BM ULTRA COMPACT / REMOTE – UC SERIES

ULTRASONIC LEVEL INSTRUMENTS (Compact/Remote version)



DESCRIPTION

The ultrasonic impulses generated from transducers "antenna system", which travel at the speed of sound, come reflected by the surface of medium and newly sent back to the transducer.

The period of time that passes between the emission of impulses and the reception of the same ones from the antenna, is proportional to the existing distance between the same antenna and the higher level of the medium to measure, therefore the principle of the ultrasonic measure can be illustrated with the following equation:

S=CXT/2, where S: distance, C: velocity of sound, T: time lapse

Because of the wideband impulses, the overlap between the emission and the reception of the same impulses increases in particular zones, extending itself from the transducer to the bottom, causing a wrong measurement of the level. This error zone is defined "blanking zones" and its dimension vary based on the various models of ultrasonic meters that are used.

The use of an advanced microprocessor and the technology "EchoDiscovery", allows the user of the instrument also in critical zones with heavy jobs. The function "False echo storage" assures the device to identify the correct echo also in presence of false ECHO, supplying correct measures. The integrated temperature sensor puts into effect a temperature compensation in real time.

PRODUCTS OVERWIEV – TECHNICAL DETAILS

UC551



UC552



UC553



NOTE: Pictures are showing Aluminium Housings

DISPLAY

The instruments can be set up in 3 ways:

1. by display
2. by BMware software
3. by HART program

.



REMOTE UNIT – RU



BM ULTRA COMPACT / REMOTE

TECHNICAL DETAILS

UC552



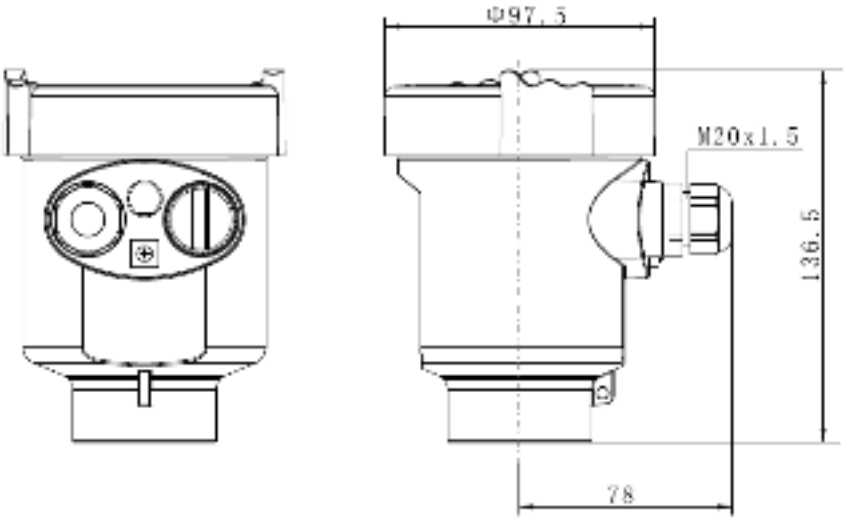
Applications:
Level measurement, suitable for highly corrosive media.
Flow measurement on open channel;

Range:	0.25…10m
Accuracy:	0.2 … 0.5 % end scale
Process connection:	G2“ A
Ultrasonic transducer:	Compact
Materials: sensor:	PBT-GF / PVDF/PTFE
housing:	plastic PBT-GF / Aluminium
Protection:	IP67
Working temperature:	-40 ÷ 70°C
Storage temperature:	-40 ÷ 80°C
Relative umidity:	<95%
Pressure of use:	-0.2…1 bar
Resistance to vibrations:	mechanical vibrations 10m/s2, 10÷15
Frequency:	35 KHz
Angle emission lobe:	5.5°
Interval of measure:	~2sec
Interval of updating:	~3sec
Resolution display:	1mm
Supply 2 wires version:	
- Input voltage:	15÷36Vdc
- Absorption:	max. 22.5mA
- Ripple allowed:	<100Hz, Uss>1V; 100Hz÷100KHz, U
Supply 4 wires version:	
- Standard input voltage:	24Vdc ±10%;
- Absorption:	max. 4VA, 2.1W
Output signal:	2/4 wires 4-20 mA, HART
Resolution:	1,6µA
Fixed signal for anomaly:	20.5mA; 22mA; 3.8mA
Resistance 2 wires version:	see following diagram
Resistance 4 wires version:	max 500 ohm
Integration time:	------
Cables entry:	1x PG 13.5
Weight:	1.8…3 kgs

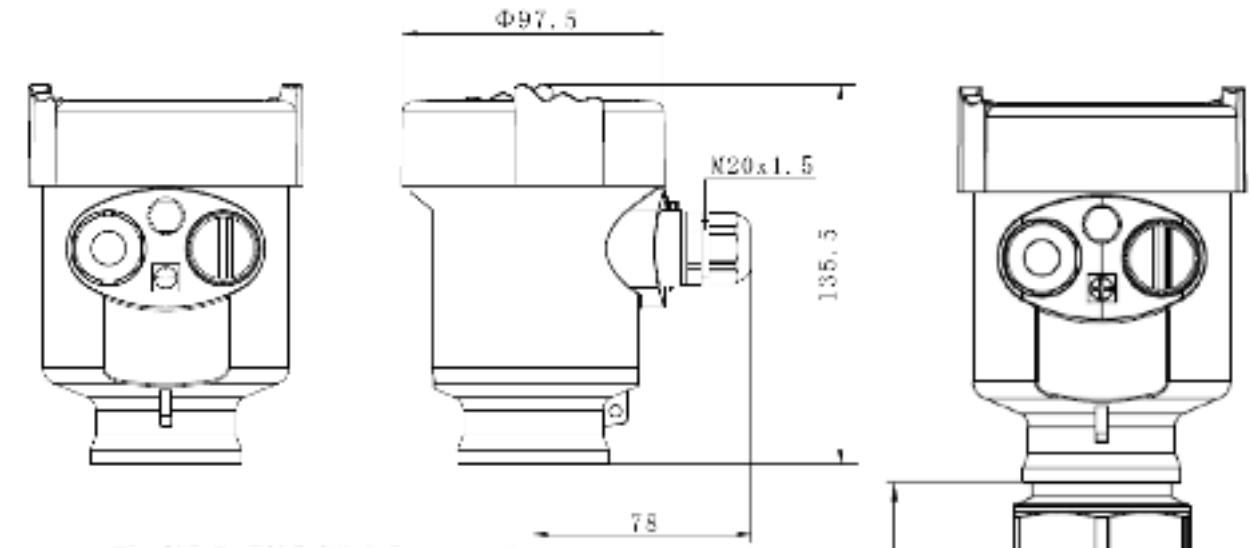
BM ULTRA COMPACT / REMOTE

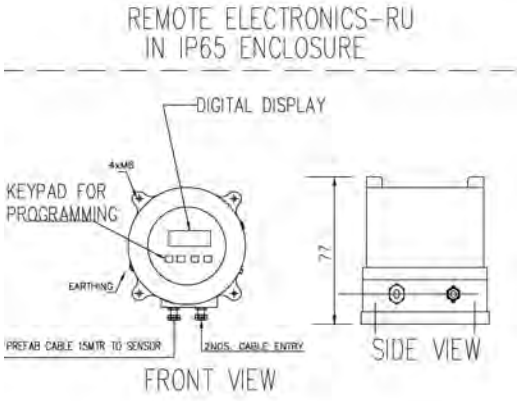
DIMENSIONS UC552

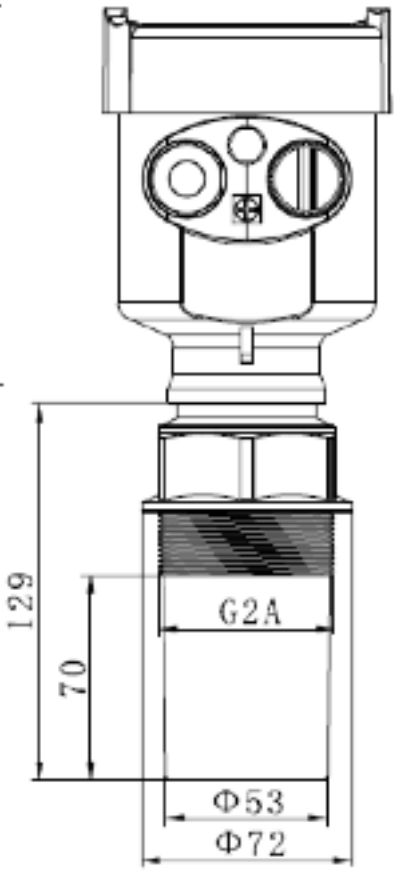
Dimensions with AL frame



Dimensions with PBT-GF frame







BM ULTRA COMPACT / REMOTE

ORDERING CODE UC552

P Standard
RU Remote Electronics and Sensor

Material / Working temperature / Protection

A PBT-GF /-40…70°C / IP66
B PVDF / -40…70°C / IP67
C PTFE

Electronic

A 4…20 mA 2 wires
B 4…20 mA / HART (2 wires)/Intrinsic Safe 'ia' (OPTIONAL)*
C 4…20 mA / 22,8…26,4 VDC / HART (2 wires) / HART (4 wires)
D 4…20 mA / 198…242 VAC / HART (4 wires)**

Material of Housing / Protection

A Aluminium / IP67
B Plastic / IP66
D Aluminium 2 chambers / IP67/Explosion Proof Ex 'd' (OPTIONAL)*
G Stainless Steel 316L / IP67

Wiring

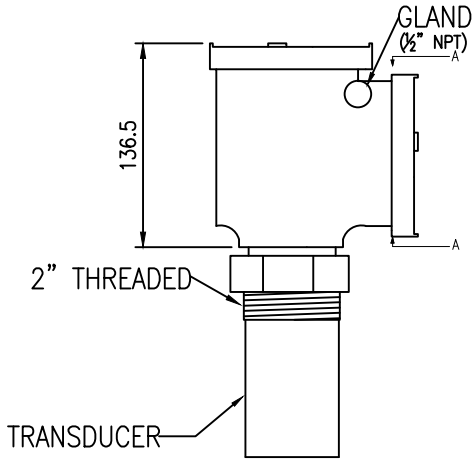
M M20x1.5
N ½ NPT

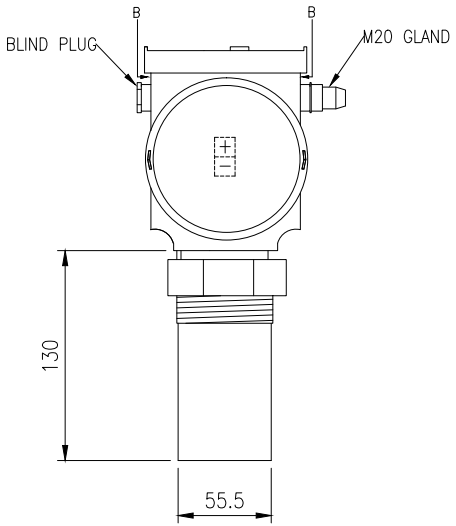
Display / Programming

A YES

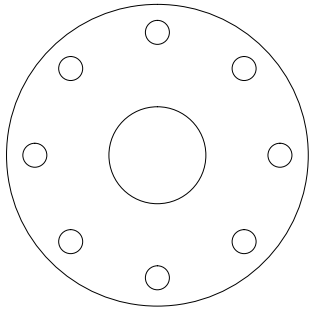
* To be Specified during ordering

UNLESS OTHERWISE STATED ALL DIMENSIONS ARE IN MILLIMETRES. DO NOT SCALE. IF IN DOUBT, ASK.



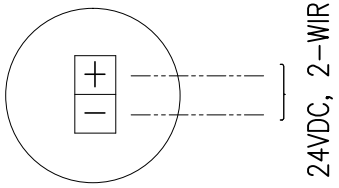


FRONT VIEW

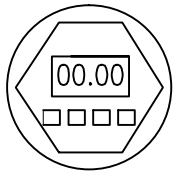


OD	: 225 mm
PCD	: 180 mm
NO. OF BOLT HOLES	: 08 NOS
BOLT HOLE SIZE	: 18.0 mm
THICKNESS	: 20 mm
MOC	: PP

INSTRUMENT FLANGE



TERMINAL DETAIL
VIEW A–A



TOP VIEW
VIEW B–B

ULTRASONIC LEVEL TRANSMITTER
(INTEGRAL TYPE)

NOTE:

1. ALL DIMENSIONS ARE IN mm WITH ±10%.
2. THE SENSOR SHOULD PROTRUDE OUTSIDE THE TOP OF THE SILO/TANK.

REV NO.	ZONE	DESCRIPTION	PPD	CHD	APPD	DATE

PROJECT	PRE-TREATMENT PLANT ENNORE
OWNER	TANGEDCO
OWNER'S ENGINEER	DESEIN PRIVATE LIMITED, CONSULTING ENGINEERS
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED
SUPPLIER	OTOKLIN GLOBAL BUSINESS LIMITED
DESCRIPTION	GA OF ULTRASONIC TRANSMITTER (INTEGRAL)

	NAME		DATE

SIZE A4 DO NOT SCALE

DOC NO : -

REV 00

OTOKLIN GLOBAL BUSINESS LIMITED	TECHNICAL DATSHEET AND HOOK UP DRAWING FOR TRANSMITTERS					
CLIENT	**BHARAT HEAVY ELECTRICALS LTD.**			**Project Doc No.:** PE-V0-412-158-A047		
PROJECT	**PreTreatment Plant Ennore**			**OTOKLIN DOC NO:-** OGBL/OC-983/TDSHKUP/TRA/PTP/18/330		
				MADE BY FN	**CHKD BY** MI	**APPD BY** AA	**Rev No:-** 3

SR. NO.	DISCRIPTION					REMARK
2.0	**DATA SHEET FOR FLOW TRANSMITTER**					
2.01	Type	Electromagnetic Type Suitable with process medium with <= 5 micro siemens conductivity.(R1)		Ultrasonic type		
2.02	Analog output	4-20 mA. With digital HART ans scalable pulse output.		4-20 mA with HART Protocol		
2.03	Operating Voltage	12-42 Volts DC		12-24 Volts DC		
2.04	Element / Housing material	Liner -PTFE & Electrode SS316L		Aluminium		
2.05	Enclosure class	IP-66		IP-65		
2.06	Accuracy	±0.2% of span or better (R2)		±0.2 mm		
2.07	Repeatability	±0.1 % of span or better		±0.2 % of measuring		
2.08	Process Connection	SS 316 Flanged (R2)		1.5 " NPT (M)		
2.09	Totaliser	local digital display configurable as totaliser		Provided		
2.10	Turn Down Ratio	-		1:100		
2.11	Accessories	Companion Flanges,SS tag plates ,gaskets, Nut s& Bolts etc,All the outdoor field instruments such as analysers/transmitters/meters etc. will be provided with suitable Free standing cabinet(s)/panel/rack so that the equipments are protected against rain/ sunlight etc. (R2)		SS tag plates,All the outdoor field instruments such as analysers/transmitters/meters etc. will be provided with suitable Free standing cabinet(s)/panel/rack so that the equipments are protected against rain/ sunlight etc,local indication will be provided only where the field instrument display will be difficult to sight. (R2)		
2.12	Cable Connection	1/2 " NPT (F) withdouble compression type Nickel-plated brass cable gland.(R1)		1/2 " NPT (F) withdouble compression type Nickel-plated brass cable gland.(R1)		
2.13	Zero Stabilty Feature , Zero and span field adjustable	Provided (R1)		Provided (R1)		
2.14	Range M3/HR	0-2600	0-600	0-1400	0-1400	0-2600	
2.15	KKS No.	90GBD01CF001	90GBS45CF001	90GBD03CF001 90GBD03CF002	90GBD10CF001	90GBD02CF001	
2.16	Line size	800 NB	400 NB	800 X 810	800 X 1610	1000 x 1330	
2.17	Qty.	1	1	2	1	1	
2.18	Model No. (R3)	FEP311.300.A.1.D.2.A1.D.1.B.1.A.0.A.1.B.2.C.1-AY.H1.JA.T3.M5	FEP311.600.A.1.D.2.A1.D.1.B.1.A.0.A.1.B.2.C.1-AY.H1.JA.T3.M5	LST300.Y0.C06.U5.B1.L1.H1.CE.L7.M5	LST300.Y0.C06.U5.B1.L1.H1.CE.L7.M5	LST300.Y0.C06.U5.B1.L1.H1.CE.L7.M5	
2.19	Origin Country	Italy		China		
2.20	Make	ABB				

ProcessMaster FEP300
Electromagnetic flowmeter

The process industry's first choice

Measurement made easy



One solution for all your needs
— The versatile product tailored to meet all your process applications

Versatile and simple configuration
— Through glass configuration eliminating the need to remove the cover and reducing commissioning time
— Soft key based functionality
— “Easy Set-up” function

State-of-the-art memory technology
— Revolutionary data storage enables transmitter interchange without the need for reconfiguration

ScanMaster in situ verification software option
— Allows the customer to perform in-situ verification of the flowmeter and plant

Advanced diagnostics for real-life situations
— Simplified plant trouble shooting increases productivity and process safety
— Status messages in accordance with NAMUR
— Help texts in the display

Un-paralleled service ability
— Fault finding help texts in the display
— Minimized down time with replaceable electronics cartridge
— Universal transmitter reduces spare parts inventory costs and storage costs

Approvals for explosion protection
— In accordance with ATEX, IECEx, FM, cFM, NEPSI and GOST

HART, PROFIBUS PA, FOUNDATION Fieldbus
— Access to all status information

Overview – models

Integral mount design

FEP311
(without explosion protection)

1), 3) 2), 3) 2), 4) 2), 5)



G01082-02

FEP315
(Zone 2 / Division 2)

1), 3) 2), 3) 2), 4)



G00487-02

FEP315
(Zone 1 / Division 1)

2), 3) 2), 4)



G00886-02

Measured error	Default: 0.4 % of measured value, 0.2 % of measured value
Nominal diameter range	DN 3 ... 2000 (1/10 " ... 80 ")
Process connection[6)]	Flange in accordance with DIN 2501 / EN 1092-1, ASME B16.5 / B16.47, JIS, AS2129
Nominal pressure	PN 10 … 100, ASME CL 150, 300, 600, 900, 1500, 2500
Liner	Hard rubber (DN 15 ... 2000), soft rubber (DN 50 ... 2000), PTFE (DN 10 ... 600), PFA (DN 3 ... 200), ETFE (DN 25 ... 600), Linatex (DN 50 ... 600)
Conductivity	> 5 µS/cm (20 µS/cm for demineralized water)
Electrodes	Stainless steel, Hastelloy B, Hastelloy C, platinum-iridium, tantalum, titanium, tungsten carbide
Process connection material	Steel, stainless steel
IP rating	IP 65, IP 67
Measuring medium temperature	-25 ... 180 °C (-13 ... 356 °F)
Power supply	100 ... 230 V AC (-15 / +10%), 24 V AC (-30 / +10%), 24 V DC (-30 / +30%)
current output	4 ... 20 mA, active or passive
Pulse output	Can be configured locally as active or passive using software
Switch output / switch input	Optoelectronic coupler, programmable function
Display	Graphical display, configurable
Housing	Integral mount design: choice of single-compartment housing or dual-compartment housing.
Communication	HART protocol (standard), PROFIBUS PA, FOUNDATION Fieldbus (option)
Explosion protection approvals	• ATEX / IECEx zone 1, 2, 21, 22 • FM / cFM Cl 1 Div 1 (≤ DN 300), Cl 1 Div 2 • NEPSI zone 1, 2 • GOST zone 1, 2
Pressure Equipment Directive 97/23/EC	Conformity assessment in accordance with category III, fluid group 1
CRN (Canadian Reg.Number)	On request

1) Single-compartment housing.
2) Dual-compartment housing.
3) Design level "B" sensor.
4) Design level "B" sensor, all versions made from stainless steel.
5) Design level "C" sensor, DN 25 … 600.
6) For information on flange thicknesses, see the chapters entitled "Dimensions for sensor design level „B"" on page 37 and "Dimensions for sensor design level „C"" on page 43.

Specification - general

Reference conditions

According to EN 29104

Fluid temperature	20 °C (68 °F) ± 2 K
Ambient temperature	20 °C (68 °F) ± 2 K
Supply power	Nominal voltage acc. to name plate U_n ± 1 %, frequency f ± 1 %
Installation conditions	- Upstream >10 x DN, straight section - Downstream >5 x DN, straight section
Warm-up phase	30 min.

Maximum measuring error

Impulse output

- Standard calibration:
  ± 0.4 % of measured value,
  ± 0.02 % $Qmax_{DN}$ (DN 3 … 2000)
- Optional calibration:
  ± 0.2 % of measured value,
  ± 0.02 % $Qmax_{DN}$ (DN 10 … 600, 800)

$Qmax_{DN}$: See table in Section "Flowmeter sizes, flow range" on page 7.

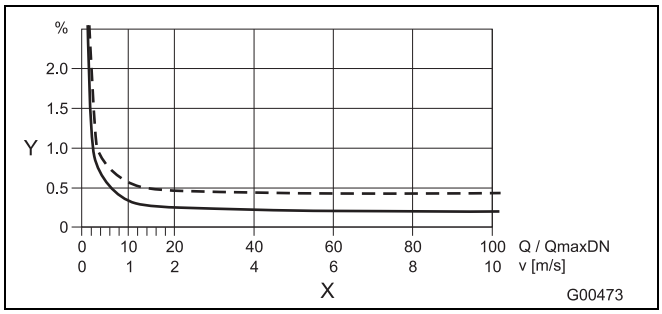


Fig. 1

Y Accuracy ± of measured value in [%]
X Flow velocity v in [m/s], Q / $Qmax_{DN}$ [%]

Analog output effects

Same as pulse output plus ± 0.1 % of measured value ± 0.01 mA

Reproducibility, response time

Reproducibility	≤ 0.11 % of measured value, t_{meas} = 100 s, v = 0.5 ... 10 m/s
Response time of current output with damping of 0.02 seconds	As step function 0 ... 99 % 5 τ ≥ 200 ms at 25 Hz excitation frequency 5 τ ≥ 400 ms at 12.5 Hz excitation frequency 5 τ ≥ 500 ms at 6.25 Hz excitation frequency

Specifications - sensor

IP rating

In accordance with EN 60529
IP 65, P 67, NEMA 4X
IP 68 (for remote mount design only)

Pipe vibration

In accordance with EN 60068-2-6
Applicable to sensors in remote mount design and sensors in integral mount design with aluminum transmitter housing.
- In the 10 ... 58 Hz range, max. deflection 0.15 mm (0.006 inch)
- In the 58 ... 150 Hz range, max. acceleration 2 g

Installation length

The flange devices comply with the installation lengths specified in VDI/VDE 2641, ISO 13359, or according to DVGW (process sheet W420, design WP, ISO 4064 short).

Signal cable

For remote mount design only
A 5 m (16.4 ft) cable is included in the scope of delivery.
If more than 5 m (16.4 ft) is required, the cable can be ordered separately (for ordering information, see the table below or the chapter entitled "Accessories" on page 71).

	Signal cable	
Application	D173D031U01	D173D027U01
Non-Ex (< DN 15)	✕	✔
Non-Ex (≥ DN 15)	✔	✔
Zone 2 / Division 2 (< DN 15)	✕	✔
Zone 2 / Division 2 (≥ DN 15)	✔	✔
Zone 1 / Division 1 (all nominal diameters)	✕	✔

✕ Application not permitted
✔ Application permitted
Supplied as standard

On the transmitter design for use in Zone 1, Division 1 (model FET325), 10 m (32.8 ft) of signal cable is permanently connected to the transmitter.

Signal cable length and preamplifier

A preamplifier is required for cable lengths > 50 m (164 ft).
Maximum signal cable length between sensor and transmitter:

Preamplifier	Signal cable length
without	Max. 50 m (164 ft) for conductivity ≥ 5 µS/cm
with	Max. 200 m (656 ft) for conductivity ≥ 5 µS/cm

Temperature Data

The temperature range offered by the device is dependent on a number of different factors.
These factors include the measuring medium temperature, the ambient temperature, the operating pressure, the liner material and the approvals for the explosion protection.

Storage temperature

-40 ... 70 °C (-40 ... 158 °F)

Minimum permissible pressure depending on measuring medium temperature

Design level "B" sensor			
Liner	**Nominal Diameter**	**$P_{operating}$ at mbar abs.**	**T_{medium} [1)]**
Hard rubber	15 ... 2000 (1/2 ... 80")	0	< 90 °C (194 °F) < 80 °C (176 °F) [2)]
Soft rubber	50 ... 2000 (2 ... 80")	0	< 60 °C (140 °F)
PTFE	10 ... 600 (3/8 ... 24")	270 400 500	< 20 °C (68 °F) < 100 °C (212 °F) < 130 °C (266 °F)
Thick PTFE, high-temp. design	25 … 80 100 … 250 300	0 67 27	< 180 °C (356 °F) < 180 °C (356 °F) < 180 °C (356 °F)
PFA	3 ... 200 (1/10 ... 8")	0	< 180 °C (356 °F)
ETFE	25 ... 600 (1 ... 24")	100	< 130 °C (266 °F)
Linatex[2)]	50 ... 600 (2 … 24“)	0	< 70 °C (158 °F)

Design level "C" sensor			
Liner	**Nominal Diameter**	**$P_{operating}$ at mbar abs.**	**T_{medium} [1)]**
Hard rubber	40 ... 600 (1 1/2 ... 24")	600	< 80 °C (176 °F)
PTFE	25 ... 600 (1 ... 24")	270 400 500	< 20 °C (68 °F) < 100 °C (212 °F) < 130 °C (266 °F)

1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the table entitled "Maximum permissible cleaning temperature".
2) For China production site only.

Liner approvals on request; please contact ABB.

Maximum permissible cleaning temperature

CIP cleaning	Sensor lining	T_{max}	T_{max} minutes	$T_{amb.}$
Steam cleaning	PTFE, PFA	150 °C (302 °F)	60	25 °C (77 °F)
Fluids	PTFE, PFA	140 °C (284 °F)	60	25 °C (77 °F)

If the ambient temperature is > 25 °C, the difference must be subtracted from the max. cleaning temperature. T_{max} - Δ °C (Δ °C = $T_{amb.}$ - 25 °C).

Maximum ambient temperature depending on measuring medium temperature

Note

When using the device in potentially explosive atmospheres, note the additional temperature data in the chapter entitled "Ex relevant specifications" on page 21.

Integral mount design (standard sensor)

Liner	Flange material	Ambient temperature		Measuring medium temperature	
		Minimum	Maximum	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F) -5 °C (23 °F) 1)	90 °C (194 °F) 4) 80 °C (176 °F) 1)
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F) -5 °C (23 °F) 1)	90 °C (194 °F) 4) 80 °C (176 °F) 1)
Soft rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	60 °C (140 °F)
Soft rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	60 °C (140 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) 2)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
PFA	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) 2)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
Thick PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) 2)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
ETFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
ETFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) 2)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)
Linatex 1)	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	70 °C (158 °F)
Linatex 1)	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F)	-20 °C (-4 °F)	70 °C (158 °F)

Integral mount design (high-temperature sensor)3)

Liner	Flange material	Ambient temperature		Measuring medium temperature	
		Minimum	Maximum	Minimum	Maximum
PFA	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
PFA	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) 2)	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
Thick PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	180 °C (356 °F)
Thick PTFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) 2)	60 °C (140 °F)	-20 °C (-13 °F)	180 °C (356 °F)
ETFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
ETFE	Stainless steel	-20 °C (-4 °F) -40 °C (-40 °F) 2)	60 °C (140 °F)	-20 °C (-13 °F)	130 °C (266 °F)

1) For China production site only.
2) For (optional) low-temperature version only.
3) With sensor design level "B" only.
4) The maximum measuring medium temperature is reduced to 80 °C (176 °F) for design level "C" sensors with a hard rubber liner.

Materials for sensors

Wetted parts

Part	Standard	Option
Liner	PTFE, PFA, ETFE, hard rubber, soft rubber	Linatex
Measurement and grounding electrode for: - Hard rubber - Soft rubber	Stainless steel 1.4571 (AISI 316Ti)	Hastelloy B-3 (2.4600), Hastelloy C-4 (2.4610), titanium, tantalum, platinum-iridium, 1.4539 (AISI 904L), tungsten carbide
- PTFE, PFA, ETFE	Stainless steel 1.4539 (AISI 904L)	Stainless steel 1.4571 (AISI 316Ti) Hast. C-4 (2.4610) Hast. B-3 (2.4600) Titanium, tantalum, platinum-iridium
Grounding plate	Stainless steel	On request
Protection plate	Stainless steel	On request

Non-wetted parts (process connection)

Design level "B" sensor


G01340

Nominal Diameter	Standard	Option
DN 3 ... 15 (1/10 ... 1/2")	Stainless steel[1)]	-
DN 20 ... 400 (3/4 ... 16")	Steel (galvanized)[2)]	Stainless steel [1)]
DN 450 ... 2000 (18 ... 80")	Steel (painted)[2)]	-

Design level "B" sensor


G01342

Nominal Diameter	Standard	Option
DN 25 ... 400 (1 ... 16")	Stainless steel (AISI 316, 316L)	-

Design level "C" sensor


G01341

Nominal Diameter	Standard	Option
DN 25 ... 600 (1 ... 24")	Steel (painted) [2)]	-

The process connections are made of one of the materials listed below:

1) 1.4301 (AISI 304), 1.4307, 1.4404 (AISI 316L) 1.4435 (AISI 316L), 1.4541 (AISI 321) 1.4571 (AISI 316Ti), ASTM A182 F304, ASTM A182 F304L, ASTM A182 F316L, ASTM A182 F321, ASTM A182 F316TI, ASTM A182 F316, 0Cr18Ni9, 0Cr18Ni10, 0Cr17Ni13Mo2, 0Cr27Ni12Mo3, 1Cr18Ni9Ti, 0Cr18Ni12Mo2Ti
2) 1.0038, 1.0460, 1.0570, 1.0432, ASTM A105, Q255A, 20#, 16Mn

Sensor housing

Design level "B" sensor


G01340

Housing	
DN 3 ... 400 (1/10 ... 16")	Pair case, cast aluminum, painted, paint coat, ≥ 80 µm thick, RAL 9002
DN 450 … 2000 (18 ... 80")	Welded steel design, painted, paint coat, ≥ 80 µm thick, RAL 9002
Terminal box	Aluminum alloy, painted, ≥ 80 µm thick, gray white, RAL 9002
Meter tube	Stainless steel [3)]
Cable gland[4)]	Polyamide
	Stainless steel (in the case of explosion-proof design for ambient temperature of -40 °C [40 °F])

Design level "B" sensor


G01342

Housing + meter tube	
DN 25 ... 400 (1 ... 16")	Stainless steel (AISI 316, 316L)
Cable gland[4)]	Polyamide

Design level "C" sensor


G01341

Housing + meter tube	
DN 25 ... 600 (1 ... 24")	Steel, painted, paint coat, ≥ 80 µm thick, RAL 9002
Terminal box	Aluminum alloy, painted, ≥ 80 µm thick, gray white, RAL 9002
Cable gland[4)]	Polyamide

The meter tube is made of one of the materials listed below:

3) 1.4301, 1.4307, 1.4404, 1.4435, 1.4541, 1.4571
ASTM materials:
Grade TP304, TP304L, TP316L, TP321, TP316Ti, TP317L, 0Cr18Ni9, 00Cr18Ni10, 0CR17Ni14Mo2, 0Cr27Ni12Mo3, 0Cr18Ni10Ti
4) Cable gland with M20x1.5 or NPT thread, to be selected via the order number.

Overview sensor design level "C"

Sensor Size	Pressure rating	Carbon steel flange	PTFE	Hard rubber	Electrode design: Standard	Sensor temp. Range: Standard Ambient temp. range: -20 ... 60 °C
DN 25 (1")	DIN PN 10, DIN PN 16, DIN PN 25, DIN PN 40 ASME CL 150, CL 300 JIS 10 K	X	X	—	X	X
DN 32 (1 1/4")		X	X	—	X	X
DN 40 (1 1/2")		X	X	X	X	X
DN 50 (2")		X	X	X	X	X
DN 65 (2 1/2")		X	X	X	X	X
DN 80 (3")		X	X	X	X	X
DN 100 (4")		X	X	X	X	X
DN 125 (5")		X	X	X	X	X
DN 150 (6")		X	X	X	X	X
DN 200 (8")		X	X	X	X	X
DN 250 (10")		X	X	X	X	X
DN 300 (12")		X	X	X	X	X
DN 350 (14")		X	X	X	X	X
DN 400 (16")		X	X	X	X	X
DN 450 (18")		X	X	X	X	X
DN 500 (20")		X	X	X	X	X
DN 600 (24")		X	X	X	X	X

Material load

Limits for the permissible fluid temperature (TS) and permissible pressure (PS) are calculated on the basis of the lining and flange material used in the device (refer to the name plate on the device).

Flowmeter sensor design level “B”

DIN flange stainless steel up to DN 600 (24")

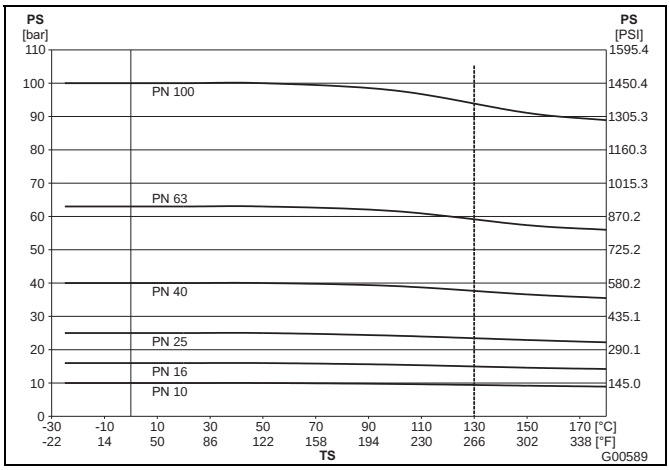


Fig. 2

ASME flange, stainless steel, up to DN 400 (16") (CL150/300) up to DN 1000 (40") (CL150)

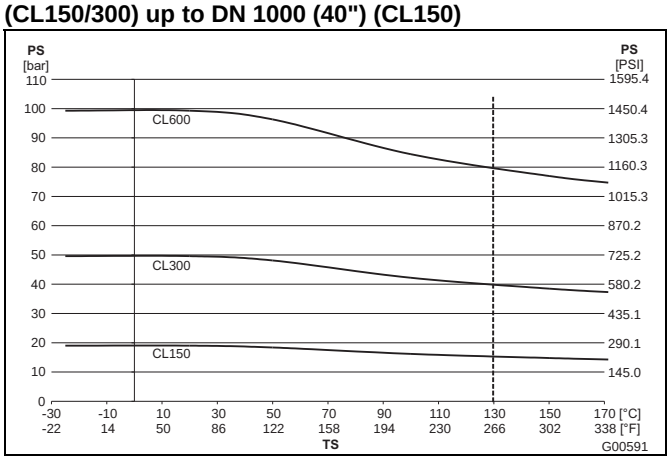


Fig. 3

DIN flange, steel, up to DN 600 (24")

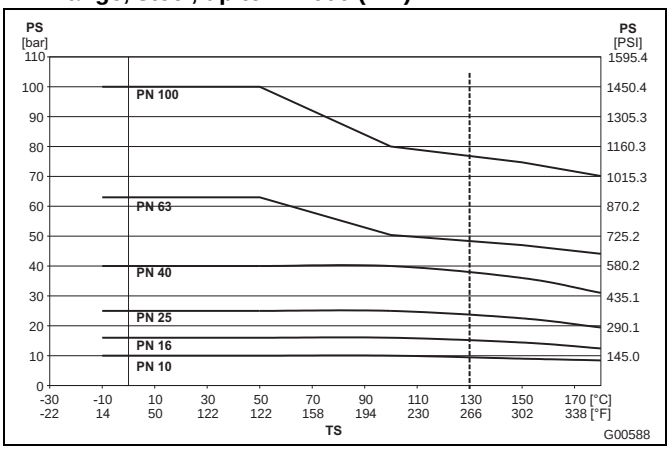


Fig. 4

ASME flange, steel, up to DN 400 (16") (CL150/300); up to DN 1000 (40") (CL150)

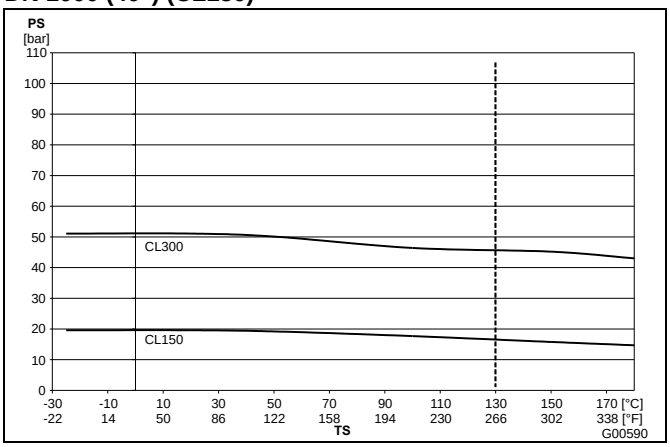


Fig. 5

JIS 10K-B2210 flange

Nominal diameter	Material	PN	TS	PS
32 ... 400 (1 1/4 ... 16")	Stainless steel	10	-25 ... 180 °C (-13 ... 356 °F)	10 bar (145 psi)
32 ... 400 (1 1/4 ... 16")	Steel	10	-10 ... 180 °C (14 ... 356 °F)	10 bar (145 psi)

DIN flange, stainless steel, DN 700 (28") up to DN 1000 (40")

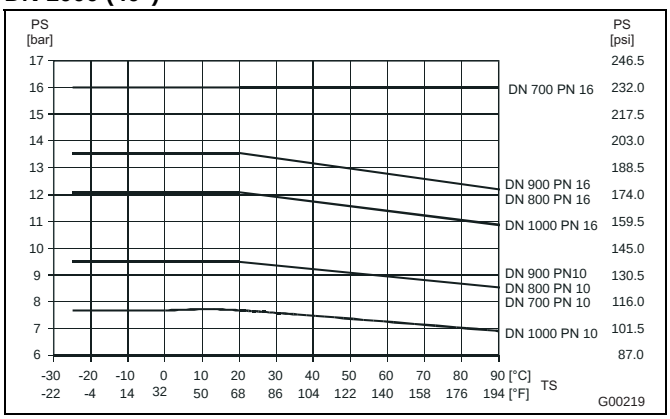


Fig. 6

DIN flange, steel, DN 700 (28") up to DN 1000 (40")

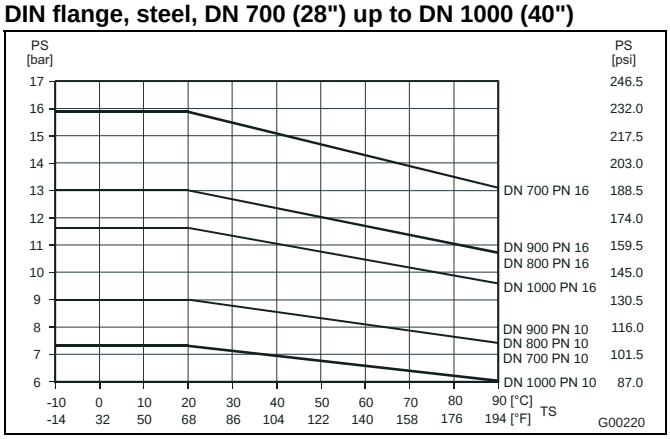


Fig. 7

ASME flange, Steel, DN 25 ... 400 (1 ... 24“)

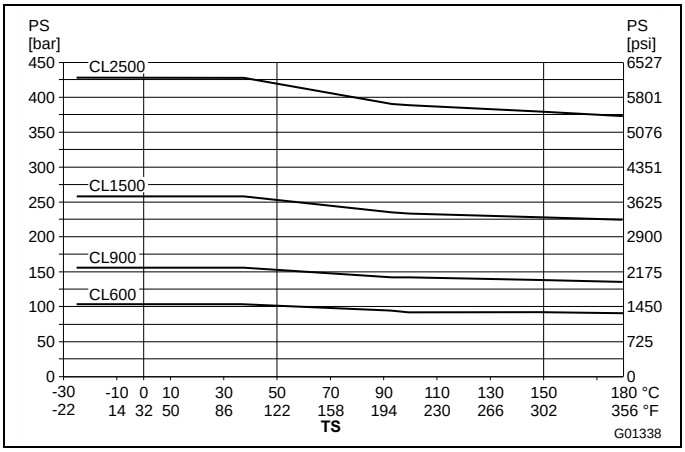


Fig. 8

ASME flange, stainless steel, DN 25 ... 400 (1 ... 24“)

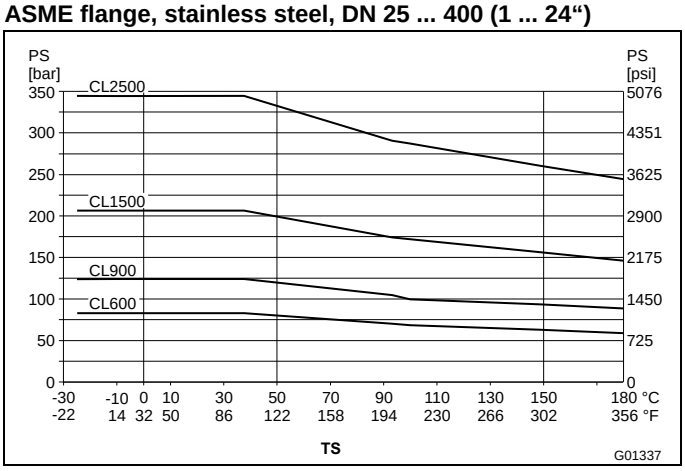


Fig. 9

Flowmeter sensor design level “C”

Steel casted housing, DN 25 ... 600 (1 ... 24“)

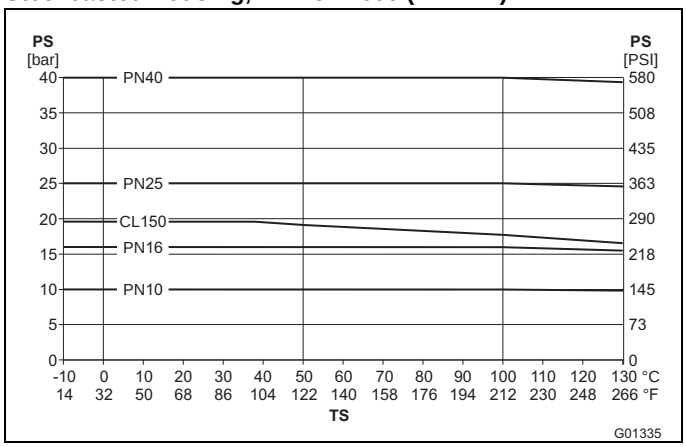


Fig. 10

Welded steel housing, DN 25 ... 600 (1 ... 24“)

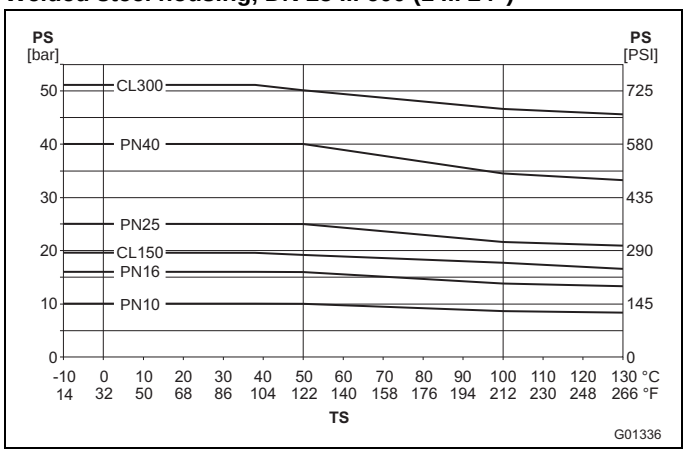


Fig. 11

Specifications - transmitter

IP rating

In accordance with EN 60529
IP 65, IP 67, NEMA 4X

Vibration

In accordance with EN 60068-2
Applicable to transmitters with remote mount design.
- In the 10 ... 58 Hz range, max. deflection 0.15 mm (0.006 inch) 1)
- In the 58 ... 150 Hz range, max. acceleration 2 g 1)

1) Peak load

Temperature Data

Ambient temperature
Standard: -20 ... 60 °C (-4 ... 140 °F)
Extended: -40 ... 60 °C (-40 ... 140 °F)

Storage temperature range
-40 ... 70 °C (-40 ... 158 °F)

Electrical data and options

Power supply

Supply voltage	100 ... 230 V AC (-15 % / +10 %), 47 ... 64 Hz 24 V AC (-30 % / +10 %), 47 ... 64 Hz 24 V DC (-30 % / +30 %), Ripple: < 5 %	
Power consumption	AC ≤ 20 VA Inrush current at 230 V: 8.8 A	DC 12 W Inrush current: 5.6 A
Screw terminals	Maximum 2.5 mm² (AWG 14)	

Isolation of inputs / outputs

The current output, digital outputs DO1 and DO2, and digital input are electrically isolated from the sensor input circuit and from each other. The same applies to the signal outputs of the versions with PROFIBUS PA and FOUNDATION Fieldbus.

Empty conduit detection

This function requires the following:
The conductivity of the measuring medium must be ≥ 20 µS/cm, the signal cable length must be ≤ 50 m (164 ft) and the nominal diameter DN must be ≥ DN 10. Furthermore, no preamplifier may be fitted to the sensor.

Mechanical properties

Integral mount design	Housing made of Aluminium	Housing made of stainless steel
Housing	Cast aluminum, painted	Stainless steel CF3M
Paint	Paint coat ≥ 80 µm thick, RAL 9002 (light gray)	-
Cable gland2)	Polyamide	Polyamide
	Stainless steel1)	Stainless steel1)

Remote mount design	
Housing	Cast aluminum, painted
Paint	Paint coat ≥ 80 µm thick, RAL 7012 (dark gray), front cover / rear cover RAL 9002 (light gray)
Cable gland2)	Polyamide
	Stainless steel1)
Weight	4.5 kg (9.92 lb)

1) In the case of hazardous area design for ambient temperature of -40 °C (40 °F)
2) Cable Gland with M20x1,5 thread or NPT thread with plug to be specified through modelcode

Electrical connections

HART, PROFIBUS PA and FOUNDATION Fieldbus protocols for devices that do not have an explosion-proof design

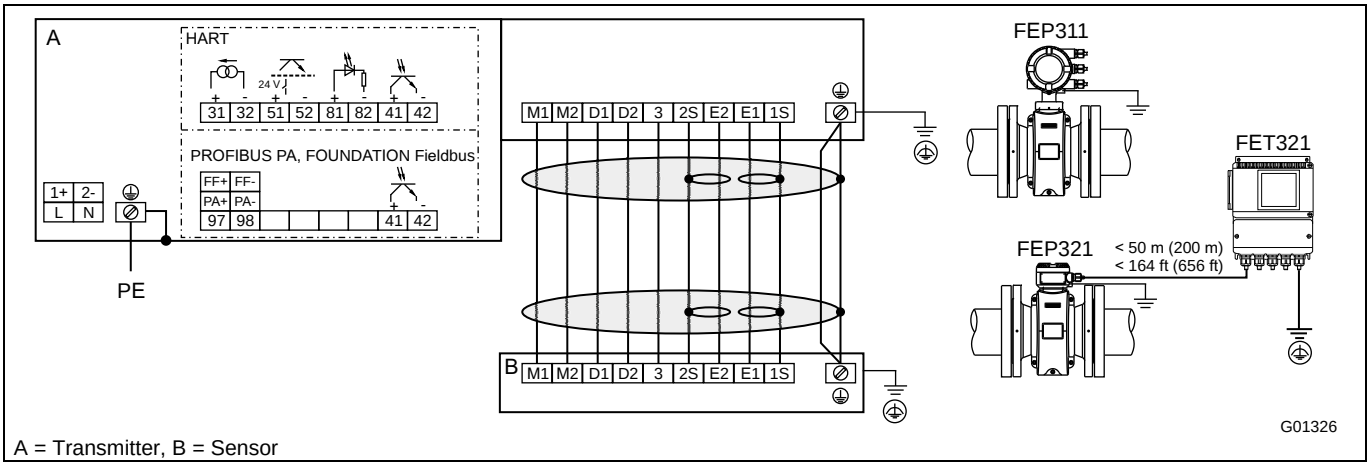


Fig. 12: HART-, PROFIBUS PA- and FOUNDATION Fieldbus protocol

Power supply connections

AC power supply	
Terminal	**Function / Notes**
L	Live / Phase
N	Neutral
PE / ⏚	Protective earth (PE)

DC power supply	
Terminal	**Function / Notes**
1+	+
2-	-
PE / ⏚	Protective earth (PE)

Sensor cable terminal connections

Only on remote mount design.

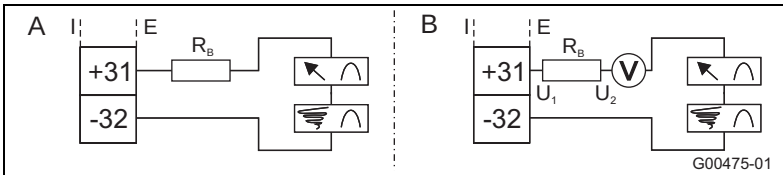
Terminal	Function / Notes	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
⏚ / SE	Shield	-
E1	Signal line	Violet
1S	Schield for E1	-
E2	Signal line	Blue
2S	Schield for E2	-
3	Measurement potential	Green

Output connections

Terminal	Function / Notes
31 / 32	**Current / HART output** The current output is available in "active" or "passive" mode.
97 / 98	**Digital communication** PROFIBUS PA (PA+ / PA-) or FOUNDATION fieldbus (FF+ / FF-) in acc. with IEC 61158-2.
51 / 52	**Digital output DO1 active / passive** Function can be configured locally as „Pulse Output" or „Digital Output". Factory setting is „Pulse Output".
81 / 82	**Digital input / contact input** Function can be configured locally as „External output switch-off", „external totalizer reset", „external totalizer stop" or „other".
41 / 42	**Digital output DO2 passive** Function can be configured locally as „Pulse Output" or „Digital Output". Factory setting is „Digital Output", flow direction signaling.
⏚	**Functional ground**

Electrical data

Current / HART output

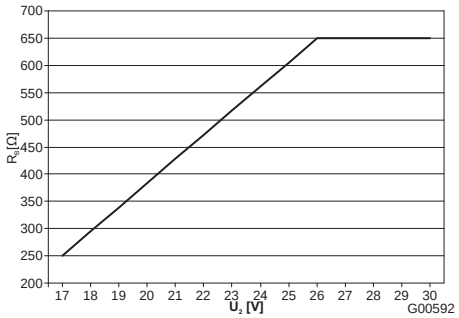


The current / HART output can be operated in "active" or "passive" mode.

A **Active:** 4 ... 20 mA, HART protocol (standard), load: 250 Ω ≤ R ≤ 650 Ω

B **Passive:** 4 ... 20 mA, HART protocol (standard), load: 250 Ω ≤ R ≤ 650 Ω
Supply voltage for the current output: minimum 11 V, maximum 30 V.

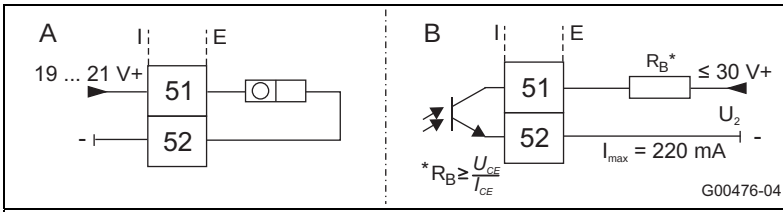
For Ex zone 1 / Div. 1 the maximum load is 300 Ω.



Max. permissible load (R_B) as a function of the source voltage (U_2)

Fig. 13: (I = internal, E = external)

Digital output DO1



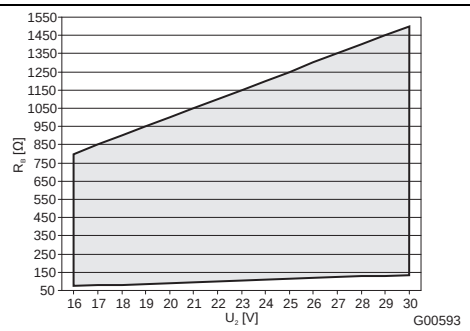
The output can be configured as an "active (A)" or "passive (B)" output (in the case of the transmitter with the dual-compartment housing, the output is configured using the software; in the case of the transmitter with the single-compartment housing, it is configured by means of jumpers on the transmitter backplane).

Configuration as "active" output:
- U = 19 ... 21 V, Imax = 220 mA , fmax ≤ 5250 Hz

Configuration as "passive" output
- Umax = 30 V, Imax = 220 mA, fmax ≤ 5250 Hz

Configuration as pulse output:
- Max. pulse frequency: 5250 Hz.
- Pulse width: 0.1 … 2000 ms.
- The pulse factor and pulse width are interdependent and are calculated dynamically.

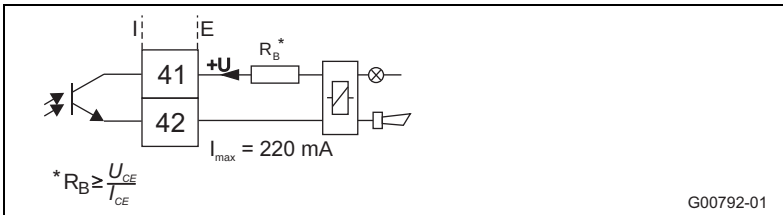
Configuration as contact output:
- Function: System alarm, empty pipe alarm, max. / min. alarm, flow direction signaling, other



Max. permissible load (R_B) as a function of the source voltage (U_2). ▒▒ = Permissible range

Fig. 14: (I = internal, E = external)

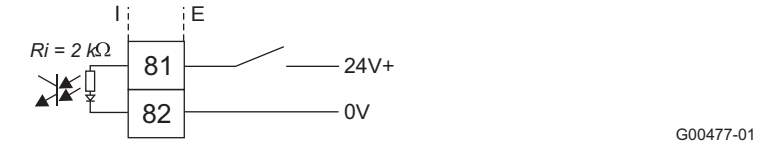
Digital output DO2



The output is always a "passive" output (optocoupler).
Data for the optocoupler:
U_{max} = 30 V, I_{max} = 220 mA, f_{max} ≤ 5250 Hz
For maximum load see diagram Fig. 14.

Fig. 15: (I = internal, E = external)

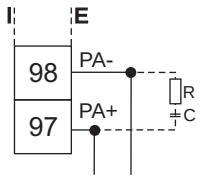
Digital input DI



Data for the optocoupler:
16 V ≤ U ≤ 30 V, Ri = 2 kΩ

Fig. 16: (I = internal, E = external)

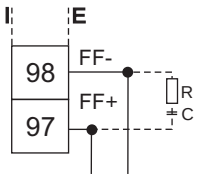
Digital communication



PROFIBUS PA (PA+ / PA-)

U = 9 ... 32 v, I = 10 mA (normal operation), I = 13 mA (in the event of an error / FDE)

Bus connection with integrated protection against polarity reversal. The bus address can be set via the DIP switches in the device (with dual-compartment transmitter housing only), the transmitter display or the fieldbus.



G00248-01

FOUNDATION Fieldbus (FF+ / FF-)

U = 9 ... 32 v, I = 10 mA (normal operation), I = 13 mA (in the event of an error / FDE)

Bus connection with integrated protection against polarity reversal

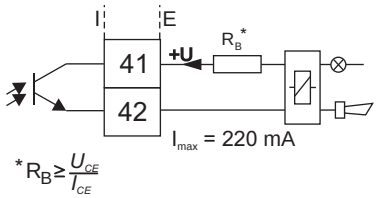
The resistance R and condenser C form the bus termination. They must be installed when the device is connected to the end of the entire bus cable. R = 100 Ω; C = 1 µF

Fig. 17: (I = internal, E = external)

Connection examples

Digital output DO2

E.g., for system monitoring, max. / min. alarm, empty meter tube or forward / reverse signal, or counting pulses (function can be configured using software)

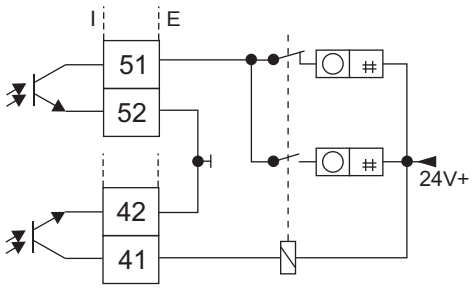


G00792-01

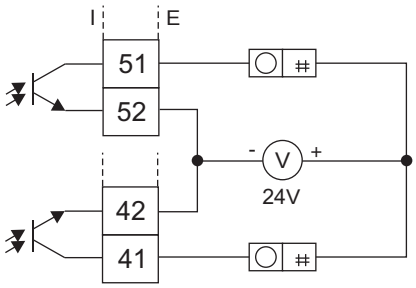
Fig. 18: (I = internal, E = external)

Digital outputs DO1 and DO2

Separate forward and reverse pulses



Separate forward and reverse pulses (alternative connection)

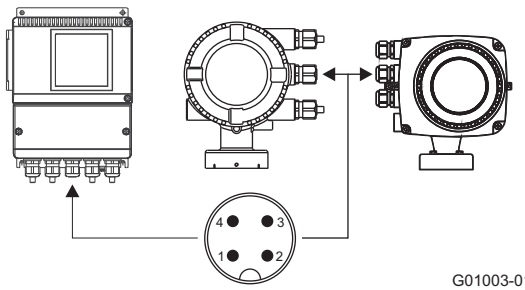


G00791

Fig. 19: (I = internal, E = external)

PROFIBUS PA - Connection via M12 plug

Only in non-hazardous areas



G01003-01

Pin assignment
(Front view showing pin insert and pins)
PIN 1 = PA+
PIN 2 = nc
PIN 3 = PA-
PIN 4 = shield

Fig. 20

Digital communication

HART protocol

The unit is registered with the HART Communication Foundation.

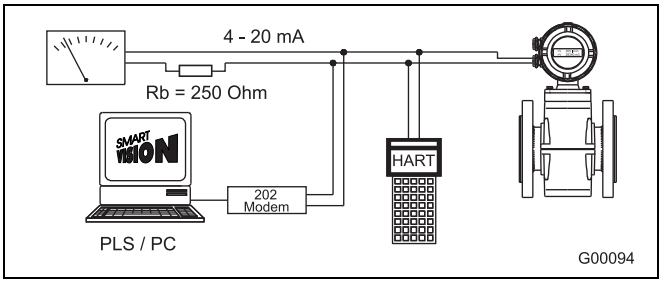


Fig. 21

Configuration	Directly on the device Software DAT200 Asset Vision Basic (+ HART-DTM)
Transmission	FSK modulation on current output 4 ... 20 mA acc. to Bell 202 standard
Max. signal amplitude	1.2 mA_{ss}
Current output load	Min. 250 Ω, max. = 560 Ω
Cable	AWG 24 twisted
Max. cable length	1500 m
Baud rate	1,200 baud
Display	Log. 1: 1,200 Hz Log. 0: 2,200 Hz

For additional information, see separate interface documentation.

System integration

In conjunction with the DTM (Device Type Manager) available for the device, communication (configuration, parameterization) can occur with the corresponding framework applications according to FDT 1.21 (DAT200 Asset Vision Basic).

Other tool/system integrations (e.g., Emerson AMS/Siemens PCS7) are available upon request.

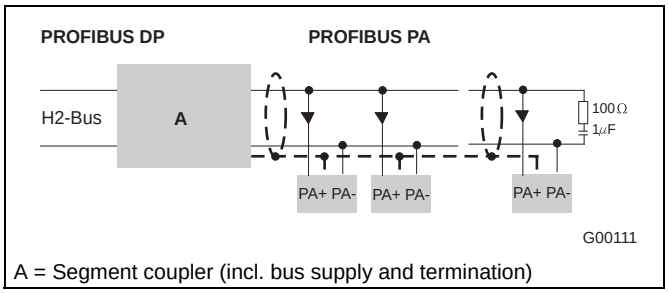
A free of charge version of the DAT200 Asset Vision Basic framework application for HART® or PROFIBUS is available upon request.

The required DTMs are contained on the DAT200 Asset Vision Basic DVD or in the DTM Library.

They can also be downloaded from www.abb.com/flow.

PROFIBUS PA

The interface conforms to profile 3.01 (PROFIBUS standard, EN 50170, DIN 19245 [PRO91]).



A = Segment coupler (incl. bus supply and termination)

Fig. 22: Example for PROFIBUS PA interface connection

PROFIBUS PA ID no	0x3430
Alternative standard ID no	0x9700 or 0x9740
Configuration	Directly on the device Software DAT200 Asset Vision Basic (+ PROFIBUS PA-DTM)
Transmission signal	Acc. to IEC 61158-2
Cable	Shielded, twisted cable (acc. to IEC 61158-2, types A or B are preferred)

Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line (RC element R = 100 Ω, C = 1 µF)

Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device is ensures that the current consumption can rise to a maximum of 13 mA.
- The upper current limit is restricted electronically.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

For additional information, see separate interface documentation.

System integration

ABB provides three different GSD files (equipment master data) which can be integrated in the system.

Users decide at system integration whether to install the full range of functions or only part.

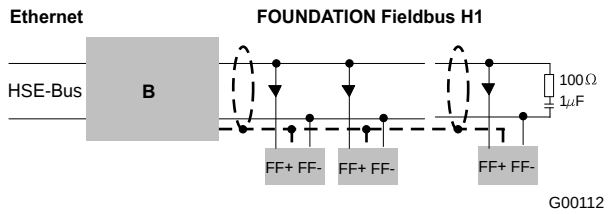
The change-over is done using the “ID-number selector” parameter.

ID number 0x9700, GSD file name: PA139700.gsd
ID number 0x9740, GSD file name: PA139740.gsd
ID number 0x3430, GSD file name: ABB_3430.gsd

The GSD files can be downloaded from www.abb.com/flow.

The files required for operation can be downloaded from www.profibus.com.

FOUNDATION Fieldbus (FF)



B = Linking device (incl. bus supply and termination)

Fig. 23: Example for FOUNDATION Fieldbus interface connection

Interoperability test campaign no.	ITK 5.20
Manufacturer ID	0x000320
Device ID	0x0124
Configuration	• Directly on the device • Via services integrated in the system • National configurator
Transmission signal	Acc. to IEC 61158-2

Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line (RC element R = 100 Ω, C = 1 µF)

Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device is ensures that the current consumption can rise to a maximum of 13 mA.
- Upper current limit: electronically restricted.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

Bus address

The bus address is automatically assigned or can be set in the system manually.
The identifier (ID) is formed using a unique combination of manufacturer ID, device ID, and device serial number.

System integration

The following are required:

- DD (Device Description) file, which includes the device description.
- The CFF (Common File Format) file is required for engineering the segment. Engineering can be performed online or offline.

The files can be downloaded from www.abb.com/flow.
The files required for operation can also be downloaded from http://www.fieldbus.org.

Installation requirements

Grounding

The flowmeter sensor must be connected to ground potential. For technical reasons, this potential should be identical to the potential of the metering fluid.

For plastic or insulated lined pipelines, the fluid is grounded by installing ground plates. When there are stray potentials present in the pipeline, a ground plate is recommended on both ends of the meter sensor.

Mounting

The following points must be observed during installation:

- The meter tube must always be completely full
- The flow direction must correspond to the marking, if present
- The maximum torque for all flange screws must be complied with These must be selected depending on the temperature, pressure, screw material, gasket material etc., and in accordance with the currently applicable regulations
- The devices must be installed without mechanical tension (torsion, bending)
- Flange devices with plane parallel counterflanges may only be installed with suitable gaskets
- Only flat gaskets made from a material that is compatible with the measuring medium and measuring medium temperature may be used
- Gaskets must not extend into the flow area, since possible turbulence could influence the accuracy of the device
- The piping may not exert any inadmissible forces or torques on the device
- Do not remove the sealing plugs in the cable glands until you are ready to install the electrical cable
- When using a separate transmitter, this must be installed at a location that is largely free of vibrations
- Do not expose the transmitter to direct sunlight and provide for appropriate sun protection where necessary

Flow direction

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 27.

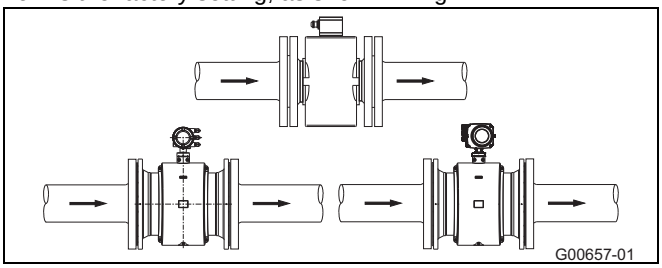


Fig. 27

Electrode axis

Electrode axis (1) should be horizontal if at all possible or no more that 45° from horizontal.

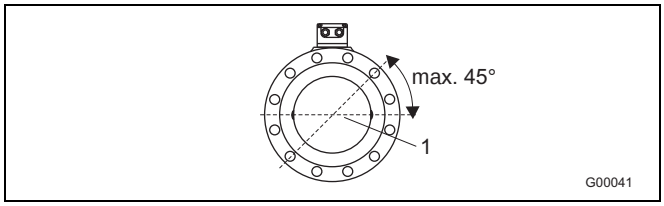


Fig. 28

Inlet and outlet pipe sections

The metering principle is independent of the flow profile as long as standing eddies do not extend into the metering section, such as may occur after double elbows (1), in the event of tangential inflow, or where half-open gate valves are located upstream of the flowmeter sensor.

In such cases, measures must be put in place to normalize the flow profile.

- Do not install fittings, manifolds, valves, etc., directly in front of the flowmeter sensor (1).
- Butterfly valves must be installed so that the valve plate does not extend into the flowmeter sensor.
- Valves or other turn-off components should be installed in the outlet pipe section (2).

Experience has shown that, in most installations, straight inlet sections 3 x DN long and straight outlet sections 2 x DN long are sufficient (DN = nominal diameter of the sensor Fig. 29).

For test stands, the reference conditions of 10 x DN straight inlet and 5 x DN straight outlet must be provided, in accordance with EN 29104 / ISO 9104.

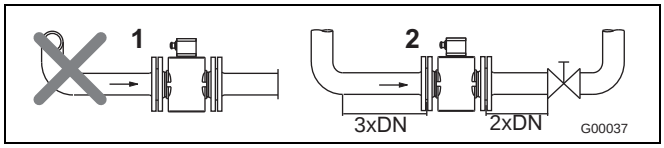


Fig. 29

Vertical connections

Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.

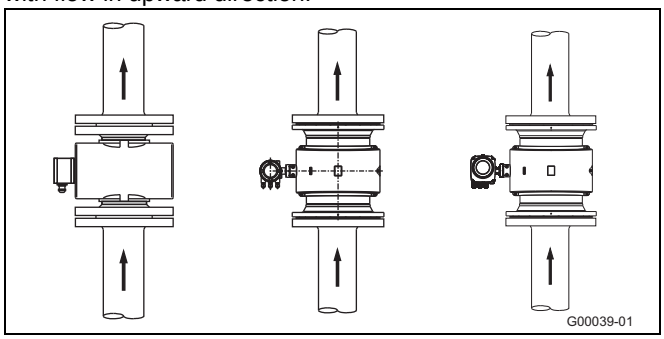


Fig. 30

Horizontal connections

- Meter tube must always be completely full.
- Provide for a slight incline of the connection for degassing.

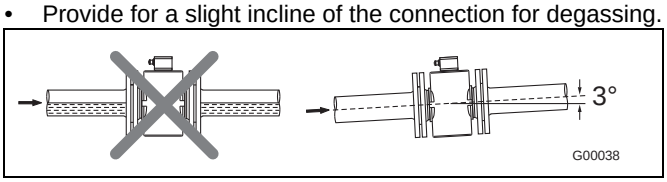


Fig. 31

Free inlet or outlet

- Do not install the flowmeter at the highest point or in the draining- off side of the pipeline, flowmeter runs empty, air bubbles can form (1).
- Provide for a siphon fluid intake for free inlets or outlets so that the pipeline is always full (2).

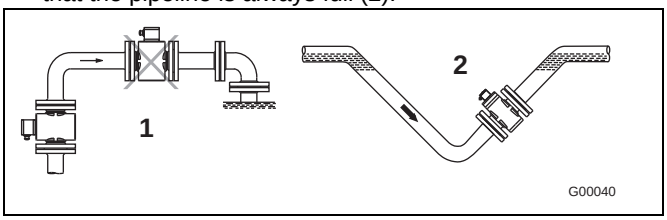


Fig. 32

Strongly contaminated measuring media

For strongly contaminated measuring media, a bypass connection according to the figure is recommended so that operation of the system can continue to run without interruption the during the mechanical cleaning.

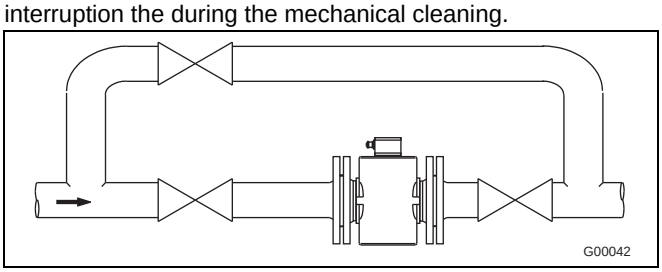


Fig. 33

Installation near pumps

If sensors are installed near pumps or other installations that cause vibration, the use of mechanical snubbers is recommended.

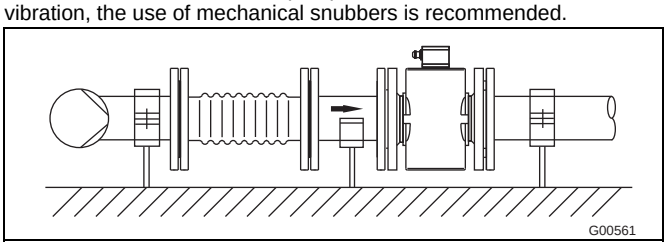


Fig. 34

Installation of the high temperature design

The high temperature design allows for complete thermal insulation of the sensor. The pipeline and sensor must be insulated after installing the unit according to the following illustration.

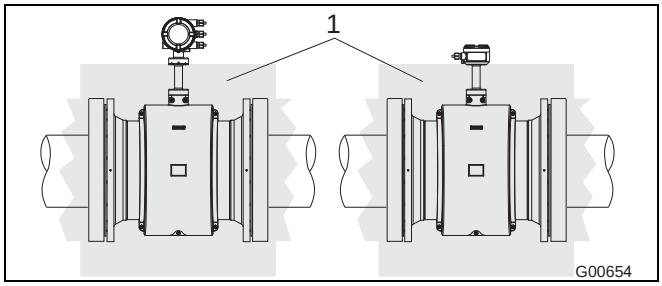


Fig. 35

1 Insulation

Installation in pipelines with larger nominal diameters

Determine the resulting pressure loss when using reduction pieces (1):

1. Calculate the diameter ratio d/D.
2. Determine the flow velocity based on the flow range nomograph (Fig. 37).
3. Read the pressure drop on the Y-axis in Fig. 37.

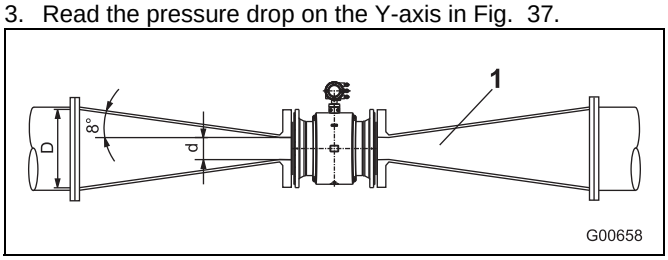


Fig. 36

1 Flange transition piece
d Inside diameter of the flowmeter
V flow velocity [m/s]
Δp pressure loss [mbar]
D Inside diameter of the pipeline

Nomograph for pressure drop calculations

For flange transition piece with $\alpha/2 = 8°$

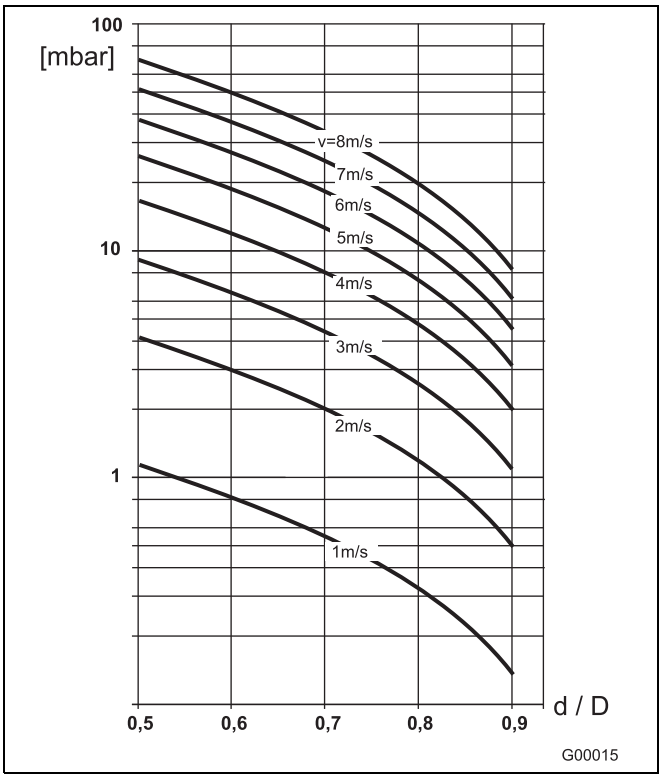


Fig. 37

Dimensions for sensor design level „C“

Flange DN 25 … 600 (18 … 24"), steel sensor housing

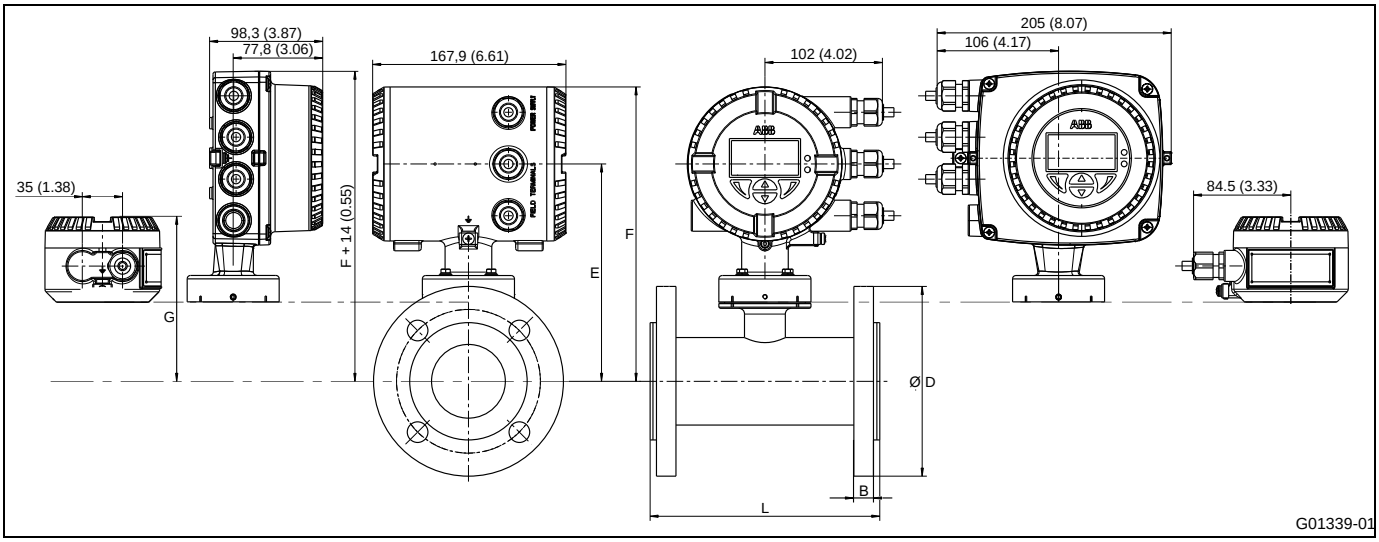


Fig. 41: Dimensions in mm (inches)

Dimensions mm (inch)								Approx. weight in kg (lb)	
DN	**Process connection**	**D**	**B**	**L [2) 3)]**	**F [4)]**	**E [4)]**	**G [4)]**	**Integral**	**Remote**
25 (1")	EN 1092-1 PN 10 ... 40 [1)]	115 (4.53)	23 (0.91)	200 (7.84)	244 (9.61)	177 (6.97)	131 (5.16)	9 (20)	7 (15)
	ASME B16.5 CL 150	115 (4.53)	23 (0.91)						
	ASME B16.5 CL 300	125 (4.92)	22 (0.87)						
	JIS 10K	115 (4.53)	23 (0.91)						
	AS2129 table D AS2129 table E	115 (4.53)	23 (0.91)						
32 (1 1/4")	EN 1092-1 PN 10 ... 40 [1)]	150 (5.91)	25 (0.98)	200 (7.84)	249 (9.80)	182 (7.17)	136 (5.35)	10 (22)	8 (18)
	ASME B16.5 CL 150	150 (5.91)	25 (0.98)						
	ASME B16.5 CL 300	135 (5.31)	23 (0.91)						
	JIS 10K	150 (5.91)	25 (0.98)						
	AS2129 table D AS2129 table E	150 (5.91)	25 (0.98)						
40 (1 1/2")	EN 1092-1 PN 10 ... 40 [1)]	150 (5.91)	23 (0.91)	200 (7.84)	254 (10.0)	187 (7.36)	141 (5.55)	11 (24)	9 (20)
	ASME B16.5 CL 150	150 (5.91)	23 (0.91)						
	ASME B16.5 CL 300	155 (6.10)	25 (0.98)						
	JIS 10K	140 (5.51)	21 (0.83)						
	AS2129 table D	150 (5.91)	23 (0.91)						
	AS2129 table E	135 (5.31)	23 (0.91)						
50 (2")	EN 1092-1 PN 10 ... 40 [1)]	165 (6.50)	27 (1.06)	200 (7.84)	257 (10.12)	190 (7.48)	144 (5.67)	12 (26)	10 (22)
	ASME B16.5 CL 150	165 (6.50)	27 (1.06)						
	ASME B16.5 CL 300	165 (6.50)	27 (1.06)						
	JIS 10K	165 (6.50)	27 (1.06)						
	AS2129 table D AS2129 table E	150 (5.91)	18 (0.71)						

Tolerance for L: +0 / -3 mm (+0 / -0.018 inch)

Dimensions mm (inch)								Approx. weight in kg (lb)	
DN	Process connection	D	B	L [2) 3)]	F [4)]	E [4)]	G [4)]	Integral	Remote
65 (2 1/2")	EN 1092-1 PN 10 ... 40 [1)]	185 (7.28)	30 (1.18)	200 (7.87)	271 (10.67)	204 (8.03)	158 (6.22)	15 (33)	13 (29)
	ASME B16.5 CL 150	180 (7.09)	30 (1.18)					13 (29)	11 (24)
	ASME B16.5 CL 300	190 (7.48)	29 (1.14)					15 (33)	13 (29)
	JIS 10K	185 (7.28)	30 (1.18)					15 (33)	13 (29)
	AS2129 table D AS2129 table E	165 (6.50)	18 (0.71)					13 (29)	11 (24)
80 (3")	EN 1092-1 PN 10 ... 40 [1)]	205 (8.07)	30 (1.18)	200 (7.87)	275 (10.83)	208 (8.19)	162 (6.38)	17 (38)	15 (33)
	ASME B16.5 CL 150	205 (8.07)	30 (1.18)					17 (38)	15 (33)
	ASME B16.5 CL 300	210 (8.27)	33 (1.30)					19 (42)	17 (38)
	JIS 10K	205 (8.07)	30 (1.18)					19 (42)	17 (38)
	AS2129 table D AS2129 table E	205 (8.07)	30 (1.18)					17 (38)	15 (33)
100 (4")	EN 1092-1 PN 10 ... 16 [1)]	235 (9.25)	29 (1.14)	250 (9.84)	306 (12.05)	239 (9.41)	193 (7.60)	24 (53)	22 (48)
	EN 1092-1 PN 25 ... 40 [1)]	235 (9.25)	28 (1.10)					24 (53)	22 (48)
	ASME B16.5 CL 150	235 (9.25)	29 (1.14)					24 (53)	22 (48)
	ASME B16.5 CL 300	255 (10.04)	38 (1.50)					30 (66)	28 (62)
	JIS 10K	235 (9.25)	29 (1.14)					19 (42)	17 (38)
	AS2129 table D AS2129 table E	235 (9.25)	29 (1.14)					21 (46)	19 (42)
125 (5")	EN 1092-1 PN 10 ... 16 [1)]	270 (10.63)	38 (1.50)	250 (9.84)	318 (12.52)	251 (9.88)	205 (8.07)	25 (55)	23 (51)
	EN 1092-1 PN 25 ... 40 [1)]	270 (10.63)	36 (1.42)					25 (55)	23 (51)
	ASME B16.5 CL 150	270 (10.63)	38 (1.50)					25 (55)	23 (51)
	ASME B16.5 CL 300	280 (11.02)	42 (1.65)					35 (77)	33 (73)
	JIS 10K	270 (10.63)	38 (1.50)					22 (49)	20 (44)
	AS2129 table D AS2129 table E	270 (10.63)	38 (1.50)					22 (49)	20 (44)
150 (6")	EN 1092-1 PN 10 ... 16 [1)]	300 (11.81)	31 (1.22)	300 (11.81)	339 (13.35)	272 (10.71)	226 (8.90)	33 (73)	31 (68)
	EN 1092-1 PN 25 ... 40 [1)]	300 (11.81)	38 (1.50)					39 (86)	37 (82)
	ASME B16.5 CL 150	300 (11.81)	31 (1.22)					33 (73)	31 (68)
	ASME B16.5 CL 300	320 (12.60)	44 (1.73)					47 (104)	45 (99)
	JIS 10K	300 (11.81)	31 (1.22)					33 (73)	31 (68)
	AS2129 table D	300 (11.81)	31 (1.22)					33 (73)	31 (68)
	AS2129 table E	280 (11.02)	24 (0.94)					33 (73)	31 (68)

Tolerance for L: +0 / -3 mm (+0 / -0.018 inch)

Dimensions mm (inch)								Approx. weight in kg (lb)	
DN	Process connection	D	B	L 2) 3)	F 4)	E 4)	G 4)	Integral	Remote
400 (16")	EN 1092-1 PN 10 1)	565 (22.24)	37 (1.46)	600 (23.62)	462 (18.19)	395 (15.55)	350 (13.78)	103 (227)	101 (223)
	EN 1092-1 PN 16 1)	580 (22.83)	43 (1.69)					126 (278)	124 (273)
	ASME B16.5 CL 150	597 (23.50)	57 (2.24)					175 (386)	173 (381)
	ASME B16.5 CL 300	647 (25.47)	88 (3.46)					265 (584)	263 (580)
	JIS 10K	560 (22.05)	33 (1.30)					126 (278)	124 (273)
	AS2129 table D	580 (22.83)	31 (1.22)					175 (386)	173 (381)
	AS2129 table E	580 (22.83)	39 (1.54)					175 (386)	173 (381)
450 (18")	ASME B16.5 CL 150	635 (25.00)	66 (2.60)	600 (23.62)	487 (19.17)	420 (16.54)	375 (14.76)	260 (573)	258 (569)
	AS2129 table D	640 (25.20)	30 (1.18)						
	AS2129 table E	640 (25.20)	40 (1.57)						
500 (20")	EN 1092-1 PN 10 1)	670 (26.38)	43 (1.96)	600 (23.62)	514 (20.24)	447 (17.60)	402 (15.83)	190 (419)	188 (415)
	EN 1092-1 PN 16 1)	715 (28.15)	51 (2.01)					240 (529)	238 (525)
	ASME B16.5 CL 150	699 (27.52)	69 (2.72)					300 (661)	298 (657)
	AS2129 table D	705 (27.76)	34 (1.34)						
	AS2129 table E	705 (27.76)	43 (1.69)						
600 (24")	EN 1092-1 PN 10 1)	780 (30.71)	47 (1.85)	800 (31.50)	569 (22.40)	502 (19.76)	457 (17.99)	246 (542)	244 (537)
	EN 1092-1 PN 16 1)	840 (33.07)	60 (2.36)					318 (701)	316 (697)
	ASME B16.5 CL 150	813 (32.01)	80 (3.15)					425 (937)	423 (933)
	AS2129 table D	825 (32.48)	47 (1.85)						
	AS2129 table E	825 (32.48)	53 (2.09)						

Tolerance for L: DN 150 ... 200 +0 / -3 mm (+0 / -0.018 inch), DN 250 ... 600 +0 / -5 mm (+0 / -0.197 inch)

1) Other pressure ratings on request.
2) If an earthing plate is fitted (attached to one side of the flange), dimension L increases by 5 mm (0.197 inch).
3) If protection plates are fitted (attached to both sides of the flange), dimension L increases by 10 mm (0.394 inch).
4) Depending on the device design, the dimensions change in accordance with the following table.

