plant for CW System	Yes	No	No	No	No	Yes	Yes
23.	CW Treatment Plant for CW system	Yes	No	No	No	No	Yes	Yes
24.	Clarified water Pump House	Yes	No	No	No	No	Yes	Yes
25.	Effluent Treatment plant bldg.	Yes	No	No	No	No	Yes	Yes
26.	Chemical Lab	Yes	No	No	No	No	Yes	Yes
27.	Sewage Treatment Plant bldg./shed	Yes	No	No	No	No	Yes	Yes
28.	DM Transfer Pump	Yes	No	No	No	No	No	No
29.	condensate make up & Boiler fill pumps	Yes	No	No	No	No	No	No
30.	Make up water Pump House	Yes	No	No	No	No	Yes	Yes
31.	Fire water Pump House	Yes	No	No	No	No	Yes	Yes
32.	CMB Waste Treatment System	Yes	No	No	No	No	Yes	Yes
	FUEL OIL SYSTEM							
33.	Fuel Oil Unloading area	Yes	No	No	No	No	No	No
34.	Fuel Oil unloading & Pressurization Pump House	Yes	No	Yes	No	No	Yes	Yes
35.	Fuel Oil Storage Tank Area	Yes	No	Yes	Yes	No	Yes	No
36.	Fuel Oil Forwarding Pump House	Yes	No	Yes	No	No	Yes	Yes
37.	Centrifuge Building	Yes	No	No	No	No	No	No
	COAL HANDLING PLANT							
38.	Wagon Tippler	Yes	No	No	No	No	No	Yes
39.	Crusher House	Yes	No	No	No	No	Yes	Yes
40.	Crushed coal stockpile	Yes	No	No	No	No	Yes	No
41.	CHP Control room	Yes	No	No	No	No	Yes	Yes
42.	Stacker Reclaimer	Not Applicable (As this is moving equipment and coal stockpile is provided with fire protection)						
43.	Transfer Point (TPs)	Yes	No	No	No	No	Yes	No
44.	Pent House (PH)	Not Applicable						
45.	Coal Belt conveyor	Yes	No	No	No	No	Yes	No
46.	Dust Suppression Pump House	Yes	No	No	No	No	Yes	Yes
47.	Cable gallery in CHP Bldg.	No	No	yes	No	NO	Yes	No
48.	Coal Pile run off pond	Not Applicable						
49.	Bull Dozer shed	Not Applicable						
	Ash Handling Plant							
50.	Fly Ash Silos	Not applicable						
51.	Ash Slurry Pump House	Yes	No	No	No	No	Yes	Yes



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52.	Ash Water Tank	Not applicable						
53.	Ash Water Pump House	Yes	No	No	No	No	Yes	Yes
54.	AHP Clarifier	Not Applicable						
55.	AHP Vacuum cum compressor house	Yes	No	No	No	No	Yes	Yes
56.	Silo Utility Building	Yes	No	No	No	No	Yes	Yes
57.	Cable gallery in AHP Bldg.	No	No	Yes	No	No	Yes	No
58.	Clarifier Ash Handling System	Not applicable						
	NON PLANT BUILDING							
59.	Admin Building	Yes	No	No	No	No	Yes	Yes
60.	Canteen	Yes	No	No	No	No	Yes	Yes
61.	Main Gate	Yes	No	No	No	No	Yes	Yes
62.	Service Building	Yes	No	No	No	No	Yes	Yes
63.	Storage sheds	Yes	No	No	No	No	Yes	Yes
64.	Training & Simulator Room	Yes	No	No	No	No	Yes	Yes
	FIRE FIGHTING SYSTEM							
65.	Foam Pump House	Yes	No	No	No	No	Yes	Yes
66.	Booster Pump House	Yes	No	No	No	No	Yes	Yes
67.	Fire Station	Yes	No	No	No	No	Yes	Yes
68.	All Equipment located outdoors (not covered in this table)	Yes	No	No	No	No	Yes	No
69.	Fire tenders	Covered by BHEL-PEM. The details shall be available in PEM doc. No: PE-DC-410-550-A001						

2. CODES & STANDARDS

The design and installation of complete fire protection system will comply with the regulations of:-

a) Tariff Advisory Committee (TAC)

- FP Manual
- Rules for Water Spray Systems
- Rules for Fire Alarm System

b) National Fire Protection Association (NFPA)

- NFPA-11 (Standard for Low-, Medium-, and High-Expansion Foam)
- NFPA-2001 (Standard on Clean Agent Fire Extinguishing Systems)

c) Indian Standards (IS)

- IS 5120 (Technical requirements for rotodynamic special purpose pumps)
- IS 1239 (Steel Tubes, Tubulars and Other Wrought Steel Fittings - Specification - Part 1 : Steel Tubes)



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- IS 3589 Gr 410 (Steel Pipes for Water and Sewage (168.3 to 2 540 mm Outside Diameter)
- IS 4736 (Specification for Hot-dip Zinc Coatings on Mild Steel Tubes)
- IS 15337 (Coal Tar Based Anticorrosion Tape for Protection of Underground Mild Steel Pipelines)
- IS 14846 (Sluice Valve for Water Works Purposes, 50 to 1200 mm Size)
- IS 210 (Grey Iron Castings)
- IS 5290 Type A (Specification for landing valves)
- IS 8442 (Stand Post Type Water and Foam Monitor for Fire Fighting)
- IS 636 (Non-percolating flexible firefighting delivery hose)
- IS 884 (Specification for first-aid hose reel for firefighting)
- IS 2871 (Specification for branch pipe, universal for firefighting purposes)
- IS 2189 (Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System - Code of Practice)
- IS 15683 (Portable Fire Extinguishers - Performance and Construction)
- IS 3034 (Fire Safety Of Industrial Buildings: Electrical Generating And Distributing Stations)
- IS 325 (Three-phase induction motors)

d) American Society for Testing and Materials (ASTM)

- A 105 (Standard Specification for Carbon Steel Forgings for Piping Applications)
- A 234 (Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service)
- A 182 (Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service)

e) British Standards (BS)

- BS 2633 (Specification for Class I arc welding of ferritic steel pipework for carrying fluids)
- BS EN 13789 (Industrial valves. Cast iron globe valves)
- BS 1868 (Specification for steel check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries)
- BS 1873 (Specification for steel globe and globe stop and check valves (flanged and butt-welding ends) for the petroleum, petrochemical and allied industries)

f) American Petroleum Institute (API)

- API 602 (Steel Gate, Globe And Check Valves For Sizes Dn 100 And Smaller For The Petroleum And Natural Gas Industries)

3. SYSTEM DESCRIPTION & DESIGN CRITERIA

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	3.1 Fire Water Pump House a) The main source of water to the fire pumps and jockey pumps shall be from IS: 2002 Gr. 2A steel made fire water storage tanks. b) There shall be Two (2) steel tanks of 2500M3 effective capacity each (<i>Clause 3.16.00 of e-PCT-TS-K-02-2014-15e-PCT-TS-K-02-2014-15-Vol IIIE-Sec-2.doc</i>) dedicated for fire protection system in line with TAC requirements. 3.2 Fire Water Pumps and other equipment: a) Fire water pumps consist of two sets of pumps, namely, fire hydrant pumps and spray water pumps. Please refer table-02 for configuration of pumps and other equipment in line with Clause No. 5.01.00 of Bid Document # <i>e-PCT-TS-K-02-2014-15e-PCT-TS-K-02-2014-15-Vol IIIE-Sec-2.doc</i> b) The fire pumps shall be designed for continuous operation at its best efficiency up to 150% of rated flow to meet the specific requirements of the system. c) The pump head shall be so designed that when the aggregate pumping capacity is being discharged at the farthest or hydraulically remotest hydrant point a minimum running pressure of 3.5 Kg/sq.cm is available at that point. d) Test line for each pump with gate valve shall be provided. Test line discharge shall be routed fire water tank. This is to check and maintain the operability of the pumps. e) The hydrant discharge header and spray water discharge header have been interconnected through an motorized isolation valve and a non-return valve. In this arrangement, water from hydrant discharge header can be used for spray water system but not vice versa. f) Pressure switches shall be provided at discharge header of Hydrant & Spray line within the Fire water pump house for control and monitoring of fire & jockey pumps. g) The water pressure in hydrant header and spray water header shall be maintained at 10.2 Kg/cm² (g) always. To maintain this parameter, a hydro pneumatic tank with air compressor system has been envisaged. h) Two jockey pumps have been provided to supply water to hydro-pneumatic tank, in case of fall in water level in the tank.	



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- i) Gate valves shall be provided on suction and discharge side of pumps.
- j) There shall be a common header for High Velocity Spray service and Medium Velocity Spray service.

Table – 02

List of pumps & other major equipments



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EQUIPMENT NAME	NOS	DETAILS
Main Hydrant Pump (electric motor driven)	2(W)	Type: Horizontal Centrifugal Pump set
		Capacity: 410 M ³ /Hr
		Head: 105 MWC
		Drive -Electric Motor
Diesel engine driven Hydrant Pump	1 (1S)	Type: Horizontal Centrifugal Pump Set
		Capacity: 410 M ³ /Hr
		D Head: 105 MWC
		Drive - Diesel Engine
Main Spray water Pump (electric motor driven)	2(W)	Type: Horizontal Centrifugal Pump Set
		Capacity: 410 M ³ /Hr
		Head: 105 MWC
		Drive -Electric Motor
Diesel engine driven Spray water Pump	1(S)	Type: Horizontal Centrifugal Pump Set
		Capacity: 410 M ³ /Hr
		Head: 105 MWC
		Drive - Diesel Engine
Jockey Pumps	2 (1W+1S)	Type: Horizontal Centrifugal
		Capacity: 40 M ³ /Hr
		Head: 110 MWC
		Drive -Electric Motor
Hydro Pneumatic Tank	1	Capacity: 18 M ³
Air Compressors	2 (1W+1S)	Capacity: 25 M3/Hr
		Discharge Pressure: 11.5 Kg/cm ²
Hydrant Booster Pump (If Applicable)	2 (1W+1S)	Type: Horizontal Centrifugal
		Capacity: 171 M ³ /Hr
		Head: As per Hydraulic Calculation
		Drive - Electric Motor & Diesel Engine
Spray Booster Pump (If Applicable)	2 (1W+1S)	Type: Horizontal Centrifugal
		Capacity: 410 M ³ /Hr
		Head: As per Hydraulic Calculation
		Drive - Electric Motor & Diesel Engine
Control Panel	1 No.	PLC based panel located in Fire Water Pump House
Control Panel	1 No.	Remote I/O panel located in booster pump house



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3.3 Fire Water Pressurization System

- a) The pressurization of both hydrant system and water spray system shall be maintained through the combination of hydro-pneumatic tank, Jockey pumps and air compressors.
- b) In case of small system leakages, there will be a pressure drop in the Delivery Header.
- c) The air pressure in the HPT will feed the water to the system and thus the water level in tank start decreasing from High water level. This decrease in water level will allow the compressed air to expand and will reduce the air pressure in the tank in turn. The pressure switch in the tank shall sense this pressure reduction and send the start signal to the air compressor. The compressor will stop when the pressure in the tank will reach a preset value.
- d) To protect the tank against excessive pressure, a solenoid operated valve is provided which will receive 'Open Signal' at a preset value. A PRV is also provided to protect the HPT against excessive pressure as a safety measure.
- e) The decrease in water level in the tank shall be sensed by a level switch at a preset point. And send the start signal to Jockey Pump. The air compressor and jockey pumps are interlocked in such a way that both are not running simultaneously.
- f) The operation of jockey pump will deliver the water to the tank as well as system. Once the level reaches preset High Level in the tank, the Level switch will stop the jockey pump automatically.

3.4 Control System

- a) Common PLC based control system (Hot Redundant) will be provided which will include the interlocks and/or monitoring functions for the fire pumps, jockey pumps, Air Compressor & Hydro-pneumatic Tank in line with clause no. 4.04.01 of Bid Documents # *e-PCT-TS-K-02-2014-15e-PCT-TS-K-02-2014-15-Vol IIIE-Sec-2.doc* . Booster Pumps and foam pump shall be operated from respective local control panel. The Operator station of the PLC will be interfaced with the Operator station in the central control room for monitoring of the fire protection system from the central control room.
- b) This PLC system will be located in the fire water pump house. The PLC is a dual redundant with hot standby processor, power supply and communication bus. Operator interface will be through one operator workstation and operator cum engineering work station with 21" TFT monitor and hardwire annunciation. Remote I/O will be provided for the booster pumps in SG area and foam pumps in foam

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	pump house. These remote I/O's will be provided in respective local panels with LCD / keypad for Operator interface. c) This PLC will be connected to main fire alarm panel (located in CCR) through dedicated fault tolerant Local Area Network (LAN) through redundant Fiber optic communication cable. d) Local start/stop push button station will be provided near the pumps for local operation. e) The PLC and remote I/O's will be powered by 230 V (by BHEL – PEM). However, a mini UPS with 30 min back up time shall be provided for PLC. f) Tripping of fire pump(s) at low level is not allowed. Stopping of all the above pumps will be manual. g) Jockey pumps and air compressors will not be running when main pumps are in operation. 3.5 Hydrant Network a) Design Guidelines ➤ As per cl. No. 7.2.2 of TAC (Tariff Advisory Committee), Thermal power plants are classified under ordinary hazard. ➤ As per TAC cl. No. 7.6.11, spacing between hydrant points in the hydrant network shall be 45 meters. These hydrant points shall not be located less than 2 meters or more than 15 meters from buildings & structures. ➤ As per TAC Cl. 7.6.14, an internal hydrant system shall be provided so that no portion of the floor is more than 45 m from an external hydrant or 30 m from an internal hydrant. ➤ The velocity of flow of water is generally not exceeding 5 m/sec in delivery header and anywhere in the system (as per Cl. 7.5.10 of FP Manual-TAC). b) System Description ➤ The Hydrant System of Fire Protection essentially consists of a large network of pipe, both underground and over ground around areas to be protected which feeds water to a number of hydrants valves (External /Internal) and to a number of outdoor type fixed water monitors.	



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- External hydrant posts will be located all around the periphery of buildings. All the required accessories (hose pipes, branch pipes, nozzles) shall be provided in a hose house. Internal Hydrant (Landing valves) will be provided at the landing floor of staircases through wet risers along with isolation valves. A hose reel and hose box with required accessories (hose pipes, branch pipes, nozzles) shall be provided with each landing valve.
- Outdoor type fixed water monitors will be provided for ESP area, boiler & mills area, bunker area, coal storage yard and areas of transfer towers & coal conveyors at locations where water cannot reach from hydrant valve.
- Hydrant piping in the main plant area (i.e. paved area) will be laid underground in RCC trench with pre-cast slabs covers and protected by means of wrapping and coating with 4mm thick (2 Layer of 2mm thickness) corrosion protection tape. Outside the main plant area, the fire water pipes shall be running aboveground on the pedestals. Where ever road crossing, pipe shall be laid in RCC Hume pipe of NP-3 class. In case of fire water pipe crossing rails, it shall be laid in RCC Hume pipe of NP-4 class.
- All operating floors of boiler staircases, turbine buildings and other multi storied structures, coal handling plant transfer point etc., shall be provided with hydrant landing valves. For ESP areas / Tall buildings (having height greater than 20 m) /coal stock piles, fixed water monitors will be provided apart from ground hydrant and landing valves.
- Water in the pipe network is kept pressurized by hydro-pneumatic tank and jockey pump arrangement as explained in Cl.3.3 above.
- Hosepipes of suitable lengths, as mentioned below, fitted with branch pipes & nozzles are kept in "Hose Houses" (for outdoor hydrants) and in "Hose Boxes" (for indoor hydrants):

	Hosepipe of 15M Length	Hosepipe of 7.5M Length
Outdoor Hydrants	2 Nos.	--
Indoor Hydrants	2 Nos.	--

- Six (6) nos. of "Hose Houses" for outdoor hydrant system shall be strategically located in outdoor plant area.
- At the most three hydrant ring mains shall be provided, one ring for the main plant area (from transformer yard to chimney) & other rings for remaining plant area. If system requirement calls for additional ring main the same shall also be provided.
- Each loop shall be interconnected for better reliability of the system. Suitable number of isolation valves (Gate Valve) shall be provided to isolate the loop for maintenance.