Device design		Dimension E, F	Dimension G
Without explosion protection	Standard temperature design	0	0
	High temperature design	+127 mm (+5 inch)	+127 mm (+5 inch)
Explosion protection Zone 1, Division 1	Standard temperature design	+74 mm (+2.91 inch)	+47 mm (+1.85 inch)
	High temperature design	+127 mm (+5 inch)	+174 mm (+6.85 inch)
Explosion protection Zone 2, Division 2	Standard temperature design	0	0
	High temperature design	+127 mm (+5 inch)	+127 mm (+5 inch)

Ordering information

Electromagnetic flowmeter ProcessMaster - FEP311 and FEP315 , integral mount design

		Main order number																						Add. order no.
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Without explosion protection	**FEP311**	**X**	**X**	**X**	**X**	**X**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
With explosion protection	**FEP315**	**X**	**X**	**X**	**X**	**X**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
Nominal diameter																								
DN 3 (1/10 in.)		0	0	3																				
DN 4 (5/32 in.)		0	0	4																				
DN 6 (1/4 in.)		0	0	6																				
DN 8 (5/16 in.)		0	0	8																				
DN 10 (3/8 in.)		0	1	0																				
DN 15 (1/2 in.)		0	1	5																				
DN 20 (3/4 in.)		0	2	0																				
DN 25 (1 in.)		0	2	5																				
DN 32 (1-1/4 in.)		0	3	2																				
DN 40 (1-1/2 in.)		0	4	0																				
DN 50 (2 in.)		0	5	0																				
DN 65 (2-1/2 in.)		0	6	5																				
DN 80 (3 in.)		0	8	0																				
DN 100 (4 in.)		1	0	0																				
DN 125 (5 in.)		1	2	5																				
DN 150 (6 in.)		1	5	0																				
DN 200 (8 in.)		2	0	0																				
DN 250 (10 in.)		2	5	0																				
DN 300 (12 in.)		3	0	0																				
DN 350 (14 in.)		3	5	0																				
DN 400 (16 in.)		4	0	0																				
DN 450 (18 in.)		4	5	0																				
DN 500 (20 in.)		5	0	0																				
DN 550 (22 in.)	1)	5	5	0																				
DN 600 (24 in.)		6	0	0																				
DN 650 (26 in.)	1)	6	5	0																				
DN 700 (28 in.)		7	0	0																				
DN 760 (30 in.)		7	6	0																				
DN 800 (32 in.)		8	0	0																				
DN 900 (36 in.)		9	0	0																				
DN 1000 (40 in.)		0	0	1																				
DN 1050 (42 in.)		0	5	1																				
DN 1100 (44 in.)		1	0	1																				
DN 1200 (48 in.)		2	0	1																				
DN 1400 (54 in.)		4	0	1																				
DN 1500 (60 in.)		5	0	1																				
DN 1600 (66 in.)		6	0	1																				
DN 1800 (72 in.)		8	0	1																				
DN 2000 (80 in.)		0	0	2																				
Lining material																								
PTFE					A																			
ETFE					E																			
Thick PTFE					F																			
Hard rubber					H																			
Linatex				2)	J																			
PFA					P																			
Soft rubber					S																			
Electrode design																								
Standard						1																		
Standard + full filling electrode (TFE)					3)	2																		
Pointed head						5																		
Pointed head + full filling electrode (TFE)					3)	6																		

Continued on next page

1) Available with JIS-Flanges.
2) For US production only, model FEP315, FEP325 (Certificate: without PED, Process Connection: ASME Cl 150 / 300, Installation length: ASME CL 150, US-compliant length).
2) TFE electrode for detecting partially filled tubes, available from DN 50 (2 in.) with sensor design level "B". Not available for Zone 1 / Div 1.

Continued

		Main order number																					Add. order no.
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Without explosion protection	**FEP311**	X	X	X	X	X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X	X	X	X	X	X	X	XX
With explosion protection	**FEP315**	X	X	X	X	X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X	X	X	X	X	X	X	XX
Signal electrode material																								
Stainless steel 1.4539 (904)							A																	
Hastelloy C-4 (2.4610)							D																	
Titanium							F																	
Tantalum							G																	
Hastelloy B-3 (2.4600)							H																	
Platinum-iridium							J																	
Stainless steel 1.4571 (316Ti)							S																	
Grounding accessories																								
Standard								1																
Grounding electrodes (for material, refer to "Signal electrode material")								2																
Grounding plate made of stainless steel, attached to one side of the flange							4)	3																
Protection plate made of stainless steel, attached to both sides of the flange							4)	4																
Process connection																								
Flange DIN PN 6								5)	D	0														
Flange DIN PN 10									D	1														
Flange DIN PN 16									**D**	**2**														
Flange DIN PN 25									D	3														
Flange DIN PN 40									D	4														
Flange DIN PN 64								6)	D	5														
Flange DIN PN 100								6)	D	6														
Flange, ASME CL 150								7)	A	1														
Flange, ASME CL 300								7)	A	3														
Flange, JIS 10K									J	1														
Flange, JIS 5K									J	2														
Flange, JIS 20K									J	3														
Flange, AS2129 table E								8)	E	4														
Flange, AS2129 table D								8)	E	5														
Process connection material																								
Steel											**B**													
Stainless steel flange										9)	D													
Certificates																								
Meter tube with PED approval												**0**												
Meter tube without PED approval (only China and US production sites. Specify installation length J1, J3 or JN)												1												
Acceptance test certificate (3.1) to EN 10204												2												
Pressure test to AD-2000												3												
Material certificate 3.1 to EN 10204 and pressure test to AD-2000												4												
Calibration																								
Standard accuracy											10)		**A**											
Increased accuracy											12)		B											
Standard accuracy + ScanMaster function											10)		K											
Increased accuracy + ScanMaster function											11)		L											
Witnessed factory calibration											12)		M											
5-point DKD calibration											13)		T											

Continued on next page

4) Can only be used for sensors ≤ DN 600 (24 in) and PTFE / thick PTFE / ETFE / PFA linings. Material: See data sheet.
5) Available from DN 1000 (40 in.)
6) DN 15 ... DN 200 (1/2 ... 8 in.) Hard rubber.
7) Flange DN 15 … 600 according to ASME B16.5. Flange > DN 600 according to ASME 16.47 Serie B.
8) Upon request
9) Material: See data sheet
10) Standard accuracy (0.4% of rate) assumes 2 calibration points. If more than 2 calibration points are required, you must specify 3 or 5 points under "Number of test points"
11) Increased accuracy (0.2% of rate) assumes 3 calibration points. If more than 3 calibration points are required, you must specify 5 points under "Number of test points". Available for DN10 (3/8 in.) ... 800 (32 in.)
12) 3rd party witnessed calibration
13) Available for nominal diameters DN 50 (2 in.) ... 600 (24 in.), DN 800 (32 in.)

Continued

	Main order number																					Add. order no.
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Without explosion protection	**FEP311**	X	X	X	X	X	X	X	X	X	X	X	X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	XX
With explosion protection	**FEP315**	X	X	X	X	X	X	X	X	X	X	X	X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	XX
Sensor temperature range / Ambient temperature range																								
Standard sensor design / -20 ... 60 °C (-4 ... 140 °F)												14)		**1**										
Standard sensor design / -40 ... 60 °C (-40 ... 140 °F)												14)		2										
High-temperature sensor design / -20 ... 60 °C (-4 ... 140 °F)												15)		3										
High-temperature sensor design / -40 ... 60 °C (-40 ... 140 °F)												15)		4										
Name plate																								
Sticker															**A**									
Stainless steel															B									
Stainless steel, and TAG label stainless steel															C									
Sticker, chinese language												19)			S									
Stainless steel, chinese language												19)			T									
Stainless steel, and TAG label stainless steel, chinese language												19)			U									
Signal cable length																								
No cable																0								
Explosion protection																								
None															16)		**A**							
ATEX / IEC Zone 1 / 21																	L							
ATEX / IEC Zone 2 / 21																	M							
usFMc Div 2 Zone 2																	P							
usFMc Div 1															17)		R							
NEPSI Zone1															18)		U							
NEPSI Zone2															18)		V							
Protection type for transmitter / sensor																								
Standard / IP67 (NEMA 4X)																18)		**1**						
Other																		9						
Cable gland																								
M20 x 1.5																			**A**					
1/2 in. NPT																			B					
PF 1/2 in.																		15)	C					
Power supply																								
100 ... 230 V AC, 50 Hz																				1				
24 V AC / DC, 50 Hz																				2				
100 ... 230 V AC, 60 Hz																				3				
24 V AC / DC, 60 Hz																				4				
Signal inputs and outputs																								
HART + 20 mA passive + pulses + contact input / output																			19)		B			
HART + 20 mA active + pulses + contact input / output																			20)		C			
HART + 20 mA active + pulses + contact output																			21)		D			
PROFIBUS PA + contact output																					E			
FOUNDATION Fieldbus + contact output																					F			
Default settings / Diagnostics																								
Parameters are at factory settings / Standard																						1		
Parameters are set according to customer specifications / Standard																						3		
Design Level																								
Sensordesign Level B																					26)		B	
Sensordesign Level C																					26)		C	

Continued on next page

14) Maximum fluid temperature for standard sensor design: 130 °C with PTFE, PFA, ETFE, thick PTFE,
90 °C (80 °C for China production site) with hard rubber,
60 °C with soft rubber,
70 °C with Linatex,
-40 °C only in conjunction with stainless steel flange.
15) Maximum fluid temperature for high-temperature sensor design: 180 °C with PFA, thick PTFE. 130 °C with ETFE, PTFE. Thick PTFE available for DN 25 ... DN 300, PFA available for DN 10 ... DN 200. -40 °C only in conjunction with stainless steel flange.
16) Only with model FEP311.
17) Div 1 available up to DN 300 (12 in.).
18) Production site: China.
19) Transmitter degree of protection = IP67 (NEMA 4X) with single-compartment and dual-compartment housing
20) Available with Ex design Zone 2 / Div 2 or Zone 1 / Div1.
21) Available with Ex design Zone 2 / Div 2.
22) Available with Ex design Zone 1 / Div 1.
23) Specified by ABB. Sesordesign Level C with model FEP311 only

Continued

	Main order number																							Add. order no.
Version number	1 – 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Without explosion protection	**FEP311**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**XX**
With explosion protection	**FEP315**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**XX**
Accessories																								
None																								AY
Plug connector																								
M12 x 1 fieldbus																						24)		U2
Transmitter housing design																								
Single-compartment housing / Aluminium																						25)		H1
Dual-compartment housing / Aluminium																								H2
Lay Length																								
Flanges, ASME CL 150, ISO-compliant installation length																								JA
Flanges, ASME CL 300, ISO-compliant installation length																								JC
Flanges (Chinese installation length) (production site: China. Certificate: Without PED approval)																						26)		JN
Sensor housing material																								
Aluminium / Carbon steel																								SMA
Additional certificates																								
Russia, metrological and GOST R certificate																								CG1
Kazakhstan, metrological and GOST K certificate																								CG2
Ukraine, metrological certificate																								CG3
Belarus, metrological certificate																								CG6
Additional Ex certificates and approvals																								
Russia, GOST-Ex and RTN certificate																								EG7
Kazakhstan, Ex applications certificate																								EG3
Ukraine, GOST Ex and Ex application certificate																								EG5
Belarus, GGTN certificate																								EG9
Inmetro (Brazil)																						27)		EB1
Number of test points																								
3 points																								T3
5 points																								T5
Language of documentation																								
German																								M1
English																								M5
Chinese																								M6
Russian																								MB
Western Europe / Scandinavia language package (languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV)																								MW
Eastern Europe language package (languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)																								ME
Shipping Register Certificates																								
Marine class approval (DNV)																								CL5
SIL2 - Declaration of Conformity																								
SIL2 - Declaration of Conformity																								CS

24) Only for PROFIBUS PA Not for model FEP315
25) Not available with Ex design Zone 1
26) To be coded in case of FM approval only.
27) Inmetro only in conjunction with explosion protection ATEX / IECEx Zone 1 (code "L") or ATEX / IECEx Zone 2/21 (code "M") and transmitter housing design "dual-compartment housing " (code H2).

LST300
Compact ultrasonic level transmitter

The most powerful ultrasonic level transmitter in a compact form

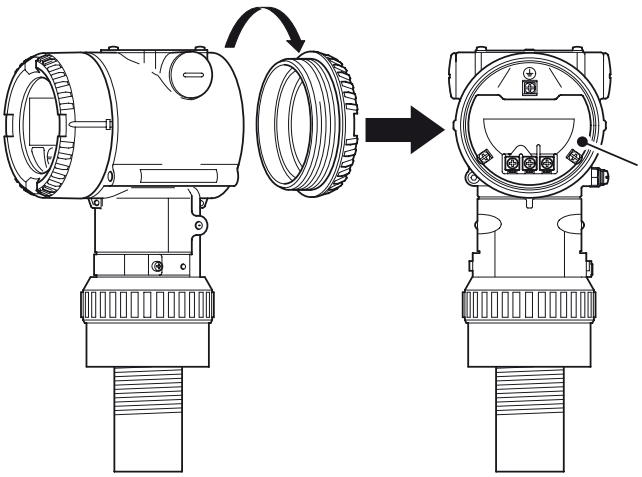
Measurement made easy



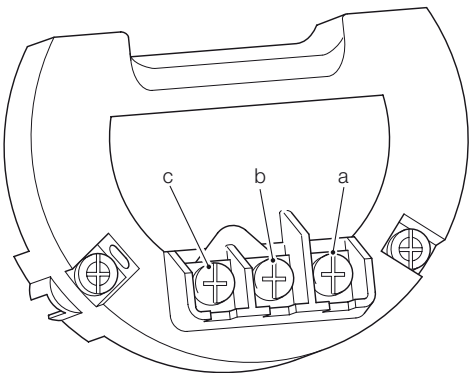
Features

— 2-wire instrument with HART digital communication
— Up to 10 m measurement range
— Wide temperature range of -40 to 85 ˚C
— Accuracy of ±2 mm or 0.2 % of full span (the larger one)
— Beam angle as low as 5˚ with false echo filtering for narrow spaces
— Easy installation with graphic echo display, advanced diagnostic and easy setup menu
— Unique GAP technology ensures the best performance under any condition
— IP66/67 and NEMA 4X (can submerge to 1 m depth for 30 minutes)
— ATEX, IEC & FM Intrinsic safe and non sparking approved

Terminal connections

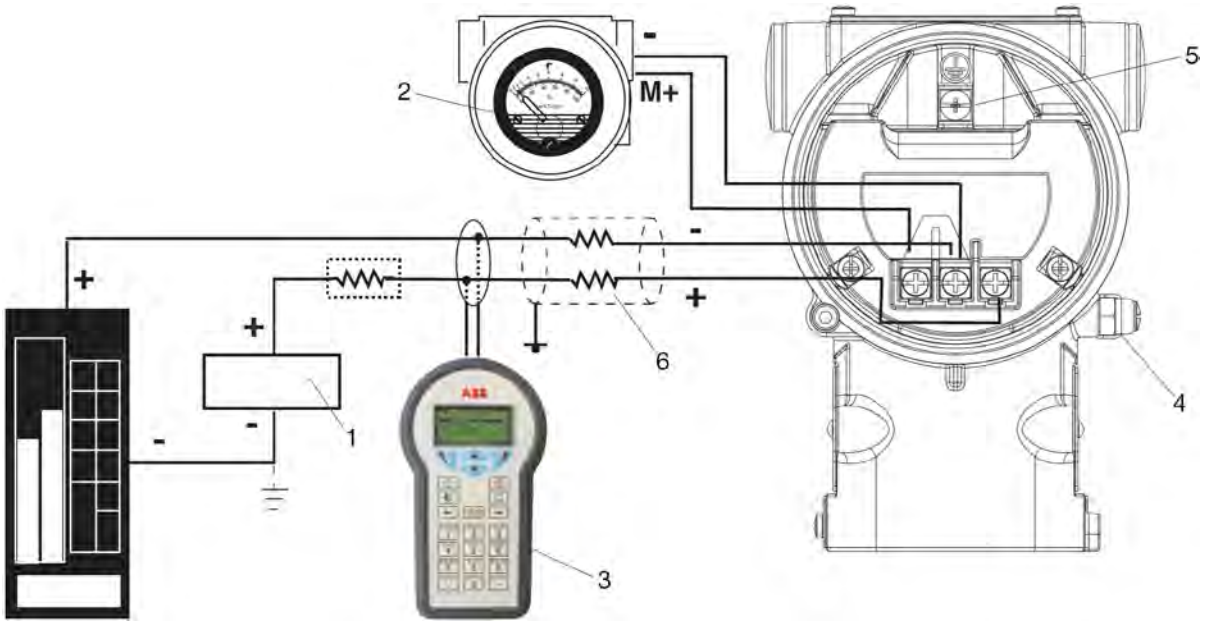


Cable connection area



Termination introduction

a Positive polarity of power supply (+)
b Negative polarity of power supply (-)
c External meter

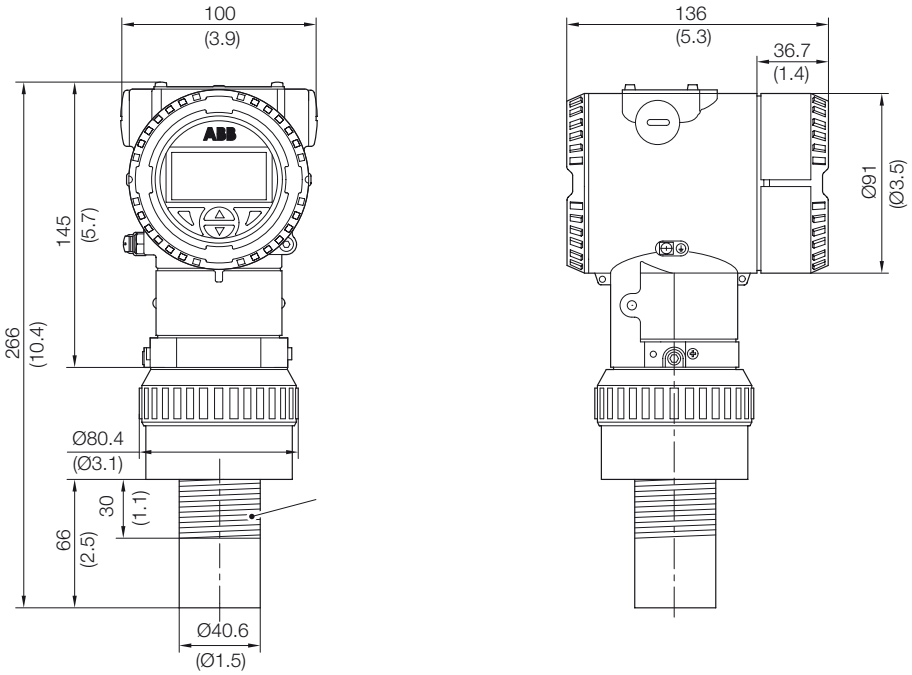


Electrical connection – HART version

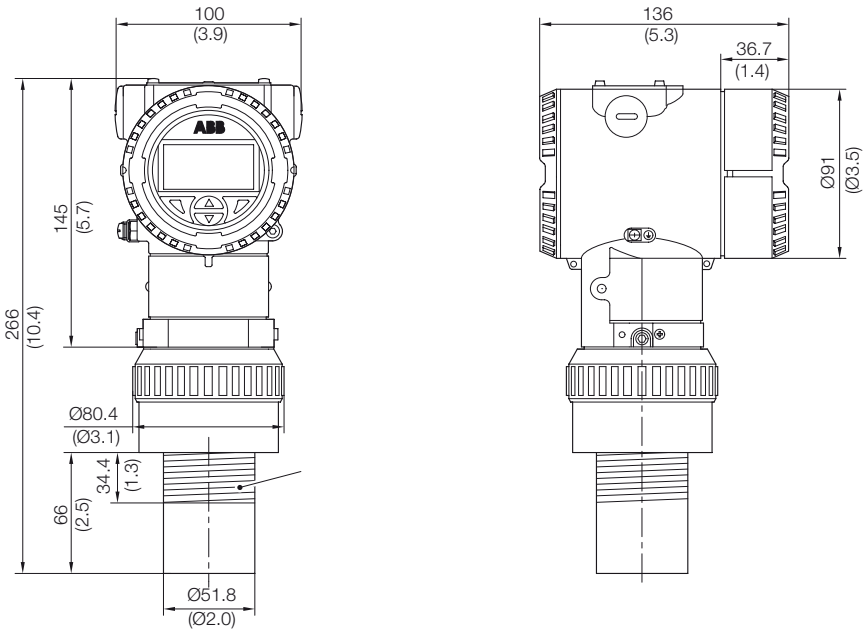
1. Power supply
2. Remote display
3. Handheld terminal
4. External ground connection
5. Internal ground connection
6. Cable entry

LST300
Ultrasonic level transmitter

Dimensions



Transmitter with 1.5 inch thread



Transmitter with 2 inch thread

LST300
Ultrasonic level transmitter

Measurement

Measurement range
C06 sensor: 0.25 to 6 m (10” to 20 ft)
C10 sensor: 0.35 to 10 m (14” to 32 ft)

Beam angle (@ -3dB, full angle)
C06 sensor: 7°
C10 sensor: 5°

Accuracy
±2 mm (0.08”) or 0.2 % of full span (the larger of the two)

Repeatability
±0.2 % of measurement range

Mechanical Data

Housing material
Metal parts: Aluminum alloy
Plastic parts: PVDF

Dimensions
Length: 136 mm (5.3”)
Width: 100 mm (3.9”) (excluding glands)
Height: 266 mm (10.4”)

Weight
2 kg (4.4 lbs)

Cable entry type
Two options:
1/2 in. threaded bore for cable gland, directly on housing:
Supplied with 1 x 1/2 in. NPT cable gland
M20 x 1.5 threaded bore for cable gland, directly on housing:
Supplied with M20 x 1.5 cable gland

Electrical Data

Terminals
Three connections for wire cross sections of up to 2.5 mm^2 (14 AWG) as connection points for power supply and communication purposes

Grounding
Internal and external ground terminals are provided for 6 mm^2 (10 AWG) wire cross sections

Power supply
The transmitter operates from 16 to 42 V DC with no load and is protected against reversed polarity (additional loads enable operation above 42 V DC).
During use in Exia zones and in other intrinsically safe applications, the power supply must not exceed 30 V DC.

Ripple
Max. 2.2 mV RMS over a 500 Ω load as per HART specifications

Load limitations
Total measurement circuit resistance at 4 to 20 mA and HART:

$$R(k\Omega) = \frac{\text{Voltage supply - Minimum operating voltage (V DC)}}{22\ mA}$$

A minimum resistance of 250 Ω is required for HART communication.

Analog output
Two-Wire output: 4 to 20 mA related to level / volume / flow, full compensation for temperature effects

Displays (Optional)

Integrated LCD display (code L7)
Widescreen LCD display, 128 x 64 pixels, 52.5 x 27.2 mm (2.06 x 1.07 in.) dot matrix
Four keys for device configuration and management
Easy setup for quick commissioning
Customized visualizations which users can select
Totalized and actual value flow indication
Temperature and diagnostics message display, and configuration settings

Integrated LCD display with TTG operation (code L2)
Same specifications as the integrated LCD display (code L7)
An innovative Through-The-Glass (TTG) keypad which can be used to activate the device configuration and management menus without having to remove the transmitter housing cover
TTG keys protected against accidental activation

LST300
Ultrasonic level transmitter

Hazardous Area Approvals

cFMus
Intrinsic Safety type of protection:
Approval according to FM US and Canada IS Class 1 Div 1/ GP ABCD- CL II/ DIV 1/ GP EFG, Zone 0 AEx/Ex ia IIC T6...T4
IS Control Drawing number: 3KXL065035U0009

Non Incendive type of protection:
Approval according to FM US and Canada NI Class 1 Div 2/GP ABCD- DIP CL II/ DIV 2/ GP EFG, Zone 2, AEx/Ex nA IIC T6…T4

ATEX/IECEx
Intrinsic Safety type of protection:
II 1 G Ex ia IIC T6...T4 Ga - II 1 D Ex ia IIIC T85° C
For electrical parameters, refer to cert, FM15ATEX0063X
Ex ia IIC T6...T4 Ga - Ex ia IIIC T85° C
For electrical parameters, refer to cert, IECEx FME 15.0010X

Non Incendive type of protection:
II 3 G Ex nA IIC T6...T4 Gc - II 3 D Ex tc IIIC T85°C
For electrical parameters, refer to cert, FM15ATEX0064X
Ex nA IIC T6...T4 Gc - Ex tc IIIC T85°C
For electrical parameters, refer to cert, IECEx FME 15.0010X

NEPSI
Intrinsic Safety type of protection:
Ex ia IIC T6...T4 Ga - Ex iaD 20 T85° C
For electrical parameters, refer to cert, GYJXXXXXX

Non Incendive type of protection:
Ex nA IIC T6...T4 Gc - DIP A22 TA85°C
For electrical parameters, refer to cert, GYJXX.XXXX

Environmental Data

Electromagnetic compatibility (EMC)
Meets requirements of EN 61326
Overvoltage strength (with surge protection): 2 kV (according to IEC 61000-4-5)

Temperature
-40 to 85 °C (-40 to 185 °F), according to EN 60068-2-14, 1 K/ min, 100 cycles

Humidity
Relative humidity: Up to 100 %
Condensation, icing: Not permissible

Pressure
Measurement functional from -4 to 44 psi (-0.25 to 3.0 bar)

Vibration resistance
Acceleration up to 1 g at frequencies of up to 2,000 Hz (according to EN 60068-2-64)

Climate class
DIN EN 60068-2-38 (Test Z/AD) DIN/IEC 68 T2-30Db

LST300
Ultrasonic level transmitter

Ordering information

Basic ordering information for LST300

Ultrasonic level transmitter	ab	cd	efg	hi	jk	lm	no
LST300							
Explosion Protection Certification							
General Purpose		Y0					
NEPSI non sparking Zone 2 (n)		C5					
NEPSI intrinsic safety		C6					
NEPSI combined C5 + C6 (Ex n + Ex ia)		C7					
ATEX / IECEx energy limited (Zone 2 / 22)		E5					
ATEX / IECEx intrinsic safety (Zone 0 / 20)		E6					
ATEX / IECEx combined E5 + E6 (Ex n + Ex ia)		E7					
cFMus energy limited Cl1 Div 2		F3					
cFMus intrinsic safety Cl1 Div 1 incl. energy limited (Div 2)		F4					
cFMus combined F3 + F4 (Ex n + Ex ia)		F8					
Sensor Type and Range							
Corrosion resistant transducer, range 10 m (approx. 30 ft)			C10				
Corrosion resistant transducer, range 6 m (approx. 20 ft)			C06				
Process Connection Type							
1.5 in. Universal thread (NPT & BSP compatible) (only available with sensor C06)				U5			
2 in. Universal thread (NPT & BSP compatible) (only available with sensor C10)				U2			
Housing Material / Cable Glands							
Aluminium / 2 pcs. metric, M20 x 1.5, 2 x plugs mounted and 1 x cable gland included					A1		
Aluminium / 2 pcs. 1/2 in. NPT threads, 2 x plugs mounted and 1 x cable gland included					B1		
Power Supply							
Loop powered						L1	
Output Signal							
HART digital communication and 4 ... 20 mA							H1

Note: When only basic ordering information is selected LST300 will be shipped with LCD Option L7, Push Buttons and Display and Glass Cover.

LST300
Ultrasonic level transmitter

Ordering information

Additional ordering information for LST300

Add one or more codes after basic ordering information to select all required options.

Ultrasonic level transmitter	**xx**	**xx**	**xxx**	**xxx**	**xx**	**xx**	**xx**	**xxx**
Mounting Bracket Shape / Material								
Extendable bracket (floor mounted)	BE							
L-shape bracket (floor mounted)	BF							
Extendable bracket (wall mounted)	BU							
L-shape bracket (wall mounted)	BV							
Certificates								
Inspection certificate 3.1 acc. EN 10204 for calibration, with test report		CE						
Flange Options								
Flange, 3 in. ANSI / ASME connection, PVC			FA3					
Flange, 4 in. ANSI / ASME connection, PVC			FA4					
Flange, 6 in. ANSI / ASME connection, PVC			FA6					
Flange, 80 mm connection, PVC			FD3					
Flange, 100 mm connection, PVC			FD4					
Flange, 150 mm connection, PVC			FD6					
Shipping certificates								
Certificate of origin				GS1				
Certificate of origin notarized by Local Chamber of Commerce				GS2				
Integrated Digital Display (LCD)								
No Display, with Blind Cover					L0			
With Push Buttons (TTG) and Display and Glass Cover					L2			
With Push Buttons and Display and Glass Cover					L7			
Documentation Language								
German						M1		
Italian						M2		
Spanish						M3		
French						M4		
English						M5		
Chinese						M6		
Surge Protector								
Surge / Transient Protector 1x							S1	
Device Identification Plate								
Stainless steel plate with TAG no.								TC1
Adhesive label with TAG no.								TCC
Supplemental wired-on stainless steel plate								TCS

TOKLIN ® AL BUSINESS LIMITED	TECHNICAL DATSHEET AND HOOK UP DRAWING FOR TRANSMITTERS			
BHARAT HEAVY ELECTRICALS LTD.	**Project Doc No.:** PE-V0-412-158-A047			
	OTOKLIN DOC NO:- OGBL/OC-983/TDSHKUP/TRA/PTP/18/330			
PreTreatment Plant Ennore	**MADE BY** FN	**CHKD BY** MI	**APPD BY** AA	**Rev No:-** 3

DISCRIPTION				**REMARK**
DATA SHEET FOR PRESSURE TRANSMITTER				
Type of sensor	Dual Inductance Type (R2)			
Diaphragm	Hastealloy C-276			
Output	Standard HART digital communication and 4 to 20 mA			
Output Load	600 Ohm			
Accuracy	± 0.04% (R2)			
Over Pressure Safety	1.5 times max. Pressure range			
Burst Pressure	2 times max. Pressure range			
Process Temperature	50 ºC			
Power Supply	24 V DC, External			
Safe Operating Voltage	36VDC			
Response Time	150 msec			
Non Linearty	0.2% of Span			
Non Repeatability	< 0.1% of Span			
Process connection material	AISI 316L SS			
Housing Material	Aluminium alloy (Barrel version)			
Mounting	Direct Line mount (Vertical)			
Process Connection	½" NPT (F)			
Electrical connection	½" NPT (F)			
Span and Zero	Locally adjustable, non-interacting			
Turn down Ratio	1:100 (R2)			
Stability	+/- 0.15% of URL for 5 years (R2)			
Zero suppression/elevation	At least 100% of span			
Manifold type	Manifold is non-integral and standalone type (R2)			
Accessories	SS316 manifold valve , SS Tag Plate, double compression type Nickel-plated brass cable gland,local indication with LCD indicator will be provided . (R2)			
Range kg/cm2	0-3			
KKS No.	90GBS45CP001 90GBS45CP002	90GBN85CP001 90GBN95CP001	90GBN65CP001 90GBN75CP001	
Line size	400 NB	25 NB	40 NB	
Qty.	2	2	2	
Model No. (R3)	266HSH.M.K.B.A.7.D2.LS.R1.B6 + 2 Valve Manifold- SS316	266HSH.M.K.B.A.7.D2.LS.R1.B6 + 2 Valve Manifold- SS316	266HSH.M.K.B.A.7.D2.LS.R1.B6 + 2 Valve Manifold- SS316	
Origin Country	India			
Make	ABB			

Model 266HSH Gauge
Model 266NSH Absolute

Engineered solutions for all applications

Measurement made easy



Base accuracy
— from 0.06 % of calibrated span (optional 0.04 %)

Reliable sensing system coupled with very latest digital technologies
— provides large turn down ratio up to 100:1

Comprehensive sensor choice
— optimize in-use total performance and stability

10–year stability
— 0.15 % of URL

Flexible configuration facilities
— provided locally via local LCD keypad

New TTG (Through-The-Glass) keypad technology
— allows quick and easy local configuration without opening the cover, even in explosion proof environments

IEC 61508 certification
— version for SIL2 (1oo1) and SIL3 (1oo2) applications

PED compliance
— Category III for PS > 20 MPa, 200 bar
— Sound Engineering Practice (SEP) for PS ≤ 20 MPa, 200 bar

WirelessHART version
— the battery powered solution compliant to IEC 62591

Best-in-class battery life
— up to 10 years @ 32 s update time
— in-field replaceable

Product in compliance with Directive 2011/65/UE (RoHS II)

In-built advanced diagnostics

Model 266HSH Gauge
Model 266NSH Absolute

Functional Specifications

Range and span limits

Sensor Code	Upper Range Limit (URL)	Lower Range Limit (LRL) 266HSH (Δ)	Minimum span 266HSH	Minimum span 266NSH
E	16 kPa 160 mbar 64 inH2O	–16 kPa –160 mbar –64 inH2O	0.54 kPa 5.4 mbar 2.16 inH2O	
F	40 kPa 400 mbar 160 inH2O	–40 kPa –400 mbar –160 inH2O	0.4 kPa 4 mbar 1.6 inH2O	0.67 kPa 6.7 mbar 5 mmHg
H	160 kPa 1600 mbar 642 inH2O	–100 kPa (§) –1 bar (§) –14.5 psi (§)	1.6 kPa 16 mbar 6.4 inH2O	2.67 kPa 26.7 mbar 20 mmHg
M	600 kPa 6 bar 87 psi	–100 kPa (§) –1 bar (§) –14.5 psi (§)	6 kPa 0.06 bar 0.87 psi	10 kPa 0.1 bar 1.45 psi
P	2400 kPa 24 bar 348 psi	–100 kPa (§) –1 bar (§) –14.5 psi (§)	24 kPa 0.24 bar 3.5 psi	40 kPa 0.4 bar 5.8 psi
Q	8000 kPa 80 bar 1160 psi	–100 kPa (§) –1 bar (§) –14.5 psi (§)	80 kPa 0.8 bar 11.6 psi	134 kPa 1.34 bar 19.4 psi
S	16000 kPa 160 bar 2320 psi	–100 kPa (§) –1 bar (§) –14.5 psi (§)	160 kPa 1.6 bar 23.2 psi	267 kPa 2.67 bar 38.7 psi
W	70000 kPa 700 bar 10150 psi	–100 kPa (§) –1 bar (§) –14.5 psi (§)	1400 kPa 14 bar 203 psi	
Z	105000 kPa 1050 bar 15225 psi	–100 kPa (§) –1 bar (§) –14.5 psi (§)	10500 kPa 105 bar 1522 psi	

(Δ) Lower Range Limit (LRL) for 266NSH is -100 kPa, -1 bar, -14.5 psi for all ranges.
(§) with atmospheric pressure reference of 100 kPa, 1 bar, 14.5 psi.

Span limits

Maximum span = URL
IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.

Zero suppression and elevation

Zero and span can be adjusted to any value within the range limits detailed in the table as long as:
— calibrated span ≥ minimum span

Damping (feature not available for WirelessHART version)
Selectable time constant : between 0 and 60 s
This is in addition to sensor response time.

Turn on time

Operation within specification in less than 10 s with minimum damping.

Insulation resistance

> 100 MΩ at 500 V DC (terminals to earth)

Operative limits

Pressure limits:

Overpressure limits

Without damage to the transmitter

Sensors	Fill fluid	Overpressure limits
Sensor E to M	Silicone oil	0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 14 MPa, 140 bar, 2030 psi
Sensor P to S	Silicone oil	0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 21 MPa, 210 bar, 3045 psi
Sensor W	Silicone oil	0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 105 MPa, 1050 bar, 15225 psi
Sensor E to M	Inert (Galden)	0.135 kPa abs, 1.35 mbar abs, 1 mmHg and 14 MPa, 140 bar, 2030 psi
Sensor P to S	Inert (Galden)	0.135 kPa abs, 1.35 mbar abs, 1 mmHg and 21 MPa, 210 bar, 3045 psi
Sensor E to M	Inert (Halocarbon)	0.4 kPa abs, 4 mbar abs, 3 mmHg and 14 MPa, 140 bar, 2030 psi (1)
Sensor P to S	Inert (Halocarbon)	0.4 kPa abs, 4 mbar abs, 3 mmHg and 21 MPa, 210 bar, 3045 psi

Sensors	Connection	Overpressure limits
Sensor Z	F250C	0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 157.5 MPa, 1575 bar, 22837 psi
Sensor Z	1/4 - 18 NPT	0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 135 MPa, 1350 bar, 19570 psi

Proof pressure

The transmitter can be exposed without leaking to line pressure of up to the following values:

Sensors	Proof pressure
Sensor E, F, H, M	28 MPa, 280 bar, 4060 psi
Sensor P, Q, S	40.25 MPa, 402.5 bar, 5836 psi
Sensor W	171.50 MPa, 1715 bar, 24868 psi
Sensor Z 1/4 - 18 NPT connection	210.5 MPa, 2105 bar, 30522 psi
Sensor Z F250C connection	239,7 MPa, 2397 bar, 34763 psi

Meet ANSI/ISA–S 82.03 hydrostatic test requirements.

Temperature limits °C (°F) :

Ambient

is the operating temperature

Models 266HSH - 266NSH	Ambient temperature limits
Silicone oil for sensor E to W	–40 and 85 °C (–40 and 185 °F)
Inert (Galden) for sensor E to S	–20 and 85 °C (–4 and 185 °F)
Inert (Halocarbon) for sensor E to S	–20 and 85 °C (–4 and 185 °F)
Sensor Z without filling	–40 and 85 °C (–40 and 185 °F)

Models 266HSH - 266NSH	Ambient temperature limits
LCD integral display	–40 and 85 °C (–40 and 185 °F)

LCD display may not be clearly readable below –20 °C (–4 °F) or above +70 °C (+158 °F)

Models 266HSH - 266NSH	Ambient temperature limit
Painted AISI 316 L ss housing	max 70 °C (158 °F) countinuous

IMPORTANT

For Hazardous Atmosphere applications see the temperature range specified on the certificate/approval relevant to the aimed type of protection.

Process

Models 266HSH - 266NSH	Process temperature limits
Silicone oil for sensor E to W	–40 and 121 °C (–40 and 250 °F) (1)
Inert (Galden) for sensor E to S	–20 and 100 °C (–4 and 212 °F) (2)
Inert (Halocarbon) for sensor E to S	–20 and 100 °C (–4 and 212 °F) (2)
Sensor Z without filling	–40 and 121 °C (–40 and 250 °F)

(1) 100 °C (212 °F) for application below atmospheric pressure
(2) 65 °C (150 °F) for application below atmospheric pressure

Storage

Models 266HSH - 266NSH	Storage temperature limits
Storage limits	–50 and 85 °C (–58 and 185 °F)
LCD integral display	–40 and 85 °C (–40 and 185 °F)

Model 266HSH Gauge
Model 266NSH Absolute

Environmental limits

Electromagnetic compatibility (EMC)
Comply with 2014/30/UE to standards EN 61326-1:2013.
For IEC 61508 SIL certified transmitter to EN 61326-3-1:2008.
For transmitter with option “YE” to NAMUR NE 021 (2004).
Surge immunity level (with surge protector): 4 kV
(according to IEC 61000-4–5 EN 61000–4–5)

Pressure equipment directive (PED)
Comply with 2014/68/UE to standards ANSI/ISA 61010-1:2012
— Category III Module H for PS ≥ than 20 MPa, 200 bar
— Sound Engineering Practice (SEP) for PS < 20 MPa, 200 bar

Humidity
Relative humidity: up to 100 %
Condensing, icing: admissible

Vibration resistance
Accelerations up to 2 g at frequency up to 1000 Hz
(according to IEC 60068–2–6)

Shock resistance
Acceleration: 50 g
Duration: 11 ms
(according to IEC 60068–2–27)

Wet and dust-laden atmospheres
The transmitter is dust and sand tight and protected against immersion effects as defined by IEC 60529 (2001) to IP 67 (IP 68 on request) or by NEMA Type 4X.
IP65 with Harting Han connector.
Aluminium and AISI housings as barrel version also comply to IP 66 as defined by IEC 60529 (2001).

Hazardous atmospheres (FOR ALL VERSIONS EXCEPT WirelessHART)
With or without integral display

INTRINSIC SAFETY Ex ia:
ATEX Europe (code E1) approval
II 1 G Ex ia IIC T6...T4 Ga and II 1/2 G Ex ia IIC T6...T4 Ga/Gb and
II 1 D Ex ia IIIC T85 °C Da and II 1/2 D Ex ia IIIC T85 °C Da; IP67.
IECEx (code E8) approval
Ex ia IIC T6...T4 Ga and Ex ia IIIC T85 °C Da; IP67.
NEPSI China (code EY)
Ex ia IIC T4/T5/T6 Ga, Ex ia IIC T4/T5/T6 Ga/Gb,
Ex iaD 20 T85/T100/T135, Ex iaD 20/21 T85/T100/T135.

EXPLOSION PROOF:
ATEX Europe (code E2) approval
II 1/2 G Ex db IIC T6 Ga/Gb Ta=–50 °C to +75 °C and
II 1/2 D Ex tb IIIC T85 °C Db Ta = –50 °C to +75 °C; IP67.
IECEx (code E9) approval
Ex db IIC T6 Ga/Gb Ta=–50 °C to +75 °C and
Ex tb IIIC T85 °C Db Ta = –50 °C to +75 °C; IP67.
NEPSI China (code EZ)
Ex d IIC T6 Gb, Ex tD A21 IP67 T85 °C.

INTRINSIC SAFETY Ex ic:
ATEX Europe (code E3) type examination
II 3 G Ex ic IIC T6...T4 Gc and II 3 D Ex tc IIIC T85 °C Dc; IP67.
IECEx (code ER) type examination
Ex ic IIC T6...T4 Gc and Ex tc IIIC T85 °C Dc; IP67.
NEPSI China (code ES) type examination
Ex ic IIC T4~T6 Gc, Ex nA IIC T4~T6 Gc, Ex tD A22 IP67 T85 °C.

Hazardous atmospheres (FOR ALL VERSIONS EXCEPT WirelessHART)

With or without integral display

FM Approvals US (code E6) and FM Approvals Canada (code E4):

— Explosionproof (US): Class I, Division 1, Groups A, B, C, D; T5

— Explosionproof (Canada): Class I, Division 1, Groups B, C, D; T5

— Dust-ignitionproof: Class II, Division 1, Groups E, F, G; Class III, Div. 1; T5

— Flameproof (US): Class I, Zone 1 AEx d IIC T4 Gb

— Flameproof (Canada): Class I, Zone 1 Ex d IIC T4 Gb

— Nonincendive: Class I, Division 2, Groups A, B, C, D T6...T4

— Energy limited (US): Class I, Zone 2 AEx nC IIC T6...T4

— Energy limited (Canada): Class I, Zone 2 Ex nC IIC T6...T4

— Intrinsically safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G T6...T4
Class I, Zone 0 AEx ia IIC T6...T4 (US)
Class I, Zone 0 Ex ia IIC T6...T4 (Canada)

Type 4X, IP67 for all above markings.

COMBINED FM Approvals US and Canada

— Intrinsically safe (code EA)

COMBINED ATEX, FM and IECEx Approvals (code EN)

Technical Regulations Customs Union EAC (Russia, Kazakhstan, Belarus), Inmetro (Brazil), Kosha (Korea)

Hazardous atmospheres (ONLY FOR WirelessHART VERSION)

With or without integral display

INTRINSIC SAFETY:

ATEX Europe (code E1) approval

II 1 G Ex ia IIC T4 and II 1/2 G Ex ia IIC T4.

IECEx (code E8) approval

Ex ia IIC T4.

FM Approvals US and FM Approvals Canada:

— Intrinsically safe: Class I, Div. 1, Groups A, B, C, D; T4 (code EA)
Class I, Zone 0 AEx ia IIC T4, Gb (FM US)
Class I, Zone 0 Ex ia IIC T4, Gb (FM Canada)

IMPORTANT

REFER TO CERTIFICATES FOR AMBIENT TEMPERATURE RANGES RELATED TO THE DIFFERENT TEMPERATURE CLASSES.

SENSORS W and Z ARE NOT IN COMPLIANCE WITH ISA 12.27.01 FOR SEALING REQUIREMENTS, SPECIFICALLY FOR FM APPROVAL (Canada).

Model 266HSH Gauge
Model 266NSH Absolute

Electrical Characteristics and Options

Optional indicators

Integrated digital display (code LS; only with HART standard functionality)



Wide screen LCD, 128 x 64 pixel, 52.5 x 27.2 mm (2.06 x 1.07 in.) dot matrix.
Two keys for zero/span or without keypad.
User selectable application-specific visualizations.
Display may also indicate static pressure, sensor temperature and diagnostic messages.

Integral display with integral keypad (code L1; not with HART standard functionality)



Wide screen LCD, 128 x 64 pixel, 52.5 x 27.2 mm (2.06 x 1.07 in.) dot matrix.
Multilanguage. Four keys for configuration and management of device.
Easy setup for quick commissioning.
User selectable application-specific visualizations.
Totalized and instantaneous flow indication.
Display may also indicate static pressure, sensor temperature and diagnostic messages and provides configuration facilities.

Integral display with Through-The-Glass (TTG) activated keypad (code L5; not with HART standard functionality)



As above integral display but equipped with the innovative TTG keypad allowing the activation of the configuration and management menus of the device without the need of removing the transmitter housing cover. TTG keypad is protected against accidental activations.

Optional surge protection

Up to 4kV
- voltage 1.2 µs rise time / 50 µs delay time to half value
- current 8 µs rise time / 20 µs delay time to half value

Process diagnostics (PILD)

Plugged impulse line detection (PILD) generates a warning via communication (HART, PA, FF). The device can be configured to drive the output to “Alarm current” or set a status “BAD”.

HART® digital communication and 4 to 20 mA output Standard and Advanced functionality

Device type: $1a06_{hex}$ (listed with HCF)

Power supply

The transmitter operates from 10.5 to 42 V DC with no load and is protected against reverse polarity connection (additional load allows operations over 42 V DC).
For Ex ia and other intrinsically safe approval power supply must not exceed 30 V DC. Minimum operating voltage increases to 12.3 V DC with optional surge protector or to 10.8 V DC with optional conformity to NAMUR NE 21 (2004).

Ripple

20 mV max on a 250 Ω load as per HART specifications.

Load limitations

4 to 20 mA and HART total loop resistance :

$$R\ (k\Omega) = \frac{\text{Supply voltage} - \text{min. operating voltage (V DC)}}{22\ \text{mA}}$$

A minimum of 250 Ω is required for HART communication.

Output signal

Two–wire 4 to 20 mA, user-selectable for linear or 22 points linearization table (i.e. for horizontal or spherical tank level measurement).
HART® communication provides digital process variable superimposed on 4 to 20 mA signal, with protocol based on Bell 202 FSK standard.
HART revision 5 is the default HART output.
HART revision 7 is available on request.

Output current limits (to NAMUR NE 43 standard)

Overload condition
- Lower limit: 3.8 mA (configurable from 3.8 to 4 mA)
- Upper limit: 20.5 mA (configurable from 20 to 21 mA)

Alarm current
- Lower limit: 3.6 mA (configurable from 3.6 to 4 mA)
- Upper limit: 21 mA (configurable from 20 to 23 mA, limited to 22 mA for HART Safety; apply for electronics release 7.1.15 or later)

Factory setting: high alarm current

IEC 62591 WirelessHART® output

Device type: $1a06_{hex}$ (listed with HCF)
Network ID: ABB_{hex} (2747 decimal)
Join keys: 57495245_{hex} (1464422981) $4c455353_{hex}$ (1279611731)
$4649454c_{hex}$ (1179206988) $444b4559_{hex}$ (1145783641).

Power Supply

1x D-cell size lithium-thionyl chloride battery.
Battery life: 10 years at 32 sec. update time, 8 years at 16 sec. update time or 5 years at 8 sec. update time.
(at reference conditions of 25 ± 2 °C ambient temperature, data routed from 3 additional devices, LCD off).
THE BATTERY CAN BE REPLACED IN FIELD, ALSO IN HAZARDOUS CLASSIFIED AREA.

Output signal

IEC 62591 WirelessHART Version 7.5 (IEEE 802.15.4-2006);
Frequency band: 2.4 GHz DSSS
Update rate: user selectable from 1 sec. to 60 min.

Integrated adjustable omnidirectional antenna

— Output radio frequency: maximum 10 mW (10 dBm) EIRP
— Range: up to 300 m. (328 yds.)
Minimum distance between antenna and person is 0.2 m. (8 in.)

Telecommunications directive

Every wireless measuring device must be certified in accordance with the telecommunications directive, in this case the frequency range. This certification is country-specific.

European directives

Radio Equipment & Telecommunications Terminal Equipment Directive 2014/53/UE to standards EN 60950-1:2013, EN 62311:2008, EN 301 489-1 V1.9.2, EN 301 489-17 V2.2.1, EN 300 328 v1.8.1.
In Europe, use of the 2400 - 2483.5 MHz frequency band is not harmonized. Country-specific regulations must be observed.

Restrictions for Norway

Operation not permitted within a radius of 20 km around Ny-Alesund in Svalbard. For more information, see www.npt.no Norway Posts and Telecommunications site

Extra-european radio frequency licences

USA to FCC Part 15.247:2009;
Canada to IC RSS-210 and ICES-003;
Argentina; United Arab Emirates (UAE)

PROFIBUS® PA output

Device type

Pressure transmitter compliant to Profiles 3.0.1
Identification number: 3450_{hex}

Power supply

The transmitter operates from 9 to 32 V DC , polarity independent, with or without surge protector.
For Ex ia approval power supply must not exceed 17.5 V DC.
Intrinsic safety installation according to FISCO model.

Current consumption

operating (quiescent): 15 mA
fault current limiting: 20 mA max.

Output signal

Physical layer in compliance to IEC 61158–2/EN 61158–2.
Transmission to Manchester II modulation, at 31.25 kbit/s.

Output interface

PROFIBUS PA communication according to Profibus DP50170 Part 2/DIN 19245 part 1–3.

Output update time

25 ms

Data blocks

3 analog input, 1 physical.

Additional blocks

1 Pressure with calibration transducer block
1 Advanced Diagnostics transducer block including Plugged Input Line Detection
1 Local Display transducer block

Transmitter failure mode

On gross transmitter failure condition, detected by self-diagnostics, the output signal can be driven to defined conditions, selectable by the user as safe, last valid or calculated value.
If electronic failure or short circuit occur the transmitter consumption is electronically limited at a defined value (20 mA approx), for safety of the network.

Model 266HSH Gauge
Model 266NSH Absolute

FOUNDATION Fieldbus™ output

Device type
LINK MASTER DEVICE
Link Active Scheduler (LAS) capability implemented.
Manufacturer code: 000320_{hex}
Device type code: 0007_{hex}

Power supply
The transmitter operates from 9 to 32 V DC, polarity independent, with or without surge protector.
For Ex ia approval power supply must not exceed 24 V DC (FF–816 certification) or 17.5 V DC (FISCO certification).

Current consumption
operating (quiescent): 15 mA
fault current limiting: 20 mA max.

Output signal
Physical layer in compliance to IEC 61158–2/EN 61158–2.
Transmission to Manchester II modulation, at 31.25 kbit/s.

Function blocks/execution period
3 enhanced Analog Input blocks/25 ms max (each)
1 enhanced PID block/40 ms max.
1 standard ARitmetic block/25 ms
1 standard Input Selector block/25 ms
1 standard Control Selector block/25 ms
1 standard Signal Characterization block/25 ms
1 standard Integrator/Totalizer block/25 ms

Additional blocks
1 enhanced Resource block,
1 custom Pressure with calibration transducer block
1 custom Advanced Diagnostics transducer block including Plugged Input Line Detection
1 custom Local Display transducer block

Number of link objects
35

Number of VCRs
35

Output interface
FOUNDATION fieldbus digital communication protocol to standard H1, compliant to specification V. 1.7.

Transmitter failure mode
The output signal is “frozen” to the last valid value on gross transmitter failure condition, detected by self-diagnostics which also indicate a BAD conditions. If electronic failure or short circuit occur the transmitter consumption is electronically limited at a defined value (20 mA approx), for safety of the network.

Performance specifications

Stated at reference condition to IEC 60770 ambient temperature of 20 °C (68 °F), relative humidity of 65 %, atmospheric pressure of 1013 hPa (1013 mbar), mounting position with vertical diaphragm and zero based range for transmitter with isolating diaphragms in AISI 316 L ss or Hastelloy and silicone oil fill and HART digital trim values equal to 4 mA and to 20 mA span end points, in linear mode. Unless otherwise specified, errors are quoted as % of span. Some performance referring to the Upper Range Limit are affected by the actual turndown (TD) as ratio between Upper Range Limit (URL) and calibrated span.
IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.

Dynamic performance (according to IEC 61298–1 definition)

Sensors	Total response time
Sensor F to W	≤ 100 ms (1)
Sensor Z	≤ 110 ms

Total response time for sensor E ≤ 130 ms, for sensor B ≤ 310 ms (1)

(1) Availability subject to special request for sensors B to H and not applicable for explosionproof and flameproof.

Total response time includes dead time of 30 ms (for all sensors) with time constant @ 63.2 % of total step change. See “Update Rate” for WirelessHART version.

Accuracy rating

% of calibrated span, including combined effects of terminal based linearity, hysteresis and repeatability.
For fieldbus versions SPAN refer to analog input function block outscale range

Model	Sensor	for TD	
266HSH	F to Q	from 1:1 to 10:1	± 0.06 %
	F to Q	from 10:1 to 100:1	± (0.006 x TD) %
	S, E	from 1:1 to 10:1	± 0.075 %
	S	from 10:1 to 100:1	± (0.0075 x TD) %
	E	from 10:1 to 30:1	± (0.0075 x TD) %
	W	from 1:1 to 5:1	± 0.075 %
	W	from 5:1 to 50:1	± (0.015 x TD) %
	Z	from 1:1 to 5:1	± 0.15 %
	Z	from 5:1 to 10:1	± (0.03 x TD) %
266HSH	F to Q	from 1:1 to 5:1	± 0.04 %
(option D2)	F to Q	from 5:1 to 100:1	± (0.0105 + 0.0059 x TD) %
266NSH	F to S	from 1:1 to 10:1	± 0.075 %
	F to S	from 10:1 to 60:1	± (0.0075 x TD) %

Ambient temperature

per 20K change between the limits of –40 °C to +85 °C (per 36 °F change between the limits of –40 to +185 °F):

Model	Sensor	for TD up to	
266HSH	F to Q	10:1	± (0.03 % URL + 0.045 % span)
	E and S	10:1	± (0.04 % URL + 0.065 % span)
	W	5:1	± (0.04 % URL + 0.065 % span)
	Z	10:1	± (0.06 % URL + 0.10 % span)
266NSH	F to Q	10:1	± (0.06 % URL + 0.09 % span)
	S	10:1	± (0.08 % URL + 0.13 % span)

for an ambient temperature change from –10 °C to +60 °C (+14 to +140 °F):

Model	Sensor	for TD up to	
266HSH	F to Q	10:1	± (0.055 % URL + 0.08 % span)
	E and S	10:1	± (0.075 % URL + 0.11 % span)
	W	5:1	± (0.075 % URL + 0.11 % span)
	Z	10:1	± (0.10 % URL + 0.15 % span)
266NSH	F to Q	10:1	± (0.11 % URL + 0.16 % span)
	S	10:1	± (0.15 % URL + 0.22 % span)

per 10K change between the limits of –40 °C to –10 °C or +60° to +85 °C (per 18 °F change between the limits of –40 to +14 °F or +140° to +185 °F):

Model	Sensor	for TD up to	
266HSH	F to Q	10:1	± (0.03 % URL + 0.04 % span)
	E and S	10:1	± (0.04 % URL + 0.055 % span)
	W	5:1	± (0.04 % URL + 0.055 % span)
	Z	10:1	± (0.06 % URL + 0.10 % span)
266NSH	F to Q	10:1	± (0.055 % URL + 0.08 % span)
	S	10:1	± (0.075 % URL + 0.11 % span)

Model 266HSH Gauge
Model 266NSH Absolute

Supply voltage
Within voltage/load specified limits the total effect is less than 0.005 % of URL per volt.

Load
Within load/voltage specified limits the total effect is negligible.

Electromagnetic field
Meets all the requirements of EN 61326 for surge immunity level (of NAMUR NE 21 on request).

Common mode interference
No effect from 100Vrms @ 50Hz, or 50 V DC

Mounting position
No effect for rotation on diaphragm plane. A tilt up to 90° from vertical causes a zero shifts up to 0.5 kPa, 5 mbar or 2 inH2O, which can be corrected with zero adjustment**.** No span effect.

Stability
±0.15 % of URL over a ten years period for sensors E to W
±0.45 % of URL over a three years period for sensor Z

Maximum total performance
For temperature change of 28 °C (50 °F) for model 266HSH with accuracy option code D2 (± 0.04 %)

Sensor	Span	Maximum total performance
M	550 kPa, 5,5 bar, 80 psi	≤± 0.120 % of calibrated span
P	2000 kPa, 20 bar, 290 psi	
Q	6900 kPa, 69 bar, 1000 psi	

$$E_{Mperf} = \sqrt{(E_{\Delta Tz} + E_{\Delta Ts})^2 + E_{lin}{}^2}$$

E_{Mperf} = Maximum total performance
$E_{\Delta Tz}$ = Effect of the ambient temperature on zero
$E_{\Delta Ts}$ = Effect of the ambient temperature on span
E_{lin} = Accuracy rating (for terminal-based linearity 0.04 %)

Total performance
similar to DIN 16086
Temperature change in the range from -10 to 60 °C (14 to 140 °F)

Model	Sensor	TD	Total performance
266HSH, D2 option	F to Q	1:1	≤± 0.14 % of calibrated span
266NSH	F to Q	1:1	≤± 0.28 % of calibrated span

$$E_{perf} = \sqrt{(E_{\Delta Tz} + E_{\Delta Ts})^2 + E_{lin}{}^2}$$

E_{perf} = Total Performance
$E_{\Delta Tz}$ = Effect of the ambient temperature on zero
$E_{\Delta Ts}$ = Effect of the ambient temperature on span
E_{lin} = Accuracy rating (for terminal-based linearity 0.04 % or 0.075% as per model/sensor accuracy)

Maximum total performance and Total performance includes the measuring errors of
— non-linearity including hysteresis and non-reproducibility,
— thermal change of the ambient temperature as regards the zero signal and the calibrated span,

Physical Specification

(Refer to ordering information sheets for variant availability related to specific model or versions code)

Materials

Process isolating diaphragms (*)

AISI 316 L ss; AISI 316 L ss gold plated;
Hastelloy® C-276; Monel 400®; Tantalum; (sensors E to S).
AISI 316 L ss; Hastelloy® C-276; (sensor W).
Inconel 718 (sensor Z).

Process connection (*)

AISI 316 L ss; Hastelloy® C-276; Monel 400® (sensors F to S).
AISI 316 L ss; Hastelloy® C-276; (sensor W).
Inconel® 718 (sensor Z) with cone in Inconel® 625 for F250C connection only.

Sensor fill fluid

Silicone oil; Inert fill (Halocarbon® 4.2 or Galden®).

Mounting bracket (**)

Zinc plated carbon steel with chrome passivation; AISI 316 L ss.

Sensor housing

AISI 316 L ss.

Electronic housing and covers

Aluminium alloy (copper content ≤ 0.3 %) with baked epoxy finish (colour RAL9002); AISI 316 L ss.

Covers O-ring

Buna N.

Local adjustments (zero, span and write protect)

For Standard HART version:

— Internal for zero and span (on communication board)
— External non-intrusive for zero, span and write protect in glass filled polyphenylene oxyde, removable (code R1).

For all other versions:

— External non-intrusive for zero, span and write protect in glass filled polyphenylene oxyde, removable.

Plates

Transmitter nameplate: AISI 316 ss screwed to the electronics housing.
Certification plate and optional tag/calibration plate : self-adhesive attached to the electronics housing or AISI 316 ss fastened to the electronics housing with rivets or screws.
Optional wired-on customer data plate: AISI 316 ss.
Laser printing on metal or thermal printing on self-adhesive.
For AISI 316 L ss housing it is mandatory to select option I2 or I3 for plates in AISI 316 ss.

Calibration

Standard: at maximum span, zero based range, ambient temperature and pressure;
Optional: at specified range and ambient conditions.

(*) Wetted parts of the transmitter.
(**) U-bolt material: high-strength alloy steel or AISI 316 L ss; bolts/nuts material: high-strength alloy steel or AISI 316 ss.

Model 266HSH Gauge
Model 266NSH Absolute

Optional extras

Mounting brackets (code Bx)
For 60mm. (2in) pipes or wall mounting.

Display (code Lx)
4-position (at 90°) user orientable, except “LS”.

Optional plates (code Ix)
Code I2: AISI 316 ss plate with laser printed tag (up to 31 characters) and calibration details (up to 31 characters: lower and upper range values and engineering unit) fixed onto transmitter housing.
Code I1: AISI 316 ss wired-on plate with laser printed customized data (4 lines of 32 characters with 4 mm/0.16 in. height).

Surge protection (code S2)

Cleaning procedure for oxygen service (code P1)

Test Certificates (test, design, calibration, material traceability) (codes Cx and Hx)

Tag and manual language (codes Tx and Mx)

Manifold mounting (code A1)
Factory mounting and pressure test of ABB M26 manifolds.

Process connections

For sensors F to S
$^1/_2$ in. – 14 NPT male or female; DIN EN837-1 G $^1/_2$ B; adapter straight (180°) entry; adapter angle (90°) entry.

For sensor W
$^1/_2$ in. – 14 NPT male or female.

For sensor Z
$^1/_4$ in. – 18 NPT female; F250C (autoclave).

Electrical connections
Two $^1/_2$ in. – 14 NPT or M20x1.5 threaded conduit entries, direct on housing. Only M20x1.5 for WirelessHART with one port used for antenna.
One certified stainless steel plug (supplied loose with thread according to housing entries) available as option.

Terminal block
HART version: three terminals for signal/external meter wiring up to 2.5 mm^2 (14 AWG), also connection points for test and communication purposes.
WirelessHART version: connection points for test and communication purposes; additional fast connection for external harvesting unit.
Fieldbus versions: two terminals for signal wiring (bus connection) up to 2.5 mm^2 (14 AWG)

Grounding
Internal and external 6 mm^2 (10 AWG) ground termination points are provided.

Mounting position
Transmitter can be mounted in any position.
Electronics housing may be rotated to any position. A positive stop prevents over travel.

Mass (without options)
2.1 kg approx (4.6 lb); add 1.5 kg (3.3 lb) for AISI housing.
Add 650 g (1.5 lb) for packing.

Packing
Carton 27 x 24 x 20 cm approx (11 x 10 x 8 in.).

Configuration

Transmitter with HART communication and 4 to 20 mA

Standard configuration

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the tag plate. If a calibration range and tag data are not specified, the transmitter will be supplied with the plate left blank and configured as follows:

Engineering Unit	kPa
4 mA	Zero
20 mA	Upper Range Limit (URL)
Output	Linear
Damping	1 s
Transmitter failure mode	Upscale
Software tag (8 characters max)	Blank
Optional LCD display	PV in kPa; output in mA and in percentage on bargraph

Any or all the above configurable parameters, including Lower range–value and Upper range-value which must be the same unit of measure, can be easily changed using the HART hand–held communicator or by a PC running the configuration software with DTM for 266 models. The transmitter database is customized with specified flange type and material, O–ring and drain/vent materials and meter code option.

Custom configuration (option N6)

The following data may be specified in addition to the standard configuration parameters:

Descriptor	16 alphanumeric characters
Message	32 alphanumeric characters
Date	Day, month, year

For HART protocol available engineering units of pressure measure are :
Pa, kPa, MPa
inH2O@4 °C, mmH2O@4 °C, psi
inH2O@68 °F, ftH2O@68 °F, mmH2O@68 °F
inHg, mmHg, Torr
g/cm^2, kg/cm^2, atm
mbar, bar
These and others are available for PROFIBUS and FOUNDATION Fieldbus.

Transmitter with WirelessHART communication

Standard configuration

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the tag plate. If a calibration range and tag data are not specified, the transmitter will be supplied with the plate left blank and configured as follows:

Engineering Unit	kPa
Output scale 0 %	Lower Range Limit (LRL)
Output scale 100 %	Upper Range Limit (URL)
Output	Linear
Update time	16 s
Software tag (8 characters max)	Blank
Optional LCD display	PV in kPa; output in percentage on bargraph

Any or all the above configurable parameters, including Lower range–value and Upper range-value which must be the same unit of measure, can be easily changed using the HART hand–held communicator or by a PC running the configuration software with DTM for 266 models. The transmitter database is customized with specified flange type and material, O–ring and drain/vent materials and meter code option.

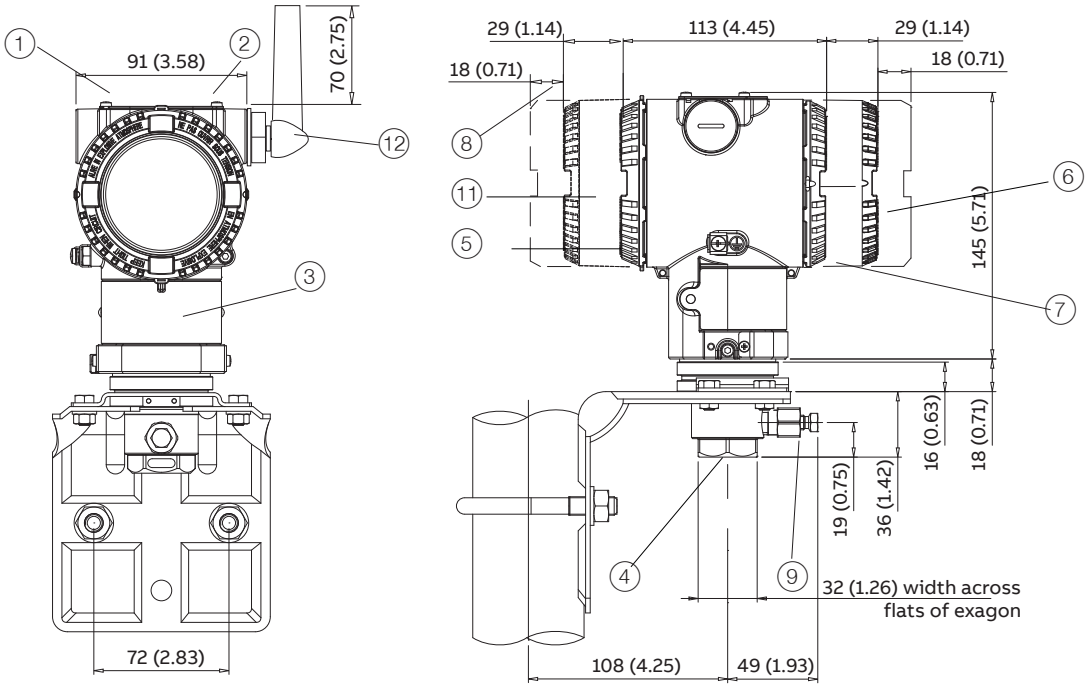
Custom configuration (option N6)

The following data may be specified in addition to the standard configuration parameters:

Descriptor	16 alphanumeric characters
Message	32 alphanumeric characters
Date	Day, month, year

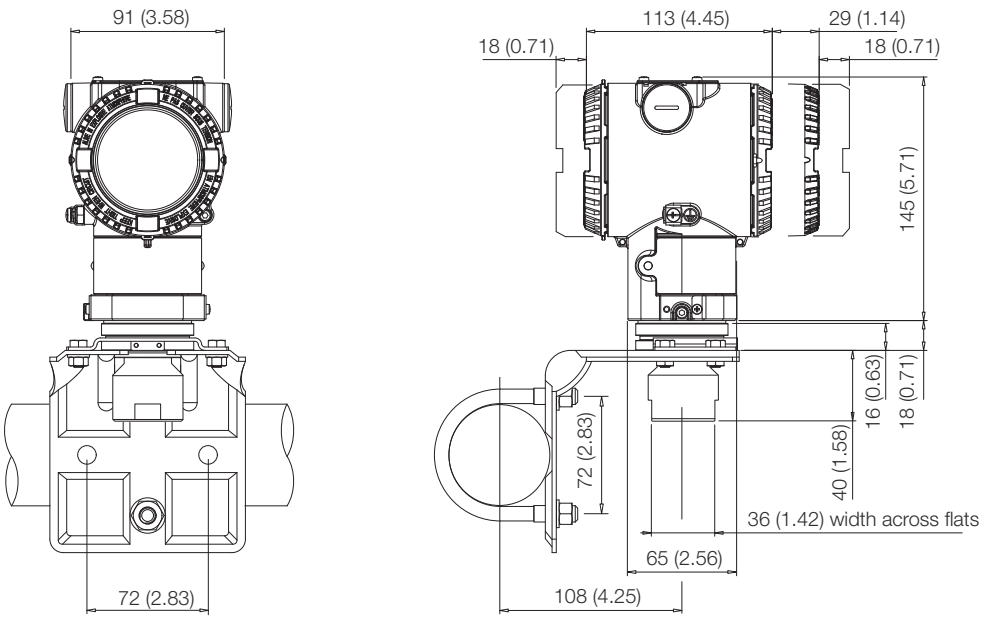
MOUNTING DIMENSIONS (not for construction unless certified) – dimensions in mm. (in.)

Transmitter with barrel housing - 1/2 in. NPT female connection for sensor E to S



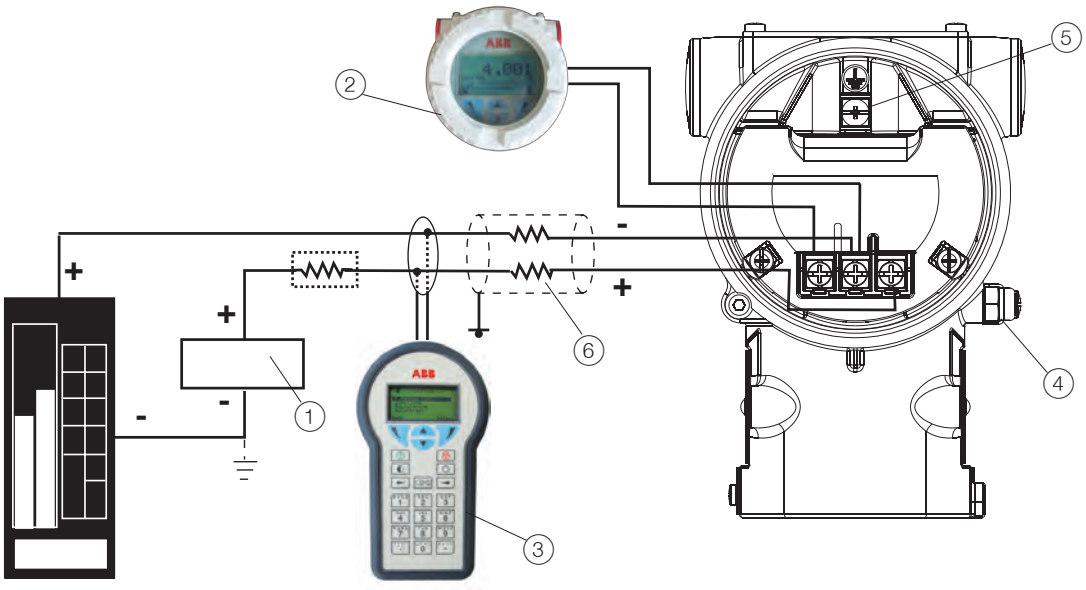
(1) Adjustments | (2) Identification plate | (3) Certification plate | (4) Process connection | (5) Terminal side | (6) L1 and L5 integral display housing | (7) Electronic side | (8) Space for cover removal | (9) Drain/vent valve | (11) Battery housing of WirelessHART version | (12) Antenna of WirelessHART version

Transmitter with barrel housing - 1/2 in. NPT female connection for sensor W



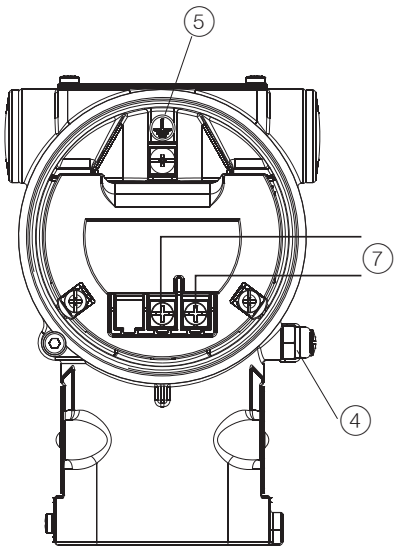
Electrical connections

HART Version



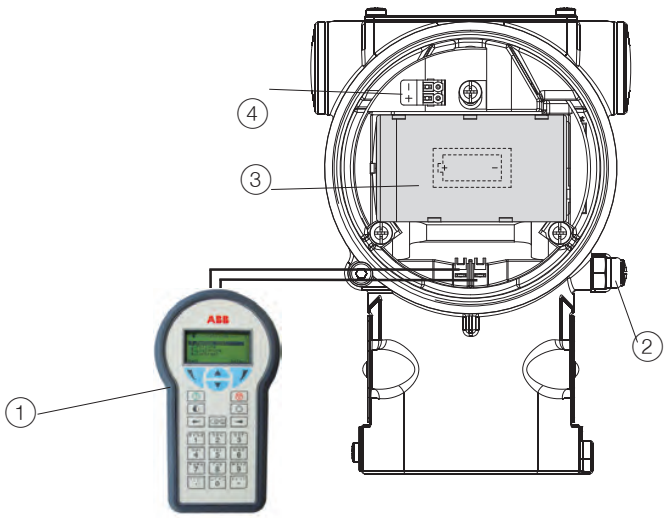
HART hand-held communicator may be connected at any wiring termination point in the loop, providing the minimum resistance is 250 ohm. If this is less than 250 ohm, additional resistance should be added to allow communications. Maximum voltage drop on external remote indicator is 0.7 V DC.

FIELDBUS Versions



(1) Power source | (2) Remote indicator | (3) Handheld communicator | (4) External ground termination point | (5) Internal ground termination point | (6) Line load | (7) Fieldbus line (polarity independent)

WirelessHART version



(1) Handheld communicator | (2) External ground termination point | (3) Battery | (4) Fast connection for harvesting unit

Model 266HSH Gauge
Model 266NSH Absolute

Ordering information

BASIC ORDERING INFORMATION model 266HSH Gauge Pressure Transmitter

Select one character or set of characters from each category and specify complete catalog number.
Refer to additional ordering information and specify one or more codes for each transmitter if additional options are required.

BASE MODEL - 1st to 6th characters					**2 6 6 H S H**	X	X	X	X	X
Gauge Pressure Transmitter – BASE ACCURACY 0.06 %										
SENSOR - Span limits - 7th character										
0.54 and 16 kPa	5.4 and 160 mbar	2.16 and 64 inH2O				E				
0.4 and 40 kPa	4 and 400 mbar	1.6 and 160 inH2O				F				
1.6 and 160 kPa	16 and 1600 mbar	6.4 and 642 inH2O				H				
6 and 600 kPa	0.06 and 6 bar	0.87 and 87 psi				M				
24 and 2400 kPa	0.24 and 24 bar	3.5 and 348 psi				P				
80 and 8000 kPa	0.8 and 80 bar	11.6 and 1160 psi				Q				
160 and 16000 kPa	1.6 and 160 bar	23.2 and 2320 psi				S				
1400 and 70000 kPa	14 and 700 bar	203 and 10150 psi	(REMARK)	(Note 22)		W				
10500 and 105000 kPa	105 and 1050 bar	1522 and 15225 psi	(REMARK)	(Note 22)		Z				
Diaphragm material / Fill fluid (wetted parts) - 8th character										
AISI 316 L ss		Silicone oil		(Note 12)		NACE	S			
Hastelloy® C-276		Silicone oil		(Notes 11, 12, 22)		NACE	K			
Monel 400®		Silicone oil		(Notes 2, 11, 12, 22)		NACE	M			
AISI 316 L ss gold plated		Silicone oil		(Notes 2, 11, 12, 22)		NACE	8			
Tantalum		Silicone oil		(Notes 2, 11, 12, 22)		NACE	T			
AISI 316 L ss		Inert fluid - Galden		(Notes 1, 2, 12, 22)		NACE	A			
Hastelloy® C-276		Inert fluid - Galden		(Notes 1, 2, 11, 12, 22)		NACE	F			
Monel 400®		Inert fluid - Galden		(Notes 1, 2, 11, 12, 22)		NACE	C			
AISI 316 L ss gold plated		Inert fluid - Galden		(Notes 1, 2, 11, 12, 22)		NACE	9			
Tantalum		Inert fluid - Galden		(Notes 1, 2, 11, 12, 22)		NACE	D			
AISI 316 L ss		Inert fluid - Halocarbon		(Notes 1, 2, 12, 22)		NACE	L			
Hastelloy® C-276		Inert fluid - Halocarbon		(Notes 1, 2, 11, 12, 22)		NACE	P			
Monel 400®		Inert fluid - Halocarbon		(Notes 1, 2, 11, 12, 22)		NACE	4			
AISI 316 L ss gold plated		Inert fluid - Halocarbon		(Notes 1, 2, 11, 12, 22)		NACE	I			
Tantalum		Inert fluid - Halocarbon		(Notes 1, 2, 11, 12, 22)		NACE	5			
Inconel® 718		No filling	(for sensor Z ONLY)	(Notes 2, 3, 22)		NACE	N			

continued
see next page

REMARK
SENSORS W and Z ARE NOT IN COMPLIANCE WITH ISA 12.27.01 FOR SEALING REQUIREMENTS, SPECIFICALLY FOR FM APPROVAL (Canada).

BASIC ORDERING INFORMATION model 266HSH Gauge Pressure Transmitter			2 6 6 H S H X X		X	X	X
Process connection (wetted parts) - 9th character							
AISI 316 L ss	1/2 in. – 14 NPT female		(Notes 4, 12)	NACE	B		
AISI 316 L ss	1/2 in. – 14 NPT male		(Notes 4, 12)	NACE	T		
AISI 316 L ss	DIN EN837-1 G 1/2 B		(Notes 2, 4, 12, 22)	NACE	P		
AISI 316 L ss	Adapter straight (180°) entry (not available with bracket)		(Notes 2, 4, 12, 22)	NACE	A		
AISI 316 L ss	Adapter angle (90°) entry		(Notes 2, 4, 12, 22)	NACE	N		
Hastelloy® C-276	1/2 in. – 14 NPT female		(Notes 5, 12, 22)	NACE	E		
Hastelloy® C-276	1/2 in. – 14 NPT male		(Notes 5, 12, 22)	NACE	K		
Hastelloy® C-276	DIN EN837-1 G 1/2 B		(Notes 2, 5, 12, 22)	NACE	D		
Hastelloy® C-276	Adapter straight (180°) entry (not available with bracket)		(Notes 2, 5, 12, 22)	NACE	F		
Hastelloy® C-276	Adapter angle (90°) entry		(Notes 2, 5, 12, 22)	NACE	C		
Monel 400®	1/2 in. – 14 NPT female		(Notes 2, 6, 12, 22	NACE	1		
Monel 400®	1/2 in. – 14 NPT male		(Notes 2, 6, 12, 22	NACE	2		
Monel 400®	DIN EN837-1 G 1/2 B		(Notes 2, 6, 12, 22	NACE	3		
Inconel® 718	F250C	(for sensor Z ONLY)	(Notes 2, 3, 22)	NACE	6		
Inconel® 718	1/4 in. – 18 NPT female	(for sensor Z ONLY)	(Notes 2, 3, 22)	NACE	7		
Housing material and electrical connection - 10th character							
Aluminium alloy (barrel version)	1/2 in. – 14 NPT			(Note 17)		A	
Aluminium alloy (barrel version)	M20 x 1.5 (CM 20)	(TO BE USED for WirelessHART)		(Note 22)		B	
AISI 316 L ss (barrel version) (I2 or I3 required)	1/2 in. – 14 NPT			(Note 17)		S	
AISI 316 L ss (barrel version) (I2 or I3 required)	M20 x 1.5 (CM20)	(TO BE USED for WirelessHART)		(Note 22)		T	
Aluminium alloy (DIN version)	M20 x 1.5 (CM20)	(not Ex d or XP)		(Notes 17, 22)		J	
Output/Additional options - 11th character							
HART and 4 to 20 mA - Standard functionality				(Note 12)			7
HART and 4 to 20 mA - Advanced functionality (includes option R1)							1
PROFIBUS PA (includes option R1)							2
FOUNDATION Fieldbus (includes option R1)							3
HART and 4 to 20 mA Safety, certified to IEC 61508 (includes option R1)				(Note 22)			8
WirelessHART (includes option R1)				(Notes 12, 16, 22)			9

NOTE - Option R1 represents the external pushbuttons

Model 266HSH Gauge
Model 266NSH Absolute

ADDITIONAL ORDERING INFORMATION for model 266HSH

Add one or more 2-digit code(s) after the basic ordering information to select all required options

				XX	XX	XX
Accuracy						
0.04 % accuracy for applicable ranges			(Notes 17, 21)	D2		
Drain/vent valve material (wetted parts)						
AISI 316 L ss	(Notes 2, 7, 12)	NACE			VA	
Hastelloy® C-276	(Notes 2, 8, 12)	NACE			VB	
Monel 400®	(Notes 2, 9, 12)	NACE			VC	
Hazardous area certifications						
ATEX Intrinsic Safety Ex ia			(Note 22)			E1
ATEX Explosion Proof Ex d			(Notes 10, 17, 22)			E2
ATEX Intrinsic Safety Ex ic			(Notes 17, 22)			E3
Combined ATEX, IECEx, FM Approvals (USA) and FM Approvals (Canada)			(Notes 10, 17, 22)			EN
FM Approvals (Canada) approval			(Notes 10, 17)			E4
FM Approvals (USA) approval			(Notes 10, 17)			E6
FM Approvals (USA and Canada) Intrinsically Safe						EA
IECEx Intrinsic Safety Ex ia			(Note 22)			E8
IECEx Explosion Proof Ex d			(Notes 10, 17, 22)			E9
IECEx Intrinsic Safety Ex ic			(Notes 17, 22)			ER
NEPSI Intrinsic Safety Ex ia			(Notes 17, 22)			EY
NEPSI Explosion Proof Ex d			(Notes 10, 17, 22)			EZ
NEPSI Type „N“			(Notes 17, 22)			ES

ADDITIONAL ORDERING INFORMATION for model 266HSH		XX	XX	XX	XX	XX	XX
Other hazardous area certifications (ONLY AS ALTERNATIVE TO BASIC CERTIFICATION CODE Ex)							
Technical Regulations Customs Union (EAC) Intrinsic Safety Ex ia for Russia	(Notes 17, 22)	W1					
Technical Regulations Customs Union (EAC) Explosion Proof Ex d for Russia	(Notes 10, 17, 22)	W2					
Technical Regulations Customs Union (EAC) combined Ex ia and Ex d for Russia	(Notes 10, 17, 22)	WC					
Technical Regulations Customs Union (EAC) Intrinsic Safety Ex ia for Kazakhstan	(Notes 17, 22)	W3					
Technical Regulations Customs Union (EAC) Explosion Proof Ex d for Kazakhstan	(Notes 10, 17, 22)	W4					
Technical Regulations Customs Union (EAC) combined Ex ia and Ex d for Kazakhstan	(Notes 10, 17, 22)	WD					
Inmetro (Brazil) Ex ia	(Notes 17, 22)	W5					
Inmetro (Brazil) Ex d	(Notes 10, 17, 22)	W6					
Inmetro (Brazil) Ex nL	(Notes 17, 22)	W7					
Combined Inmetro (Brazil) - Intrinsic Safety, Explosion Proof and Type „N“	(Notes 10, 17, 22)	W8					
Technical Regulations Customs Union (EAC) Intrinsic Safety Ex ia for Belarus	(Notes 16, 17, 22)	WF					
Technical Regulations Customs Union (EAC) Explosion Proof Ex d for Belarus	(Notes 10, 17, 22)	WG					
Technical Regulations Customs Union (EAC) combined Ex ia and Ex d for Belarus	(Notes 10, 17, 22)	WH					
Kosha (Korea) Intrinsic Safety Ex ia IIC T6, IP67	(Notes 2, 14, 17, 22)	WM					
Kosha (Korea) Explosion Proof Ex d IIC T6, IP67	(Notes 2, 10, 14, 17, 22)	WN					
Combined Kosha (Korea) - Intrinsic Safety and Explosion Proof	(Notes 2, 10, 14, 17, 22)	WP					
Integral LCD							
Digital LCD integral display with integrated keypad	(Note 14)		L1				
Digital LCD integral display with TTG (Through-The-Glass) activated keypad	(Note 14)		L5				
Integrated digital LCD display (ONLY SELECTABLE WITH OUTPUT CODE 7)	(Note 20)		LS				
External non intrusive Z, S and WP pushbuttons							
Transmitters with external pushbutton (ONLY SELECTABLE WITH OUTPUT CODE 7)				R1			
Mounting bracket (shape and material)							
For pipe/wall mounting - Carbon steel	(Not suitable for AISI housing)				B6		
For pipe/wall mounting - AISI 316 L ss					B7		
Surge							
Surge/Transient Protector	(Note 17)					S2	
Operating manual (multiple selection allowed)							
German (FOR HART, WirelessHART and PROFIBUS VERSIONS)							M1
Italian (ONLY FOR HART VERSIONS)							M2
Spanish (FOR HART, WirelessHART and FOUNDATION Fieldbus VERSIONS)							M3
French (ONLY FOR HART VERSIONS)							M4
English							M5
Portuguese (ONLY FOR HART VERSIONS)							MA
Russian (ONLY FOR HART VERSIONS)							MB

Model 266HSH Gauge
Model 266NSH Absolute

ADDITIONAL ORDERING INFORMATION for model 266HSH	XX	XX	XX	XX	XX
Plates language					
German	T1				
Italian	T2				
Spanish	T3				
French	T4				
Additional tag plate					
Supplemental wired-on stainless steel plate		I1			
Tag and certification stainless steel plates and laser printing of tag		I2			
Tag, certification and supplemental wired-on stainless steel plates and laser printing of tag		I3			
Configuration					
Standard – Pressure = inH2O/ psi at 68 °F; Temperature = deg. F			N2		
Standard – Pressure = inH2O/ psi at 39.2 °F; Temperature = deg. F			N3		
Standard – Pressure = inH2O/ psi at 20 °C; Temperature = deg. C			N4		
Standard – Pressure = inH2O/ psi at 4 °C; Temperature = deg. C			N5		
Custom			N6		
Preparation procedure					
Oxygen service cleaning (only available with inert fill) (Notes 2, 12, 15, 22)				P1	
Pmax =10 MPa for Galden, 9 MPa for Halocarbon for sensors E to S; Tmax=60 °C/140 °F					
Certificates (multiple selection allowed)					
Inspection certificate EN 10204–3.1 of calibration (9-point)					C1
Inspection certificate EN 10204–3.1 of the cleanliness stage (Note 22)					C3
Inspection certificate EN 10204–3.1 of helium leakage test of the sensor module (Note 22)					C4
Inspection certificate EN 10204–3.1 of the pressure test					C5
Certificate of compliance with the order EN 10204–2.1 of instrument design					C6
PMI test of wetted parts (FOR SENSOR Z, APPLIES ONLY TO THE PROCESS CONNECTION) (Note 22)					CT

ADDITIONAL ORDERING INFORMATION FOR MODEL 266HSH			XX	XX	XX	XX	XX	XX
Approvals								
Metrologic Pattern for Russia	(NOT APPLICABLE WITH ANY HAZARDOUS AREA CERTIFICATION)	(Note 22)	Y1					
Metrologic Pattern for Kazakhstan	(NOT APPLICABLE WITH ANY HAZARDOUS AREA CERTIFICATION)	(Note 22)	Y2					
Metrologic Pattern for Belarus	(NOT APPLICABLE WITH ANY HAZARDOUS AREA CERTIFICATION)	(Note 22)	Y4					
Chinese pattern	(NOT APPLICABLE WITH ANY HAZARDOUS AREA CERTIFICATION)	(Note 22)	Y5					
DNV GL approval		(Notes 2, 12, 14, 17)		YA				
Conformity to NAMUR NE 021 (2004)	(NOT APPLICABLE WITH SURGE PROTECTOR CODE "S2")	(Notes 2, 12, 14, 17, 19, 21)		YE				
NSF/ANSI 61 Drinking Water Certified				YN				
Material traceability								
Inspection certificate EN 10204–3.1 of process wetted parts (not for gaskets)		(Note 22)			H3			
Test report EN 10204–2.2 of pressure bearing and process wetted parts (not for gaskets)		(Note 22)			H4			
National radio frequency licence								
Basic countries (Europe, USA, Canada)		(Note 18)				FB		
Argentina		(Note 18)				FA		
United Arab Emirates		(Note 18)				FG		
Electrical connection plug								
One certified stainless steel plug (supplied loose with thread according to housing entries)							Z1	
Accessory								
Manifold mounting and pressure test	(NOT AVAILABLE WITH OXYGEN SERVICE CLEANING - PREPARATION PROCEDURE CODE "P1" or FOR SENSOR "Z" or WITH DIN EN837-1 G 1/2 B PROCESS CONNECTION CODE "P", "D", "3")	(Note 22)						A1

Note 1: Suitable for oxygen service
Note 2: Not available with Sensor code W
Note 3: Not available with Sensor code E to S
Note 4: Not available with diaphragm code M, T, C, D, 4, 5
Note 5: Not available with diaphragm code S, A, L, M, C, 4, 8, 9, I
Note 6: Not available with diaphragm code S, K, T, A, F, D, L, P, 5, E, G, 8, 9, I
Note 7: Not available with Process connection code E, K, D, F, C, 1, 2, 3
Note 8: Not available with Process connection code B, T, A, P, N, 1, 2, 3
Note 9: Not available with Process connection code E, K, D, F, C, B, T, A, P, N
Note 10: Not available with Housing code J
Note 11: Not available with Sensor code E and F
Note 12: Not available with Sensor code Z
Note 13: Not available with Sensor code E, S, W, Z
Note 14: Not available with Output code 7
Note 15: Not available with Process connection code P, A, N, D, F, C, 3
Note 16: Not available with Housing code A, S, J
Note 17: Not available with Output code 9
Note 18: Not available with Output code 1, 2, 3, 7, 8
Note 19: Not available with Output code 2, 3
Note 20: Not available with Hazardous area certification code WM, WN, WP
Note 21: Not available with Hazardous area certification code EN, E4, E6, EA, EY, EZ, ES, W1, W2, WC, W3, W4, WD, W5, W6, W7, W8, WF, WG, WH, WM, WN, WP
Note 22: Not available NSF/ANSI 61 approval code YN

Standard delivery items (can be differently specified by additional ordering code)

– No drain/vent valves
– General purpose (no electrical certification)
– No display, no mounting bracket, no surge protection
– Multilanguage short-form operating instruction manual and labels in english (metal nameplate; self-adhesive certification and tag)
– Configuration with kPa and deg. C units
– No test, inspection or material traceability certificates

OTOKLIN GLOBAL BUSINESS LIMITED	TECHNICAL DATSHEET AND HOOK UP DRAWING FOR TRANSMITTERS				
CLIENT	**BHARAT HEAVY ELECTRICALS LTD.**	**Project Doc No.:** PE-V0-412-158-A047			
PROJECT	**PreTreatment Plant Ennore**	**OTOKLIN DOC NO:-** OGBL/OC-983/TDSHKUP/TRA/PTP/18/330			
		MADE BY FN	**CHKD BY** MI	**APPD BY** AA	**Rev No:-** 3

SR. NO.	DISCRIPTION			REMARK
4.0	**DATA SHEET FOR ADDITIONAL LOCAL LCD/LED DISPLAY (R3)**			
4.01	Current	4-20 mA		
4.02	Voltage drop	<3V to <5V		
4.03	Display	0.56", Seven Segment LED, Red 4-digit	0.5", Seven Segment LCD, Black 4-digit	
4.04	Indication range	(-)1999 to 9999		
4.05	Decimals	Selectable, 0 to 3		
4.06	Response time	< 500 mSec		
4.07	Scaling	Via Three pushbuttons at front panel		
4.08	Accuracy	0.1% of FS (+/- 1 digit)		
4.09	Resolution	12 bits		
4.10	Temp-co	36VDC		
4.11	Response Time	< 100ppm		
4.12	Enclosure Color	Grey		
4.13	Material	ABS		
4.14	Dimensions (W x H x D)	122 x 88 x 44 mm		
4.15	Weight	180g	170g	
4.16	Operarting Temperature	0 to 55°C		
4.17	KKS No of instruemnts with additional dsplay	90GBN91CL001 90GBN61CL001 90GBN62CL001 90GBN71CL001 90GBN82CL001 90GBN60CL001 90GBN63CL001 90GBN72CL001 90GBN81CL001	90GBD03CF001 90GBD03CF002 90GBD10CF001 90GBD02CF001	
4.18	Qty.	9	4	
4.19	Model No.	LP1-LED-W	LP1-LCD-W	
4.20	Origin Country	India		
4.21	Make	Masibus		



LPI-1 - LCD-P



LPI-1 - LED-P



LPI-1 - LCD-W



LPI-1 - LED-W

LPI-1

Loop Powered Indicator

Indicators with
- LED or LCD Display
- Panel or Wall Mount Enclosure

Masibus LPI-1 series Loop Powered Indicators come in four models; LED in Panel and Wall Mount as well as LCD in Panel and Wall Mount, to suit different viewing and mounting applications. All models are two-wire loop powered and need no Auxiliary power.