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- Air release valves shall be provided at the highest point in each wet riser.
- Separate header shall be provided for Hydrant system and spray system from the outlet of the pump house.
- For fuel oil storage tank/dykes and fuel oil unloading area, single headed hydrants and foam cum water monitors shall be provided.

c) Operation of Hydrant System

- The hydrant system will be a pressurized system provided with automatic starting of pumps. The mode of operation of hydrant system will be as follows:
- In the event of fire when hydrant valves are opened, the pressure in the header will drop due to the resulting flow and at a preset low pressure in the header, the motor driven pump will start automatically by getting a signal from pressure switch mounted on the header.
- In case, the motor driven pump fails to start, the pressure in the mains will drop further and sequentially start the 2nd motor driven pump. There will be a provision to start the pump manually in case of emergency.
- Stopping of all the above pumps will be manual.
- Interlock shall be provided between main hydrant pumps, Jockey pumps and air compressors such that, jockey pumps and air compressor will shut down when main hydrant pumps are in operation.
- A flow switch is provided in the hydrant line near boiler area. In case of fire, when there is water flow in this line, the flow switch gives a signal to start the main booster pump. The stand-by diesel engine driven booster pump will come into operation automatically with low pressure on main booster pump discharge.

3.6 Water Spray System

Fire Water Spray System includes fixed water spray arrangement, strategically installed in specified areas of plant (mentioned elsewhere) for protection against fire damage.

This application requires forceful directional water discharged achieved by specially designed nozzles according to the risk and environment. The discharged is broken into droplets of water traveling at high velocity which provides the necessary mechanical agitation and cooling at the surface of the burning liquid.



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a) Automatic High Velocity Water Spray System (HVWS)

Design Guidelines

- The density of spray will be 10.2 lpm/m² of the surface area for the HVWS system as per cl. No. 3.2.3.6.1 of TAC manual for Spray System.
- The minimum running water pressure at any spray nozzles will not be less than 3.5 kg/cm² (g) and not greater than 5.0 kg/cm² (g). The velocity in feed pipes shall not be more than 10m/s as per cl. No. 3.2.3.6.2.7 of TAC manual for Spray System.

System Description

- Automatic High Velocity Water Spray (HVWS) System is provided for the following equipment as per the table below:

S. No.	Area/Equipment	Remarks
1.	Auxiliary Boiler	Protected With HVWS system
2.	Turbine Lube Oil tank and purifier	Protected With HVWS system
3.	Boiler Burner front	Protected With HVWS system
4.	Turbine oil canal pipeline	Protected With HVWS system
5.	Generator seal oil system	Protected With HVWS system
6.	Lube oil console for turbine driven BFP	Protected With HVWS system
7.	Lube oil conditioning unit	Protected With HVWS system
8.	Clean/Dirty oil Tanks	Protected With HVWS system
9.	Generator transformers	Protected With HVWS system- Qty- 3 Numbers Rating- Single phase 330/264/198 MVA (Reference : Key SLD, PE-DG-410-565-E001,R01)
10.	Unit transformers	Protected With HVWS system- Qty- 2 Numbers Rating - 52/5 MVA (Reference : Key SLD, PE-DG-410-565-E001,R01)
11.	Unit Auxiliary transformers	Protected With HVWS system- Qty- 2 Numbers Rating- 16 MVA



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		(Reference : Key SLD, PE-DG-410-565-E001,R01)
	12. Station Auxiliary transformers	<u>Not to be protected</u> with HVWS system (As capacity of each transformer is 6.3 MVA rating) (Reference : Key SLD, PE-DG-410-565-E001,R01) However, HVWS system shall be furnished if oil capacity of each of the transformer is greater than 2000 lts.
	13. Station transformer	Protected With HVWS system- Qty- 1 Number Rating- 125/62.5/62.5 MVA (Reference : Key SLD, PE-DG-410-565-E001,R01)
	14. Spare generator Transformer	<u>Not to be protected</u> with HVWS system, as this transformer is not part of KEY SLD, and hence same shall be deleted from HVWS protection.
	15. CHP Auxiliary Transformer	Protected With HVWS system- Qty- 2 Number Rating- 10 MVA (Reference : Key SLD, PE-DG-410-565-E001,R01)
	16. AHP Auxiliary Transformer	<u>Not to be protected</u> with HVWS system (As capacity of each transformer is 3.5 MVA rating) (Reference : Key SLD, PE-DG-410-565-E001,R01) However, HVWS system shall be furnished for transformer, if oil capacity of each of the transformer is greater than 2000 lts.

- The spray system has been provided in accordance with Cl. No. 8.8.1 of IS 3034 (Fire Safety of Industrial Buildings - Electrical Generating and Distributing Stations) - which specifies that no fixed fire protection equipment (such as high velocity water spray) is required for transformers below 10 MVA or in the case of oil filled transformers with oil capacity of 2000 liters and below.
- For all other transformers of higher rating for which the above clause is not applicable shall be provided with high velocity water spray system.



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- The detection in HVWS system is through heat sensing detectors of fusible type (Quartzoid Bulb). In the event of fire, the surrounding temperature increases. As the surrounding temperature reaches the rated temperature of QB detector, the detector bulb bursts and allows water in detection line to flow out. This creates a pressure drop in the detection line. The pressure drop in detection line will open the deluge valve and water starts projecting out from the spray nozzles.

- The water supply to HVWS system will be controlled by wet pilot type deluge valve which will be operated hydraulically and is normally closed by water pressure. Water for deluge valves shall be supplied from spray header. Gate valves shall be provided for each deluge valve on upstream and downstream. Fast acting butterfly valve is provided in the bypass line of deluge valve. Y- Strainer shall be provided at upstream of each deluge valve.

- A provision is also made to operate the HVWS system manually through local push button station and remotely from fire alarm panel. The system will automatically detect, control and extinguish any outbreak of fire and simultaneously give audible alarm.

Operation of HVWS System

The mode of operation of HVWS system will be as follows:

- As explained above, when the deluge valve opens there is a pressure drop in the spray header. This pressure drop is sensed by a pressure switch (provided in the spray header) and gives a signal to start the main spray water pumps.
- In case the motor driven pumps fails to start, the pressure in the spray header will drop further and sequentially start the diesel engine driven pump. There will be a provision to start the pump manually in case of emergency.
- Stopping of all the above pumps will be manual.

b) Medium Velocity Water Spray System (MVWS)

Design Guidelines

- In case of MVW spray system minimum and maximum pressure shall be 1.4 kg/cm² and 3.5 kg/cm² respectively as per Cl. 4.5.2.5 of TAC spray Manual. However for cable vaults/ cable spreader rooms and cable galleries, a minimum running pressure of 2.8 kg/cm² (g) shall be achieved at the hydraulically remotest nozzle/sprayer as per Cl. 4.8.3 of TAC spray Manual.
- The density of spray and pressure required at the hydraulically remotest point for various equipment covered in MVWS system are indicated in the following table:



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S. No.	Equipment to be protected	Density of Spray	Min. Press. Required	Type of Detection
1.	Cable Gallery in TG Bldg & ESP Building	12.2 lpm/m ²	2.8 bar	LHS Cable & Multi Sensor Detector.
2.	Coal Conveyors, Bunker Bay	10.2 lpm/m ²	1.4 bar	LHS Cable, IR Detector & QBD
3.	HFO and LDO tanks	10.2 lpm/m ²	1.4 bar	Rate of Rise Detectors
4.	Main DG Set Diesel Tank	10.2 lpm/m ²	2.8 bar	QBD
5.	Fuel Oil Unloading and Pressurizing Pump House	10.2 lpm/m ²	1.4 bar	QBD
6.	Fuel oil Forwarding Pump house	10.2 lpm/m ²	1.4 bar	QBD

- The velocity in feed pipes shall not be more than 10 m/s as per clause no 4.8.5.3 and 4.9.5.3 of TAC manual for spray system.

System Description

- Medium velocity Water Spray (MVWS) System is provided as per table given below:

S. No.	Area/Equipment
1.	Cable cellar room in TG building
2.	Cable cellar room in ESP building
3.	Cable gallery in CHP building
4.	Cable gallery in DM building
5.	Cable gallery in AHP building
6.	Cable gallery in CW Pump House Control building
7.	Transfer Points in CHP
8.	Coal conveyor in CHP
9.	Coal conveyor in Bunker area
10.	HFO and LDO tanks
11.	Main DG set Diesel tanks
12.	Fuel Oil Unloading and Pressurizing Pump House
13.	Fuel oil Forwarding Pump house

- The detection in MVWS system is through optical Linear Heat Sensing (LHS) cable. In the event of fire, the surrounding temperature increases. As the surrounding temperature reaches the set point temperature, the LHS cable gives a signal to main fire alarm panel. With the receipt of fire signal from LHS cable, the main fire alarm panel opens the



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solenoid valve placed in the detection line of deluge valve. As the solenoid valve opens, the water in detection line to flow out. This creates a pressure drop in the detection line. The pressure drop in detection line will open the deluge valve and water starts projecting out from the spray nozzles.

- In order to avoid total flooding of the area, the area will be divided into number of zones. Each zone will have separate water supply network controlled by a deluge valve. Gate valves shall be provided in the upstream and downstream of each deluge valve. Fast acting butterfly valve is provided in the bypass line of each deluge valve.
- The MVWS system for fuel oil pump house will be provided similar to that of the system provided for cable galleries except that there will not be any zoning in this area. The fire in the fuel oil pump house will be detected by a detection system (water filled quartzoid bulb detectors), which will actuate the deluge valve.

Operation of MVWS System

- On detection of fire the deluge valve is opened and water will be released from the spray nozzles. This will cause a pressure drop in the spray header from which water supply is taken for MVWS system. This pressure drop in the system will start the pumps as explained in HVWS system.

3.7 Fire Detection & Alarm System

a) Scope of fire detection & alarm system

Fire alarm detection and protection system shall consist of the following major devices:-

- One (01) Main fire alarm panel located in Central Control Room (CCR).
- One (01) Local fire alarm panel located in DM plant.
- One (01) Local fire alarm panel located in AHP room.
- One (01) Local fire alarm panel located in CHP control room.
- One (01) Local fire alarm panel located in CW pump house.
- One (01) Repeater Panel located in fire station.
- One (01) lot of Detectors.
- One (01) lot of Optical Linear Heat Sensing (LHS) cable.
- One (01) lot of manual call points.
- One (01) lot of notification appliances (hooter & beacons).
- One (01) lot of interface modules.
- One (01) lot of cables.

Miscellaneous Items:-



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- Back Lit maintained "emergency exit light" shall be provided in control room, control equipment rooms, switchgear and MCC rooms, battery charger rooms, escape stair case in power house and transfer points in coal conveyor area and other buildings in the plant. These will be switched on upon detection of fire.
- One (1) no. of siren – This siren will be operated by main fire alarm panel in case fire in any part of the plant.
- One (1) no. of operator Work Station with printer. – Connected to main fire alarm panel through RS 485/232.
- Isolator modules shall be provided as per IS 2189.
- All consumables like lubricants, markers, printer papers etc. as per requirement.

All equipment such as fire detectors, panels, notification appliances shall be approved or listed by UL/FM/LPCB/VDs/TAC.

b) General Description Of The System

- This system is provided for all the buildings and closed spaces within the scope of BHEL. Please refer to Table-01 for details.
- The Fire Detection and Alarm System will comprise of a network of Addressable Detectors (fire/smoke), Microprocessor based Fire Alarm Control Panels, Repeater Panels, , Manual Call Points, Linear Heat Sensing cable (LHS), Modules, Notification Appliances, Cables and other accessories required to form a network (i.e. Terminal Boxes and Junction Boxes).
- Automatic Fire Detection and Alarm System detect fire / over-heating by means of the attendant phenomena of fire, such as smoke or heat. It initiates alarm in fire alarm control panel and actuates pre-programmed control actions. Based fire affected area – spray system (HVWS or MVWS) or inert gas fire extinguishing system or foam system will be actuated. Detection of fire at an early stage permits rapid intervention by fire fighting forces. Thus the automatic fire detection and alarm system reduces damage to property and risk to human lives.
- The fire detectors will be wired on a common connecting line called loop. Each loop consists of about 100 to 250 detectors / devices based on OEM standard. The number of loops and location of detectors to be installed in the various areas will be finalized during detailed engineering stage based on standards mentioned above.
- Proposed detectors/devices for Fire detection and alarm system for different plant areas are given below:

Sl. No.	Area	Type of Detection	Type of Protection
1.	All transformers of rating greater	Quartzoid Bulb	HVWS System



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	than or equal to 10 MVA and/or oil capacity more than 2000 liters. a) Generator Transformers b) Spare Generator Transformer c) Unit Transformers d) Unit Auxiliary Transformers e) Station Transformer f) Station Auxiliary Transformers	Detectors	
2.	Common control room and Control Equipment room in TG building	Air Sampling Detectors	Argonite System
3.	HFO & LDO Tanks	Rate Of Rise Detectors	Foam System and MVWS System
4.	Cable Spreading Areas / Cable Galleries a) Cable gallery in TG building b) Cable gallery in ESP building c) Cable gallery in AHP building d) Cable gallery in CHP building. e) Cable gallery in DM building. f) CW control building.	Optical Linear Heat Sensing Cable and Multi Sensor Detectors	MVWS System
5.	Coal Conveyors, Transfer Points and Bunker Bay Conveyors	Infrared spark/ember Detector and Optical Linear Heat Sensing Cable	MVWS System
6.	Turbine Oil Tanks & Purifiers, Boiler Firing Floors, Lube Oil Piping in Turbine Areas, Generator Seal Oil System, Lube Oil System for Turbine Driven BFP's, Auxiliary Boiler, Lube Oil Conditioning Unit, Clean/Dirty Oil Tank	Quartzoid Bulb Detectors	HVWS System
7.	All buildings listed in plot plan (including false flooring & false ceiling)	Multi Sensor Detectors	Portable Fire Extinguishers
8.	Outdoor Areas	Manual Call Points	-

- In case of fire, the detector or device envisaged in respective area will pick up appropriate signal and conveys it to fire alarm panel located in CCR. These signals triggers two types of actions, (1) visual and audio alarms in CCR and affected area,



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and (2) actuates firefighting process and gives signals to MCC to stop/close/shutdown the equipment in affected area. It initiates tripping of AHU for a/c system, air washer fans in ventilation system, package air-conditioners, fire dampers, conveyor motors, etc. related to the affected area. The system initiates operation of extinguishing systems such as deluge system, sprinklers and transmits alarm and fault signals to predetermined points. The system must ensure that more number of detectors / devices can be connected in a loop and there will be a facility for additional loop modules for future expansion.

- All detectors & devices shall be connected to the Main Fire Alarm Panel (MFAP) located in common control room. All the signals received by main fire alarm panel shall be repeated in the repeater panel located in the fire station.
 - The fire detectors are inherently addressable, which provide continuous surveillance in an area. The Microprocessor based Fire Alarm Control Panel located in Control Room will process the input signals from detectors at various locations of the plant and actuate the respective protection system.
 - The system will have following self-diagnostic features:
 - Detector cabling will be completely supervised for open circuit and short circuit.
 - Unauthorized removal of a detector head from its base will be supervised to give a fault alarm on the connected control panel.
 - Annunciation will be provided for battery low voltage, battery earth fault, fuse blown and loss of main AC supply.
 - Alarm verification features.
 - Facility to transmit annunciation to Repeater Panel.
 - All Fire detection alarm panels, Repeater panels and PC based operator stations shall be connected by a dedicated fault tolerant Local Area Network (LAN) through redundant Fiber optic communication cable.
- c) Layout and Coverage of detectors/devices in buildings/ plant areas shall be as mentioned below:-
- Spacing of detectors shall be as per cl. No. 6 of IS 2189.
 - Optical LHS cable shall be laid in cable galleries as per cl. No. 6.5.2 of TAC (Rules for Fire Alarm System).
 - In coal conveyors, Optical LHS cable shall be laid as per cl. No. 6.5.3 of TAC (Rules for Fire Alarm System).



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- Logging of alarm, time and action text on printers.
 - Programmed activation of various interlocks with fire protection system and other associated system such as ventilation and air conditioning, etc.
 - The Fire Alarm Control Panel will have adequate number of loops so as to cover all the areas to be protected. Provision shall also be made in Fire Alarm Control Panel to add additional detector loop modules for further expansion.
 - Fire Alarm Control Panel shall have provision for repeating annunciation of fire, water spray on, deluge valve signals for each area to be protected by interfacing with pressure switch/test switch or auxiliary contacts from fire protection panels.
- The main fire alarm panel shall be interfaced with the following panels such that all signals shall be available in main fire alarm panel:
- PLC panel for fire water pumps located in fire water cum clarified water pump house through dedicated fault tolerant Local Area Network (LAN) through redundant Fiber optic communication cable.
 - Remote IO panel for foam system located in foam pump house through dedicated fault tolerant Local Area Network (LAN) through redundant Fiber optic communication cable.
 - Inert gas panel located in control rooms by potential free contacts.
- e) Repeater Fire Alarm Panels
- All Repeater Panels will be Microprocessor based which will repeat all the annunciations (audio & visual) from Main Fire Alarm Control Panel.
- f) Power supply system for fire alarm detection system equipment:
- The system shall be provided with main power supply and a standby power supply as per TAC norms. The standby power supply shall takeover automatically incase failure of main power supply.
- The fire detection and alarm system normally operates on 230 V AC power supply (provided by BHEL – PEM). 1 x 100% SMF Lead Acid battery bank has been provided as standby power source which will cut-in automatically in the event of AC power failure.
- Float cum-boost charger of adequate capacity has been provided to trickle charge the battery from AC supply during normal operation. The standby power source has been provided with a battery bank to power fire detection and alarm system for 48 hours of continuous load.



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R.C PURAM BHEL, HYDERABAD –32.
PROJECT ENGINEERING & SYSTEMS DIVISION

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- Generally Cable required for complete Fire Alarm System for interconnecting Fire Alarm Control Panels, Detectors, Manual Call Point, other field devices, Microcomputer, Repeater Panel, VDU, Printer, etc. shall be 1.1 kV – Low Voltage Copper Conductor Cables.
- Control/power cables used for looping the detectors shall be armored, overall screened FRLS type.
- All detectors, junction boxes, manual call points and cable marshalling boxes shall be earthed with 8 SWG GI wire in case the operating voltage of the system is greater than 24 V.

3.8 Foam Protection System

- a) Automatic foam protection system will be provided for HFO and LDO oil storage tanks located in fuel oil dyke area. The system will be designed as per NFPA – 11/TAC. The system will consist of one foam concentrate tank (MS) with foam concentrate, foam ejectors with discharge outlets, associated piping, valves, fittings, instrumentation etc. It will be discharged to the foam inductors through 2 x 100% capacity foam pumps (1 Motor driven and 1 diesel engine driven) through balancing line, with control valves, flow controllers etc. The foam will be Aqueous Film Forming Foam (AFFF) type.
- b) All the foam protection system equipment are located in foam pump house.
- c) Foam pumps shall be controlled from a relay based local control panel. This panel is located in foam pump house. This panel is hard-wired with main fire alarm panel through potential free contacts.
- d) Foam pumps are powered by 415 V AC, 50 Hz and relay based panel is powered by 230 V. The relay based panel shall have a redundant UPS power supply.

Operation of Foam System

- a) In case of a fire inside the tank, the detection system shall detect the fire and will cause following sequence of events through relay based foam system panel:
 - Start the Foam pump
 - Open the Deluge valve of respective tank



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- Open the foam supply valve (Solenoid valve) to the respective foam proportioner.

b) Further, following annunciations will appear in relay based foam system panel:

- Fire annunciation of respective tank
- Pump running annunciation
- “DV Open” annunciation for the respective deluge valve through the pressure switch at downstream of DV.

c) Water from deluge valve flows through the proportioner where foam concentrate is injected and mixed with the flowing water in definite proportion. The foam water mixture flows to the foam chamber mounted at top of the protected tank where foam is generated and discharged in to the tank.

d) The foam will cover the entire burning oil surface thereby cutting off oxygen, cooling the oil surface and finally extinguishing the fire. The system can be operated locally by manual operation through DV local control panel in foam pump house.

Design Guidelines

- a) Complete foam system will be designed with an application rate of 5 lpm/m² of oil surface area applicable for fixed roof tank as per cl. no. 7.4.1.4.3 of TAC manual.
- b) Foam concentrate will be 100% AFFF type.
- c) The minimum effective capacity of foam concentrate tank shall be for a duration of 60 minutes of discharge time.

3.9 Inert Gas Extinguishing System

a) Following areas of TG building shall be protected with inert gas system:

- Control equipment room
- Common control room
- Computer room

b) The inert gas system shall employ any of the proven inert gas specified as in NFPA-2001.

c) The gas release panel of the cylinder bank shall be connected to the main fire alarm panel located in control room.

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	d) The System consists of gas release panel, cylinders, nozzles, directional valves, check valves, manifolds etc. e) The gas release panel shall be power by 230 V. Standby power supply shall be catered by 24 V DC Ni-Cd batteries. f) Common cylinder bank with directional valve systems are provided for each protected area. Main cylinders will be calculated based on the single largest risk in each protected area and these cylinders will be located in the cylinder storage room near the protected area. Operation a) Fire detectors used in these areas (areas where inert gas is provided) are cross zoned. Upon receipt of signal from any detector in the protected enclosure & pre-discharge signal shall be sent to the main fire alarm panel. Upon receipt of signal from second detector from the protected enclosure & discharge signal shall be sent to the gas release panel of respective control room/ system, which activates the solenoid valve in the master control head of the inert system cylinder. Manual mechanical actuation of the inert cylinder is also possible using the Manual mechanical actuator in the master control head. b) Every zone does have one master cylinder (which can operate slave cylinders) which has release unit consist of solenoid actuator, manual actuator and contact gauge, mounted on the cylinder valve. When the solenoid valve opens, propellant from the gauge port on the cylinder valve trips the internal actuating device opening the cylinder valve. The cylinder valve will remain open until internal cylinder pressure reaches approx. 1 bar. A high-pressure pilot hose(s) inter-connect the cylinder valves. The interconnected cylinder valves opens simultaneously as the internal actuators are pressurized at the same time. Thus releases inert gas to the protected room area through a restrictor, Selector Valve, the distribution pipe work and the discharge nozzles. c) In Automatic operation, the detectors will send the fire signal to the main fire alarm panel. Then the signal is sent to the Pre-discharge Audio/Video Signal Unit to allow personnel evacuation prior to discharge. This alarm is for Personnel evacuation prior to system discharge takes place normally after a specified time delay (0-3 minutes adjustable, set time to be decided by client based on time required for personnel evacuation, supplier recommends for set time of 60 sec). Simultaneously the solenoid valve on the manifold gets energized through a signal from panel. This in turn will open the directional valve and the gas is released from the cylinder to the area under fire. 3.10 Portable Fire extinguishers	



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- a) Portable fire extinguishers are provided for the areas as per Table-01. In general, portable fire extinguishers are provided for all indoor and outdoor areas.
- b) Following type of fire extinguishers shall be provided.
- Portable Carbon Dioxide type.
 - Portable Dry Chemical Powder type.
 - Portable Foam type.
 - Mobile Carbon dioxide type
 - Mobile Dry Chemical Powder type.
- c) Distribution of these extinguishers in various locations shall be as per the guidelines of TAC. (Separate document shall be submitted for Portable & Mobile Fire extinguishers titled as "Schedule of Portable Fire Extinguishers, Doc. No: PEMC-06393")

4. MATERIAL OF CONSTRUCTION (MOC) OF MAJOR EQUIPMENTS

The major items of FPS system and their MOC is listed in the table below:-

SL. NO.	ITEM	MOC
1.	Fire water Pumps (Electric Motor Driven, Diesel Engine Driven, Jockey Pumps and Booster Pumps (if any))	• Casing : 2.5% Ni Cl as per IS:210 Gr. FG 260 • Casing liner : 2.5% Ni Cl as per IS:210 Gr. FG 260 • Impeller : ASTM A743 Gr. CF8M • Wearing rings : SS-304 • Pump shaft : AISI 410 (Hardened) • Gland : 2.5% Ni Cl as per IS:210 Gr. FG 260 • Base plate : Carbon Steel as per IS-2062 • Wetted Fasteners : SS-316 • Mechanical Seal : As per Manufacturer's Standard • Companion Flange : Carbon Steel as per IS-2062
2.	Fire Water Pipes (150 NB and below)	M. S. ERW pipes as per IS-1239, Part – 1 heavy grade
3.	Fire Water Pipes (200 NB and above)	M. S. ERW pipes as per IS-3589 Gr.410



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4.	Fire Water Pipes (Over ground pipes normally empty but periodically charge with water & foam system applications)	Galvanized as per IS 4736
5.	Gate Valve (65 NB and above)	C.I. as per IS 14846
6.	Butterfly Valve	C.I. as per IS 13095
7.	Valves below 50 NB	As per IS 778
8.	HVWS Nozzle	S.S 304
9.	MVWS Nozzle	S.S 304
10.	Hydrant Valve	S.S 304
11.	Basket/Y Strainer	Body is MS fabricated as per IS 2062 and internal is S.S (AISI 316), 30 mesh
12.	Branch Pipe	S.S 304
13.	Air Release Valve	Gun Metal as per IS 318
14.	Deluge Valve	Cast Iron conforming to IS:210 Gr.FG-260
15.	Flanges	ASTM A 105
16.	Fittings	Upto 1 ½ "ASTM A 105 and above 1 ½ "ASTM A 234 Gr. WPB. <u>Note:</u> All fittings and flanges for galvanized pipes shall be galvanized as per IS 4736.
17.	Hose Pipe	Reinforced Rubber Lined Fire Hose as per IS 636, Type – A
18.	Bolts, Screws and Nuts	As per IS 1363 (Part I and II)

5. METHODOLOGY OF EXECUTION OF FIRE PROTECTION SYSTEM BY BHEL:

Fire protection system for **1 x 800 MW Sri Kothagudem Thermal Power Station (KTPS), Stage-VII, Unit-12** shall be designed in-house by BHEL-PESD and Erection & Commissioning of same shall be carried out by BHEL-PSWR. Please refer Annexure-01 attached with this document for detailed methodology of execution of FPS.

6. LIST OF ANNEXURE:

Annexure- No.	Description	
01	Methodology of Execution of FPS Package by BHEL	

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RECORD OF REVISIONS

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ON 'DRG'

EACH OF THE DIESEL ENGINE SHALL BE PROVIDED WITH THE FOLLOWING INSTRUMENTS:

- A) TEMPERATURE INDICATOR (CONTACT TYPE) IN COOLING WATER INLET AND OUTLET.
 B) TEMPERATURE INDICATOR IN LUBRICATING OIL OUTLET FROM THE OIL COOLER.
 C) PRESSURE GAUGES (CONTACT TYPE) FOR LUBRICATING OIL SYSTEM.
 D) DIFFERENTIAL PRESSURE GAUGES (CONTACT TYPE) ACROSS STRAINERS/ FILTERS.
 E) SPEED INDICATOR.
 F) RUNNING HOUR METER.
 G) DIP STICK TYPE LUBRICATING OIL SUMP LEVEL INDICATOR.
 H) GAUGE GLASS TYPE FUEL OIL TANK LEVEL INDICATOR.
 I) VOLTMETER & AMMETER IN DYNAMO TYPE BATTERY CHARGING CIRCUIT.
 J) LEVEL TRANSMITTER IN DIESEL STORAGE TANK

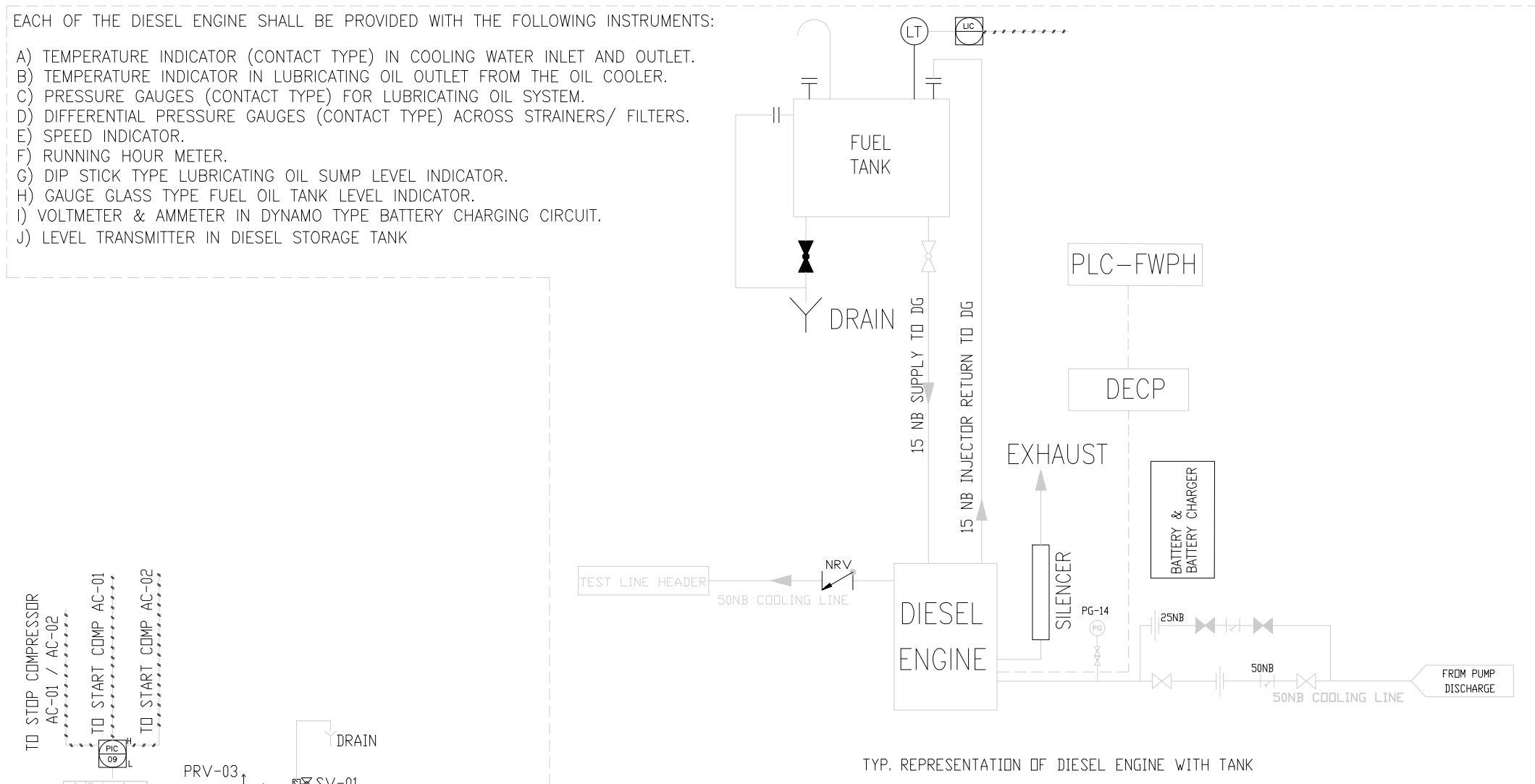


TABLE-1

PRESSURE SETTINGS OF INSTRUMENTS

Sr. No.	PUMP TAG No.	START SIGNAL		PUMP RUNNING		PUMP FAILS TO START	
		Pr. SWITCH TAG No.	SETTING Kg/cm ² (g)	Pr. SWITCH TAG No.	SETTING Kg/cm ² (g)	Pr. SWITCH TAG No.	SETTING Kg/cm ² (g)
1	H-M-01	PT-1	9.0	PT-2	3.0	PT-1	9.0
2	H-M-02	PT-1	8.0	PT-3	3.0	PT-1	8.0
3	H-D-01	PT-1	7.0	PT-4	3.0	PT-1	7.0
4	WS-M-01	PT-05	9.0	PT-06	3.0	PT-05	9.0
5	WS-M-02	PT-05	8.0	PT-07	3.0	PT-05	8.0
6	WS-D-01	PT-05	7.0	PT-08	3.0	PT-05	7.0
7	JP-M-01	-	-	PS-01	3.0	PS-01	9.0
8	JP-M-02	-	-	PS-02	3.0	PS-02	9.0

The Fail to Start Annunciation for Fire Pumps is derived from Pressure TRANSMITTER placed on common PUMP delivery header with a Suitable Time Delay and for Jockey Pumps is derived from Pressure TRANSMITTER on upstream of NRV with a Suitable Time Delay.