LPI-1 series indicators are housed in compact with ergonomically designed front fascia, the panel mount models have an IP65 front panel whereas the Wall mount models qualify for IP65 housing, all models deliver an accuracy of 0.1% of FS combined with a low temperature drift.

The indication range can be easily scaled by 3 front pushbuttons, the scale can be set to any range between -1999 to 9999 for 4-20mA input, and reverse scaling is also possible.

Features

- 4-Digit LED or LCD Display options
- Loop Powered with low voltage drop
- Reverse scaling for indication range
- Square root extraction
- Accuracy 0.1% of FS
- Panel or Wall mounting options
- Easy configuration with pushbuttons
- Compact and IP65 front/housing

Applications

For Loop powered applications in Industries like

- Power
- Metals
- Chemicals
- Fertilizer
- Cement

Technical Specifications





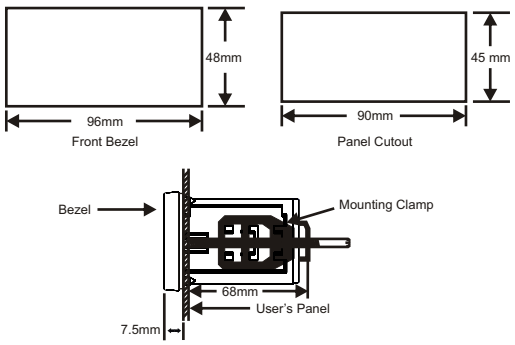




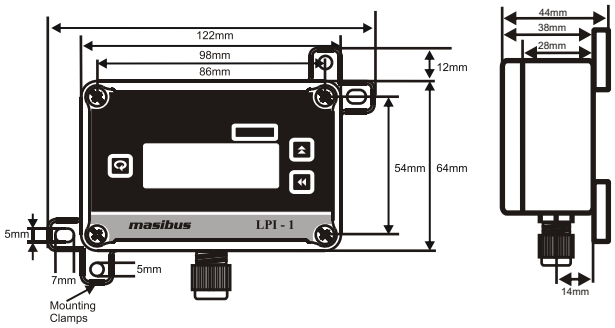
	LED Panel Mount	LED Wall Mount	LCD Panel Mount	LCD Wall Mount
Input				
Current	4-20mA			
Voltage drop	< 5V		< 3V	
Maximum current	30mA			
Minimum current for operation	3.5mA			
Display				
Display	0.56", Seven Segment LED, Red 4-digit		0.5", Seven Segment LCD, Black 4-digit	
Indication Range	-1999 to 9999			
Decimals	Selectable, 0 to 3			
Response time	< 500 mSec			
Configuration				
Scaling	Via Three pushbuttons at front panel			
Accuracy				
Indication	0.1% of FS (+/- 1 digit)			
Resolution	12 bits			
Temp-co	< 100ppm			
Physical				
Enclosure Color	Black	Grey	Black	Grey
Material	Flame resistant Noryl SE 1 GFN 1	ABS	Flame resistant Noryl SE 1 GFN 1	ABS
Dimensions (W x H x D)	96 x 48 x 68 mm	122 x 88 x 44 mm	96 x 48 x 68 mm	122 x 88 x 44 mm
Weight	150g	180g	140g	170g
IP (Ingress Protection)	Front IP65	Enclosure IP65	Front IP65	Enclosure IP65
Environmental				
Operating Temperature	0 to 55°C			
Storage Temperature	0 to 80°C			
Humidity	20 to 95% (Non-condensing)			

Mechanical Layout

LPI-1 Panel Mount



LPI-1 Wall Mount



Ordering code

Model	Display	Mounting	
LPI-1	LED	W	Wall
		P	Panel
	LCD	W	Wall
		P	Panel

Head Office:
Masibus Automation And Instrumentation Pvt. Ltd.
B-30, GIDC Electronics Estate, Sector-25, Gandhinagar-382044, Gujarat, India.
Tel: +91 79 23287275-79, Fax: +91 79 23287281-82.
E-mail: sales@masibus.com, Web: www.masibus.com

All specifications are subject to change without notice due to continuous improvements.
Doc. Ref. LPI-1/R1F/0214

Masibus Representative:

Peenya, Bengaluru
July 3, 2019

Sub.:- Declaration of Manufacturing location for ABB MAKE LST300

To Whomsoever it May Concern,

This is to confirm that ABB has single manufacturing location for Ultrasonic level transmitters, LST300 model, in Shanghai, China as on date.

Yours Faithfully

03/07/19

Soma Kumari

Product manager, India

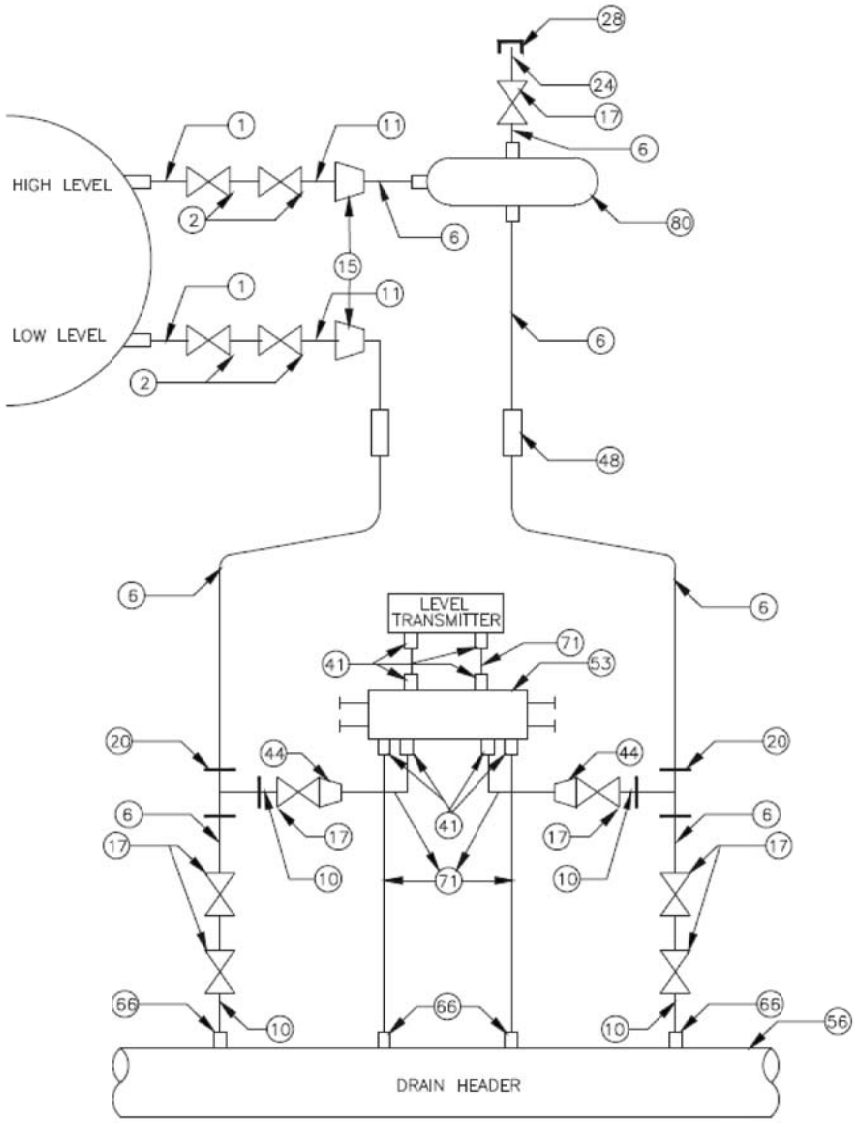
COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in any way detrimental to the interest of the company.

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

DRAWING NO.

CUSTOMER'S DRAWING NO.



TRANSMITTER MOUNTED BELOW INST. SOURCE POINT

TAG NO.	DESCRIPTION	BOM
80	CONDENSATION CHAMBER	1
71	1/2"OD IMPULSE TUBE, SS-316	AS REQD
66	1/2" GI SOCKET / FUNNEL	4
56	2"NB GI DRAIN HEADER	AS REQD
53	5-VALVE MANIFOLD, SS-316	1
48	1/2" SW, CS/AS BULK HEAD PIPE UNION	2
44	1/2"BWX1/2"OD COMPRESSION TUBE FITTING,SS-316	2
41	1/2"NPT(M)X1/2"OD TUBE COMPRESSION FITTING,SS-316	8
28	1/2" NPT (F) CS CAP	1
24	1/2" NPS SCH-80/160X1/2"NPT(M) CS/AS NIPPLE	1
20	1/2" SOCKET WELDED EQUAL TEE CS/AS	2
17	1/2" SOCKET WELDED CS GLOBE VALVE	7
15	1"TO 1/2" SOCKET WELD REDUCER	2
11	1" NPS SCH 80/160 CS/AS NIPPLE	2
10	1/2" NPS SCH 80/160,CS/AS NIPPLE	4
6	1/2" NPS SCH 80/160 CS/AS PIPE	AS REQD
2	1/2"/3/4"/1" SOCKET WELDED GLOBE VLV/ROOT VLV.	4
1	1/2" NPS SCH 80 NIPPLES OF MATERIAL SAME AS MAIN PIPE WITH NECESSARY ATTACH TO FLANGES	AS REQD

NOTE:-
1. FOR HIGH TEMP. SERVICE (MORE THAN 80°C) A 'U' TUBE(REF. DWG NO. 114-04-0100) SHALL BE PROVIDED BETWEEN THE MANIFOLD AND THE TRANSMITTER
2. FOR HIGH PR.(MORE THAN 40kg/sqcm) ONE NO. OF ISOLATING VLV. IS PROVIDED IN EACH LINE BETWEEN VLV. MANIFOLD AND 1/2"SW EQUAL TEE AND 2NO. DRAIN VLV. ARE ALSO

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

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT		NAME	SIGN	DATE
CODE	DRN	FAISAL N	FN	11-07-19
MAX	DESN	FAISAL N	FN	11-07-19
	CHD	MUAZZAM I	MI	11-07-19
	APPD	ASLAM A	AA	11-07-19

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

BHEL DOC NO.
PE-V0-412-158-A047

TITLE HOOKUP DIAGRAM FOR LEVEL TRANSMITTER

DEPT. SCALE
SIGN
DATE

OGBL DOC NO.
OGBL/OC-BHE/TDHKUP/TRA/PTP/18/B00

SHEET 81 OF 83 REV 0

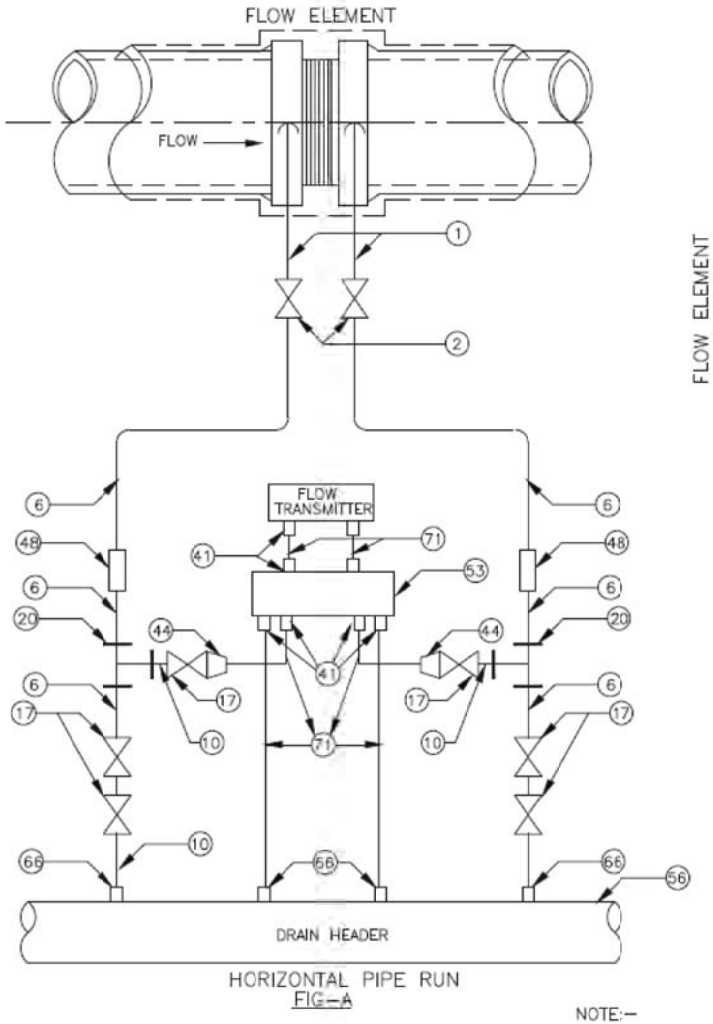
SIZE-A1

FIRST ANGLE PROJECTION

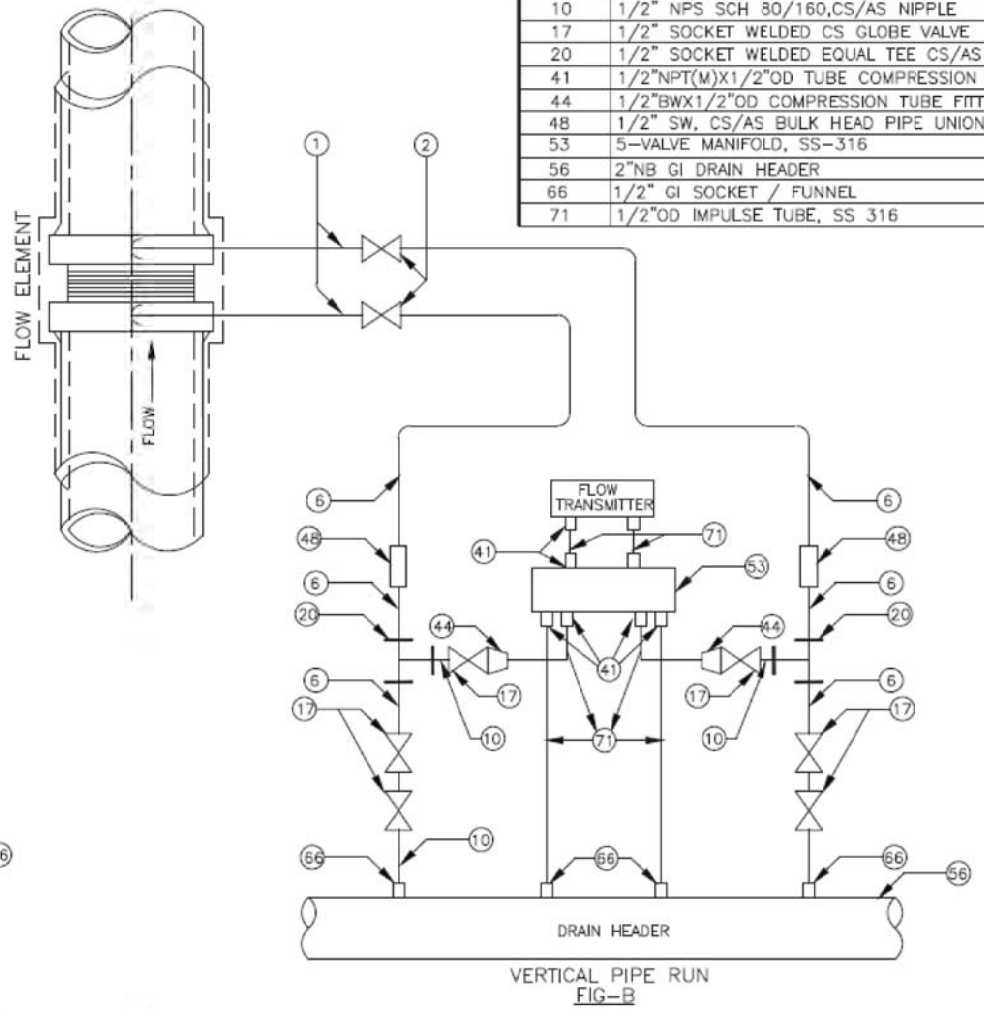
ALL DIMENSIONS ARE IN MM

CUSTOMER'S DRAWING NO.

TAG NO.	DESCRIPTION	QTY. A	QTY. B
1	1/2" NPS SCH 80 NIPPLES OF MATERIAL SAME AS MAIN PIPE WITH NECESSARY ATTACH TO FLANGES	AS REQ	
2	1/2" SOCKET WELDED GLOBE VALVE	2	2
6	1/2" NPS SCH 80/160 CS/AS PIPE	AS REQ	
10	1/2" NPS SCH 80/160,CS/AS NIPPLE	4	4
17	1/2" SOCKET WELDED CS GLOBE VALVE	4	4
20	1/2" SOCKET WELDED EQUAL TEE CS/AS	2	2
41	1/2"NPT(M)X1/2"OD TUBE COMPRESSION FITTING,SS-316	8	8
44	1/2"BWX1/2"OD COMPRESSION TUBE FITTING,SS-316	2	2
48	1/2" SW, CS/AS BULK HEAD PIPE UNION	2	2
53	5-VALVE MANIFOLD, SS-316	1	1
56	2"NB GI DRAIN HEADER	AS REQ	
66	1/2" GI SOCKET / FUNNEL	4	4
71	1/2"OD IMPULSE TUBE, SS 316	AS REQ	



HORIZONTAL PIPE RUN
FIG-A



VERTICAL PIPE RUN
FIG-B

NOTE:-
FOR PROCESS PR. ABOVE 40Kg/sqcm DOUBLE VLV.
SHALL BE USED FOR CONNECTION TO THE DRAIN HEADER

COPY RIGHT 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.

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	11-07-19
	DESN	FAISAL N	FN	11-07-19
	CHD	MUAZZAM I	MI	11-07-19
	APPD	ASLAM A	AA	11-07-19

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

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

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

BHEL DOC NO.
PE-V0-412-158-A047

TITLE HOOKUP DIAGRAM FOR FLOW TRANSMITTER

OGBL DOC NO.
OGBL/OC-SSS/TDSHKUP/TRA/FTP/18/SSS

DEPT. SCALE
SIGN
DATE

SHEET 82 OF 83 REV 0

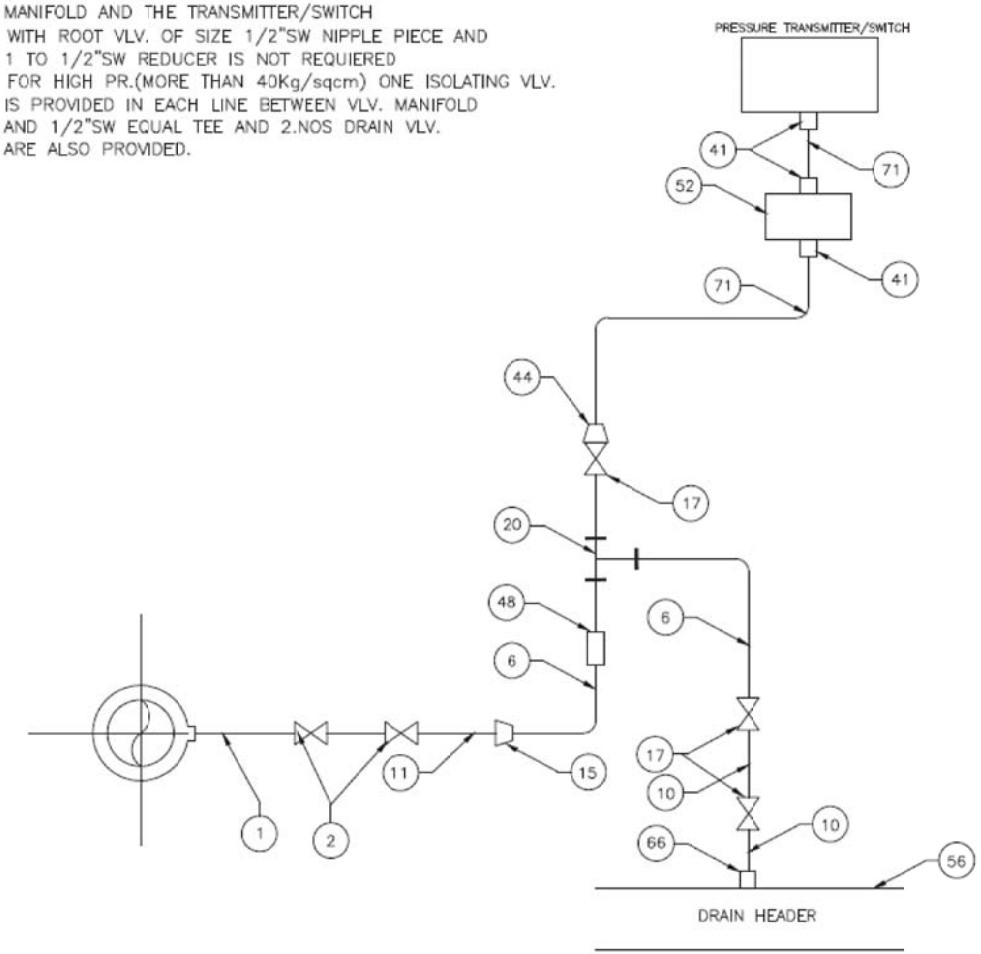
SIZE-A1

COPY RIGHT 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.

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM | DRAWING NO. | CUSTOMER'S DRAWING NO.

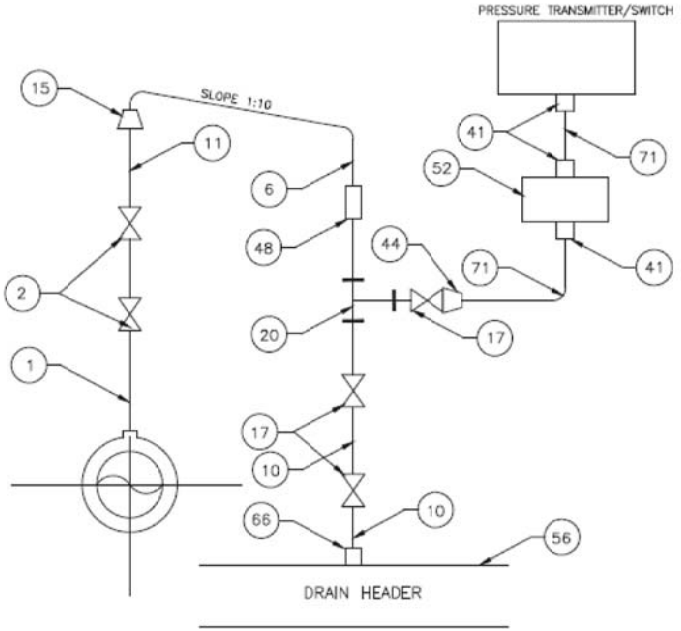
NOTE:–

1. FOR HIGH TEMP. SERVICE (MORE THAN '80C) A 'U'–TUBE / SYPHON (REF. DWG NO. IN–114–04–0100)SHALL BE PROVIDED BETWEEN THE MANIFOLD AND THE TRANSMITTER/SWITCH
2. WITH ROOT VLV. OF SIZE 1/2"SW NIPPLE PIECE AND 1 TO 1/2"SW REDUCER IS NOT REQUIERED
3. FOR HIGH PR.(MORE THAN 40Kg/sqcm) ONE ISOLATING VLV. IS PROVIDED IN EACH LINE BETWEEN VLV. MANIFOLD AND 1/2"SW EQUAL TEE AND 2.NOS DRAIN VLV. ARE ALSO PROVIDED.



TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

FIG–D



TRANSMITTER MOUNTED ABOVE INSTRUMENT SOURCE POINT

FIG–C

TAG NO.	DESCRIPTION	QTY. C	QTY. D
71	1/2"OD IMPULSE TUBE,SS–316	AS REQD.	
66	1/2" GI SOCKET	1	1
56	2"NB GI DRAIN HEADER		
52	5/3/2–VALVE MANIFOLDS,SS–316	1	1
48	1/2"SW,CS/AS BULK HEAD PIPE UNION	1	1
44	1/2"BW X 1/2"OD COMRESSION TUBE FITTING,SS–316	1	1
41	1/2"NPT(M) X 1/2"OD TUBE COMPRESSION FITTING,SS–316	3	3
20	1/2"SW EQUAL TEE,CS	1	1
17	1/2" SW,CS GLOBE VALVE / NEEDLE VALVE	3	3
15	1" TO 1/2" SW REDUCER	1	1
11	1" NPS SCH–80 CS/AS NIPPLE	1	1
10	1/2" NPS,SCH 80/160, CS/AS NIPPLE	2	2
6	1/2" NPS. SCH–80/160 CS/ AS PIPE	AS REQD.	
2	1/2"/3/4"/1" ROOT VALVE	2	2
1	1/2"/3/4"/1" CARBON/ALLOY STEEL NIPPLE OF MTL. SAME AS THAT OF MAIN PIPE(AS PER PROCESS REQD.)	AS REQD.	

BILL OF MATERIAL

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

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	11–07–19
	DESN	FAISAL N	FN	11–07–19
	CHD	MUAZZAM I	MI	11–07–19
	APPD	ASLAM A	AA	11–07–19

BHEL LOA NO: PW/PE/PG/EN1/P–310/17
BHEL DOC NO. PE–V0–412–158–A047
TITLE HOOKUP DIAGRAM FOR PRESSURE TRANSMITTER
OGBL DOC NO. OGBL/OC–088/TDHKUP/TRA/PTP/18/088
DEPT. SCALE
SIGN
DATE
SHEET 81 OF 83 REV 0
SIZE–A1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:	REV	DATE	ALTERED:
		CHECKED:			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED

PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

TECHNICAL DATSHEET AND HOOK UP DRAWING FOR ANALYZER for PT PLANT

	NAME	SIGN	DATE
PREP	FAISAL N	FN	25-03-19
CHKD	MUAZZAM I	MI	25-03-19
APPD	ASLAM A	AA	25-03-19

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

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A048	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/TDSHKUP/ANA/PTP/18/331	03
DATE								NO. OF SHEETS 50 EXCLUDING COVER PAGE	

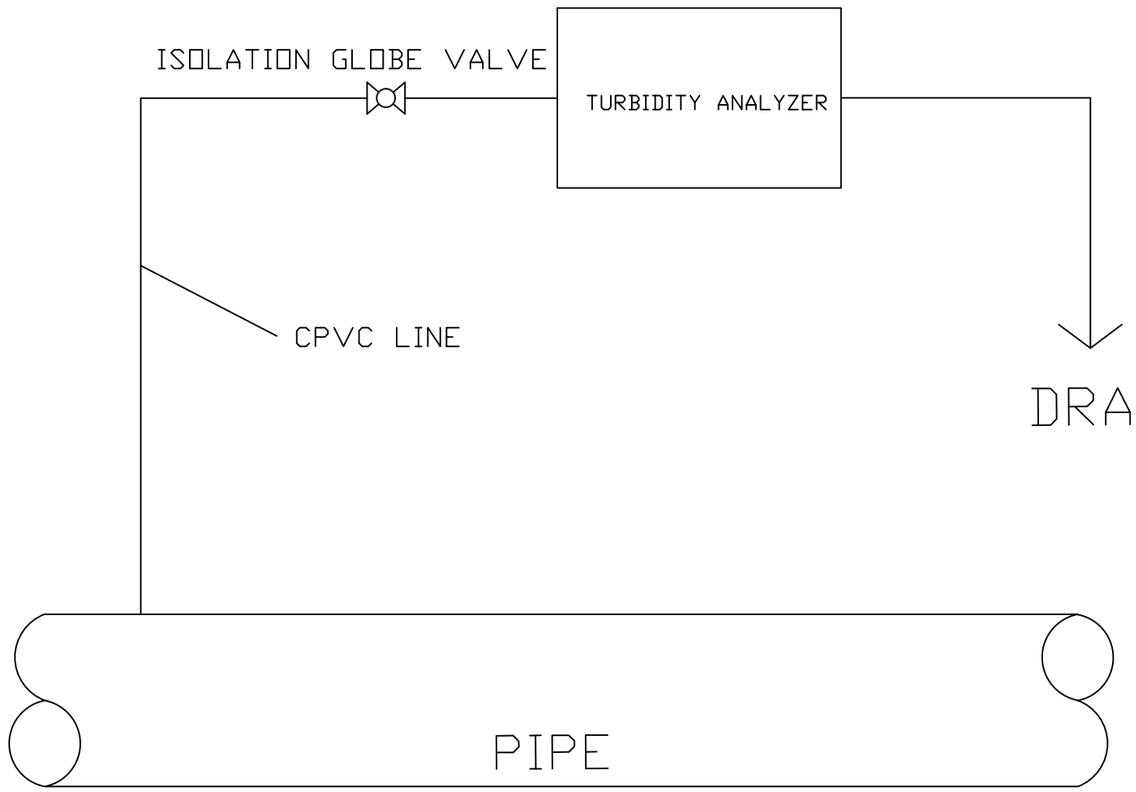
OTOKLIN GLOBAL BUSINESS LIMITED	TECHNICAL DATSHEET AND HOOK UP DRAWING FOR ANALYSERS FOR PT PLANT				
CLIENT	**BHARAT HEAVY ELECTRICALS LTD.**	**Project Doc No.:** PE-V0-412-158-A048			
PROJECT	**Pre Treatment Plant Ennore**	**OTOKLIN DOC NO:-** OGBL/OC-983/TDSHKUP/ANA/PTP/18/331			
		MADE BY FN	**CHKD BY** MI	**APPD BY** AA	**Rev No:-** 2

SR. NO.	DISCRIPTION		REMARK
	DATA SHEET FOR TURBIDITY ANALYZER (ON-LINE)		
1.0	**Sensor**		
1.1	Components	Microprocessor-controlled turbidity bypass sensor ULTRATURB sc for very low to medium turbidities with comprehensive self-diagnostics	
1.2	Measuring technique	90° infrared pulse scattered light technique in accordance with DIN EN ISO 7027	
1.3	Measuring range	0.0001–1000 FNU (TE/F, NTU, FTU) can be programmed as required (0.0001–250 EBC = 2500 ppm SiO2)	
1.4	Resolution	0.0001–0.9999 / 1.00–9.99 / 10.0–99.9 / 100–1000 FNU	
1.5	Precision	±0.008 FNU or ±1 % of the measured value (0–10 FNU)	
1.6	Reproducibility	±0.003 FNU or ±0.5 % of the measured value (0–2 FNU)	
1.7	Technique variation coefficient	1 % in accordance with DIN 38402	
1.8	Response time	1–60 s (can be programmed as required)	
1.9	Air bubble compensation	Physical-mathematical	
1.10	Calibration	Permanently set in the factory (Validation using formazine, StablCal, dry standard CVM)	
1.11	Sample flow rate	Min. 0.2 L/min, max. 1 L/min, max. 6 bar (at 20 °C (at 68 °F))	
1.12	Sample temperature	Max. 50 °C (Max. 122 °F)	
1.13	Salt content of the probe (only for seawater)	Tested up to 65 g/L	
1.14	Ambient temperature	2 °C to +40 °C (+ 36 °F to +104 °F)	
1.15	Sample connection	Tubing (ID 13 mm) (CPVC) or fixed connection (PVC system component pipework)	(R2)
1.16	Automatic cleaning of the measuring chamber (only for plus and seawater)	Automatic wiper cleaning, time controlled and as required	
1.17	Materials	Measuring window: quartz Measuring chamber: Noryl GFN2 Wiper axle: stainless steel 1.4571 Wiperarm (seawater): titanium alloy Wiper profile: silicone	
1.18	Housing	Enclosure rating: IP 65 Plastic housing ASA	
	Transmitter		
1.19	Type	Microprocessor Based	
1.20	Enclosure Material	Polycarbonate	
1.21	Display	Graphic dot matrix LCD with LED backlighting, transreflective	
1.22	Display Size	1.9 x 2.7 in. (48 mm x 68 mm)	
1.23	Display Resolution	240 x 160 pixels	
1.24	Resolution	0.0001 to 0.9999 / 1.000 to 9.999 / 10.00 to 99.99 / 100 to 1000 FNU (NTU)	
1.25	Repeatability	±0.003 FNU ±0.5% of reading (0 to 2 FNU)	
1.26	Accuracy	± 0.1% of FS (20mA) at 25 °C, ± 0.5% of FS over -20 °C to 60 °C range	
1.27	Variation Coefficient	1% in accordance with DIN 38402	
1.28	Power Requirements (Voltage)	100 - 240 V AC, 24 V DC ,All major equipment/systems shall be served from UPS through redundant two 100% capacity feeders.	(R2)
1.29	Power Requirements (Hz)	50/60 Hz	
1.30	Output	4-20 mA HART	
1.31	Operating Temperature Range	minus 20 to 60 °C , 0 to 95% RH non-condensing	
1.32	Enclosure Rating	NEMA 4X/IP66	
1.33	Electrical Conduit Openings	1/2 in NPT(F) Conduit with double compression type Nickel-plated brass/SS316 cable glands.	(R2)
1.34	Memory Backup	Flash memory	
1.35	Accessories	SS Tag Plate , Double compression fittings,Cable between transmitter and sensor.	(R2)
1.36	Qty.	1	
1.37	KKS NO.	90GBD01CQ001	
1.38	Make	HACH INDIA	

CUSTOMER'S DRAWING NO.
DRAWING NO.
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
Fold-1
Fold-2
Fold-3
Fold-4
COPY RIGHT 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.

HOOK-UP FOR TURBIDITY ANALYZER

TAGNO	LOCATION
90GBD01CQ001	RAWWATER LINE



REV	DATE	ALTD	CHD		REV	DATE	ALTD	CHD		REV	DATE	ALTD	CHD	APPD

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	25-03-19
	DESN	FAISAL N	FN	25-03-19
	CHD	MUAZZAM I	MI	25-03-19
	APPD	ASLAM A	AA	25-03-19

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

TITLE
INSTRUMENT HOOK-UP DRAWING OF ANALYZERS

BHEL DOC NO.
PE-V0-412-158-A048

OGBL DOC NO.
OGBL/OC-983/TDSHKUP/ANA/PTP/18/331

DEPT. | SCALE
SIGN
DATE

SHEET 2 OF 2 | REV 3

SIZE-A1

sc200™ UNIVERSAL CONTROLLER

Applications
- Drinking Water
- Wastewater
- Industrial Water
- Power



One Controller for the Broadest Range of Sensors.

Choose from 30 digital and analog sensor families for up to 17 different parameters.

Maximum Versatility

The sc200 controller allows the use of digital and analog sensors, either alone or in combination, to provide compatibility with Hach's broad range of sensors, eliminating the need for dedicated, parameter-specific controllers.

Ease of Use and Confidence in Results

Large, high-resolution, transreflective display provides optimal viewing resolution in any lighting condition. Guided calibration procedures in 19 languages minimize complexity and reduce operator error. Password-protected SD card reader offers a simple solution for data download and transfer. Visual warning system provides critical alerts.

Wide Variety of Communication Options

Utilize two to five analog outputs to transmit primary and secondary values for each sensor, or integrate Hach sensors and analyzers into MODBUS RS232/RS485, Profibus® DP, and HART networks.



Password protected SD card reader offers a simple solution for data download and transfer, and sc200 and digital sensor configuration file duplication and backup.

Controller Comparison







Features	Previous Models sc100™ Controller	Previous Models GLI53 Controller	sc200™ Controller	Benefits
Display	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	160 x 240 pixels 48 x 68 mm (1.89 x 2.67 in.) Transreflective	• Improved user interface—50% bigger • Easier to read in daylight and sunlight
Data Management	irDA Port/PDA Service Cable	N/A	SD Card Service Cable	• Simplifies data transfer • Standardized accessories/max compatibility
Sensor Inputs	2 Max Direct Digital Analog via External Gateway	2 Max Analog Depending on Parameter	2 Max Digital and/or Analog with Sensor Card	• Simplifies analog sensor connections • Works with analog and digital sensors
Analog Inputs	N/A	N/A	1 Analog Input Signal Analog 4-20mA Card	• Enables non-sc analyzer monitoring • Accepts mA signals from other analyzers for local display • Consolidates analog mA signals to a digital output
4-20 mA Outputs	2 Standard	2 Standard	2 Standard Optional 3 Additional	• Total of five (5) 4-20 mA outputs allows multiple mA outputs per sensor input
Digital Communication	MODBUS RS232/RS485 Profibus DP V1.0	HART	MODBUS RS232/RS485 Profibus DP V1.0 HART 7.2	• Unprecedented combination of sensor breadth and digital communication options

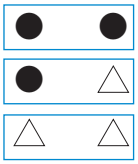
Choose from Hach's Broad Range of Digital and Analog Sensors

Parameter	Sensor	Digital or Analog
Ammonia	AMTAX™ sc, NH4D sc, AISE sc, AN-ISE sc	●
Chlorine	CLF10 sc, CLT10 sc, 9184 sc	●
Chlorine Dioxide	9185 sc	●
Conductivity	GLI 3400 Contacting, GLI 3700 Inductive	△
Dissolved Oxygen	LDO® Model 2, 5740 sc	●
Dissolved Oxygen	5500	△
Flow	U53, F53 Sensors	△
Nitrate	NITRATAX™ sc, NO3D sc, NISE sc, AN-ISE sc	●
Oil in Water	FP360 sc	●
Organics	UVAS sc	●
Ozone	9187 sc	●
pH/ORP	pHD	●
pH/ORP	pHD, pH Combination, LCP	△
Phosphate	PHOSPHAX™ sc	●
Sludge Level	SONATAX™ sc	●
Suspended Solids	SOLITAX™ sc, TSS sc	●
Turbidity	1720E, FT660 sc, SS7 sc, ULTRATURB sc, SOLITAX sc, TSS sc	●
Ultra Pure Conductivity	8310, 8311, 8312, 8315, 8316, 8317 Contacting	△
Ultra Pure pH/ORP	8362	△

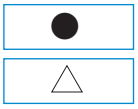
● = Digital △ = Analog

Connect up to two of any of the sensors listed above, in any combination, to meet your application needs. The diagrams below demonstrate the potential configurations. Operation of analog sensors requires the controller to be equipped with the appropriate sensor module. Contact Hach Technical Support for help with selecting the appropriate module.

2 Channel Configurations



1 Channel Configurations



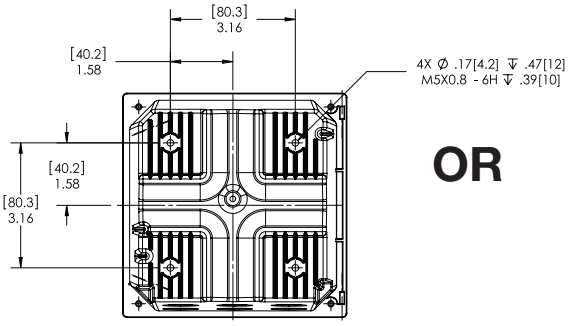
Specifications*

Dimensions (H x W x D)	5.7 in x 5.7 in x 7.1 in (144 mm x 144 mm x 181 mm)
Display	Graphic dot matrix LCD with LED backlighting, transreflective
Display Size	1.9 x 2.7 in. (48 mm x 68 mm)
Display Resolution	240 x 160 pixels
Weight	3.75 lbs. (1.70 kg)
Power Requirements (Voltage)	100 - 240 V AC, 24 V DC
Power Requirements (Hz)	50/60 Hz
Operating Temperature Range	-20 to 60 °C , 0 to 95% RH non-condensing
Analog Outputs	Two (Five with optional expansion module) to isolated current outputs, max 550 Ω , Accuracy: ± 0.1% of FS (20mA) at 25 °C, ± 0.5% of FS over -20 °C to 60 °C range Operational Mode: measurement or calculated value
Analog Output Functional Mode	Linear, Logarithmic, Bi-linear, PID
Security Levels	2 password-protected levels
Mounting Configurations	Wall, pole, and panel mounting
Enclosure Rating	NEMA 4X/IP66
Conduit Openings	1/2 in NPT Conduit
Relay: Operational Mode	Primary or secondary measurement, calculated value (dual channel only) or timer
Relay Functions	Scheduler (Timer), Alarm, Feeder Control, Event Control, Pulse Width Modulation, Frequency Control, and Warning
Relays	Four electromechanical SPDT (Form C) contacts, 1200 W, 5 A
Communication	MODBUS RS232/RS485, PROFIBUS DPV1, or HART 7.2 optional
Memory Backup	Flash memory
Electrical Certifications	EMC CE compliant for conducted and radiated emissions: - CISPR 11 (Class A limits) - EMC Immunity EN 61326-1 (Industrial limits) Safety cETLus safety mark for: - General Locations per ANSI/UL 61010-1 & CAN/CSA C22.2. No. 61010-1 - Hazardous Location Class I, Division 2, Groups A,B,C & D (Zone 2, Group IIC) per FM 3600 / FM 3611 & CSA C22.2 No. 213 M1987 with approved options and appropriately rated Class I, Division 2 or Zone 2 sensors cULus safety mark - General Locations per UL 61010-1 & CAN/CSA C22.2. No. 61010-1

Subject to change without notice.

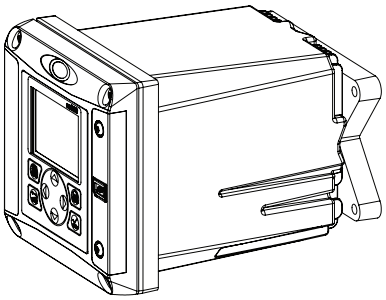
Dimensions

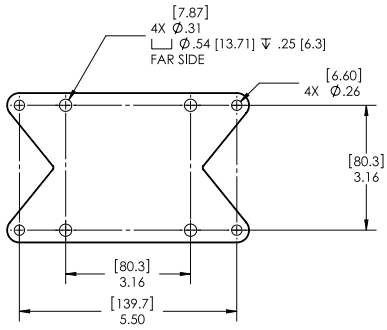
Surface Mounting Dimensions



Mounting Dimensions
(Rear View)

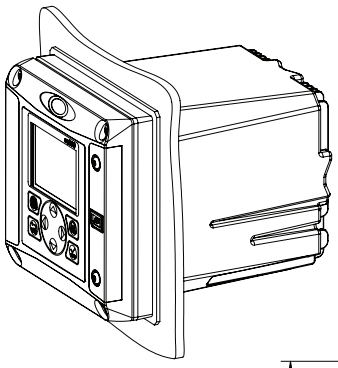
OR

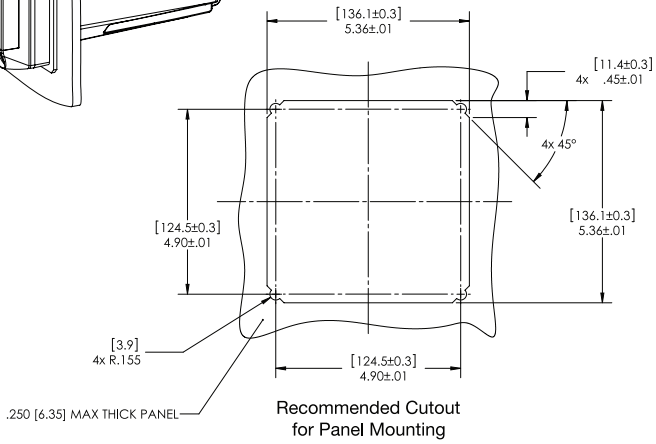




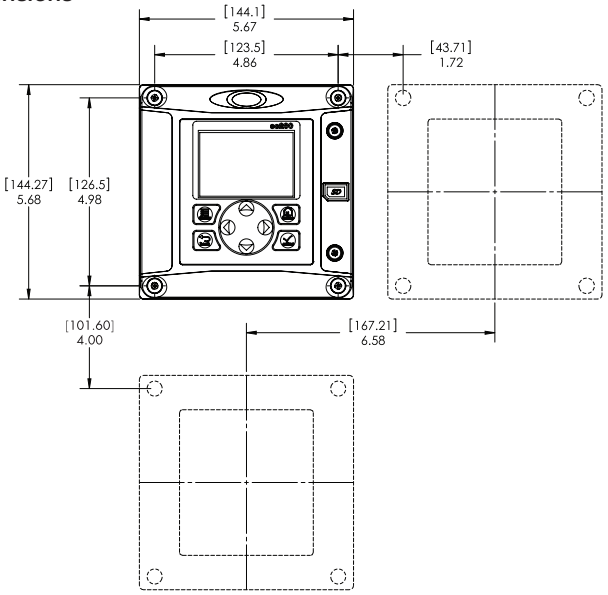
Bracket (supplied) for Surface Mounting
(Not compatible with Weather and Sun Shield
p/n 9220600 when surface mounting.)

Panel Mounting Dimensions



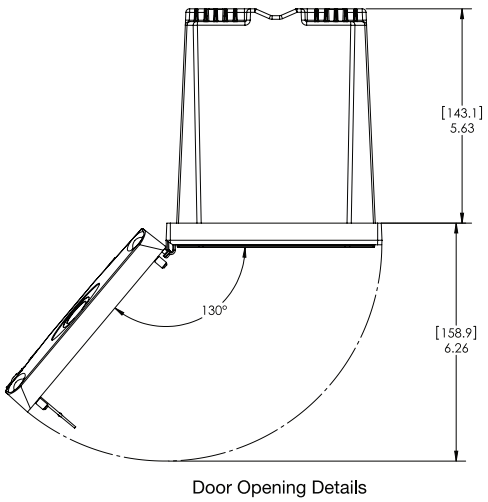


Recommended Cutout
for Panel Mounting

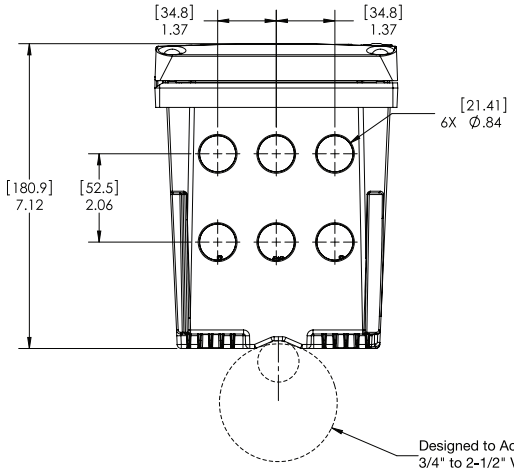


Minimum Spacing Dimensions
for Group Mounting

Top and Bottom Views



Door Opening Details



Ordering Information

sc200 for Hach Digital and Analog Sensors

LXV404.99.00552	sc200 controller, 2 channels, digital
LXV404.99.00502	sc200 controller, 1 channel, digital
LXV404.99.00102	sc200 controller, 1 channel, pH/DO
LXV404.99.00202	sc200 controller, 1 channel, Conductivity
LXV404.99.01552	sc200 controller, 2 channels, digital, Modbus RS232/RS485
LXV404.99.00112	sc200 controller, 2 channel, pH/DO

Note: Other Sensor combinations are available. Please contact Hach Technical Support or your Hach representative.

Note: Communication options (MODBUS, Profibus DPV1, and HART) are available. Please contact Hach Technical Support or your Hach representative.



sc200 for Ultrapure Sensors

9500.99.00602	sc200 controller, 1 channel, ultrapure conductivity
9500.99.00702	sc200 controller, 1 channel, ultrapure pH
9500.99.00662	sc200 controller, 2 channel, ultrapure conductivity
9500.99.00772	sc200 controller, 2 channel, ultrapure pH



Sensor and Communication Modules

9012900	Analog pH/ORP and DO module for GLI Sensors
9013000	Analog Conductivity module for GLI Sensors
9012700	Flow module
9012800	4-20 mA Input Module
9525700	Analog pH/ORP Module for Polymetron Sensors
9525800	Analog Conductivity Module for Polymetron Sensors
9013200	Modbus 232/485 Module
9173900	Profibus DP Module
9328100	HART Module
9334600	4-20 mA Output Module (Provides 3 additional mA Outputs)



Accessories

9220600	sc200 Weather and Sun Shield with UV Protection Screen
8809200	sc200 UV Protection Screen
9218200	SD card reader (USB) for connection to PC
9218100	4 GB SD card

HACH COMPANY World Headquarters: Loveland, Colorado USA

United States: 800-227-4224 tel 970-669-2932 fax orders@hach.com
Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
hach.com

LIT2665 Rev 7
K13 Printed in U.S.A.
©Hach Company, 2013. All rights reserved.
In the interest of improving and updating its equipment,
Hach Company reserves the right to alter specifications to equipment at any time.

HACH® Be Right™

ULTRATURB plus sc Sensor



ISO 7027 APPROVED

The Hach ULTRATURB plus sc Sensor is a precisely measures turbidity of ultra-clear to medium turbid media for optimum filtration control in municipal and industrial water processing plants. Data display and processing of measured data is performed by Hach sc Digital Controllers.

Features and Benefits

Wide Measurement Range – 0 to 1000 FNU (NTU)

The Hach ULTRATURB plus sc Sensor measures turbidity from 0 to 1000 FNU (NTU) for a wide variety of low to medium range turbidity applications. Use it to effectively monitor conventional filtered water processes, effluent water, distribution systems, and elevated tanks where small-sized particulates or air entrapment may be an issue.

Self-cleaning Sample Chamber Option

The ULTRATURB sensor is available with an automatically self-cleaning sample chamber that guarantees stable measured values. The silicon wiper blades inside the sample chamber are held in place with a magnetic coupling wheel to further keep the sample chamber intact.

Seawater Version

The new ULTRATURB plus Seawater sc is resistant to salt concentrations up to 65 g/L.

Ratio Methodology Detects Sample Chamber Fouling

The ULTRATURB sensor uses ratio methodology with detection at 90° and 180° to minimize reflections in the measuring cell and on the windows. In this way, fouling of the sample chamber is detected earlier than with a single detection system.

Compatible with Hach Multi-Sensor, Multi-Parameter Digital Controller

The ULTRATURB sensor can be used with Hach's sc Digital Controllers. The sc200 controller accepts up to two sensors. The sc1000 accepts up to eight sensors. Multiple controllers can be networked to accommodate many more sensors and parameters, reducing the cost per measuring point. Just plug in any Hach "plug and play" digital sensor and it's ready to use without software configuration. "Plug and play" connectivity means there's no complicated wiring or set up. Network the ULTRATURB plus sensor with any of Hach's digital sensors for measuring dissolved oxygen, ORP, conductivity, and many other parameters.

Dry Verification Modules



The Calibration/Verification Module (CVM) is an optical standard for rapid and straightforward checking of the ULTRATURB sensor. It facilitates problem-free routine checks and confirmation of measurements without the need to mix liquid calibration standards. CVM modules are available in different turbidity ranges from 0.6 to 25 FNU (NTU).

Complies with ISO 7027

The Hach ULTRATURB plus sc Sensor meets the ISO 7027 turbidity requirements for on-line process turbidity.

Specifications*

Measurement Technique
90° scattered light in accordance with DIN EN ISO 7027 infrared light 860 nm

Range
0.0001 to 1000 FNU, freely programmable (0.0001 to 250 EBC = 2500 ppm SiO_2) (Note: 1 FNU is equivalent to 1 NTU)

Resolution
0.0001 to 0.9999 / 1.000 to 9.999 / 10.00 to 99.99 / 100 to 1000 FNU (NTU)

Precision
±0.008 FNU ±1% of reading (0 to 10 FNU)

Repeatability
±0.003 FNU ±0.5% of reading (0 to 2 FNU)

Variation Coefficient
1% in accordance with DIN 38402

Response Time
1 to 60 seconds (programmable)

Verification
StablCal or dry standard CVM module

Ambient Temperature
Sensor: 36 to 104°F (2 to 40°C)

Display unit: 14 to 104°F (-10 to 40°C)

Sample Temperature
122°F (50°C) maximum

Sample Flow
0.2 to 1 L/min

Sample Pressure
87 PSI at 68°F (6 bar at 20°C)

Sample Connection
13 mm I.D. hose or fixed connection with with G+F system parts

Automatic Cleaning
Wiper

Materials
Window: quartz

Measurement chamber: Noryl, GFN2

Wiper blade: silicon

Wiper shaft: stainless steel 1.4571

Housing: ASA

Enclosure Rating
IP 65

Dimensions
9.9 x 9.4 x 4.3 in. (250 x 240 x 110 mm)

Weight
Approx. 3.3 lbs. (1.5 kg)

Display Unit
Hach sc200 Digital Controller or Hach sc1000 Universal Controller

**Specifications subject to change without notice.*

Engineering Specifications

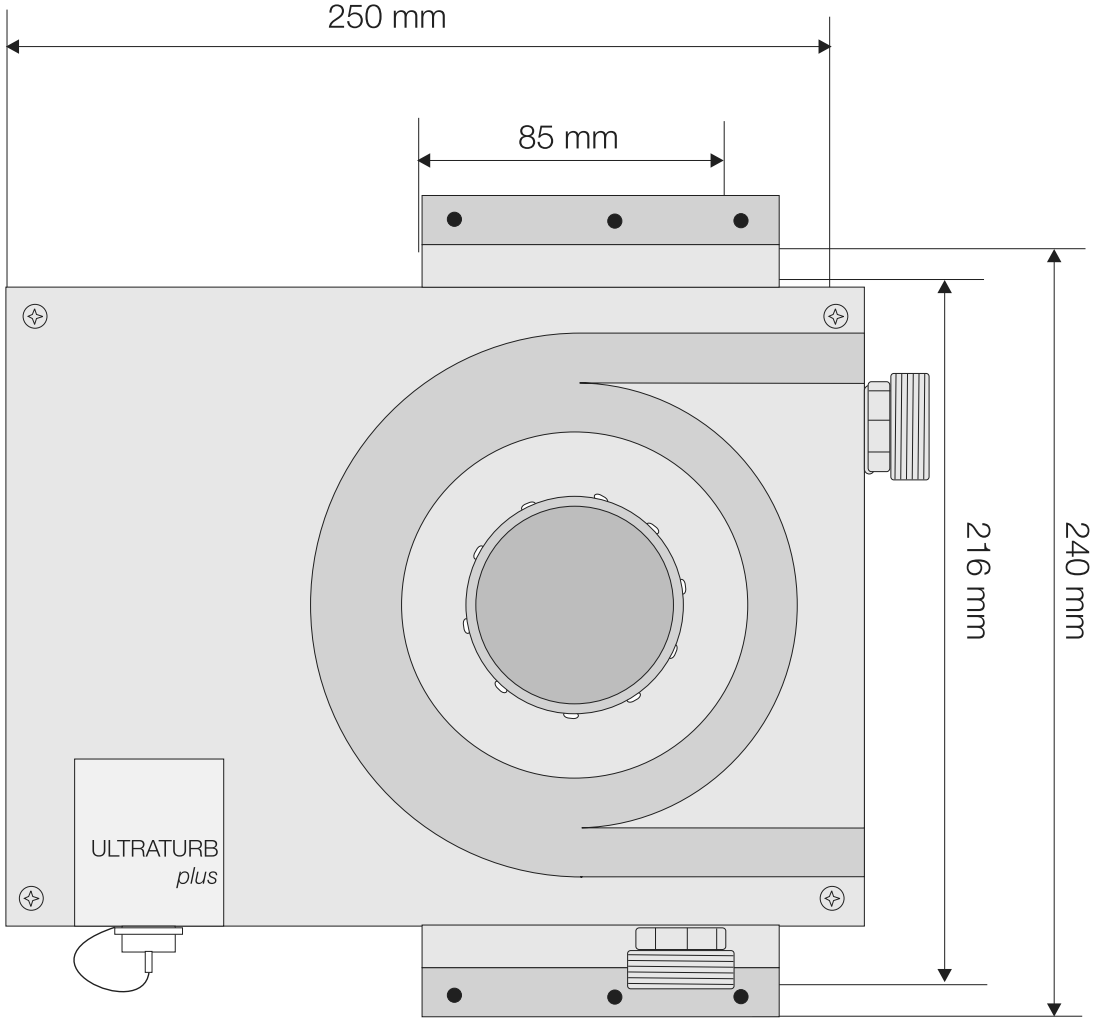
1. The sensor shall continuously measure turbidity in water using detectors at 90 and 180 degrees.
2. The measurement technology shall use infrared pulse scattered light process according DIN EN ISO 7027.
3. The measuring range shall be from 0.0001 to 1000 NTU.
4. The precision shall be ±0.5% or ±0.008 NTU of the measured value.
5. The response time shall be approximately 1 to 60 seconds.
6. The flow rate of sample shall be 0.2 to 1 L/minute.
7. The verification of calibration for the sensor shall be by StablCal or dry standard CVM module.
8. The transmitter enclosure shall be rated at IP 65.
9. The sensor shall be model ULTRATURB plus sc Sensor manufactured by Hach Company.

Optional:

1. The sensor shall be equipped with a self-cleaning sample chamber that uses a silicon wiper that is held in place magnetically.
2. The sensor shall include a calibration/verification module with a factory-certified calibration value for periodic verification of calibration.

Dimensions

The sensor should be installed in an accessible location. It can be mounted on a flat, vertical surface (such as a panel, stand, etc.). It should allow for access for any checking or maintenance. Sample flow should meet the specifications above.



Ordering Information

ULTRATURB plus sc Sensor

LPV415.52.11002	Sensor with 0.35 m cable
LPV415.52.21002	Sensor with 5 m cable
LPV415.52.31002	Sensor with 10 m cable
LPV415.52.41002	Sensor with 15 m cable
LPV415.52.51002	Sensor with 20 m cable
LPV415.52.61002	Sensor with 30 m cable
LPV415.52.71002	Sensor with 50 m cable

ULTRATURB plus sc Sensor with Auto-clean

LPV415.52.10002	Sensor with 0.35 m cable and Auto-clean system
LPV415.52.20002	Sensor with 5 m cable and Auto-clean system
LPV415.52.30002	Sensor with 10 m cable and Auto-clean system
LPV415.52.40002	Sensor with 15 m cable and Auto-clean system
LPV415.52.50002	Sensor with 20 m cable and Auto-clean system
LPV415.52.60002	Sensor with 30 m cable and Auto-clean system
LPV415.52.70002	Sensor with 50 m cable and Auto-clean system
LPV415.99.22002	Sensor Seawater sc with 5 m cable
LPV415.99.32002	Sensor Seawater sc with 10 m cable
LPV415.99.42002	Sensor Seawater sc with 15 m cable
LPV415.99.52002	Sensor Seawater with 20 m cable
LPV415.99.62002	Sensor Seawater sc with 30 m cable
LPV415.99.72002	Sensor Seawater sc with 50 m cable
LPV415.99.82002	Sensor Seawater sc with 1 m cable

sc200 / sc1000 Controller Options

sc200 for Hach Digital Sensors

LXV404.99.00552	sc200 controller, 2 channel, digital
LXV404.99.00502	sc200 controller, 1 channel, digital
LXV404.99.00542	sc200 controller, 2 channel, digital & mA input

sc1000 for Hach Digital Sensors

LXV400.99.1R572	sc1000 Probe Module; 4 sensors - analog
LXV400.99.1B572	sc1000 Probe Module; 4 sensors - RS485
LXV400.99.1F572	sc1000 Probe Module; 4 sensors - PROFIBUS DP
LXV400.99.1R572	sc1000 Probe Module; 6 sensors - analog

Dry/Secondary Verification Modules

LZV414.00.00000	CVM Module; 0.6 NTU
LZV414.00.10000	CVM Module; 1.5 NTU
LZV414.00.20000	CVM Module; 6 NTU
LZV414.00.30000	CVM Module; 15 NTU
LZV414.00.40000	CVM Module; 25 NTU

Spare Parts

LZV275	Wiper blades; set of 4
DOC023.52.03231	User Manual

Calibration Tools

246142	Formazin; 4000 NTU, 500 mL
LZV451	Calibration/Cleaning Kit
LZV325	Filters with Apparatus; for zero calibration (0.2 micron)

Lit. No. 2620 Rev 1
J10 Printed in U.S.A.
©Hach Company, 2010. All rights reserved.
In the interest of improving and updating its equipment, Hach Company reserves the right to alter specifications to equipment at any time.

At Hach, it's about learning from our customers and providing the right answers. It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

Be right.

For current price information, technical support, and ordering assistance, contact the Hach office or distributor serving your area.

In the United States, contact:

HACH COMPANY World Headquarters
P.O. Box 389
Loveland, Colorado 80539-0389
U.S.A.
Telephone: 800-227-4224
Fax: 970-669-2932
E-mail: orders@hach.com
www.hach.com

U.S. exporters and customers in Canada, Latin America, sub-Saharan Africa, Asia, and Australia/New Zealand, contact:

HACH COMPANY World Headquarters
P.O. Box 389
Loveland, Colorado 80539-0389
U.S.A.
Telephone: 970-669-3050
Fax: 970-461-3939
E-mail: intl@hach.com
www.hach.com

In Europe, the Middle East, and Mediterranean Africa, contact:

HACH LANGE GmbH
Willstätterstraße 11
D-40549 Düsseldorf
GERMANY
Tel: +49 (0) 211 5288-0
Fax: +49 (0) 211 5288-143
E-mail: info@hach-lange.de
www.hach-lange.com

HACH®

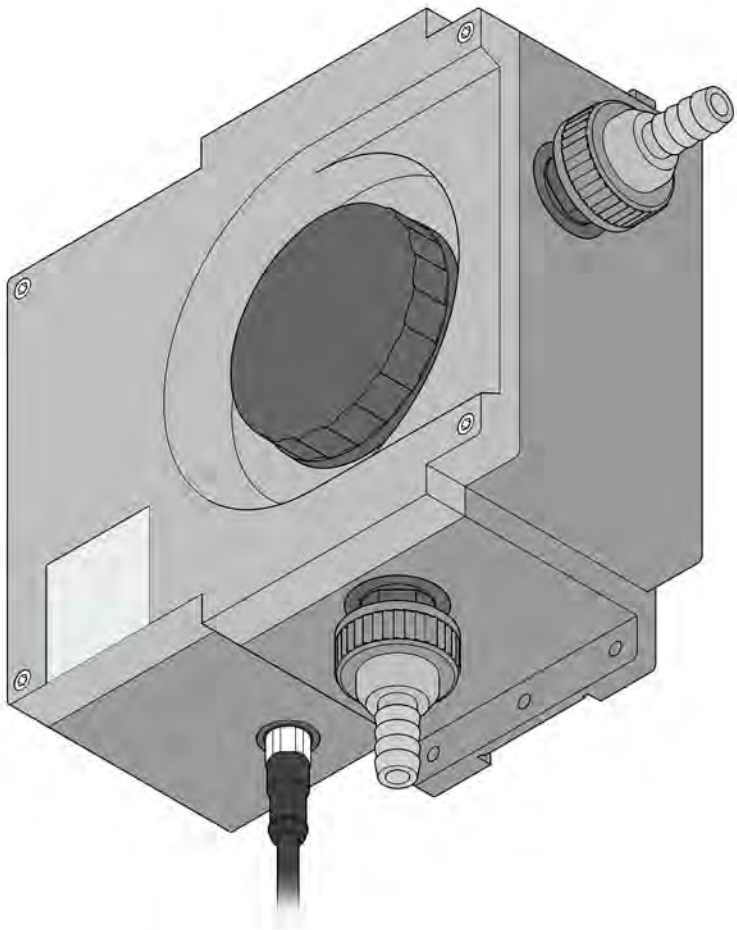
Be Right™

DOC023.53.03231

ULTRATURB sc
basic/plus/seawater

User Manual

07/2017, Edition 7



© HACH Company, 2007–2010, 2017. All rights reserved. Printed in Germany

Table of contents

Section 1 Specifications 5
1.1 Dimensions 6

Section 2 General information 7
2.1 Safety information 7
2.1.1 Use of hazard information 7
2.1.2 Precautionary labels 7
2.2 Applications 8
2.3 Measuring principle 8
2.4 Handling 8
2.5 Items supplied 9
2.6 Function check 9

Section 3 Installation 11
3.1 Assembling 11
3.1.1 Connectors 12
3.2 Instrument layout 13
3.3 Connecting sensor cable 14

Section 4 Operation 15
4.1 Operating the sc controller 15
4.2 Sensor setup 15
4.3 Sensor data logger 15
4.4 Menu structure 15
4.4.1 SENSOR DIAG 15
4.4.2 SENSOR SETUP 16
4.5 Calibration with standard solution 18
4.6 Verify using dry standard CVM 19
4.7 Zero point setting 19

Section 5 Maintenance 21
5.1 Maintenance schedule 21
5.2 Cleaning measuring chamber 21
5.3 Replacing wiper profiles (only plus and *seawater* version) 22
5.4 Replacing desiccant 23
5.5 Monitoring test equipment 24
5.5.1 Preparing formazine solution in accordance with DIN EN ISO 7027 24

Section 6 Faults, causes, rectification 27
6.1 Error messages 27
6.2 Warnings 27

Section 7 Replacement parts and accessories 29
7.1 Sensor options 29
7.2 Replacement parts 29
7.3 Accessories 30

Section 8 Limited warranty 31

Section 9 Contact 33

Appendix A ModBUS Register Information 35

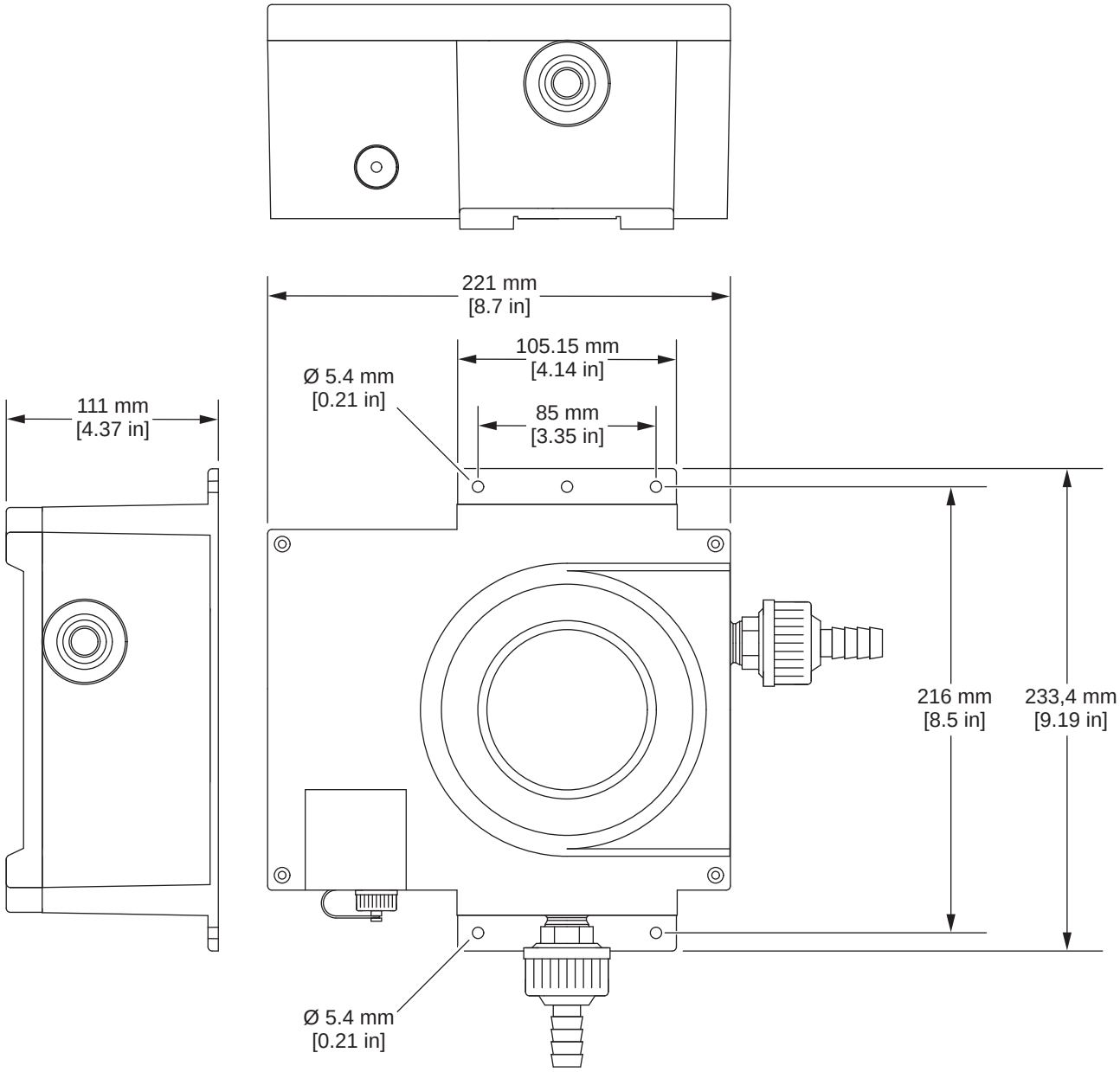
Section 1 Specifications

Components	Microprocessor-controlled turbidity bypass sensor ULTRATURB sc for very low to medium turbidities with comprehensive self-diagnostics
Measuring technique	90° infrared pulse scattered light technique in accordance with DIN EN ISO 7027
Measuring range	0.0001–1000 FNU (TE/F, NTU, FTU) can be programmed as required (0.0001–250 EBC = 2500 ppm SiO2)
Resolution	0.0001–0.9999 / 1.00–9.99 / 10.0–99.9 / 100–1000 FNU
Precision	±0.008 FNU or ±1 % of the measured value (0–10 FNU)
Reproducibility	±0.003 FNU or ±0.5 % of the measured value (0–2 FNU)
Technique variation coefficient	1 % in accordance with DIN 38402
Response time	1–60 s (can be programmed as required)
Air bubble compensation	Physical-mathematical
Calibration	Permanently set in the factory (Validation using formazine, StablCal, dry standard CVM)
Sample flow rate	Min. 0.2 L/min, max. 1 L/min, max. 6 bar (at 20 °C (at 68 °F))
Sample temperature	Max. 50 °C (Max. 122 °F)
Salt content of the probe (only for *seawater*)	Tested up to 65 g/L
Ambient temperature	+2 °C to +40 °C (+ 36 °F to +104 °F)
Sample connection	Tubing (ID 13 mm) or fixed connection (PVC system component pipework)
Automatic cleaning of the measuring chamber (only for *plus* and *seawater*)	Automatic wiper cleaning, time controlled and as required
Materials	Measuring window: quartz
	Measuring chamber: Noryl GFN2
	Wiper axle: stainless steel 1.4571
	Wiperarm (*seawater*): titanium alloy
	Wiper profile: silicone
Housing	Enclosure rating: IP 65 Plastic housing ASA
Inspection interval	Once a year, service contract on request with warranty extension of five years; please request a quote
Dimensions	(W × H × D) 250 × 240 × 110 mm
Mass	Approx. 1.5 kg
User maintenance	*basic*: 2 h / month, typical *plus* and *seawater*: 0.5 h / month, typical

Specifications are subject to change without notice.

1.1 Dimensions

Fig. 1 ULTRATURB sc dimensions



2.1 Safety information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

2.1.1 Use of hazard information



DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION
Indicates a potentially hazardous situation that may result in minor or moderate injury.

Important note: *Information that requires special emphasis.*

Note: *Information that supplements points in the main text.*

2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol, if noted on the instrument, will be included with a danger or caution statement in the manual.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user. ***Note:*** *For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories and all auxiliary items for proper disposal.*
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists.

2.2 Applications

ULTRATURB sc bypass sensors are innovative precision turbidity measuring instruments developed using the latest technical findings.
ULTRATURB sc bypass sensos are developed primary for waste and drinking water applications. The very robust *seawater* version is developed especially for seawater applications with high salt concentrations (e.g. drinking water abstraction from seawater, fish farming or seawater aquariums).
Turbidities in the range of FNU (NTU) 0.0001–1000 are measured and displayed alphanumerically using a controller. This high resolution facilitates precision differentiation, even for ultra clear liquids.

A pulsed, long-life IR radiation source (LED) ensures that costs are minimised.

ULTRATURB sc turbidity sensors are designed in accordance with DIN EN ISO 7027 and are permanently calibrated before leaving the factory. All key data is set to practical standard values.

The instruments are immediately ready for use after connection to the power supply and the supply of sample water. The measuring range and all data outputs are modified to suit requirements using menus on the controller.

All optical and electronic assemblies are installed in housings that are physically very strong and proof against water jets.

ULTRATURB sc turbidity sensors are available in the classic *basic* version, the convenient *plus* version and the robust *seawater* version.

The measuring chambers of the ULTRATURB *plus* sc and of the ULTRATURB *seawater* sc also have automatic wiper cleaning that reliably prevents soiling of the optical systems as it starts to build up and significantly reduces the user maintenance. Cleaning is performed at an interval set to suit local requirements. The cleaning intervals are adjusted to suit the expected level of soiling during commissioning. The user can straightforwardly change the interval at a later date. The number of cleaning operations already performed can be checked on the SENSOR SETUP menu using the COUNTER command.

2.3 Measuring principle

The nephelometric scattered light technique is a method for the determination of the very low to medium turbidities in liquids that is comparable worldwide.

Using this method, the light scattered sideways by the turbidity particles is measured over an angle of 90°. The low acquisition limit for this method makes it possible to even reliably differentiate turbidity particles in distilled water. This technique is defined in DIN EN ISO 7027. ULTRATURB sc sensors are designed in accordance with the requirements in this standard.

2.4 Handling

The sensor contains high-quality optical and electronic assemblies. For this reason attention is to be paid to ensuring that the sensor is not subjected to any hard mechanical knocks. There are no components that can be maintained by the user inside the sensor or the display unit – except the manual cleaning of the measuring chamber and the replacement of the wiper profiles and the desiccant.

2.5 Items supplied

- ULTRATURB sc sensor
- Connecting cable (length as per order)
- User Manual
- Factory test certificate
- Accessory set LZP816
- Wiper set (for 4 changes) LZV275
  (only *plus* and *seawater* version)

2.6 Function check

After unpacking, all components should be checked for any transport damage and a short function check performed prior to installation.

For this purpose the sensor is connected to the display unit and the display unit plugged into the mains. Shortly after the display unit is plugged in, the display is activated and the instrument switches to the display of measurements. Here the measured value taken in air is meaningless.

Note: *It is only possible to check the operative zero point using very high purity water!*

If no messages appear in the lower part of the display, the function check is then complete.

DANGER
Installation may only be carried out by qualified experts in accordance with all local safety regulations.

3.1 Assembling

Select an appropriate installation location for the instrument to guarantee

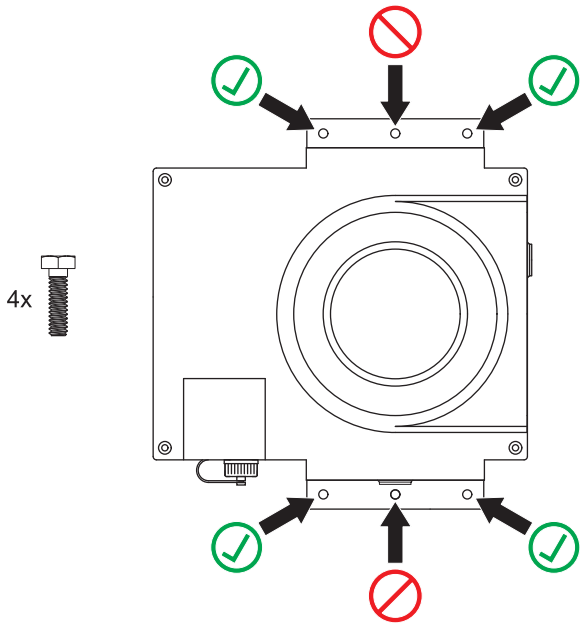
- safe installation
- safe operation
- problem-free maintenance

Plan how to lay cables and hoses and their path in advance. Lay the hoses, data cables and power cables without any bends. Only original replacement and accessory parts recommended by the manufacturer may be used.

Make sure the mount has a sufficient bearing capacity. The dowels must be selected and authorized according to the condition of the wall. The manufacturer shall accept no liability if the instrument is installed incorrectly.

Install the instrument in a horizontal position.

Fig. 2 Assembling



3.1.1 Connectors

Important Note: *The instrument can be damaged if the connectors and/or the union nuts are attached too tightly. Only hand-tighten the union nuts for the hose mounts. If necessary, hold the connectors with a tool (SW 22).*

The measuring instrument can be integrated into the measurement and analysis process using tubing (ID 13 mm) or a fixed connection (PVC system component pipework, compatible with 1" union nut).

Table 1: Connectors

External thread	Pipe thread in accordance with DIN ISO 228
large	G1A
small	G½A

3.1.1.1 Selection of diaphragm plate

With samples that tend to emit gases, bubbles may form in the measuring chamber. This causes extremely strongly fluctuating measurement values. In the event of strongly fluctuating measurement values, replace the diaphragm plate in the drain connector.

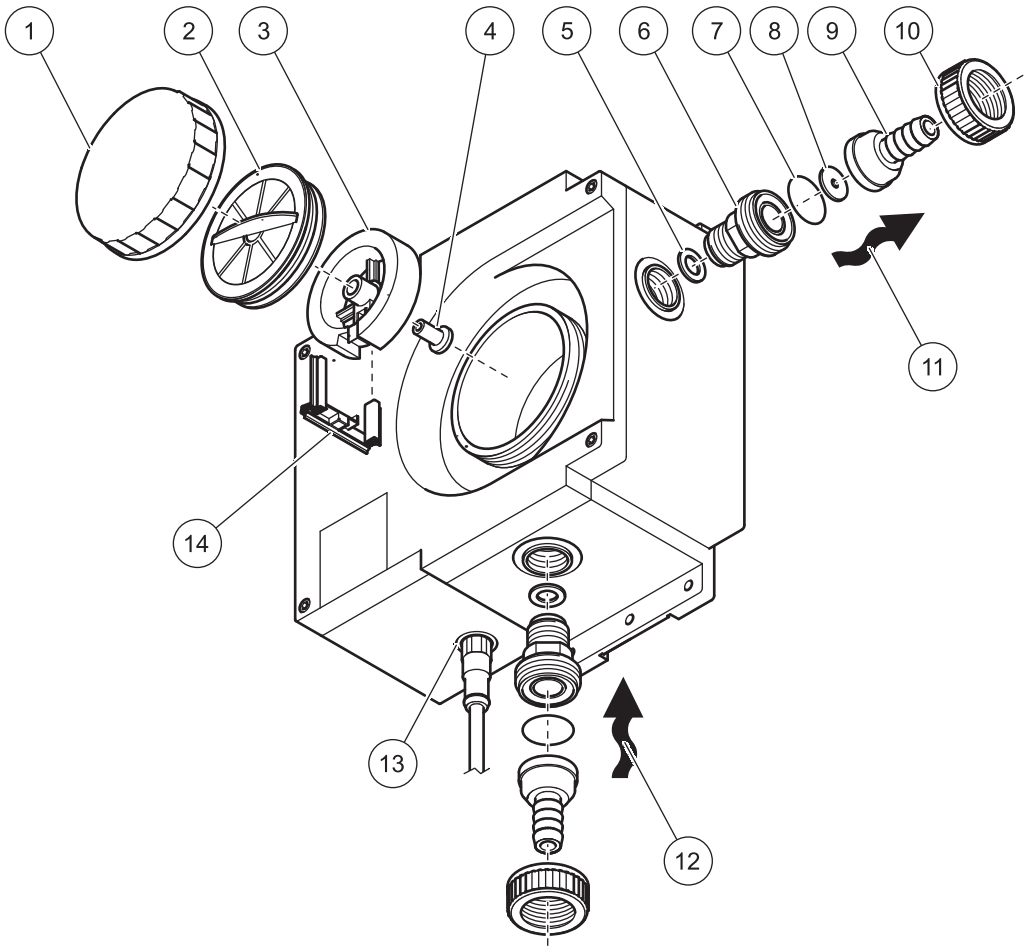
Note: *Observe the flow quantity and flow direction of the sample provided in the technical data.*

Table 2: Preselect the diaphragm plate

Flow quantity/pressure	Diaphragm plate
large	large hole
medium	medium hole
small	small hole

3.2 Instrument layout

Fig. 3 Instrument layout ULTRATURB sc



1. Screw top, HRR195	**8.** Diaphragm plate* (if necessary) HRS185: 1.2 mm HRS186: 2 mm HRS187: 3 mm
2. Measuring chamber sealing plug, HAD087	**9.** Tubing nipple* (Ø 13 mm), HXA072
3. Clutch wheel, BVK001	**10.** Union nut* 1“, ERM033
4. Plug socket, HRB151	**11.** Drain
5. Sealing ring (pre-assembled), EZD166	**12.** Feed
6. Union (pre-assembled), HXA087	**13.** Sensor cable socket
7. O-ring*, EZD114	**14.** Wiper holder (only *plus* version: casting compound brown, BHH211) (only *seawater* version: casting compound black/blue, BHH233)

* Included in the accessory set (connection) LZP816

3.3 Connecting sensor cable

CAUTION
Always lay cables and hoses so that they do not pose a tripping risk.