TABLE-2

SCHEDULE OF INSTRUMENTS

SL. NO.	TYPE OF INSTRUMENTS	DESCRIPTION	QTY
1	PRESSURE SWITCH (PS)	PS-01 TO PS-02	02
2	PRESSURE INDICATOR (PI)	PI-01 TO PI-13	13
3	LEVEL TRANSMITTER (LT)	LT-01 TO LT-04	04
4	DIFFERENTIAL PRESSURE (DPS)	DPS-01	01
5	PRESSURE RELIEF VALVE (PRV)	PRV-01 TO PRV-03	03
6	SOLENOID VALVE (SV)	SV-01	01
7	PRESSURE TRANSMITTER (PT)	PT-01 TO PT-09	09



Reviewed only for general conformance with contract drawings and specifications. Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents

ACTION 2 DATE 21.12.2015

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1	Distributed	4	Approved except as noted. Resubmission required
2	Approved	5	Disapproved see accompanying letter
3	Approved except as noted. Forward final drawings	6	For information only

SEE COVERING LETTER

LETTER REF NO. 0958 DATE. 21.12.2015

NOTE:

- THE SYSTEM NETWORK SHALL BE MAINTAINED TO 10.2 KG/SQ.CM
- ALL PUMPS SHALL HAVE MAUNAL STARTING IN ADDITION TO AUTO START
- MAIN PUMPS SHALL BE STOPPED BY MANUAL OPERATION ONLY
- EXHAUST OF ENGINES SHALL BE ROUTED AT SAFE ELEVATIONS OUTSIDE THE PUMP HOUSE
- CONTROL AND MONITORING OF ALL EQUIPMENTS OF FWPH SHALL BE FROM THE PLC LOCATED IN THE FIRE PUMP HOUSE

ALL DIESEL PUMP CONTROL PANELS SHALL BE INTERFACED WITH PLC. ALL INTERLOCKS, START-UPS SHALL ALSO BE ENVISAGED FROM PLUGS OF FIRE PROTECTION SYSTEM.

TABLE-3

PRESSURE SWITCH/LEVEL SWITCH SETTING SCHEDULE FOR AIR COMPRESSORS & HP TANK

Sr. No.	EQUIP TAG No.	Pr. Transmitter TAG No.	Level Transmitter TAG No.	Setting Kg/cm ² (g)	SETTING Kg/cm ² (g)	SIGNAL
1	AC-01	PT-09	-	10.8	-	AC-01/AC-02 STOP
2	AC-02	-	-	10.2	-	AC-01 START
3	JP-M-01/JP-M-02	-	LT-01 A/B	9.7	-	AT 2/3 HIT OF HP TANK (VL-H) JP-M-01 / JP-M-02 STOP
4	JP-M-01	-	LT-01-A/B	-	500MM LESS THEN THE LVL OF "H"(VL-L)	START
5	JP-M-02	-	LT-01-A/B	-	-	START
5	HPT-01	PT-09	-	-	11	HP TANK AIR PRESSURE HIGH/ SOLENOID VALVE OPEN
6	HPT-01	PT-09	-	-	8.5	HP TANK AIR PRESSURE LOW
7	-	PT-01	-	-	4.0	HYDRANT DISCHARGE HEADER LOW PRESSURE
7	-	PT-05	-	-	5.5	SPRAY DISCHARGE HEADER LOW PRESSURE

TABLE-4

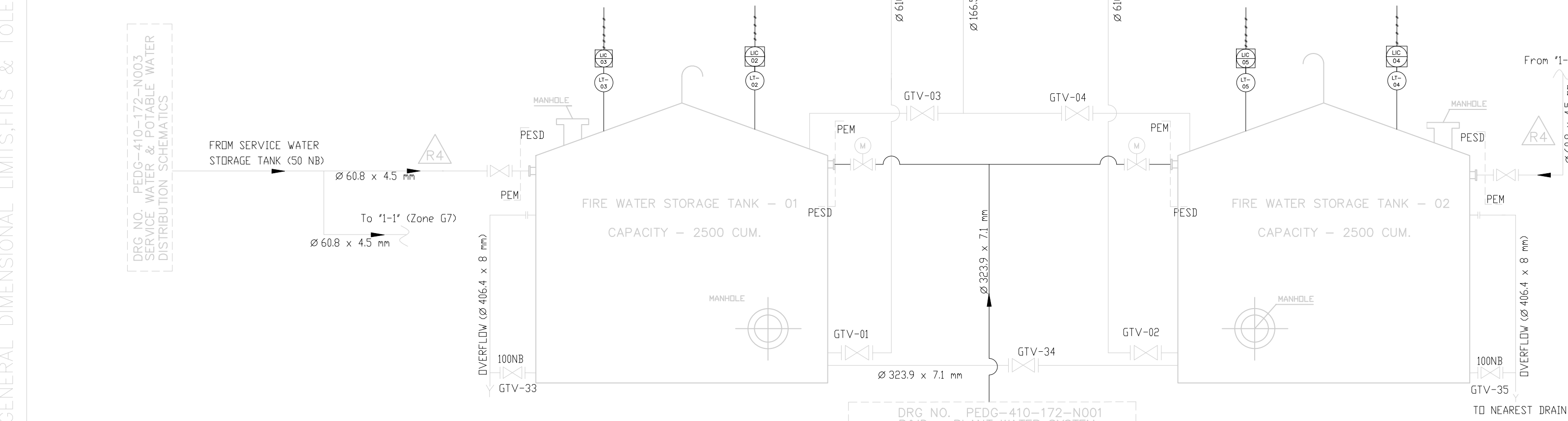
EQUIPMENT DATA

SL. NO.	TAG NO.	DESCRIPTION	QTY	CAPACITY (M ³ /Hr)	HEAD (TDH)
1	H-M-01	MOTOR DRIVEN HYDRANT MAIN PUMP	01	410	105
2	H-M-02	MOTOR DRIVEN HYDRANT MAIN PUMP	01	410	105
3	H-D-01	DIESEL ENGINE HYDRANT STANDBY PUMP	01	410	105
4	WS-D-01	DIESEL ENGINE SPRAY STANDBY PUMP	01	410	105
5	WS-M-01	MOTOR DRIVEN SPRAY MAIN PUMP	01	410	105
6	WS-M-02	MOTOR DRIVEN SPRAY MAIN PUMP	01	410	105
7	JP-M-01	MOTOR DRIVEN JOCKEY MAIN PUMP	01	40	110
8	JP-M-02	MOTOR DRIVEN JOCKEY STANDBY PUMP	01	40	110
9	AC-01	AIR COMPRESSOR (WORKING)	01	25	-
10	AC-02	AIR COMPRESSOR (STANDBY)	01	25	-

LEGEND:-

WATER PIPE LINE	ALARM/ANNUNCIATION
COMPRESSED AIR PIPING	TEST LINE
GATE VALVE	LEVEL SWITCH
GATE VALVE (NORMALLY CLOSE)	LEVEL INDICATOR
GLOBE VALVE	PRESSURE SWITCH
NON RETURN VALVE	PRESSURE GAUGE
BASKET TYPE STRAINER	DIFFERENTIAL PRESSURE SWITCH
HORIZONTAL PUMP	DIESEL ENGINE
CONCENTRIC REDUCER	ELECTRIC MOTOR
ECCENTRIC REDUCER	'Y' TYPE STRAINER
PRESSURE RELIEF VALVE	NORMALLY OPEN
FIRE WATER	NORMALLY CLOSE
BUTTERFLY VALVE	CONTROLLER
CONTROL CABLE	
SUCTION LINE	

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261



SL. NO.	DESCRIPTION	PUMP CAPACITY (Q) (M ³ /HR)	CONSIDER NO OF PUMPS	VELOCITY (V) IN M/SEC	FORMULA	DIAMETER OF PIPE IN MM	EQUIVALE NT DIA OF PIPE IN MM
1	MAIN SUCTION HEADER PIPE FOR ALL PUMPS	410	4	2.0	SQRT(4Q/VPI)	538.5	600
2	INLET PIPE OF EACH HYDRANT PUMP (SUCTION)	410	1	2.0	SQRT(4Q/VPI)	269.3	300
3	INLET PIPE OF SPRAY PUMP (SUCTION)	410	1	2.0	SQRT(4Q/VPI)	269.3	300
4	OUTLET PIPE OF EACH HYDRANT PUMP (DELIVERY)	410	1	3.0	SQRT(4Q/VPI)	219.87	250
5	OUTLET PIPE OF SPRAY PUMP (DELIVERY)	410	1	3.0	SQRT(4Q/VPI)	219.87	250
6	INLET PIPE OF JOCKEY PUMP	40	1	2.0	SQRT(4Q/VPI)	84.11	100
7	OUTLET PIPE OF JOCKEY PUMP	40	1	3.0	SQRT(4Q/VPI)	68.67	80
8	COMMON DELIVERY HEADER OF HYDRANT PUMPS	410	2	3.0	SQRT(4Q/VPI)	310.99	400
9	COMMON DELIVERY HEADER OF SPRAY PUMPS	410	2	3.0	SQRT(4Q/VPI)	310.99	400



TELANGANA STATE POWER GENERATION CORPORATION LTD
 TELANGANA STATE, INDIA
 1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12, PALONCHA



DEVELOPMENT CONSULTANTS PVT. LTD.
 CONSULTING ENGINEERS
 KOLKATA • MUMBAI • CHENNAI • NEW DELHI



BHARAT HEAVY ELECTRICALS LTD. R.C.PURAM HYDERABAD-32	DRN.	NAME	SIGN	DATE
	CHD.	K. G.		01.06.15
	APPD.	MNSR		01.06.15

BHEL - PESD HYDERABAD

TITLE :	FIRE PROTECTION SYSTEM P&ID OF FIRE WATER PUMP HOUSE			
UNIT :	SCALE :	BHEL DWG. NO. : 1-38316-00180	SHEET NO. 01 NO. OF SHEET 01	REV. 04

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

TABLE-4

TAG NO.	SETTING			FUNCTION	
	PRESSURE (kg/cm ²)	LEVEL	FLOW (m ³ /hr)	CONTROL	ANNUNCIATION
PT-13	9	--	--	A) JOCKEY PUMP CUTOFF B) MAIN HYDRANT PUMP START	--
	13			A) BOOSTER PUMP 02 STARTS	A) BOOSTER PUMP 01 FAILS TO START
PT-14	12.5		--	PUMP RUNNING SIGNAL	
PT-15	12.5		--	PUMP RUNNING SIGNAL	

Note: The Fail to start annunciation is taken from Pressure Transmitter placed on common booster pump delivery header with a suitable time delay.

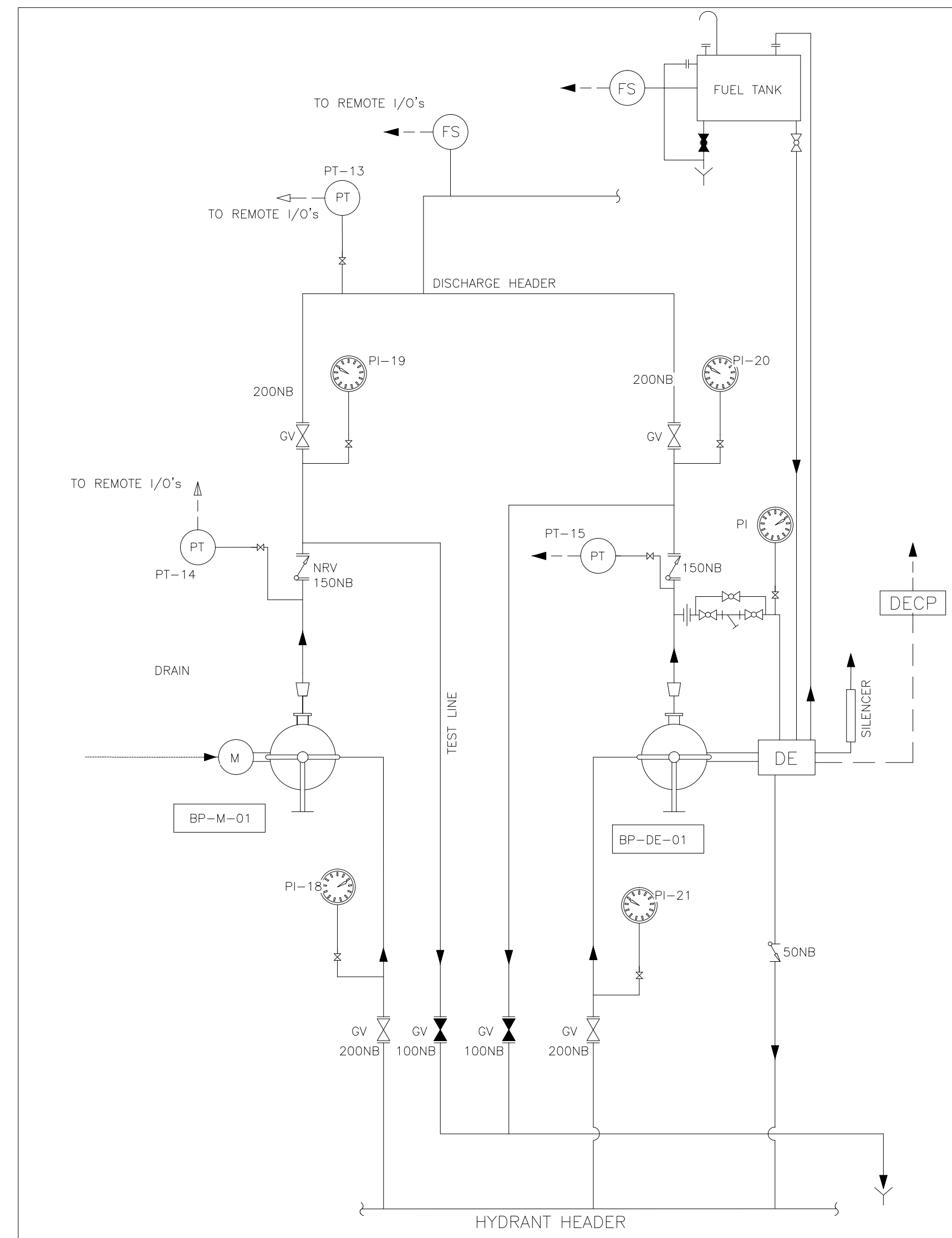
1. THE SYSTEM NETWORK SHALL BE MAINTAINED TO 10.2 KG/SQ.CM
2. ALL PUMPS SHALL HAVE MAUNAL STARTING IN ADDITION TO AUTO START
3. BOOSTER PUMPS SHALL BE STOPPED BY MANUAL OPERATION ONLY
4. EXHAUST OF ENGINES SHALL BE ROUTED AT SAFE ELEVATIONS OUTSIDE THE PUMP HOUSE
5. CONTROL AND MONITORING OF ALL EQUIPMENTS OF BOOSTER PUMP HOUSE SHALL BE FROM THE PLC LOCATED IN THE FIRE PUMP HOUSE

TABLE-2

TABLE-3

 DEVELOPMENT CONSULTANTS PVT. LIMITED.	
Reviewed only for general conformance with contract drawings and specifications. Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents.	
ACTION	DATE
DISTRIBUTED BY: MRG	16.12.16
1 Distributed	✓ Approved except as noted. Restriction required
2 Approved	5 Disapproved as accompanying letter
3 Approved except as noted. Forward final drawings	6 For information only
SEE COVERING LETTER	
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LEGEND:-



P&ID FOR SPRAY BOOSTER PUMP

LEGEND:—

— — — — —	WATER PIPE LINE	A	ALARM/ANNUNCIATION
— — — — —	COMPRESSED AIR PIPING		TEST LINE
	GATE VALVE		LEVEL SWITCH
	GATE VALVE (NORMALY CLOSE)		LEVEL INDICATOR
	GLOBE VALVE		PRESSURE SWITCH
	NON RETURN VALVE		PRESSURE GAUGE
	BASKET TYPE STRAINER		DIFFERENTIAL PRESSURE SWITCH
	HORIZONTAL PUMP		DIESEL ENGINE
	CONCENTRIC REDUCER		ELECTRIC MOTOR
	ECCENTRIC REDUCER		'Y' TYPE STRAINER
	PRESSURE RELIEF VALVE	NO	NORMALLY OPEN
	FIRE WATER	NC	NORMALLY CLOSE
	BUTTERFLY VALVE		CONTROLLER
— — — — —	CONTROL CABLE		DIESEL ENGINE CONTROL PANEL
— — — — —	SUCTION LINE		

	TELANGANA STATE POWER GENERATION CORPORATION LTD TELANGANA STATE, INDIA 1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12, PALONCHA																			
	DESIGN CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA • MUMBAI • CHENNAI • NEW DELHI																			
	BHARAT HEAVY ELECTRICALS LTD. R.C.PURAM HYDERABAD-32		<table><tr><th></th><th>NAME</th><th>SIGN</th><th>DATE</th></tr><tr><td>DRN.</td><td>AVIRAL</td><td></td><td>03.09.16</td></tr><tr><td></td><td>KUMARAMITI</td><td></td><td></td></tr><tr><td>APPD.</td><td>K GUNJAN</td><td></td><td>03.09.16</td></tr></table>			NAME	SIGN	DATE	DRN.	AVIRAL		03.09.16		KUMARAMITI			APPD.	K GUNJAN		03.09.16
	NAME	SIGN	DATE																	
DRN.	AVIRAL		03.09.16																	
	KUMARAMITI																			
APPD.	K GUNJAN		03.09.16																	
BHEL – PESD HYDERABAD																				
TITLE : FIRE PROTECTION SYSTEM P&ID OF FIRE WATER BOOSTER PUMPS																				
UNIT :	SCALE :	BHEL DWG. NO. : 1-38316-00421	<table><tr><td>SHEET NO.</td><td>01</td></tr><tr><td>NO. OF SHEET</td><td>01</td></tr></table>	SHEET NO.	01	NO. OF SHEET	01	REV. 00												
SHEET NO.	01																			
NO. OF SHEET	01																			

REFERENCE DRAWINGS

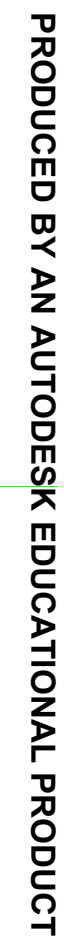
CUSTOMER	TELANGANA STATE POWER GENERATION CO. LTD.
----------	--

CUSTOMER'S
CONSULTANT

 DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS

	BHARAT HEAVY ELECTRICALS LTD.			NAME	SIGN.	DATE	NO.OF VAR.	
	HYDERABAD			DRN.	AVPAL	-SD-		26.07.16
	PROJECT ENGG & SYSTEMS DIVISION			CHD.	AMT	-SD-		26.07.16
				APPD.	K.GUNJAN	-SD-		26.07.16

PED CODE 450	UNTIL DIMS. GR. 9/14/97		SCALE 1:2500	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEMS
TITLE P&ID FOR HYDRANT SYSTEM				CARD CODE NA	BHEL DRG. NO. 0-38316-00058	-NA-	-NA-
				CUST. DRG. NO.	REV. 01		
				SHT. No 01	NO. OF SHT 02		



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INVENTORY NO	SIGN. AND DATE	REF. ORG. NO.	COMPUTER FILE NAME
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Project : 1 x 800 M W KOTHAGUDEM TPSTSGENCO			Our Ref
			Date: 11/01/17
Package: FPS System			DCPL Ref:
			Dated: 16.12.16
Sub : BHEL's Response Sheet for DCPL's comments on P&ID for Hydrant System , Rev-00 Doc No: As listed below			Category of Document : Information / Approval / Erection
Sl. No.	Drawing/ Document No.	DCPL's Comments on Rev 00	BHEL's Reply/ clarification with Rev 01
1	P&ID for Hydrant system (Rev 00)	Reference drawings shall be indicated	Noted. The same indicated in the revised drawing.
		Hydrant below ground shall be indicated	Please note that, P&ID is schematic representation to indicate the spread of all hydrants, monitors etc. across the complete plant. Hydrants below and above ground are shown separately in Composite layout of Hydrant and Spray drawing (Drg No 03831600035)
		The quantities indicated for hydrants, monitors etc , are indicative only. However, it will be based on finalization of building and structures,	The quantities indicated are as per Latest Plot plan, TPs, Crusher house and other building architectural drawings. However quantities shall be revised , if any Engineering requirement arise, due to revisions in drawings.
		Legend Shall be indicated for HB,LV etc.	Noted. The same indicated in the revised drawing.
		Provide the Piping schedule in tabular column.	Please note that Piping schedule is indicated in Composite layout of Hydrant and Spray drawing (Drg No 03831600035), and hence same shall not be shown in this drawing.
		Isometrics drawings shall be provided for better clarity of elevations.	Please note that, Fire escape Hydrant (FEH) layout for applicable buildings/ Structures shall be furnished separately indicating the various elevations where the landing valves are being installed.
		KKStagging shall be indicated for equipments (typical)	Please note that, in one of the ERM's with Customer/DCPL, it was agreed mutually that, BHEL standard tagging philosophy rather KKStagging philosophy shall be followed for tagging equipments/instruments etc. Also, in other drawings such as P&ID for FWPH, P&ID for HVWS/MVWS and composite layout, BHEL standard tagging philosophy is followed.
		Typical detail of SH for both above and under ground , WM shall be shown.	Please note that, the asked details are already indicated in Sheet No: 02 of Composite layout of Hydrant and Spray drawing (Drg No 03831600035), hence same is not indicated in this drawing.

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

COMPUTER FILE NAME

REF. DRG. NO.

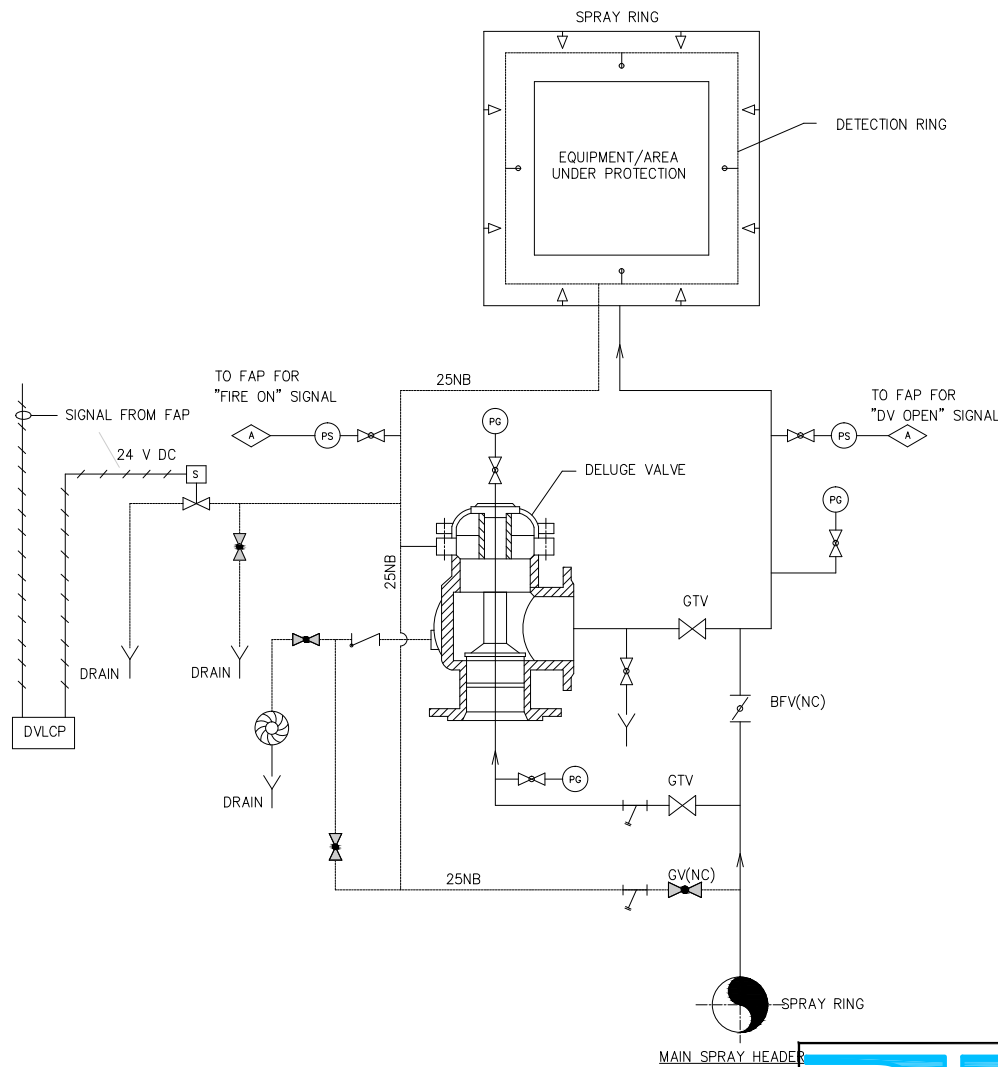
SIGN. AND DATE

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

JCS

DRG. NO.

SH. 01 OF 01



LEGEND:

	SPRAY LINE		DRAIN
	CONTROL CABLE		PRESSURE SWITCH
	WET DETECTION PIPE		PRESSURE GAUGE
	SOLENOID VALVE		MULTISENSOR DETECTOR
	GLOBE VALVE-NORMALLY OPEN		LINEAR HEAT SENSOR
	GLOBE VALVE-NORMALLY CLOSED		INFRA RED DETECTOR
	NON RETURN VALVE		PUSH BUTTON STATION
	"Y" TYPE STRAINER		QUARTZOID BULB DETECTORS
	ANNUNCIATION IN FIRE ALARM PANEL		WATER MOTOR GONG

TABLE-1 EQUIPMENTS TO BE PROTECTED BY HVWS SYSTEM	
SN	DESCRIPTION
1	AUXILIARY BOILER
2	TURBINE LUBE OIL TANK AND PURIFIER
3	BOILER BURNER FRONT
4	TURBINE OIL CANAL PIPELINE
5	GENERATOR SEAL OIL SYSTEM
6	LUBE OIL CONSOLE FOR TURBINE DRIVEN BFP
7	LUBE OIL CONDITIONING UNIT
8	CLEAN/DIRTY OIL TANK

TABLE-1(CONT.) EQUIPMENTS TO BE PROTECTED BY HVWS SYSTEM			Nos.
SN	DESCRIPTION		
09	GENERATOR TRANSFORMER		3
10	UNIT TRANSFORMER		2
11	UNIT AUXILIARY TRANSFORMER		2
12	STATION TRANSFORMER		1
13	CHP AREA TRANSFORMER		2
14	ALL OIL TYPE TRANSFORMER WITH OIL CAPACITY HIGHER THAN 2000 LTS.		--

AUTOMATIC HVW SPRAY SYSTEM(TYP)
REFER TABLE-1

NOTE: A) HVW SPRAY SYSTEM SHALL BE DESIGNED AS PER TAC GUIDELINES.

DEVELOPMENT CONSULTANTS PVT. LIMITED.

Reviewed only for general conformance with contract drawings and specifications. Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents

ACTION 2		DATE 22.01.2016	
DISTRIBUTED BY. SM			
1	Distributed	4	Approved except as noted. Resubmission required
2	Approved	5	Disapproved see accompanying letter
3	Approved except as noted. Forward final drawings	6	For information only
SEE COVERING LETTER			
LETTER REF. NO. 1115		DATE 22.01.2016	

CUSTOMER



TELANGANA STATE POWER GENERATION CORPORATION LTD.

PROJECT

1 X 800 MW KOTHAGUDAM TPS (PALONCHA ,STAGE-VII, UNIT # 12)

DEPT. IN CHARGE

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

PROJECT ENGG & SYSTEMS DIVISION

DEPT. IN CHARGE

CONTROL. DIMS.

SCALE

WEIGHT (KG)

REF. TO ASSY. DRG.

ITEM NO.

NO.OF VAR.

NO.OF ITEMS

NO.OF

REV.

05

CARD CODE

N.A.

DRAWING NO.

3-38316-00013

REV.

05

SHT. No 01

NO. OF SHT. 01

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

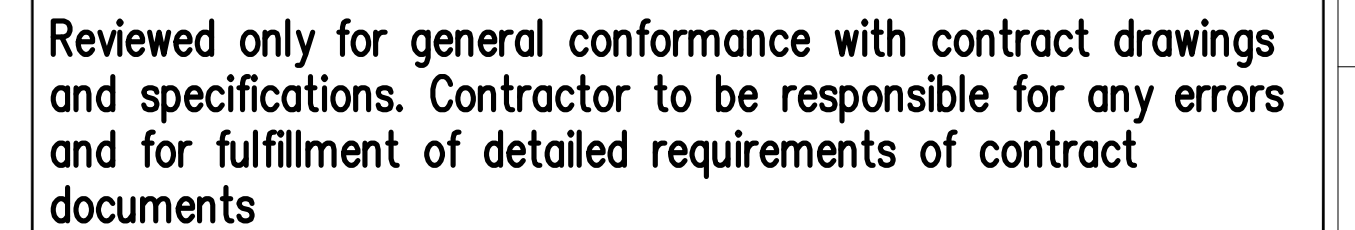
GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

REFER TABLE-1

REFER TABLE-2

02

NOTE: A) MVW SPRAY SYSTEM SHALL BE DESIGNED AS PER TAC GUIDELINES.