1. Unscrew the protective caps from the controller socket and the cable plug and retain them.
2. Pay attention to the guide in the plug and slide the plug into the socket.
3. Tighten the nut by hand.

Note: *Extension cables are available in various lengths (refer to Section 7, Replacement parts and accessories, page 29).*
Maximum cable length 100 m (328 ft).

Fig. 4 Connection of the sensor plug to the controller

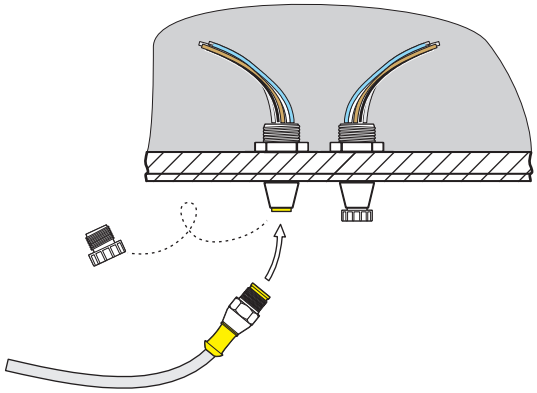
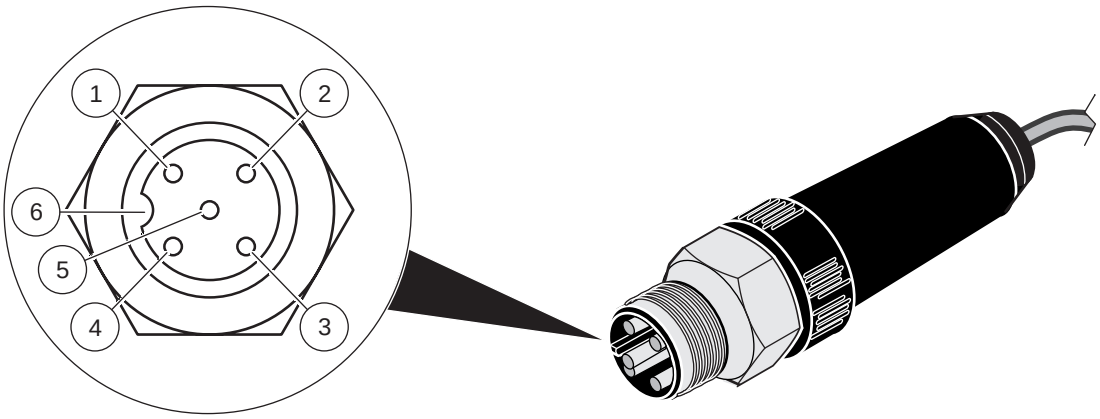


Fig. 5 Sensor connector pin assignment



Number	Description	Cable colour
1	+12 VDC	brown
2	Ground	black
3	Data (+)	blue
4	Data (–)	white
5	Screen	Screen (grey)
6	Notch	–

Section 4 Operation

4.1 Operating the sc controller

The sensor can be operated with all sc controllers. Prior to using the sensor, familiarise yourself with the principle of operation of your controller. Learn how to navigate in the menus and run appropriate functions.

4.2 Sensor setup

When you connect the sensor for the first time, the serial number of the sensor is displayed as the sensor name. You can change the sensor name as follows:

1. Open the MAIN MENU.
2. Choose SENSOR SETUP and accept.
3. Choose the related sensor and accept.
4. Choose CONFIGURE and accept.
5. Choose EDITED NAME and accept.
6. Edit the name and accept to return to the SENSOR SETUP menu.

In the same way complete your system configuration using the following commands:

- MEAS UNITS
- CLEAN. INTERVAL
- RESPONSE TIME
- LOGGER INTERVAL
- RESOLUTION
- SET DEFAULTS

4.3 Sensor data logger

A data memory and event memory per sensor are available via the sc controller. While measured data are saved in the data memory at stipulated intervals, the event memory collects numerous events such as configuration changes, alarms and warning conditions. Both the data memory and the event memory can be read out in CSV format. For information on how you can download the data, please see the controller manual.

4.4 Menu structure

4.4.1 SENSOR DIAG

ERROR LIST	
	Possible error messages: WIPER POS, LED C., GAIN TOO HIGH
WARNING LIST	
	Possible warnings: PROFILE COUNTER, MOIST, USER CAL INTERVAL

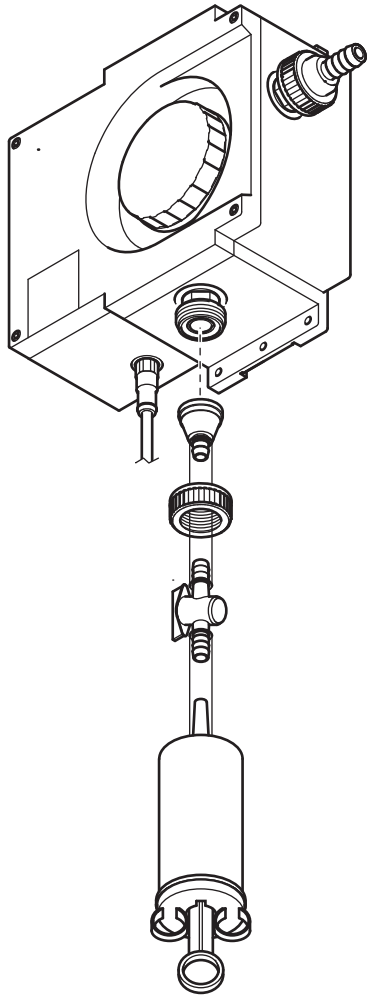
Note: *In Section 7, page 29 you will find, along with a list of all error messages and warnings, also a description of all the actions necessary.*

4.4.2 SENSOR SETUP

WIPE				*Initiates a wiping action*
VERIFY			Verification using CVM module	*Verification with dry standard*
CALIBRATE				
	STANDARD	Selection as per CAL. CONFIG OUTPUT MODE	Calibration with standard solution	*Procedure during calibration, menu based*
	OFFSET	Selection as per CAL. CONFIG OUTPUT MODE	Zero point setting	*Zero point setting, menu based*
	CAL. FAKTORS	FAC. STANDARD		*0.50 to 2.00*
		OFFSET		*-0.100 to +0.100 TRBFNU*
	CAL. CONFIG	OUTPUT MODE	HOLD ACTIVE TRANSFER CHOICE	*Behaviour of the outputs during calibration or zero point setting*
		CAL. INTERVAL		*Adjustable from 0 to 365 days*
	SET CAL DEFLT			Reset to the default calibration
CONFIGURE				
	EDITED NAME		SET DEFAULTS Instrument number	*Up to 16-character name possible*
	MEAS UNITS	mg/L, FNU, NTU, TE/F, EBC	SET DEFAULTS FNU	
	CLEAN. INTERVAL		SET DEFAULTS 12 h	*10 min, 20 min, 30 min, 2 h, 6 h, 12 h, 10:00*
	RESPONSE TIME		SET DEFAULTS 15 s	*0 to 60 s*
	LOGGER INTERVAL		SET DEFAULTS 10 min	*1-30 min*
	RESOLUTION		SET DEFAULTS 0.xxx	*0.xxx or 0.xxxx (<1 FNU)*
	SET DEFAULTS	Confirmation prompt		*Reset to default configuration for all menu commands listed above.*

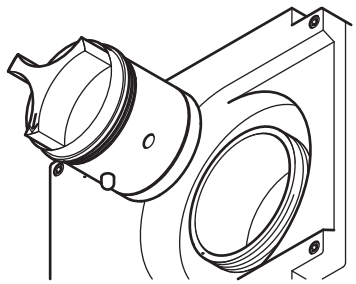
TEST/MAINT				
PROBE INFO	ULTRATURBsc	Instrument name	
	EDITED NAME		
	SERIAL NUMBER		
	RANGE	0.001 ... 1000 FNU	
	MODEL NUMBER	Item no. sensor	
	SOFTWARE VERS	Sensor software	
	DRIVER VERS		
CAL. DATA	CAL. DATE	Date of the last calibration	
	FACTOR	Default setting 1.00	
	OFFSET	Default setting 0.000 TRBFNU	
COUNTER	TOTAL TIME		
	PROFILE		
	MOTOR		
MAINT. PROC.	CLN. MEAS CHAMB	OUTPUT MODE information	*Procedure during cleaning*
	REPLACE PROFILE	OUTPUT MODE information	*Procedure during wiper change*
	WIPE	RESOLUTION	*Initiates a wiping action*
	SIGNALS	AVER.:	*Average value*
		S. VAL.:	*Individual measured value*
		M:	*Measured level*
		R:	*Reference level*
		Q:	*Quotient M/R*
		MOIST	*Relative humidity in %*
	OUTPUT MODE	ACTIVE HOLD TRANSFER CHOICE	*Behaviour of the instrument outputs in the MAINT. PROC. menu*

4.5 Calibration with standard solution



1. Open the MAIN MENU.
2. Choose SENSOR SETUP and accept.
3. Choose the related sensor and accept.
4. Choose CALIBRATE and accept.
5. Choose STANDARD and accept.
6. Shut-off the feed and accept TURN OFF SAMPLE INLET.
7. Drain the measuring chamber using the lower feed union. Accept DRAIN MEAS. CHAMBER.
8. Connect the calibration syringe to the feed union (see Figure) and add the calibration standard. Accept POUR STD INTO MEAS. CHAMBER.
9. Accept PRESS ENTER WHEN STABLE x.xxx TRBFNU.
10. Enter the concentration of the standard solution. Accept CALIBRATE (x.xxx TRBFNU).
11. Remove the calibration syringe and accept REMOVE CALIBRATION SYRINGE.
12. Re-connect the feed and accept CONNECT SAMPLE INLET.
13. Open the feed and accept CAL READY OPEN INLET.
14. Accept OUTPUT ACTIVE.

4.6 Verify using dry standard CVM



1. Open the MAIN MENU.
2. Choose SENSOR SETUP and accept.
3. Choose the related sensor and accept.
4. Choose VERIFY and accept.
5. Choose STANDARD and accept.
6. Shut-off the feed and accept TURN OFF SAMPLE INLET.
7. Drain the measuring chamber via the lower feed union and accept DRAIN MEAS. CHAMBER.
8. Open the screw top and remove the sealing plug and wiper holder.
9. Carefully dry the measuring chamber.
10. Clean the CVM module with a cloth (included in the accessory setof the CVM modul).
11. Guide the CVM module into the measuring chamber.
    The arrow mark must point downwards!
    Ensure that the spring-loaded ball engages by turning slightly in the sample feed opening on the measuring chamber, see Figure).
    Accept INSERT CVM DRY STANDARD.
12. Accept x.xxx TRBFNU.
13. Remove the CVM module and accept REMOVE CVM MODULE .
14. Re-fit the sealing plug and wiper holder and accept REPLACE WIPER HOLDER AND CAP.
15. Screw back on the screw top and accept TIGHTEN CAP.
16. Re-connect the feed and accept CONNECT SAMPLE INLET.
17. Open the feed and accept VER. READY OPEN INLET.
18. Accept OUTPUT ACTIVE.

4.7 Zero point setting

1. Open the MAIN MENU.
2. Choose SENSOR SETUP and accept.
3. Choose the related sensor and accept.
4. Choose CALIBRATE and accept.
5. Choose OFFSET and accept.
6. Shut off the feed and drain the measuring chamber. Connect a membrane filter (LZV325) to the measuring chamber feed. Open the feed and accept POUR 0 STD INTO MEAS. CHAMBER.
7. Accept PRESS ENTER WHEN STABLE x.xxx TRBFNU.
8. Set the zero point and accept CALIBRATE (x.xxx TRBFNU).
9. Accept CAL READY OUTPUT ACTIVE.

It has been possible to reduce the scope of the maintenance to be performed by the user to only a few actions. Clearly summarised in a table and described in detail in the following sections, these actions can be quickly and straightforwardly performed by qualified personnel.

5.1 Maintenance schedule

Maintenance task	Interval
Clean measuring chamber:	**Dependent on the substances contained in the water**
Replace wiper profile (only *plus* and *seawater* version)	**After 1200 cycles**
Replace desiccant	**Every 2 years**
Monitor test equipment (CVM dry standard)	**Every 2 years (factory test with certification)**
Check zero point	**Dependent on the substances contained in the water**
Check gradient	**At least once a year**

5.2 Cleaning measuring chamber

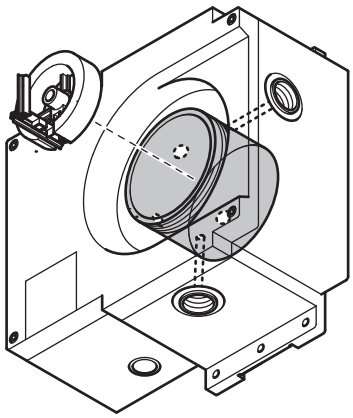
The cleanliness of the measuring chamber is crucial for correct measured results. This cylindrical optical measuring chamber has a rotating wiper with three wiper profiles (only on *plus* and *seawater* version); these prevent normal soiling of the optical system as it starts to build up. With very stubborn deposits, manual cleaning with a suitable cleaning agent (e.g. citric acid) is recommended.



CAUTION
Observe safety regulations and wear safety clothing!

- Safety glasses
- Gloves
- Overalls

1. Open the MAIN MENU.
2. Choose SENSOR SETUP and accept.
3. Choose the related sensor and accept.
4. Choose TEST/MAINT and accept.
5. Choose MAINT. PROC and accept.
6. Choose CLN. MEAS CHAMB and accept.
7. Shut-off the feed and accept TURN OFF SAMPLE INLET.
8. Drain the measuring chamber via the lower feed union and accept DRAIN MEAS. CHAMBER.

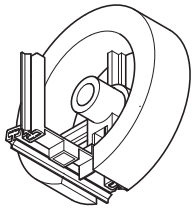


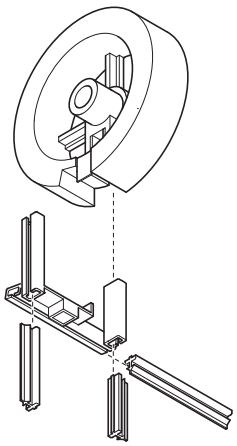
9. Remove the screw top and the sealing plug for the measuring chamber and accept OPEN MEAS. CHAMBER.
10. Remove the wiper holder and accept REMOVE WIPER HOLDER (only for *plus* and for *seawater* version).
11. Clean the measuring chamber and accept CLN. MEAS CHAMB.
12. Re-fit the wiper holder and accept REPLACE WIPER HOLDER (only for *plus* and *seawater* version).
13. Seal the measuring chamber again with sealing plug and screw top and accept CLOSE MEAS. CHAMBER.
14. Open the sample feed and accept TURN OFF SAMPLE INLET.
    An automatic wipe is performed.

5.3 Replacing wiper profiles (only *plus* and *seawater* version)

The life of the wiper profiles is, on the one hand, dependent on the number of cleaning actions performed, and on the other hand is also dependent on the type of deposits to be removed. Thus the life of the wiper profiles varies from case to case.

The wiper profiles supplied with the instrument are sufficient to the cover requirements for an average year.





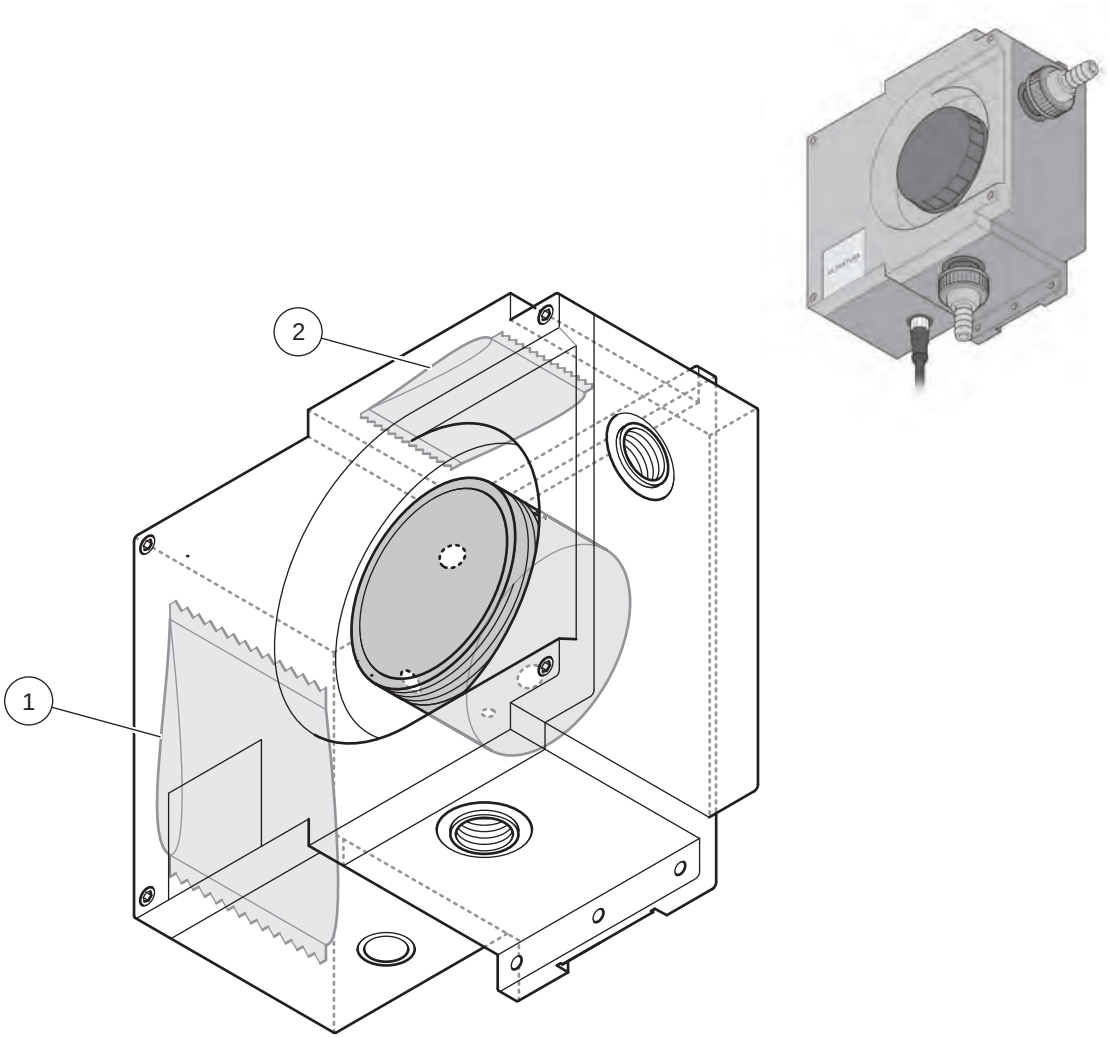
1. Open the MAIN MENU.
2. Choose SENSOR SETUP and accept.
3. Choose the related sensor and accept.
4. Choose TEST/MAINT and accept.
5. Choose MAINT. PROC and accept.
6. Choose REPLACE PROFILE and accept.
7. Shut-off the feed and accept TURN OFF SAMPLE INLET.
8. Drain the measuring chamber via the lower feed union and accept DRAIN MEAS. CHAMBER.
9. Remove the screw top and the sealing plug for the measuring chamber and accept OPEN MEAS. CHAMBER.
10. Remove the wiper holder and accept REMOVE WIPER HOLDER.
11. Clean the measuring chamber and accept CLN. MEAS CHAMB.
12. Renew the wiper profiles and accept REPLACE PROFILE.
13. Re-fit the wiper holder and accept REPLACE WIPER HOLDER.
14. Seal the measuring chamber again with sealing plug and screw top and accept CLOSE MEAS. CHAMBER.
15. Open the sample feed and accept TURN OFF SAMPLE INLET.
    An automatic wipe is performed.

5.4 Replacing desiccant

The ULTRATURB sc turbidity sensor is continuously subject to a wet environment. To provide protection against the moisture, there are 2 generously sized desiccant bags close to the optical and electronic components. To maintain this protection, the manufacturer recommends replacement or regeneration every 2 years.

To replace the desiccant, open the housing and replace the two desiccant bags, 4 units (see Figure 6, item 1) and 0.5 units (see Figure 6, item 2) as per the figure.

Figure 6 Replacing desiccant



1. Desiccant bag with 4 units, LZX304	**2.** Desiccant bag with 0.5 units, LZX303

5.5 Monitoring test equipment

As part of a quality assurance system for test equipment monitoring, it is necessary to check the instrument calibration; this can be performed using a formazine standard series in accordance with DIN EN ISO 7027.

You can either make up the formazine solution yourself as per the instructions that follow 5.5.1 Preparing formazine solution in accordance with DIN EN ISO 7027 or procure it from the manufacturer (LCW 813 or Stabl Cal).

1. To check the instrument calibration, first thoroughly rinse out the measuring chamber using distilled water.
2. Prepare a turbidity series using formazine reference solutions as per DIN EN ISO 7027; the measuring series should correspond to the measuring range selected. For example, in the measuring range FNU 0–5.0 chose reference solutions with FNU 0.5–1.0–2.0–3.0–4.0.

Note: *If there are any variations in the measurements, it is recommendable to measure a new standard preparation prior to changing the instrument calibration! Experience has shown that the variation in the formazine preparation can be greater than the possible drift in the ULTRATURB instrument.*

When checking the instruments as per EN 450901 or GLP we therefore recommend recording the date in an instrument log and checking for any long-term drift. Checks on the operation of the ULTRATURB can in practice also be made by means of parallel measurements with turbidity photometers designed in accordance with DIN and ISO.

5.5.1 Preparing formazine solution in accordance with DIN EN ISO 7027

Chemicals

Chemicals of "analysis" purity are used. The chemicals must be stored in hard glass bottles.

Water

- Place a membrane filter, pore size 0.1 µm (for bacteriological experiments), for 1 hour in 100 mL of distilled water.
- Filter 250 mL water through this filter and discard the water.
- Then filter 500 mL of distilled water twice through the same filter and use this water for making up the standard solution.

Formazine ($C_2H_4N_2$) parent solution



CAUTION
Hydrazine sulphate is toxic and possibly carcinogenic

- Dissolve 10.0 g of hexamethylentetramine ($C_6H_{12}N_4$) in water and top up to 100 mL (solution A).
- Dissolve 1 g of hydrazine sulphate ($N_2H_6SO_4$) in water and top up to 100 mL (solution B).
- Mix 5 mL of solution A with 5 mL of solution B.
- After 24 hours at 25° C (±3 °C) (77 °F (± 5.4 °F)) top up this solution with water to 100 mL.

The turbidity of this parent solution is 400, stated in Formazine Attenuation Units (FAU) or Formazine Nephelometric Units (FNU). This solution can be stored in a dark place at 25 °C (±3 °C) (77 °F (± 5.4 °F)) for around 4 weeks.

Formazine reference solution

Dilute the parent solution with the aid of pipettes and measuring flasks to produce reference solutions in the required range. These solutions can only be stored for a very limited period.

6.1 Error messages

Possible sensor errors are displayed by the controller.

Table 3: Error messages

Error displayed	Cause	Rectification
NONE	Correct operation	
WIPER POS.	Wiper not is correct starting position	Initiate wiper function, call service
LED C.	LED faulty	Call service
GAIN TOO HIGH	Incorrect adjustment Incorrect calibration standard Measuring chamber soiled LED faulty	Clean measuring chamber, perform calibration, call service

6.2 Warnings

Possible warning messages are displayed by the controller.

Table 4: Warnings

Error displayed	Cause	Rectification
NONE	Correct operation	
PROFILE COUNTER	Counter elapsed	Change wiper profiles
MOIST	Moisture > 10 % relative humidity	Replace desiccant
CAL. INTERVAL	Counter elapsed	Perform calibration

7.1 Sensor options

Description	Cat. no.
ULTRATURB *basic* sc turbidity bypass sensor without cable	LPV415.99.01001
ULTRATURB *basic* sc turbidity bypass sensor with 0.35 m (1.1 ft.) cable	LPV415.99.11001
ULTRATURB *basic* sc turbidity bypass sensor with 1 m (3.3 ft.) cable	LPV415.99.81001
ULTRATURB *basic* sc turbidity bypass sensor with 5 m (16.40 ft.) cable	LPV415.99.21001
ULTRATURB *basic* sc turbidity bypass sensor with 10 m (32.81 ft.) cable	LPV415.99.31001
ULTRATURB *basic* sc turbidity bypass sensor with 15 m (49.21 ft.) cable	LPV415.99.41001
ULTRATURB *basic* sc turbidity bypass sensor with 20 m (65.62 ft.) cable	LPV415.99.51001
ULTRATURB *basic* sc turbidity bypass sensor with 30 m (98.43 ft.) cable	LPV415.99.61001
ULTRATURB *basic* sc turbidity bypass sensor with 50 m (164.04 ft.) cable	LPV415.99.71001
ULTRATURB *plus* sc turbidity bypass sensor without cable	LPV415.99.00001
ULTRATURB *plus* sc turbidity bypass sensor with 0.35 m (1.1 ft.) cable	LPV415.99.10001
ULTRATURB *plus* sc turbidity bypass sensor with 1 m (3.3 ft.) cable	LPV415.99.80001
ULTRATURB *plus* sc turbidity bypass sensor with 5 m (16.40 ft.) cable	LPV415.99.20001
ULTRATURB *plus* sc turbidity bypass sensor with 10 m (32.81 ft.) cable	LPV415.99.30001
ULTRATURB *plus* sc turbidity bypass sensor with 15 m (49.21 ft.) cable	LPV415.99.40001
ULTRATURB *plus* sc turbidity bypass sensor with 20 m (65.62 ft.) cable	LPV415.99.50001
ULTRATURB *plus* sc turbidity bypass sensor with 30 m (98.43 ft.) cable	LPV415.99.60001
ULTRATURB *plus* sc turbidity bypass sensor with 50 m (164.04 ft.) cable	LPV415.99.70001
ULTRATURB *seawater* sc turbidity bypass sensor without cable	LPV415.99.02001
ULTRATURB *seawater* sc turbidity bypass sensor with 0.35 m (1.1 ft.) cable	LPV415.99.12001
ULTRATURB *seawater* sc turbidity bypass sensor with 1 m (3.3 ft.) cable	LPV415.99.82001
ULTRATURB *seawater* sc turbidity bypass sensor with 5 m (16.40 ft.) cable	LPV415.99.22001
ULTRATURB *seawater* sc turbidity bypass sensor with 10 m (32.81 ft.) cable	LPV415.99.32001
ULTRATURB *seawater* sc turbidity bypass sensor with 15 m (49.21 ft.) cable	LPV415.99.42001
ULTRATURB *seawater* sc turbidity bypass sensor with 20 m (65.62 ft.) cable	LPV415.99.52001
ULTRATURB *seawater* sc turbidity bypass sensor with 30 m (98.43 ft.) cable	LPV415.99.62001
ULTRATURB *seawater* sc turbidity bypass sensor with 50 m (164.04 ft.) cable	LPV415.99.72001

7.2 Replacement parts

Description	Cat. no.
Set of wiper profiles (for 4 changes)	LZV275
Desiccant bag 0.5 U	LZX303
Desiccant bag 4 U	LZX304
Accessory set (connection)	LZP816

7.3 Accessories

Description	Cat. no.
Extention cable 1 m (3.3 ft.)	6122400
Extention cable 5 m (16.40 ft.)	LZX848
Extention cable 10 m (32.81 ft.)	LZX849
Extention cable 15 m (49.21 ft.)	LZX850
Extention cable 20 m (65.62 ft.)	LZX851
Extention cable 30 m (98.43 ft.)	LZX852
Formazine turbidity standard	LCW813
Turbidity calibration set for liquid standard	LZV451
Set of filters for zero point calibration (0.2 mm membrane filter incl. connecting material)	LZV325
0.2 µm membrane filter (without accessories)	EXF014
CVM Certified Verification Module (dry standard) approx. 0.6 FNU	LZV414.00.00000
CVM Certified Verification Module (dry standard) approx. 1.5 FNU	LZV414.00.10000
CVM Certified Verification Module (dry standard) approx. 6 FNU	LZV414.00.20000
CVM Certified Verification Module (dry standard) approx. 15 FNU	LZV414.00.30000
CVM Certified Verification Module (dry standard) approx. 25 FNU	LZV414.00.40000

Hach Company warrants its products to the original purchaser against any defects that are due to faulty material or workmanship for a period of one year from date of shipment unless otherwise noted in the product manual.

In the event that a defect is discovered during the warranty period, Hach Company agrees that, at its option, it will repair or replace the defective product or refund the purchase price excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents; or consumable components of a product, such as, but not limited to, lamps and tubing.

Contact Hach Company or your distributor to initiate warranty support. Products may not be returned without authorization from Hach Company.

Limitations

This warranty does not cover:

- Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction
- Damage caused by misuse, neglect, accident or improper application or installation
- Damage caused by any repair or attempted repair not authorized by Hach Company
- Any product not used in accordance with the instructions furnished by Hach Company
- Freight charges to return merchandise to Hach Company
- Freight charges on expedited or express shipment of warranted parts or product
- Travel fees associated with on-site warranty repair

This warranty contains the sole express warranty made by Hach Company in connection with its products. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Hach Company.

Limitation of Remedies

The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall Hach Company be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.

HACH Company
World Headquarters
P.O. Box 389
Loveland, Colorado
80539-0389 U.S.A.
Tel (800) 227-HACH
(800) -227-4224
(U.S.A. only)
Fax (970) 669-2932
orders@hach.com
www.hach.com

Repair Service in the United States:
HACH Company
Ames Service
100 Dayton Avenue
Ames, Iowa 50010
Tel (800) 227-4224
(U.S.A. only)
Fax (515) 232-3835

Repair Service in Canada:
Hach Sales & Service
Canada Ltd.
1313 Border Street, Unit 34
Winnipeg, Manitoba
R3H 0X4
Tel (800) 665-7635
(Canada only)
Tel (204) 632-5598
Fax (204) 694-5134
canada@hach.com

Repair Service in Latin America, the Caribbean, the Far East, Indian Subcontinent, Africa, Europe, or the Middle East:
Hach Company World
Headquarters,
P.O. Box 389
Loveland, Colorado,
80539-0389 U.S.A.
Tel +001 (970) 669-3050
Fax +001 (970) 669-2932
intl@hach.com

HACH LANGE GMBH
Willstätterstraße 11
D-40549 Düsseldorf
Tel. +49 (0)2 11 52 88-320
Fax +49 (0)2 11 52 88-210
info@hach-lange.de
www.hach-lange.de

HACH LANGE LTD
Pacific Way
Salford
GB-Manchester, M50 1DL
Tel. +44 (0)161 872 14 87
Fax +44 (0)161 848 73 24
info@hach-lange.co.uk
www.hach-lange.co.uk

HACH LANGE LTD
Unit 1, Chestnut Road
Western Industrial Estate
IRL-Dublin 12
Tel. +353(0)1 46 02 5 22
Fax +353(0)1 4 50 93 37
info@hach-lange.ie
www.hach-lange.ie

HACH LANGE GMBH
Hütteldorferstr. 299/Top 6
A-1140 Wien
Tel. +43 (0)1 9 12 16 92
Fax +43 (0)1 9 12 16 92-99
info@hach-lange.at
www.hach-lange.at

HACH LANGE
Rorschacherstrasse 30 a CH-9424 Rheineck
Tel. +41 (0)71 886 91 11
Fax +41 (0)71 886 91 66
info@hach-lange.ch
www.hach-lange.ch

HACH LANGE FRANCE S.A.S.
8, mail Barthélémy Thimonnier
Lognes
F-77437 Marne-La-Vallée cedex 2
Tél. +33 (0)8 20 20 14 14
Fax +33 (0)1 69 67 34 99
info@hach-lange.fr
www.hach-lange.fr

HACH LANGE SA
Motstraat 54
B-2800 Mechelen
Tél. +32 (0)15 42 35 00
Fax +32 (0)15 41 61 20
info@hach-lange.be
www.hach-lange.be

DR. LANGE NEDERLAND B.V.
Laan van Westroijen 2a
NL-4003 AZ Tiel
Tel. +31(0)344 63 11 30
Fax +31(0)344 63 11 50
info@hach-lange.nl
www.hach-lange.nl

HACH LANGE APS
Åkandevej 21
DK-2700 Brønshøj
Tel. +45 36 77 29 11
Fax +45 36 77 49 11
info@hach-lange.dk
www.hach-lange.dk

HACH LANGE AB
Vinthundsvägen 159A
SE-128 62 Sköndal
Tel. +46 (0)8 7 98 05 00
Fax +46 (0)8 7 98 05 30
info@hach-lange.se
www.hach-lange.se

HACH LANGE S.R.L.
Via Riccione, 14
I-20156 Milano
Tel. +39 02 39 23 14-1
Fax +39 02 39 23 14-39
info@hach-lange.it
www.hach-lange.it

HACH LANGE S.L.U.
Edif. Arteaga Centrum
C/Larrauri, 1C- 2ª Pl.
E-48160 Derio/Vizcaya
Tel. +34 94 657 33 88
Fax +34 94 657 33 97
info@hach-lange.es
www.hach-lange.es

HACH LANGE LDA
Av. do Forte nº8
Fracção M
P-2790-072 Carnaxide
Tel. +351 214 253 420
Fax +351 214 253 429
info@hach-lange.pt
www.hach-lange.pt

HACH LANGE SP.ZO.O.
ul. Opolska 143 a
PL-52-013 Wrocław
Tel. +48 (0)71 342 10-83
Fax +48 (0)71 342 10-79
info@hach-lange.pl
www.hach-lange.pl

HACH LANGE S.R.O.
Lešanská 2a/1176
CZ-141 00 Praha 4
Tel. +420 272 12 45 45
Fax +420 272 12 45 46
info@hach-lange.cz
www.hach-lange.cz

HACH LANGE S.R.O.
Roľnícka 21
SK-831 07 Bratislava – Vajnory
Tel. +421 (0)2 4820 9091
Fax +421 (0)2 4820 9093
info@hach-lange.sk
www.hach-lange.sk

HACH LANGE KFT.
Vöröskereszt utca. 8-10.
H-1222 Budapest XXII. ker.
Tel. +36 (06)1 225 7783
Fax +36 (06)1 225 7784
info@hach-lange.hu
www.hach-lange.hu

HACH LANGE S.R.L.
Str. Căminului nr. 3
Sector 2
RO-021741 Bucureşti
Tel. +40 (0) 21 205 30 03
Fax +40 (0) 21 205 30 17
info@hach-lange.ro
www.hach-lange.ro

HACH LANGE
8, Kr. Sarafov str.
BG-1164 Sofia
Tel. +359 (0)2 963 44 54
Fax +359 (0)2 866 15 26
info@hach-lange.bg
www.hach-lange.bg

HACH LANGE SU ANALİZ SİSTEMLERİ LTD.ŞTİ.
Hilal Mah. 75. Sokak
Arman Plaza No: 9/A
TR-06550 Çankaya/ANKARA
Tel. +90 (0)312 440 98 98
Fax +90 (0)312 442 11 01
bilgi@hach-lange.com.tr
www.hach-lange.com.tr

HACH LANGE D.O.O.
Fajfarjeva 15
SI-1230 Domžale
Tel. +386 (0)59 051 000
Fax +386 (0)59 051 010
info@hach-lange.si
www.hach-lange.si

HACH LANGE Ε.Π.Ε.
Αυλίδος 27
GR-115 27 Αθήνα
Τηλ. +30 210 7777038
Fax +30 210 7777976
info@hach-lange.gr
www.hach-lange.gr

HACH LANGE E.P.E.
27, Avlidos str
GR-115 27 Athens
Tel. +30 210 7777038
Fax +30 210 7777976
info@hach-lange.gr
www.hach-lange.gr

HACH LANGE D.O.O.
Ivana Severa bb
42 000 Varaždin
Tel. +385 (0) 42 305 086
Fax +385 (0) 42 305 087
info@hach-lange.hr
www.hach-lange.hr

HACH LANGE MAROC SARLAU
Villa 14 – Rue 2 Casa Plaisance
Quartier Racine Extension
MA-Casablanca 20000
Tél. +212 (0)522 97 95 75
Fax +212 (0)522 36 89 34
info-maroc@hach-lange.com
www.hach-lange.ma

Table 5: Sensor ModBUS Registers

Group Name	Register #	Data Type	Length	R/W	Description
measurement	40001	Float	2	R	diplayed measurement value
unit	40003	Unsigned Integer	1	R/W	unit
parameter	40004	Unsigned Integer	1	R/W	parameter
reserved	40005	Unsigned Integer	1	R/W	reserved
correction	40006	Float	2	R/W	correction
offset	40008	Float	2	R/W	offset
reserved	40010	Unsigned Integer	1	R/W	reserved
cleaning_interval	40011	Unsigned Integer	1	R/W	cleaning interval
led_current	40012	Unsigned Integer	1	R/W	LED current
wiper state	40013	Unsigned Integer	1	R/W	wiper state
resp time	40014	Unsigned Integer	1	R/W	response time
drv_struct_ver	40015	Unsigned Integer	1	R	driver structure version
drv_firmw_ver	40016	Unsigned Integer	1	R	driver firmware version
drv_cont_ver	40017	Unsigned Integer	1	R	driver content version
location	40018	String	8	R/W	location
profile	40026	Integer	2	R	profile counter
motor_cycles	40028	Integer	2	R	motor cycles
operating_hours	40030	Integer	2	R	operating hours
service_counter	40032	Integer	2	R	service counter
profile reset val	40034	Integer	2	R/W	profile reset val
service reset val	40036	Integer	2	R/W	service reset val
des_measurement	40038	Float	2	R/W	desired measurement value
meas_single_value	40040	Float	2	R	measurement single value
M	40042	Float	2	R	m
R	40044	Float	2	R	r
ouotient	40046	Float	2	R	quotient
humidity_main	40048	Float	2	R	humidity - main
cal_date	40050	Time	2	R	calibration time and date
user_cal_date	40052	Time	2	R	user calibration time and date
fac_meas_0	40054	Float	2	R	factor meas. 0
fac_meas_1	40056	Float	2	R	factor meas. 1
fac_meas_2	40058	Float	2	R	factor meas. 2
fac_meas_3	40060	Float	2	R	factor meas. 3
fac_ref_0	40062	Float	2	R	factor ref 0
fac_ref_1	40064	Float	2	R	factor ref 1
fac_quo_q	40066	Float	2	R	factor quotient q
dist_q	40068	Float	2	R	distortion light q
fac_quo_m	40070	Float	2	R	factor quotient m
dist_m	40072	Float	2	R	distortion light m
prg_vers	40074	String	4	R	program version
ser_no	40078	Integer	2	R	serial number
process	40080	Unsigned Integer	1	R/W	process register
menu	40081	Unsigned Integer	1	R	menu state

Table 5: Sensor ModBUS Registers (continued)

Group Name	Register #	Data Type	Length	R/W	Description
user_cal_int	40082	Integer	1	R/W	user cal int
cal_out_cfg	40083	Integer	1	R/W	cal. Output mode
meas_mode	40084	Integer	1	R/W	measure mode
meas_val_format	40085	Integer	2	R	measurement format
meas_prec	40087	Integer	1	R/W	measurement precesion
logger_int	40088	Integer	1	R/W	logger interval
service output	40089	Integer	1	R/W	service output mode

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:	REV	DATE	ALTERED:
		CHECKED:			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED

PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

INSTRUMENT SCHEDULE FOR PT PLANT

	NAME	SIGN	DATE
PREP	FAISAL N	FN	05-03-19
CHKD	MUAZZAM I	MI	05-03-19
APPD	ASLAM A	AA	05-03-19

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

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A049	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/IS/PTP/18/332	02
DATE								NO. OF SHEETS 2 EXCLUDING COVER PAGE	

INSTRUMENT SCHEDULE

CLIENT: BHARAT HEAVY ELECTRICALS LIMITED

PROJECT: 2 X 660 MW ENNORE SEZ STPP

PACKAGE: PRE TREATMENT PLANT

BHEL DOC NO-PE-V0-412-158-A049		REV NO	2
OTOKLIN DOC NO- OGBL/OC-983/IS/PTP/18/332		REF P&ID DRAWING NO	PE-V0-412-158-A001

SL. NO.	TAG NO	DESCRIPTION	MEDIUM	TYPE/MODEL OF INSTRUMENT	TYPE OF SIGNAL (R2)	Process Temperature (R1)	Design Process Parameter (R2)	Operating Process parameter (R2)	RANGE	ENGG.UNIT	PROCESS CONNECTION	ELECTRICAL CONNECTION	LINE SIZE
A.LEVEL INDICATOR													
1	90GBN91CL501	NaOCl Dosing tank	NaOCl + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.3 M	0-1.3 M	0-1.3 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
2	90GBN61CL501	FECL3 DOSING TANK	FECL3 + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.73 M	0-1.73 M	0-1.73 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
3	90GBN62CL501	FECL3 DOSING TANK	FECL3 + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.73 M	0-1.73 M	0-1.73 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
4	90GBN63CL501	FECL3 DOSING TANK	FECL3 + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.73 M	0-1.73 M	0-1.73 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
5	90GBN71CL501	LIME DOSING TANK	LIME + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.73 M	0-1.73 M	0-1.73 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
6	90GBN72CL501	LIME DOSING TANK	LIME + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.73 M	0-1.73 M	0-1.73 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
7	90GBN81CL501	PE DOSING TANK	PE + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.73 M	0-1.73 M	0-1.73 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
8	90GBN82CL501	PE DOSING TANK	PE + WATER	GLASS TUBE TYPE	NA	35-50 degC	0-1.73 M	0-1.73 M	0-1.73 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
9	90GBN60CL501	OVERHEAD CLARIIFED WATER TANK	WATER	GLASS TUBE TYPE	NA	35-50 degC	0-2.3 M	0-2.3 M	0-2.3 M	MTR.	FLANGE MOUNTED	N.A.	N.A.
10	90GBD10CL501	CLARIFIED WATER STORAGE TANK	WATER	STAFF GAUGE TYPE	NA	35-50 degC	0-4.3 M	0-4.3 M	0-4.3 M	MTR.	SCREWED	N.A.	N.A.
11	90GBD10CL502	CLARIFIED WATER STORAGE TANK	WATER	STAFF GAUGE TYPE	NA	35-50 degC	0-4.3 M	0-4.3 M	0-4.3 M	MTR.	SCREWED	N.A.	N.A.
12	90GBS50CL502	SLUDGE SUMP	SLUDGE	STAFF GAUGE TYPE	NA	35-50 degC	0-4.5 M	0-4.5 M	0-4.5 M	MTR.	SCREWED	N.A.	N.A.
13	90GBS50CL503	SLUDGE SUMP	SLUDGE	STAFF GAUGE TYPE	NA	35-50 degC	0-4.5 M	0-4.5 M	0-4.5 M	MTR.	SCREWED	N.A.	N.A.
14	90GBS50CL501	SLUDGE TRANSFER SUMP	SLUDGE	STAFF GAUGE TYPE	NA	35-50 degC	0-4.5 M	0-4.5 M	0-4.5 M	MTR.	SCREWED	N.A.	N.A.
B. LEVEL TRANSMITTER													
1	90GBN91CL001	NaOCl Dosing tank	NaOCl + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.3 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
2	90GBN61CL001	FECL3 DOSING TANK	FECL3 + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.73 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
3	90GBN62CL001	FECL3 DOSING TANK	FECL3 + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.73 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
4	90GBN63CL001	FECL3 DOSING TANK	FECL3 + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.73 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
5	90GBN71CL001	LIME DOSING TANK	LIME + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.73 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
6	90GBN72CL001	LIME DOSING TANK	LIME + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.73 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
7	90GBN81CL001	PE DOSING TANK	PE + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.73 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
8	90GBN82CL001	PE DOSING TANK	PE + WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-1.73 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
9	90GBN60CL001	OVERHEAD CLARIIFED WATER TANK	WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-2.3 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
10	90GBS50CL003	SLUDGE SUMP	SLUDGE	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-4.5 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
11	90GBS50CL004	SLUDGE SUMP	SLUDGE	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-4.5 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
12	90GBD10CL001	CLARIFIED WATER STORAGE TANK	WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-4.3 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
13	90GBD10CL002	CLARIFIED WATER STORAGE TANK	WATER	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-4.3 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
14	90GBS50CL001	SLUDGE TRANSFER SUMP	SLUDGE	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-4.5 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
15	90GBS50CL002	SLUDGE TRANSFER SUMP	SLUDGE	ULTRASONIC TYPE	4-20 mA HART	35-50 degC	upto 10 meters	0-4.5 M	0.3 - 10	MTR.	4" 150# FLANGE MOUNTED	M20 X1 .5	N.A.
C. PRESSURE TRANSMITTER													
1	90GBS45CP001	SLUDGE TRANSFER SUMP	SLUDGE	DUAL INDUCTANCE TYPE	4-20 mA HART	35-50 degC	upto 3 kg/cm3	1.2 kg/cm2	0-3	KG/CM2	1/2 " NPT (F)	1/2 " NPT	400
2	90GBS45CP002	SLUDGE TRANSFER SUMP	SLUDGE	DUAL INDUCTANCE TYPE	4-20 mA HART	35-50 degC	upto 3 kg/cm3	1.2 kg/cm2	0-3	KG/CM2	1/2 " NPT (F)	1/2 " NPT	400
3	90GBN85CP001	PE DOSING TANK	PE + WATER	DUAL INDUCTANCE TYPE	4-20 mA HART	35-50 degC	upto 3 kg/cm3	1.0 kg/cm2	0-3	KG/CM2	1/2 " NPT (F)	1/2 " NPT	25
4	90GBN65CP001	FECL3 DOSING TANK	FECL3 + WATER	DUAL INDUCTANCE TYPE	4-20 mA HART	35-50 degC	upto 3 kg/cm3	1.0 kg/cm2	0-3	KG/CM2	1/2 " NPT (F)	1/2 " NPT	40
5	90GBN75CP001	LIME DOSING TANK	LIME + WATER	DUAL INDUCTANCE TYPE	4-20 mA HART	35-50 degC	upto 3 kg/cm3	1.0 kg/cm2	0-3	KG/CM2	1/2 " NPT (F)	1/2 " NPT	40
6	90GBN95CP001	NaOCl Dosing tank	NaOCl + WATER	DUAL INDUCTANCE TYPE	4-20 mA HART	35-50 degC	upto 3 kg/cm3	1.0 kg/cm2	0-3	KG/CM2	1/2 " NPT (F)	1/2 " NPT	25
D. PRESSURE GUAGE													
1	90GBD01CP501	RAW WATER LINE	WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	800NB
2	90GBS41CP501	SLUDGE TRANSFER PUMP	SLUDGE	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.2 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	400NB
3	90GBS42CP501	SLUDGE TRANSFER PUMP	SLUDGE	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.2 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	400NB
4	90GBS43CP501	SLUDGE TRANSFER PUMP	SLUDGE	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.2 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	400NB
5	90GBS45CP501	SLUDGE TRANSFER PUMP COMMON HEADER LINE	SLUDGE	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.2 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	400NB
6	90GBN83CP501	PE DOSING PUMP	PE + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	25NB
7	90GBN83CP502	PE DOSING PUMP	PE + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	25NB
8	90GBN85CP501	PE DOSING PUMP	PE + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	25NB
9	90GBN64CP501	FECL3 DOSING PUMP	FECL3 + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	40NB

SL. NO.	TAG NO	DESCRIPTION	MEDIUM	TYPE/MODEL OF INSTRUMENT	TYPE OF SIGNAL (R2)	Process Temperature (R1)	Design Process Parameter (R2)	Operating Process parameter (R2)	RANGE	ENGG.UNIT	PROCESS CONNECTION	ELECTRICAL CONNECTION	LINE SIZE
10	90GBN64CP502	FECL3 DOSING PUMP	FECL3 + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	40NB
11	90GBN65CP501	FECL3 DOSING PUMP	FECL3 + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	40NB
12	90GBN73CP501	LIME DOSING PUMP	LIME + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	40NB
13	90GBN73CP502	LIME DOSING PUMP	LIME + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	40NB
14	90GBN75CP501	LIME DOSING PUMP	LIME + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	40NB
15	90GBN92CP501	NAOCL DOSING PUMP	NaOCl + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	25NB
16	90GBN92CP502	NAOCL DOSING PUMP	NaOCl + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 2.5kg/cm3	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	25NB
17	90GBN95CP501	NAOCL DOSING PUMP	NaOCl + WATER	BOURDON TYPE	ANALOG	35-50 degC	upto 1 kg/cm2	1.0 kg/cm2	0-2.5	KG/CM2	1/2 " NPT (M)	NA	25NB
18	90GBS31CP501	AIR BLOWER LINE	AIR	BOURDON TYPE	ANALOG	35-50 degC	upto 1 kg/cm2	0.4 kg/cm2	0-1	KG/CM2	1/2 " NPT (M)	NA	80NB
19	90GBS32CP501	AIR BLOWER LINE	AIR	BOURDON TYPE	ANALOG	35-50 degC	upto 1 kg/cm2	0.4 kg/cm2	0-1	KG/CM2	1/2 " NPT (M)	NA	80NB
F. PRESSURE SWITCH													
1	90GBS40CP101	AIR BLOWER LINE	AIR	DIAPHRAGM SEAL TYPE	2 SPDT 5A@24 VDC	35-50 degC	upto 1 kg/cm2	0.4 kg/cm2	0-1	KG/CM2	1/2" NPT(M)	4 PIN CONNECTOR TYPE	80NB
2	90GBS41CP101	SLUDGE TRANSFER PUMP	SLUDGE	DIAPHRAGM SEAL TYPE	2 SPDT 5A@24 VDC	35-50 degC	upto 1 kg/cm2	1.2 kg/cm2	0-2.5	KG/CM2	1/2" NPT(M)	4 PIN CONNECTOR TYPE	400NB
3	90GBS42CP101	SLUDGE TRANSFER PUMP	SLUDGE	DIAPHRAGM SEAL TYPE	2 SPDT 5A@24 VDC	35-50 degC	upto 1 kg/cm2	1.2 kg/cm2	0-2.5	KG/CM2	1/2" NPT(M)	4 PIN CONNECTOR TYPE	400NB
4	90GBS43CP101	SLUDGE TRANSFER PUMP	SLUDGE	DIAPHRAGM SEAL TYPE	2 SPDT 5A@24 VDC	35-50 degC	upto 1 kg/cm2	1.2 kg/cm2	0-2.5	KG/CM2	1/2" NPT(M)	4 PIN CONNECTOR TYPE	400NB
G. FLOW TRANSMITTER													
1	90GBD01CF001	RAW WATER LINE	WATER	FLOW TRANSMITTER (EMF TYPE)	4-20 mA HART	35-50 degC	upto 2600m3/hr	2378 m3/hr	0-2600	M3/HR	FLANGE MOUNTED	1/2" NPT	800NB
2	90GBD02CF001	PARSHAL FLUME	WATER	FLOW TRANSMITTER (ULTRASONIC TYPE)	4-20 mA HART	35-50 degC	upto 2600 m3/hr	2378 m3/hr	0-2600	M3/HR	1.5 " NPT	1/2" NPT	1000 x 1330
3	90GBD03CF001	PARSHAL FLUME CLARIFLOCCULATOR 1	WATER	FLOW TRANSMITTER (ULTRASONIC TYPE)	4-20 mA HART	35-50 degC	upto 1400 m3/hr	1189 m3/hr	0-1400	M3/HR	1.5 " NPT	1/2" NPT	800 x 810
4	90GBD03CF002	PARSHAL FLUME CLARIFLOCCULATOR 2	WATER	FLOW TRANSMITTER (ULTRASONIC TYPE)	4-20 mA HART	35-50 degC	upto 1400 m3/hr	1189 m3/hr	0-1400	M3/HR	1.5 " NPT	1/2" NPT	800 x 810
5	90GBS45CF001	SLUDGE TRANSFER PUMP	SLUDGE	FLOW TRANSMITTER (EMF TYPE)	4-20 mA HART	35-50 degC	upto 600 m3/hr	500 m3/hr	0-600	M3/HR	FLANGE MOUNTED	1/2" NPT	400NB
6	90GBD10CF001	PARHAL FLUME BEFORE CLARIFIED STORAGE TANK	WATER	FLOW TRANSMITTER (ULTRASONIC TYPE)	4-20 mA HART	35-50 degC	upto 1400 m3/hr	1189 m3/hr	0-1400	M3/HR	1.5 " NPT	1/2" NPT	800 x1610
H. ANALYZER													
1	90GBD01CQ001	RAW WATER LINE	ALKALI	TURBIDITYANALYZER	4-20 mA HART	35-50 degC	upto 1000 NTU	upto 500 NTU	0-1000	NTU	PANEL MOUNTED	1/2" NPT(F)	800NB
I. LIMIT SWITCH (R1)													
1	NA	RAW WATER LINE	WATER	NO/NC TYPE	DIGITAL	35-50 degC	NA		NA	NA	MOUNTIING BRACKET	1/2" NPT	800NB
2	NA	RAW WATER LINE	WATER	NO/NC TYPE	DIGITAL	35-50 degC			NA	NA	MOUNTIING BRACKET	1/2" NPT	800NB
3	NA	RAW WATER LINE	WATER	NO/NC TYPE	DIGITAL	35-50 degC			NA	NA	MOUNTIING BRACKET	1/2" NPT	800NB
4	NA	RAW WATER LINE	WATER	NO/NC TYPE	DIGITAL	35-50 degC			NA	NA	MOUNTIING BRACKET	1/2" NPT	800NB
5	NA	RAW WATER BYPASS LINE	WATER	NO/NC TYPE	DIGITAL	35-50 degC			NA	NA	MOUNTIING BRACKET	1/2" NPT	800NB
6	NA	SLUDGE TRANSFER PUMP LINE	SLUDGE	NO/NC TYPE	DIGITAL	35-50 degC			NA	NA	MOUNTIING BRACKET	1/2" NPT	400 NB
7	NA	SLUDGE TRANSFER PUMP LINE	SLUDGE	NO/NC TYPE	DIGITAL	35-50 degC			NA	NA	MOUNTIING BRACKET	1/2" NPT	400 NB

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:	REV	DATE	ALTERED:
		CHECKED:			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED

PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

QAP / CHECK LIST FOR ALL INSTRUMENTS
OF PRE TREATMENT PLANT

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

	NAME	SIGN	DATE
PREP	ALOYSIUS	AF	16-07-18
CHKD	MUAZZAM I	MI	16-07-18
APPD	ASLAM A	AA	16-07-18

DEPT.							CARD CODE
SIGN			N.A.				-
DATE							

BHEL DRAWING NO.
PE-V0-412-158-A054

OTOKLIN-DRG/DOC-NO..
OGBL/OC-983/QAP/ICL/PTP/18/354

REV 0

NO. OF SHEETS 1 EXCLUDING COVER PAGE

OTOKLIN GLOBAL BUSINESS LIMITED	OTOKLIN GLOBAL BUSINESS LIMITED R-02 Remi Bizcourt, Off Veera Desai Road, Andheri West, Mumbai 400 053, India	**MANUFACTURING QUALITY PLAN** **ITEM: INSTRUMENT** **SUB-SYSTEM:** **PRETREATMENT PLANT** **QP NO.: PE-V0-412-158-A054** **REV.NO.: 00** **DATE: 16-07-2018** **PAGE: 1 OF 1**	PROJECT: 2X660 MW ENNORE SEZ STPP AT ASH DYKE OF NCTPS PACKAGE: PRETREATMENT PLANT CONTRACT NO.: 412 MAIN-SUPPLIER: BHEL SUB- CONTRACTOR:- OTOKLIN

S.NO	COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
										M	C	N	
1	2	3	4	5	6	7	8	9	D	10			11
	INSRUMENTS												
1.1	Pressure Gauges	a. Make, Model , Range & Type.	Major	Visual	1 per type	Data Sheet	Data Sheet	MFG. TC	✓	P	W	R	
1.2	Pressure Transmitters												
1.3	Level Guages	b. Overall dimension/ process connection	Major	Meas.	1 per type	Data Sheet	Data Sheet	MFG. TC	✓	P	W	R	
1.4	Flow Transmitter	c. Calibration, & Accuracy	Major	Document Review	1 per type	Data Sheet	Data Sheet	MFG. TC	✓	P	W	R	
1.5	Pressure switch												
1.6	Level Transmitter	d. Degree of protection	Major	Document Review	1 per type	Data Sheet	Data Sheet	MFG. TC	✓	P	W	R	
1.7	Turbidity Analyzer	e. Over range test (As applicable)	Major	Meas.	1 per type	Data Sheet	Data Sheet	MFG. TC	✓	P	W	R	

OTOKLIN GLOBAL BUSINESS LTD. MUMBAI

Bharat Heavy Electricals Limited PPEI Sector-16A NOIDA 201 301 PEM/Mech

MANUFACTURER / SUBCONTRACTOR	CONTRACTOR
SIGNATURE	

LEGEND:
* RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

** M: MANUFACTURER/SUB-SUPPLIER — P - Performing the Test

C: SUPPLIER/NOMINATED INSPECTION AGENCY — W - Witnessing the Test

N: THE OWNER — R - Review the Test

FOR THE

DOC. NO.:
REV..... CAT.....

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:	REV	DATE	ALTERED:
		CHECKED:			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

IO LIST OF PRE TREATMENT PLANT

	NAME	SIGN	DATE
PREP	BILAL S	BS	06-11-19
CHKD	MUAZZAM I	MI	06-11-19
APPD	ASLAM A	AA	06-11-19

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

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A056	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/IOLIST/PTP/18/370	01
DATE								NO. OF SHEETS 7 EXCLUDING COVER PAGE	

PT SYSTEM - IO LIST REV 02

S.No	KKS_CODE	DESCRIPTION	STATUS	JB	RECORD_ TYPE	IO_TYPE	NO_NC	O_I_C	AREA	EQUP_GR	PACKAGE	DDCMIS NAME	PROCESS_BLOCK _STREAM	FG	RIO	SOURCE	DESTINATION	ALM	PARAMETER	INST_TYPE	PROCESS_RANGE	INST_SCOPE	REF_DOC_NO	SPECIAL_RE MARKS	REV_REMARK	REV_ NUMBER	REV_CODE	JB TERM-1	JB TERM-2
1	90GBD01AA001	Raw WTR Inlet to AERATOR "ACTUATOR OPEN FB"	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
2		Raw WTR Inlet to AERATOR "ACTUATOR CLOSE FB"	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
3		Raw WTR Inlet to AERATOR " ACTUATOR DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
4		Raw WTR Inlet to AERATOR " ACTUATOR IN REMOTE	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
5		Raw WTR Inlet to AERATOR "ACTUATOR OPEN CMD"	NA	NA	DO	DO[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
6		Raw WTR Inlet to AERATOR"ACTUATOR CLOSE CMD"	NA	NA	DO	DO[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
7	90GBD01AA502	Raw WTR Inlet to AERATOR "ACTUATOR LIMIT SWITCH OPEN	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
8		Raw WTR Inlet to AERATOR"ACTUATOR LIMIT SWITCH CLOSE	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
9	90GBD01AA503	Raw WTR Inlet to AERATOR "ACTUATOR LIMIT SWITCH OPEN	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
10		Raw WTR Inlet to AERATOR"ACTUATOR LIMIT SWITCH CLOSE	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
11	90GBD01AA002	Raw WTR Inlet to AERATOR "ACTUATOR OPEN FB"	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
12		Raw WTR Inlet to AERATOR "ACTUATOR CLOSE FB"	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
13		Raw WTR Inlet to AERATOR " ACTUATOR DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
14		Raw WTR Inlet to AERATOR " ACTUATOR IN REMOTE	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
15		Raw WTR Inlet to AERATOR "ACTUATOR OPEN CMD"	NA	NA	DO	DO[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
16		Raw WTR Inlet to AERATOR"ACTUATOR CLOSE CMD"	NA	NA	DO	DO[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
17	90GBD01AA504	Raw WTR Inlet to AERATOR "ACTUATOR LIMIT SWITCH OPEN	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
18		Raw WTR Inlet to AERATOR"ACTUATOR LIMIT SWITCH CLOSE	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
19	90GBD01AA505	Raw WTR Inlet to AERATOR "ACTUATOR LIMIT SWITCH OPEN	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
20		Raw WTR Inlet to AERATOR"ACTUATOR LIMIT SWITCH CLOSE	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
21	90GBD01AA509	RAW Water Bypass Line	NA	NA	DI	DI[DRY]	NA	O	RAW WTR INLET		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
22	90GBN71CL001	LIME DOSING TANK LEVEL 1	NA	JB-1	AI	AI[4-20]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
23	90GAA01AM004	LIME DOSING TANK-A AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
24		LIME DOSING TANK-A AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
25		LIME DOSING TANK-A AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
26		LIME DOSING TANK-A AGI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
27		LIME DOSING TANK-A AGI " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
28		LIME DOSING TANK-A AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
29		LIME DOSING TANK-A AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
30		LIME DOSING TANK-A AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
31	90GAA01AM005	LIME DOSING TANK-B AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
32		LIME DOSING TANK-B AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
33		LIME DOSING TANK-B AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
34		LIME DOSING TANK-B AGI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
35		LIME DOSING TANK-B AGI " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
36		LIME DOSING TANK-B AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
37		LIME DOSING TANK-B AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
38		LIME DOSING TANK-B AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
39	90GBN72CL001	LIME DOSING TANK LEVEL2	NA	JB-1	AI	AI[4-20]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
40	90GBN73AP001	LIME DOSING PUMP-A "ON FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
41		LIME DOSING PUMP-A "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
42		LIME DOSING PUMP-A " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
43		LIME DOSING PUMP-AI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
44		LIME DOSING PUMP-A EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
45		LIME DOSING PUMP-A "START CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
46		LIME DOSING PUMP-A "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
47		LIME DOSING PUMP-A TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
48	90GBN73AP002	LIME DOSING PUMP-B "ON FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
49		LIME DOSING PUMP-B "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
50		LIME DOSING PUMP-B " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
51		LIME DOSING PUMP-B " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
52		LIME DOSING PUMP-B " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
53		LIME DOSING PUMP-B "START CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
54		LIME DOSING PUMP-B "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
55		LIME DOSING PUMP-B TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
56	90GBN75CP001	LIME DOSING PUMP DISCHARGE HEADER PRESSURE	NA	JB-1	AI	AI[4-20]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DUAL INDUCTANCE TYPE	0-3kg/cm2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
57	90GBN61CL001	FeCl3 DOSING TANK LEVEL 1	NA	JB-1	AI	AI[4-20]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
58	GTA61AM001	FeCl3 DOSING TANK-A AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
59		FeCl3 DOSING TNK-A AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
60		FeCl3 DOSING TNK-A AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
61		FeCl3 DOSING TNK-A AGI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
62		FeCl3 DOSING TNK-A AGI "EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
63		FeCl3 DOSING TNK-A AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						

S.No	KKS_CODE	DESCRIPTION	STATUS	JB	RECORD_TYPE	IO_TYPE	NO_NC	O_I_C	AREA	EQUP_GR	PACKAGE	DDCMIS NAME	PROCESS_BLOCK_STREAM	FG	RIO	SOURCE	DESTINATION	ALM	PARAMETER	INST_TYPE	PROCESS_RANGE	INST_SCOPE	REF_DOC_NO	SPECIAL_REMARKS	REV_REMARK	REV_ NUMBER	REV_CODE	JB TERM-1	JB TERM-2
64		FeCl3 DOSING TNK-A AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
65		FeCl3 DOSING TNK-A AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
66	GTA62AM001	FeCl3 DOSING TANK-B AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
67		FeCl3 DOSING TNK-B AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
68		FeCl3 DOSING TNK-B AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
69		FeCl3 DOSING TNK-B AGI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
70		FeCl3 DOSING TNK-B AGI "EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
71		FeCl3 DOSING TNK-B AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
72		FeCl3 DOSING TNK-B AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
73		FeCl3 DOSING TNK-B AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
74	GTA63AM001	FeCl3 DOSING TANK-C AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
75		FeCl3 DOSING TNK-C AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
76		FeCl3 DOSING TNK-C AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
77		FeCl3 DOSING TNK-C AGI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
78		FeCl3 DOSING TNK-C AGI "EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
79		FeCl3 DOSING TNK-C AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
80		FeCl3 DOSING TNK-C "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
81		FeCl3 DOSING TNK-C AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
82	90GBN62CL001	FeCl3 DOSING TANK LEVEL 2	NA	JB-1	AI	AI[4-20]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
83	GTA64AP001	FeCl3 DOSING PUMP-A "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
84		FeCl3 DOSING PUMP-A "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
85		FeCl3 DOSING PUMP-A " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
86		FeCl3 DOSING PUMP-A " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
87		FeCl3 DOSING PUMP-A "EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
88		FeCl3 DOSING PUMP-A "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
89		FeCl3 DOSING PUMP-A "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
90		FeCl3 DOSING PUMP-A TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
91	GTA64AP002	FeCl3 DOSING PUMP-B "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
92		FeCl3 DOSING PUMP-B "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
93		FeCl3 DOSING PUMP-B " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
94		FeCl3 DOSING PUMP-B " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
95		FeCl3 DOSING PUMP-B "EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
96		FeCl3 DOSING PUMP-B "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
97		FeCl3 DOSING PUMP-B "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
98		FeCl3 DOSING PUMP-B TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
99	90GBN63CL001	FeCl3 DOSING TANK LEVEL 3	NA	JB-1	AI	AI[4-20]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
100	90GBN65CP001	FeCl3 DOSING PUMP DISCHARGE HEADER PRESSURE	NA	JB-1	AI	AI[4-20]	NA	O	FeCl3 DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DUAL INDUCTANCE TYPE	0-3.0kg/cm2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
101	90GBN81CL001	PE DOSINGTANK LEVEL 1	NA	JB-1	AI	AI[4-20]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
102	90GBN81AM001	PE PREPEARTION TNK -A AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
103		PE PREPEARTION TNK-A AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
104		PE PREPEARTION TNK-A AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
105		PE PREPEARTION TNK-A AGI " MCC AVAILABLE"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
106		PE PREPEARTION TNK-A AGI " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
107		PE PREPEARTION TNK-A AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
108		PE PREPEARTION TNK-A AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
109		PE PREPEARTION TNK-A AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
110	90GBN82AM001	PE PREPEARTION TNK -B AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
111		PE PREPEARTION TNK-B AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
112		PE PREPEARTION TNK-B AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
113		PE PREPEARTION TNK-B AGI " MCC AVAILABLE "	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
114		PE PREPEARTION TNK-B AGI " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
115		PE PREPEARTION TNK-B AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
116		PE PREPEARTION TNK-B AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						

S.No	KKS_CODE	DESCRIPTION	STATUS	JB	RECORD_TYPE	IO_TYPE	NO_NC	O_I_C	AREA	EQUP_GR	PACKAGE	DDCMIS NAME	PROCESS_BLOCK_STREAM	FG	RIO	SOURCE	DESTINATION	ALM	PARAMETER	INST_TYPE	PROCESS_RANGE	INST_SCOPE	REF_DOC_NO	SPECIAL_REMARKS	REV_REMARK	REV_ NUMBER	REV_CODE	JB TERM-1	JB TERM-2
117		PE PREPEARTION TNK-B AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
118	90GBN82CL001	PE DOSINGTANK LEVEL 2	NA	JB-1	AI	AI[4-20]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
119		PE DOSING PUMP-A "ON FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
120		PE DOSING PUMP-A "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
121		PE DOSING PUMP-A " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
122	90GBN83AP001	PE DOSING PUMP-A " MCC AVAILABLE"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
123		PE DOSING PUMP-A " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
124		PE DOSING PUMP-A "START CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
125		PE DOSING PUMP-A "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
126		PE DOSING PUMP-A TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
127		PE DOSING PUMP-B "ON FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
128		PE DOSING PUMP-B "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
129		PE DOSING PUMP-B " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
130	90GBN83AP002	PE DOSING PUMP-B " MCC AVAILABLE"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
131		PE DOSING PUMP-B " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
132		PE DOSING PUMP-B "START CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
133		PE DOSING PUMP-B "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
134		PE DOSING PUMP-B TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
135	90GBN85CP001	PE DOSING PUMP DISCHARGE HEADER PRESSURE	NA	JB-1	AI	AI[4-20]	NA	O	PE DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DUAL INDUCTANCE TYPE	0-3 kg/cm2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
136		FLASH MIXER AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
137		FLASH MIXER AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
138		FLASH MIXER AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
139	90GBD02AM001	FLASH MIXER AGI " MCC AVAILABLE"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
140		FLASH MIXER AGI " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
141		FLASH MIXER AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
142		FLASH MIXER AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
143		FLASH MIXER AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
144		FLOCCULATION TANK AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
145		FLOCCULATION TANK AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
146		FLOCCULATION TANK AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
147	90GAA01BB005	FLOCCULATION TANK AGI " MCC AVAILABLE	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
148		FLOCCULATION TANK AGI " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						

S.No	KKS_CODE	DESCRIPTION	STATUS	JB	RECORD_TYPE	IO_TYPE	NO_NC	O_I_C	AREA	EQUP_GR	PACKAGE	DDCMIS NAME	PROCESS_BLOCK_STREAM	FG	RIO	SOURCE	DESTINATION	ALM	PARAMETER	INST_TYPE	PROCESS_RANGE	INST_SCOPE	REF_DOC_NO	SPECIAL_REMARKS	REV_REMARK	REV_ NUMBER	REV_CODE	JB TERM-1	JB TERM-2
149		FLOCCULATION TANK AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
150		FLOCCULATION TANK AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
151		FLOCCULATION TANK AGI " TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
152		FLOCCULATION TANK AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
153		FLOCCULATION TANK AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
154		FLOCCULATION TANK AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
155	90GAA01BB006	FLOCCULATION TANK AGI " MCC AVAILABLE "	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
156		FLOCCULATION TANK AGI " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
157		FLOCCULATION TANK AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
158		FLOCCULATION TANK AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
159		FLOCCULATION TANK AGI " TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
160		END CARRIAGE DRIVE"ON FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
161		END CARRIAGE DRIVE "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
162		END CARRIAGE DRIVE " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
163	90GAA01BB005	END CARRIAGE DRIVE " MCC AVAILABLE "	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
164		END CARRIAGE " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
165		END CARRIAGE DRIVE "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
166		END CARRIAGE DRIVE "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
167		END CARRIAGE DRIVE " TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
168		END CARRIAGE DRIVE"ON FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
169		END CARRIAGE DRIVE "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
170		END CARRIAGE DRIVE " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
171	90GAA01BB006	END CARRIAGE DRIVE " MCC AVAILABLE "	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
172		END CARRIAGE " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
173		END CARRIAGE DRIVE "START CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
174		END CARRIAGE DRIVE "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
175		END CARRIAGE DRIVE " TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	FLOCCULATION AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
176		AIR BLR-B1-A "ON FB"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
177		AIR BLR-B1-A "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
178		AIR BLR-B1-A " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
179		AIR BLR-B1-A " MCC AVAILABLE	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
180	90GBS31AN001	AIR BLR-B1-A " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
181		AIR BLR-B1-A "START CMD"	NA	NA	DO	DO[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
182		AIR BLR-B1-A "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
183		AIR BLR-B1-A " TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
184		AIR BLR-B1-B "ON FB"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
185		AIR BLR-B1-B "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
186		AIR BLR-B1-B " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
187		AIR BLR-B1-B " MCC AVAILABLE	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
188	90GBS32AN001	AIR BLR-B1-B " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
189		AIR BLR-B1-B "START CMD"	NA	NA	DO	DO[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
190		AIR BLR-B1-B "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
191		AIR BLR-B1-B " TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
192	90GBS40CP101	AIR BLOWER DISCHARGE PRESSURE	NA	NA	DI	DI[DRY]	NA	O	AIR BLOWER SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DIAPHRAGM SEAL TYPE	0-1 kg/cm2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
193	90GBS50CL001	SLUDGE TRANSFER SUMP	NA	JB-2	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
194	90GBS50CL002	SLUDGE TRANSFER SUMP	NA	JB-2	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
195		SLUDGE TRANSFER PUMP -A "ON FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
196		SLUDGE TRANSFER PUMP -A "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
197		SLUDGE TRANSFER PUMP -A " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
198		SLUDGE TRANSFER PUMP -A " MCC AVAILABLE"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
199	90GBS41AP001	SLUDGE TRANSFER PUMP -A " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
200		SLUDGE TRANSFER PUMP -A "START CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
201		SLUDGE TRANSFER PUMP -A "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						

S.No	KKS_CODE	DESCRIPTION	STATUS	JB	RECORD_TYPE	IO_TYPE	NO_NC	O_I_C	AREA	EQUP_GR	PACKAGE	DDCMIS NAME	PROCESS_BLOCK_STREAM	FG	RIO	SOURCE	DESTINATION	ALM	PARAMETER	INST_TYPE	PROCESS_RANGE	INST_SCOPE	REF_DOC_NO	SPECIAL_REMARKS	REV_REMARK	REV_ NUMBER	REV_CODE	JB TERM-1	JB TERM-2
202		SLUDGE TRANSFER PUMP -A "CURRENT F/B"	NA	NA	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
203		SLUDGE TRANSFER PUMP -A" TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
204		SLUDGE TRANSFER PUMP -B "ON FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
205		SLUDGE TRANSFER PUMP -B "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
206		SLUDGE TRANSFER PUMP -B " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
207		SLUDGE TRANSFER PUMP -B " MCC AVAILABLE"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
208	90GBS42AP001	SLUDGE TRANSFER PUMP -B " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
209		SLUDGE TRANSFER PUMP -B "START CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
210		SLUDGE TRANSFER PUMP -B "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
211		SLUDGE TRANSFER PUMP -B "CURRENT F/B	NA	NA	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-05						
212		SLUDGE TRANSFER PUMP -B" TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
213		SLUDGE TRANSFER PUMP -C "ON FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
214		SLUDGE TRANSFER PUMP -C "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
215		SLUDGE TRANSFER PUMP -C " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
216		SLUDGE TRANSFER PUMP -C " MCC AVAILABLE"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
217	90GBS43AP001	SLUDGE TRANSFER PUMP -C " EPB OPERATED"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
218		SLUDGE TRANSFER PUMP C "START CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
219		SLUDGE TRANSFER PUMP -C "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
220		SLUDGE TRANSFER PUMP -C CURRENT F/B	NA	NA	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
221		SLUDGE TRANSFER PUMP -C" TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
222		SLUDGE TRANSFER PUMP -A DISCHARGE VALVE "ACTUATOR OPEN FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
223		SLUDGE TRANSFER PUMP -A DISCHARGE VALVE "ACTUATOR CLOSE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
224	90GBS41AA001	SLUDGE TRANSFER PUMP -A DISCHARGE VALVE " ACTUATOR DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
225		SLUDGE TRANSFER PUMP -A DISCHARGE VALVE " ACTUATOR IN REMOTE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
226		SLUDGE TRANSFER PUMP -A DISCHARGE VALVE "ACTUATOR OPEN CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
227		SLUDGE TRANSFER PUMP -A DISCHARGE VALVE " ACTUATOR CLOSE CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
228		SLUDGE TRANSFER PUMP -B DISCHARGE VALVE "ACTUATOR OPEN FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
229		SLUDGE TRANSFER PUMP -B DISCHARGE VALVE "ACTUATOR CLOSE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
230	90GBS42AA001	SLUDGE TRANSFER PUMP -B DISCHARGE VALVE " ACTUATOR DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
231		SLUDGE TRANSFER PUMP -B DISCHARGE VALVE " ACTUATOR IN REMOTE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
232		SLUDGE TRANSFER PUMP -B DISCHARGE VALVE "ACTUATOR OPEN CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
233		SLUDGE TRANSFER PUMP -B DISCHARGE VALVE "ACTUATOR CLOSE CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
234		SLUDGE TRANSFER PUMP -C DISCHARGE VALVE "ACTUATOR OPEN FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
235		SLUDGE TRANSFER PUMP -C DISCHARGE VALVE "ACTUATOR CLOSE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
236	90GBS43AA001	SLUDGE TRANSFER PUMP -C DISCHARGE VALVE " ACTUATOR DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
237		SLUDGE TRANSFER PUMP -C DISCHARGE VALVE " ACTUATOR IN REMOTE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
238		SLUDGE TRANSFER PUMP -C DISCHARGE VALVE "ACTUATOR OPEN CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
239		SLUDGE TRANSFER PUMP -C DISCHARGE VALVE " ACTUATOR CLOSE CMD"	NA	NA	DO	DO[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
240	90GAA01AA651	SLUDGE TRANSFER PUMP DISCHARGE VALVE " LIMIT SWITCH OPEN	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
241		SLUDGE TRANSFER PUMP DISCHARGE VALVE " LIMIT SWITCH CLOSE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
242	90GAA01AA652	SLUDGE TRANSFER PUMP DISCHARGE VALVE "LIMIT SWITCH OPEN	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
243		SLUDGE TRANSFER PUMP DISCHARGE VALVE " ACTUATOR CLOSE CMD"LIMIT SWITCH CLOSE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
244	90GBS41CP101	SLUDGE TRANSFER PUMP-A DISCHARGE HEADER PRESSURE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DIAPHRAGM SEAL TYPE	0-2.5KG/CM2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
245	90GBS42CP101	SLUDGE TRANSFER PUMP -B DISCHARGE HEADER PRESSURE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DIAPHRAGM SEAL TYPE	0-2.5KG/CM2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
246	90GBS43CP101	SLUDGE TRANSFER PUMP -C DISCHARGE HEADER PRESSURE	NA	NA	DI	DI[DRY]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DIAPHRAGM SEAL TYPE	0-2.5KG/CM2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
247	90GBS45CP001	SLUDGE TRANSFER PUMP COMMON DISCHARGE HEADER PRESSURE	NA	JB-2	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DUAL INDUCTANCE TYPE	0-3 kg/cm2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
248	90GBS45CP002	SLUDGE TRANSFER PUMP COMMON DISCHARGE HEADER PRESSURE	NA	JB-2	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DUAL INDUCTANCE TYPE	0-3 kg/cm2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
249	90GBN60CL001	OVER HEAD CLARIFIED WATER TANK	NA	JB-1	AI	AI[4-20]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
250	90GBD10CL001	CLARIFIED WATER STORAGE TANK COMP-I	NA	JB-1	AI	AI[4-20]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
251	90GBD10CL002	CLARIFIED WATER STORAGE TANK COMP-II	NA	JB-1	AI	AI[4-20]	NA	O	LIME DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
252	90GBS50CL003	SLUDGE SUMP COMP-I	NA	JB-1	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
253	90GBS50CL004	SLUDGE SUMP COMP-II	NA	JB-1	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
254	90GBD01CF001	RAW WATER INLET	NA	JB-2	AI	AI[4-20]	NA	O	CLARIFLOCCULATOR AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		FLOW TRANSMITTER	EMF	0-2600m3/hr	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
255	90GBD02CF001	PARSHALL FLUME	NA	JB-2	AI	AI[4-20]	NA	O	CLARIFLOCCULATOR AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		FLOW TRANSMITTER	ULTRASONIC	0-2600m3/hr	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
256	90GBD03CF001	OUTLET CHANNEL CLARIFLOCCULATOR-1	NA	JB-2	AI	AI[4-20]	NA	O	CLARIFLOCCULATOR AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		FLOW TRANSMITTER	ULTRASONIC	0-1400m3/hr	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						

S.No	KKS_CODE	DESCRIPTION	STATUS	JB	RECORD_TYPE	IO_TYPE	NO_NC	O_I_C	AREA	EQUP_GR	PACKAGE	DDCMIS NAME	PROCESS_BLOCK_STREAM	FG	RIO	SOURCE	DESTINATION	ALM	PARAMETER	INST_TYPE	PROCESS_RANGE	INST_SCOPE	REF_DOC_NO	SPECIAL_REMARKS	REV_REMARK	REV_ NUMBER	REV_CODE	JB TERM-1	JB TERM-2
257	90GBD03CF002	OUTLET CHANNEL CLARIFLOCCULATOR-2	NA	JB-2	AI	AI[4-20]	NA	O	CLARIFLOCCULATOR AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		FLOW TRANSMITTER	ULTRASONIC	0-1400m3/hr	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
258	90GBS45CF001	SLUDGE TRANSFER PUMP DISCHARGE	NA	JB-2	AI	AI[4-20]	NA	O	SLUDGE AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		FLOW TRANSMITTER	EMF	0-600m3/hr	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
259	90GBD10CF001	COMMON OUTLET CHANNEL CLARIFLOCCULATOR	NA	JB-2	AI	AI[4-20]	NA	O	CLARIFLOCCULATOR AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		FLOW TRANSMITTER	ULTRASONIC	0-1400m3/hr	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
260	90GBD01CQ001	RAW WATER LINE	NA	JB-2	AI	AI[4-20]	NA	O	CLARIFLOCCULATOR AREA		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		TURBIDITY ANALYZER		0-1000NTU	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
261	90GBN91CL001	NAOCL DOSING TANK LEVEL 1	NA	JB-1	AI	AI[4-20]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		LEVEL	ULTRASONIC	0.3-10M	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
262	90GBN91AM001	NAOCL DOSING TANK-A AGI "ON FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
263		NAOCL DOSING TANK-A AGI "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
264		NAOCL DOSING TANK-A AGI " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
265		NAOCL DOSING TANK-A AGI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
266		NAOCL DOSING TANK-A AGI " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
267		NAOCL DOSING TANK-A AGI "START CMD"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
268		NAOCL DOSING TANK-A AGI "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
269		NAOCL DOSING TANK-A AGI TRIP ANNUNCIATION	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
270	90GBN92AP001	NAOCL DOSING PUMP-A "ON FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
271		NAOCL DOSING PUMP-A "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
272		NAOCL DOSING PUMP-A " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
273		NAOCL DOSING PUMP-AI " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
274		NAOCL DOSING PUMP-A EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
275		NAOCL DOSING PUMP-A "START CMD"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
276		NAOCL DOSING PUMP-A "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
277		NAOCL DOSING PUMP-A "TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
278	90GBN92AP002	NAOCL DOSING PUMP-B "ON FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
279		NAOCL DOSING PUMP-B "OFF FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
280		NAOCL DOSING PUMP-B " MCC DISTURBANCE FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
281		NAOCL DOSING PUMP-B " MCC AVAILABLE FB"	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
282		NAOCL DOSING PUMP-B " EPB OPERATED	NA	NA	DI	DI[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			MCC	DDCMIS		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
283		NAOCL DOSING PUMP-B "START CMD"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
284		NAOCL DOSING PUMP-B "STOP CMD"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			DDCMIS	MCC		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
285		NAOCL DOSING PUMP-B "TRIP ANNUNCIATION"	NA	NA	DO	DO[DRY]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			PLC	CONTROL DESK		NA	NA		OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
286	90GBN95CP001	NAOCL DOSING PUMP DISCHARGE HEADER PRESSURE	NA	JB-1	AI	AI[4-20]	NA	O	NAOCL DOS SYS		PT PLANT	NA	PT PLANT BLOCK			FIELD	DDCMIS		PRESSURE	DUAL INDUCTANCE TYPE	0-3kg/cm2	OTOKLIN	PE-V0-412-158-A001 (P&ID)REV-04						
287	90BRV81EH201	UPS -1 RECTIFIER-1	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
288	90BRV81EH202	UPS -1 RECTIFIER-2	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
289	90BRV81EH203	UPS -1 INVERTER-1	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
290	90BRV81EH204	UPS -1 INVERTER-2	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
291	90BRV81EH205	UPS -1 BATTERY-1 LOW	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
292	90BRV81EH206	UPS -1 BATTERY-2 LOW	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
293	90BRV81EH207	UPS -1 LOAD ON STATIC BYPASS	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
294	90BRV81EH208	UPS -1 STATIC BYPASS FAILED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
295	90BRV81EH209	UPS -1 INVERTER OFF OR FAILED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
296	90BRV81EH210	UPS -1 FAN TRIPPED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
297	90BRV81EH211	UPS ACDB-1 INCOMER TRIPPED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
298	90BRV82EH211	UPS ACDB-2 INCOMER TRIPPED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
299	BRV41EH001	UPS-1 OUTPUT CURRENT		NA	AI	4-20mA				UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
300	BRV41EH002	UPS-1 OUTPUT VOLTAGE		NA	AI	4-20mA				UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
301	BRV41EH003	UPS-1 OUTPUT FREQ		NA	AI	4-20mA				UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
302	90BRV82EH201	UPS -2 RECTIFIER-1	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
303	90BRV82EH202	UPS -2 RECTIFIER-2	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
304	90BRV82EH203	UPS -2 INVERTER-1	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
305	90BRV82EH204	UPS -2 INVERTER-2	TRIPPED	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
306	90BRV82EH205	UPS -2 BATTERY-1 LOW	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
307	90BRV82EH206	UPS -2 BATTERY-2 LOW	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
308	90BRV82EH207	UPS -2 LOAD ON STATIC BYPASS	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
309	90BRV82EH208	UPS -2 STATIC BYPASS FAILED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
310	90BRV82EH209	UPS -2 INVERTER OFF OR FAILED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
311	90BRV82EH210	UPS -2 FAN TRIPPED	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
312	-	COOLING FAN FAIL	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
313	-	230 V AC/24 V DC CONVERTOR FAIL	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
314	-	24 V DC UNDER VOLTAGE	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												

S.No	KKS_CODE	DESCRIPTION	STATUS	JB	RECORD_ TYPE	IO_TYPE	NO_NC	O_I_C	AREA	EQUP_GR	PACKAGE	DDCMIS NAME	PROCESS_BLOCK _STREAM	FG	RIO	SOURCE	DESTINATION	ALM	PARAMETER	INST_TYPE	PROCESS_RANGE	INST_SCOPE	REF_DOC_NO	SPECIAL_RE MARKS	REV_REMARK	REV_ NUMBER	REV_CODE	JB TERM-1	JB TERM-2
315	-	24 V DC OVER VOLTAGE	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
316	-	LOSS OF UPS POWER SUPPLY FEEDER	TRUE	NA	DI	PF	NO			UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
317	BRV42EH001	UPS-2 OUTPUT CURRENT		NA	AI	4-20mA				UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
318	BRV42EH002	UPS-2 OUTPUT VOLTAGE		NA	AI	4-20mA				UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												
319	BRV42EH003	UPS-2 OUTPUT FREQ		NA	AI	4-20mA				UPS	PT PLANT	NA	PT PLANT BLOCK			UPS PNL	DDCMIS												