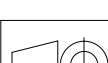


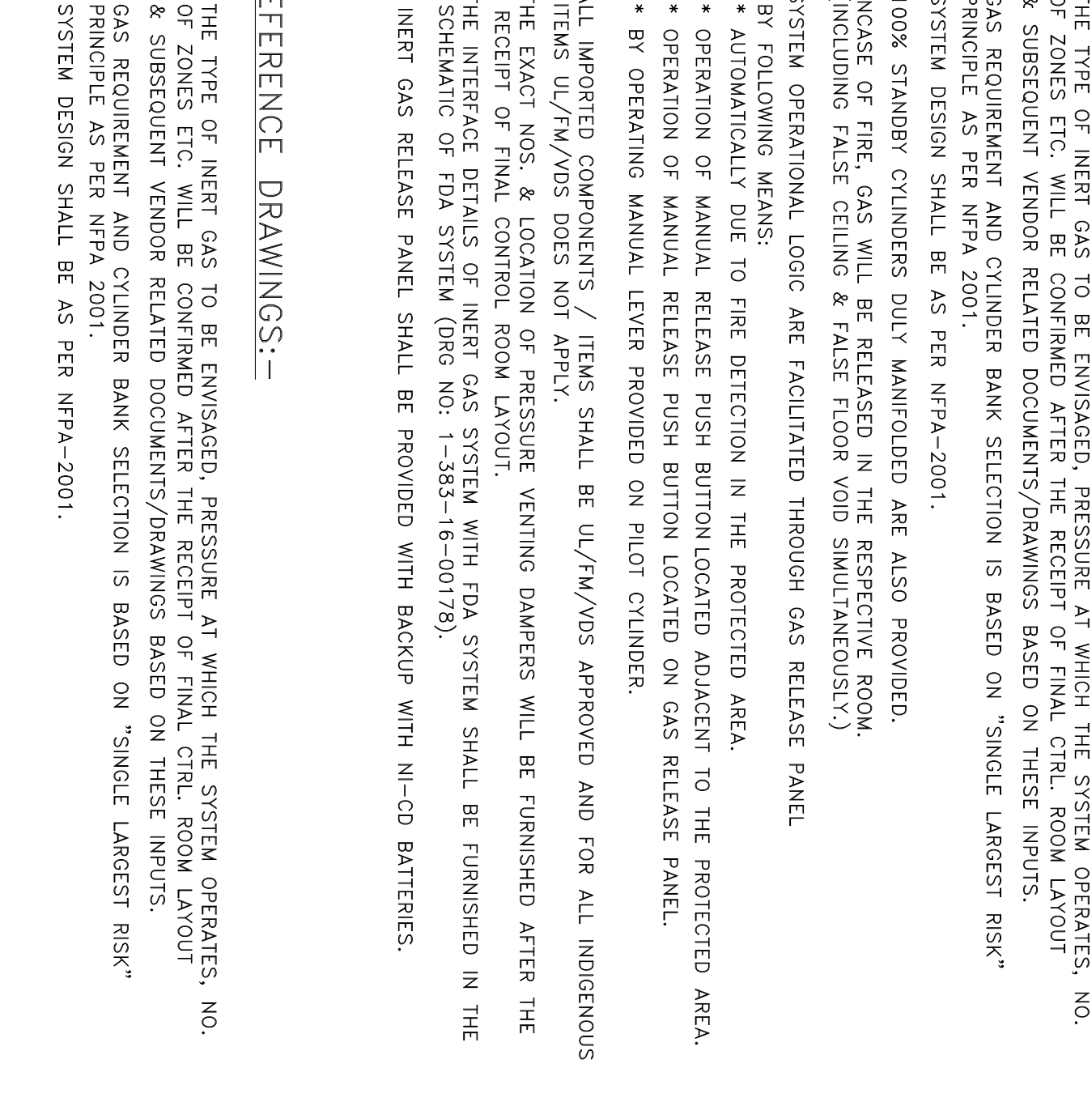
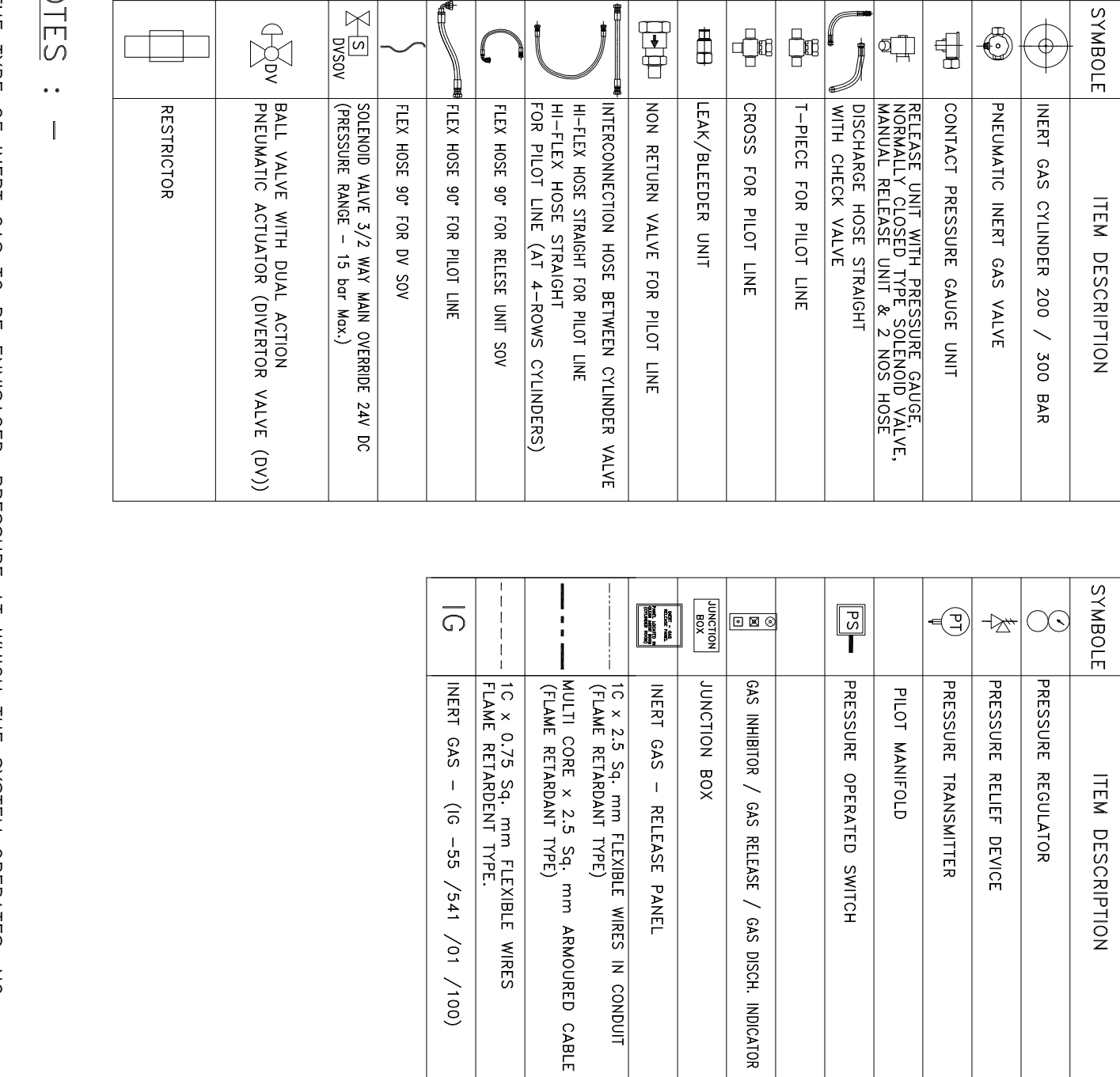
ACTION 2		DATE 05.11.2015	
DISTRIBUTED BY. SM			
1	Distributed	4	Approved except as noted. Resubmission required
2	Approved	5	Disapproved see accompanying letter
3	Approved except as noted. Forward final drawings	6	For information only
SEE COVERING LETTER			
LETTER REF NO. 0745		DATE. 05.11.2015	



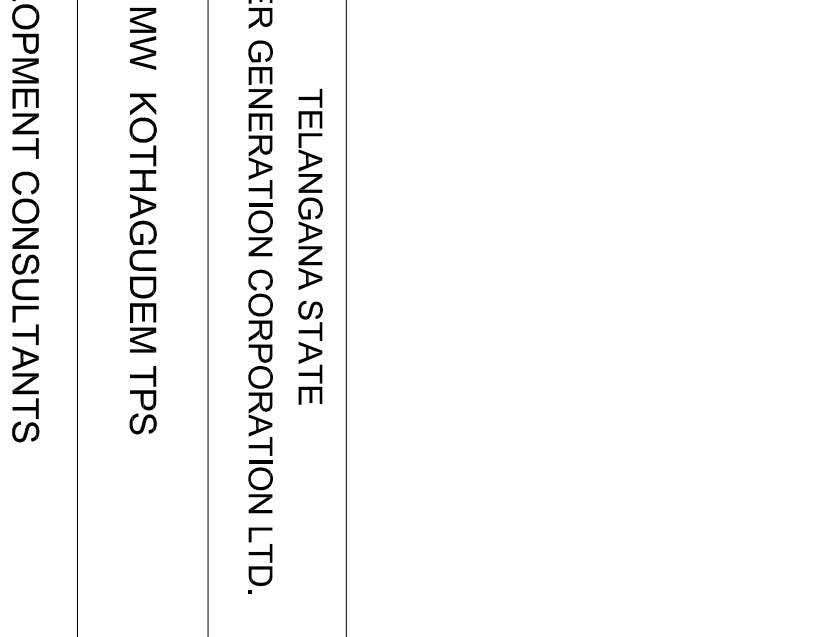
REFER TABLE-3

REFER TABLE-4

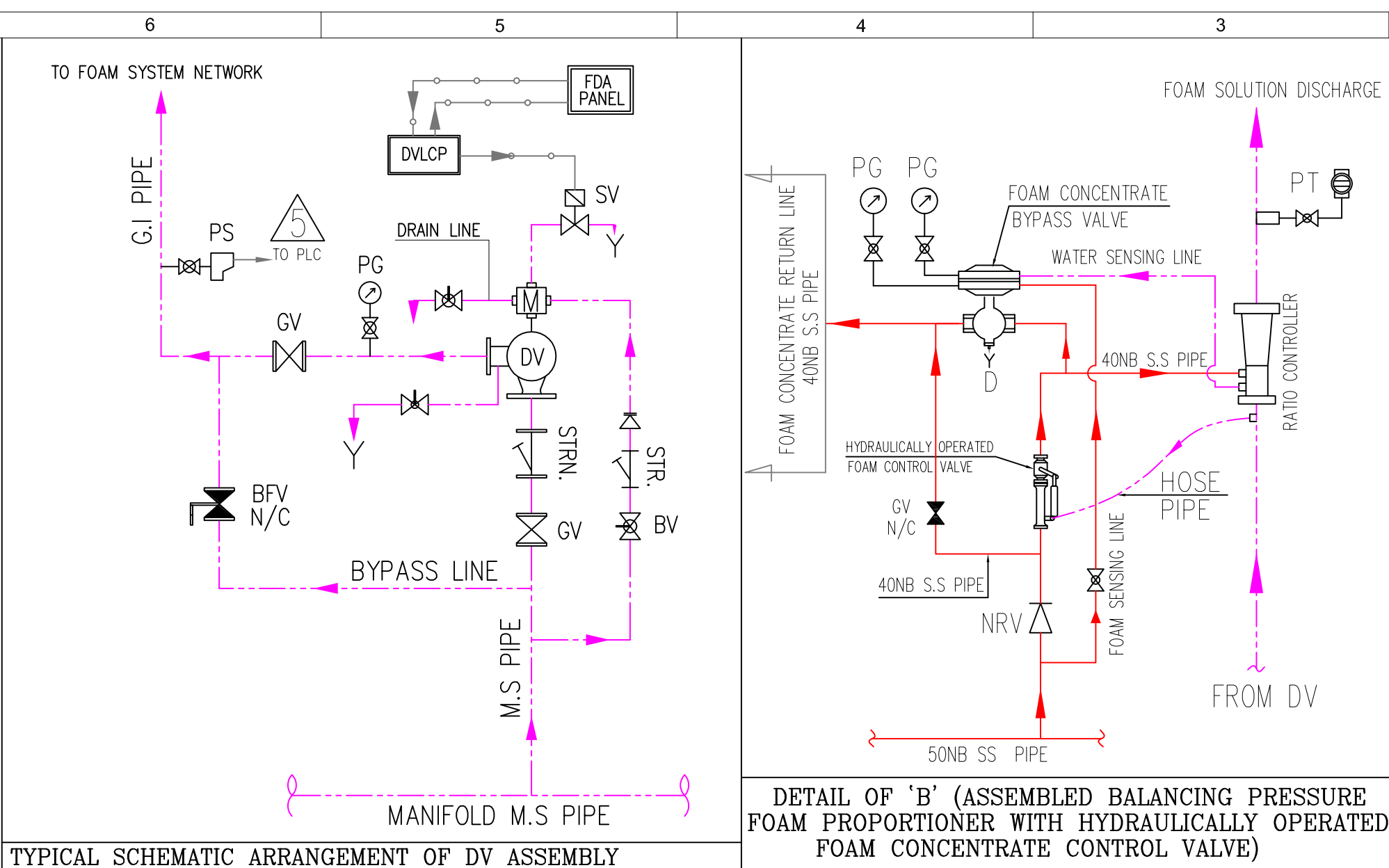
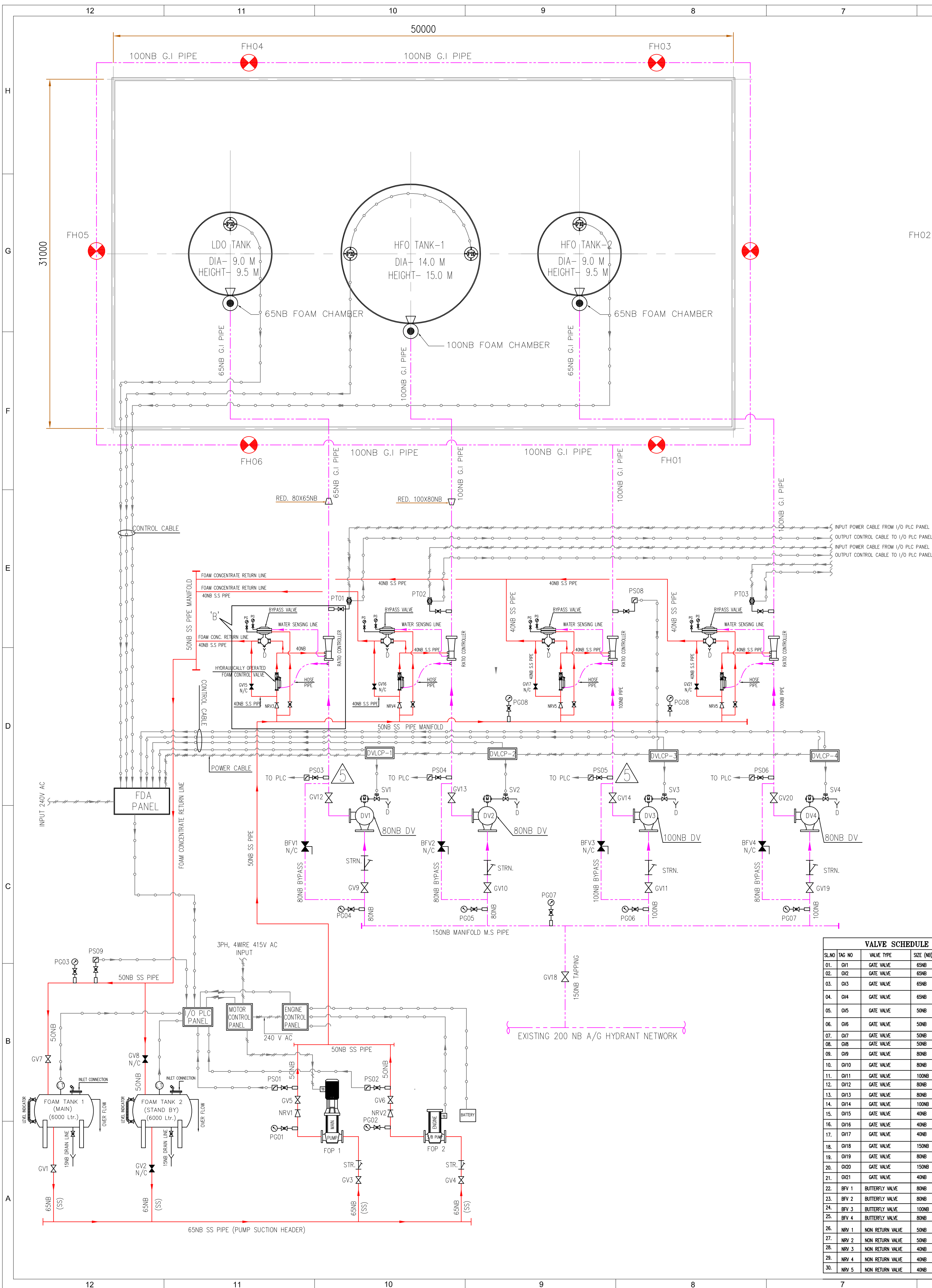
CUSTOMER	 GENERATION STATE POWER GENERATION CORPORATION LTD.									
CUSTOMER'S CONSULTANT	 DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA MUMBAI CHENNAI NEW DELHI									
PROJECT	1 X 800 MW KOTHAGUDEM TPS (PALONCHA, STAGE-VII, UNIT # 12)									
	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD PROJECT ENGG & SYSTEMS DIVISION									
	DRN.	AMIT	NAME	SIGN.	DATE	NO. OF VAR.				
	CHD.	KGUNJAN	—SD—	—SD—	30.05.15	N.A.				
	APPD	MNSR	—SD—	—SD—	30.05.15	N.A.				
DEPT.	PE & SD	UNTL. DIM. GR		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEMS		
CODE	450	C/M/F		N.A.	N.A.	N.A.	N.A.	REV.		
TITLE P&ID MWVS SYSTEM						Doc. No. 1-38316-00174		02		
CARD CODE NA						SHEET 1 OF 1		SIZE-A-		



CUSTOMER	 TELANGANA STATE POWER GENERATION CORPORATION LTD.
PROJECT	1 x 800 MW KOTHAGUDEM TPS



PAITEIA	PERF.	UNTL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF
K. CUNJIN	RED.		N.T.S.	N.A.	N.A.	N.A.	PLAS
AS PER COMMENTS	CODE 450						
TITLE PAID OF INERT GAS EXTINGUISHING SYSTEM							
	CARD CODE	DRG. NO.	1-383-16-00256				
	DIST. DRG. NO.						
	NA						
	SHT. No. 01	No. of SHT. 01	SIZE - A1				
							02



DESIGN BASIS OF FOAM SYSTEM FOR LDO TANK:-

01. **REQUIRED FOAM CONCENTRATE FOR LDO TANK -**
STORAGE TANK DIA. = 9.0 M (ID)
TOP SURFACE AREA = 63.58 SQ.M
TYPE OF FOAM MAKING CONCENTRATE 3% AFF (REF CL. NO. 3.3.12.2 OF NFPA11)
SYSTEM OPERATING TIME = 60 MINUTES
DISCHARGE DENSITY REQUIRED ON FUEL SURFACE = 6.1 LPM/SQ.M
REQUIRED FOAM CONCENTRATE FOR LDO TANK = 63.58X6.1X3 = 698.163 LTR.