Notes :
1) Spare capacity/requirements shall be inline with technical specification, Vol. V, cl. No. 4.03.11
2) I/O redundancy shall be considered as per specification, Vol. V, Chapter 4
3) Reference document - Drive Control Philosophy, PE-DM-412-145-I002

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED: FN	REV	DATE	ALTERED:
0	10.08.2018	CHECKED: MI			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

DRIVE LIST FOR PT PLANT

	NAME	SIGN	DATE
PREP	FAISAL N	FN	01-10-18
CHKD	MUAZZAM I	MI	01-10-18
APPD	ASLAM A	AA	01-10-18

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

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A057	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/ELL/PTP/18/363	01
DATE								NO. OF SHEETS 2 EXCLUDING COVER PAGE	

LOAD TITLE / (KKS tag nos)	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
NaOCl Dosing Pumps (90GBN92AP001/90GBN92AP002)		0.37	U	1	1	D	U		I		Chemical House							
Agitator for NaOCl dosing tanks 90GBN91AM001		0.37	U	1	0	D	U		I		Chemical House							
Agitator for FeCl3 dosing tanks (90GBN61AM001/90GBN62AM001/ 90GBN63AM001)		0.75	U	1	2	D	U		I		Chemical House							
FeCl3 Dosing Pumps (90GBN64AP001/90GBN64AP002)		1.5	U	1	1	D	U		I		Chemical House							
Agitator for Lime dosing tanks (90GAA01AM004/90GAA01AM005)		0.75	U	1	1	D	U		I		Chemical House							
Lime Dosing Pumps (90GBN73AP001/90GBN73AP002)		0.75	U	1	1	D	U		I		Chemical House							
Agitator for PE Dosing Tanks (90GBN81AM001/90GBN82AM001)		0.75	U	1	1	D	U		I		Chemical House							
PE Dosing Pump (90GBN83AP001/90GBN83AP002)		1.5	U	1	1	D	U		I		Chemical House							
Electrical Monorail Hoist		2.2	U	2	0	D	S		I		Chemical House							

NOTES:

1. **COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)**
2. **ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V**
   : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Motor Operated Butterfly Valve (90GBD01AA001/90GBD01AA002/ 90GBS41AA001/90GBS42AA001/ 90GBS43AA001)		1.1	U	5	0	D	S		I		PTP area							
Flash mixer agitator (90GBD02AM001)		3.7	U	1	0	D	U		C		PTP area							
Flocculator Drive (90GAA01BB005/90GAA01BB006)		0.75	U	8	0	D	U		C		PTP area							
End Carriage Drive (90GAA01BB005/90GAA01BB006)		1.5	U	2	0	D	U		C		PTP area							
Sludge transfer Pump (90GBS41AP001/90GBS42AP001/ 90GBS43AP001)		37	U	2	1	D	U		I		PTP area							
Air Blower (90GBS31AN001/90GBS32AN001)		7.5	U	1	1	D	U		C		PTP area							
Electrical Monorail Hoist		2.2	U	1	0	D	S		I		PTP area							
Misc. Load-1		3.0	U	1	1	D	U		C		PTP area							

NOTES:
1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)
2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V
: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

	DRIVE LIST FOR PT PLANT (ELECTRICAL)	JOB NO.	-	ORIGINATING AGENCY		PEM (ELECTRICAL)
		PROJECT TITLE	2x660 MW ENNORE SEZ COAL BASED STPP AT DYKE OF NCTPS, CHENNAI.	NAME	OTOKLIN	DATA FILLED UP ON 02/10/2018
		SYSTEM / S	PRE- TREATMENT PLANT	SIGN.		DOC NO PE-V0-412-158-A057
		DEPTT. / SECTION		SHEET 2 OF 2	REV. 01	DE'S SIGN. & DATE

DRAWING NO. PE-V0-412-158-A058

2 X 660 MW ENNORE SEZ STPP

CONTROL SCHEME
FOR
PRE TREATMENT PLANT

JOB NO. 412					JOB NO. 412				
STATUS CONTRACT					STATUS CONTRACT				
DISTRIBUTION					DISTRIBUTION				
TO					TO				
No. of					No. of				
REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
02	29.01.19	NJ	VKV	SCS	01	16.11.18	NJ	VKV	SCS
1.	REVISED IN LINE WITH THE CUST/ CONSULTANT COMMENTS VIDE LTR. D.839 dated 28.12.18				1.	REVISED IN LINE WITH THE CUST/ CONSULTANT COMMENTS VIDE LTR. D.4837 dated 16.11.18			

PROJECT–	2 X 660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT AT ASH DYKE OF NCTPS, CHENNAI	
OWNER	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION LIMITED	
OWNER'S CONSULTANT	DESEIN PRIVATE LIMITED DESEIN HOUSE, NEW DELHI	
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	DEPT CODE: I
TITLE	CONTROL SCHEME FOR PRE TREATMENT PLANT	

	NAME	SIGN	DATE
DSGN	NJ	-sd-	16.07.18
CHD	VKV	-sd-	16.07.18
APPD	SCS	-sd-	16.07.18

DEPT.	SCALE	DRAWING NO.	
SIGN		PE-V0-412-158-A058	
DATE		SHEET 1 OF 47	REV 02

INDEX

Sh.No.	DESCRIPTION	REVISION No				
		0	1	2	3	4
1.	TITILE SHEET	X				
2.	INDEX SHEET	X				
3.	INDEX SHEET	X				
4.	LIST OF DRIVES	X				
5	REFERENCE DRAWINGS	X	X			
6.	RAW WATER TO CASCADE AERATOR I/L VLV-1	X				
7.	RAW WATER TO CASCADE AERATOR BYPASS VLV-2	X				
8.	ON/OFF DUTY VLV WITHOUT INTERLOCK	X				
9.	NaOCl SOL TANK AGITATOR-01	X		X		
10.	FeCl3 SOL TANK AGITATOR-01	X		X		
11.	FeCl3 SOL TANK AGITATOR-02	X		X		
12.	FeCl3 SOL TANK AGITATOR-03	X		X		
13.	LIME SOL TANK AGITATOR-01	X		X		
14.	LIME SOL TANK AGITATOR-02	X		X		
15.	POLY ELECTROLYTE SOL TANKs AGITATOR-01	X		X		
16.	POLY ELECTROLYTE SOL TANKs AGITATOR-02	X		X		
17.	NaOCl DOSING PMPs STANDBY SELECTION	X				
18	NaOCl DOSING PUMP-A	X		X		
19.	NaOCl DOSING PUMP-B	X		X		
20.	NaOCl DOSING MISC. LOGIC	X				
21.	FeCl3 DOSING PMPs STANDBY SELECTION	X				
22.	FeCl3 DOSING PUMP-A	X		X		
23.	FeCl3 DOSING PUMP-B	X		X		
24.	FeCl3 DOSING PUMPs MISC. LOGIC	X				
25.	FeCl3 DOSING TANKs MISC. LOGIC	X				

	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
	TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT	REV. NO.	02 DATE: 29.01.19
	INDEX	SHT	2 OF 47

INDEX

Sh.No.	DESCRIPTION	REVISION No				
		0	1	2	3	4
26.	LIME SOL DOSING PMPs STANDBY SELECTION	X				
27.	LIME SOL DOSING PUMP–A	X		X		
28.	LIME SOL DOSING PUMP–B	X		X		
29.	LIME SOL DOSING PUMPs MISC. LOGIC	X				
30.	LIME SOL DOSING TANKs MISC. LOGIC	X				
31.	POLY ELECTROLYTE DOSING PMPs STANDBY SELECTION	X				
32.	POLY ELECTROLYTE DOSING PUMP–A	X		X		
33.	POLY ELECTROLYTE DOSING PUMP–B	X		X		
34.	POLY ELECTROLYTE DOSING PUMPs MISC. LOGIC	X				
35.	POLY ELECTROLYTE DOSING TANKs MISC. LOGIC	X				
36.	SLUDGE FEED PUMPs STANDBY SELECTION	X				
37.	SLUDGE FEED PUMPs TRIP LOGIC	X				
38.	SLUDGE FEED PUMP–A	X		X		
39.	SLUDGE FEED PUMP–B	X		X		
40.	SLUDGE FEED PUMP–C	X		X		
41.	SLUDGE FEED PUMP–A DISCH VLV	X				
42.	SLUDGE FEED PUMP–B DISCH VLV	X				
43.	SLUDGE FEED PUMP–C DISCH VLV	X				
44.	SLUDGE FEED PUMPs MISC. LOGIC	X				
45.	AIR BLOWERs STANDBY SELECTION LOGIC	X				
46.	AIR BLOWER–A	X		X		
47.	AIR BLOWER–B	X		X		

	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT	REV. NO.	02	DATE: 29.01.19
		INDEX	SHT	3 OF 47	

LIST OF DRIVES

Sl. No.	KKS	TAG No.	DESCRIPTION	TYPE OF DRIVE	OPERATIOIN	LOGIC Sht.No.
1.	90GBD01AA001		RAW WATER TO CASCADE AERATOR I/L VLV–1	ANALOG		6
2.	90GBD01AA002		RAW WATER TO CASCADE AERATOR BYPASS VLV–2	BID	OPEN/CLOSE	7
3.	90GBD01AT001		RAKE ARM DRIVE FOR CLARIFIER–A	LTUD	ON/OFF	8
4.	90GBD01AT002		IMPELLER DRIVE FOR CLARIFIER–A	LTUD	ON/OFF	8
5.	90GBD02AT001		RAKE ARM DRIVE FOR CLARIFIER–B	LTUD	ON/OFF	8
6.	90GBD02AT002		IMPELLER DRIVE FOR CLARIFIER–B	LTUD	ON/OFF	8
7.	90GBD02AM001		FLASH MIXER AGITATOR	LTUD	ON/OFF	8
8.	90GBN91AM001		NaOCl SOL TANK AGITATOR–01	LTUD	ON/OFF	9
9.	90GBN61AM001		FeCl3 SOL TANK AGITATOR–01	LTUD	ON/OFF	10
10.	90GBN62AM001		FeCl3 SOL TANK AGITATOR–02	LTUD	ON/OFF	11
11.	90GBN63AM001		FeCl3 SOL TANK AGITATOR–03	LTUD	ON/OFF	12
12.	90GBN71AM001		LIME SOL TANK AGITATOR–01	LTUD	ON/OFF	13
13.	90GBN72AM001		LIME SOL TANK AGITATOR–02	LTUD	ON/OFF	14
14.	90GBN81AM001		POLY ELECTROLYTE SOL TANKs AGITATOR–01	LTUD	ON/OFF	15
15.	90GBN82AM001		POLY ELECTROLYTE SOL TANKs AGITATOR–02	LTUD	ON/OFF	16
16.	90GBN92AP001		NaOCl DOSING PUMP–A	LTUD	ON/OFF	18
17.	90GBN92AP001		NaOCl DOSING PUMP–B	LTUD	ON/OFF	19
18.	90GBN64AP001		FeCl3 DOSING PUMP–A	LTUD	ON/OFF	22
19.	90GBN64AP002		FeCl3 DOSING PUMP–B	LTUD	ON/OFF	23
20.	90GBN73AP001		LIME SOL DOSING PUMP–A	LTUD	ON/OFF	27
21.	90GBN73AP002		LIME SOL DOSING PUMP–B	LTUD	ON/OFF	28
22.	90GBN83AP001		POLY ELECTROLYTE DOSING PUMP–A	LTUD	ON/OFF	32
23.	90GBN83AP002		POLY ELECTROLYTE DOSING PUMP–B	LTUD	ON/OFF	33
24.	90GBS41AP001		SLUDGE FEED PUMP–A	LTUD	ON/OFF	38
25.	90GBS42AP001		SLUDGE FEED PUMP–B	LTUD	ON/OFF	39
26.	90GBS43AP001		SLUDGE FEED PUMP–C	LTUD	ON/OFF	40
27.	90GBS41AA001		SLUDGE FEED PUMP–A DISCH VLV	BID	OPEN/CLOSE	41
28.	90GBS42AA001		SLUDGE FEED PUMP–B DISCH VLV	BID	OPEN/CLOSE	42
29.	90GBS43AA001		SLUDGE FEED PUMP–C DISCH VLV	BID	OPEN/CLOSE	43
30.	90GBS31AN001		AIR BLOWER–A	LTUD	ON/OFF	46
31.	90GBS32AN001		AIR BLOWER–B	LTUD	ON/OFF	47

REFERENCE DRAWINGs :-

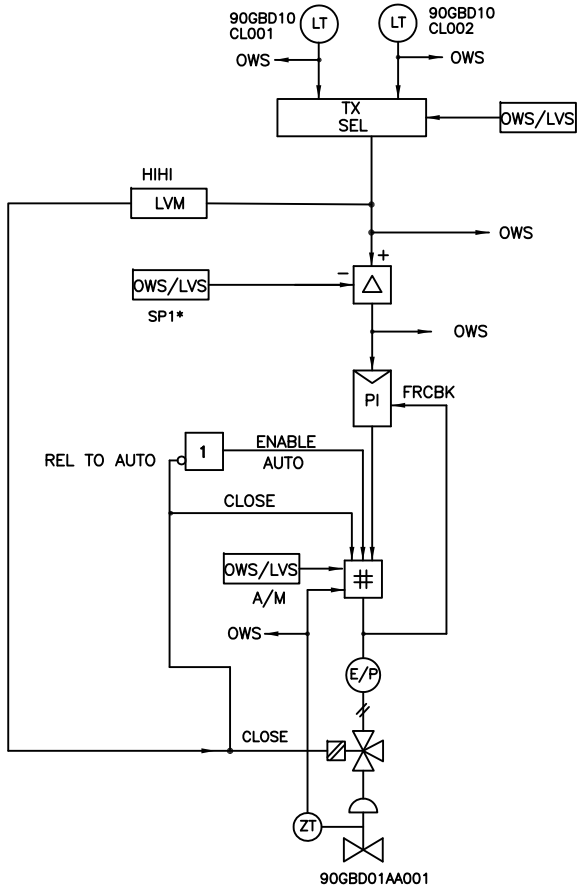
1. P&ID FOR PRE TREATMENT PLANT — DRG. NO. PE-DG-412-158-A001
2. CONTROL PHILOSOPHY OF PRE TREATMENT PLANT — DRG. NO. PE-DG-412-158-A007

NOTEs:-

1. THIS DOCUMENT COVERS BINARY DRIVES CONTROLLED FOR PRE TREATMENT PLANT STANDALONE DDCMIS UNDER STATION C&I PACKAGE.
2. ALL TIMER VALUES ARE SUGGESTIVE ONLY AND TO BE SET AT SITE DURING COMMISSIONING.
3. LEGEND SHEETS AND DRIVE CONTROL MODULES INDICATED IN THE SCHEME ARE GENERIC AND SAME SHALL BE TAKEN CARE BY BHEL (EDN)-DDCMIS APPLICATION ENGINEER, WHILE IMPLEMENTING THE CONTROL SCHEMES IN METSO DNA (Valmet DNA) CONTROL SYSTEM.
4. (1) FIRST UNIT KKS TAGS TO BE READ WITH PREFIX '10' AND SECOND UNIT TAG NOS. TO BE READ WITH PREFIX '20'. KKS TAG FOR SYSTEMS COMMON TO BOTH UNITS TO BE READ WITH PREFIX '90'.
5. (1) BHEL WILL REVISE THE DRAWINGS AFTER FINALIZATION OF ALL RELATED SCHEMES, WRITE-UP AND P&ID'S EVEN AFTER APPROVAL OF THE DOCUMENT.
6. (1) BHEL BEING AN EPC CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTNESS, COMPLETENESS & FINAL SUCCESSFUL IMPLEMENTATION OF FUNCTIONAL DIAGRAMS/ OLCS/CLCS IN EVERY ASPECT FOR COMPLETE CONTROL, OPERATION & COMMISSIONING OF PLANT AS PER FINAL APPROVED P & IDS & CONTROL WRITE-UPS.
7. (2) THE BINARY AND ANALOG OUTPUTS FROM ONE SUBSYSTEM(SG/TG/BOP/OTHER SUBSYSTEMS) OF THE CONTROL SYSTEM TO OTHER WHICH ARE REQUIRED IN THESE SYSTEMS FOR PROTECTION PURPOSES AND SIGNALS DIRECTLY AFFECTING THE PERFORMANCE OF CLOSED LOOP CONTROLS (CRITICAL LOOPS OF BOP), SHALL BE MADE AVAILABLE FROM TRIPLE OR DUAL REDUNDANT BINARY AND ANALOG OUTPUT MODULES DEPENDING ON THE SYSTEM AND PROCESS REQUIREMENT. IN ADDITION, OTHER CRITICAL SIGNALS EXCHANGE BETWEEN SUBSYSTEMS (SG/TG/BOP/OTHER SUBSYSTEMS) SHALL ALSO BE HARDWIRED BASED ON SYSTEM AND PROCESS REQUIREMENT. FAILURE OF ANY SINGLE MODULE SHALL NOT AFFECT OPERATION OF MORE THAN ONE SINGLE DRIVE OF SAME SERVICE.

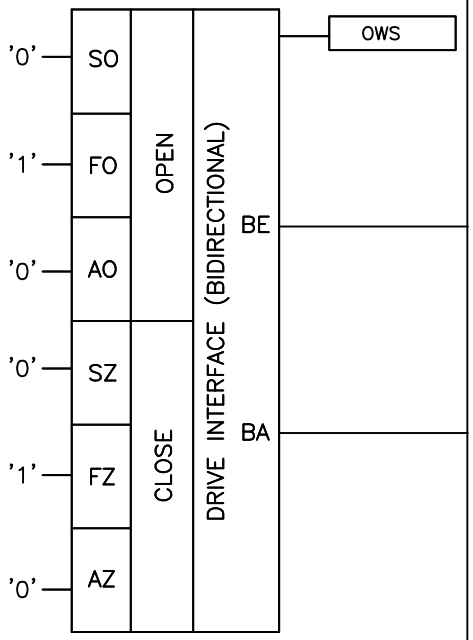
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.

CLARIFIED WATER DISTRIBUTION CHAMBER LEVEL



RAW WATER TO CASCADE AERATOR I/L VLV-1

	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058	
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT RAW WATER TO CASCADE AERATOR I/L VLV-1	REV. NO.	02	DATE: 29.01.19
			SHT	6 OF 47	

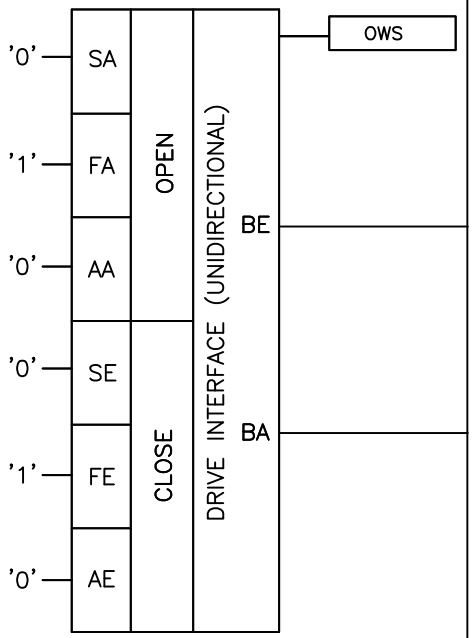
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
OPEN/CLOSE DUTY VLV WITHOUT INTERLOCK				
VLV POSITION FEEDBACK-ZT(TX)	/FIELD		OWS	

(90GBD01AA002)

COMMAND — OPEN /ACTR

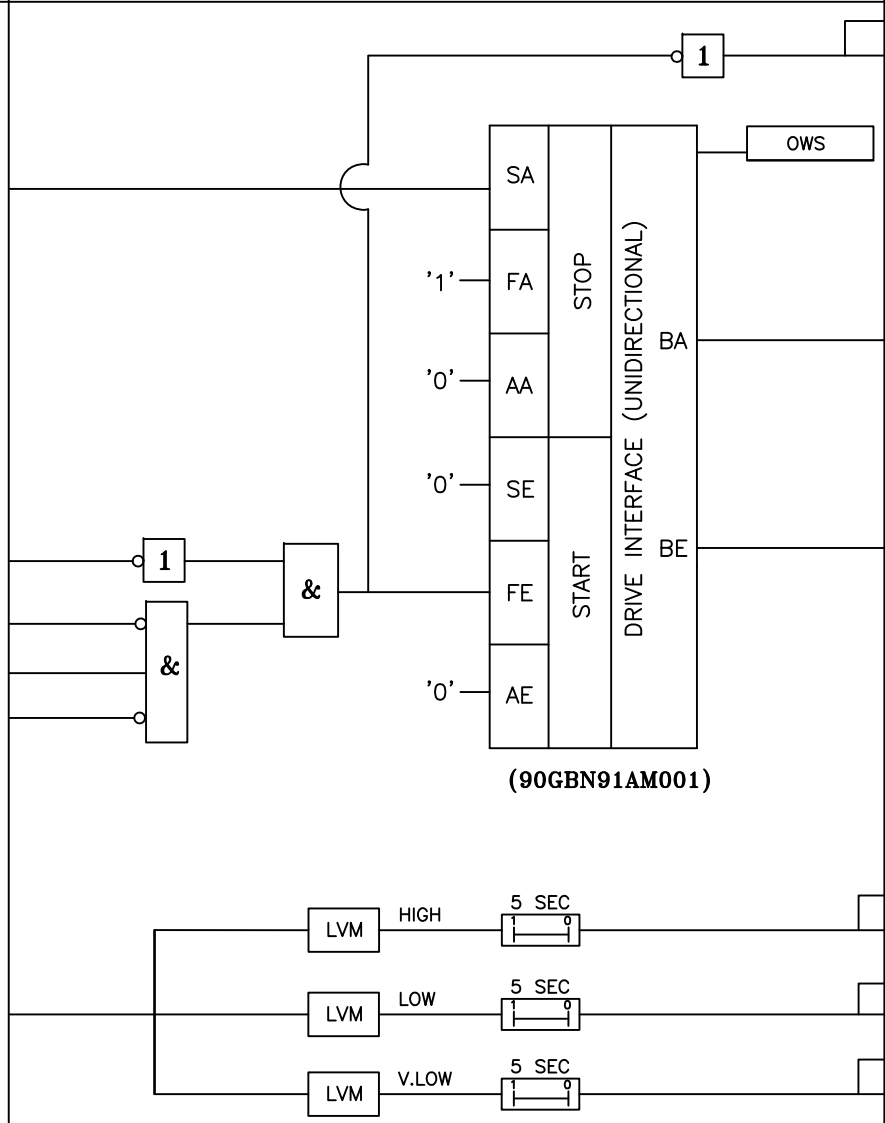
COMMAND — CLOSE /ACTR

	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT RAW WATER TO CASCADE AERATOR BYPASS VLV-2	REV. NO. 02 DATE: 29.01.19 SHT 7 OF 47	

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	**STATUS** FROM SIG/SHT NO.		**DESCRIPTION**	**STATUS** TO SIG/SHT NO.
OPEN/CLOSE DUTY VALVE WITHOUT INTERLOCK APPLICABLE FOR FOLLOWING DRIVES: 1.90GBD01AT001–RAKE ARM DRIVE FOR CLARIFIER (CW)–A 2.90GBD01AT002–IMPELLER DRIVE FOR CLARIFIER (CW)– A 3.90GBD02AT001–RAKE ARM DRIVE FOR CLARIFIER (CW)– B 4.90GBD02AT002–IMPELLER DRIVE FOR CLARIFIER (CW)–B 5.90GBD02AM001–FLASH MIXER AGITATOR			COMMAND COMMAND	OPEN /ACTR CLOSE /ACTR

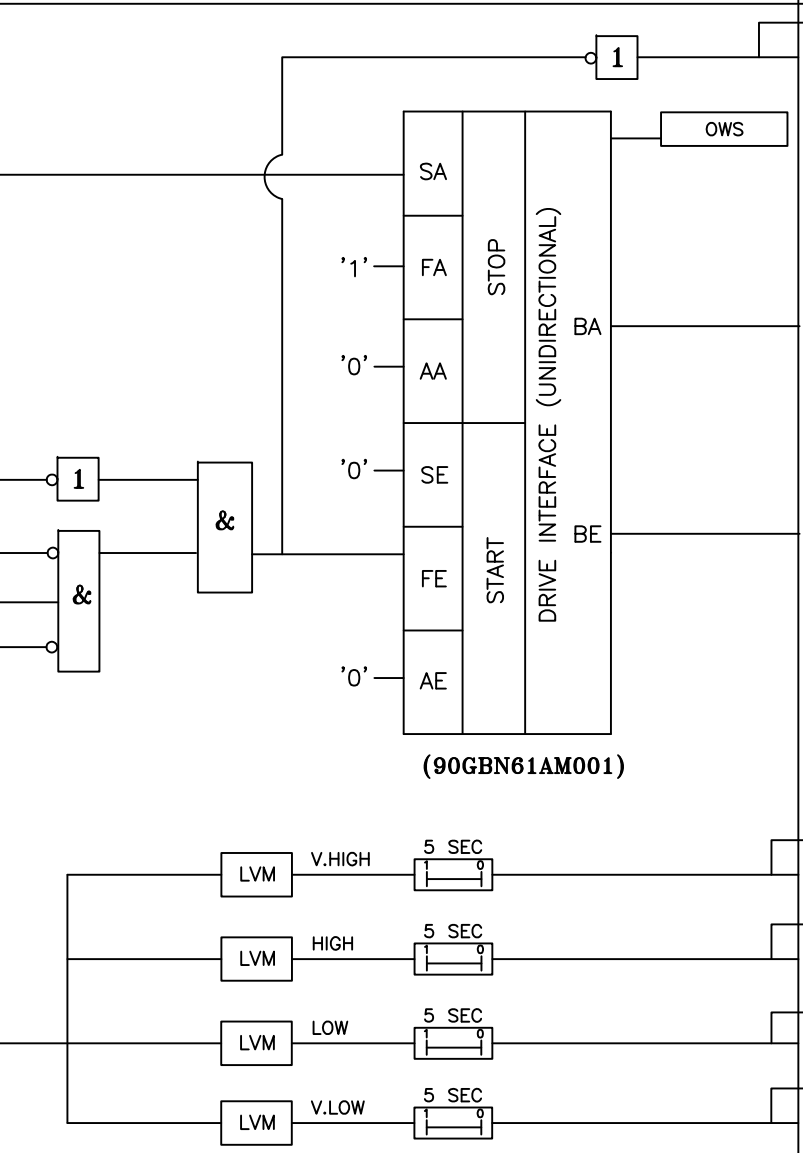
	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT ON/OFF DUTY VLV WITHOUT INTERLOCK	REV. NO.	02 DATE: 29.01.19
			SHT	8 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	**STATUS** FROM SIG/SHT NO.		**DESCRIPTION**	**STATUS** TO SIG/SHT NO.
NaOCl DOSING TANK LEVEL	V.LOW 2/9		NaOCl AGITATOR START PERMISSIVES NOT AVLBL	2
NaOCl DOSING TANK LEVEL	LOW 1/9		NaOCl DOSING TANK AGITATOR	STOP /MCC
NaOCl AGITATOR	MCC DISTB /MCC		NaOCl DOSING TANK AGITATOR	START /MCC
NaOCl AGITATOR	2 MCC AVLBL /MCC			
NaOCl AGITATOR	EPB OPTD /MCC			
NaOCl DOSING TANK LEVEL 90GBN91CL001	/FIELD		NaOCl DOSING TANK LEVEL	HIGH
			NaOCl DOSING TANK LEVEL	LOW 1/9, 20
			NaOCl DOSING TANK LEVEL	V.LOW 2/9, 20



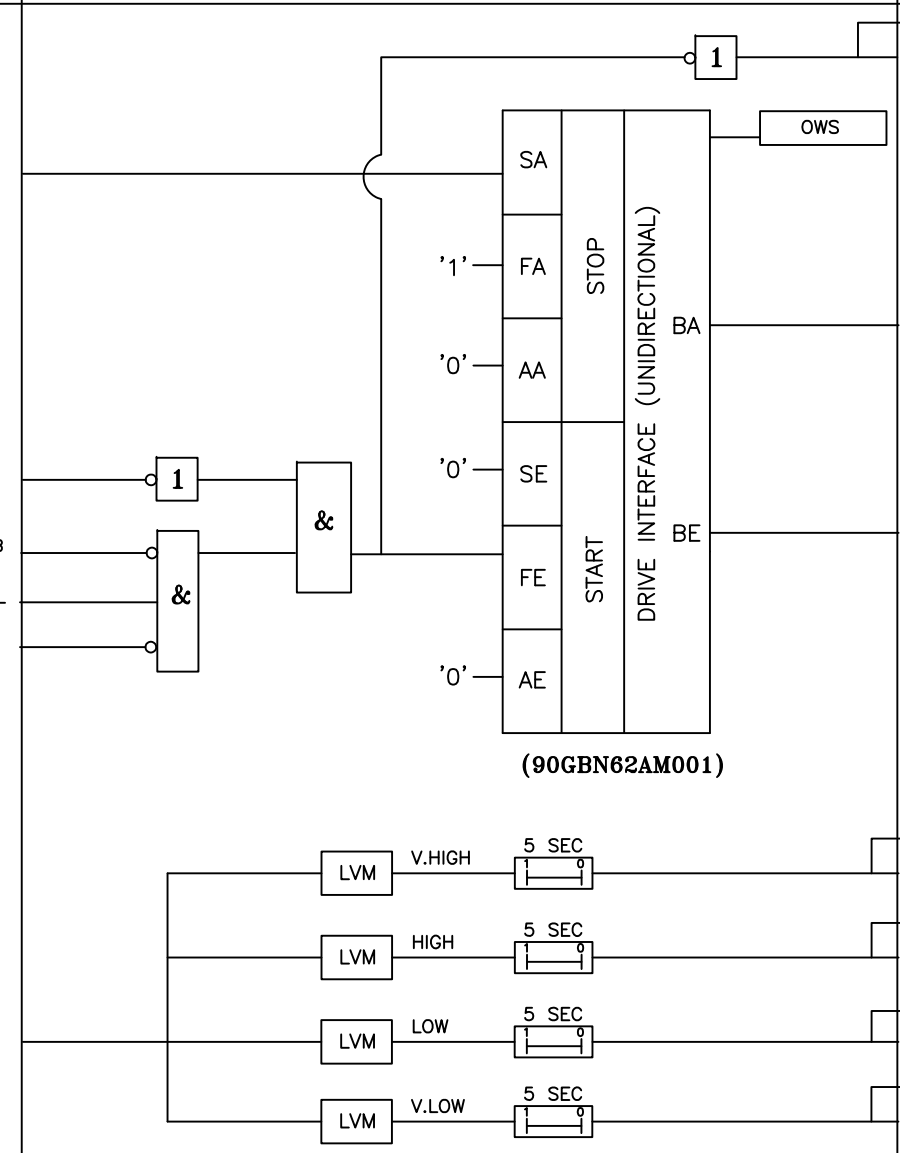
	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT NaOCl TANK AGITATOR,AG-01	REV. NO.	02 DATE: 29.01.19
			SHT	9 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
			FeCl3 AGITATOR–1 START PERMISSIVE NOT AVLBL	A, 2
FeCl3 SOLN TANK–1 LEVEL	V.LOW 2/10			
			FeCl3 SOLN TANK–1 AGITATOR	STOP /MCC
FeCl3 SOLN TANK–1 LEVEL	LOW 1/10			
FeCl3 AGITATOR–1	MCC DISTB /MCC		FeCl3 SOLN TANK–1 AGITATOR	START /MCC
FeCl3 AGITATOR–1	2, MCC AVLBL /MCC			
FeCl3 AGITATOR–1	EPB OPTD /MCC			
FeCl3 SOLN TANK–1 LEVEL 90GBN61CL001	/FIELD		FeCl3 SOLN TANK–1 LEVEL	V.HIGH
			FeCl3 SOLN TANK–1 LEVEL	HIGH
			FeCl3 SOLN TANK–1 LEVEL	LOW 1/10, 25
			FeCl3 SOLN TANK–1 LEVEL	V.LOW 2/10, 25



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT	REV. NO.	02 DATE: 29.01.19
		FeCl3 SOLN TANK AGITATOR,AG–01	SHT	10 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
			FeCl3 AGITATOR–2 START PERMISSIVE NOT AVLBL	A, 2
FeCl3 SOLN TANK–2 LEVEL	V.LOW 2/11			
			FeCl3 SOLN TANK–2 AGITATOR	STOP /MCC
FeCl3 SOLN TANK–2 LEVEL	LOW 1/11			
FeCl3 AGITATOR–2	MCC DISTB /MCC		FeCl3 SOLN TANK–2 AGITATOR	START /MCC
FeCl3 AGITATOR–2	2, MCC AVLBL /MCC			
FeCl3 AGITATOR–2	EPB OPTD /MCC			
FeCl3 SOLN TANK–2 LEVEL 90GBN62CL001	/FIELD		FeCl3 SOLN TANK–2 LEVEL	V.HIGH
			FeCl3 SOLN TANK–2 LEVEL	HIGH
			FeCl3 SOLN TANK–2 LEVEL	LOW 1/11, 25
			FeCl3 SOLN TANK–2 LEVEL	V.LOW 2/11, 25



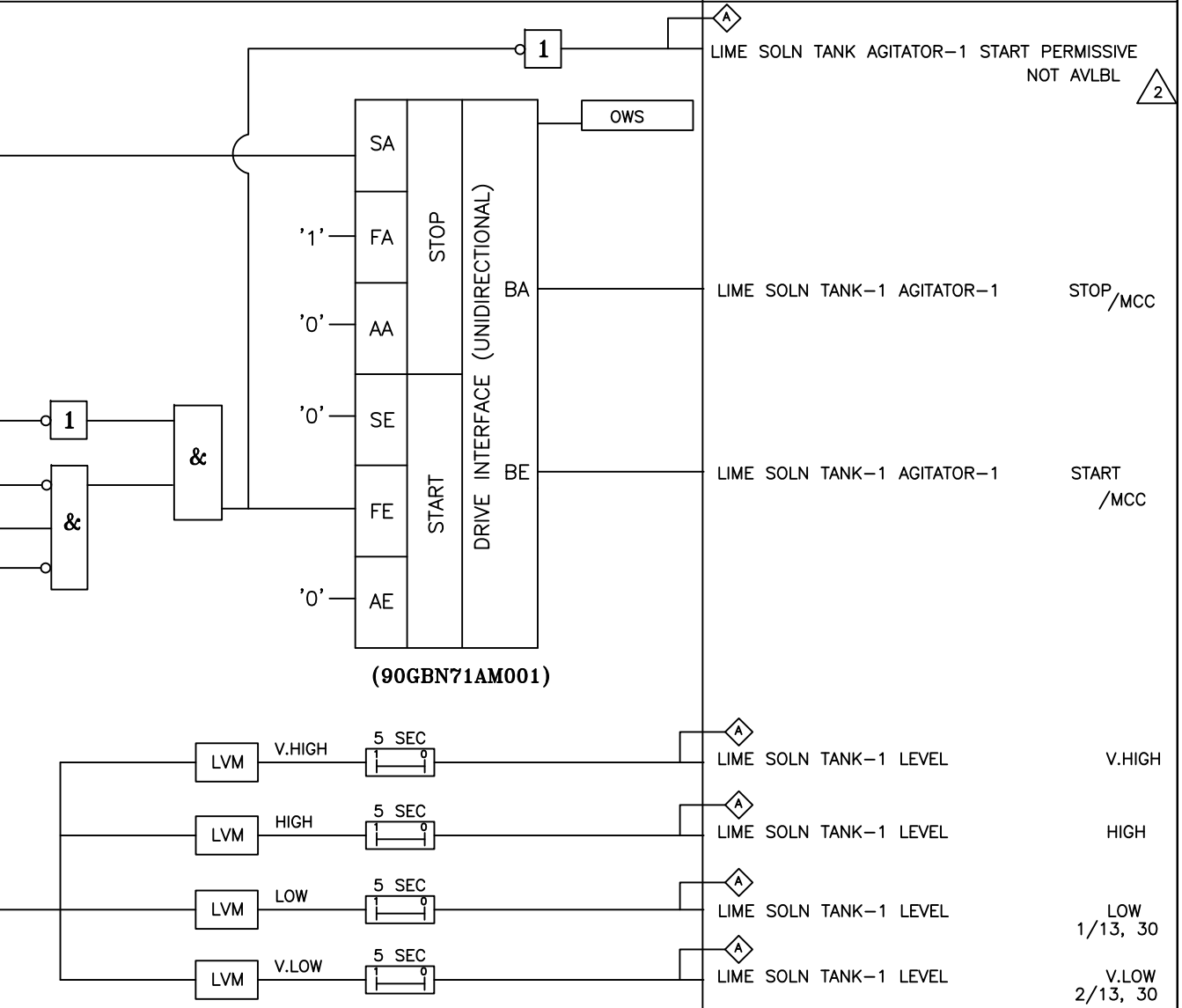
	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT	REV. NO.	02 DATE: 29.01.19
		FeCl3 SOLN TANK AGITATOR,AG–02	SHT	11 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
			FeCl3 AGITATOR–3 START PERMISSIVE NOT AVLBL	A, 2
FeCl3 SOLN TANK–3 LEVEL	V.LOW 2/12			
			FeCl3 SOLN TANK–3 AGITATOR	STOP /MCC
FeCl3 SOLN TANK–3 LEVEL	LOW 1/12			
FeCl3 AGITATOR–3	MCC DISTB /MCC		FeCl3 SOLN TANK–3 AGITATOR	START /MCC
FeCl3 AGITATOR–3	2, MCC AVLBL /MCC			
FeCl3 AGITATOR–3	EPB OPTD /MCC			
FeCl3 SOLN TANK–3 LEVEL 90GBN63CL001	/FIELD		FeCl3 SOLN TANK–3 LEVEL	V.HIGH
			FeCl3 SOLN TANK–3 LEVEL	HIGH
			FeCl3 SOLN TANK–3 LEVEL	LOW 1/12, 25
			FeCl3 SOLN TANK–3 LEVEL	V.LOW 2/12, 25

(90GBN63AM001)

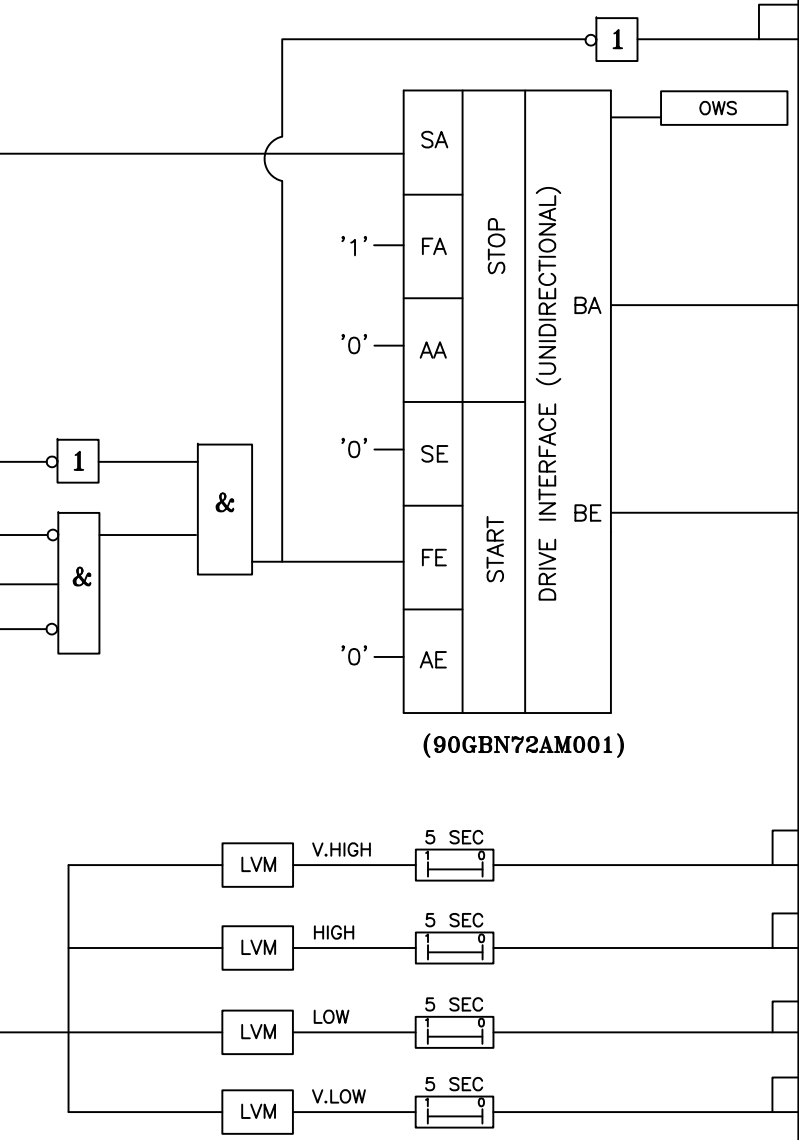
	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT FeCl3 SOLN TANK AGITATOR,AG–03	REV. NO.	02 DATE: 29.01.19
		SHT	12 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
LIME SOLN TANK–1 LEVEL	V.LOW 2/13		LIME SOLN TANK–1 START PERMISSIVE NOT AVLBL	2
LIME SOLN TANK–1 LEVEL	LOW 1/13		LIME SOLN TANK–1 AGITATOR–1	STOP /MCC
LIME SOLN TANK AGITATOR–1	MCC DISTB /MCC		LIME SOLN TANK–1 AGITATOR–1	START /MCC
LIME SOLN TANK AGITATOR–1	2 MCC AVLBL /MCC			
LIME SOLN TANK AGITATOR–1	EPB OPTD /MCC			
LIME SOLN TANK–1 LEVEL 90GBN71CL001	/FIELD		LIME SOLN TANK–1 LEVEL	V.HIGH
			LIME SOLN TANK–1 LEVEL	HIGH
			LIME SOLN TANK–1 LEVEL	LOW 1/13, 30
			LIME SOLN TANK–1 LEVEL	V.LOW 2/13, 30



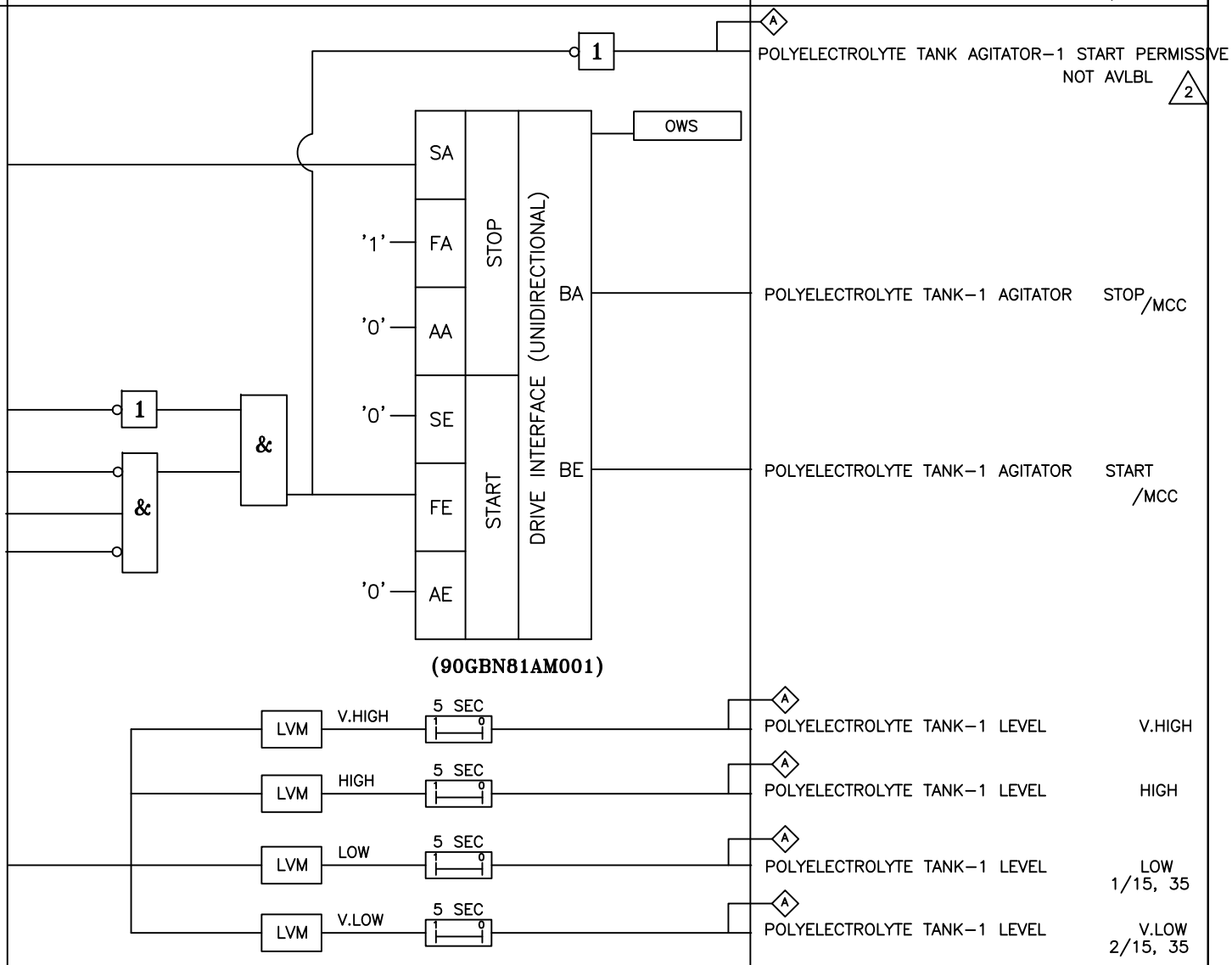
	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT LIME SOLN TANK AGITATOR,AG–01	REV. NO.	02 DATE: 29.01.19
			SHT	13 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
			LIME SOLN TANK AGITATOR-2 START PERMISSIVE NOT AVLBL	A, 2
LIME SOLN TANK-2 LEVEL	V.LOW 2/14			
			LIME SOLN TANK-2 AGITATOR	STOP /MCC
LIME SOLN TANK-2 LEVEL	LOW 1/14			
LIME SOLN TANK AGITATOR-2	MCC DISTB /MCC		LIME SOLN TANK-2 AGITATOR	START /MCC
LIME SOLN TANK AGITATOR-2	2, MCC AVLBL /MCC			
LIME SOLN TANK AGITATOR-2	EPB OPTD /MCC			
			LIME SOLN TANK-2 LEVEL	V.HIGH
			LIME SOLN TANK-2 LEVEL	HIGH
LIME SOLN TANK-2 LEVEL 90GBN72CL001	/FIELD		LIME SOLN TANK-2 LEVEL	LOW 1/14, 30
			LIME SOLN TANK-2 LEVEL	V.LOW 2/14, 30



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT LIME SOLN TANK AGITATOR,AG-02	REV. NO. 02	DATE: 29.01.19
			SHT 14	OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
			POLYELECTROLYTE TANK AGITATOR-1 START PERMISSIVE NOT AVLBL	2
POLYELECTROLYTE TANK-1 LEVEL	V.LOW 2/15			
			POLYELECTROLYTE TANK-1 AGITATOR	STOP /MCC
POLYELECTROLYTE TANK-1 LEVEL	LOW 1/15			
POLYELECTROLYTE TANK AGITATOR-1	MCC DISTB /MCC			
POLYELECTROLYTE TANK AGITATOR-1	2 MCC AVLBL /MCC		POLYELECTROLYTE TANK-1 AGITATOR	START /MCC
POLYELECTROLYTE TANK AGITATOR-1	EPB OPTD /MCC			
			POLYELECTROLYTE TANK-1 LEVEL	V.HIGH
			POLYELECTROLYTE TANK-1 LEVEL	HIGH
POLYELECTROLYTE TANK-1 LEVEL 90GBN81CL001	/FIELD		POLYELECTROLYTE TANK-1 LEVEL	LOW 1/15, 35
			POLYELECTROLYTE TANK-1 LEVEL	V.LOW 2/15, 35

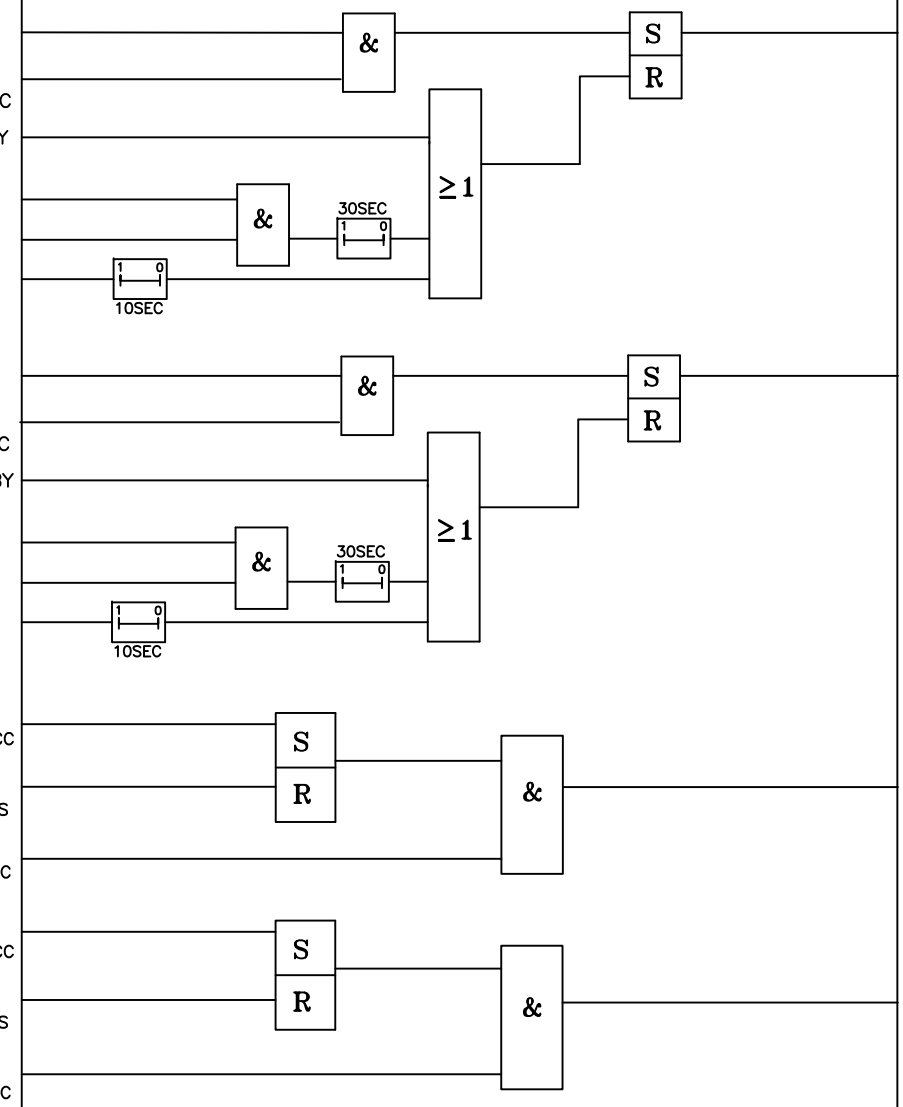


	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT POLYELECTROLYTE TANK AGITATOR,AG-01	REV. NO.	02 DATE: 29.01.19
			SHT	15 OF 47

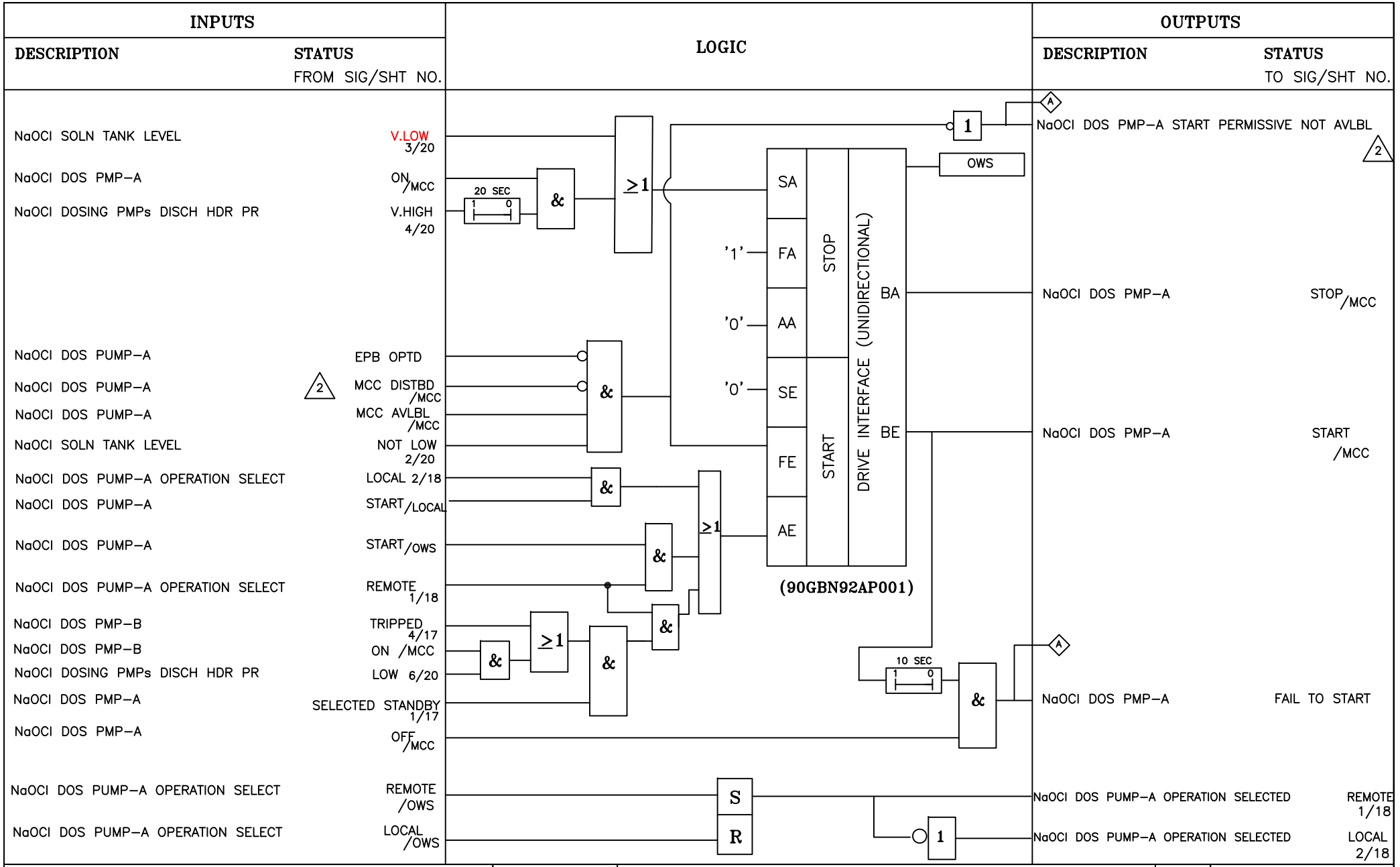
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
			POLYELECTROLYTE TANK AGITATOR-2 START PERMISSIVE NOT AVLBL 2	
POLYELECTROLYTE TANK-2 LEVEL	V.LOW 2/16			
			POLYELECTROLYTE TANK-2 AGITATOR STOP /MCC	
POLYELECTROLYTE TANK-2 LEVEL	LOW 1/16			
POLYELECTROLYTE TANK AGITATOR-2	MCC DISTB /MCC		POLYELECTROLYTE TANK-2 AGITATOR START /MCC	
POLYELECTROLYTE TANK AGITATOR-2 2	MCC AVLBL /MCC			
POLYELECTROLYTE TANK AGITATOR-2	EPB OPTD /MCC			
		(90GBN82AM001)		
POLYELECTROLYTE TANK-2 LEVEL 90GBN82CL001	/FIELD		POLYELECTROLYTE TANK-2 LEVEL V.HIGH	
			POLYELECTROLYTE TANK-2 LEVEL HIGH	
			POLYELECTROLYTE TANK-2 LEVEL LOW 1/16, 35	
			POLYELECTROLYTE TANK-2 LEVEL V.LOW 2/16, 35	

	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT POLYELECTROLYTE TANK AGITATOR,AG-02	REV. NO. 02	DATE: 29.01.19
			SHT 16	OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
NaOCl DOS PMP–A	STDBY /OWS		NaOCl DOS PMP–A	SELECTED STAND BY 1/18
NaOCl DOS PMP–B	ON /MCC			
NaOCl DOS PMP–A	NOT STDBY /OWS			
NaOCl DOS PMP–B	OFF /MCC			
NaOCl DOS PMP–A	OFF /MCC			
NaOCl DOS PMP–A	ON /MCC			
NaOCl DOS PMP–B	STDBY /OWS		NaOCl DOS PMP–B	SELECTED STAND BY 2/19
NaOCl DOS PMP–A	ON /MCC			
NaOCl DOS PMP–B	NOT STDBY /OWS			
NaOCl DOS PMP–B	OFF /MCC			
NaOCl DOS PMP–A	OFF /MCC			
NaOCl DOS PMP–B	ON /MCC			
NaOCl DOS PMP–A	ON /MCC		NaOCl DOS PMP–A	TRIPPED 3/19
NaOCl DOS PMP–A	STOP /OWS			
NaOCl DOS PMP–A	OFF /MCC			
NaOCl DOS PMP–B	ON /MCC		NaOCl DOS PMP–B	TRIPPED 4/18
NaOCl DOS PMP–B	STOP /OWS			
NaOCl DOS PMP–B	OFF /MCC			



	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT NaOCl DOS PMPs STANDBY SELECTION LOGIC	REV. NO.	02 DATE: 29.01.19
		SHT	17 OF 47



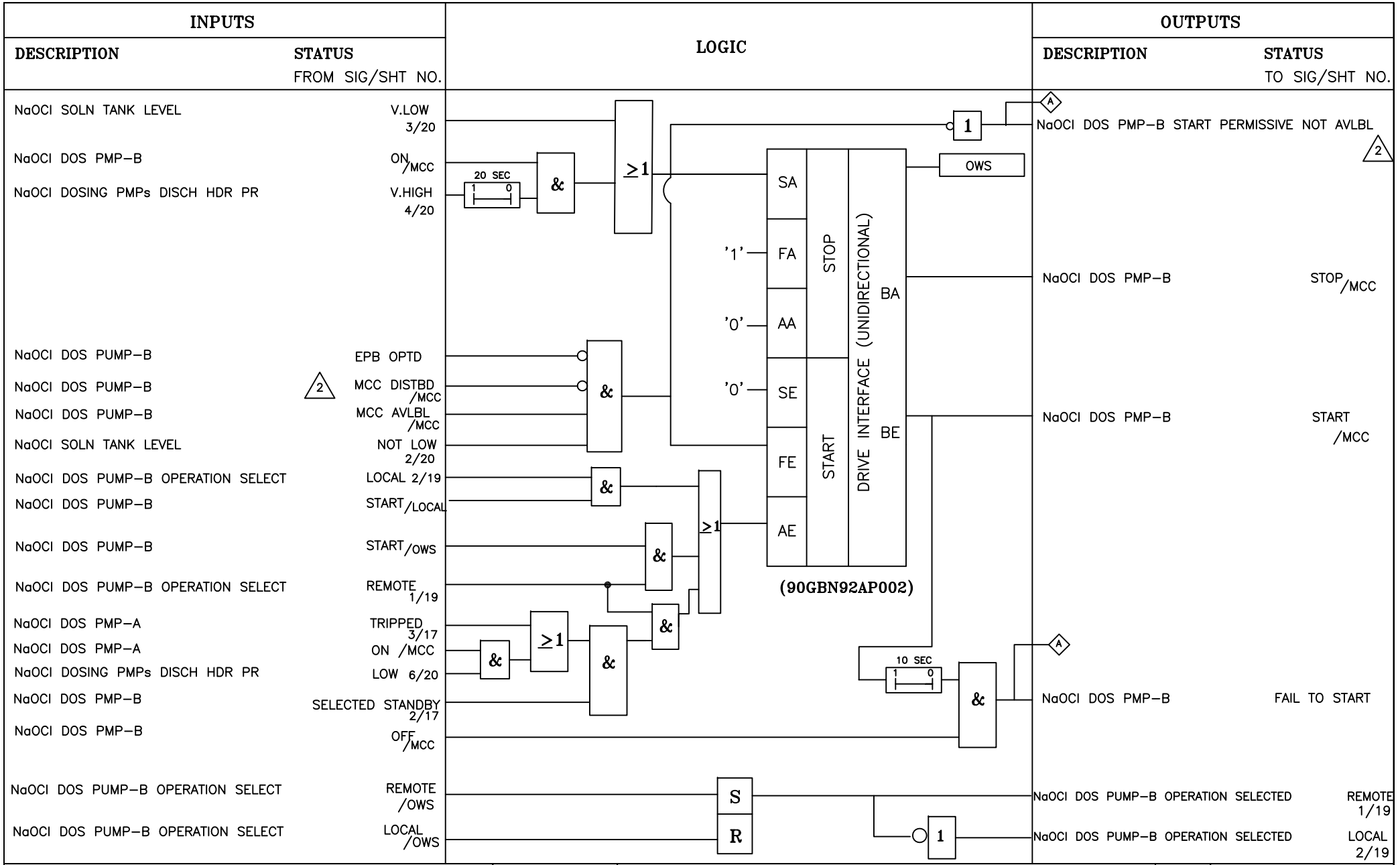
BHEL

ENNORE STPP (2X660 MW)

TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT

NaOCl DOS PMP–A

DRG. NO.	PE–V0–412–158–A058		
REV. NO.	02	DATE:	29.01.19
SHT	18 OF 47		

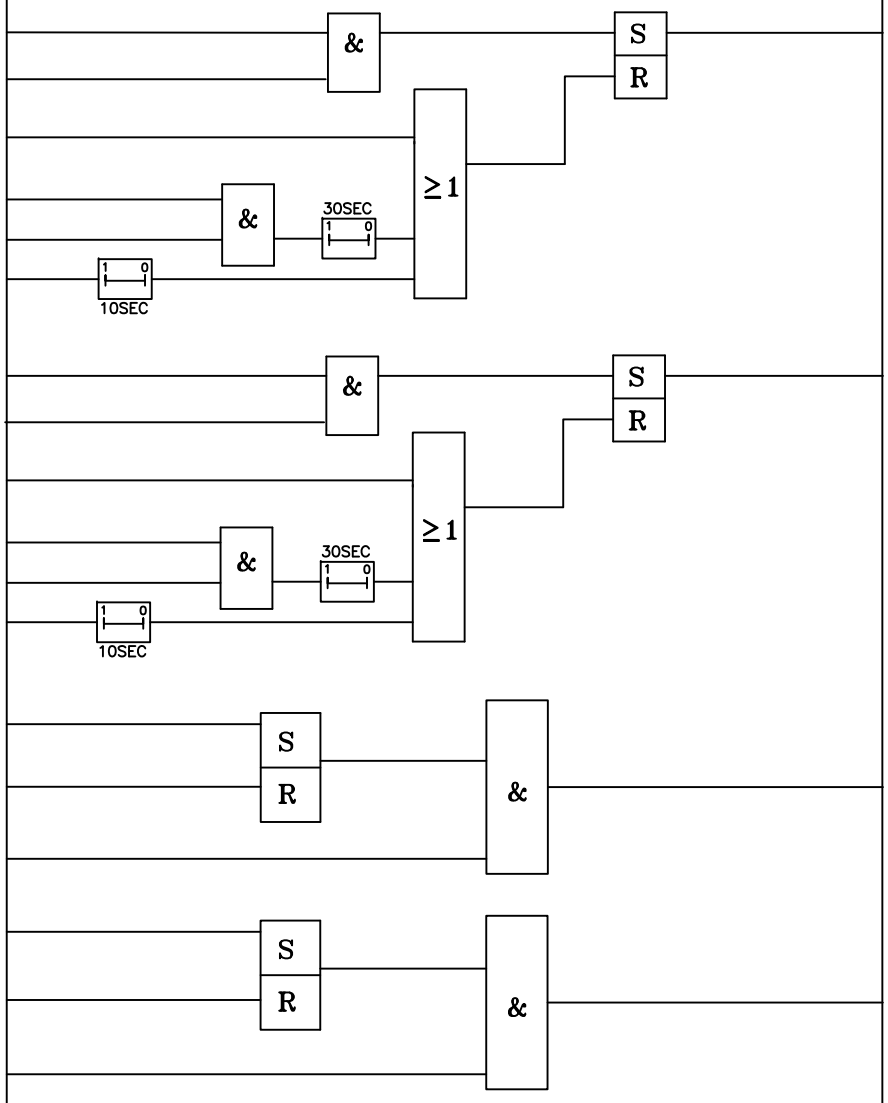


	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT NaOCl DOS PMP–B	REV. NO.	02 DATE: 29.01.19
			SHT	19 OF 47

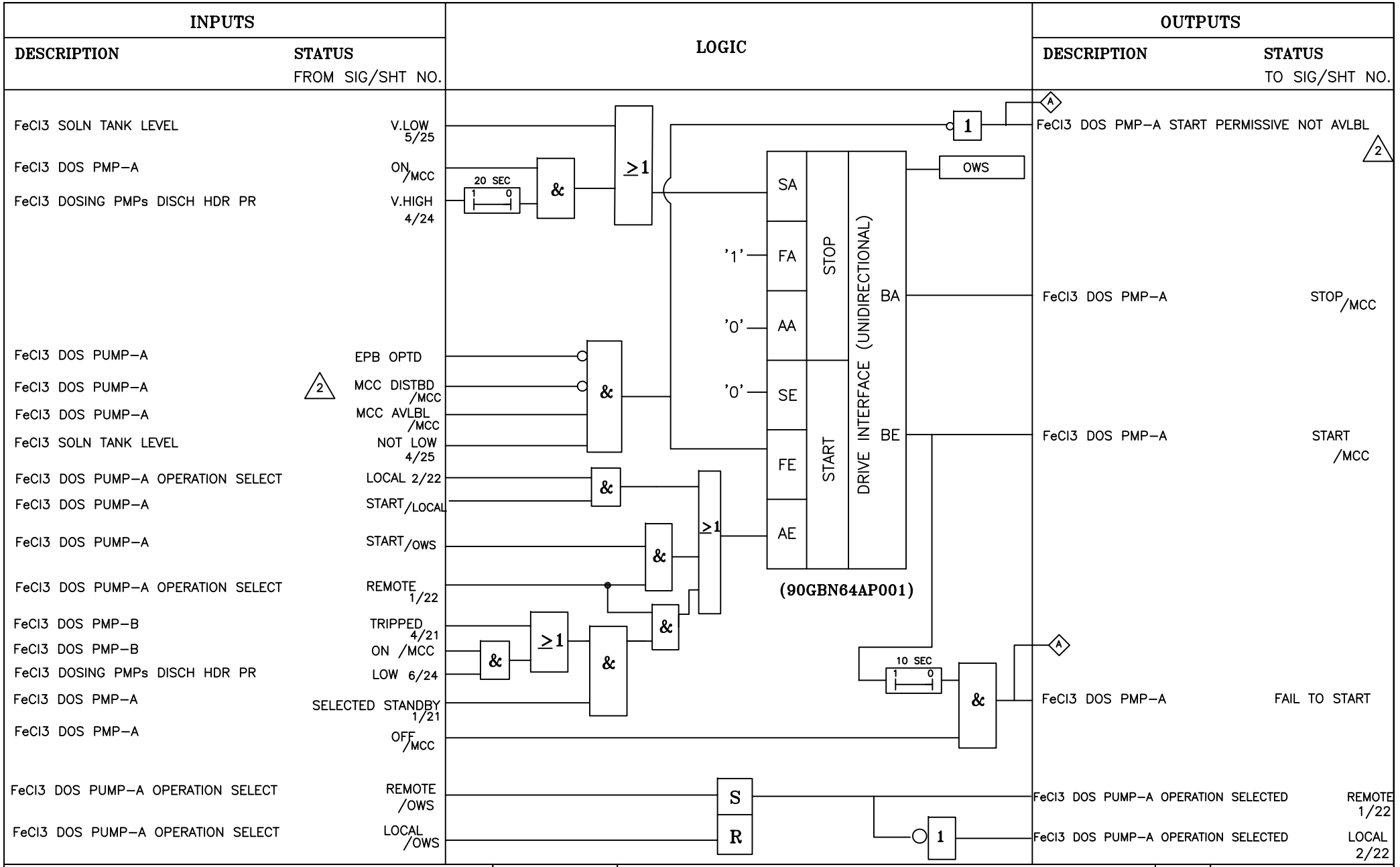
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	**STATUS** FROM SIG/SHT NO.		**DESCRIPTION**	**STATUS** TO SIG/SHT NO.
NaOCl SOLN TANK SELECTED	SELECTED /OWS	S R	NaOCl SOLN TANK SELECTED	1/20
NaOCl SOLN TANK SELECTED NaOCl SOLN TANK LEVEL	1/20 LOW 1/9	&	NaOCl SOLN TANK LVL	NOT LOW 2/18, 19
NaOCl SOLN TANK SELECTED NaOCl SOLN TANK LEVEL	1/20 V.LOW 2/9	≥1	NaOCl SOLN TANK LVL	V.LOW 3/18, 19
NaOCl DOS PMPs DISCH HDR PRESS 90GBN95CP001	/FIELD	LVM V.HIGH	NaOCl DOS PMP DISCH HDR PRESS	V.HIGH 4/18,19
		LVM HIGH	NaOCl DOS PMP DISCH HDR PRESS	HIGH
		LVM LOW	NaOCl DOS PMP DISCH HDR PRESS	LOW 6/18,19
		LVM VLOW	NaOCl DOS PMP DISCH HDR PRESS	V.LOW 7/18,19
NaOCl DOS PMP–A 90GBN92AP001 NaOCl DOS PMP–B 90GBN92AP002	ON /MCC ON /MCC	& &	NaOCl DOS A & B PMP's ON & DISCH HDR PR	LOW

	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT NaOCl DOSING MISC. LOGIC	REV. NO.	02	DATE: 29.01.19
		SHT	20 OF 47	

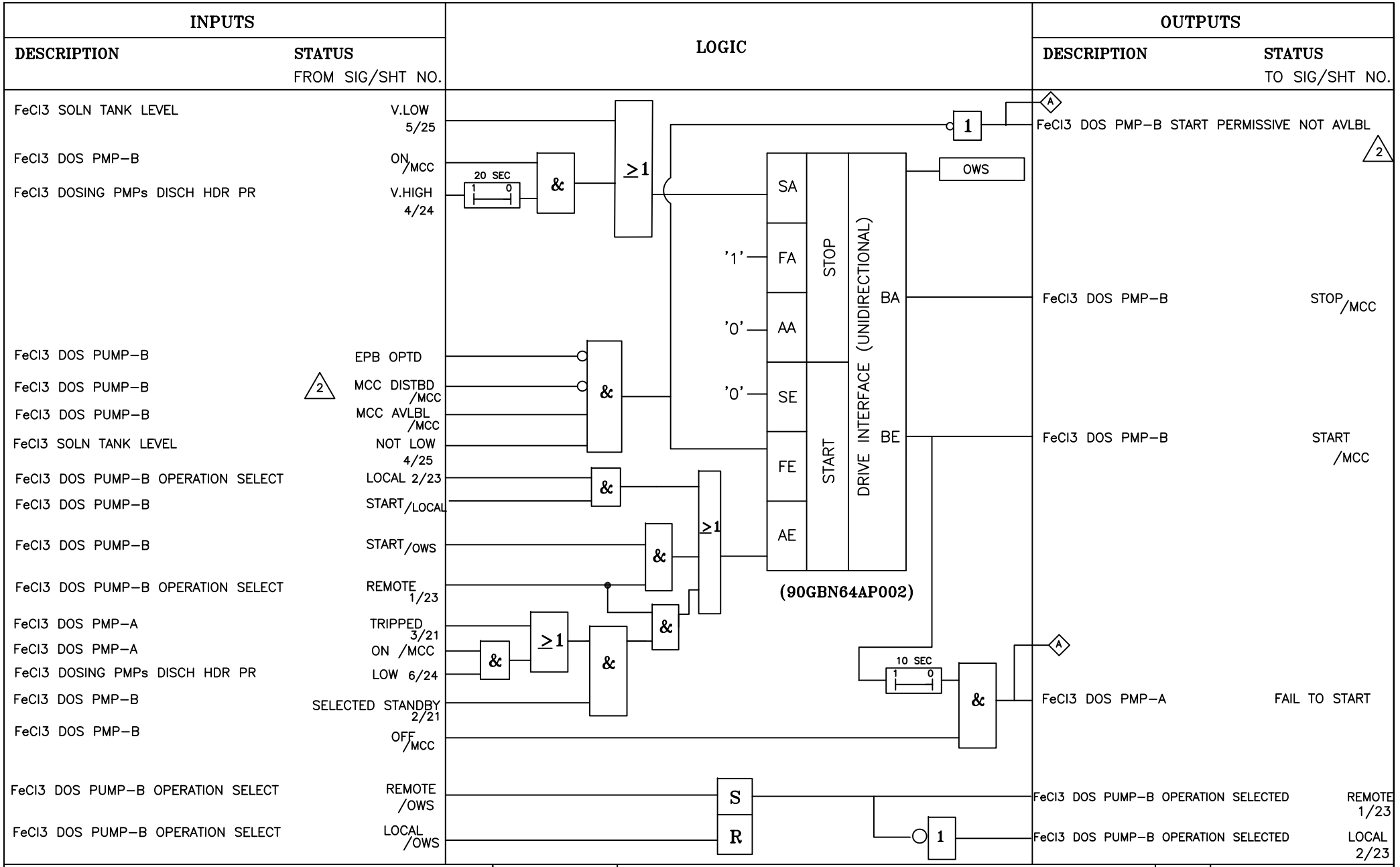
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
FeCl3 DOS PMP–A	STDBY /OWS		FeCl3 DOS PMP–A	SELECTED STAND BY 1/22
FeCl3 DOS PMP–B	ON /MCC			
FeCl3 DOS PMP–A	NOT STDBY /OWS			
FeCl3 DOS PMP–B	OFF /MCC			
FeCl3 DOS PMP–A	OFF /MCC			
FeCl3 DOS PMP–A	ON /MCC			
FeCl3 DOS PMP–B	STDBY /OWS		FeCl3 DOS PMP–B	SELECTED STAND BY 2/23
FeCl3 DOS PMP–A	ON /MCC			
FeCl3 DOS PMP–B	NOT STDBY /OWS			
FeCl3 DOS PMP–B	OFF /MCC			
FeCl3 DOS PMP–A	OFF /MCC			
FeCl3 DOS PMP–B	ON /MCC			
FeCl3 DOS PMP–A	ON /MCC		FeCl3 DOS PMP–A	TRIPPED 3/23
FeCl3 DOS PMP–A	STOP /OWS			
FeCl3 DOS PMP–A	OFF /MCC			
FeCl3 DOS PMP–B	ON /MCC		FeCl3 DOS PMP–B	TRIPPED 4/22
FeCl3 DOS PMP–B	STOP /OWS			
FeCl3 DOS PMP–B	OFF /MCC			



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT	REV. NO.	02	DATE: 29.01.19
		FeCl3 DOS PMPs STANDBY SELECTION LOGIC	SHT	21 OF 47	

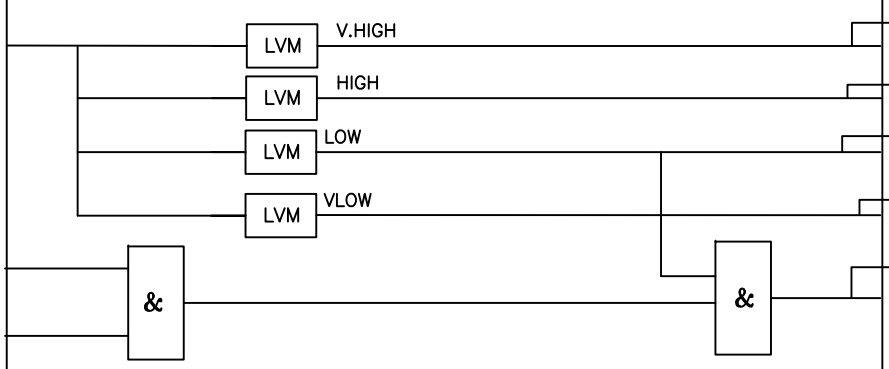


	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT FeCl3 DOS PMP–A	REV. NO.	02 DATE: 29.01.19
			SHT	22 OF 47



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT FeCl3 DOS PMP-B	REV. NO.	02 DATE: 29.01.19
			SHT	23 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
FeCl3 DOS PMPs DISCH HDR PRESS 90GBN65CP001	/FIELD			
FeCl3 DOS PMP–A 90GBN64AP001	ON /MCC			
FeCl3 DOS PMP–B 90GBN64AP002	ON /MCC			

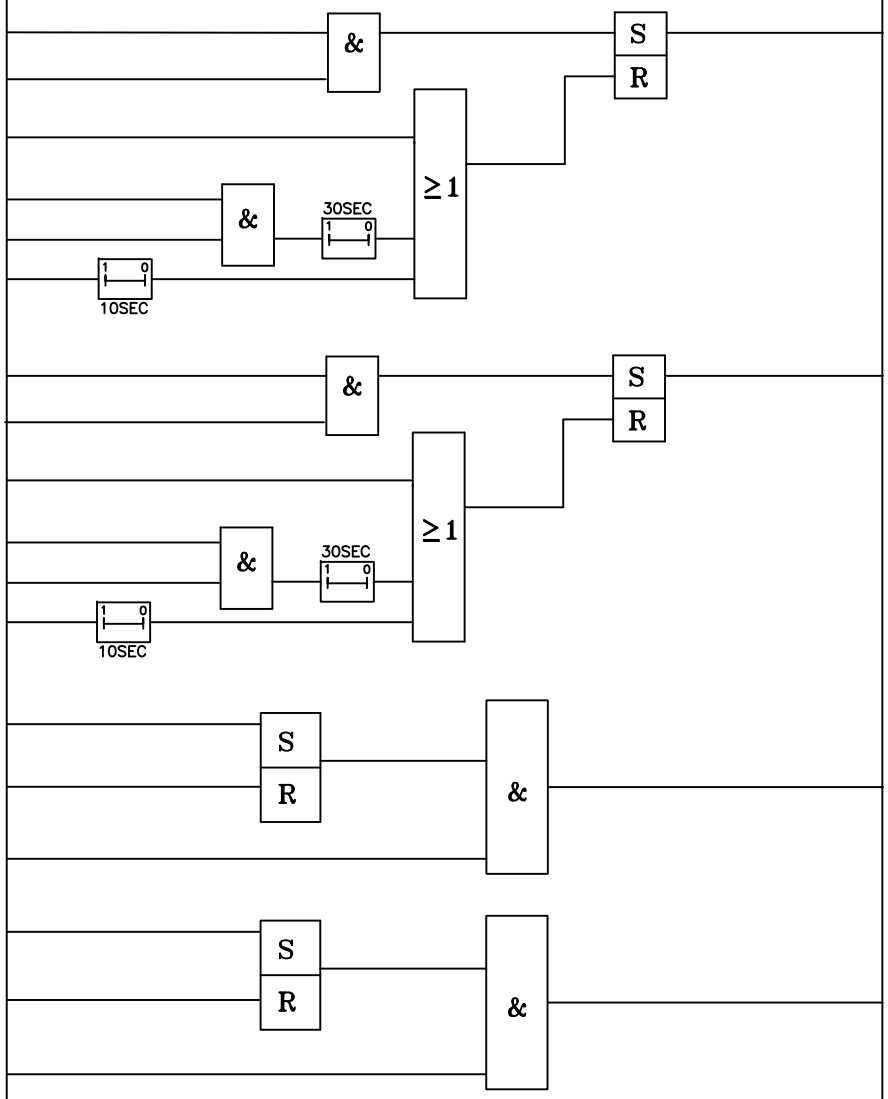


	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT FeCl3 DOS PMPs MISC. LOGIC	REV. NO.	02 DATE: 29.01.19
			SHT	24 OF 47

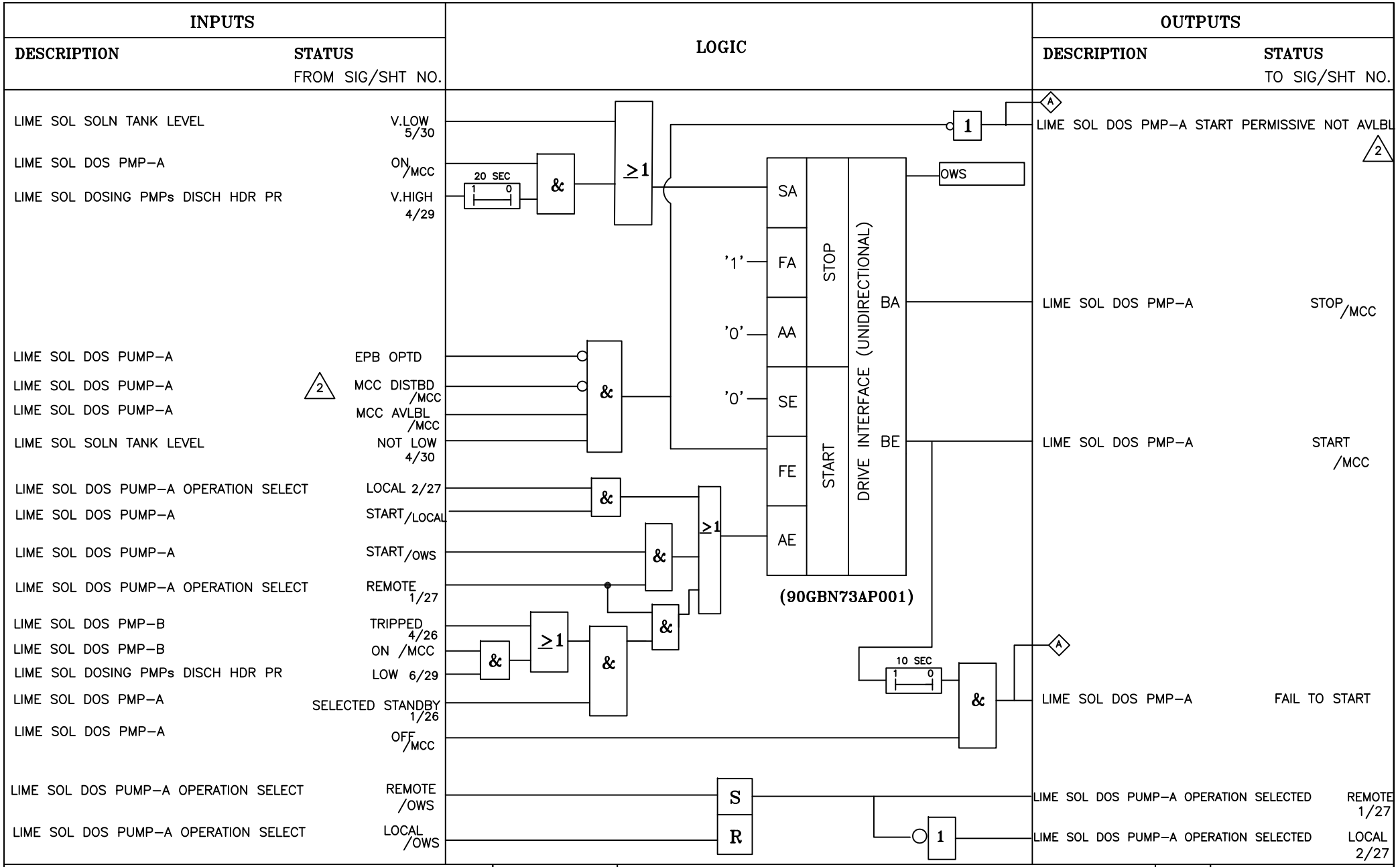
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	**STATUS** FROM SIG/SHT NO.		**DESCRIPTION**	**STATUS** TO SIG/SHT NO.
FeCl3 SOLN TANK–1 SELECTED	SELECTED /OWS	S R	FeCl3 SOLN TANK–1 SELECTED	1/25
FeCl3 SOLN TANK–2 SELECTED	SELECTED /OWS	S R	FeCl3 SOLN TANK–2 SELECTED	2/25
FeCl3 SOLN TANK–3 SELECTED	SELECTED /OWS	S R	FeCl3 SOLN TANK–3 SELECTED	3/25
FeCl3 SOLN TANK–1 SELECTED FeCl3 SOLN TANK–1 LEVEL	1/25 LOW 1/10	&		
FeCl3 SOLN TANK–2 SELECTED FeCl3 SOLN TANK–2 LEVEL	2/25 LOW 1/11	&	FeCl3 SOLN TANK LVL	NOT LOW 4/22,23
FeCl3 SOLN TANK–3 SELECTED FeCl3 SOLN TANK–3 LEVEL	3/25 LOW 1/12	& ≥1		
FeCl3 SOLN TANK–1 SELECTED FeCl3 SOLN TANK–1 LEVEL	1/25 V.LOW 2/10	≥1		
FeCl3 SOLN TANK–2 SELECTED FeCl3 SOLN TANK–2 LEVEL	2/25 V.LOW 2/11	≥1 &	FeCl3 SOLN TANK LVL	V.LOW 5/22,23
FeCl3 SOLN TANK–3 SELECTED FeCl3 SOLN TANK–3 LEVEL	3/25 V.LOW 2/12	≥1		

	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT FeCl3 DOS TANKs MISC. LOGIC	REV. NO.	02 DATE: 29.01.19
		SHT	25 OF 47