02. **SELECTED FOAM CHAMBER SIZE -**
TOP SURFACE AREA = 63.58 SQ.M
FOAM SOLUTION THROUGH FOAM CHAMBER = 63.58X6.1 = 387.83 LPM.
MINIMUM DISCHARGE PRESSURE AT FOAM CHAMBER = 5.5KG/SQ.CM
= SELECTED FOAM CHAMBER SIZE = K= 387.83/5.5 = 165.371= 65NB (AS PER FCA MODEL)

DESIGN BASIS OF FOAM SYSTEM FOR HFO TANK:-

01. **REQUIRED FOAM CONCENTRATE FOR HFO TANK -**
STORAGE TANK DIA. = 14.0 M (ID)
TOP SURFACE AREA = 153.86 SQ.M
TYPE OF FOAM MAKING CONCENTRATE 3% AFF (REF CL. NO. 3.3.12.2 OF NFPA11)
SYSTEM OPERATING TIME = 60 MINUTES
DISCHARGE DENSITY REQUIRED ON FUEL SURFACE = 6.1 LPM/SQ.CM
REQUIRED FOAM CONCENTRATE FOR HFO TANK = 153.86X6.1X3 = 1689.382 LTR.

02. **SELECTED FOAM CHAMBER SIZE -**
TOP SURFACE AREA = 153.86 SQ.M
FOAM SOLUTION THROUGH FOAM CHAMBER = 153.86X6.1 = 938.546 LPM.
MINIMUM DISCHARGE PRESSURE AT FOAM CHAMBER = 5.0KG/SQ.CM
= SELECTED FOAM CHAMBER SIZE = K= 938.546/5.0 = 419.73 = 100 NB (AS PER FCA MODEL)

DESIGN BASIS OF FOAM SYSTEM FOR FOAM HYDRANT NETWORK:-
CONSIDERING 2 NOS. FOAM HYDRANT TO PROTECT LDO & HFO TANK'S DYKE AREA.

01. **REQUIRED FOAM CONCENTRATE FOR FOAM HYDRANT NETWORK:-**
REQUIRED FOAM SOLUTION AS PER IS:8442 SHALL BE 2X700=1400 LPM FOR 2 NOS. 65NB FOAM HYDRANT.
TYPE OF FOAM MAKING CONCENTRATE 3% AFF (REF CL. NO. 3.3.12.2 OF NFPA11)
SYSTEM OPERATING TIME = 60 MINUTES
REQUIRED FOAM CONCENTRATE FOR FOAM HYDRANT NETWORK = 1400X3X60 = 2520.0 LTR.

DESIGN BASIS OF FOAM SYSTEM FOR SELECTED FOAM TANK:-
TOTAL REQUIRED FOAM CONCENTRATE FOR FOAM SYSTEM (LDO TANK + HFO TANK +FOAM HYDRANT NETWORK) = (698.163+1689.382+2520.0) = 4907.545 LTR.
TOTAL REQUIRED FOAM CONCENTRATE WITH CONSIDERING 10% OVER THE CALCULATED TANK CAPACITY. 4907.545 X 10% = 5398.299 LTR. ≈ 6000 LTR.
100% STANDBY FOAM CONCENTRATE SHALL BE STORAGE IN TANK.

VALVE SCHEDULE FOR FOAM SYSTEM			
SLNO	TAG NO	VALVE TYPE	SIZE (NB)
01.	GV1	GATE VALVE	65NB
02.	GV2	GATE VALVE	65NB
03.	GV3	GATE VALVE	65NB
04.	GV4	GATE VALVE	65NB
05.	GV5	GATE VALVE	50NB
06.	GV6	GATE VALVE	50NB
07.	GV7	GATE VALVE	50NB
08.	GV8	GATE VALVE	50NB
09.	GV9	GATE VALVE	80NB
10.	GV10	GATE VALVE	80NB
11.	GV11	GATE VALVE	100NB
12.	GV12	GATE VALVE	80NB
13.	GV13	GATE VALVE	80NB
14.	GV14	GATE VALVE	100NB
15.	GV15	GATE VALVE	40NB
16.	GV16	GATE VALVE	40NB
17.	GV17	GATE VALVE	40NB
18.	GV18	GATE VALVE	150NB
19.	GV19	GATE VALVE	100NB
20.	GV20	GATE VALVE	150NB
21.	GV21	GATE VALVE	40NB
22.	BFV1	BUTTERFLY VALVE	80NB
23.	BFV2	BUTTERFLY VALVE	80NB
24.	BFV3	BUTTERFLY VALVE	100NB
25.	BFV4	BUTTERFLY VALVE	80NB
26.	NRV1	NON RETURN VALVE	50NB
27.	NRV2	NON RETURN VALVE	50NB
28.	NRV3	NON RETURN VALVE	40NB
29.	NRV4	NON RETURN VALVE	40NB
30.	NRV5	NON RETURN VALVE	40NB

SCHEDULE OF PRESSURE SWITCH			
SLNO	DESCRIPTION	WORKING PURPOSE	SET PR.
01.	PRESSURE SWITCH-PS1	FOAM PUMP (FP-M-01) RUNNING ALARM	6.5 KG/ CM ²
02.	PRESSURE SWITCH-PS2	FOAM PUMP (FP-D-01) RUNNING ALARM	6.0 KG/ CM ²
03.	PRESSURE SWITCH-PS3	TO START MAIN PUMP & DELUGE VALVE IN OPERATION ALARM AT DVLCF FOR LDO TANK	3.0 KG/ CM ²
04.	PRESSURE SWITCH-PS4	TO START MAIN PUMP & DELUGE VALVE IN OPERATION ALARM AT DVLCF FOR HFO TANK-1	3.0 KG/ CM ²
05.	PRESSURE SWITCH-PS5	TO START MAIN PUMP & DELUGE VALVE IN OPERATION ALARM AT DVLCF FOR TANK DYKE AREA	3.0 KG/ CM ²
06.	PRESSURE SWITCH-PS6	TO START MAIN PUMP & DELUGE VALVE IN OPERATION ALARM AT DVLCF FOR HFO TANK-2	3.0 KG/ CM ²
07.	PRESSURE TRANSMITTER-PT1	TO DVLCF FOAM SYSTEM IN OPERATION AT LDO TANK	--
08.	PRESSURE TRANSMITTER-PT2	TO DVLCF FOAM SYSTEM IN OPERATION AT HFO TANK	--
09.	PRESSURE SWITCH-PS8	TO DVLCF FOAM SYSTEM IN OPERATION AT TANK DYKE AREA	6.5 KG/ CM ²
10.	PRESSURE SWITCH-PS9	TO I/O PLC FOAM SYSTEM IN OPERATION OF FOAM CONCENTRATION BACK FLOW TO THE FOAM TANK	3.5 KG/ CM ²
11.	LEVEL TRANSMITTER-LT1	TO I/O PLC FOAM SYSTEM IN OPERATION OF LOW LEVEL SIGNAL AT FOAM TANK-1	--
12.	LEVEL TRANSMITTER-LT2	TO I/O PLC FOAM SYSTEM IN OPERATION OF LOW LEVEL SIGNAL AT FOAM TANK-2	--

REV	DATE	ALTERED	BY	DATE	ALTERED	BY	DATE	ALTERED	BY	DATE	ALTERED	BY	DATE	ALTERED	BY
01	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18

LEGEND

	M.S. & G.I. PIPE
	SS PIPE
	CONTROL CABLE
	POWER CABLE
	BUTTERFLY VALVE (BFV)/NORMALLY CLOSED
	GATE VALVE (GV)/NORMALLY CLOSED
	SOLINOID VALVE (SOV)
	NON-RETURN VALVE
	GLOBE/BALL VALVE
	REDUCER
	DELUGE VALVE LOCAL CONTROL PANEL
	FOAM CHAMBER
	PRESSURE GAUGE
	PRESSURE SWITCH
	LEVEL TRANSMITTER
	PRESSURE TRANSMITTER
	LEVEL INDICATOR
	PROBE TYPE HEAT DETECTOR
	Y STRAINER
	FOAM HYDRANT
	RATIO CONTROLLER
	FIRE DETECTION ALARM PANEL
	4 WAY MANIFOLD
	HYDRAULICALLY OPERATED FOAM CONCENTRATE CONTROL VALVE

PUMP DATA

TAG. NO.	DESCRIPTION	DISCHARGE	HEAD	QTY.	TYPE
P-1	MAIN PUMP	6 CU.M/Hr.	80 M.	01 No.	MOTOR DRIVEN
P-2	STAND BY PUMP	6 CU.M/Hr.	80 M.	01 No.	DIESEL ENGINE

NOTES :-

- ALL PIPE SIZES ARE IN M.M. AND NOMINAL DIA ONLY.
- ALL DIMENSIONS ARE IN M.M. UNLESS OTHERWISE SPECIFIED.
- FOAM CONCENTRATE CONTAIN PIPE SHALL BE S.S.
- ALL PIPE UP TO INLET OF DELUGE VALVE SHALL BE MS BLACK HEAVY GR. AS PER IS:1239 (PART-I).
- ALL PIPE FOR DOWNSTREAM OF DELUGE VALVE SHALL BE G.I MEDIUM GR. AS PER IS:1239 (PART-I).
- ALL FITTINGS UPTO 150NB SHALL BE AS PER IS:1239 (PART-II).
- MINOR MODIFICATION IN LAYOUT MAY BE DONE DURING ERECTION TO SUIT SITE CONDITION.

PIPE SCHEDULE FOR FOAM SYSTEM

SLNO	DESCRIPTION	PIPE SIZE (NB)	STANDARD	THICKNESS
01.	FOAM CONCENTRATE SS PIPE	80NB	SS to ASTM 312,TP-304, SCH10	THK. 3.05mm
		65NB	SS to ASTM 312,TP-304, SCH10	THK. 3.05mm
		50NB	SS to ASTM 312,TP-304, SCH10	THK. 2.77mm
		40NB	SS to ASTM 312,TP-304, SCH10	THK. 2.77mm
02.	FOAM SOLUTION GI PIPE/ DV DOWN STREAM GI PIPE	100NB	IS:1239, PART-1, MEDIUM GRADE GALVANIZED AS PER IS:4736	THK. 4.5mm
		80NB	IS:1239, PART-1, MEDIUM GRADE GALVANIZED AS PER IS:4736	THK. 4.0mm
		65NB	IS:1239, PART-1, MEDIUM GRADE GALVANIZED AS PER IS:4736	THK. 3.6mm
		150NB	IS:1239, PART-1, HEAVY GRADE	THK. 5.4mm
03.	MS ERW PIPE FOR DV UPSTREAM	100NB	IS:1239, PART-1, HEAVY GRADE	THK. 5.4mm
		80NB	IS:1239, PART-1, HEAVY GRADE	THK. 4.8mm

DV SCHEDULE

SLNO	DV NO.	DV SIZE	DESCRIPTION
01.	DV-1	80NB	FOR LDO TANK
02.	DV-2	80NB	FOR HFO TANK
03.	DV-3	100NB	FOR FOAM HYDRANT NETWORK

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA STATE, INDIA
1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12, PALONCHA

OWNER'S CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA MUMBAI CHENNAI NEW DELHI
BHARAT HEAVY ELECTRICALS LTD
PROJECT ENGINEERING & SYSTEMS DIVISION
HYDERABAD

DATE: 01.01.18
BY: 01.01.18
CHKD: 01.01.18
APPD: 01.01.18

REVISIONS:

REV	DATE	ALTERED	BY	DATE	ALTERED	BY	DATE	ALTERED	BY	DATE	ALTERED	BY	DATE	ALTERED	BY
01	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18	01.01.18

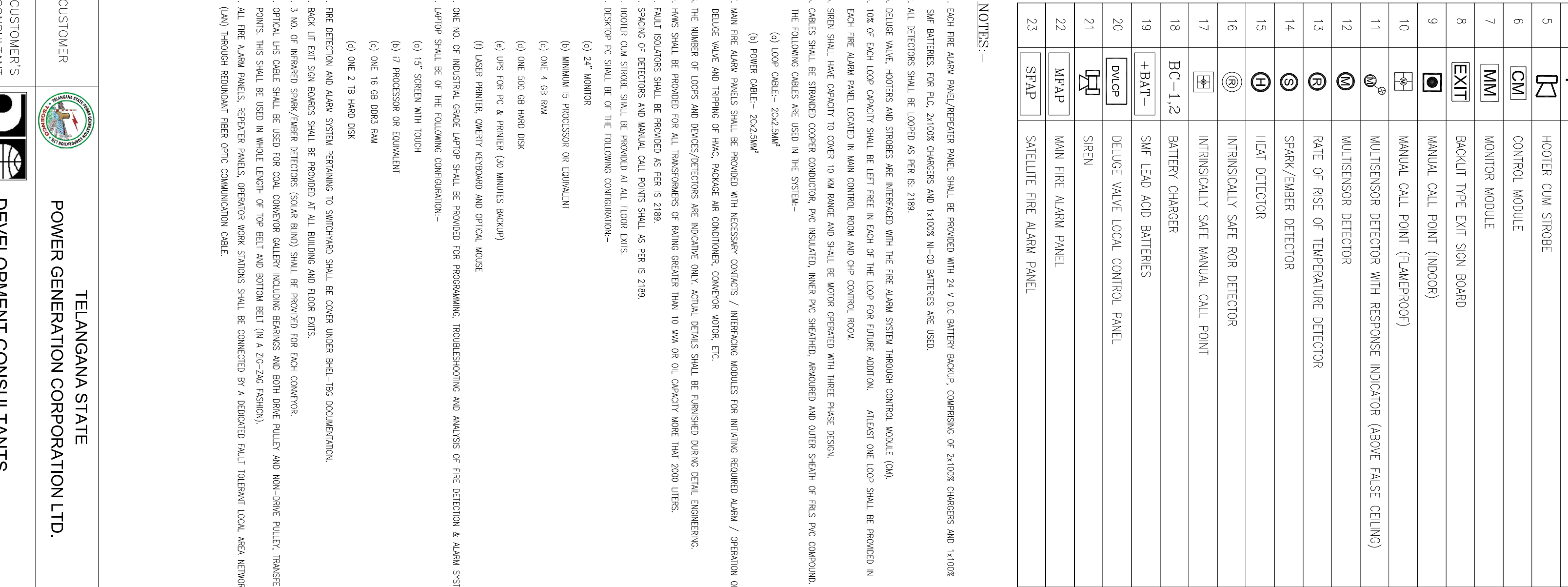
TITLE P&ID OF FOAM PROTECTION SYSTEM

SCALE 1-38316-00202

DRAWING NO. 1-38316-00202

SHEET 1 OF 1

REV. 05

[illegible]