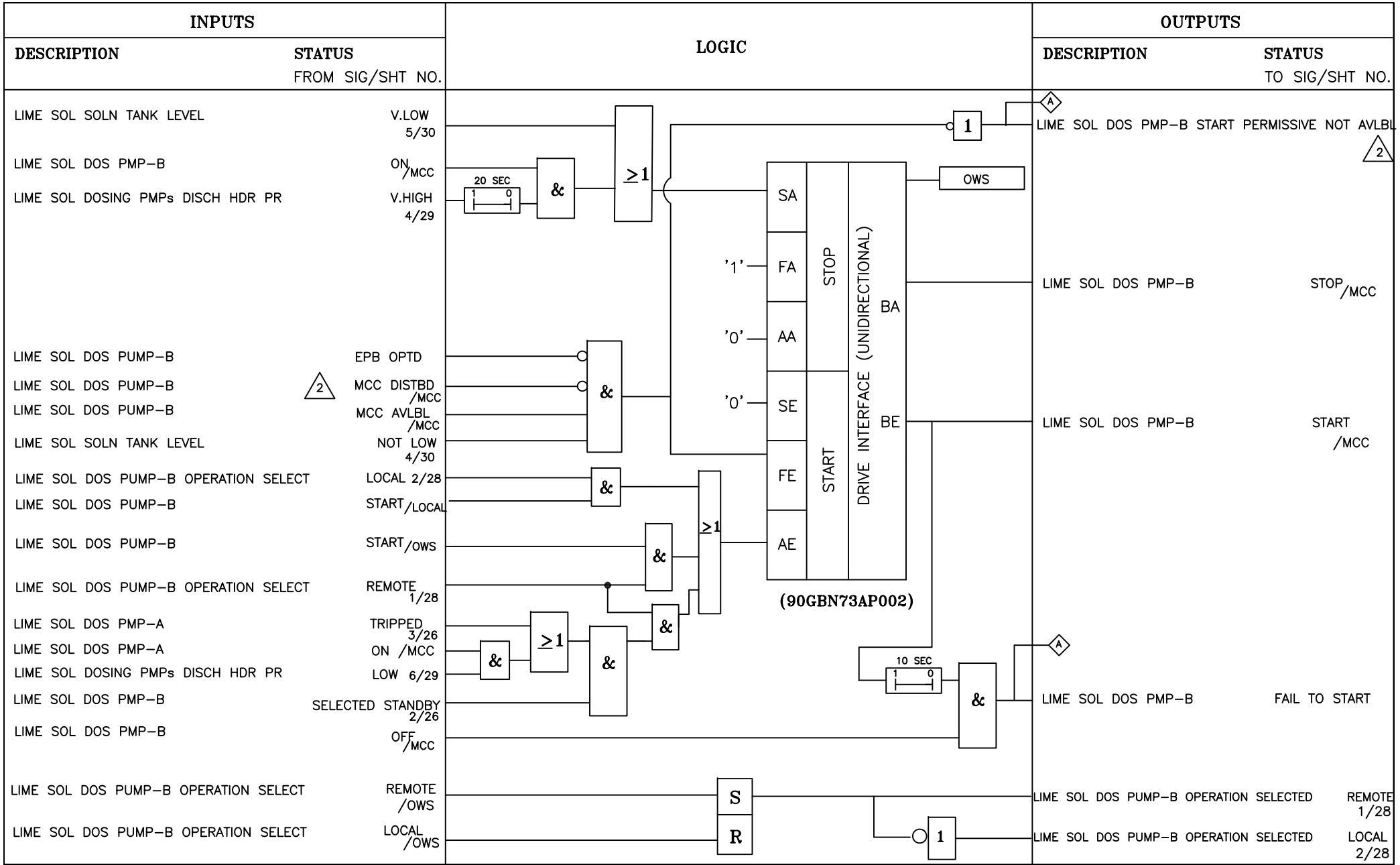
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
LIME SOL DOS PMP–A	STDBY /OWS		LIME SOL DOS PMP–A	SELECTED STAND BY 1/27
LIME SOL DOS PMP–B	ON /MCC			
LIME SOL DOS PMP–A	NOT STDBY /OWS			
LIME SOL DOS PMP–B	OFF /MCC			
LIME SOL DOS PMP–A	OFF /MCC			
LIME SOL DOS PMP–A	ON /MCC			
LIME SOL DOS PMP–B	STDBY /OWS		LIME SOL DOS PMP–B	SELECTED STAND BY 2/28
LIME SOL DOS PMP–A	ON /MCC			
LIME SOL DOS PMP–B	NOT STDBY /OWS			
LIME SOL DOS PMP–B	OFF /MCC			
LIME SOL DOS PMP–A	OFF /MCC			
LIME SOL DOS PMP–B	ON /MCC			
LIME SOL DOS PMP–A	ON /MCC		LIME SOL DOS PMP–A	TRIPPED 3/28
LIME SOL DOS PMP–A	STOP /OWS			
LIME SOL DOS PMP–A	OFF /MCC			
LIME SOL DOS PMP–B	ON /MCC		LIME SOL DOS PMP–B	TRIPPED 4/27
LIME SOL DOS PMP–B	STOP /OWS			
LIME SOL DOS PMP–B	OFF /MCC			



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT	REV. NO.	02 DATE: 29.01.19
		LIME SOL DOS PMPs STANDBY SELECTION LOGIC	SHT	26 OF 47



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT LIME SOL DOS PMP–A	REV. NO.	02 DATE: 29.01.19
			SHT	27 OF 47

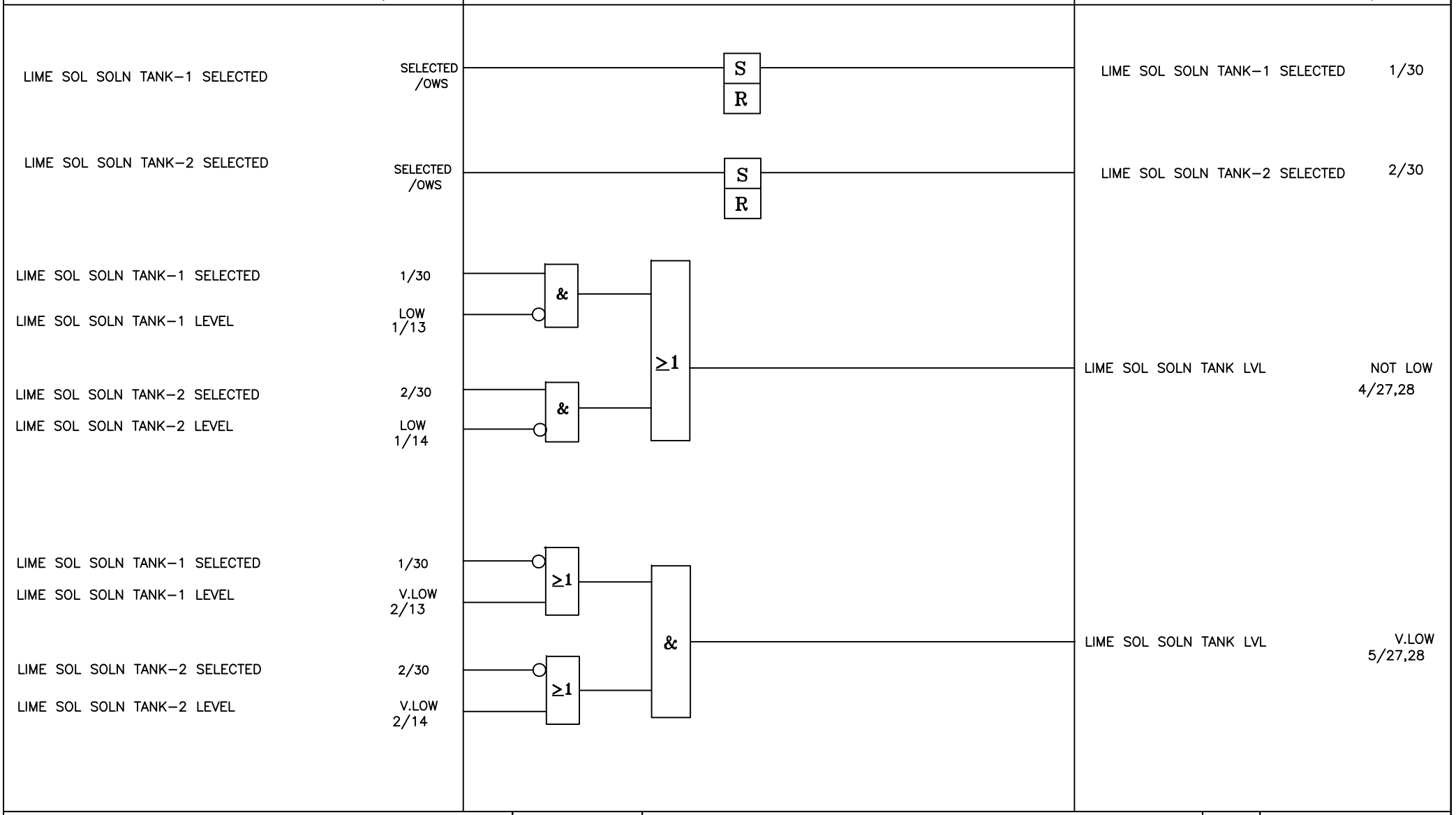


	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT LIME SOL DOS PMP–B	REV. NO.	02	DATE: 29.01.19
		SHT	28 OF 47	

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
LIME SOL DOS PMPs DISCH HDR PRESS 90GBN75CP001	/FIELD	LVM V.HIGH	LIME SOL DOS PMP DISCH HDR PRESS	V.HIGH 4/27,28
		LVM HIGH	LIME SOL DOS PMP DISCH HDR PRESS	HIGH
		LVM LOW	LIME SOL DOS PMP DISCH HDR PRESS	LOW 6/27,28
		LVM V.LOW	LIME SOL DOS PMP DISCH HDR PRESS	V.LOW 7/27,28
LIME SOL DOS PMP–A 90GBN73AP001	ON /MCC	& &	LIME SOL DOS A & B PMP's ON & DISCH HDR PR	LOW
LIME SOL DOS PMP–B 90GBN73AP002	ON /MCC			

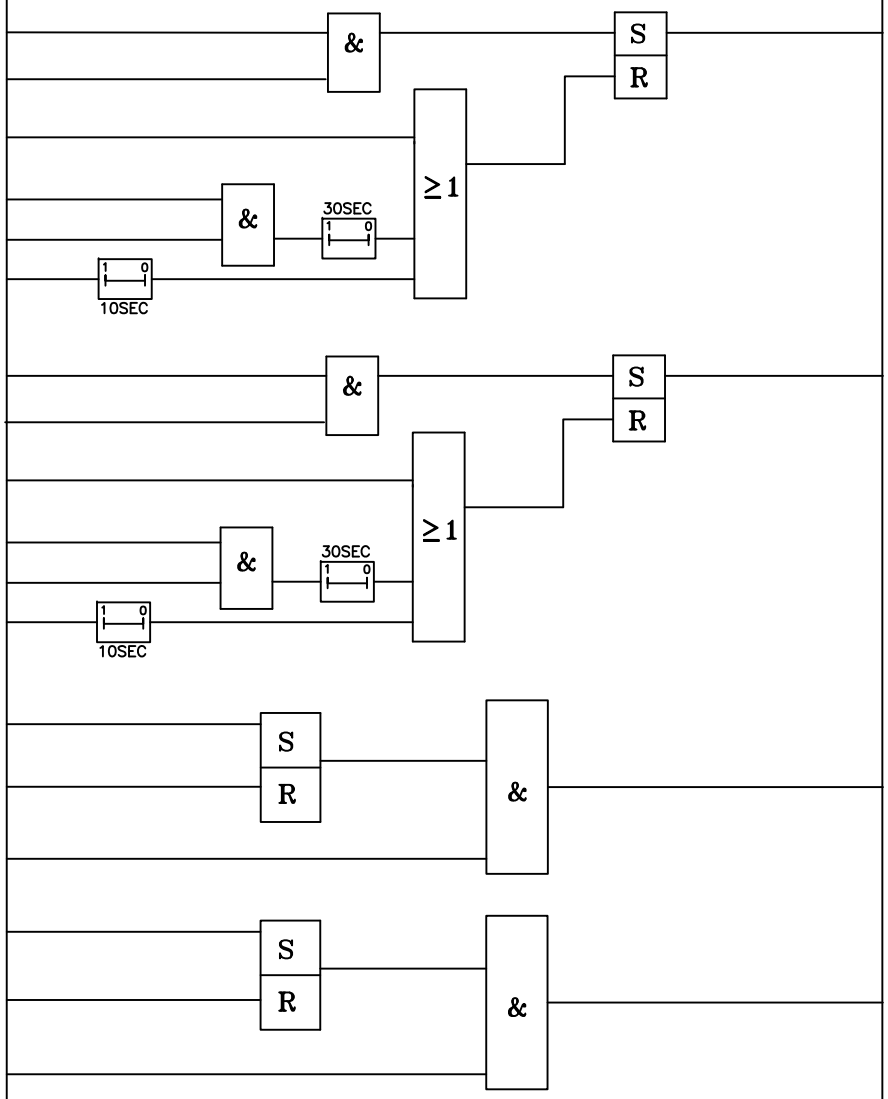
	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT LIME SOL DOS PMPs MISC. LOGIC	REV. NO.	02 DATE: 29.01.19
		SHT	29 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	**STATUS** FROM SIG/SHT NO.		**DESCRIPTION**	**STATUS** TO SIG/SHT NO.



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058	
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT LIME SOL DOS TANKs MISC. LOGIC	REV. NO.	02	DATE: 29.01.19
			SHT	30 OF 47	

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
POLY ELECTROLYTE DOS PMP–A	STDBY /OWS		POLYELECTROLYTE DOS PMP–A	SELECTED STAND BY 1/32
POLY ELECTROLYTE DOS PMP–B	ON /MCC			
POLY ELECTROLYTE DOS PMP–A	NOT STDBY /OWS			
POLY ELECTROLYTE DOS PMP–B	OFF /MCC			
POLY ELECTROLYTE DOS PMP–A	OFF /MCC			
POLY ELECTROLYTE DOS PMP–A	ON /MCC			
POLY ELECTROLYTE DOS PMP–B	STDBY /OWS		POLYELECTROLYTE DOS PMP–A	SELECTED STAND BY 2/33
POLY ELECTROLYTE DOS PMP–A	ON /MCC			
POLY ELECTROLYTE DOS PMP–B	NOT STDBY /OWS			
POLY ELECTROLYTE DOS PMP–B	OFF /MCC			
POLY ELECTROLYTE DOS PMP–A	OFF /MCC			
POLY ELECTROLYTE DOS PMP–B	ON /MCC			
POLY ELECTROLYTE DOS PMP–A	ON /MCC		POLY ELECTROLYTE DOS PMP–A	TRIPPED 3/33
POLY ELECTROLYTE DOS PMP–A	STOP /OWS			
POLY ELECTROLYTE DOS PMP–A	OFF /MCC			
POLY ELECTROLYTE DOS PMP–B	ON /MCC		POLY ELECTROLYTE DOS PMP–B	TRIPPED 4/32
POLY ELECTROLYTE DOS PMP–B	STOP /OWS			
POLY ELECTROLYTE DOS PMP–B	OFF /MCC			



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO. PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT POLY ELECTROLYTE DOS PMPs STANDBY SELECTION LOGIC	REV. NO. 02 DATE: 29.01.19 SHT 31 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
POLY ELECTROLYTE SOLN TANK LEVEL	V.LOW 5/35		POLY ELECTROLYTE DOS PMP–A START PERMISSIVE	A
POLY ELECTROLYTE DOS PMP–A	ON /MCC		NOT AVLBL	2
POLY ELECTROLYTE DOSING PMPs DISCH HDR PR	V.HIGH 4/34		OWS	
POLY ELECTROLYTE DOS PMP–A	EPB OPTD		POLY ELECTROLYTE DOS PMP–A	STOP /MCC
POLY ELECTROLYTE DOS PMP–A	2 MCC DISTBD /MCC			
POLY ELECTROLYTE DOS PMP–A	MCC AVLBL /MCC			
POLY ELECTROLYTE SOLN TANK LEVEL	NOT LOW 4/35		POLY ELECTROLYTE DOS PMP–A	START /MCC
POLY ELECTROLYTE DOS PMP–A OP. SELECT	LOCAL 2/32			
POLY ELECTROLYTE DOS PMP–A	START /LOCAL			
POLY ELECTROLYTE DOS PMP–A	START /OWS			
POLY ELECTROLYTE DOS PMP–A OP. SELECT	REMOTE 1/32			
POLY ELECTROLYTE DOS PMP–B	TRIPPED 4/31			
POLY ELECTROLYTE DOS PMP–B	ON /MCC			
POLY ELECTROLYTE DOSING PMPs DISCH HDR PR	LOW 6/34			
POLY ELECTROLYTE DOS PMP–A	SELECTED STANDBY 1/31		POLY ELECTROLYTE DOS PMP–A	FAIL TO START
POLY ELECTROLYTE DOS PMP–A	OFF /MCC			
POLY ELECTROLYTE DOS PUMP–A OPERATION SELECT	REMOTE /OWS		POLY ELECTROLYTE DOS PUMP–A OP. SELECTED	REMOTE 1/32
POLY ELECTROLYTE DOS PUMP–A OPERATION SELECT	LOCAL /OWS		POLY ELECTROLYTE DOS PUMP–A OP. SELECTED	LOCAL 2/32

20 SEC

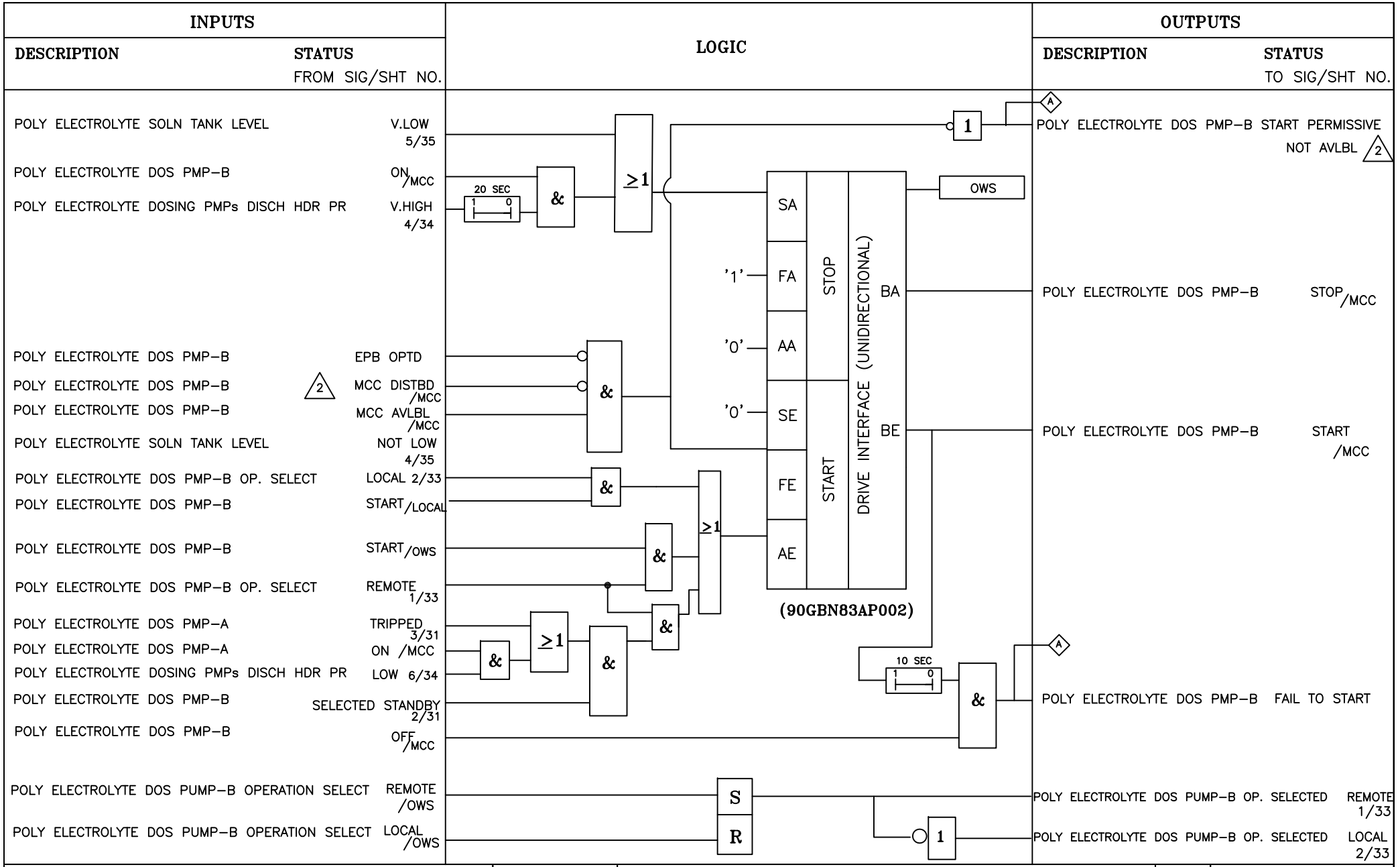
10 SEC

SA, FA, SE, FE, AE, BA, BE — STOP, START — DRIVE INTERFACE (UNIDIRECTIONAL)

'1' '0' '0'

(90GBN83AP001)

BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT POLY ELECTROLYTE DOS PMP–A	REV. NO.	02 DATE: 29.01.19
		SHT	32 OF 47



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT POLY ELECTROLYTE DOS PMP-B	REV. NO.	02 DATE: 29.01.19
			SHT	33 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
POLY ELECTROLYTE DOS PMPs DISCH HDR PRESS 90GBN85CP001	/FIELD	LVM V.HIGH	POLY ELECTROLYTE DOS PMP DISCH HDR PRESS	V.HIGH 4/32,33
		LVM HIGH	POLY ELECTROLYTE DOS PMP DISCH HDR PRESS	HIGH
		LVM LOW	POLY ELECTROLYTE DOS PMP DISCH HDR PRESS	LOW 6/32,33
		LVM VLOW	POLY ELECTROLYTE DOS PMP DISCH HDR PRESS	V.LOW 7/32,33
POLY ELECTROLYTE DOS PMP–A 90GBN83AP001	ON /MCC	&	POLY ELECTROLYTE DOS A & B PMP's ON & DISCH HDR PR	LOW
POLY ELECTROLYTE DOS PMP–B 90GBN83AP002	ON /MCC			

	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT POLY ELECTROLYTE DOS PMPs MISC. LOGIC	REV. NO.	02	DATE: 29.01.19
		SHT	34 OF 47	

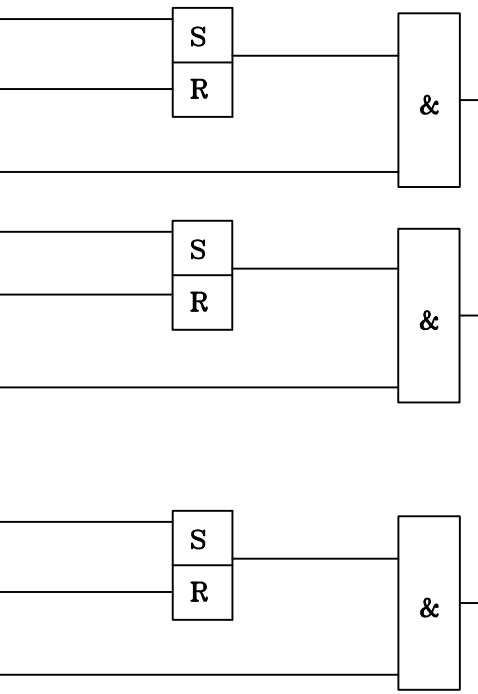
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
POLY ELECTROLYTE SOLN TANK-1 SELECTED	SELECTED /OWS	S R	POLY ELECTROLYTE SOLN TANK-1 SELECTED	1/35
POLY ELECTROLYTE SOLN TANK-2 SELECTED	SELECTED /OWS	S R	POLY ELECTROLYTE SOLN TANK-2 SELECTED	2/35
POLY ELECTROLYTE SOLN TANK-1 SELECTED POLY ELECTROLYTE SOLN TANK-1 LEVEL POLY ELECTROLYTE SOLN TANK-2 SELECTED POLY ELECTROLYTE SOLN TANK-2 LEVEL	1/35 LOW 1/15 2/35 LOW 1/16	&, &, ≥1	POLY ELECTROLYTE SOLN TANK LVL	NOT LOW 4/32, 33
POLY ELECTROLYTE SOLN TANK-1 SELECTED POLY ELECTROLYTE SOLN TANK-1 LEVEL POLY ELECTROLYTE SOLN TANK-2 SELECTED POLY ELECTROLYTE SOLN TANK-2 LEVEL	1/35 V.LOW 2/15 2/35 V.LOW 2/16	≥1, ≥1, &	POLY ELECTROLYTE SOLN TANK LVL	V.LOW 5/32, 33

	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT POLY ELECTROLYTE DOS TANKs MISC. LOGIC	REV. NO.	02 DATE: 29.01.19
			SHT	35 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
SLUDGE FEED PMP–A	STDBY /OWS		SLUDGE FEED PMP–A	SELECTED STAND BY 1/38
SLUDGE FEED PMP–B	ON/MCC			
SLUDGE FEED PMP–C	ON/MCC			
SLUDGE FEED PMP–A	NOT STDBY /OWS			
SLUDGE FEED PMP–B	OFF /MCC			
SLUDGE FEED PMP–A	OFF /MCC			
SLUDGE FEED PMP–C	OFF /MCC			
SLUDGE FEED PMP–A	ON /MCC			
SLUDGE FEED PMP–B	STDBY /OWS		SLUDGE FEED PMP–B	SELECTED STAND BY 2/39
SLUDGE FEED PMP–A	ON/MCC			
SLUDGE FEED PMP–C	ON/MCC			
SLUDGE FEED PMP–B	NOT STDBY /OWS			
SLUDGE FEED PMP–B	OFF /MCC			
SLUDGE FEED PMP–A	OFF /MCC			
SLUDGE FEED PMP–C	OFF /MCC			
SLUDGE FEED PMP–B	ON /MCC			
SLUDGE FEED PMP–C	STDBY /OWS		SLUDGE FEED PMP–C	SELECTED STAND BY 3/40
SLUDGE FEED PMP–B	ON/MCC			
SLUDGE FEED PMP–A	ON/MCC			
SLUDGE FEED PMP–C	NOT STDBY /OWS			
SLUDGE FEED PMP–B	OFF /MCC			
SLUDGE FEED PMP–A	OFF /MCC			
SLUDGE FEED PMP–C	OFF /MCC			
SLUDGE FEED PMP–C	ON /MCC			

	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMPs STANDBY SEL LOGIC	REV. NO.	02 DATE: 29.01.19
			SHT	36 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	**STATUS** FROM SIG/SHT NO.		**DESCRIPTION**	**STATUS** TO SIG/SHT NO.
SLUDGE FEED PMP–A	ON /MCC			
SLUDGE FEED PMP–A	STOP /OWS		SLUDGE FEED PMP–A	TRIPPED 1/39,40
SLUDGE FEED PMP–A	OFF /MCC			
SLUDGE FEED PMP–B	ON /MCC			
SLUDGE FEED PMP–B	STOP /OWS		SLUDGE FEED PMP–B	TRIPPED 2/38,40
SLUDGE FEED PMP–B	OFF /MCC			
SLUDGE FEED PMP–C	ON /MCC			
SLUDGE FEED PMP–C	STOP /OWS		SLUDGE FEED PMP–C	TRIPPED 3/38,39
SLUDGE FEED PMP–C	OFF /MCC			



	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMPs TRIP LOGIC	REV. NO.	02 DATE: 29.01.19
		SHT	37 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
SLUDGE PIT TANK LEVEL	LOW 4/44		SLUDGE FEED PMP–A START PERMISSIVE NOT AVLBL	A, 2
SLUDGE FEED PMP–A	ON /MCC			
SLUDGE FEEDING PMPs DISCH HDR PR	V.HIGH 5/44			
SLUDGE FEED PMP–A	ON /MCC			
SLUDGE FEED PMP–A DISCH VLV	OPENED			
SLUDGE FEED PMP–A	EPB OPTD		SLUDGE FEED PMP–A	STOP /MCC
SLUDGE FEED PMP–A	MCC DISTBD /MCC			
SLUDGE FEED PMP–A	MCC AVLBL /MCC			
SLUDGE FEED SOLN TANK LEVEL	NOT LOW 2/44			
SLUDGE FEED PUMP–A OP. SELECT	LOCAL 2/38		SLUDGE FEED PMP–A	START /MCC
SLUDGE FEED PUMP–A	START /LOCAL			
SLUDGE FEED PUMP–A	START /OWS			
SLUDGE FEED PUMP–A OP. SELECT	REMOTE 1/38			
SLUDGE FEED PMP–B	TRIPPED 2/37			
SLUDGE FEED PMP–C	TRIPPED 3/37			
SLUDGE FEEDING PMPs DISCH HDR PR	LOW 6/44			
SLUDGE FEED PMP–A	SELECTED STANDBY 1/36		SLUDGE FEED PMP–A	FAIL TO START
SLUDGE FEED PMP–A	OFF /MCC			
SLUDGE FEED PUMP–A OPERATION SELECT	REMOTE /OWS		SLUDGE FEED PUMP–A OP. SELECTED	REMOTE 1/38
SLUDGE FEED PUMP–A OPERATION SELECT	LOCAL /OWS		SLUDGE FEED PUMP–A OP. SELECTED	LOCAL 2/38

(90GBS41AP001)

	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
TITLE :–	CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMP–A	REV. NO.	02 DATE: 29.01.19
		SHT	38 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
SLUDGE PIT TANK LEVEL	LOW 4/44		SLUDGE FEED PMP–B START PERMISSIVE NOT AVLBL	A, 2
SLUDGE FEED PMP–B	ON /MCC			
SLUDGE FEEDING PMPs DISCH HDR PR	V.HIGH 5/44			
SLUDGE FEED PMP–B	ON /MCC			
SLUDGE FEED PMP–B DISCH VLV	OPENED			
SLUDGE FEED PMP–B	EPB OPTD		SLUDGE FEED PMP–B	STOP /MCC
SLUDGE FEED PMP–B	MCC DISTBD /MCC			
SLUDGE FEED PMP–B	MCC AVLBL /MCC			
SLUDGE FEED SOLN TANK LEVEL	NOT LOW 2/44			
SLUDGE FEED PUMP–B OP. SELECT	LOCAL 2/39		SLUDGE FEED PMP–B	START /MCC
SLUDGE FEED PUMP–B	START /LOCAL			
SLUDGE FEED PUMP–B	START /OWS			
SLUDGE FEED PUMP–B OP. SELECT	REMOTE 1/39			
SLUDGE FEED PMP–A	TRIPPED 1/37			
SLUDGE FEED PMP–C	TRIPPED 3/37			
SLUDGE FEEDING PMPs DISCH HDR PR	LOW 6/44			
SLUDGE FEED PMP–B	SELECTED STANDBY 2/36		SLUDGE FEED PMP–B	FAIL TO START
SLUDGE FEED PMP–B	OFF /MCC			
SLUDGE FEED PUMP–B OPERATION SELECT	REMOTE /OWS		SLUDGE FEED PUMP–B OP. SELECTED	REMOTE 1/39
SLUDGE FEED PUMP–B OPERATION SELECT	LOCAL /OWS		SLUDGE FEED PUMP–B OP. SELECTED	LOCAL 2/39

20 SEC, 30 SEC, 10 SEC

SA, FA, AA, SE, FE, AE, BA, BE

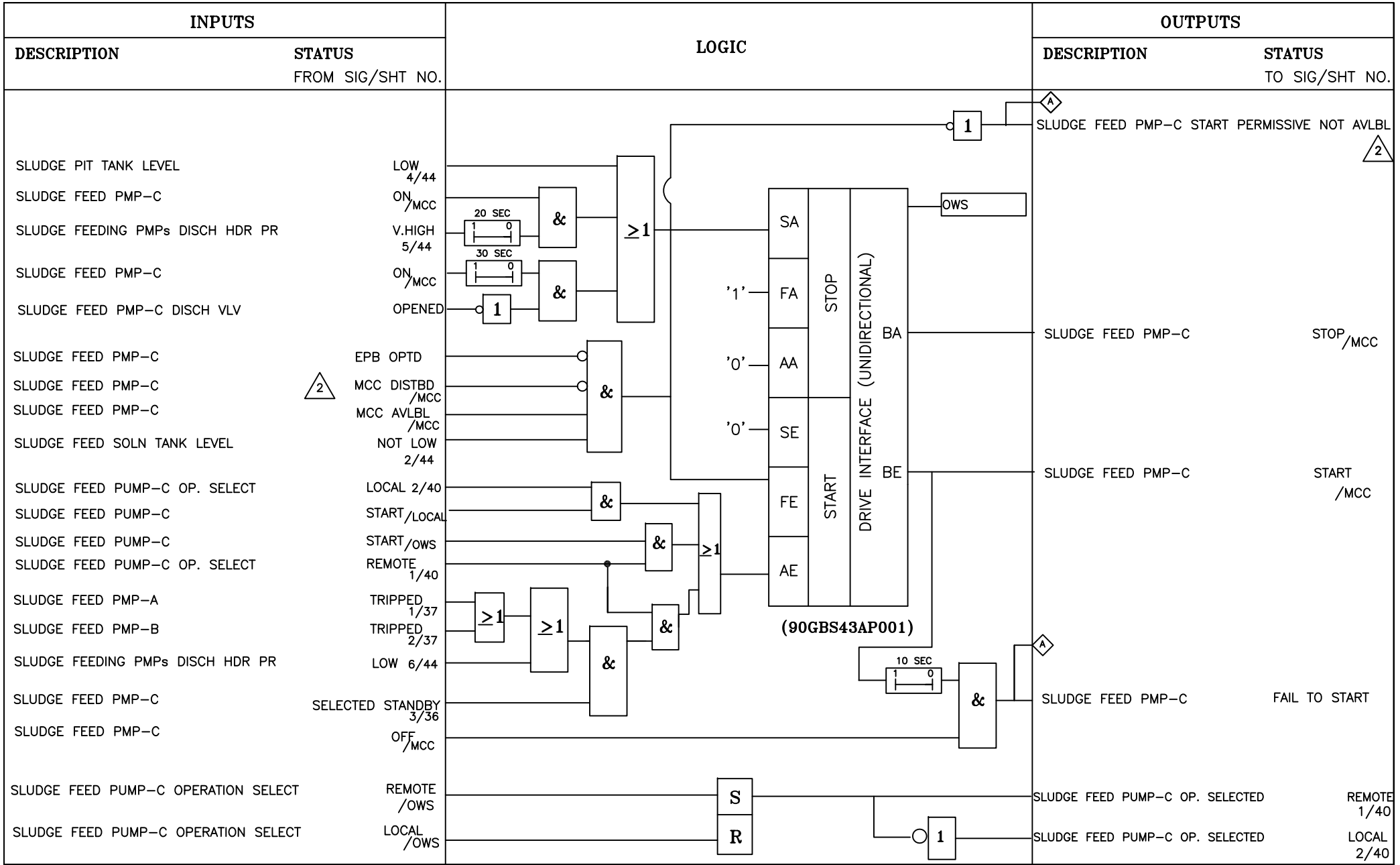
'1', '0', '0'

STOP, START, DRIVE INTERFACE (UNIDIRECTIONAL)

OWS

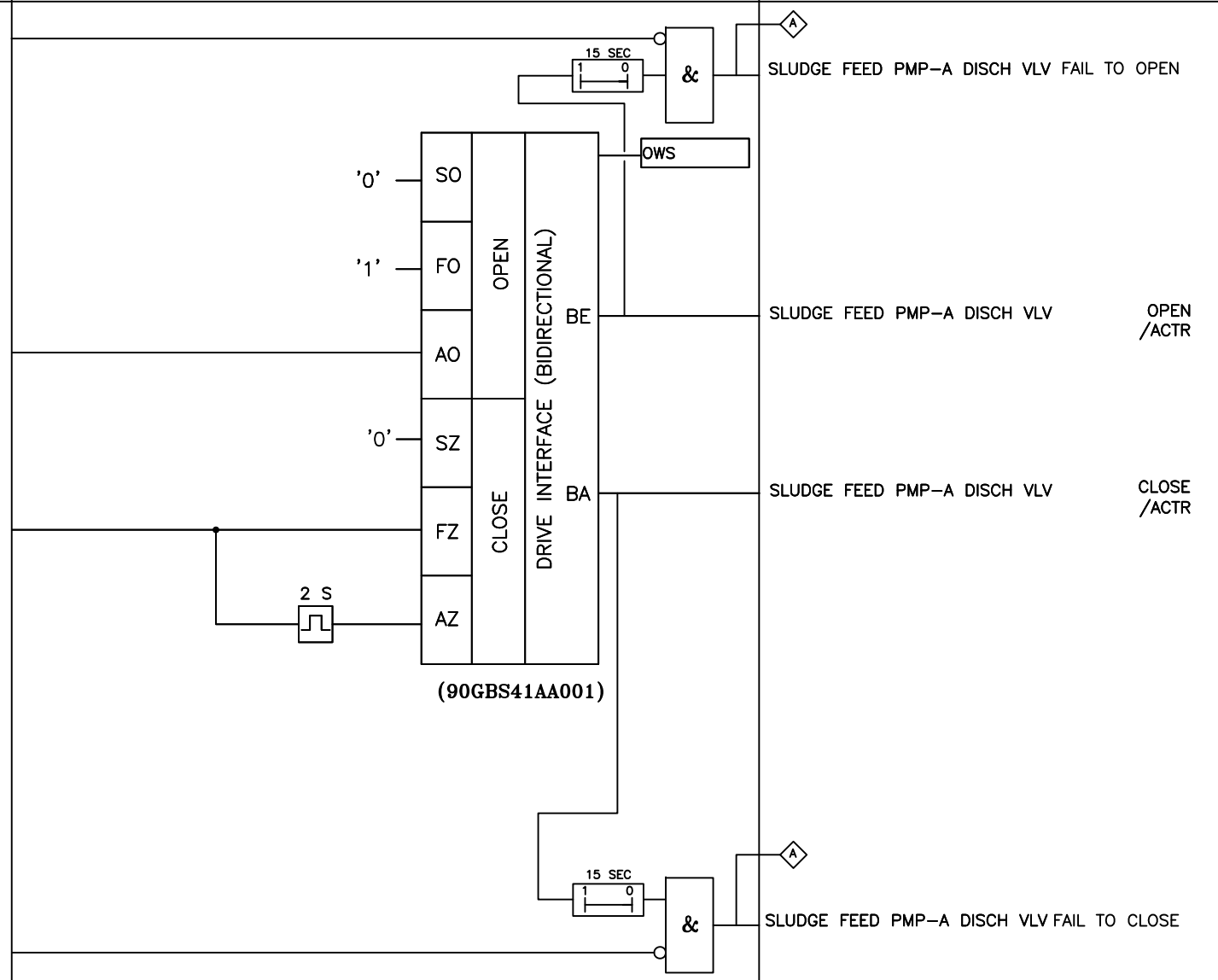
(90GBS42AP001)

	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMP–B	REV. NO.	02 DATE: 29.01.19
		SHT	39 OF 47



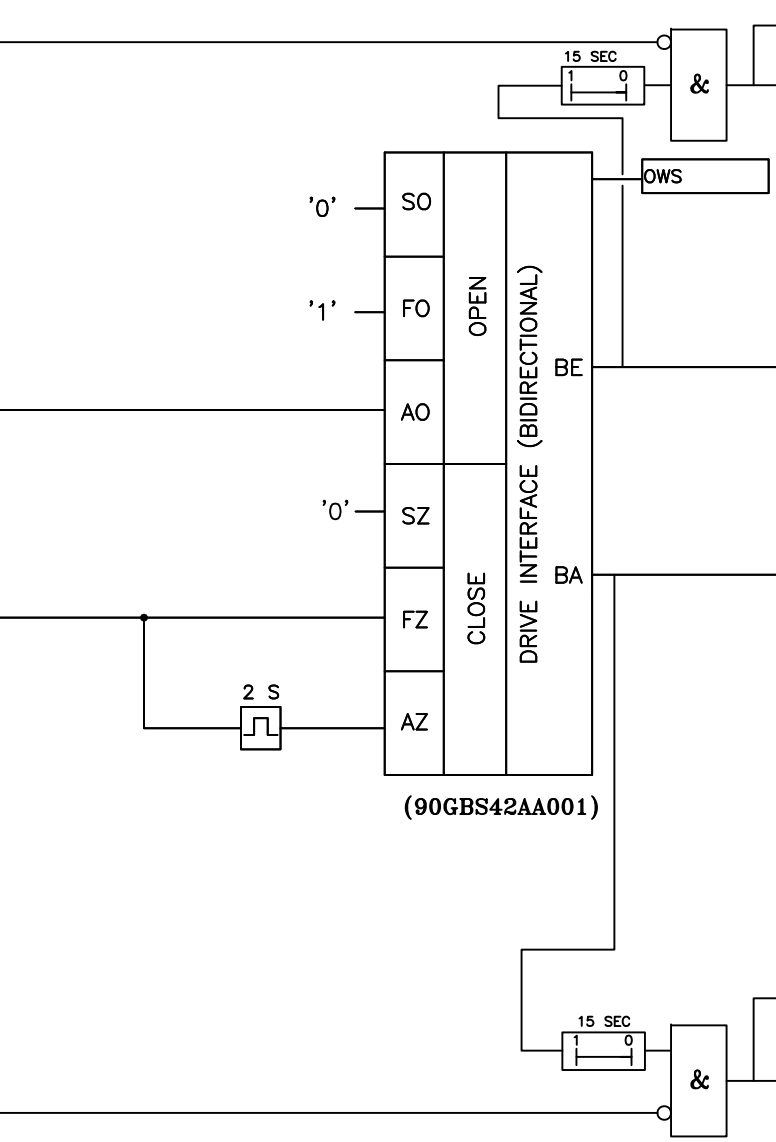
	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE-V0-412-158-A058
		TITLE :- CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMP-C	REV. NO.	02 DATE: 29.01.19
			SHT	40 OF 47

INPUTS		OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.	DESCRIPTION	STATUS TO SIG/SHT NO.
SLUDGE FEED PMP–A DISCH VLV	OPEN /ACTR	SLUDGE FEED PMP–A DISCH VLV FAIL TO OPEN	A
SLUDGE FEED PMP–A	ON /MCC	SLUDGE FEED PMP–A DISCH VLV	OPEN /ACTR
SLUDGE FEED PMP–A	OFF /MCC	SLUDGE FEED PMP–A DISCH VLV	CLOSE /ACTR
SLUDGE FEED PMP–A DISCH VLV	CLOSE /ACTR	SLUDGE FEED PMP–A DISCH VLV FAIL TO CLOSE	A



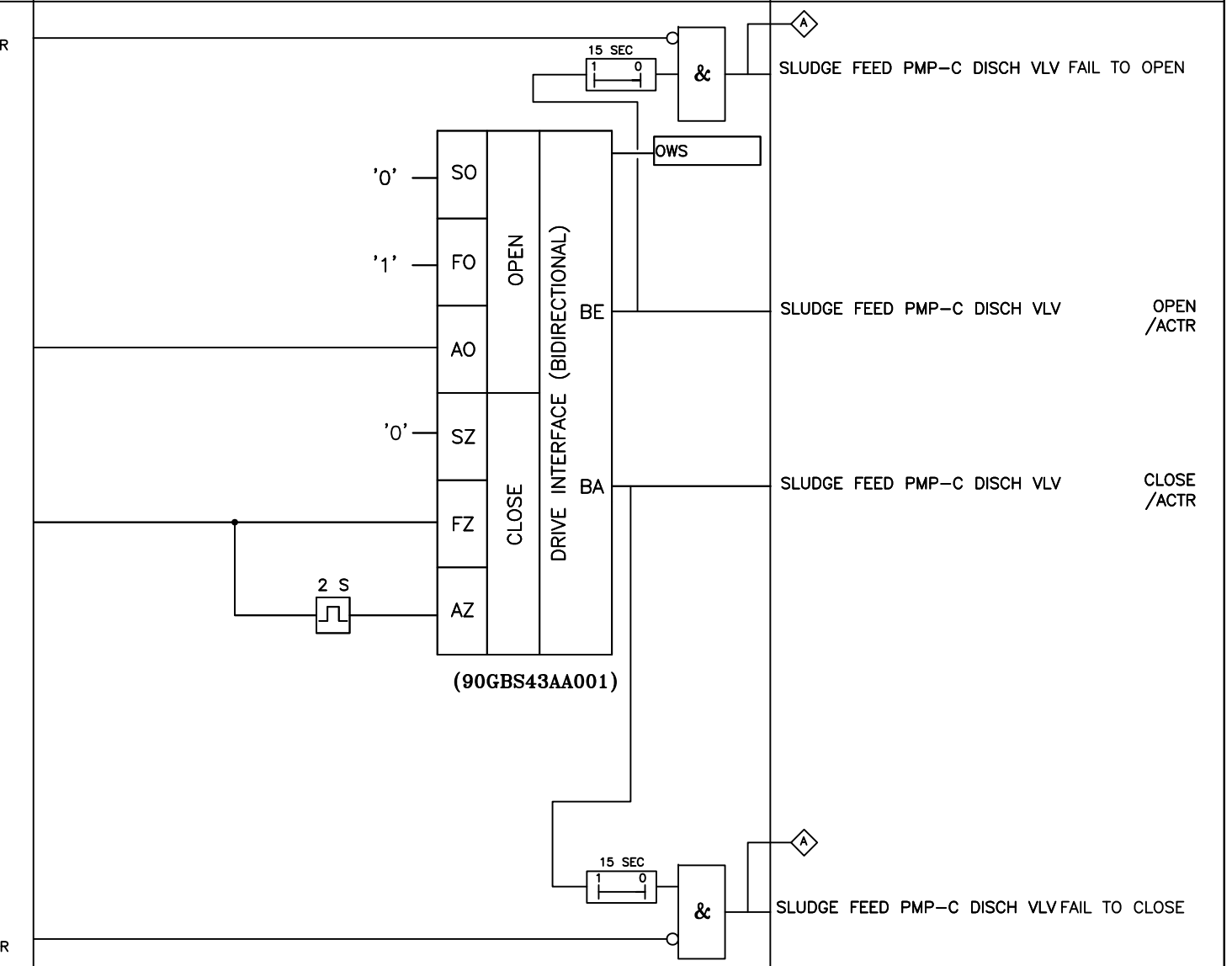
	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMP–A DISCH VLV	REV. NO.	02 DATE: 29.01.19
			SHT	41 OF 47

INPUTS		OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.	DESCRIPTION	STATUS TO SIG/SHT NO.
SLUDGE FEED PMP–B DISCH VLV	OPEN /ACTR	SLUDGE FEED PMP–B DISCH VLV FAIL TO OPEN	A
SLUDGE FEED PMP–B 90GBS42AP001	ON /MCC	SLUDGE FEED PMP–B DISCH VLV	OPEN /ACTR
SLUDGE FEED PMP–B 90GBS42AP001	OFF /MCC	SLUDGE FEED PMP–B DISCH VLV	CLOSE /ACTR
SLUDGE FEED PMP–B DISCH VLV	CLOSE /ACTR	SLUDGE FEED PMP–B DISCH VLV FAIL TO CLOSE	A

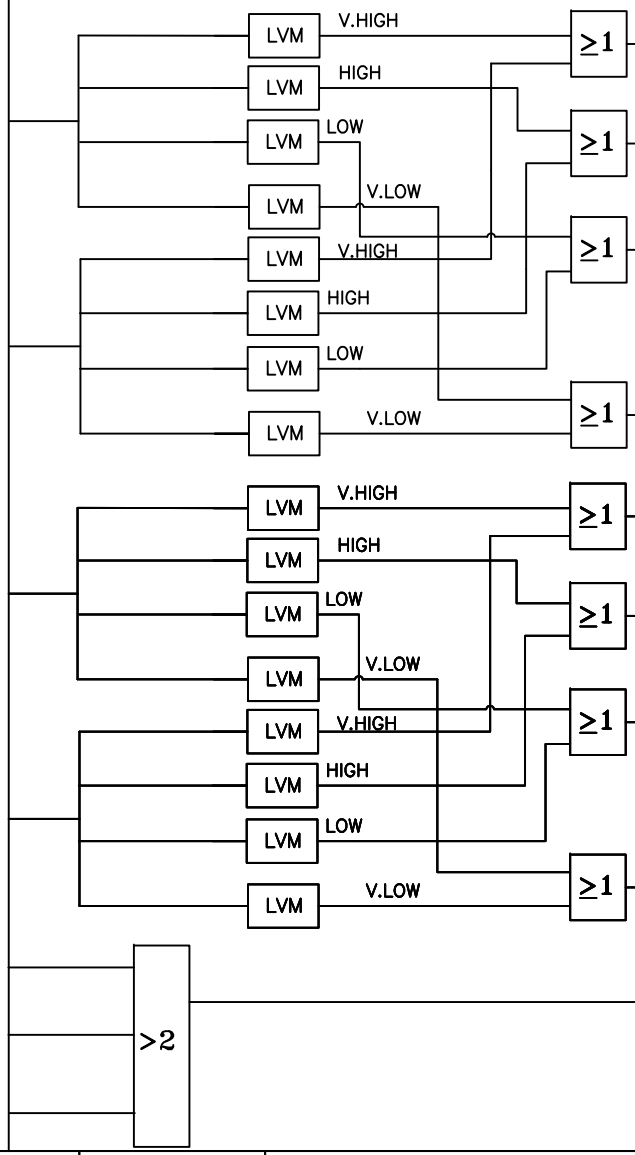


	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMP–B DISCH VLV	REV. NO.	02 DATE: 29.01.19
			SHT	42 OF 47

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
SLUDGE FEED PMP–C DISCH VLV	OPEN /ACTR		SLUDGE FEED PMP–C DISCH VLV FAIL TO OPEN	
SLUDGE FEED PMP–C	ON /MCC		SLUDGE FEED PMP–C DISCH VLV	OPEN /ACTR
SLUDGE FEED PMP–C	OFF /MCC		SLUDGE FEED PMP–C DISCH VLV	CLOSE /ACTR
SLUDGE FEED PMP–C DISCH VLV	CLOSE /ACTR		SLUDGE FEED PMP–C DISCH VLV FAIL TO CLOSE	

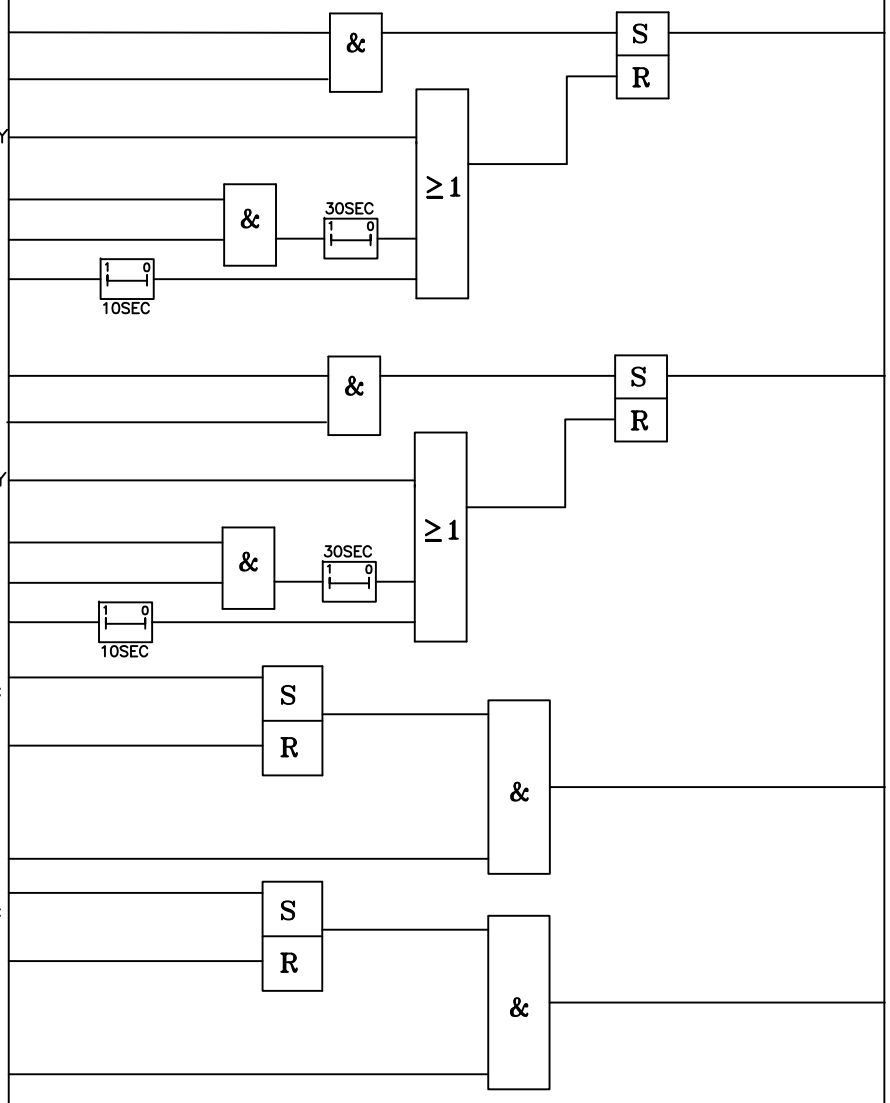


	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PMP–C DISCH VLV	REV. NO.	02	DATE: 29.01.19
			SHT	43 OF 47	

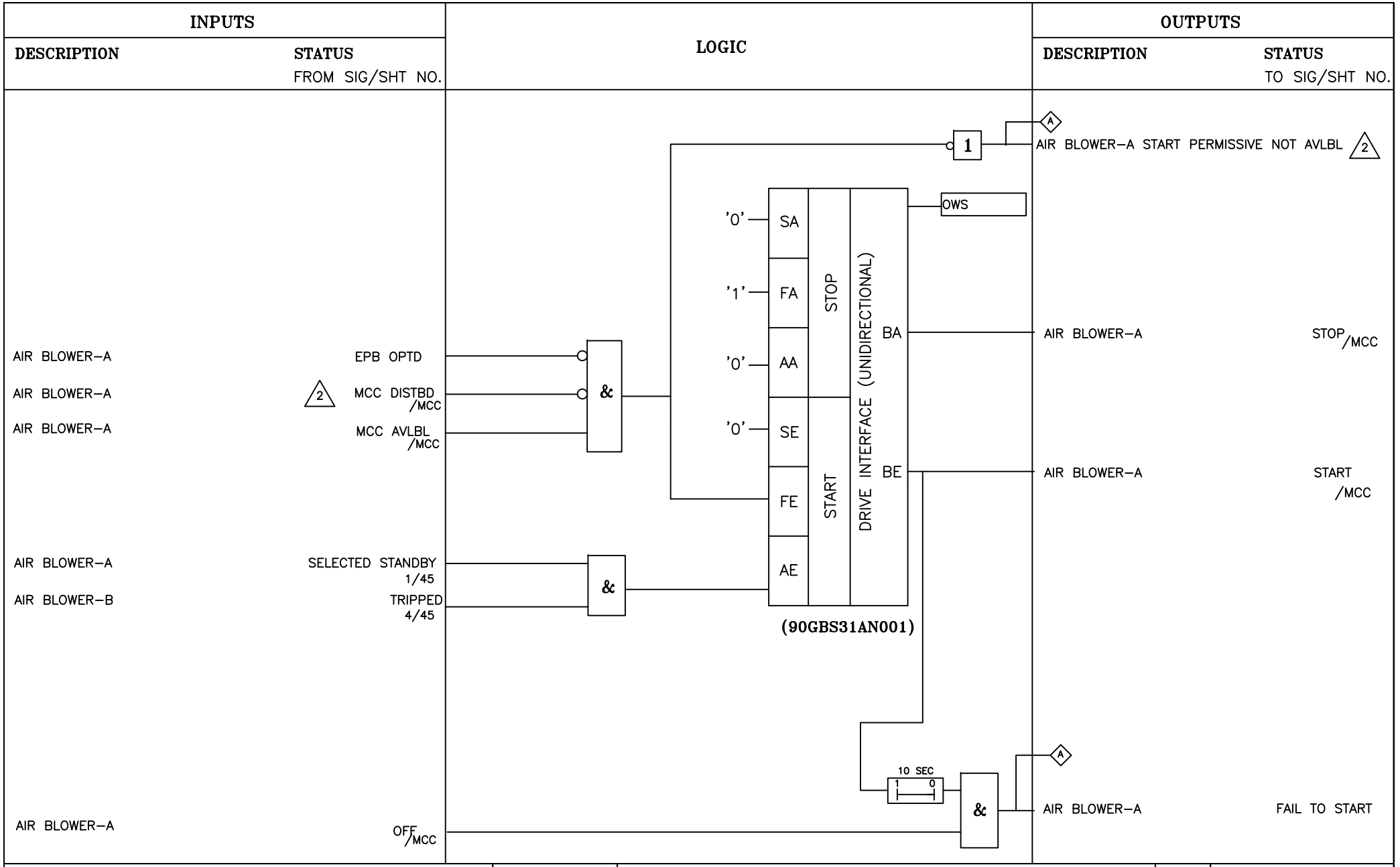
INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	**STATUS** FROM SIG/SHT NO.		**DESCRIPTION**	**STATUS** TO SIG/SHT NO.
SLUDGE PIT SUMP LEVEL 90GBS50CL001	/FIELD		SLUDGE PIT SUMP LEVEL	V,HIGH 4/38,39,40
			SLUDGE PIT SUMP LEVEL	HIGH 1/38,39,40
			SLUDGE PIT SUMP LEVEL	LOW 2/38,39,40
SLUDGE PIT SUMP LEVEL 90GBS50CL002	/FIELD		SLUDGE PIT SUMP LEVEL	V.LOW 3/38,39,40
SLUDGE FEED PMPs DISCH HDR PRESS 90GBS45CP001	/FIELD		SLUDGE FEED PMP DISCH HDR PRESS	V.HIGH 5/38,39,40
			SLUDGE FEED PMP DISCH HDR PRESS	HIGH
SLUDGE FEED PMPs DISCH HDR PRESS 90GBS45CP002	/FIELD		SLUDGE FEED PMP DISCH HDR PRESS	LOW 6/38,39,40
			SLUDGE FEED PMP DISCH HDR PRESS	V.LOW
SLUDGE FEED PMP–A	ON /MCC		SLUDGE FEED PMP ON & DISCH HDR PR	LOW
SLUDGE FEED PMP–B	ON /MCC			
SLUDGE FEED PMP–C	ON /MCC			

	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
TITLE :–	CONTROL LOGIC SCHEME FOR PT PLANT SLUDGE FEED PUMPS MISCELLANEOUS LOGIC	REV. NO.	02	DATE: 29.01.19
		SHT	44 OF 47	

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.
AIR BLWR–A	SELECT STDBY /OWS		AIR BLWR–A	STAND BY 1/46
AIR BLWR–B	ON /MCC			
AIR BLWR–A	DESELECT STDBY /OWS			
AIR BLWR–B	OFF /MCC			
AIR BLWR–A	OFF /MCC			
AIR BLWR–A	ON /MCC			
AIR BLWR–B	SELECT STDBY /OWS		AIR BLWR–B	STAND BY 2/47
AIR BLWR–A	ON /MCC			
AIR BLWR–B	DESELECT STDBY /OWS			
AIR BLWR–B	OFF /MCC			
AIR BLWR–A	OFF /MCC			
AIR BLWR–B	ON /MCC			
AIR BLWR–A	ON /MCC		AIR BLWR–A	TRIPPED 3/47
AIR BLWR–A	STOP /OWS			
AIR BLWR–A	OFF /MCC			
AIR BLWR–B	ON /MCC		AIR BLWR–B	TRIPPED 4/46
AIR BLWR–B	STOP /OWS			
AIR BLWR–B	OFF /MCC			

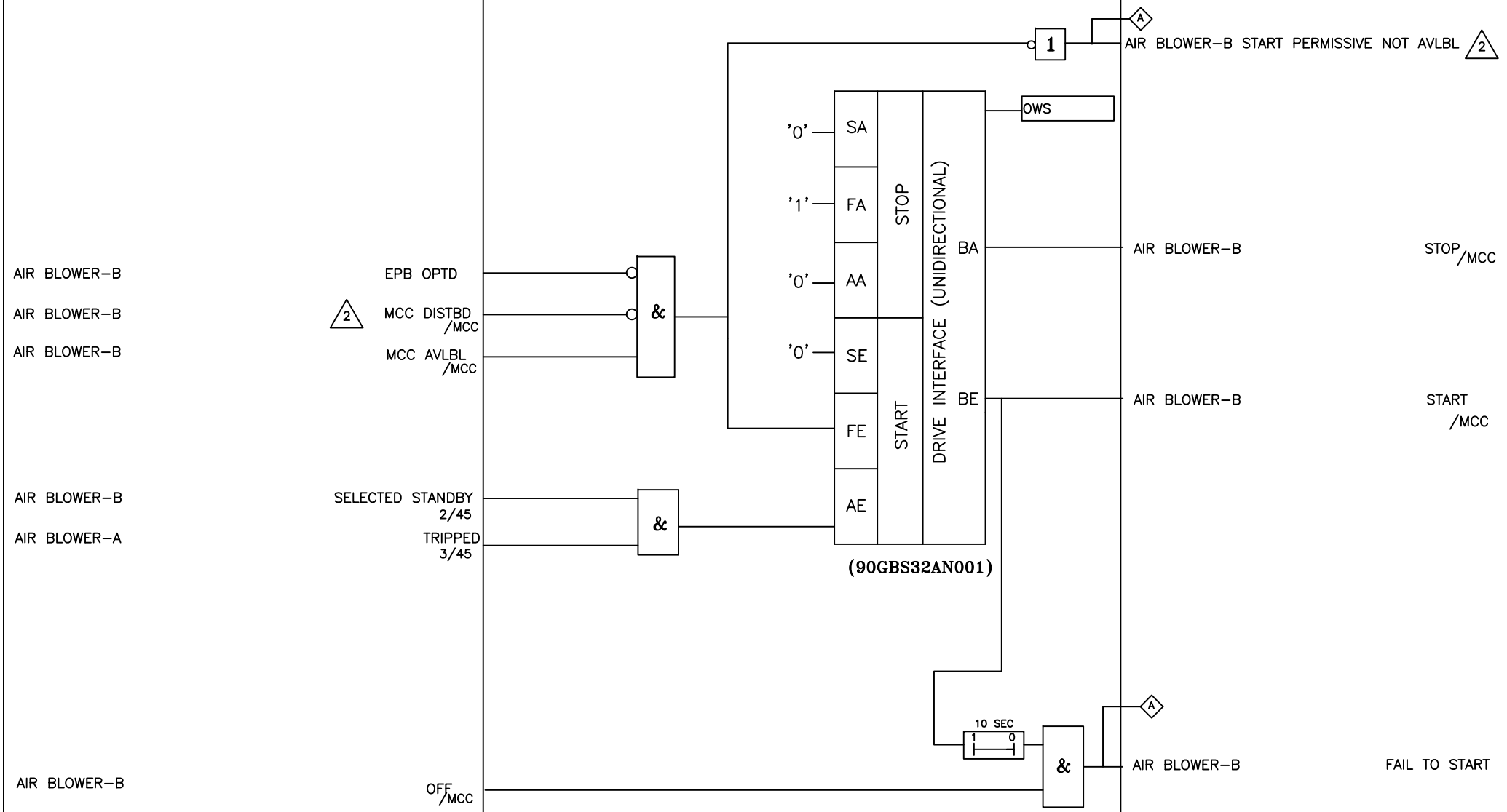


	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT AIR BLWRs STANDBY SELECTION LOGIC	REV. NO.	02 DATE: 29.01.19
			SHT	45 OF 47



	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058	
	TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT AIR BLOWER–A	REV. NO.	02	DATE: 29.01.19
		SHT	46 OF 47	

INPUTS		LOGIC	OUTPUTS	
DESCRIPTION	STATUS FROM SIG/SHT NO.		DESCRIPTION	STATUS TO SIG/SHT NO.



	BHEL	ENNORE STPP (2X660 MW)	DRG. NO.	PE–V0–412–158–A058
		TITLE :– CONTROL LOGIC SCHEME FOR PT PLANT AIR BLOWER–B	REV. NO.	02 DATE: 29.01.19
			SHT	47 OF 47

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:
2		31.7.19

Document revised as per discussion with M/s Desein

REV	DATE	ALTERED:
3		24.12.19

Document revised as per discussion with M/s Desein

STATUS : CONTRACT

JOB NO.: 412

REV	DATE	ALTERED:
4		25.5.22

Document revised as per discussion with M/s DESEIN & comments on drg of Aerator & Stilling Chamber/Parshall flume/Flash Mixer.

1. Drawing approved based on compliance received.
2. CAT "A"Approval does not absolve the turnkey vendor of the responsibility of ensuring correctness, safety and functional requirements as per NIT.

COPY RIGHT 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

PACKAGE : PRE-TREATMENT PLANT

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

CIVIL DESIGN CALCULATION OF CASCADE AREATOR, FLASH MIXER , STILLING CHAMBER AND PARSHAL FLUME

	NAME	SIGN	DATE
PREP	FAISAL N	FN	25.5.22
CHKD	MUAZZAM I	MI	25.5.22
APPD	ASLAM A	AA	25.5.22

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

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A060	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/CDC/ASFMPF/PTP/18/335	4
DATE								NO. OF SHEETS 23 EXCLUDING COVER PAGE	

INDEX		
SR. NO.	DESCRIPTION	PAGE NO.
1.	Design Methodology for water retaining structure	3
2.	Design Methodology for general Structure:	3
3.	Design of Slab, Column and its foundation	3
4.	Design of Central shaft	5
5.	Design of drain wall	6
5a.	Design of Aerator Channel supporting beam (B-1) = 300 x 500	7
6.	Design of Interconnecting Walkway between Clarifier and Cascade Aerator:	7
7.	Design of Stair Case and cascade aerator	8
8.	Design of central shaft and its foundation of cascade aerator	11
9.	Crack Width Calculations (Cascade Aerator)	14
10.	Design of Flash Mixer, Stilling Chamber, Parshall Flume, Size (4400 x 4400 x 4616) and (4400 x 4400 x 4407)	15
11.	Design of Flash mixer, Stilling Chamber supporting column and foundation	17
12.	Design Parshall flume	19

Design of Cascade Aerator

1. DESIGN METHODOLOGY FOR WATER RETAINING STRUCTURE:

1. Grade of Concrete is M30
2. Steel permissible stress in Tension is 1400 kg/cm2 and 1400 kg/cm2 at outside face of water as per clause 4.5.3.2 & table 4 of IS 3370 Part 2, 2009
3. Design based on Uncracked section for Water Retaining Structure
4. Reference IS Code: IS 3370 Part 1 to 4 – (Latest Version)

2. DESIGN METHODOLOGY FOR GENERAL STRUCTURE:

1. Grade of Concrete is M30
2. Grade of Steel Fy = 500 N/mm2
3. Reference IS Code: IS 456, SP 16, IS 1893, IS875 – (All latest version)

3. DESIGN OF SLAB, COLUMN AND ITS FOUNDATION:

Maximum dia (inside) = 12900 mm
The structure is support by 8 Nos of Column (**C1**).
c/c distance column = 5.18 m (considering 400 X 400 X column)
Foundation depth is 2.0 m
Safe bearing capacity of soil (net) at 2.0m below E.G.L is = 7.0 T/m^2

Loading:-

a) Dead load
   200 mm thick aerator slab = 0.2 X 2.5 = 0.500 T/m^2
b) Steps =0.075 X 2.5 =0.1875 T/m^2
c) Wt. of 75mm thick water = 0.075 X 1.0 = 0.075 T/m^2

Total (w) = 0.7625 T/m^2

Span of slab = $\frac{(12.9-1.28)}{2}$ = 5.81 m
(Supported between central shaft and aerator channel)

Moment at support = (1/10) X 0.8 X (5.81)2 = 2.70 T-m/m
deff = 200-20-6 =174 mm
Moment at span = (1/8) X 0.77 X (5.81)2 – (2.70/2) = 1.89 T-m/m
Area of steel req at top = $(2.7 \times 10^5) / (0.86 \times 1500 \times 17.4) = 12.02\ cm^2/m$
Provided 16∅@150 c/c at edge and 12∅ @150 c/c (T) at span.

Area of steel at bottom:
$A_{st} = (1.89 \times 10^5) / (0.86 \times 14000 \times 17.4) = 9.02\ cm^2/m$
Provided 12 ∅ @140 c/c (B) all through.
Distribution steel = (0.30/100) x 100 x 20 = 6.0 cm_2/m
Provided 10∅@175 c/c at (T) (B) radially.

Note: 250mm thk. Aerator slab with revised reinforcement indicated/provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

Load on Aerator Column (C1) (Total)- 8 Nos.

1. Wt. from slab + steps = 0.80 X0.80 x $(\pi/4)$ x 12.9^2 = **102.89 T**
2. Wt of channel = 0.150 x (2 x 0.83 +0.8) x π x 13.2 x 2.5 = 38.24 T
3. Wt. of water = 0.83 x 1.0 x π x 13.2 x 0.800 = 27.52 T
4. Wt. of beam = 0.300 x 0.500 x 3.2 x π x 2.5 = 15.54 T
5. Self wt of column = 8 x 0.4 x0.4 x 7.246 x2.5 = 23.19 T

Total = 207.38 T ≈ 208 T

Wt. of earth = π x 13.2 x 1.8 x1.6 x 1.8 = 214.86 T
Total load = 423.86 T = 424 T

Seismic Analysis:

Here, Z =0.16, I = 1.75 | (maximum considered)
R = 3.0, Sa/g = 2.5 | Ref, Is 1893 part-1

$$Ah = \frac{ZI}{2R} X \frac{Sa}{g} = \frac{0.16 \text{ x } 1.75 \text{ x } 2.5}{2\ X\ 3} = 0.1166$$

V_B (base shear) = A_h X W = 0.1166 X 424 = 49.43 T
Moment at base = 49.43 X 2.0 = 98.87 T-m
Gross for (f_g) = p/A = M/I x Y_{max}

Design of foundation F1

Area of strip:(1.8 m width) = π x 13.2 x 1.8 = 74.60 m^2

$$I = [\frac{\pi}{4} X (14.1)^4 - \frac{\pi}{64} X (12.3)^4] = [1939.22 - 1122.97] = 816.25\ m^4$$

$$f_g = \frac{424}{74.6} \pm \frac{98.87}{816.25} X \frac{14.1}{2} = (5.68 \pm 0.85) = 6.53\ T/m^2$$

Net =6.53-0.3 X 2.5 -1.7 X 1.8 = 2.72 T/m^2 < 7.0 T/m^2
≈ 3.0 T/m^2 for design purpose.

Maximum moment at the face of the beam = $\frac{1}{2}$ X 3.0 X $(0.675)^2$ =0.684 T-m/m

d_{eff} = 300-50-6 =244 mm

$$M_u/bd^2 = \frac{1.2\ X\ 0.684\ X10^7}{1000\ X\ (244)^2} = 0.137$$

Provided minimum A_{st} = 0.12/100 X 100 X 30.0 = 3.6 cm^2/m
Provided 12Ø@175 c/c (B) along shorter side.
Provided 10Ø@175 c/c (B) along longer side.
Provide 10Ø@200 c/c at top both ways.

Design of foundation beam FB1 (450 x 600)

Load on beam = 3 x 1.8 – 0.450 x 0.3 x 2.5 =5.06 T/m
D =13.2 (c/c of column) r = 13.2/2 =6.6 m
W = 5.06 x π x 13.2 =209.72 T
Span = 5.18m
Maximum support moment ,
M_s = 0.0083 Wr = 0.0083 X 209.72 X 6.6 =11.4888 T-m
Span moment (M_s) = 0.00416 Wr =5.758 T-m
Torsional moment (T) = 0.0006Wr = 0.830 T-m
Equivalent torsional moment (M_T) = T(1+D/b) = 0.830 X (1+ 600/450) =1.94 T-m
Total support moment = 11.48+1.94 =13.42 T-m

d_{eff} = 600-50-6 =540 mm

$M_u/bd^2 = \frac{1.2\ X\ 13.42\ X10\text{^}7}{450\ X\ 540\text{^}2} = 1.227$

Corresponding (p_t) = 0.301

Provided minimum A_{st} = 0.301/100 X 100 X 30.0 = 7.31 cm_2/m

Provided 3 -20∅ alt at top.

Area of steel at span = $\frac{1.2\ X\ 5.758\ X10\text{^}7}{450\ X\ 540\text{^}2} = 0.526$

p_t =0.128

A_{st} mim = 0.2048

A_{st} req = 0.2048/100 X 45 X 54 =4.97 cm^2

Provided 3-16∅ bottom all through. (However, increased to 3-20∅ as per comments & indicated in drg)

Provided 10∅@150 c/c all through the beam.

Design of column (400 x 400) (C1)

Load / column = 208/8 =26 T

Moment in each column = 98.87/8 =12.36 T-m

Clear wt of column = 5246 -150-300+2000 =6796 mm ≈ 6.8m

L_{ex}/D = 680/40.017 > 12

e_{ax}/D = 0.145 (ref table 1 of sp-10, page-106)

e_{ax} =0.145 x 400 =58 mm

Moment due to slender = 1.508 T-m

b = 400 mm f_{ck} = 25 N/mm_2

d = 400 mm f_y = 500 N/mm_2

d'/D = 0.10

$P_u/f_ubd = \frac{1.2\ X\ 26\ X10\text{^}4}{25\ X\ 400\ X\ 400\text{^}2} = 0.078$

Total moment = 13.86 T-m

$M_u/f_{ck}bd_2 = = \frac{1.2\ X\ 13.86\ X10\text{^}7}{2.5\ X\ 400\ X\ 400\text{^}2} = 0.104$

Corresponding (p_t/f_{ck}) =0.052 [ref table 40 of SP-16]

p_t = 0.052 X 25 = 1.3

A_{st} req = 1.3/100 X 40 X 40 =20.8 cm_2

Provided 8-20∅ long steel.

Provided 10∅@150 c/c links.

4. DESIGN OF CENTRAL SHAFT:

Load on shaft = 1 x π/4 x $(4.5)^2$ = 12.71T

Self wt. = π x 1.04 x 9.686 x 0.140 x 2.5 = 11.07 T

Total load = 12.71 + 11.07 = 23.78 T ≈ 24 T

Moment = 12.38 T-m

A= = $\frac{\pi}{4}$ X $[(1.28)^2 - (0.9)^2]$ = 4570 cm^2

P/A = = $\frac{23.78\ X\ 10\text{^}3}{4750} = 5.203$ kg/cm_2

I = $\frac{1}{64} X\ [(1.28)^4 - (0.9)^4] = 0.0629$ m^4 =6293138 cm^4

Z = I /118 =53331.67 cm^3

M/Z = $\frac{(12.36\ X\ 10^5)}{53331.67} = 23.175$ kg/cm^2

So, $\frac{5.23}{50} + \frac{23.175}{85}$ = 0.104 +0.272 =0.376 <1

Hence, safe.

For M 25 concrete [permissible value of concrete in direct comp σ_{cc} =50 kg/cm^2
Permissible value of conc. In bending comp σ_{cb} =85 kg/cm^2]

Note: 200mm thk. Central shaft thickness provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

5. DESIGN OF DRAIN WALL:

Ht. of wall = 830mm

Ht. of water = 530mm

Moment at wall at (A)

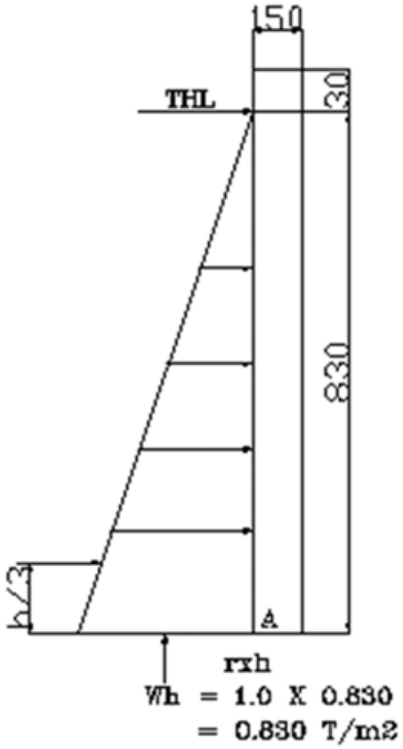
= $\frac{1}{2}$ x 0.530 x 0.830 x 0.830 x$\frac{1}{3}$

= 0.095 T.m/m

Difference = 150 – 30 -5 = 115 mm

Area of Steel Rod = $\frac{M}{A_{st}\, jd}$

$A_{st} = \frac{0.095 \text{ x}10\text{^}5}{0.86\ X1400\ X\ 11.5}$ = 0.685 cm2/m



But maximum A_{st} = 0.30 – $\frac{50}{450-100}$% = 0.157% (As per IS: 3370 part-2)

A_{st} = $\frac{0.157}{100}$ X 100 X 15.0 = 2.357 cm^2/m

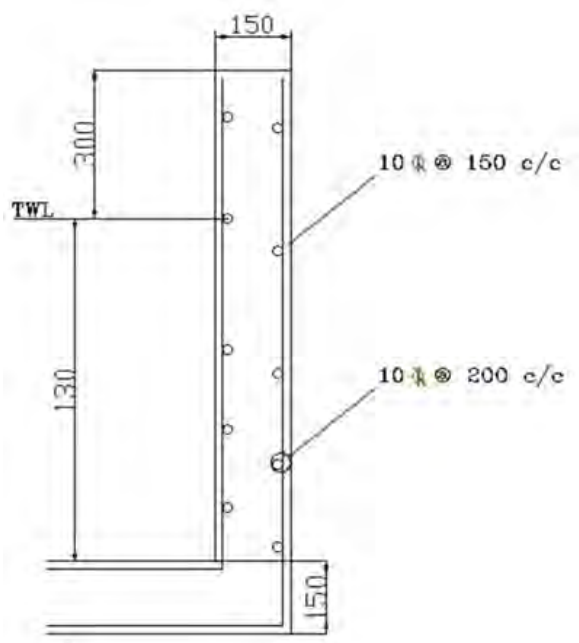
Provide 10TOR at 150 c/c vertically at outer and inner face of wall. (5.26 cm2/m provided).

Provide 10TOR at 200 c/c horizontally at each face of wall.

So the 150 thk wall is OK

Note: 250mm thk. Drain wall thickness with revised reinforcement indicated/provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

5a. <u>DESIGN OF AERATOR CHANNEL SUPPORTING BEAM (B-1) = 300 X 500:</u>



Load on beam = $3.0^{T/m}$+ 0.3 x 0.35 x 2.5 = $3.26^{T/m}$

Span = 5.0M

Maximum support moment = $\frac{1}{10}$ x 3.26 x $(5.0)^2$ = 8.15 T.m

Open moment = $\frac{1}{8}$ x 3.26 x $(5.0)^2$ - $\frac{1}{2}$ x 8.15 = 6.16 T.m

Differenece = 500 - 25 - 10 = 465mm

Area of steel rod at top = $\frac{8.15\ X\ 10^5}{0.86\ X\ 1400\ X\ 46.5}$

= 14.52 cm^2

Provide 4-16 Tor allt + 3.20Tor Extra weight top at support.

A_{st} at bottom = $\frac{6.16\ X\ 10^5}{0.86\ X\ 1400\ X\ 46.5}$ = 12.8 cm^2

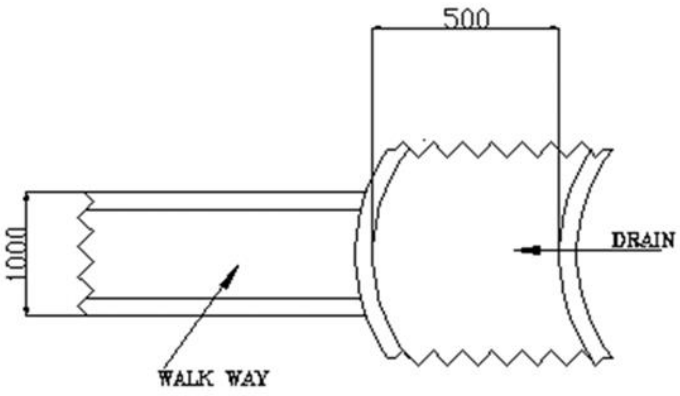
Provide 4-20 Φ at alt at bottom

Provide 2L-10 Φ at 150 c/c at support and @ 175 c/c at span

<u>Note: However, Beam B-1 design modified and provided as per reference drawing/discussion & indicated in drg, incorporating M/S DESEIN & M/S TANGEDCO comments</u>

6. <u>DESIGN OF INTERCONNECTING WALKWAY BETWEEN CLARIFIER AND CASCADE AERATOR:</u>

As the walkway loads locally in wall, there is no affect in wall design



Maximum moment at the face of column

= $\frac{1}{2}$ x 8.27 x 0.825^2

=2.82 T m/m

Difference = 300 -50 - 6 = 244 mm

$\frac{Mn}{bdv^2}$ = $\frac{(1.2\ X\ 2.82\ X\ 10^7)}{1000\ X\ (244)^2}$ = 0.567

Provide minimum A_{st}

= $\frac{0.12}{100}$ x 100 x 30 = 3.6 Cu/m

Provide 12 Tor 200 c/c at Bottom bothways

Provide 10 Tor 200 c/c at Top bothways

<u>Note: 1200mm wide walkway indicated/provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments</u>

7. <u>DESIGN OF STAIR CASE IN CASCADE AERATOR:</u>

Span = 6.2mm Slab Thickness =225 m

D.l of waist slab = 0.225 x 2.5 = 0.5625 T/m^2

Wt. of steps = 0.15 X $\frac{1}{2}$ X2.5 =0.1875 T/m^2

Total load = 1.25 T/m^2

Maximum moment = 1/10 X 1.25 X 6.2^2 =4.8 Tm/m

Deff 225-25-8 = 192 mm

$$\frac{Mn}{\mathrm{bdv}^2} = \frac{(4.8\ X\ 1.5\ X\ 10^7)}{(1000\ X\ 192^2)} = 1.95$$

Fy =500 N/mm^2

Corresponding Pt=0.488

Area required $= \frac{(0.488\ X\ 100\ X\ 19.2}{100}$

= 9.36 cm^2/m

Provide 16 130c/c =15.5 cm^2/m

Dist steel = 10 Φ 200c/c

Check for deflection: Y $= \frac{5wL^4}{384EI}$

W = 1.25 t/m2 = 12.5 kg/cm

M.I. = 1/12 x 100 x $(22.5)^3$ = 94921.87 cm^4

L = 6.2m = 620 cm

E = 5000 SQRT(30) = 2.7 x 10^4 N/mm^2 = 2.7 x 10^5 kg/cm^2

Therefore, Y = 9.28 mm (Deflection).

Limiting value, $Y_1 = \frac{1}{135}$ x span = 620/325 = 1.907 cm = 19.7 mm

So, Y_1 > Y…. Hence it is Safe.

DESIGN OF STAIRCASE FOUNDATION CASCADE AREA FOUNDATION SIZE = 3.9M X 1.6M X 0.250M (F4)

W = 1.25 T/m² on staircase (Ref page no. 6)

Loading on column C-4:

a) From slab = (5.25/2 + 1.0) x 1.25 x ¼
= 1.13T

b) Set wt. of column = 0.250 x 0.400 x 6.336 x 2.5
= 1.58 T

c) Wt. of Tie Beam = (5.25/2 + 2.4/2) x 0.250 x 0.400 x 2.5
= 0.96 T

Total = 3.67 T

DESIGN OF FOUNDATION (F4) STAIRCASE OF AERATOR:

Load from column on foundation = 2 x 3.67
= 7.34 T

Wt. of Foundation = 1.6 x 3.9 x 0.250 x 2.5
= 3.90 T

Wt. of Earth = (1.6 x 3.9 – 2 x 0.250 x 0.400) x 1.75 x 1.80
= 19.02T

Total Load (PG) = 30.26 T

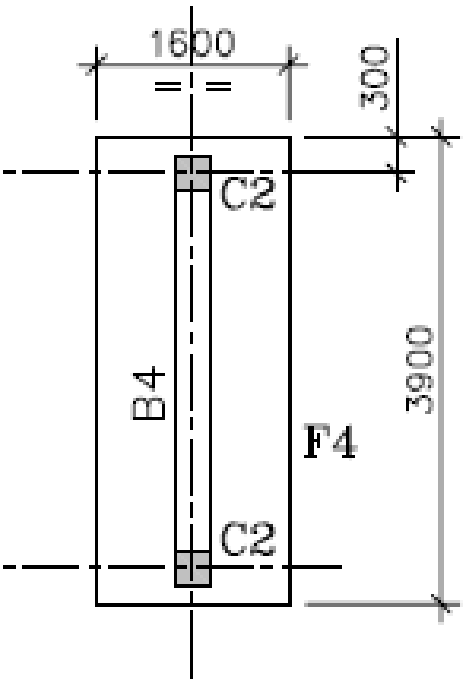
Moments at base = 7.34 x 0.105 x ((2.3+2.0)/2)
=1.65 T-m

f g (gross pr.) = $\frac{30.26}{3.9\ X 1.6}$ x $\frac{1.65\ X\ 6}{1.6\ X\ 3.9^2}$

= 4.85 $\pm$ 0.41

fg (max.) = 5.26 T/m^2

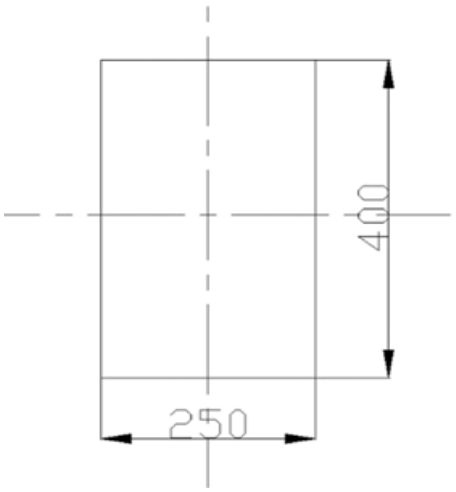
f_{net} = 5.26 -0.25-1.75 x 1.8 x 2.5
= 1.485 T/m²
= 1.5 T/m² < 7.0 T/m²



As the base pressure is nominal provide 250 Thk strip foundation. Provide 12 φ @ 200c/c @ (B) both ways. Provide 10 φ @ 200c/c @ (T) both ways.