TELEGANA STATE POWER GENERATION CORPORATION LTD. (TSGENCO)



1X800MW KOTHAGUDEM TPS, STAGE–VII,UNIT#12
PALONCHA, TELANGANA

00	08.12.16	INITIAL SUBMISSION
REV	DATE	DESCRIPTION



TELANGANA STATE POWER GENERATION CORPORATION LTD. (TSGENCO)

ADDITIONAL INFORMATION		1 x 800 MW KOTHAGUDEM TPS STAGE-VII, UNIT#12, PALONCHA													
STATUS OF DRAWING															
DISTRIBUTION OF PRINTS															
MANUFACTURER :		BHARAT HEAVY ELECTRICALS LTD. PE & SD HYDERABAD			NAME	SIGN.	DATE	NO.OF VAR.							
				DRN.	PRAVEEN	—sd—	05.12.16								
				CHD.	GUNJAN	—sd—	06.12.6								
				APPD.	MNSR	—sd—	06.12.16								
DEPT. PESD CODE 450		UNTOL. DIM. GR. C/M/F				SCALE		WEIGHT (KG)		REF. TO ASSY DRG.		ITEM NO.		NO.OF ITEMS	
		TITLE: ALLOCATION CHART OF PORTABLE FIRE EXTINGUISHERS						DOCUMENT NO PEMC–07105				REV. 00			
								SHT No. 01				NO OF SHT. 01			

	PROJECT :	1 x 800 MW, KOTHAGUDEM SUPER-CRITICAL THERMAL POWER STATION										DOC. NO.	PEMC-07105	
	CUSTOMER :	TSGENCO										REV NO.	00	
	PACKAGE :	FIRE PROTECTION & DETECTION SYSTEM										DATE	05.12.16	
	DOCUMENT :	FIRE EXTINGUISHERS ALLOCATION CHART												
Sl. No.	Name of Area	Reference Dwg. No.	Size		Area (m ²)	No. of Extinguishers required as per TAC (Equivalent to no. of water type ext. calculated as per Cl. 4.1.3.2 of TAC)	No.of Extinguishers Provided as per TAC (Clause No. 4.1.3.2 and 4.1.3.8)							
			Length (m)	Width (m)			Pressurized water type (operated by CO2 cartridge type) - 9 Lit.	CO2 (4.5Kg.)	CO2 (22.5Kg.) Trolley Mounted	DCP (6Kg.)	DCP (25Kg.)	Mech. Foam (9 lit.)	Mech. Foam (50 lit.)	
1.0	Power House													
a)	At El. 0.0m	PE-DG-410-611-C035												
i	Cable Vault		21	35	735	3				2	1			
ii	Gas Cylinder Room		12	4	48	2	1	1						
iii	Passage b/w CD bay, Lift Lobby & Main Stair		140	31	4340	15	4	4	1	4		2		
iv	SWAS Room		12	10	120	2		1		1				
v	CPU I/O Room		4.5	3.5	15.75	2		1		1				
vi	Lube Oil Purification Area		10	8	80	2		1					1	
vii	Maintenance Area		21	30	630	3	1		1	1				
viii	PLC Control Room		12.5	4.5	56.25	2		1		1				
ix	Inert Gas Cylinder Storage Room		11.2	11.2	125.44	2	1			1				
x	A/C Plant Room		16	7	112	2	1			1				
xi	MCC Room		23	10.2	234.6	2		1			1			
b)	At El. 3.5m	PE-DG-410-611-C039												
i	MV Switchgear room		43	21	903	4		1		2	1			
ii	SWAS Room		12	12	144	2		1		1				
iii	Area b/w Grid 5 to 8		24	12	288	2	1			1				
c)	At El 8.5m	PE-DG-410-611-C040												
i	Cable Vault		35.2	20	704	3		1		1	1			
ii	Battery Room		33	13	429	2			1	1				
iii	UPS Battery Room		22	11	242	2		1		1				
iv	Oil Room		17	10.2	173.4	2						1	1	
v	AHU Room		11	10.2	112.2	2	1			1				
vi	Depressed Floor at El. 7.7m		20	12	240	2				1		1		
vii	Area b/w Grid B-10 to B-14		45	12	540	2	1			1				
viii	Area b/w Grid 13 to 14		30	12	360	2	1			1				
ix	Area b/w Grid A'c-5 to A'c-8		33	7	231	2	1			1				
d)	At El 12m	PE-DG-410-611-C042												
i	Cable Vault		42	24	1008	4		1		2	1			
ii	LV Switchgear room		21	34	714	3		1		1	1			
e)	At El. 17.0m	PE-DG-410-611-C051												

Sl. No.	Name of Area	Reference Dwg. No.	Size		Area (m ²)	No. of Extinguishers required as per TAC (Equivalent to no. of water type ext. calculated as per Cl. 4.1.3.2 of TAC)	No.of Extinguishers Provided as per TAC (Clause No. 4.1.3.2 and 4.1.3.8)						
			Length (m)	Width (m)			Pressurized water type (operated by CO2 cartridge type) - 9 Lit.	CO2 (4.5Kg.)	CO2 (22.5Kg.) Trolley Mounted	DCP (6Kg.)	DCP (25Kg.)	Mech. Foam (9 lit.)	Mech. Foam (50 lit.)
i	CCR		23	12	276	2		1		1			
ii	CER		33	23	759	3		1		2			
iii	Computer Room		12	11	132	2		1		1			
iv	Laydown area - 2 nos				1200	4	2			2			
f)	At El. 24.0m	PE-DG-410-611-C053											
i	AHU Room		27	12	324	2				2			
ii	Cable Vault		33	24	792	3	1			2			
g)	At El. 27.5m	PE-DG-410-611-C054											
i	Boiler MCC		33	24	792	3				2		1	
ii	AHU Room		27	12	324	2	1			1			
h.	El. 29.5 M	PE-DG-410-611-C055											
i	Air Washer Room		34	12	408	2	1			1			
ii	Piping Corridor		70	12	840	3	1	1		1			
iii	Lift Lobby & other areas b/w grid 1 to 4		31	12	372	2	1	1					
i.	El. 35.50 M	PE-DG-410-611-C056											
	Complete Floor		140	12	1680	6	2			2	1		
j.	El. 40.0 M	PE-DG-410-611-C057											
	Lift machine Room		8	6	48	2	1			1			
2.0	Service Building												
a.	Ground Floor (El. 0.0 M)	PE-DG-410-640-C001	42	22	924	4	1	1		2			
i	MCC Room & Machine Room		16.5	9	148.5	2				2			
ii	Miscellaneous				500	2	1			1			
b.	First Floor (El. 4.25 M)	PE-DG-410-640-C002	42	22	924	4	1	1		2			
i	Office(16.5 x 17.9), Conference(12.5 x 5.7) & Training room (12.5 x 5.7)				438	2	1	1		1			
c.	Second Floor (El. 8.5 M)	PE-DG-410-640-C003	42	22	924	4	1	1		2			
i	Office		16.5	17.9	295.35	2		1		1			
ii	C&I Lab		12.5	5.7	71.25	2				2			
d.	Third Floor (El. 12.75 M)	PE-DG-410-640-C004	42	22	924	4	1	1		2			
i	Office(16.5 x 17.9), Conference(9.9 x 5.7) & Training room (12.5 x 5.7)				423	2	1	1		1			
e.	Fourth Floor (El. 17.0 M)	PE-DG-410-640-C005	42	22	924	4							
i	Office(16.5 x 17.9), Conference(9.9 x 5.7) & Computer room (12.5 x 5.7)				438	2	1	1		1			
f.	Roof (El. 21.2 M), Machine Room	PE-DG-410-640-C006	6	9	438	2	1			1			

Sl. No.	Name of Area	Reference Dwg. No.	Size		Area (m ²)	No. of Extinguishers required as per TAC (Equivalent to no. of water type ext. calculated as per Cl. 4.1.3.2 of TAC)	No.of Extinguishers Provided as per TAC (Clause No. 4.1.3.2 and 4.1.3.8)						
			Length (m)	Width (m)			Pressurized water type (operated by CO2 cartridge type) - 9 Lit.	CO2 (4.5Kg.)	CO2 (22.5Kg.) Trolley Mounted	DCP (6Kg.)	DCP (25Kg.)	Mech. Foam (9 lit.)	Mech. Foam (50 lit.)
3.0	Admin. Building												
a.	Floor @ El. 0.0m	PE-DG-410-641-C001	56	25	1400	5		2	1	2			
i	MCC Room		18	10	180	2		1			1		
b.	Floor @ El. 4.50m	PE-DG-410-641-C002	56	25	1400	5		2	1	2			
i	Office space, Conference room & waiting area				250	2	1	1		1			
c.	Floor @ El. 8.75m		51	31.5	1606.5	6		2	1	2	1		
d.	Floor @ El. 13.50m		51	31.5	1606.5	6		2	1	2	1		
4.0	DG Set Building	PE-DG-410-642-C001	17.3	14	242.2	2				1			1
5.0	Canteen Building	PE-DG-410-610-C001	27	26	702	3		2		1			
6.0	ESP Ctrl. Building	PE-DG-410-619-C001											
a.	Floor @ El. 0.0m		75	17	1275	5		2	1	2			
b.	Floor @ El. 4.50m		75	17	1275	5		3		2		1	
c.	Floor @ El. 8.50m (Control Room & PAC equipment room)		70	17	1190	4	1	1		1	1		
7.0	Compressore House Building	PE-DG-410-647-C001											
a.	Floor @ El. 0.0m		33	12	396	2	1	1					
b.	Electrical annex room		12	5.5	66	2				1	1		
8.0	Auxiliary Boiler Annex Building	PE-DG-410-617-C001											
a.	Floor @ El. 0.0m		28	6.5	182	2		1			1		
b.	Floor @ El. 4.50m		28	6.5	182	2		1		1			
9.0	Transformer Yard												
a.	Air Washer Unit-1		12	10	120	2		1		1			
b.	Air Washer Unit-2		12	10	120	2		1		1			
10.0	Mill Bays												
a.	Mill Bay-A to E					6		6					
11.0	DM Plant Area		25	15	375	2		1			1		
a.	DM palnt bldg. Ground Floor		20	20	400	2		1			1		
b.	DM palnt bldg. First Floor		20	20	400	2		1			1		
12.0	Raw Water Pump House		30	10	300	2	1		1	1			
13.0	Chemical House		25	30	750	3		2			1		
14.0	CHP Control Building												
a.	Ground Floor		75	17.5	1312.5	5	1	1	1	1		1	

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			Length (m)	Width (m)			Pressurized water type (operated by CO2 cartridge type) - 9 Lit.	CO2 (4.5Kg.)	CO2 (22.5Kg.) Trolley Mounted	DCP (6Kg.)	DCP (25Kg.)	Mech. Foam (9 lit.)	Mech. Foam (50 lit.)
b.	First Floor		75	17.5	1312.5	5	1	1		2		1	
15.0	CW & ACW pump House		56	13	728	3	1	1			1		
16.0	CW pump House Control Room & Electrical Annexe		16	16	256	2		2		2			
17.0	Fuel oil Unloading Pump House		26	10	260	2						1	1
18.0	HFO & LDO Storage Area					3						2	1
19.0	Fuel oil Forwarding Pump House		30	15	450	2				1		1	
20.0	Chemical House of ISG		14	4	56	2	1			1			
21.0	Fire Station	PE-DG-410-650-C001											
a.	Ground Floor		20	15	300	2	1			1			
b.	First Floor		20	15	300	2	1			1			
22.0	Fire Water Pump House incldg. Swgr. Room (40x9 + 26x6.5)m				529	2	1	1		1			
23.0	Ash water Pump House		28	7	196	2		1		1			
24.0	Ash Slurry Pump House		30	13	390	2		1		1			
25.0	AHP Silo Utility MCC room		35	12	420	2		1			1		
26.0	Centrifuge Bldg.		27	15	405	2	1			1			
27.0	CHP MCC Room		40	12	480	2		1			1		
28.0	Make up Water Pump House		24	8	192	2		1		1			
29.0	DS pump House		30	35	1050	4	2	1		1			
30.0	Workshop		15	60	900	3		1	1	2			
31.0	Ash Compressor house/ Blower House		45	23	1035	4	1	1		2			
32.0	Wagon Tippler Area incldg. Control room				1500	5	1	1		2	1		
33.0	Silo Utility Building		20	6	120	2		1		1			
34.0	Training & Simulator Room		30	25	750	3	1	1		1			
35.0	Chlorination & CW treatment Area		40	25	1000	4	1	1	1	1			
36.0	CPU Regeneration Unit		50	30	1500	5	1	1	1	2			
37.0	Crusher House												
a.	Floor @ El.5.0m		24	24	576	2		1		2			
b.	Floor @ El. 16.0m		36	18	648	3		1		2			
c.	Floor @ El. 22.5m		36	18	648	3		1		2			
d.	Floor @ El. 27.0m		36	18	648	3		1		2			
e.	Floor @ El. 34.0m		36	18	648	3		1		2			
38.0	Gate House												
a.	Floor @ El. -1.0m		15	15	225	2	1	1		1			
b.	Floor @ El. 3.0m		15	15	225	2	1	1		1			

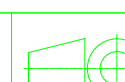
Sl. No.	Name of Area	Reference Dwg. No.	Size		Area (m ²)	No. of Extinguishers required as per TAC (Equivalent to no. of water type ext. calculated as per Cl. 4.1.3.2 of TAC)	No.of Extinguishers Provided as per TAC (Clause No. 4.1.3.2 and 4.1.3.8)						
			Length (m)	Width (m)			Pressurized water type (operated by CO2 cartridge type) - 9 Lit.	CO2 (4.5Kg.)	CO2 (22.5Kg.) Trolley Mounted	DCP (6Kg.)	DCP (25Kg.)	Mech. Foam (9 lit.)	Mech. Foam (50 lit.)
c.	Floor @ El. 7.0m		15	15	225	2	1	1		1			
39.0	Transfer House TP-1 to 13												
a.	@ Two in each floor for three floors of each TP					78	39			39			
40.0	Foam Pump House		10	8	80	2		1		1			
41.0	Booster Pump House		12	8	96	2		1		1			
42.0	Indoor Stores (Permanent)		75	20	1500	5	2		1	2			
43.0	Gas Cylinder Shed		16	8	128	2				1		1	
44.0	Weigh Bridge		20	10	200	2		1		1			
45.0	Clarified Water pump house		28	7	196	2	1	1		1			
46.0	Bulldozer Shed		20	10	200	2		1		1			
47.0	CMB Waste Treatment system		36	25	900	3	2	1			1		
48.0	Ambient Air Quality Monitoring station		4	4	16	2		1					
						409	98	97	14	170	22	13	5

0-38316-00035



RAW WATER
RESERVOIR
FOR UNIT # 12

HUME PIPE DETAILS (CONT. FROM SHEET NO. 01)

CUSTOMER		TELANGANA STATE POWER GENERATION CO. LTD.											
CUSTOMER'S CONSULTANT		DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS											
PROJECT		*1800 MW KOTHAGUDEM TPS,STAGE-VII,UNIT-12 PALACHA, TELANGANA								JOB NO. 411			
		BHARAT HEAVY ELECTRICALS LTD. HYDERABAD PROJECT ENG'G & SYSTEMS DIVISION											
DEPT. FID. CODE 450		UNTIL DMS. 9/4/77		 SCALE 1:2500		WEIGHT (KG)		REF. TO ASSY. DRG. -N-		ITEM NO. -003-		NO. OF ITEMS -N-	
TITLE		COMPOSITE LAYOUT OF HYDRANT & SPRAY SYSTEM				CARD CODE NA		BHEL DRG. NO. 0-38316-0003 CLUST. DRG. NO. 0-38316-0003 SHT. NO. 02 NO. OF SHT. 03				REV. 02	