Note: 300mm depth footing indicated/provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

DESIGN OF BEAM B-4 (300X500) - STAIRCASE OF AERATOR



Load on beam = 1.5 x 1.6= 2.4 T/M

Cant. Moment = $\frac{1}{2}$ x $(0.750)^2$ x 2.4 = 0.675 T-M

Span moment = $\frac{1}{8}$ x $(2.4)^2$ x 2.4 = 1.73 T-M

deff = 500-50-8=442 mm

$$\frac{Mm}{bdr} = \frac{(1.2\ X\ 1.73\ X\ 10^7)}{(300\ X\ 442^2)} = 0.354$$

Provide 2-16 φ at (T) & (B)

Note: Beam size & reinforcement indicated/provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

DESIGN OF COLUMN – C4 (250 X 400)

P= 3.67 T

M = 1.65/2 = 0.83 T-m

$$(Ph/\ f_{ck}bd) = \frac{(1.2\ X\ 3.67\ X\ 10^4)}{(30\ X\ 250\ X\ 400^2)} = 0.0146$$

$$Uh/\ f_{ck}bDr = \frac{(1.2\ X\ 0.83\ X\ 10^7)}{(30\ X\ 250\ X\ 400^2)} = 0.0083$$

Provide minimum Ast. = $\frac{0.8}{100}$ x 25 x 40 = 8.0 cm^2

Provide 8 φ@ 150c/c link

Provide 8- 20 φ@ long steel

Note: Column size & reinforcement indicated/provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

DESIGN OF BEAM B3 (250 X 400) at Staircase:

Load on beam = 1.25 x (5.25/2 +1.0) + 0.20(sect wt.)
= 4.73 T/m

Span = 2.4 m

Maximum moment = 1/8 x 4.73 x 2.42
= 3.41 T/m

Raft = 400-25-8 = 367 mm

$$\frac{Mm}{bdr} \frac{(1.5\ X\ 3.41\ X\ 10^7)}{(250\ X\ 367^2)} = = 1.52$$

Pt = 0.381

Ast. Required = 0.381/100 x 25 x 36.7

= 3.49 cm2

Provide 2-16 φ @ T & bottom

Provide 8 φ @ 150 c/c stirrups

Note: Beam depth revised to 450mm & reinforcement revised indicated/provided in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

DESIGN OF BEAM (B-2) (250 X 400) at Staircase:

As loading is not arising in beam provide nominal reinforcement (min) in the beam.

8. DESIGN OF CENTRAL SHAFT AND ITS FOUNDATION OF CASCADE AERATOR:

Height of shaft = 9.786 M

OD of shaft = 1280 mm

Wall Thickness = 140 mm

Loading:-

a) Self wt of Aerator slab	= 0.200 x 2.5	= 0.500 T/m^2
b) Wt of Steps	= (0.250/2) x 2.5	= 0.3125 T/m^2
c) Wt of Water	= (1.75/2) x 1.0	= 0.875 T/m^2
	Total Load(W)	= 1.6975 T/m2
		≈ **1.70** T/m2

Load on Column:-

1) From Areator slab + steps + water (D= 12.9/2 = 6.45 m)	= 1.70 x (π/4) x 6.452	= 55.51 T
2) Self wt of shaft	= πx 1.140 x 9.78 x 0.140 x 2.5	= 12.26 T
	Total	= **67.77**

Seismic Analysis:

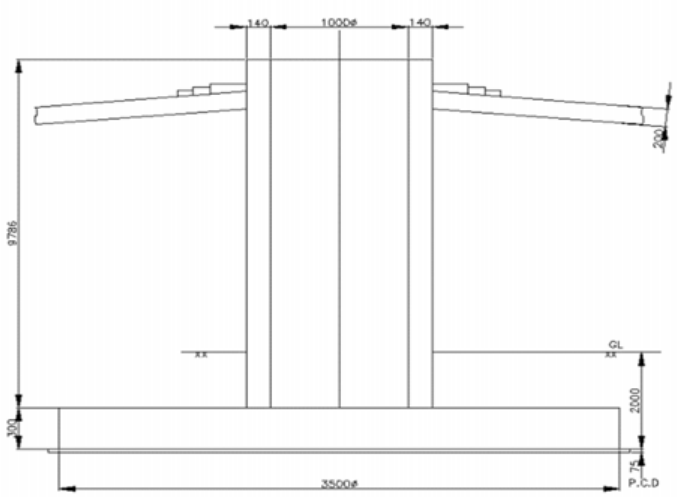
VB (Base Shaft) = Ah x W = (ZI/2R) x (Sa/g) x W

Z = 0.24; I = 1.75

R=5.0; Sa/g = 2.5

Ah = (0.24 x 1.75) x 2.5 / (2 x 5) = 0.105

VB = 0.105 x 67.77 = 7.11 T



Moment at base of shaft = (9.786 – 0.250) x (1/2) x 7.11

= 33.90 Tm

L_{eff}/D = (9.536 x 100)/128.0 = 7.95 < 12.0 (Not Slender)

Design of Foundation Raft

Self wt of foundation = $(\pi/4) \times 3.8^2 \times 0.300 \times 2.5$ = 8.50 T

Wt of earth = $(\pi/4) \times (3.8^2 - 1.28^2) \times 1.7 \times 1.60$ = 27.34 T

Gross load on foundation (f_g) = 103.61 T

(P/A ± M/I x Y)

Gross Pr (f_g) = 103.61 / $((\pi/4) \times 3.8^2)$ ± (33.90/10.23) x 1.9

= 9.14 ± 6.29

($I_{xx} = (\pi/64) \times 3.84^4$ = 10.23 m^4)

$F_g(Max^m)$ = 15.43 T/m^2 < 8 x 1.5 + 2.0 x 1.8 = 15.7 T/m^2

Net Bearing capacity of may be increased by 50% as per IS:1893 (Seismic Criteria)

Maximum moment at the face of shaft = ½ x 11.86 x $(1.26)_2$ = 9.40 Tm / m

d_{eff} = 300 – 50 - 8 = 242 mm

Mu / bd^2 = 1.2 x 9.40 x 10^7 / 1000 x $(242)^2$ = 1.947; f_t = 0.493

As required = 11.94 cm^2 / m

Provide 16 Ø @ 150 c-c at bottom both ways (13.42cm^2/ m)

Provide 12 Ø @ 150 c-c at top both ways

Shear check

Max^{m} shear (Vu) = 1.2 x 11.86 x 1.26 = 17.94 T/M

τ_{uv} = 13.66 x 10^4 / 1000 x 242 = 0.56 wt/mm^2

shear at a distance 'd' from the face of shaft	= 17.96/1.26 x 0.960	= 13.66 T/m
Pt = 100A_s / bd	=100 x 15.46 / 100 x 24.2	= 0.64
Corresponding τ_{Co} = 0.58 N/mm² > τ_{uv}	**Hence safe.**	

Design of Central Shaft

Axial load on shaft (p) = 67.77 T = 68.0 T

Cross sectional Area of Shaft

π/4 x (1.28² - 1.0)² = 0.498m²

Axial stress (σ_{ac}) = 68 x10^3 / 49.80 = 13.65 kg /cm²

Bending Stress = 33.90 x 10^5 / 18.8 x 10^7 x 128/2 = 1.29 kg/cm²

Ixx / Iyy of shaft = π/64 (128^4 -100^4) = 18.8 x 10^7 cm^4

So, (13.65 / 60) + (1.29 / 85)	= 0.23 + 0.015
	= 0.245 < 1.0
	Hence safe

Note: Central shaft thickness revised to 200mm in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

9. CRACK WIDTH CALCULATIONS (AERATOR SLAB):

Loading:-

a) Dead load (250 mm thick) aerator slab = 0.25 X 2.5 = 0.625 T/m^2
b) Steps =0.125 X 2.5 =0.3125 T/m^2
c) Wt. of 75mm thick water = 0.075 X 1.0 = 0.075 T/m^2
Total weight (w) = **1.0125** T/m^2

Span of slab = (12.9-1.28) *.5 = 5.81 m (Supported between central shaft and aerator channel)

Moment at support = (1/12) X 1.0125 X (5.81)^2 = 2.85 T-m/m

Moment at centre = (1/24) X 1.0125 X (5.81)^2 = 1.425 T-m/m

CHECK FOR CRACKWIDTH (Wcr)

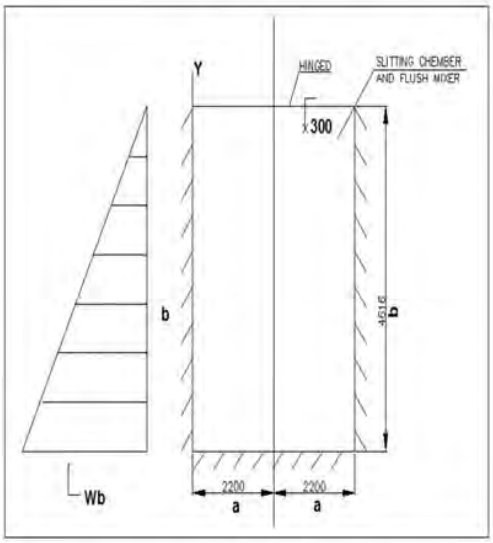
$$W_{cr} = \frac{3a_{cr}\varepsilon_m}{1+\frac{2(a_{cr}-C_{min})}{h-x}} \qquad \varepsilon_m = \varepsilon 1 - \frac{b(h-x)(a-x)}{3E_S A_s (d-x)}$$

Annexure-F of IS 456 : 2000

Where,
W_{cr} - design surface crackwidth
a_{cr} - distance from the point considered to the point of the nearest longitudinal bar
ε_m - average steel strain at the level considered
x - depth of neutral axis
ε_1 - strain at the level considerd, calculated ignorning the stiffening of the concrete in the tension zone
a - distance from the compression face to the point at which crack width is being calculated

f_c		**30**	N/mm^2
f_y		**500**	N/mm^2
A_s	Area of steel provided	754.0	mm^2
b	Taking Width	**1000**	mm
h	Over all depth	**375**	mm
d	Effective depth	339	mm
C_{min}	Clear cover	**30**	mm
S	Spacing of bars	**150**	mm
Bar dia		**12**	mm
a_{cr}		77.2	mm
Moment under service condition M		**28**	kN-m
Modulus of elasticity of concrete Ec		= 5000x sqrt (fck)	
Ec		27386	N/mm^2
Modulus of elasticity of steel Es		**200000**	N/mm^2
Modular ratio m		9.333	280/(3σ_{cbc})
Percentage of steel p		0.0022	
Depth of neutral axis X		$bx^2/2 = mA_s(d-x)$	
500 x^2 =	7037.16754	(d-x)	
x^2 =	4771.19959	14.074	x
Solving quadratic equation x =		62.394	mm
Z =	d - x/3	318.202	mm
σ_{st} Stress in reinforcement	M / A_s Z		
σ_{st} =		116.53328	N/mm^2
σ_{bc} Stress in Concrete	σst x A_s / 0.5σ_{bc} b x		
σ_{bc} =		2.81641	N/mm^2
Strain at concrete outer face €1		(σ_{st}/E_s) (h-x)/(d-x)	
€1 =		0.00066	
€m =		-0.00012	
Crack width W_{cr} =		**0.000**	mm
Permissible crack width		**0.100**	mm

10. DESIGN OF FLASH MIXER, STILLING CHAMBER, PARSHALL FLUME, SIZE (4400 X 4400 X 4616) and (4400 X 4400 X 4407):



Considering water height is full

$(a/b) = (2200/4616) = 0.476 \cong 0.5$

Reference: Moody's Chart

Horizontal Moment: -

Maximum (+)ve B.M. = (+) 0.0249 x 1.0 x $(4.616)^2$ = 0.5305 T.m/m

Maximum (-)ve B.M. = (-) 0.0119 x 1.0 x $(4.616)^2$ = 0.2536 T.m/m

Vertical Moment: -

Maximum (+)ve B.M. = (+) 0.0320 x 1.0 x $(4.616)^2$ = 0.681 T.m/m

Maximum (-)ve B.M. = (-) 0.0118 x 1.0 x $(4.616)^2$ = 0.251 T.m/m

Using 300 thk wall;

(D) d_1 = 300-25-6 = 261mm

K1 = $(d_1/D) = 0.89 \cong 0.9$

For k = 0.90, M-30, $\frac{M}{bd^2} = 3.536$, b = 100cm

$$D = \sqrt{\frac{M}{3.536\ X\ b}} = \sqrt{\frac{0.681\ X\ 10^5}{3.536\ X\ 100}} = 13.87\text{cm}$$

Provide 300 thk wall

Vertical Reinforcement (Inside)

$$A_{st} = \sqrt{\frac{0.681\ X\ 10^5}{0.86\ X\ 1400\ X\ 26.1}} = 1.472\ \text{cm}^2/\text{m}$$

Provide 12 φ @ 200 c/c (5.65 cm)

Vertical Reinforcement (Outside)

$$A_{st} = \sqrt{\frac{0.251\ X\ 10^5}{0.86\ X\ 1400\ X\ 26.1}} = 0.893\ \text{cm}_2/\text{m}$$

Provide 12 φ @ 200 c/c

Mimimum Ast = $0.30 - \left(\frac{0.30-0.2}{450-100}\right) \times 150 = 0.257\%$

Ast = 7.71 cm^2/m,

Provide 10 φ @ 200 c/c in each of the either two directions.

Horizontal Reinforcement (Inside)

$A_{st} = \sqrt{\frac{0.251\ X\ 10^5}{0.86\ X\ 1400\ X\ 26.1}}$ = 1.688 cm^2/m

Provide 12 φ @ 200 c/c

Horizontal Reinforcement (Outside)

$A_{st} = \sqrt{\frac{0.2536\ X\ 10^5}{0.86\ X\ 1400\ X\ 26.1}}$ = 0.893 cm^2/m

Provide 10 φ @ 175 c/c

Design of bottom slab (300 thk)

W= 0.3 x 2.5 + 1.0 x 4.316 = 5.06 T/m_2

Consider as an interior panel,

$(\tau y/Cx)$= (4.4/4.4) = 1.0

Interior Panels: ↔↕ Along Long / Short Span equal

Negative moment at cont. edges = 0.032 x 5.06 x $(4.4)^2$ = 3.13 T.m/m

Positive moment at mid span = 0.024 x 5.06 x $(4.4)^2$ = 2.35 T.m/m

$D = \sqrt{\frac{3.31\ X\ 10^5}{100\ X\ 3.536}}$ = 29.7 cm

Provide 300 thk slab

A_{st} at Top:-

$A_{st} = \sqrt{\frac{0.5305\ X\ 10^5}{0.86\ X\ 1400\ X\ 27.4}}$ = 1.268 cm^2/m diff = 300-20-6 = 274mm

Provide 12 φ @ 125 cm2/m both ways at top.

A_{st} at Bottom:-

$A_{st} = \sqrt{\frac{2.35\ X\ 10^5}{0.86\ X\ 1400\ X\ 27.4}}$ = 2.668 cm^2/m

Provide 12 φ @ 180 cm2/m at bottom both ways.

Note: Additional beam **B-1** at centre of base slab of stilling chamber & flash mixer is incorporated in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

11. DESIGN OF FLASH MIXER, STILLING CHAMBER SUPPORTING COLUMN AND FOUNDATION:

Load calculations:

a) Weight of wall (300lbh) = 2 (4.7 + 4.7) x 4.616 x 0.3 x 2.5
= 65.087 T

b) Weight of water = 4.4 x 4.4 x 4.316 x 1.0
= 83.55 T

Total = 148.64 T

Seismic Force :

(VB) = A_h x W

$= \left(\frac{ZI}{2R} \text{ X } \frac{Sa}{g}\right)$ x W

$= \left(\frac{0.24 \text{ x } 1.75}{2\ X\ 5}\right)$ x 2.5 x 148.64

= 15.60 T

Force in each column = $\frac{15.6}{4}$ = 3.90 T

Moment in base = 3.9 x $\frac{4}{2}$ = 7.80 T.m

Load in each cal_n = $\frac{148.64}{4}$ = 37.16 T

Design F2 :-

Using 2.0M x 3.3M x 0.3 Thk. foundation
Self-wt. of foundation = 2 x 3.3 x 0.3 x 2.5 = 4.95T
Weight of Earth = (2 x 3.3 - 0.3 x 0.450) x 1.7 x 1.8 = 19.78T
Total load (PG) = 61.89T

Gross Pr(fg) = $\frac{61.89}{2.0\ X\ 3.3} \pm \frac{6\ X\ 7.8}{2\ X\ 3.3^2}$ = **9.37 ± 2.14**

Fg (Max^m) = 11.51T < 7.0 x 1.5 + 2 x 1.8 = 14.10 T/m^2

Fnet = 11.51 - 0.3 x 2.5- 1.7 x 1.8 = 7.7 T/m2 < 7 x 1.25 = 8.75T/m. Hence Safe

Maximum moment at the force of column
= (1/2) x 7.7 x 1.425^2 = 7.82 T.m/m
Diff = 300 - 50 - 6 = 244 mm
Mu / bd^2 = $\frac{(1.2\ X\ 7.82\ X\ 10^2)}{(1000\ X\ 244^2)}$ = 1.576 ≅ 1.58
Corresponding (Pt) = 0.392

Area of steel required = 9.56 cm^2/m
(Provide 12Ø @ 115 c/c bottom along layer side)

Provide 10Ø @ 175 c/c along shorter side
Provide 10Ø @ 200 c/c at (T) bothways.

Note: Footing dimensions and depth along with reinforcement revised and is incorporated in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

Design of column (300 x 450) C1 & C2 (Ref drg:A062)

P = 37.16T ≅ 38 T D= 450 |b= 300| f_{ch} =30 N/mm^2
M = 7.80 T.m Fy = 500| dı/D = 0.10

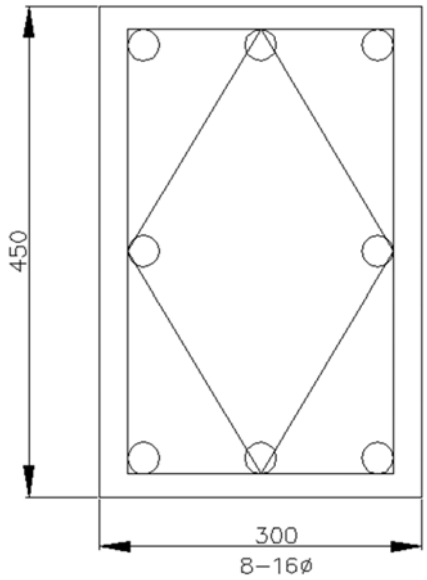
$\frac{pn}{fcubd}$ = $\frac{(1.2\ X\ 38\ X\ 10^4)}{(30\ X\ 300\ X\ 450)}$ = 0.1125

$\frac{Mu}{fcnbd^2}$ = $\frac{(1.2\ X\ 7.8\ X\ 10^7)}{(30\ X\ 300\ X\ 450^2)}$ = 0.05

Provide Min^{m} A_{rt}

= (0.8/100) X 30 x 45.0 = 10.80 cm^2

Provide 8 - 16 Ø long steel
Provide 8 Ø @ 150 c/c long steel



Note: Column dimensions along with reinforcement revised and is incorporated in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

12. DESIGN PARSHALL FLUME:

A) Wall 150thk.

Height of wall = 1.62 m

Height of water = 1.315 m

Considering full ht. of water intensity of water at the base of wall = 1.0 x 1.620 = 1.62T/m^2

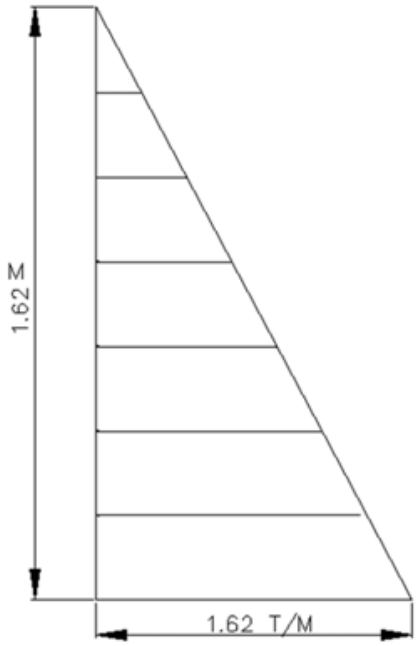
Moment at base = (1/2) x 1.62 x 1.62 x 1/3 x 1.62

= 0.709 T-m/m

D_{eff} = 150-20-5 = 125 mm.

Ast. Required = 0.709 x 10^5 /0.86 x 1400 x 12.5 = 4.70 cm^2/m

Provide 10 φ@ 150 c/c vertically in each face of wall
Provide 10 φ@ 200 c/c horizontally at each face of wall



B) Bottom Slab (150thk.)

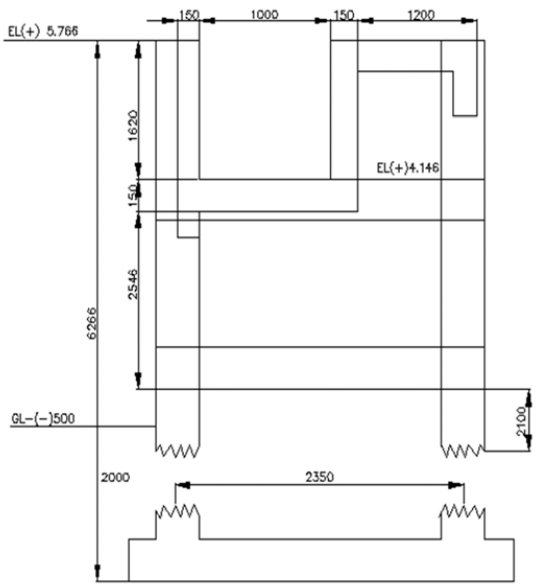
W = 1.62 T/m2 +0.150 x 2.5
= 1.995 T/m2 = 2.0 T/m2

Span c/c = 1000 + 150 = 1150 = 1.15 m
Maximum moment = 1/8 x 2.0 x 1.5^2 = 0.331 T-m/m
D_{eff} = 125 mm
Ast. Required = 0.331 x 10^7 /0.86 x 1500 x 12.5 = 2.05 cm^2/m

Provide 10 φ@ 200 c/c at top and bottom both ways.

Note: Reinforcement revised and is incorporated in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

Design of Foundation (F3) (2350 x 1600 x 250) Refer Drg PE-V0-412-158-A062 Foundation plan.



Load on foundation 50thk wall

= 0.150 x 2 x 1.62 x $\frac{1}{2}$ x (4.231 + 3.019) x 2.5

= 4.46 T

Wt of Base slab of Parshall flume (water + self wt)

= 5.06 x 1.3 x $\frac{1}{2}$ x (4.231 + 3.019) x 3.625

= 23.84 T

Weight of wall way slab

= (2.5 x 0.150 + 0.500) x 1.2 x 3.625

=3.81 T

Self-weight of column

= 0.300 x 0.500 x 7.5 x 2 x 2.5

=5.63 T

Load from transverse tie beam

= 2 x 0.250 x 0.450 x 2.35 x 2.5

= 1.32 T

Load from long beam

=2 x 0.250 x 0.450 x 3.625 x 2.5

= 2.04 T

Total = 41.04 T

Seismic Analysis:

$V_B = A_h$ x W = 0.105 x 41.04 = 4.31T

$A_h = \left(\frac{ZI}{2R} X \frac{Sa}{g}\right) = \left(\frac{0.24\ x\ 1.75}{2\ X\ 5} X\ 2.5\right) = 0.105$

Force in each level = $\frac{4.31}{3}$ = 1.44T

Moment at base

= 3 x 0.72 x $\frac{4.2}{2}$ x 2

= 8.86 T.m

Load from column = 41.04 T

Self wt of foundation

= 3.35 x 1.6 x 0.250 x 2.5 = 3.35 T

Weight of earth

= 1.6 x 3.35 – 0.3 x 0.5 x 1.8 x 1.75

= 16.41T

Total column load = 60.80T

Corros Pr. (Fg)

= $\pm$

= 11.27 $\pm$ 2.76

Fg (Maximum) = 14.3 T/m^2 < 7 x 1.5 + 2.0 x 1.8 =

10.25 T/m^2

Maximum moment at the face of beam

= $\frac{1}{2}$ x 10.25 x (0.600)^2 = 1.845 T.m/m

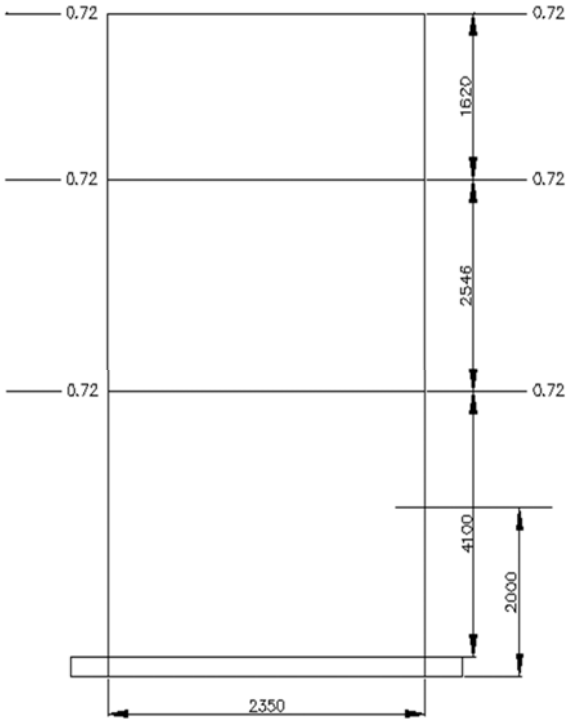
Diff = 250-50-6 = 194mm

$$\frac{Mu}{bd^2} = \frac{1.2\ X\ 1.845\ X\ 10^7}{1000\ X\ (194)^2} = 0.588 \cong 0.59$$

Pt = 0.140

Area of steel required = $\frac{0.140}{100}$ x 100 x 19.4 = 2.72 cm^2/m

Provide 12 φ @ 150 c/c (B) along shorter side.
Provide 12 φ @ 175 c/c (B) along longer side.
Provide 10 φ @ 200 c/c at top both ways.



Note: Footing dimensions and depth along with reinforcement revised and is incorporated in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

Design of foundation beam FB2 (350 x 550) (Refer Foundation F3 Sh 1 of 2 drg PE-V0-412-158-A062)

Load on beam = 10.25 x 1.6 – 0.350 x 0.250 x 2.5 = 16.18 T/m

Maximum moment (Cantilever) = $\frac{1}{2}$ x 16.18 x $(0.500)^2$ = 2.02 T.m

Span moment (Net) = $\frac{1}{8}$ x 16.18 x $(2.35)^2$ -2.02 = 9.15 T.m

Diff = 550-50-10 = 490mm

$\frac{Mu}{bd^2} = \frac{1.2\ X\ 9.15\ X\ 10^7}{350\ X\ (490)^2} = 1.306$; pt = 0.324

Area of steel required = $\frac{0.324}{100}$ x 35 x 49 = 5.5 cm^2

Provide 3-16 φ @ top and bottom.

Provide 8 φ @ 150 c/c shear reinforcement.

Design of column (350 x 500) C1 & C2:

(Foundation plan/Section 1-1, Sh 1 of 2 drg PE-V0-412-158-A062)

P =42T b = 350mm

M = 8.86 T.m D = 500mm

Fcu = 30 N/mm2

Fy = 500 N/mm2

dl/D = 0.10

$$\frac{pn}{fcubd} = \frac{(1.2\ X\ 42\ X\ 10^4)}{(30\ X\ 350\ X\ 500)} = 0.096$$

$$\frac{Mu}{fcnbd^2} = \frac{(1.2\ X\ 8.86\ X\ 10^7)}{(30\ X\ 350\ X\ 500^2)} = 0.0405$$

Provide Min^{m} Ast

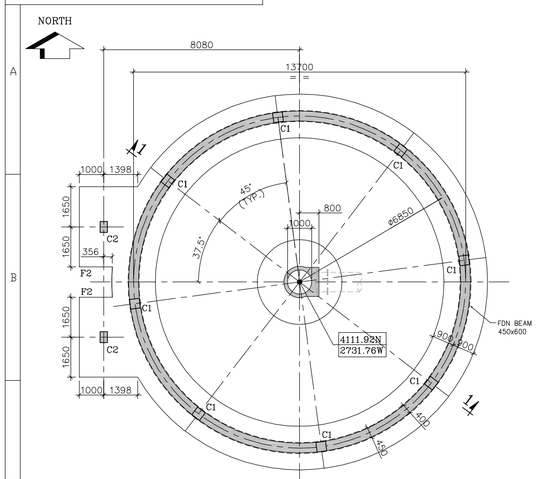
$= \frac{0.8}{100}$ x 35 x 50 = 14.0 cm^2

Provide 8-16Ø long steel.

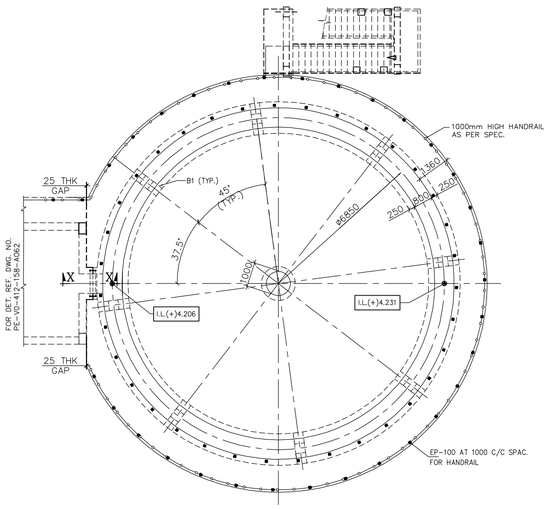
Provide 8 Ø @ 150 c/c limits.

Note: Reinforcement revised and is incorporated in drawing as per discussion & incorporating M/S DESEIN & M/S TANGEDCO comments

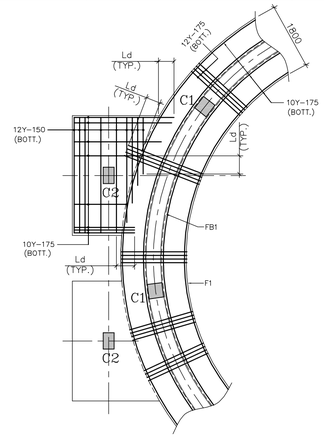
COPY RIGHT AND CONFIDENTIAL:
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in any way detrimental to the interest of the company.



PLAN AT EL(−)2.500M

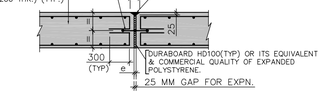


PLAN AT EL(+)7.586M

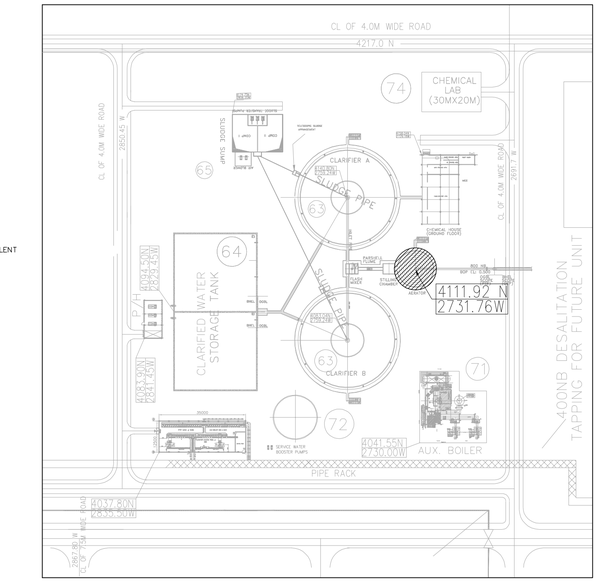


TYPICAL DETAIL OF COMBINATION PLAN FOR FOUNDATION MARKED F1 AND F2.

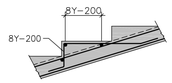
TOP REINFORCEMENT OF FOUNDATIONS ARE NOT SHOWN DUE TO CLARITY BUT THE R.C.C. DETAILS ARE SAME AS ABOVE.



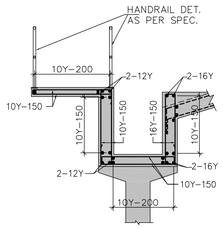
SECTION X−X



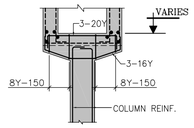
KEY PLAN



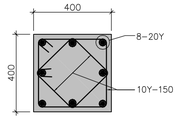
DETAIL−1
TYP. REINF. DETAIL
OF STEPS



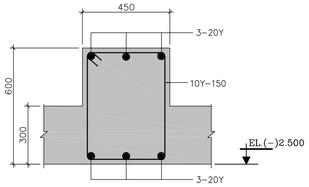
TYP. REINF. DETAIL
OF LOUNDER



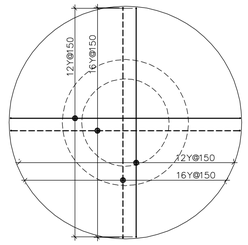
REINF. DETAIL OF
BEAM MKD. B1



COLUMN−C1
SECTION 2−2



FDN BEAM MKD−FB1
(FOOTING. R/F NOT SHOWN FOR CLARITY)



VIEW A−A

TOP REINF.
BOTT. REINF

NOTES:−

1. ALL DIMENSIONS ARE IN MILIMETERS AND ELEVATIONS IN METERS UNLESS NOTED.
2. ALL ELEVATIONS ARE REFERRED TO THE FINISHED GROUND FLOOR LEVEL OF POWER HOUSE BUILDING AS EL. 0.00 M WHICH CORRESPONDS TO RL. +10.00 M. ABOVE MEAN SEA LEVEL.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, SPECIFICATION AND SCHEDULE OF ITEMS.
4. ALL STRUCTURAL CONCRETE SHALL BE DESIGN MIX CONC. OF GRADE M−35 UNLESS OTHERWISE NOTED.
5. ALL REINFORCEMENTS SHALL BE FUSION BONDED EPOXY COATED TMT BARS OF MINIMUM GRADE Fe500 CONFORMING TO IS:1786
6. CEMENT SHALL BE OPC WITH C3A CONTENT FROM 5% TO 8%
7. NET SBC CONSIDERED FOR FOUNDATION DESIGN AT EL(−)2.50M IS 7T/SQM.
8. LAPPING OF BARS SHALL BE SUITABLY STAGGERED AND IN NO CASE MORE THAN 50% BARS SHALL BE LAPPED AT ANY SECTION.
9. LAP LENGTH SHALL BE 45D WHERE D IS THE DIA OF THE SMALLER BAR.
10. THE FOUNDATION & PEDESTAL WORK BELOW GROUND COMING IN CONTACT WITH SOIL, BITUMINOUS PAINTING OF GRADE 85/25 CONFORMING IS 702@ 1.7 KG/ SQM.(MIN) SHALL BE PROVIDED.
11. NOMINAL COVER (AS DEFINED IN IS 456 : 2000) TO REINFORCEMENT SHALL BE AS FOLLOWS OR BAR DIA WHICHEVER IS GREATER UNLESS STATED OTHERWISE :−

	TOP	BOTTOM	SIDES	ENDS
1. FOUNDATION	50	50	50	−
2. COLUMNS	−	−	45	50
3. BEAMS	45	45	45	45
4. SLABS	30	30	30	−
5. WALLS	30	30	30	−

12. MINIMUM CEMENT CONTENT IN CONCRETE IS 400 KG./m3
13. REF. IS CODES ARE IS:3370 (PART 1 TO PART 4) IS : 456, SP−16, NBC CODES, IS:1893, IS:875 AND HAND BOOK FOR WATER RETAINING STRUCTURES.
14. IN CASE ANY SOIL/LOOSE STRATUM IS ENCOUNTERED AT DESIRED FOUNDING LEVEL, THE SAME SHALL BE COMPLETELY REMOVED AND FILLED BACK WITH PCC OF GRADE M15 WITH 20MM DOWN GRADED AGGREGATES UP TO DESIRED FOUNDING LEVEL.
15. WATERPROOFING OF STRUCTURE SHALL BE AS PER CLAUSE 6.11.00 OF CIVIL SPECIFICATION.

REFERENCE DRGS :−

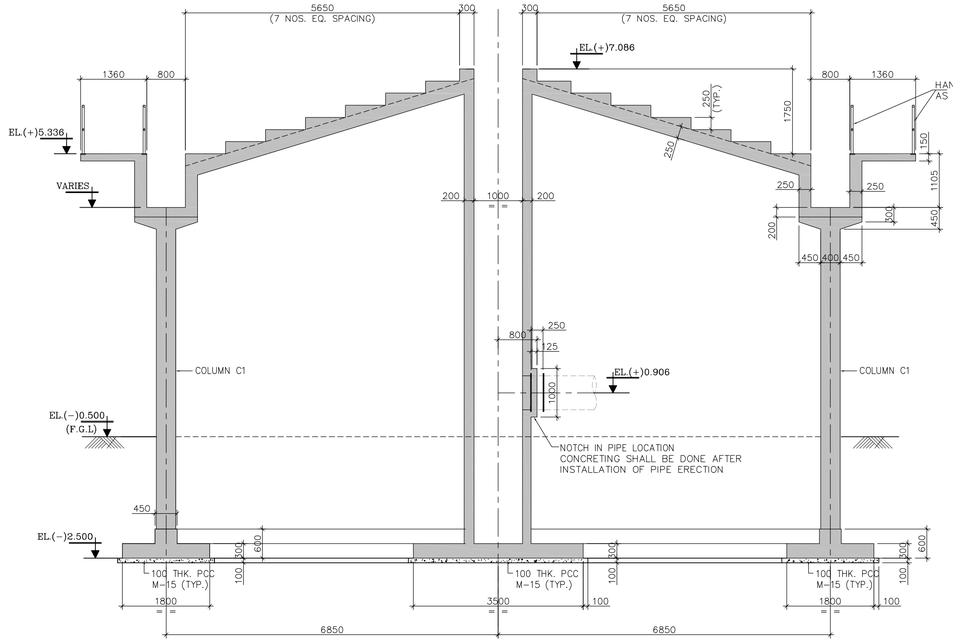
1. PLOT PLAN ––PE−DG−412−100−M001

LEGENDS−:

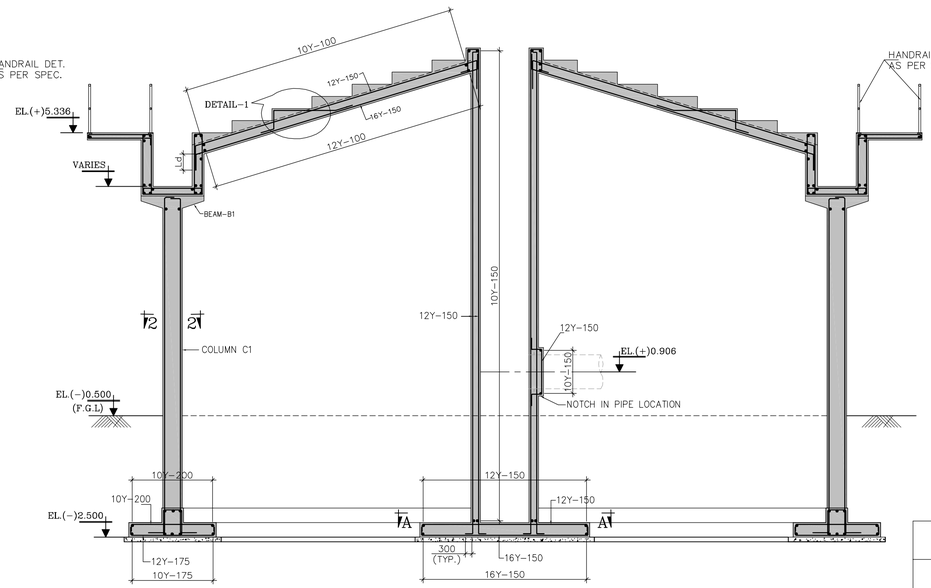
(B.O.C) − BOTTOM OF CONCRETE
(T.O.C) − TOP OF CONCRETE

20 Y 175
- C/C OF BAR
- REINFORCEMENT STEEL
- DIA OF BAR

BHEL−PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED ✓ IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	VIJAY KANDA
SIGNATURE	−sd−
DATE	23 MAY 2022



SECTION 1−1
(GA DETAIL)



SECTION 1−1
(REINF. DETAIL)

1. Drawing approved based on compliance received.
2. CAT "A "Approval does not absolve the turnkey vendor of the responsibility of ensuring correctness, safety and functional requirements as per NIT.

REV	DATE	ALTD	CHD	APPD
06	23.05.22	FN	MI	AA

NO CHANGE.

REV	DATE	ALTD	CHD	APPD
05	20.04.21	FN	MI	AA

REVISED AS PER TANGEDCO COMMENTS AND MKD AS RS

REV	DATE	ALTD	CHD	APPD
04	05.08.19	FN	MI	AA

GENERALLY REVISED.

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	11/06/19
	DESN	FAISAL N	FN	11/06/19
	CHD	MUAZZAM I	MI	11/06/19
	APPD	ASLAM A	AA	11/06/19

BHEL LOA NO: PW/PE/PG/EN1/P−310/17

TITLE
G.A AND RC DETAIL OF CASCADE AERATOR.

DEPT. SCALE −
SIGN
DATE

BHEL DOC NO.
PE−V0−412−158−A061

OGBL DOC NO.
OGBL/OC−983/CGA/ASFMPF/PTP/18/336

SHEET 1 OF 1 REV 6

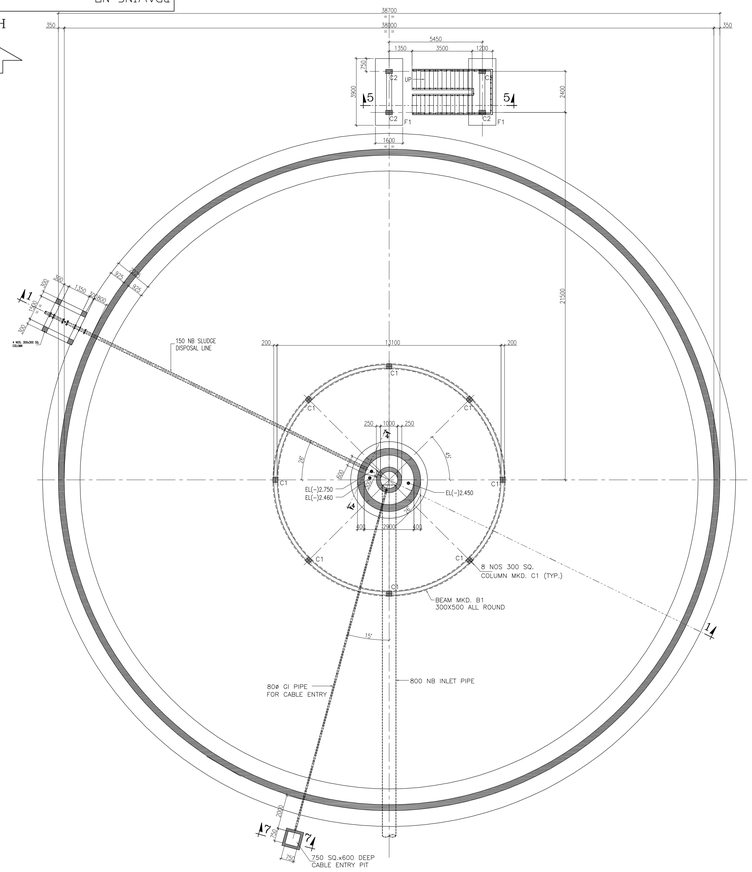
SIZE−A1

COPY RIGHT 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.

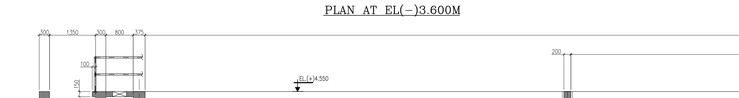
FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM

DRAWING NO. — CUSTOMER'S DRAWING NO.

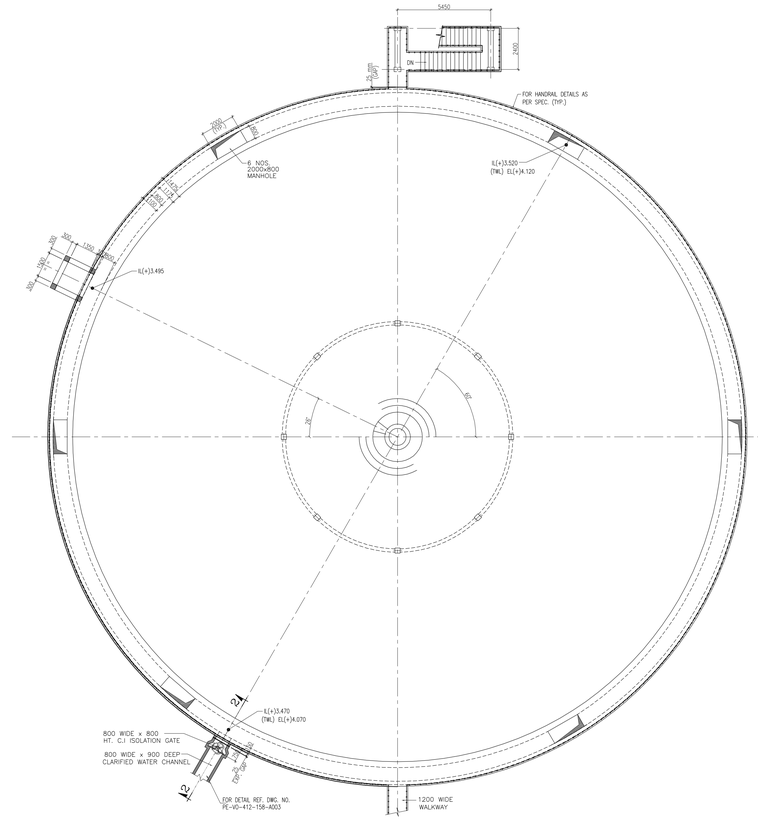
NORTH



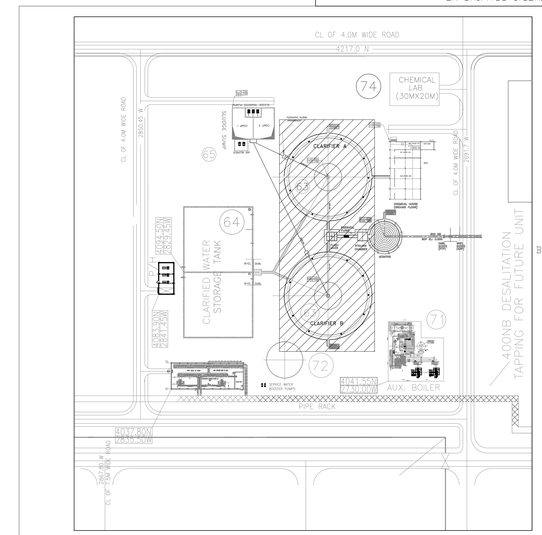
SECTION 1-1



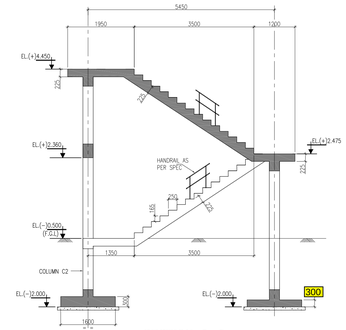
PLAN AT EL(-)3.600M



TOP PLAN AT EL(+)4.550M

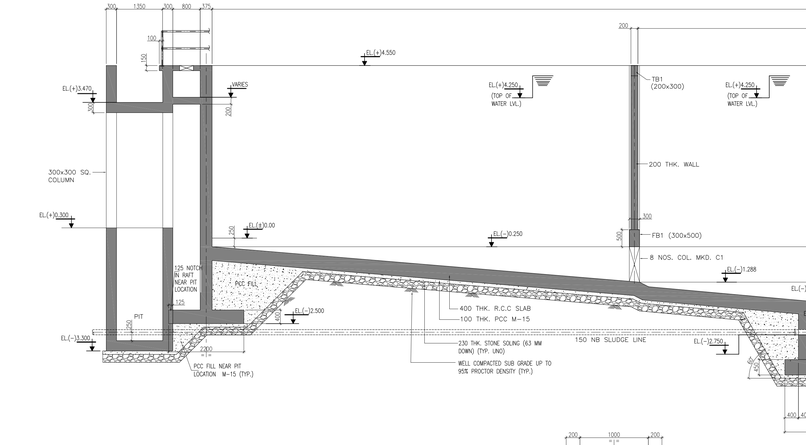


KEY PLAN

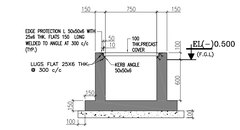


SECTION 5-5

1. Document approved based on compliance received.
2. CAT "A "Approval does not absolve the turnkey vendor of the responsibility of ensuring correctness, safety and functional requirements as per NIT.



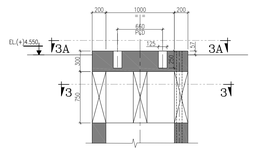
SECTION 1-1

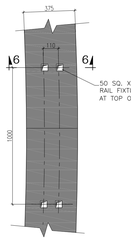


SECTION 7-7 (OA DETAIL)

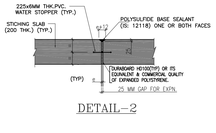
NOTES:-

1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METER UNLESS OTHERWISE STATED.
2. GRADE OF CONCRETE SHALL BE M35 FOR STRUCTURE IN DIRECT CONTACT TO SEA WATER AND M30 FOR OTHERS.
3. MINIMUM CEMENT CONTENT IN CONCRETE IS 400 KG./m3
4. ALL REINFORCEMENT STEEL SHALL BE FUSION BONDED EPOXY COATED TMT AND CONFIRMING TO IS:1786.
5. CLEAR COVER TO MAIN REINFORCEMENT FOR
   a) RAFT = 50 m.m, b) WALL = 30 m.m, c) FDN. BEAM = 50 m.m
   d) COLUMN = 40 m.m,
6. NET SAFE BEARING CAPACITY OF SOIL 7.0 T/m2 AT 2.0M BELOW G.L EXCEPT CLARIFIER PORTION. PRESSURE BELOW CLERIFIER PORTION CHECKED FOR 5t/m2
7. F.G.L (-) 0.5M CORRESPONDS TO RL (+) 9.5M
8. REF. IS CODES ARE IS:3370 (PART 1 TO PART 4) IS : 456, SP-16, NBC CODES, IS:1893, IS:875 AND HAND BOOK FOR WATER RETAINING STRUCTURES.
9. IN CASE ANY SOIL/LOOSE STRATUM IS ENCOUNTERED AT DESIRED FOUNDING LEVEL, THE SAME SHALL BE COMPLETELY REMOVED AND FILLED BACK WITH PCC OF GRADE M15 WITH 20MM DOWN GRADED AGGREGATES UP TO DESIRED FOUNDING LEVEL.
10. WATERPROOFING OF STRUCTURE SHALL BE AS PER CLAUSE 6.11.00 OF CIVIL SPECIFICATION.

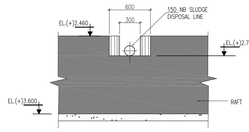




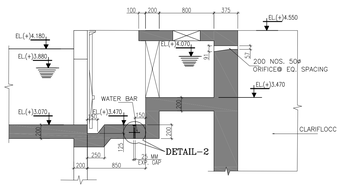
TYP DETAIL OF SQUARE BILLET FIXING ARRANGEMENT AT TOP OF CLARIFIER WALL



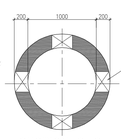
DETAIL-2



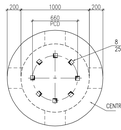
SECTION 4-4



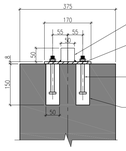
SECTION 2-2



SECTION 3-3



SECTION 3A-3A



SECTION 6-6

SR. NO.	DRAWING NO.	DRAWING TITLE
1	PE-VO-412-158-A008	MECH. GA FOR CASCADE AERATOR, STILLING CHAMBER, PLATE MIXER AND PADDEL FLASH FOR CLARIFIER AND CONNECTING CHANNEL
2	PE-VO-412-158-A030	MECH. GA FOR CLARIFIER
3	PE-VO-412-158-A060	CIVIL DESIGN CALCULATION FOR CASCADE AERATOR, STILLING CHAMBER, PLATE MIXER AND PADDEL FLASH FOR CLARIFIER
4	PE-VO-412-158-A065	CIVIL GA AND RC DETAILS FOR STILLING CHAMBER, CASCADE AERATOR, PLATE MIXER
5	PE-VO-412-158-A066	RC DETAILS OF CLARIFIER SUMP-I & II A1
6	PE-VO-412-158-A065	CIVIL GA AND RC DETAILS OF CLARIFLOCCULATOR OUTLET CHANNEL

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)

THIS DRAWING MARKED (✓) IS RELEASED FOR
- [x] COMMENTS/APPROVAL
- [ ] PLANNING/INFORMATION
- [ ] CONSTRUCTION

STAMP ALL PREVIOUS REVISION AS SUPERSEDED

ISSUED BY	
NAME	VIJAY KANDA
SIGNATURE	-sd-
DATE	12.04.2022

REV	DATE	ALTD	CHD		REV	DATE	ALTD	CHD

REV	DATE	ALTD	CHD	APPD
R5	12.04.22	FN	MI	VK

REVISED AS PER COMMENTS ON (R4)

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	11-06-19
	DESN	FAISAL N	FN	11-06-19
	CHD	MUAZZAM I	MI	11-06-19
	APPD	ASLAM A	AA	11-06-19

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

TITLE: CIVIL GA FOR CLARIFLOCCULATOR

BHEL DOC NO. PE-V0-412-158-A064

OGBL DOC NO. OGBL/OC-983/CGA/CLA/PTP/18/339

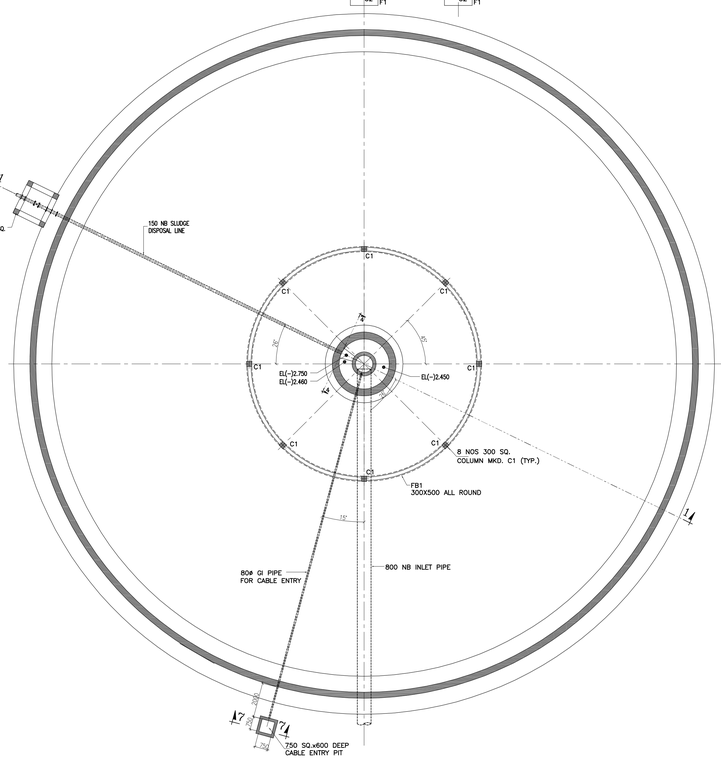
DEPT. | SIGN | DATE | SCALE: 1:130

SHEET 1 OF 2 | REV 05

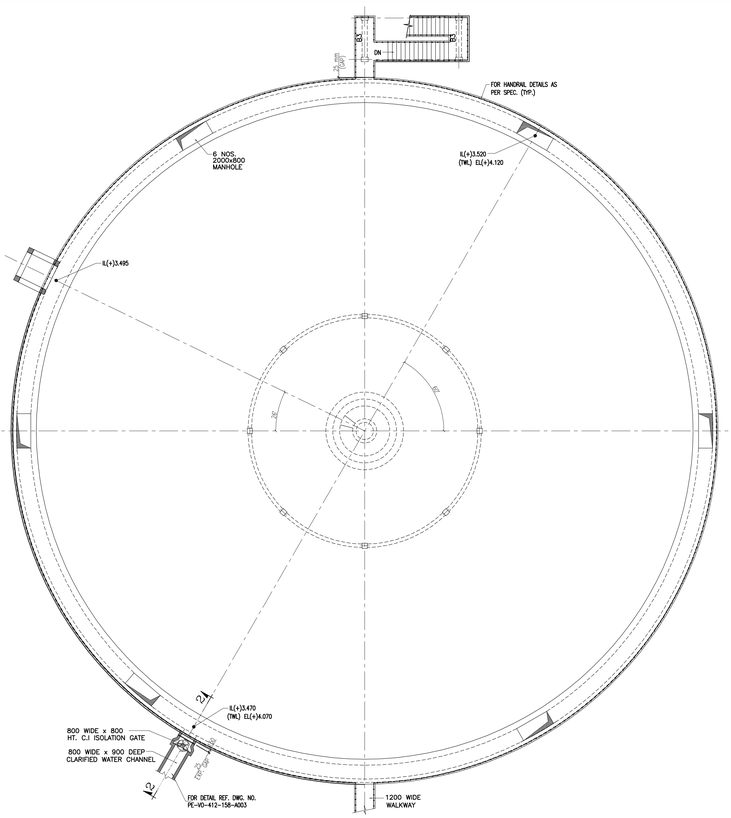
SIZE-A1

FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
DRAWING NO.
CUSTOMER'S DRAWING NO.
COPY RIGHT 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.

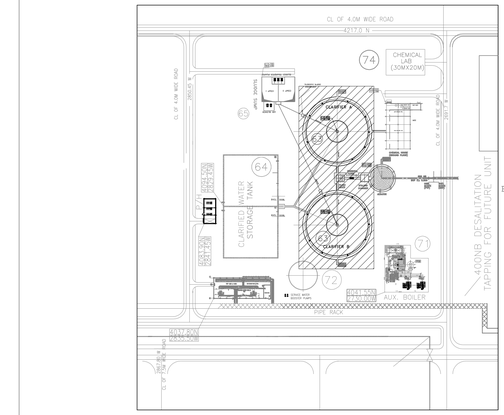
NORTH



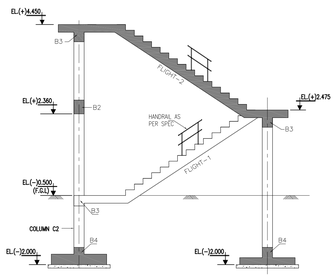
PLAN AT EL(−)3.600M



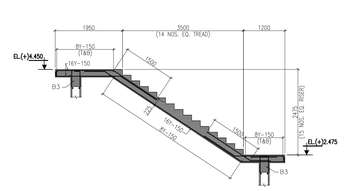
TOP PLAN AT EL(+)4.550M



KEY PLAN

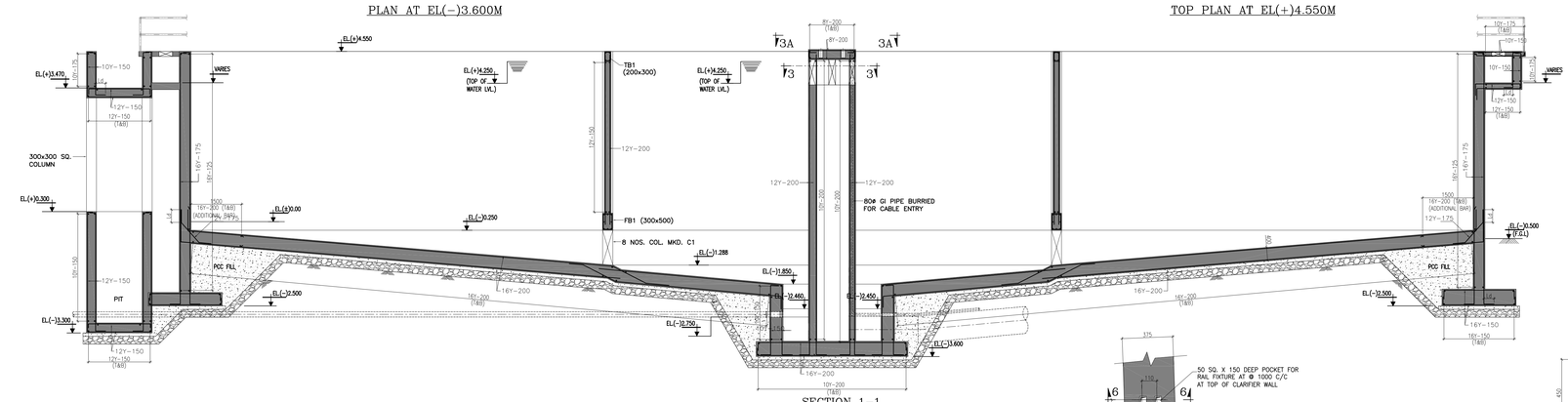


SECTION 5–5

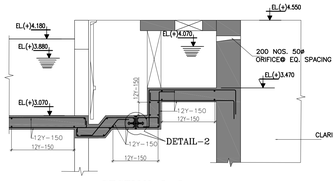


R/F DETAIL OF FLIGHT MKD. 2

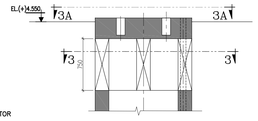
R/F DETAIL OF FLIGHT MKD. 1



SECTION 1–1

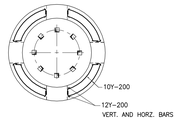


SECTION 2–2

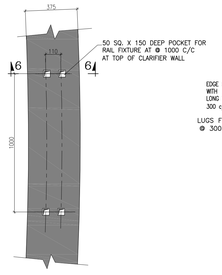


DETAIL–1

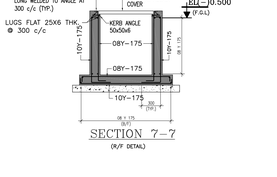
SECTION 3–3



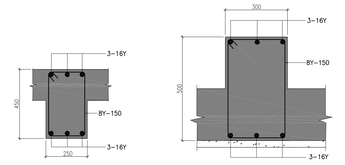
SECTION 3A–3A

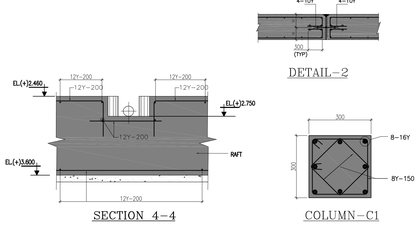


TYP DETAIL OF SQUARE BILLET FIXING ARRANGEMENT AT TOP OF CLARIFIER WALL



SECTION 7–7 (R/F DETAIL)

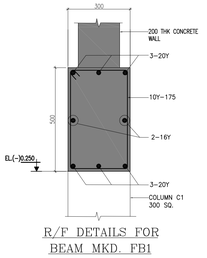




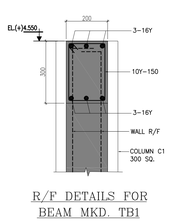
SECTION 4–4

COLUMN–C1

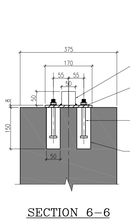
DETAIL–2



R/F DETAILS FOR BEAM MKD. FB1



R/F DETAILS FOR BEAM MKD. TB1



SECTION 6–6

NOTES:–

1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METER UNLESS OTHERWISE STATED.
2. GRADE OF CONCRETE SHALL BE M35 FOR STRUCTURE IN DIRECT CONTACT TO SEA WATER AND M30 FOR OTHERS.
3. MINIMUM CEMENT CONTENT IN CONCRETE IS 400 KG./m3
4. ALL REINFORCEMENT STEEL SHALL BE FUSION BONDED EPOXY COATED TMT AND CONFIRMING TO IS:1786.
5. CLEAR COVER TO MAIN REINFORCEMENT FOR
   a) RAFT = 50 m.m, b) WALL = 30 m.m, c) FDN. BEAM = 50 m.m
   d) COLUMN = 40 m.m,
6. NET SAFE BEARING CAPACITY OF SOIL 7.0 T/m2 AT 2.0M BELOW G.L EXCEPT CLARIFIER PORTION. PRESSURE BELOW CLARIFIER PORTION CHECKED FOR 5t/m2
7. F.G.L (–) 0.5M CORRESPONDS TO RL (+) 9.5M
8. REF. IS CODES ARE IS:3370 (PART 1 TO PART 4) IS : 456, SP–16, NBC CODES, IS:1893, IS:875 AND HAND BOOK FOR WATER RETAINING STRUCTURES.
9. IN CASE ANY SOIL/LOOSE STRATUM IS ENCOUNTERED AT DESIRED FOUNDING LEVEL, THE SAME SHALL BE COMPLETELY REMOVED AND FILLED BACK WITH PCC OF GRADE M15 WITH 20MM DOWN GRADED AGGREGATES UP TO DESIRED FOUNDING LEVEL.
10. WATERPROOFING OF STRUCTURE SHALL BE AS PER CLAUSE 6.11.00 OF CIVIL SPECIFICATION.

1. Document approved based on compliance received.
2. CAT "A "Approval does not absolve the turnkey vendor of the responsibility of ensuring correctness, safety and functional requirements as per NIT.

SER NO.	DRAWING NO.	DRAWING TITLE
1	PE-VO-412-158-A098	MECH. CL FOR CASCADE AERATOR, STILLING CHAMBER, PLAIN SCREEN AND PARSHALL FLUME FOR CLARIFIER AND CONNECTING CHANNEL
2	PE-VO-412-158-A099	MECH. CL FOR CLARIFIER
3	PE-VO-412-158-A060	CIVIL DESIGN CALCULATION FOR CASCADE AERATOR, STILLING CHAMBER, PLAIN SCREEN AND PARSHALL FLUME FOR CLARIFIER
4	PE-VO-412-158-A061	CIVIL GA, AND RC DETAILS FOR STILLING CHAMBER, PARSHALL FLUME AND PLAIN SCREEN
5	PE-VO-412-158-A064	CIVIL GA FOR CLARIFIER (SHEET 1 OF 2)
6	PE-VO-412-158-A065	CIVIL GA AND RC DETAILS OF CLARIFLOCCULATOR OUTLET CHANNEL

BHEL–PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED( ) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	VIJAY KANDA
SIGNATURE	–sd–
DATE	12.04.2022

REV	DATE	ALTD	CHD		REV	DATE	ALTD	CHD

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION

TO									
No.OFF									

REV	DATE	ALTD	CHD	APPD
R5	12.04.22	FN	MI	VK
	REVISED AS PER COMMENTS ON (R4)			

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT		NAME	SIGN	DATE
CODE	DRN	FAISAL N	FN	11–06–19
MAX	DESN	FAISAL N	FN	11–06–19
	CHD	MUAZZAM I	MI	11–06–19
	APPD	ASLAM A	AA	11–06–19

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

TITLE: R.C DETAIL FOR CLARIFLOCCULATOR

BHEL DOC NO. PE–V0–412–158–A064

DEPT. | SCALE: 1:130

SIGN

DATE

OGBL DOC NO. OGBL/OC–983/CGA/CLA/PTP/18/339

SHEET 2 OF 2 | REV 05

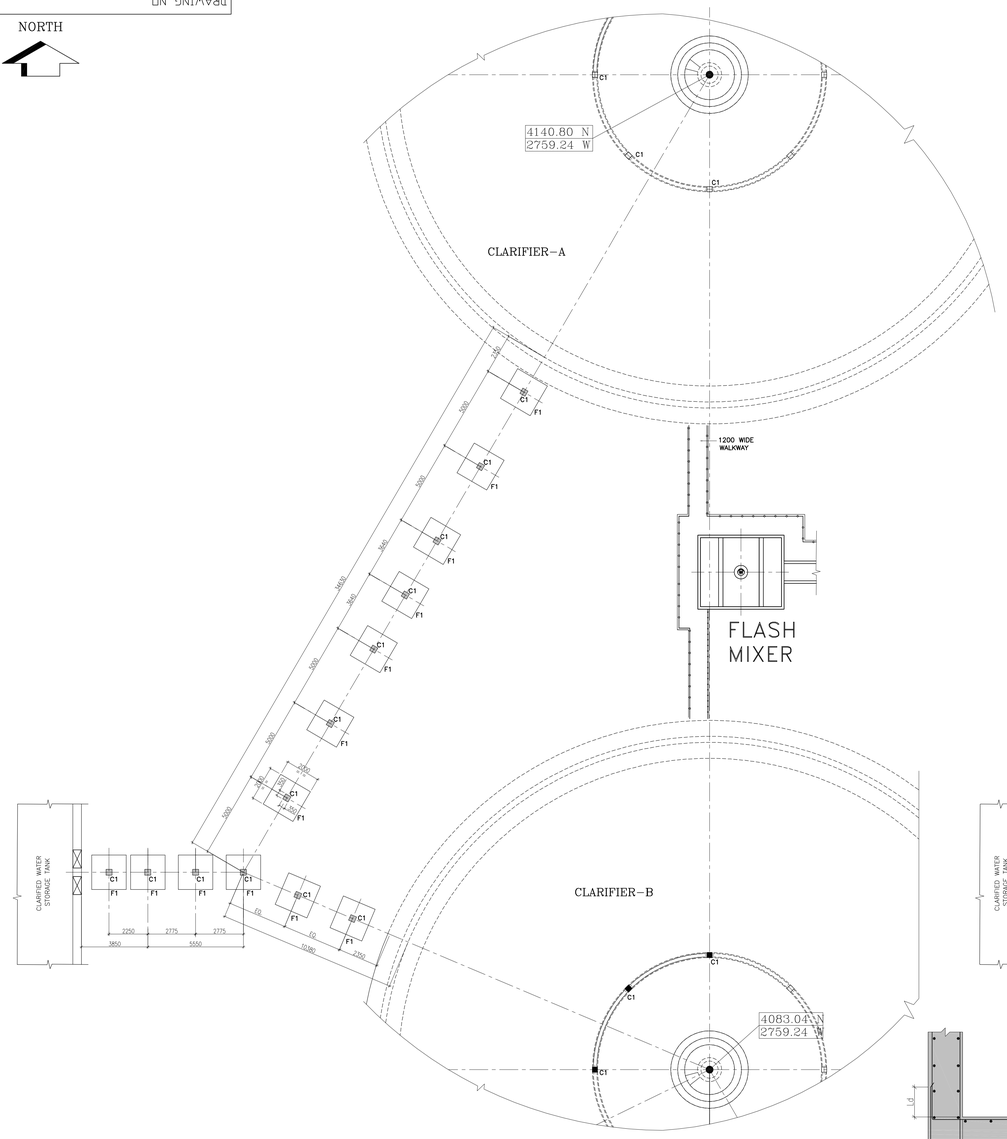
SIZE–A1

COPY RIGHT 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.

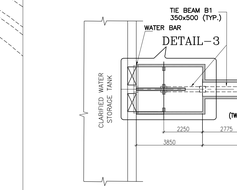
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM

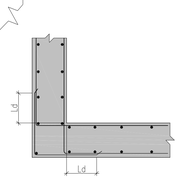
DRAWING NO. PE-V0-412-158-A065 | CUSTOMER'S DRAWING NO.

NORTH



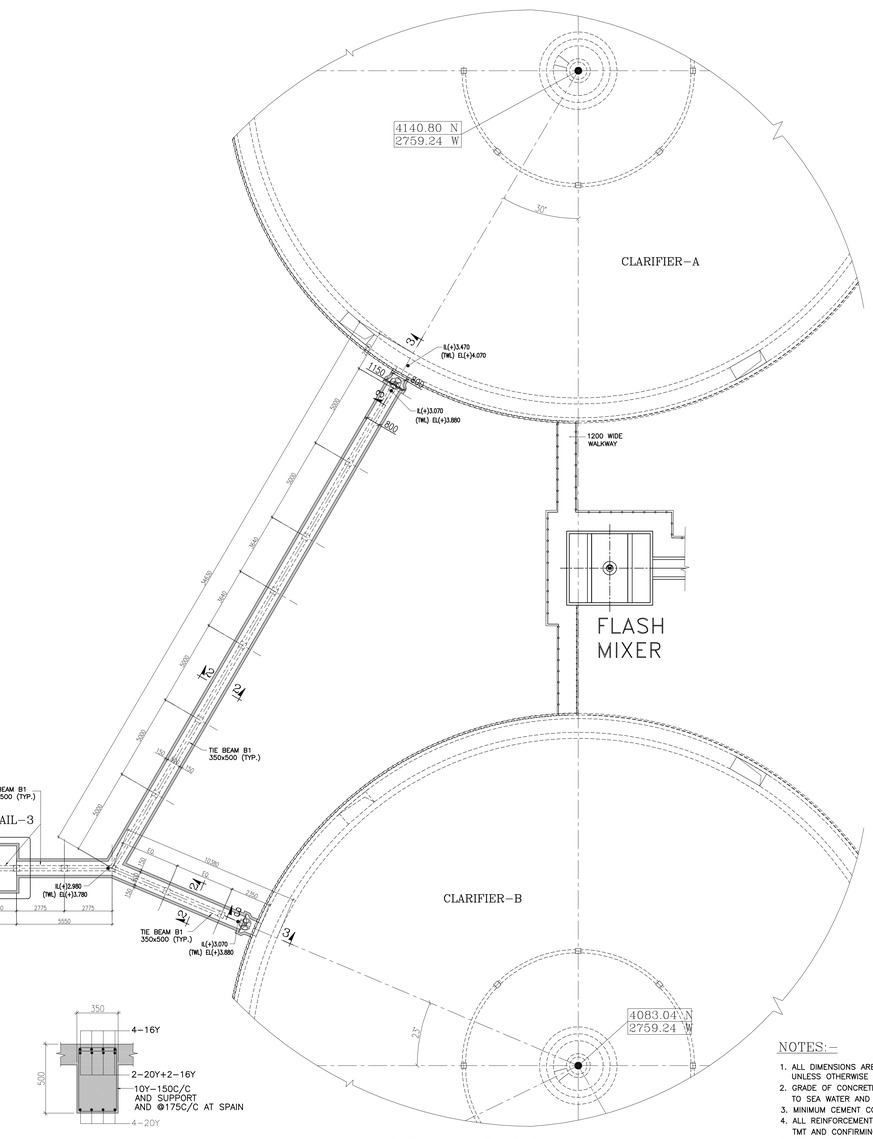
PLAN OF INTER CONNECTING CHANNEL
CLARIFLOCCULATOR TO CLARIFIRD WATER STORAGE TANK



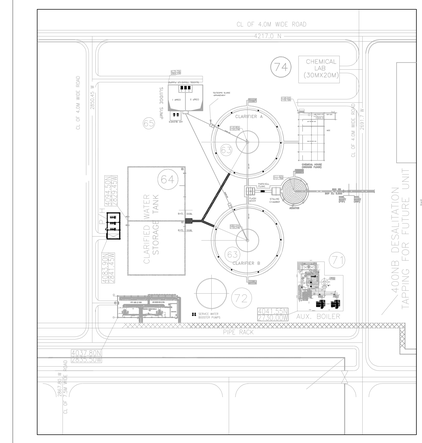


DETAIL–1

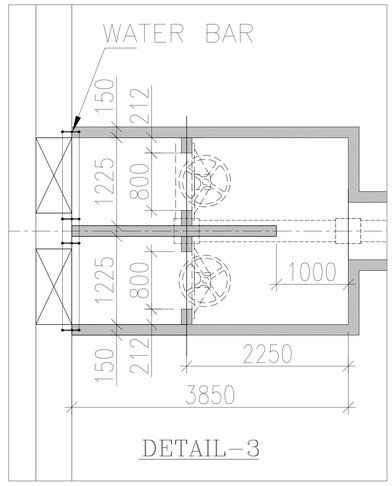
R/F DETAIL OF
BEAM MKD. B1



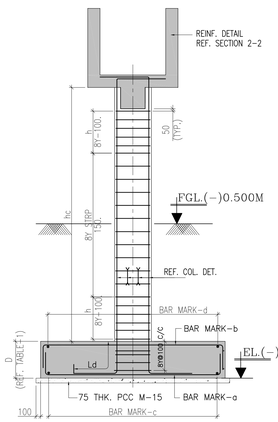
PLAN OF INTER CONNECTING CHANNEL
CLARIFLOCCULATOR TO CLARIFIRD WATER STORAGE TANK



KEY PLAN

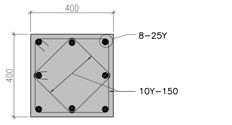


DETAIL–3

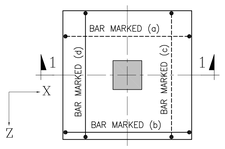


SECTION 1–1

h – SHALL NOT BE LESS THAN:–
1 – LARGER LATERAL DIMENSION OF COLUMN
2 – 1/6 OF hc
3 – 450mm

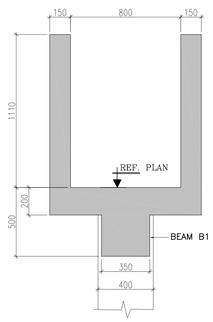


COLUMN–C1

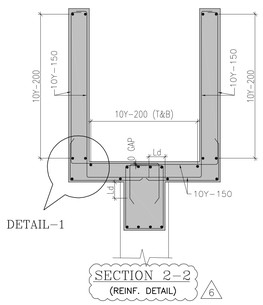


TYP. DETAIL OF FOOTING
(FOR COLUMN ORIENTATION REFER PLAN)

TOP REINF.
BOTT. REINF

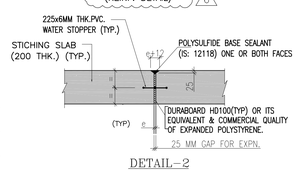


SECTION 2–2
(GA DETAIL)

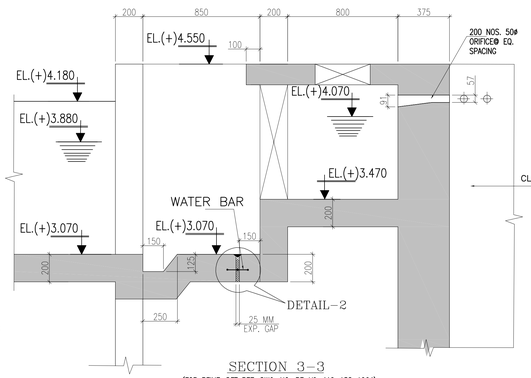


DETAIL–1

SECTION 2–2
(REINF. DETAIL)



DETAIL–2



DETAIL–2

SECTION 3–3
(FOR REINF. DET REF. DWG. NO. PE-V0-412-158-A064)

(TABLE–1) SCHEDULE OF FOUNDATION REINFORCEMENT

Group Marked	Lx	Lz	DEPTH (D)	Along Z–Z		Along X–X	
	mm	mm	mm	BOTTOM(c)	TOP(d)	BOTTOM(a)	TOP(b)
F1	2000	2000	300	12Y–200	10Y–100	12Y–200	10Y–100

NOTES:–

1. ALL DIMENSIONS ARE IN m.m & LEVELS ARE IN METER UNLESS OTHERWISE STATED.
2. GRADE OF CONCRETE SHALL BE M35 FOR STRUCTURE IN DIRECT CONTACT TO SEA WATER AND M30 FOR OTHERS.
3. MINIMUM CEMENT CONTENT IN CONCRETE IS 400 KG./m3
4. ALL REINFORCEMENT STEEL SHALL BE FUSION BONDED EPOXY COATED TMT AND CONFIRMING TO IS:1786.
5. CLEAR COVER TO MAIN REINFORCEMENT FOR
   a) RAFT = 50 m.m, b) WALL = 30 m.m, c) FDN. BEAM = 50 m.m
   d) COLUMN = 40 m.m,
6. NET SAFE BEARING CAPACITY OF SOIL 7.0 T/m2 AT 2.50M.
7. F.G.L (–) 0.5M CORRESPONDS TO RL (+) 9.5M
8. REF. IS CODES ARE IS:3370 (PART 1 TO PART 4) IS : 456, SP–16, NBC CODES, IS:1893, IS:875 AND HAND BOOK FOR WATER RETAINING STRUCTURES.
9. IN CASE ANY SOIL/LOOSE STRATUM IS ENCOUNTERED AT DESIRED FOUNDING LEVEL, THE SAME SHALL BE COMPLETELY REMOVED AND FILLED BACK WITH PCC OF GRADE M15 WITH 20MM DOWN GRADED AGGREGATES UP TO DESIRED FOUNDING LEVEL.
10. WATERPROOFING OF STRUCTURE SHALL BE AS PER CLAUSE 6.11.00 OF CIVIL SPECIFICATION.
11. THIS DRAWING IS PREPARED BASED ON HYDRAULIC FLOW DIAGRAM (BHEL DRG. NO. PE–V0–412–158–A003)
12. FOR SIZING & LOCATION OF GATES/VALVES PL. REFER P&ID. OF PRE–TREATMENT PLANT (BHEL DRG. NO. PE–V0–412–158–A001)

FOUNDATION SHALL BE CASTED AFTER COMPLETION OF GROUND IMPROVEMENT

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO

No.OFF	REV	DATE	ALTD	CHD	APPD
1.	06	29.07.22	MUAZZAM I	MUAZZAM	ASLAM A

1. DRAWING REVISED AS PER M/s TANGECO AND M/s DESEIN COMMENTS AND MKD. AS 6

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

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	11–06–19
	DESN	FAISAL N	FN	11–06–19
	CHD	MUAZZAM I	MI	11–06–19
	APPD	ASLAM A	AA	11–06–19

BHEL LOA NO: BHEL LOA NO: PW/PE/PG/EN1/P–310/17
BHEL DOC NO. PE–V0–412–158–A065

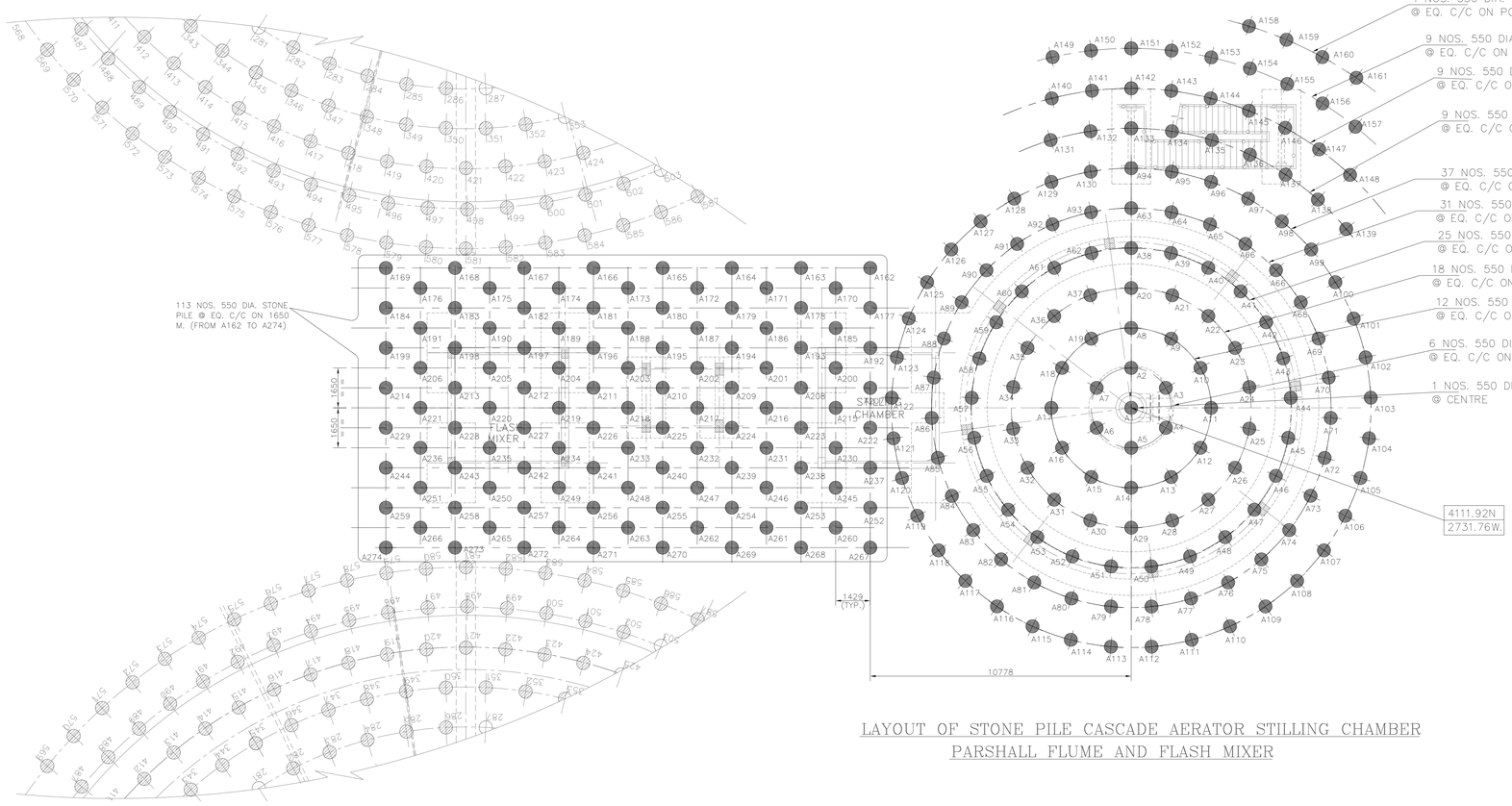
TITLE CIVIL GA & RC DETAIL OF CLARIFLOCCULATOR OUTLET CHANNELS

DEPT. | SCALE: 1:130 | OGBL DOC NO. OGBL/OC–983/CGA/CLA/PTP/18/339
SIGN
DATE
SHEET 1 OF 1 | REV 06

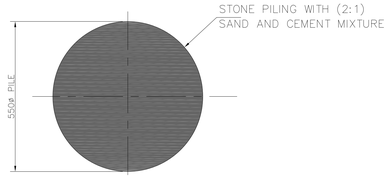
SIZE–A1

COPY RIGHT 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 interests of the Company

NORTH

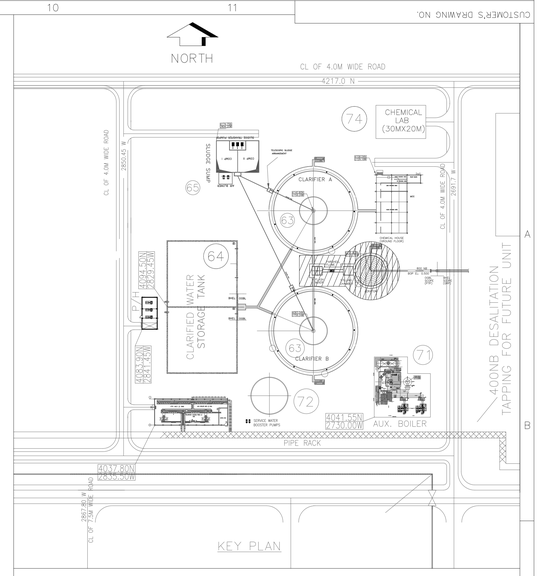


LAYOUT OF STONE PILE CASCADE AERATOR STILLING CHAMBER PARSHALL FLUME AND FLASH MIXER



SECTION 1–1
STONE PILING

NORTH



NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS NOTE OTHERWISE.
2. EL(+)0.00 CORRESPONDS TO RL.(+) 10.000 M.
3. FGL IS EL(–)0.500 M.
4. GROUND IMPROVEMENT SHALL BE DONE BY PROVIDING AND INSTALLING 550 MM DIAMETER DRIVEN CAST– IN–SITU COMPACTION PILE OF 11.0 M LENGTH
5. FILL MATERIAL FOR COMPACTION PILE SHALL BE 1 SAND : 2 STONE AGGREGATES. THE FILLING WITH COMPACTION SHALL BE DONE AS PER SPECIFICATION UP TO FGL/EGL.
6. COMPACTION PILE SHALL BE INSTALLED AS PER SPECIFICATION.
7. THIS DRAWING IS MEANT FOR GROUND IMPROVEMENT WORKS ONLY.

LEGENDS:

– 550 DIA DRIVEN CAST–IN–SITU COMPACTION PILE
FGL – FINISHED GROUND LEVEL

REFRENCE DRAWINGS:

1. PE–V0–412–158–A002 LAYOUT FOR PT PLANT
2. PE–V0–412–158–A028 MECH. GA FOR CASCADE AERATOR, STILLING CHAMBER, FLASH MIXER AND PARSHALL FLUME FOR STP
3. PE–V0–412–158–A030 MECH. GA FOR CLARIFIER
4. PE–V0–412–158–A068 GROUND IMPROVEMENT OF CLARIFIER–PTP

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

REV	DATE	ALTD	CHD	APPD

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

		NAME	SIGN	DATE
DEPT CODE	DRN			18.03.19
MAX	DESN			18.03.19
	CHD			18.03.19
	APPD			18.03.19

BHEL LOA NO: PW/PE/PG/EN1/P–310/17

BHEL DOC NO.
PE–V0–412–158–A067

TITLE GROUND IMPROVEMENT OF CASCADE AERATOR, STILLING CHAMBER, PARSHALL FLUME AND FLASH MIXER

DEPT. SCALE: –1:130
SIGN
DATE

OGBL DOC NO.
OGBL/OC–983/RD/CLA/PTP/18/340A

SHEET 1 OF 1 REV 00

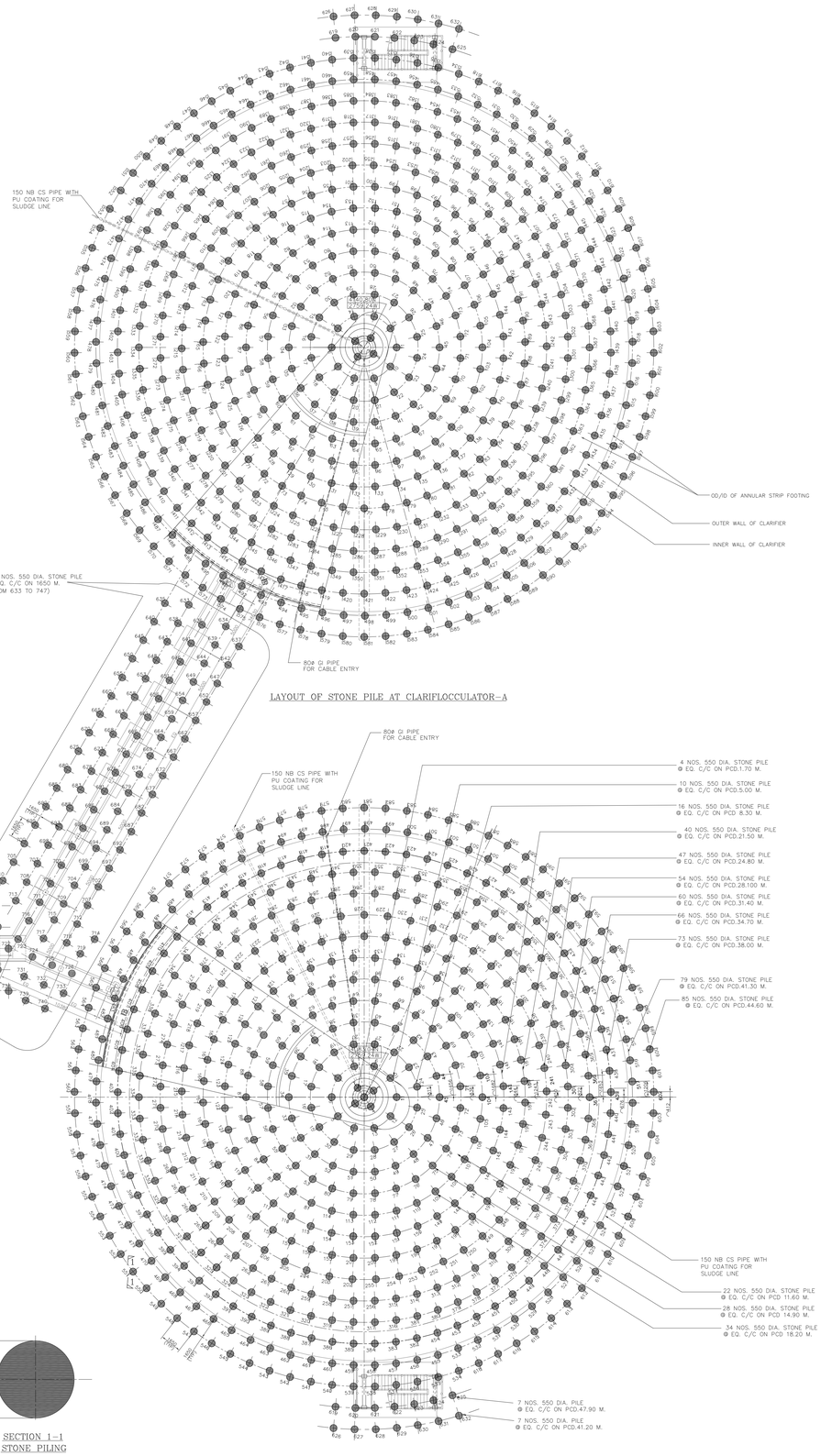
SIZE–A1

COPY RIGHT 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

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM

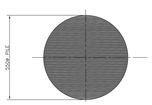
DRAWING NO. | CUSTOMER'S DRAWING NO.

NORTH

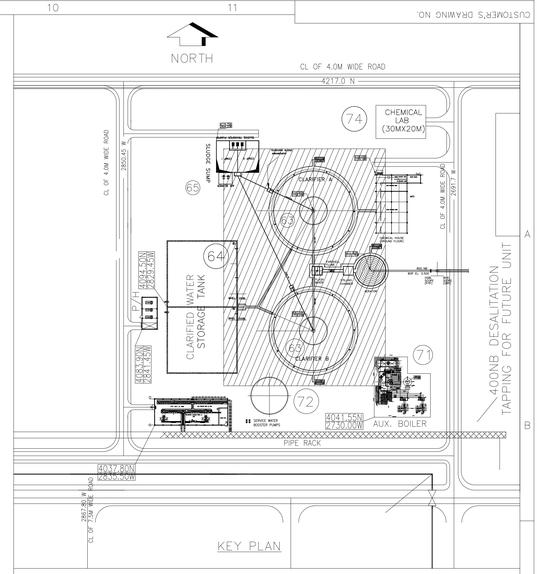


LAYOUT OF STONE PILE AT CLARIFLOCCULATOR-A

LAYOUT OF STONE PILE AT CLARIFLOCCULATOR-B



SECTION 1-1
STONE PILING



NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS NOTE OTHERWISE.
2. EL(+)0.00 CORRESPONDS TO RL.(+) 10.000 M.
3. FGL IS EL(-)0.500 M.
4. GROUND IMPROVEMENT SHALL BE DONE BY PROVIDING AND INSTALLING 550 MM DIAMETER DRIVEN CAST- IN-SITU COMPACTION PILE OF 11.0 M LENGTH
5. FILL MATERIAL FOR COMPACTION PILE SHALL BE 1 SAND : 2 STONE AGGREGATES. THE FILLING WITH COMPACTION SHALL BE DONE AS PER SPECIFICATION UP TO FGL/EGL.
6. COMPACTION PILE SHALL BE INSTALLED AS PER SPECIFICATION.
7. THIS DRAWING IS MEANT FOR GROUND IMPROVEMENT WORKS ONLY.

LEGENDS:

-- 550 DIA DRIVEN CAST-IN-SITU COMPACTION PILE

FGL - FINISHED GROUND LEVEL

REFRENCE DRAWINGS:

1. PE-V0-412-158-A002 LAYOUT FOR PT PLANT
2. PE-V0-412-158-A030 MECH. GA FOR CLARIFIER

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

	DEPT	NAME	SIGN	DATE
MAX	CODE DRN			12.03.19
	DESN			12.03.19
	CHD			12.03.19
	APPD			12.03.19

JOB NO. 412
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

REV	DATE	ALTD	CHD	APPD

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

TITLE: GROUND IMPROVEMENT OF CLARIFIER-PTP

BHEL DOC NO. PE-V0-412-158-A068

DEPT. | SCALE: -1:130 | OGBL DOC NO. OGBL/OC-983/RD/CLA/PTP/18/340

SIGN | DATE

SHEET 1 OF 1 | REV 01

SIZE-A1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:	REV	DATE	ALTERED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

CIVIL DESIGN CALCULATION FOR SLUDGE SUMP

	NAME	SIGN	DATE
PREP	BILAL S	BS	27-08-19
CHKD	MUAZZAM I	MI	27-08-19
APPD	ASLAM A	AA	27-08-19

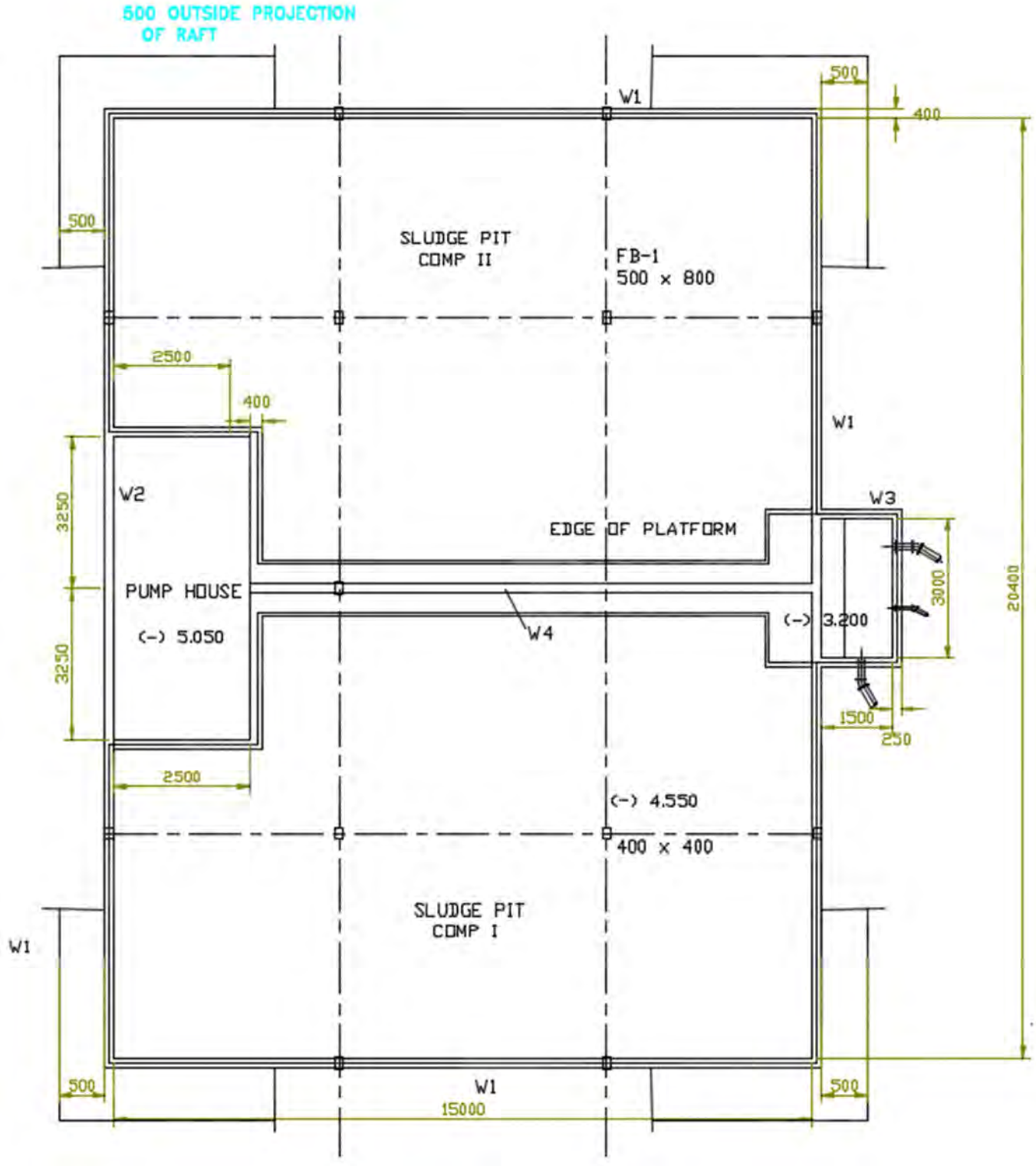
BHEL LOA NO: PW/PE/PG/EN1/P-310/17 DTD. 18.01.2018

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A075	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/CDC/SS/PTP/18/342	01
DATE								NO. OF SHEETS 18 EXCLUDING COVER PAGE	

TABLE OF CONTENTS

Sr. No	Description	Page No
1	Input Mechanical Sludge Sump Drawing	2
2	Design of Wall W1,W2	3
3	Design of Beam WBF	6
4	Design of Wall W3	9
5	Design of Walkway Above Sump Wall	12
6	Design of Raft	13
7	Design of Raft Panel Interior	14
8	Design of foundation beam FB1	14
9	Design of Pump Supporting Slab above sludge sump	15
10	Calculation for crack width for Sludge Sump Wall	16
11	Check for uplift at Sludge Sump	19

1) Input Mechanical Sludge Sump Drawing



ht of Wall W_2 From Top of Wall = 4.75^M
ht of Wall W_1 From Top of Wall = 4.25^M
ht of Wall W_3 From Top of Wall = 2.90^M

2) Design of Wall W_1/W_2

Considering earth pressure from outside, inside of sump is empty:-

γ = 1.8T/m^3 (DE unity of soil)

γw = 1.0T/m^3 unit will of water

Φ = 30° (Angle of internal friction of soil)

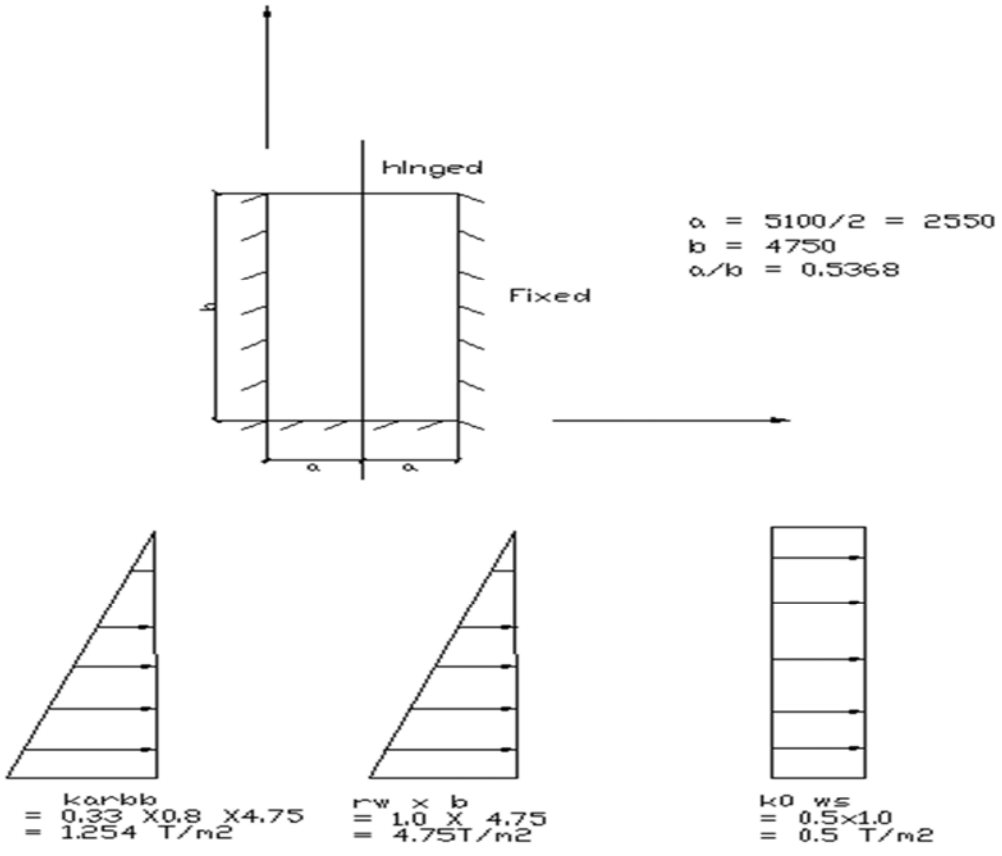
Ka = 1-Sin Φ/ 1+ Sin Φ = 0.33

γb = Submerged density of soil ² (1.8-1.0) = 0.8T/M^3

Ws Ξ Surcharge bond beside wall = 1.0 T / m^2

Ko = 0.50 (Coeff of earth pressure at rest)

Max ^{m} Pannel size of Wall ^{2} (5100 x 4750)
((2a) x b)



Horizontal moment

a) For triangular loading

Max^{m} (-ve) B.M = 0.0119 pb^2

= 0.0119 (1.254 + 4.75) x $(4.75)^2$ (-)

= 1.612T-m/m

b) For Rectangular Loading

Max(-ve) B.M = 0.0266 x 0.5 x $(4.75)^2$ = (-) 0.3008 T-m/m

c) for max$^{m\ (+)}$ ve triangular loading

Max^{m} B.M = (+) 0.0247 (1.254 + 4.75) x $(4.75)^2$ (+) = 3.345 T-m/m

d) for Max^{m} B.M (+) > 0.0574 x 0.50 x $(4.75)^2$ (+) = 0.648 T-m/m

Vertical moment:-

a) Max ^{m} (-ve) B.M for Triangular loading

= (-) 0.0120 x (1.254+4.75) x $(4.75)^2$ = 1.625 T-m/m

b) Max ^{m} (-) ve B.M for Rectangular loading = 0.0228 x 0.5 x $(4.75)^2$ (-) = 0.257 T-m/m

c) Max^{m} (+) ve B.M for triangular loading = (+) 0.0014x(1.254 + 4.75) x $(4.75)^2$ = 0.189 T-m/m

d) Maxm (+) ve B.M for rectangular (+) Loading = 0.0117x 0.50 x $(4.75)^2$ = 0.132 T-m/m

Horizontal moment:-

a) for Max^{m} (-ve) B.M (Triangular + Rectangular) Loading

= (1.612+0.3008 = 1.9128 T-m/m

b) for Maxm (+) B.M (Triangular + rectangular Loading) = (+) ve (3.345+0.648) = 3.993 T-m/m

Vertical moment:-

for Max^{m} (-ve) B.M (Triangular + Rectangular) Loading = (-) ve 1.625+0.257 = 1.882 T-m/m

for Max^{m} (+) ve B.M (Triangular + Rectangular Loading)

= (+) (0.189 + 0.132) = <u>0.321</u> T-m/m

Max^{m} B.M (+) B.M Tension untried = 3.993 T-m/m

Members in bending (Unreached Condition) Coefficient for banked sachem (Ase=0)

$\underline{M}$= 3.536Kg.cm^2 (Table 2.5 for water retaining structure Handbook)

bd^2

d (overall depth) = SQRT($\underline{3.993x10^5}$/100 x 3.536)

= 33.604 Cm

Provide d = 400 mm > 336 mm

d_1 = 400-30-6 = 364 mm

d_1/d = k = 0.91

Tension due to bending (σct)

$$= \frac{3.993 \times 10^5}{{}^1/_6 \text{X}100\text{x}40^2}$$

= 14.97Kg/cm^2 < 20Kg/cm^2

(for M-30)

Ref Table 2.1

of Water retaining Hand Book

or IS:3370 (Part-2)

Horizontal Reference at outer fare of wall (horizontally)

$$\underline{= 3.993 \times 10^5}$$

0.86 X 1500 X 36.4 = 8.45Cm$^{2/}$m

Provide 12Re 130C/C at Outer fare of wall horizontally.

Vertical reinforcement at outer fare of wall = $\underline{1.882 \times 10^5}$ = 3.984 Cm^2/m

0.86 x 1500 x 36.4

Provide 1.2 TOR C 200^c/C at Outer face of wall Vertically (5.69Cm^2/m)

Horizontal enforcement at inner face of wall

$$>\underline{1.9128 \times 10^5} = 4.074\text{Cm}^{2/}\text{m}$$

0.86 x 1500 x 36.4

Provide 12 OR C 200^c/C Horizontally

Vertical reinforcement at inner face of wall

$$\underline{= 0.321 \times 10^5} = 0.684\text{Cm}^2/\text{m}$$

0.86 x 1500 x 36.4

Min^{m} reinforcement

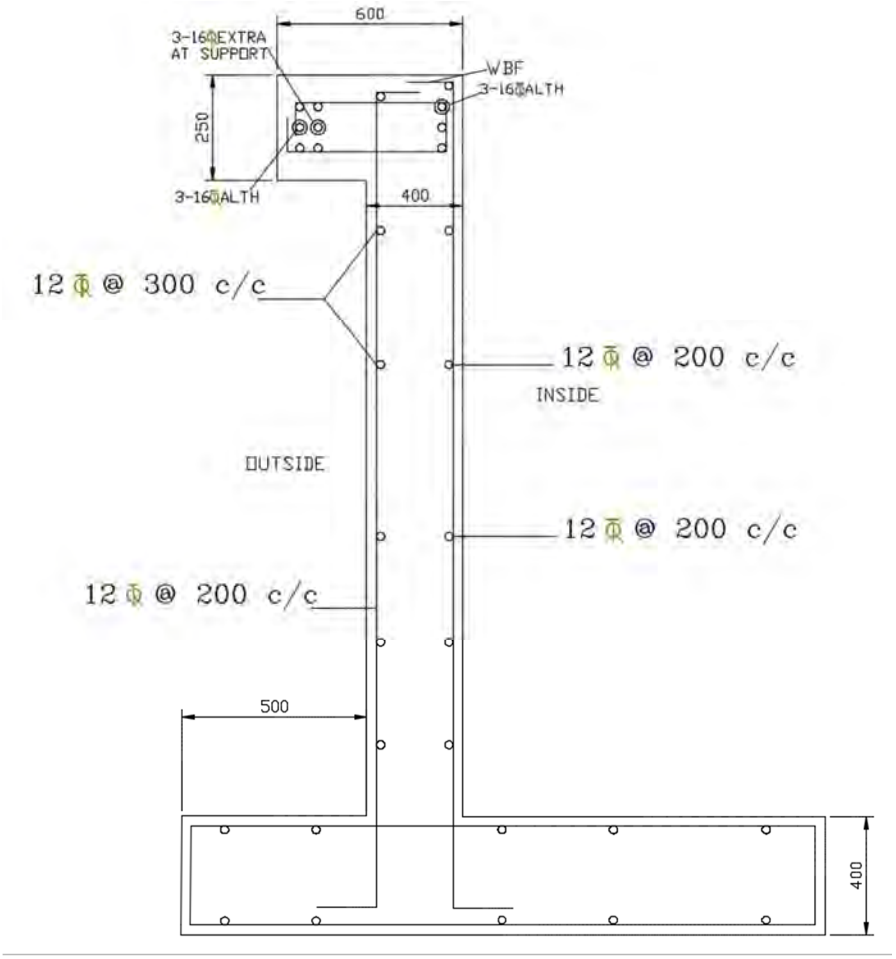
= 0.30 – (0.3-0.2) x (450-400) = 0.285%

(450 – 100)

Area of steel reqd = 0.285 X100 x 40 = 11.4Cm^2/m in each of the either direction

100

Provide 1.2 R @ 200C/C vertically at inner face of wall.



3) Design of Beam (WBF)

(500 x 250)

W.d.l on beam i.e. Max^{m} Reaction at the top of wall due to triangular load and rectangular Load = pl X Coff

= (1.254 + 4.75) X 4.75 X 0.1066

= 3.04T/m + 0.2503 X 0.50 X 4.75 = 3.63T/^{m}

Span = 5.1 m

Max^{m} meant = $\frac{1}{10}$ X 363 X $(5.1)^2$ = 9.44 T^{m}

Deff = 600-30 – 6 = 564 mm

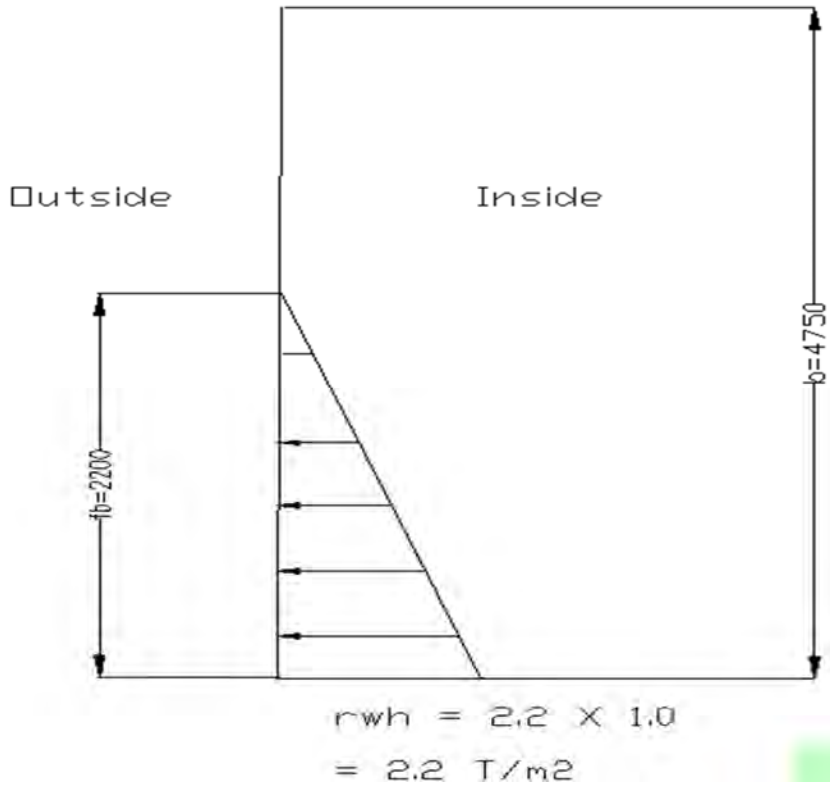
Ast Read = $\frac{9.44 \text{ X } 10^5}{0.86 \text{ X } 1500 \text{ X } 46.4}$ = 12.89 Cm^2

Provide 10 Re
150c/c Stirrups
(3-16TOR alth +3-20TOR extra) at Outer face of beam and 3-16 alth at inside of Beam.

Water pressure acting from inside the wall on, earth pr from outside:-

a = 5100/2 = 2550; b = 4750

a/b = $\frac{2550}{4750}$ =0.5368



Horizontal Moment

Max^{m} (+) ve B.M
= 0.0165 x 2.2 X $(4.75)^2$ = 0.819 T-m/m

Max^{m} (-ve) B.M
= 0.0072 x 2.2 x $(4.75)^2$ = 0.357 T-m/m

Vertical Moment:-

Max^{m} (+) ve B.M = 0.0236 x 2.2 x $(4.75)^2$ = 1.171 T-m/m

Max^{m} (-)ve B.M = 0.0075 X 2.2 X $(4.75)^2$ = 0.3722 T-m/m

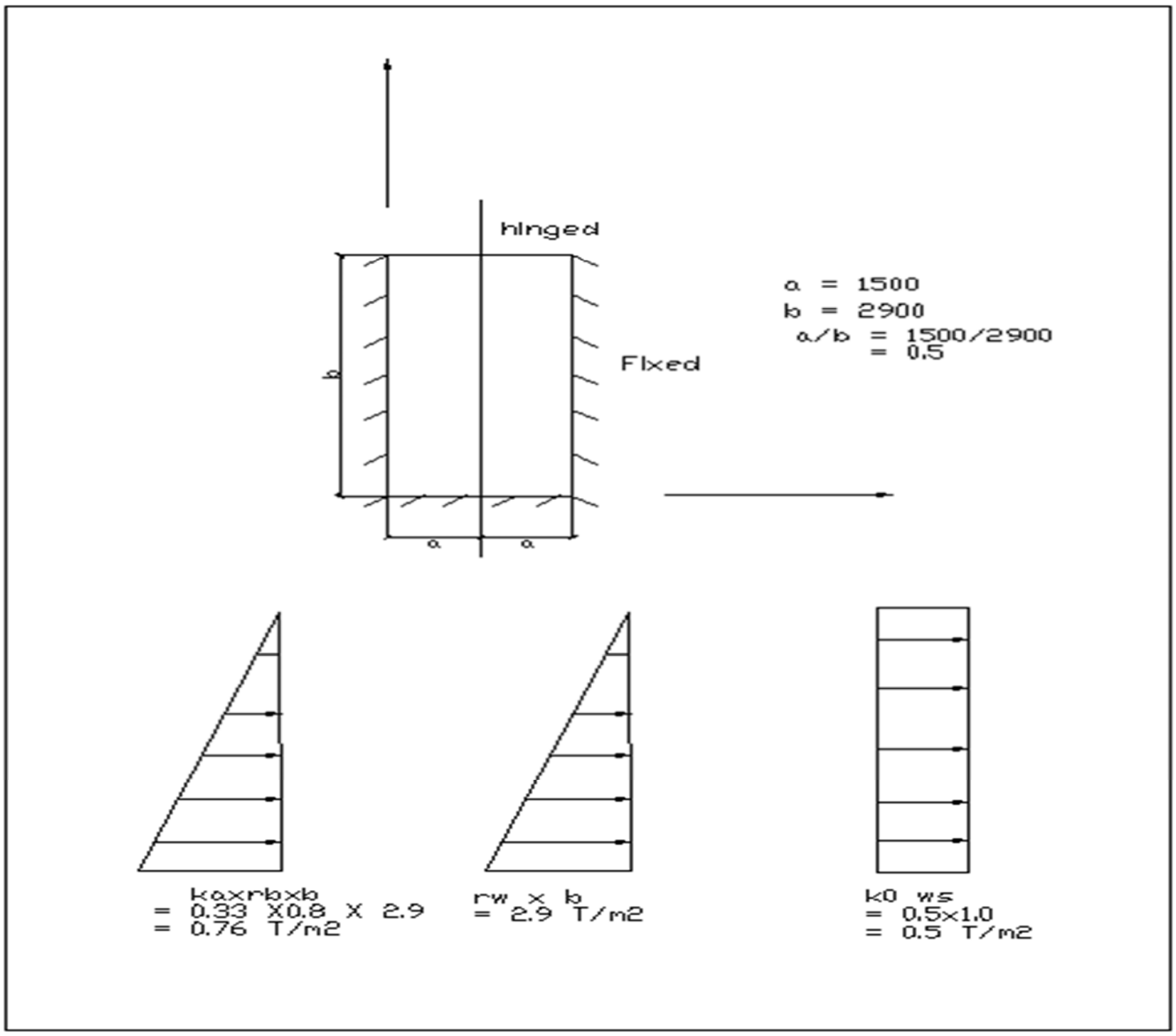
Deff = 364^{mm}
D = 400^{mm}

$$\frac{= 1.171 \times 10^5}{0.56 \times 1500 \times 364} = 2.493 \text{ Cm}^2/\text{m}$$

Provide 12Re 200^{c}/c Vertically at Inside face of wall
Provide 12Re 200^{c}/c horizontally at Inside face also

4) Design of wall w3 (300thk)

Earth Pressure from Outside , Inside is empty.



Horizontal Moment:-

a) For triangular loading Max^{m} (-ve)B.M

$= 0.0119\ pb^2$

$= 0.0119 \times (0.76 + 2.9) \times (2.9)^2$

$= 0.366$ T-m/m

b) For rectangular loading = 0.0266 x (9.30) x $(2.9)^2$
Max^m (-ve) B.M = 0.1118 T-m/m

c) For Max^m (+) ve B.M
(Triangular Loading) = 0.0247 x (0.76 + 2.9) x $(2.9)^2$ = 0.760 T-m/m

d) For Max^m (+) B.M (Rectangular loading)
= 0.0574 x 0.50 x $(2.9)^2$ = 0.241 T-m/m

Vertical Moment:-

a) Max^m (-ve) B.M for triangular Loading
= (-) 0.0120 x (0.76 + 2.9) x $(2.9)^2$ = 0.369 T-m/m

b) Max^m (-ve) B.M for rectangular loading = 0.0228 x 0.5 x $(2.9)^2$ = 0.096 T-m/m

c) Max^m (+) B.M for triangular loading
= (+) 0.0014 x (0.76 + 2.9) x $(2.9)^2$ = 0.043 T-m/m

d) Max^m (+) ve B.M for rectangular
Loading = 0.0117 x 0.50 x $(2.9)^2$ = 0.049 T-m/m

Horizontal Moment:-

a) For max^m (-ve) B.M (Triangular + rectangular loading) Total
= 0.3.66 + 0.0118) T-m/m = 0.478 T-m/m

b) For Max^m (+) B.M = (0.760 + 0.241)
= 1.001 T-m/m

Vertical Moment:-

a) Max^m (-ve) B.M Total = (0.369 + 0.096)
= 0.465 T-m/m

b) Max (+) B.M Total = (0.043 + 0.049)
= 0.092 T-m/m

Max^m Moment = 1.001 $T^m/^m$

K=0.90; $\frac{M^u}{Bd^r}$ = 3.536 Kg/cm^2

d(overall depth) = SQRT(1.001 x 10^5 /3.536 x 100)
=16.02 cm

Provide d = 250 mm > 168.2 mm
d1 = 250-30-5 = 215 mm
$\frac{d1}{}$= 0.86 = 0.90

Tender stress due to Bending (σct)

$= \frac{1.001 \times 1.05}{1/6 \times 100 \times (25)^2}$ = 9.601 Kg/cm^2 < 20Kg/cm^2

Horizontal reinforcement at outer face of wall

$= \frac{1.001 \times 105}{0.86 \times 1500 \times 21.5}$ = 3.589Cm^2/m Provide 10 Re 150^c/^{c} at outer face of wall horizontally

Vertical reinforcement at outer face of wall = $\frac{0.465 \times 10^5}{0.86 \times 1750 \times 21.5}$ = 1.634Cm^2/m

Provide 10 Re 200^c/^{c} Vertically at outer face of wall

Horizontal reinf. at inner fare of wall

$= \frac{0.478 \times 105}{0.86 \times 1500 \times 21.5}$ = 1.723Cm/m

Provide 10Rc 200^c/^{c} horizontally at inner fare of wall

Provide 10 Re 200^c/^{c} vertically at inner face of wall (3.95 Cm^2/m)

Min Ast = 0.30 – $\frac{(0.30 – 0.20)}{(450 – 100)}$ = 150 = 0.757%

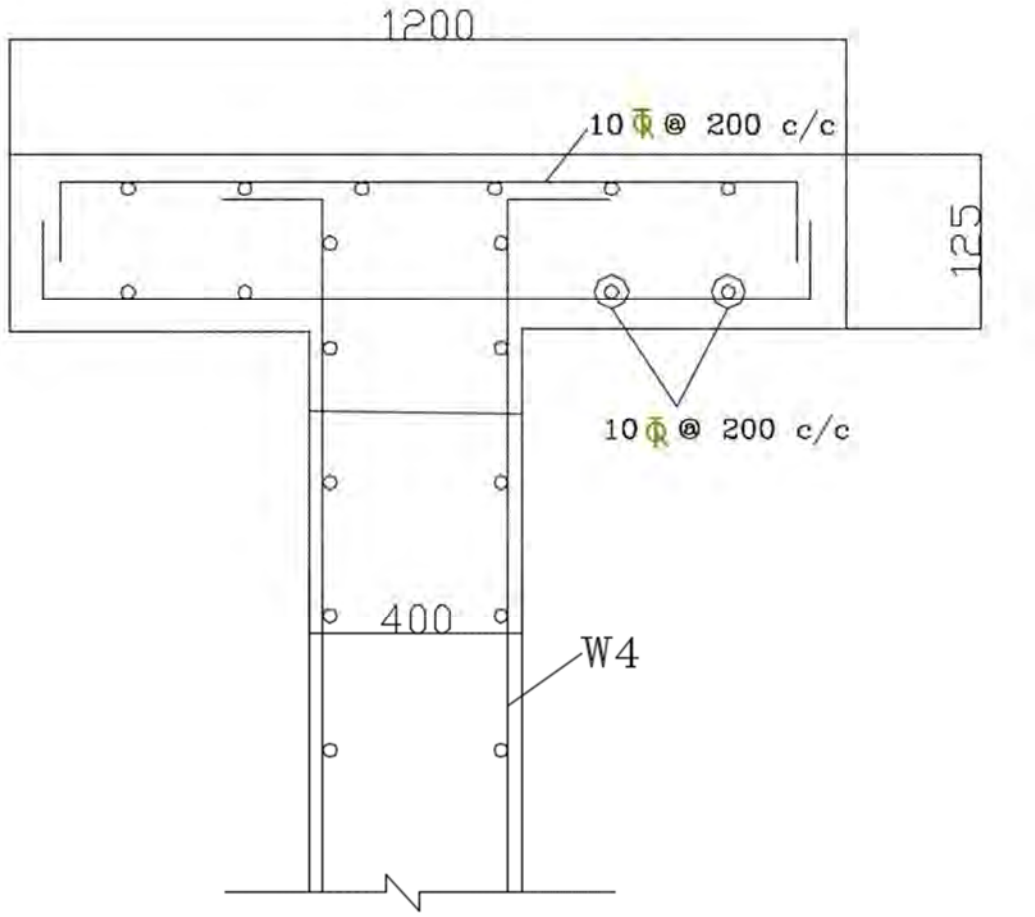
Ast = $\frac{0.257}{110}$ x 100 x 25.0 = 6.425 Cm^2/m

(in each of the either directions) = 3.21 Cm^2/m

Design of Wall – W4 (400 Thk)

For design purpose consider one chamber of the tank is empty and other is full, only wall is subjected to inside water pressure it Provide reinforcement similar to reinforcement provided at water face of wall both ways at both faces i.e 12TOR e 200c/c vertically and horizontally also.

5) Design of walkway above Sump wall (125 thk)



Load intensity on wall way = $0.125 \times 2.5 + 0.500^{T/m2}$

(W) = $0.575^{T/m2} = 0.9^{T/m2}$

Max^{m} B.M at the face of wall = ½ x 0.9 x $(0.4)^2$

= $0.072^{T.m/m}$

Deff = 125 – 20-5 = 100mm

Provide 10Re 200$^{c}/_{c}$ at (T & B) both ways

$$\underline{My} = \frac{1.5 \times 0.072 \times 10^7}{bdr \quad 1000 \times (100)^2}$$

= 0.108

Provide mem^{m} Ast = $\frac{0.12}{100} \times 102 \times 12.5$

= 1.5 Cm^2/m

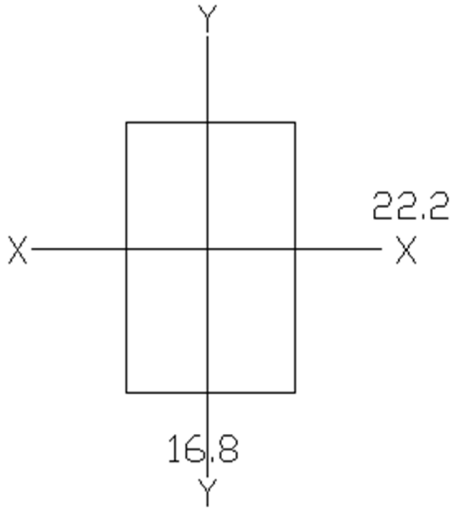
6) DESIGN OF RAFT (400 THK)

a) Wt of Base Raft = 22.2 x 16.8 x 0.400 x 2.5 = 383.04^T
b) Wall (Out ride) Load = (15.4 + 20.8) x 4.75 x 0.400 x 2.5 = 343.90^T
c) Wall Internal partita an = 15.0 x 4.75 x 0.4 x 2.5 = 71.25^T
d) Wall (Pump House Poor on) = 2 x (2.8 + 6.5) x 4.75 x 0.4 x 2.5 = 88.35^T
e) Pump House Floor = 2.8 x 6.5 x $1.5^T/^m$ (DL + LL) = 27.30^T
f) Pump + Motor load (3 Nos.) = 3 x 4^T = 12.0^T
g) Wt of earth = (2) x [22 + 16.2] x 0.500 x 4.6 x 1.80 = 316.29^T
h) Wt of water = (20 x 15 – 6.5 x 2.5) x 1.7 x 1.0 + 2.5 x 6.5 x 1.0 x 2.2 = 518.0^T
i) Wt of Platform = 1.2 x 12.5 x 0.875 $^{I/M}$ (DL + LL) = 13.12^T

Total = 1773.25^T

Moment (MYY) = 1.882 x 2 x 20 = 75.28 T.m = 1775^T

Moment (Mxx) = 1.882 x 2 x 15 = 56.46 T.m



Fg (gross pr)

$$= \frac{1775}{16.8 \times 22.2} \pm \frac{75.28 \times 6}{22.2 \times (16.8)^2} \pm \frac{56.46 \times 6}{16.8 \times (22.2)^2}$$

$$= 4.75 \pm 0.072 \pm 0.041$$

Fg ($Max^{m)}$ = $4.86^T/^{m2} < 5.5^T/^{m2}$

Fret = 4.86 – 0.4 x 2.5 = $3.86^T/^{m2} < 5.5^T/^{m2}$

7) Design Raft panel (Interior) (5133 X5200)

Base pressure = 3.86 T/m2 =4.0 T/m2

Iy/Ix =5.2/5.133 =1.013

Along Short Span:

(-ve) moment at cont. edges =0.033 X 4.0 X(5.133)2 = 3.372 T-m/m

(+ve) moment at mid span = $0.024X4.0X(5.133)^2$ = 2.529T-m/m

Area of bottom = $\frac{3.477 \times 10^5}{0.86 \times 1500 \times 34.4}$

= 6.715 cm^2/m

Provide 10 Re 150 c/c at (bottom bothways)

Deff = 400-50-6 = 344 m

Area at top = $\frac{2.635 \times 10^5}{0.86 \times 1500 \times 34.4}$

= 5.937 cm^2/m

Provide 12 Re 175 c/c at top bothways

8) DESIGN OF FOUNDATION BEAM FB-1 (500 X 800)

Load on beam = $\frac{4.0 \times 5.2}{3} \times 2$ —- 0.500 X 0.300 X2.5

=13.5 T/m^2

Span = 5.2 m

Maximum Support moment = $1/10 \times 13.5 \times 5.2^2$

= 36.5 T- m

Span moment (net) = $1/8 \times 13.5 \times 5.2^2$ = 36.5 T-m

Deff = 800-50-10 = 740 mm

Area at bottom = $\frac{36.5 \times 10^5}{0.86 \times 1500 \times 74}$

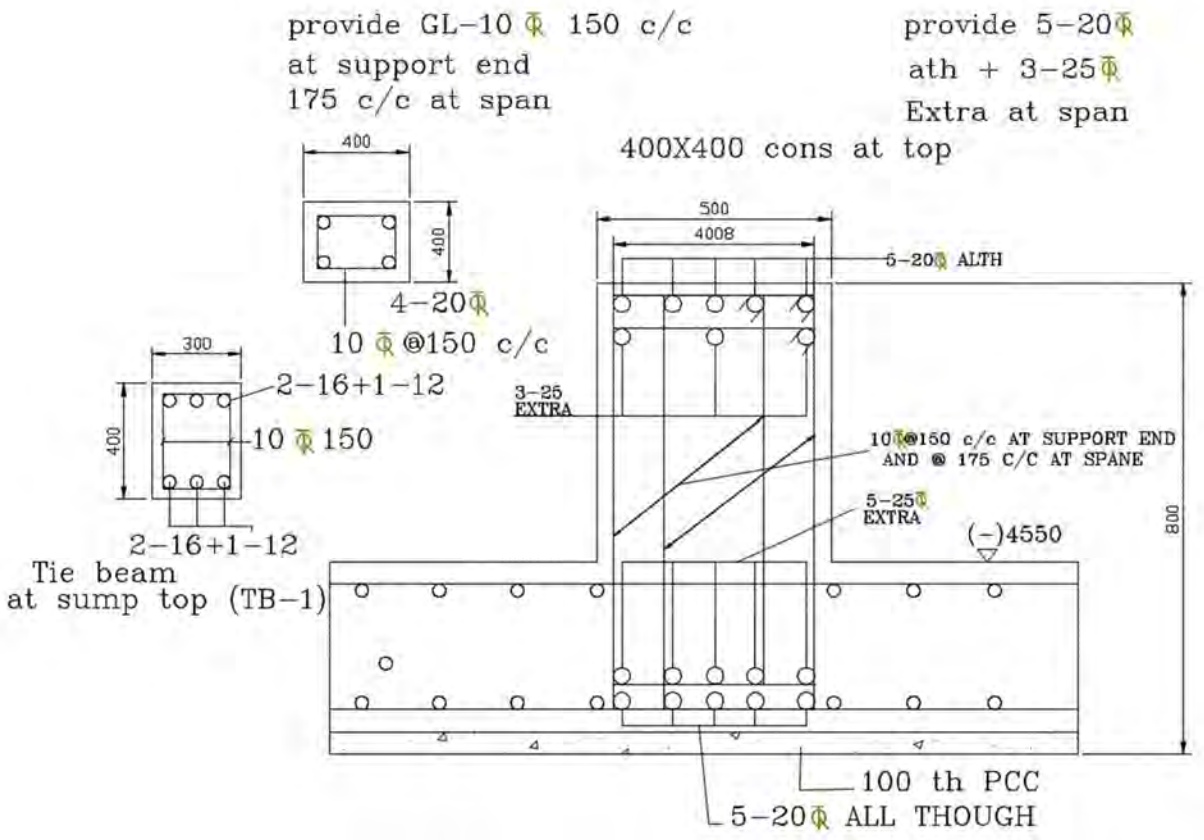
= 38.036 cm2

Provide 5-20 R ath + 5.25 R extra at support bottom

Area at top = $\frac{27.38 \times 10^5}{0.86 \times 1500 \times 74}$

$= 28.68\ cm^2$

Provide 5-20Torr + 3-25Torr (Extra) at Top all through.



9) Design of pump supporting slab above Sludge sump :

a) 150 thk slab = 0.150 X2.5 = 0.375 T/m2
b) Line load = 1.500 T/m2

1.875T/m2

≈ 2.0 T/m2

Span= 2.5m + 0.4 m = 2.9 m

Maximum Moment = 1/8 x2.0x 2.9^2 = 2.10 T-m/m

Deff = 150-20-5 = 125 mm

$Mm = \frac{1.5 \times 2.10 \times 10^7}{Bdr \quad 1000 \times 125^2}$

= 2.01; for = 0.517

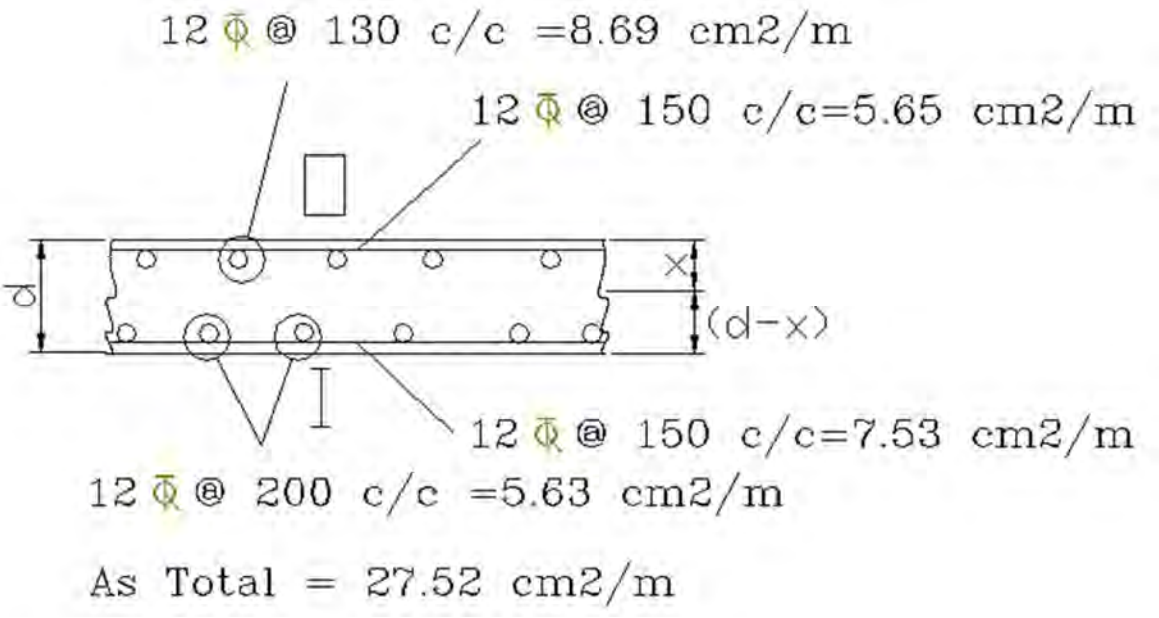
Area road = 6.46cm2/m

Provide 10 Re 115 c/c (B) along starter side.
Provide 10 Re 175 c/c dist steel at (T) and (B)

10) Calculation for crack width for Sludge Sump Wall

Concrete grade M-30

d = 400 mm



Es = 2 x 10^5 N/mm^2

Ec = 5700 √fch

= 27386 N/mm^2

m = Es/Ec = 7.30

Transformed area for Tension Steel

= m Ast < 7.30 x 14.34 = 104.68Cm^2

Transformed area in compression

= (m-1) Ast = (7.3-1) x 13.18 = 83.04 cm^2

Min^m Corner To long bar (Cm) = 30 + 6 = 36cm

To find N.A, taking movement from N.A

$\frac{X^2}{2}$ + 83.04 x (x-3.6) = 104.68 x (36.4-x)

So, x^2 + 166.08 x (x-3.6) = 209.36 x (36.4-x)

So, x^2 + 166.88 x – 597.88 = 7620.70 – 209.36x

So, x^2 + 376.24x – 8218 = 0

So,x = $-376.24 \pm \frac{\sqrt{\{(376.24)^2 - 4 \times 1 \times 8218\}}}{2 \times 1}$

= $\frac{(-376.24 \pm 330)}{2}$; x = 23.12Cm = 231mm

d – x = 169mm

Stress in tension Steel

(fs) = m x $\frac{M}{Ixx}$ x (d-x)

Ixx = 1/3 x 40.0 x $(23.12)^3$ + 83.04 x $(23.12 - 3.6)^2$+104.68 x $(40 - 23.12)^2$

= 164779 + 31641 + 29827 = 226247 cm^4

fs = $\frac{7.3 \times 3.993 \times 10^5}{226247}$ (40 – 23.12) = 217.48 kg/cm^2

Strain in tension steel = $\frac{fs}{Es} = \frac{217.48}{2 \times 10^6} = 1.08 \times 10^{-4}$

Elastic Strain on the wall face

= $1.08^{-4} \times \frac{(40-23.12)}{36.4 - 23.12} = 1.36 \times 10^{-4}$

Em = Average stiffening effect of core

in tension Zone = $\frac{b(d-x)\ (a-x)}{3ES\ AS\ (d1-x)} = \frac{17.7\ x(40-23.21) \times 40-23.22)}{3 \times 2 \times 10^6 \times 27.52x12.7}$

(Total) = 11.89 x 10-4

d1= eff defth = 40 – 3.0 – 1.2

= 35.8cm

a = d = 40cm; b = $\frac{35.4}{2}$ = 17.7cm

$(d_1 - x) = (35.8 - 23.1)$

= 12.7cm

distance from Comp. face to the point at which the crack width is being calculated

Average Strain

$= E_1 - Em$

$= 10.89 \times 10^{-4} - 1.36 \times 10^{-4}$

$= 9.53 \times 10^{-4}$

Design crack width (Wcr)

$$= \frac{3acr\ Eav}{1 + 2\left[\frac{acr - Cmin}{b-x}\right]}$$

acr = distance from point considered to the surface of the nearest long bar

= 30 + 6 = 36mm

= 3.6cm

Cmin = Clean corner

= 30mm = 3.0cm

$$Wcr = \frac{3 \times 3.6 \times 9.53 \times 10^{-4}}{1 + 2 \times \left(\frac{3.6 - 3.0}{40 - 23.12}\right)}$$

$= \frac{113.724 \times 10^{-4}}{1.075}$ = 00095.3cm

= 0.095mm <0.1mm

Hence safe

11) CHECK FOR UPLIFT AT SLUDGE SUMP:-

Maximum height submerged water = (5.05 – 0.5 + 0.4) = 4.95M ≈ 50M
Raft Area = 21.2M x 15.8 = 334.96 m2 ≈ 335m2
Total uplift Force = 335 x 5.0 x 1.0
= 1675 T

Deed Load:-

a) Raft Load = 373 x 0.4 x 2.5 = 373 T
b) Wall = 2 x (208 + 15.8) x 4.55 x 0.400 x 2.5 = 333.06 T
c) Partition wall = 12.1 x 0.400 x 4.55 x 2.5 = 55.0 T
d) Chamber = (6.9 + 2 x 2.7) x 0.400 x 4.95 x 2.5 = 60.81 T
e) Raft beam = 0.5 x 0.4 x $\frac{2 \times 115+12.1+2 \times 19.2}{80.5}$ x 2.5 = 40.25 T
f) Chamber at (-) 2700 level = (3.25 + 2 x 1.625) x 2.2 x 2.5 + 1.75 x 3.5 x 0.0.25 x 2.5= 39.57
g) Weightt of earth = 2 x (16.3 + 27.1) x 4.55 x 0.500 x 2.0 = 394.94 T
h) Weight of platform = 0.150 x 1.2 x 12.1 x 2.5 = 5.45 T
i) Weight of Top beam = 80.5 x 0.3 x 0.5 x 2.5 = 30.18 T
j) Wall fractioning between cone and soil (W x μ) = 2(15.8 + 21.2) x 5.0 x 0.5 x 2.0T/m3 x 0.5
= 370 T
μ = 0.5 Coeff of friction
k) Slab and Beam self weight above PH = 7.3 x 2.9 x 0.250 x 2.5 = 13.23 T
2071.62 T
l) Weight of Wall beam at sump top = 0.600 x 0.250 x 2(15.8 + 21.2) x 2.5 = 27.75 T
m) Weight of misc platform, walkway, pit which is connected to clarifier = 20 T
n) Weight of Launde channel = π x (39) x 1.2 x 0.150 x 2.5 = 55.10 T
Total = 2274.47
W ≈ 2300 T

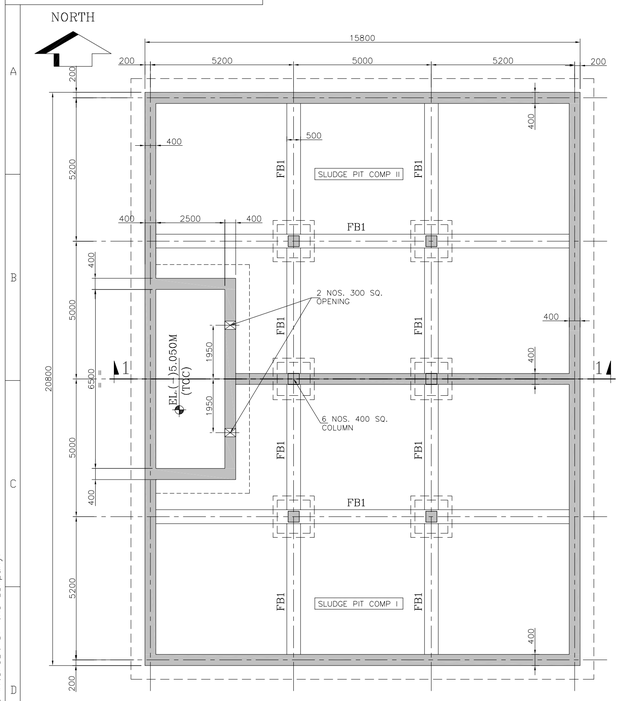
F.S against Buoyancy = $\frac{W \times \mu}{\text{Uplift Force}}$ = $\frac{2300 \times 0.9}{1675}$ = 1.235 > 1.2

(Hence safe)

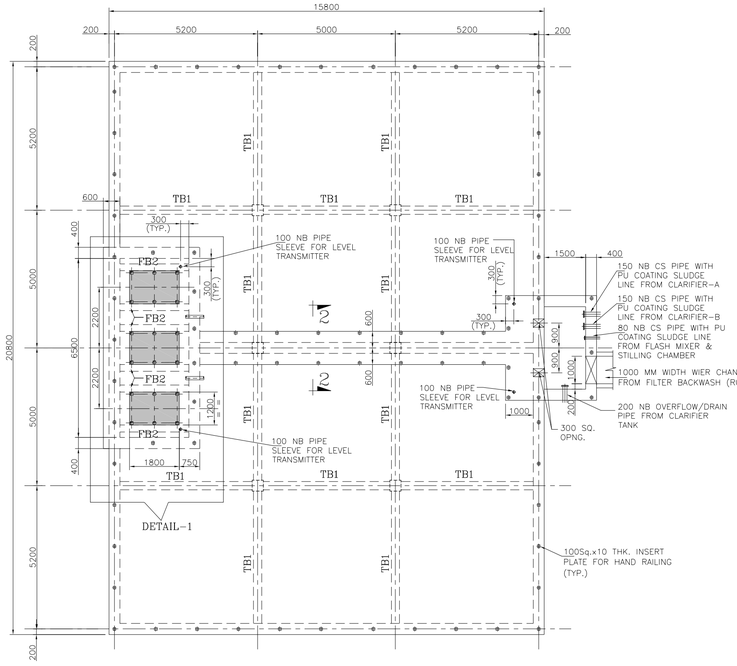
COPY RIGHT AND CONFIDENTIAL
The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED
it must not be used directly or indirectly in any way detrimental to the interest of the company

FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM

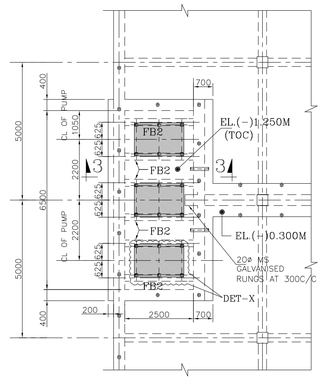
DRAWING NO. — CUSTOMER'S DRAWING NO.



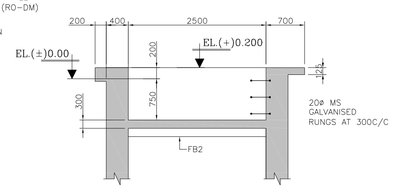
PLAN AT EL(−)4.650M



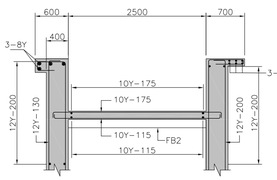
TOP PLAN AT EL(+)0.200M



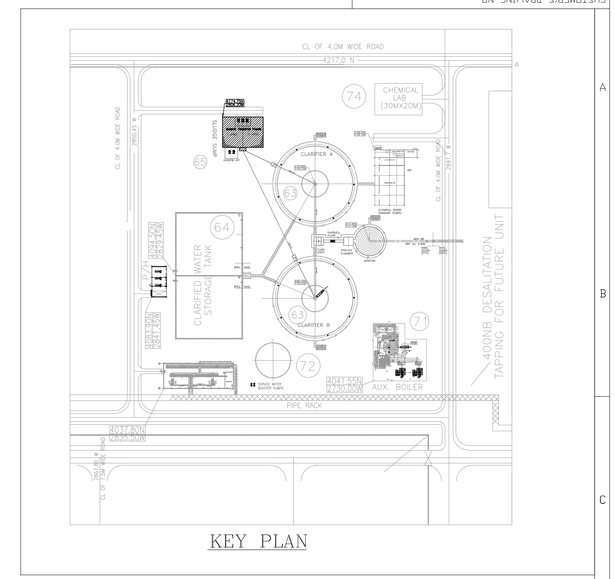
DETAIL−1



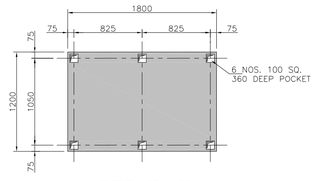
SECTION 3−3
(G.A DETAIL)



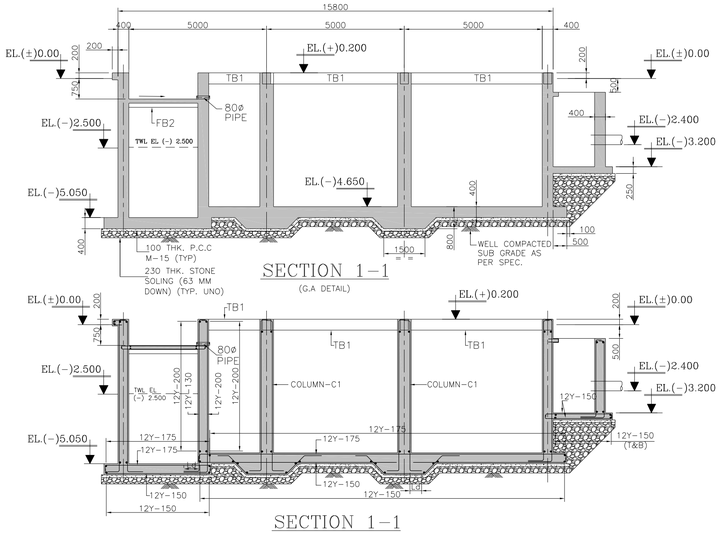
SECTION 3−3
(R/F DETAIL)



KEY PLAN

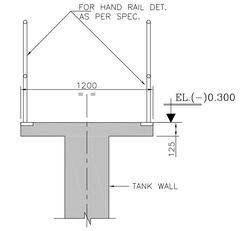


DETAIL−X
PLAN FOR SLUDGE TRANSFER PUMPS
(3 NOS. REQUIRED)

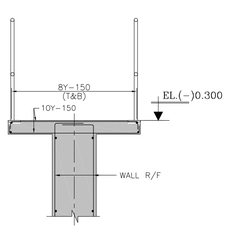


SECTION 1−1
(G.A DETAIL)

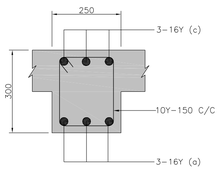
SECTION 1−1
(R/F DETAIL)



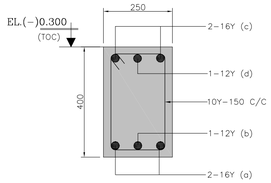
SECTION 2−2
(G.A DETAIL)



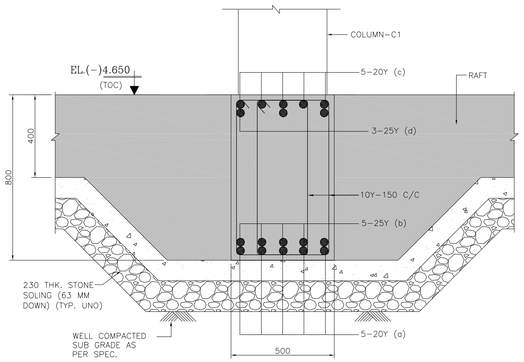
SECTION 2−2
(R/F DETAIL)



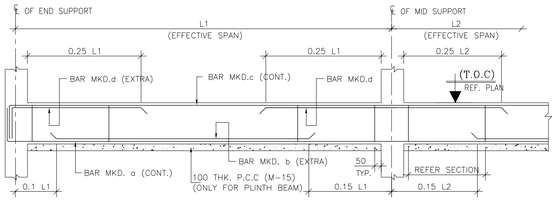
R/F DETAIL OF BEAM MKD. FB2



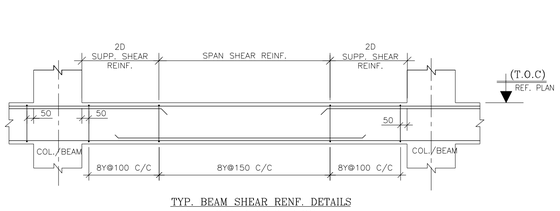
R/F DETAIL OF BEAM MKD. TB1



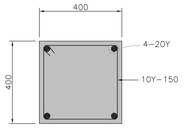
R/F DETAIL OF BEAM MKD. FB1



TYP. DETAIL OF BEAM REINFORCEMENT



TYP. BEAM SHEAR RENF. DETAILS
(D=EFFECTIVE DEPTH OF BEAM)



R/F DETAIL OF COLUMN MKD. C1

NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH CONTRACT TERMS AND CONDITIONS, TECHNICAL SPECIFICATIONS AND SCHEDULE OF ITEMS.
2. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
3. ALL ELEVATIONS ARE REFERRED TO THE FINISHED FLOOR LEVEL OF POWER HOUSE BUILDING AS EL. 0.00 M WHICH CORRESPONDS TO RL.(+) 10.0 M.
4. CONCRETE USED SHALL BE OF GRADE M35 CONFORMING TO IS:456−2000.
5. ALL REINFORCEMENTS SHALL BE FUSION BONDED EPOXY COATED TMT BARS OF MINIMUM GRADE Fe500 CONFORMING TO IS:1786
6. LAP/BOND LENGTH SHOULD BE PLACED IN STAGGERED FASHION OF MIN. LENGTH 50 TIMES DIA. OF BAR.
7. FOR CLEAR COVER REFER DRAWING NO. PE−DG−412−600−C001.
8. CEMENT SHALL BE OPC WITH C3A CONTENT FROM 5% TO 8%.
9. GRADE OF CONCRETE SHALL BE M35 FOR STRUCTURE IN DIRECT CONTACT TO SEA WATER AND M30 FOR OTHERS.
10. NET SAFE BEARING CAPACITY OF SOIL 7.0 T/m2 AT 2.0M BELOW G.L EXCEPT CLARIFIER PORTION.

LEGEND

1. (T.O.C.) TOP OF CONCRETE
2. (TYP) TYPICAL

BHEL−PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	VIJAY KANDA
SIGNATURE	−sd−
DATE	17 OCTOBER 2019

DATE	ALTD	CHD	APPD	REV

JOB NO. 412	
STATUS CONTRACT	
DISTRIBUTION	
TO	
No.OFF	

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LTD
POWER GROUP
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

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

DEPT CODE		NAME	SIGN	DATE
MAX	DRN	FAISAL N	FN	15−05−18
	DESN	FAISAL N	FN	15−05−18
	CHD	MUAZZAM I	MI	15−05−18
	APPD	ASLAM A	AA	15−05−18

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

BHEL DOC NO.
PE−V0−412−158−A077

TITLE
GA AND RC DETAILS FOR SLUDGE SUMP

DEPT. | SCALE: − | SIGN | DATE

OGBL DOC NO.
OGBL/OC−983/CGA/SS/PTP/18/343

SHEET 1 OF 1 | REV 01

SIZE−A1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED: AF	REV	DATE	ALTERED:
00	30.07.18	CHECKED: MI			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED

PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

PAINTING SCHEDULE

	NAME	SIGN	DATE
PREP	ALOYSIUS	AF	18-07-19
CHKD	MUAZZAM I	MI	18-07-19
APPD	ASLAM A	AA	18-07-19

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

DEPT.							CARD CODE	BHEL DRAWING NO.	REV
SIGN			N.A.				-	PE-V0-412-158-A092	03
DATE								OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/PS/PTP/18/361	

NO. OF SHEETS 1 EXCLUDING COVER PAGE

OTOKLIN GLOBAL BUSINESS LIMITED	PAINTING SPECIFICATION FOR PT PLANT		
CLIENT	BHARAT HEAVY ELECTRICALS LIMITED	BHEL DOC NO.: PE-V0-412-158-A092	REV NO:- 03
PACKAGE	PRE-TREATMENT PLANT	OTOKLIN DOC NO:- OGBL/OC-983/PS/PTP/18/361	
		MADE BY: AF / CHKD BY: MI / APPD BY: AA	
CONTRACTOR: OTOKLIN GLOBAL BUSINESS LIMITED		PROJECT: 2X660 MW ENNORE SEZ STPP	

PAINTING SPECIFICATION

1	**External Painting** (For Carbon steel & Low Alloy Steel Uninsulated) - Applicable to **Sluice Gate, Piping, Valve, Pump, Blower, Motor, Agitator, Structures, Platform, Pipe Supports, Ladder, Hand railing, Electric hoist** Operating upto Temp. of 60 Deg. C.
1.1	Surface Preparation :- Sand Blast to SA 2 1/2
1.2	Primer :- 1 coat of Epoxy Resin based Zinc PhosphatePrimer @ 50 Micron DFT/Coat
1.3	Intermediate:-1 coat of Epoxy based MIO Pigmented Paint @ 50 Micron DFT/Coat
1.4	Finish:- 2 coat of Polyamide Curved Epoxy Finish Coat @(25 to 35) Microns DFT/Coat
1.5	**Total DFT** = 150 min Microns
2	**PAINTING SPECIFICATION FOR UNDER GROUND PIPES NOT HANDLING SEA WATER.**
2.1	**External Coating and wrapping as per IS 10221** - Applicable to Under ground /Buried piping.
2.2	**External Surface of Pipe**
A	Cleaning of external pipe surface.
B	Primer :-2 Coats of Coal Tar Primer Compatible with Coal Tar Enamel Grade @ 35 Micron DFT/Coat (2 x 35 = 70 Microns) **(R1)**
C	First coat of coal tar enamel with 2 mm min. thickness
D	First layer of inner wrapping with glass fiber tissue of 0.3 mm min. thickness
E	Outer wrap coal tar impregnated glass fiber with 0.7 mm min. thickness .
F	White colour latex emulsion paint or white wash.
G	Total thikness of coal tar enamel and wrapping shall be of 4.0 mm min. thickness. **(R1)**
2.3	**Internal Surface of Pipe**
A	Cleaning of internal pipe surface.
B	Primer :- 2 Coats of Epoxy primer coat @ 35 Micron DFT/Coat (2 x 35 = 70 Microns) **(R1)**
C	Finish:- 2 coat of Polyamide Curved Epoxy Finish Coat @(25 to 35) Microns DFT/Coat
D	Total DFT = 150 min Microns
3	**PAINTING SPECIFICATION FOR UNDER GROUND PIPES HANDLING SEA WATER.** **(R1)**
3.1	**External Coating and wrapping as per IS 10221** - Applicable to Under ground /Buried piping.
3.2	**External Surface of Pipe**
A	Cleaning of external pipe surface.
B	Primer :-2 Coats of Coal Tar Primer Compatible with Coal Tar Enamel Grade @ 35 Micron DFT/Coat (2 x 35 = 70 Microns)
C	First coat of coal tar enamel with 2 mm min. thickness
D	First layer of inner wrapping with glass fiber tissue of 0.3 mm min. thickness
E	Outer wrap coal tar impregnated glass fiber with 0.7 mm min. thickness .
F	White colour latex emulsion paint or white wash.
G	Total thikness of coal tar enamel and wrapping shall be of 4.0 mm min. thickness.
3.3	**Internal Surface of Pipe**
A	Cleaning of internal pipe surface.
B	800 NB line upto valve control station will be provided as CS pipe with glass flake corrocoat and the rest Bypass line and buried piping will be provided in GRP **MOC** **(R2)**

COLOUR SELECTION SCHEME

Sr. No.	Service	Recommonded Colour	Colour Code (IS-5)	Colour Band	Colour Code (IS-5)
1	Steel Structures, Platforms,Ladders, Handrails Assemblies and Safety Cages	Dark Admiralty Grey	632	-	-
2	Sluice Gate, Pumps, Blowers, Agitators, Motors, etc	Light Grey	631	-	-
	Electric Hoist (Crane)				
3	Crane structure	Golden Yellow	356	Black	-
4	Trolley & hook	Crimson	540	-	-
	Piping				
5	Air	Sky Blue	101	-	-
6	Sea Water / Sludge / Valves	Sea Green	217	White	-
7	Clarified Water / Service Water	Sea Green	217	French Blue	166

NOTES :-

1. All Temperature noted in this schedule shall be maximum operating & not design.
2. Coating thickness indicated are minimum dry film thickness.
3. Painting shall not be applicable for Stainless steel, SS Duplex, UPVC ,GRPand other Nonmetallic .
4. Shade colour of SS pipes & Valves shall be as per manufacturers std.
5. Spray painting shall be used for areas where brush painting is not possible due to high temperature or congestion.

REV NO.: 03	PREPARED BY: AF	CHKD. & APPD. BY: AA		DATE: 18.07.2019

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED: FN	REV	DATE	ALTERED:
		CHECKED: MI			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

PG TEST FOR PT PLANT

	NAME	SIGN	DATE
PREP	AQEEL K	AK	10-01-19
CHKD	MUAZZAM I	MI	10-01-19
APPD	ASLAM A	AA	10-01-19

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

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A094	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/PG/PTP/18/358	00
DATE								NO. OF SHEETS 8 EXCLUDING COVER PAGE	

PERFORMANCE GUARANTEE TEST PROCEDURE

FOR PRETREATMENT (PT) PLANT

OWNER	:	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
CLIENT	:	BHARAT HEAVY ELECTRICALS LIMITED (BHEL)
PROJECT	:	2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI
SUPPLIER	:	OTOKLIN GLOBAL BUSINESS LIMITED

TABLE OF CONTENT

OBJECTIVE	**3**
ANNEXURE-I	**4-5**
ANNEXURE-II	**6**
LOG SHEETS	**7**
GENERAL CONDITIONS	**8**

OBJECTIVE

The objective of the PG Test is to ensure that the system is performing well, with respect to pump capacity and head and meeting/delivering the required parameters at the outlet of Clariflocculator as prescribed in the customer's purchase order.

The system is closely monitored to ensure trouble free and optimum/ efficient performance of all the electrical & mechanical equipment, accuracy of all instruments and functioning of all process and safety interlocks for system reliability and integrity. Further, the PG test will also establish that the consumption of chemical and power is as per commitment with in tolerance limits, if any. Noise level for the pumps shall be demonstrated during PG test. The noise level shall not exceed 70 dB at plant boundary. The sound pressure level limit of 85 dB shall be measured at a height of 1.5 m above the floor level in elevation and at a distance of 1.0 m horizontally from the nearest surface of the Equipment/Machine, furnished and installed under these specifications.

ANNEXURE – I

A. SEA WATER ANALYSIS:

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

S.No.	Parameter	Unit	Value (Range)
e	Bicarbonate	Mg/l	144-148
f	Carbonate	Mg/l	Nil
g	Fluoride	Mg/l	2.64-2.8
h	Boron	Mg/l	0.14-0.17
i	Phosphate	Micro g/l	240-380
j	Sulphide	Micro g/l	Below detectable limit (detectable Limit : 100)
k	Silica Dissolved	Micro g/l as SiO2	200-250
4	**Heavy Metals**		
A	Arsenic	Micro g/l	Below detectable limit (detectable Limit : 2)
B	Mercury	Micro g/l	Below detectable limit (detectable Limit : 1)
C	Cadmium	Micro g/l	120-130
D	Copper	Micro g/l	200-220
E	Nickel	Micro g/l	470-490
F	Molybdenum	Micro g/l	Below detectable limit (detectable Limit : 100)
5	**Suspended Particle Size Range**		
A	10 micron & above	Mg/l	Below detectable limit(detectable Limit : 10)
B	5 micron to 10 micron	Mg/l	Below detectable limit(detectable Limit : 10)
C	1 micron to 5 micron	Mg/l	Below detectable limit(detectable Limit : 10)
D	0.1 micron to 1 micron	Mg/l	20-26
6	**Colloidal Particle Size Range**		
A	SDI (10 Minutes)	-	10-20
B	SDI (5 Minutes)	-	20-40
7	Density of sea water	Kg/ cum	1030

TREATED WATER QUALITY

B. CLARIFIED WATER

Sl. No.	Constituent	Units	Values
1.	Total Suspend Solids at outlet of Clariflocculator	ppm	10

ANNEXURE – II

STANDARD OPERATING PROCEDURE (SOP) FOR CONDUCTING THE P.G.TEST

STEP 1: COMPLETION OF ERECTION OF MECHANICAL AND ELECTRICAL EQUIPMENTS.

Certify that all equipment's (Mechanical / Electrical / Instrumentation as indicated in O&M manual for PT Plant) have been erected and the plant is ready for PG test.

STEP 2: CALIBRATION OF INSTRUMENTS AND INTERLOCKS

Certify that all instruments (as indicated in O&M manual for PT Plant) have been calibrated and all interlocks are provided and tested.

STEP 3: COLLECTION OF SAMPLES AT FEED TO PT PLANT

These samples will be collected at the time of the PG Test. Sampling will be done jointly once in 48 hours at the respective Clariflocculator row. Testing of those samples shall be carried by OGBL and to be witnessed by TANGEDCO.

STEP 4: LOG SHEET CERTIFICATION

All readings noted will be jointly signed by representatives of TANGEDCO, BHEL & OTOKLIN.

STEP 5: AUTHORIZATION OF TEAM FOR PG TEST

OTOKLIN:

BHEL:

TANGEDCO:

LOG SHEET
PT PLANT

Clariflocculator No.:

Sr. No.	Date	Time	Sea Water			Clariflocculator Outlet		Remarks
			Flow in M^3/hr	pH	TSS PPM	pH	TSS PPM	

TANGEDCO **BHEL** **OGBL**

GENERAL CONDITIONS

1) Different water Parameters except Turbidity to the PT plant should be provided by client prior to the startup of the P.G. test.

2) Required quality of Sea water (as mentioned in Annexure-I), power (as per approved load list of both three and single phase)) & air (compressed air to run the pneumatically operated equipment) must be available on continuous basis.

   In case of non-availability of the same or in case of any interruption during the PG test, the breakage in sequence will be considered as a part of the PG test & not the steps.

3) All interlocks are process and safety interlocks.

4) Necessary calibrated tool and Portable instrument required for PG test shall be arranged by M/s OGBL as per contract however facility as available in M/s TANGEDCO lab can be used with prior permission from M/s TANGEDCO.

5) The Pretreatment Plant and its associated system will be put in trial run for uninterrupted period of 15 days. During the trial run the water treatment plant and its associate system will be subject to a reliability run for 72 hours uninterrupted. In case of any disruption in between the test, the time lapsed earlier shall be counted for full PG test.

6) At the end of the PG test, if the objective mentioned in the beginning of this PG test procedure is established, an MOM (minutes of meeting) will be signed off between BHEL/TANGEDCO & OGBL mentioning that the PG test has been completed & that the plant has been taken over for operation to BHEL. Punch points, if any, may be mentioned in the said MOM to enable OGBL to subsequently address the same. These punch points will not have any effect on the success of the PG test.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:	REV	DATE	ALTERED:
		CHECKED:			CHECKED:

STATUS : CONTRACT

JOB NO.: 412

COPY RIGHT 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

PACKAGE - PRE TREATMENT PLANT

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

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)

CONSULTANT: DESEIN PVT LTD, NEW DELHI.

BHARAT HEAVY ELECTRICALS LIMITED
PROJECTS ENGINEERING MANAGEMENT,NEW DELHI

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

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

QAP FOR 800 NB BUTTERFLY VALVES

	NAME	SIGN	DATE
PREP	ALOYSIUS	AF	12-07-19
CHKD	MUAZZAM I	MI	12-07-19
APPD	ASLAM A	AA	12-07-19

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

DEPT.							CARD CODE	BHEL DRAWING NO. PE-V0-412-158-A097	REV
SIGN			N.A.				-	OTOKLIN-DRG/DOC-NO.. OGBL/OC-983/QAP/800BFV/PTP/18/371	0
DATE								NO. OF SHEETS 1 EXCLUDING COVER PAGE	

OTOKLIN GLOBAL BUSINESS LIMITED	OTOKLIN GLOBAL BUSINESS LIMITED R-02 Remi Bizcourt, Off Veera Desai Road, Andheri West, Mumbai 400 053, India	**MANUFACTURING QUALITY PLAN** **ITEM: VALVE (800 NB Actuated & Non Actuated Butterfly Valves)** **SUB-SYSTEM: PRETREATMENT PLANT** **QP NO.: PE-V0-412-158-A097** **REV.NO.: 0** **DATE: 12-07-2019** **PAGE: 1 OF 1**	PROJECT: 2X660 MW ENNORE SEZ STPP AT ASH DYKE OF NCTPS PACKAGE: PRETREATMENT PLANT CONTRACT NO.: 412 MAIN-SUPPLIER: BHEL SUB- CONTRACTOR:- OTOKLIN

S.NO	COMPONENT & OPERATIONS	CHARACTERISTICS CHECKED	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
										M	C	N	
1	2	3	4	5	6	7	8	9	D	10			11
[1]	**MATERIAL CONTROL**												
1.1	MAJOR CI COMPONENTS	PHYSICAL	MAJOR	UTS & BHN	1 / HEAT	APPROVED DRG. & DATA SHEET	APPROVED DRG. & DATA SHEET	INSP. REP. MFG. TC	✓	P	R	R	
1.1	SPINDLE	CHEMICAL	MAJOR	CHEM. COMPO.	1 Sample/Lot	APPROVED DRG. & DATA SHEET	APPROVED DRG. & DATA SHEET	INSP. REP. MFG. TC	✓	P	R	R	
1.2	BODY & SEAT RING & SURFACE DEFECTS	CHEMICAL & VISUAL	MAJOR	CHEM. COMPO.	1 Sample/Lot	APPROVED DRG. & DATA SHEET	APPROVED DRG. & DATA SHEET	INSP. REP. MFG. TC	✓	P	R	R	
[2]	**IN-PROCESS CONTROL**												
2.1	MACHINING OF ALL COMPONENTS & SURFACE FINISH	DIMENSIONS & VISUAL	MAJOR	MEASURMENT	100%	APPROVED DRAWING.	APPROVED DRAWING.	INSPN. REPORT.	✓	P	R	R	
2.2	SURFACE DEFECTS	VISUAL	MAJOR	VISUAL CHECK	100%	APPROVED DRAWING.	APPROVED DRAWING.	INSPN. REPORT.	✓	P	R	R	
[3]	**ASSEMBLY**												
3.1	COMPLETE ARRANGEMENT ASSY.	OVERALL DIMENSIONS, OPERATE	WITNESS	MEASURMENT	100%	APPROVED DRG.& DATA SHEET	APPROVED DRG.& DATA SHEET	INSPN. REPORT.	✓	P	W	W	Only overall dimension may check as per GAD
3.2	HYDROTEST (Body & Seat)	HYDROTEST	WITNESS	PRESSURE & LEAKAGE TIGHTNESS	SAMPLING	APPROVED DRG.& DATA SHEET	APPROVED DRG.& DATA SHEET	INSPN. REPORT.	✓	P	W	W	

LEGEND:
* RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

** M: MANUFACTURER/SUB-SUPPLIER — P - Performing the Test

C: SUPPLIER/NOMINATED INSPECTION AGENCY — W - Witnessing the Test

N: THE OWNER — R- Review the Test

MANUFACTURER / SUBCONTRACTOR	CONTRACTOR
SIGNATURE	

LIST OF SCHEDULES

SCHEDULE OF PRE-BID CLARIFICATION

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATION REQUIREMENT	CLARIFICATION	REASONS FOR CLARIFICATION

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

DEVIATION SHEET (COST OF WITHDRAWL)

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

PACKAGE:-PRE-TREATMENT PLANT

TENDER ENQUIRY REFERENCE:-

NAME OF BIDDER:-

SL NO (1)	VOULME/ SECTION (2)	PAGE NO. (3)	CLAUSE NO. (4)	TECHNICAL SPECIFICATION/ TENDER DOCUMENT (5)	COMPLETE DESCRIPTION OF DEVIATION (6)	COST OF WITHDRAWL OF DEVIATION (7)	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE (8)	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE) (9)	REASON FOR QUOTING DEVIATION (10)
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

COMPLIANCE CUM CONFIRMATION SCHEDULE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer:

a.) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.

b.) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.
QP will be subject to BHEL/Customer approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.
The charges for 3rd party inspection (Lloyds, TUV or equivalent) for imported components shall be included in the base price of the equipment by the bidder

c.) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval. GA drawings, as submitted with offer at tender stage are for reference purpose only and shall be subject to approval during contract stage.

d.) There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'

e.) The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.

f.) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).

g.) All sub vendors shall be subject to BHEL/CUSTOMER approval

h.) Any special tools & tackles, if required, shall be in bidder's scope.

i.) Demonstration parameters shall stand valid till the satisfactory completion of demonstration test and its acceptance by BHEL/Customer.

	TITLE *** SCHEDULE OF DECLARATIONS**	**BHEL DOCUMENTS NO.: PE-TS-412-158-A002** VOL III SHEET…….. OF……

*** Bidder shall include this schedule both in technical and Price offers**

DECLARATION

I ……..……certify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated …….. and there is no deviation to the specification (except indicated in the deviation sheet (cost of withdrawal).

I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Biders Company Name …….

Authorised representative's
Signature ……..

Name …….

Bider's Name

The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL