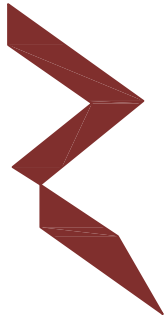


# WASTEWATER COLLECTION, TREATMENT, AND DISPOSAL SYSTEM IN HA.BAARAH, MALDIVES

## ANNEX III - DETAILED DRAWINGS



**RIYAN PRIVATE LIMITED**

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*3rd floor, H. Azum, Ameenemagu, Male'*

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DRAWING No.	TITLE	REVISION No.	DATE	REMARKS
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**CONSULTANCY SERVICES FOR SURVEY & DESIGN  
OF SEWERAGE FACILITIES IN HA,BAARAH,  
MALDIVES**

CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY  
 PROJECT NUMBER: -  
 DATE: MARCH 2017

Rev no      Date  
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## TABLE OF CONTENT

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**CONSULTANCY SERVICES FOR SURVEY & DESIGN  
 OF SEWERAGE FACILITIES IN HA.BAARAH,  
 MALDIVES**

**CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY**  
 PROJECT NUMBER: -  
 DATE: MARCH 2017

Rev no	Date
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**NOTE**

1. ALL LEVELS SHOWN ARE IN METERS.
2. ALL LEVELS SHOWN ARE FROM MEAN SEA LEVEL
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
4. ALL GRAVITY SEWER PIPES SHALL BE UPVC TO BS EN1401-1:2009.
5. ALL GRAVITY SEWER MAINS SHALL BE 160MM DIA UPVC OF WALL THICKNESS & STIFFNESS RATED TO SN4 & SDR41.
6. ALL GRAVITY HOUSE LATERALS SHALL BE 110MM DIA UPVC OF WALL THICKNESS & STIFFNESS RATED TO SN4 & SDR41.
7. ALL GRAVITY SEWER MAINS SHALL HAVE MINIMUM 0.4% SLOPE.
8. ALL GRAVITY SEWER PIPES SHALL BE JOINTED USING RUBBER RING PUSH FIT JOINTING METHOD & RUBBER RINGS COMPLY WITH BS 2494 (TYP2).
9. CONNECTION FROM THE HOUSEHOLD TO THE INSPECTION CHAMBER IS NOT INCLUDED. PROVISION SHALL BE GIVEN IN IC FOR MULTIPLE CONNECTIONS.
10. ALL SEWER PIPES SHALL BE BURIED UNDER EARTH COVER OF MINIMUM 0.6 METERS.
11. CATCHMENT OVER FLOW LINKS ARE TO BE CONNECTED BETWEEN THE FOLLOWING CLEANOUTS: CO1-16 to CO1-40, CO1-45 to O2-28, CO1-31 to CO2-01, CO2-10 to CO2-31, CO3-09 to CO2-06 and CO3-37 to CO3-06

**LEGEND**

-  160mm Ø uPVC Gravity Sewer Main (SN4, SDR41) - 12700 m
-  110 mm Ø HDPE Pumping Main (PE100, PN16, SDR11) - 630 m
-  160 mm Ø HDPE Pumping Main (PE100, PN16, SDR11) - 550 m
-  160 mm Ø HDPE Sea Outfall Pipe (PE100, PN16, SDR11)- 300m
-  600mm Ø PE/PP Maintenance Shaft - 161 nos
-  160mmØ uPVC Clean Out - 127 nos

- PRIMARY BENCH MARKS**
-  PBM-1(754148.0543N,302338.2476E)
  -  PBM-2(753560.0568N,302158.7372E)



**HA.BAARAH NETWORK LAYOUT**  
SCALE 1:7500



CONSULTANCY SERVICES FOR SURVEY, DESIGN & SUPERVISION  
OF SEWERAGE FACILITIES IN K. THULUSDHOO, MALDIVES  
CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY

PROJECT NUMBER: -  
DATE: MARCH 2017  
ENGINEER: - Mohamed Saif Saeed  
CHECKED BY: - Ihsan Wáheed  
DRAWN BY: - Mohamed Saif Saeed

Rev no	Date
-	-
-	-
-	-



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3rd floor, H. Azum, Ameenemagu, Male'

Title: Ha.Baarah Network Layout  
Page: A-01/28




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- NOTE**
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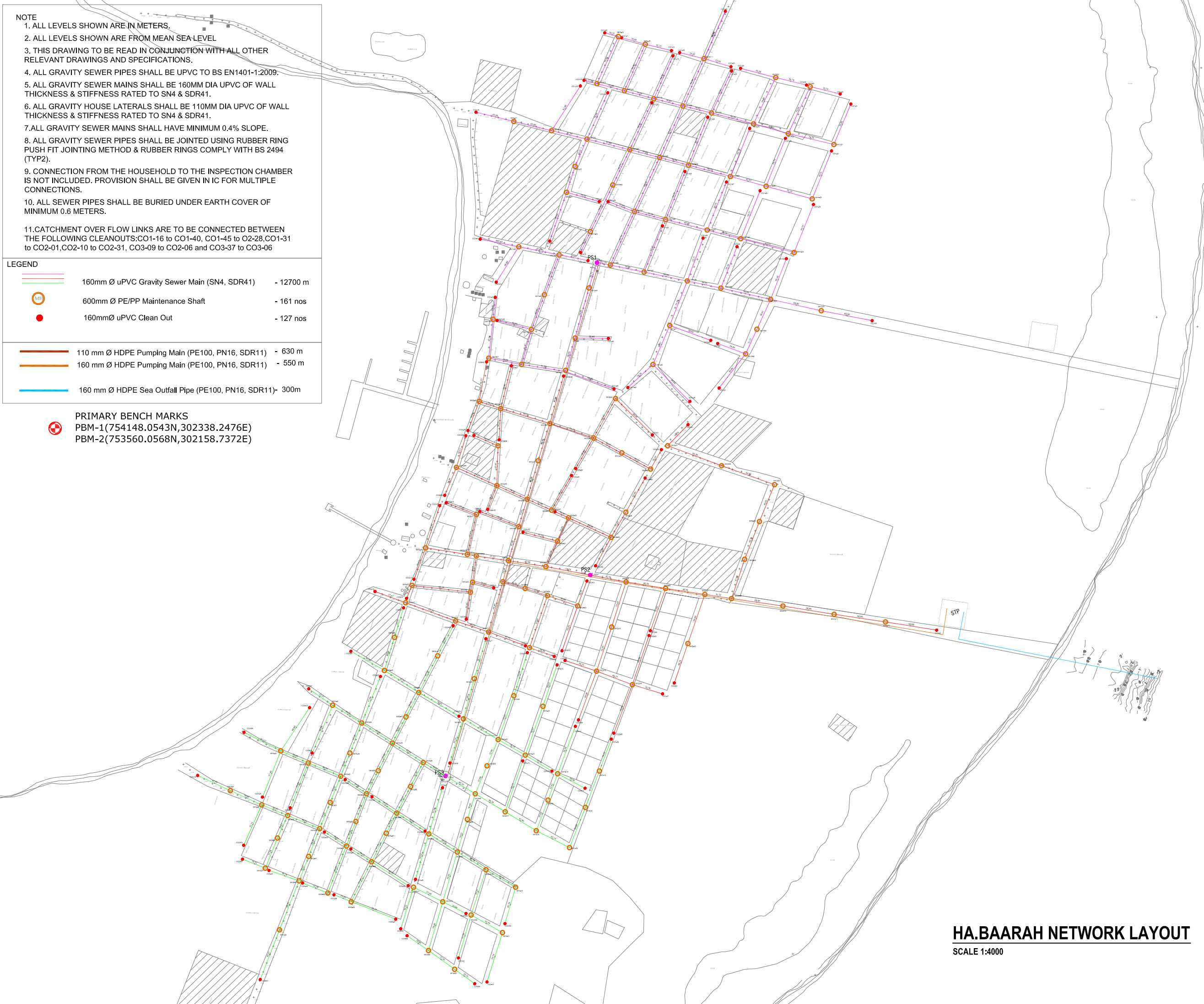
11. CATCHMENT OVER FLOW LINKS ARE TO BE CONNECTED BETWEEN THE FOLLOWING CLEANOUTS: CO1-16 to CO1-40, CO1-45 to O2-28, CO1-31 to CO2-01, CO2-10 to CO2-31, CO3-09 to CO2-06 and CO3-37 to CO3-06

**LEGEND**

	160mm Ø uPVC Gravity Sewer Main (SN4, SDR41)	- 12700 m
	600mm Ø PE/PP Maintenance Shaft	- 161 nos
	160mmØ uPVC Clean Out	- 127 nos

	110 mm Ø HDPE Pumping Main (PE100, PN16, SDR11)	- 630 m
	160 mm Ø HDPE Pumping Main (PE100, PN16, SDR11)	- 550 m
	160 mm Ø HDPE Sea Outfall Pipe (PE100, PN16, SDR11)	- 300m

 **PRIMARY BENCH MARKS**  
PBM-1(754148.0543N,302338.2476E)  
PBM-2(753560.0568N,302158.7372E)



**HA.BAARAH NETWORK LAYOUT**  
SCALE 1:4000



CONSULTANCY SERVICES FOR SURVEY, DESIGN & SUPERVISION  
OF SEWERAGE FACILITIES IN K. THULUSDHOO, MALDIVES  
CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY

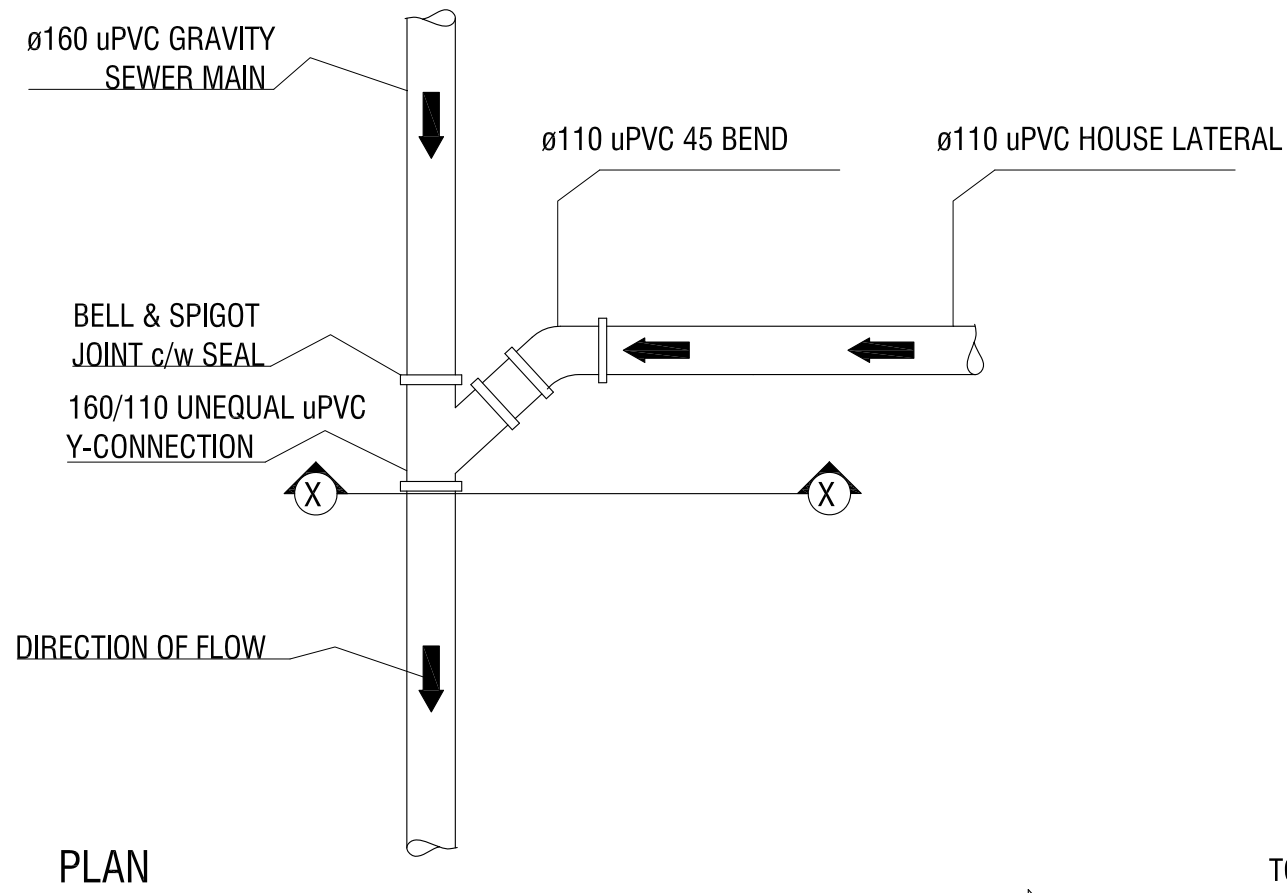
PROJECT NUMBER :  
DATE: MARCH 2017  
ENGINEER : - Mohamed Saif Saeed  
CHECKED BY : - Ihsan Wahheed  
DRAWN BY : - Mohamed Saif Saeed

Rev no	Date
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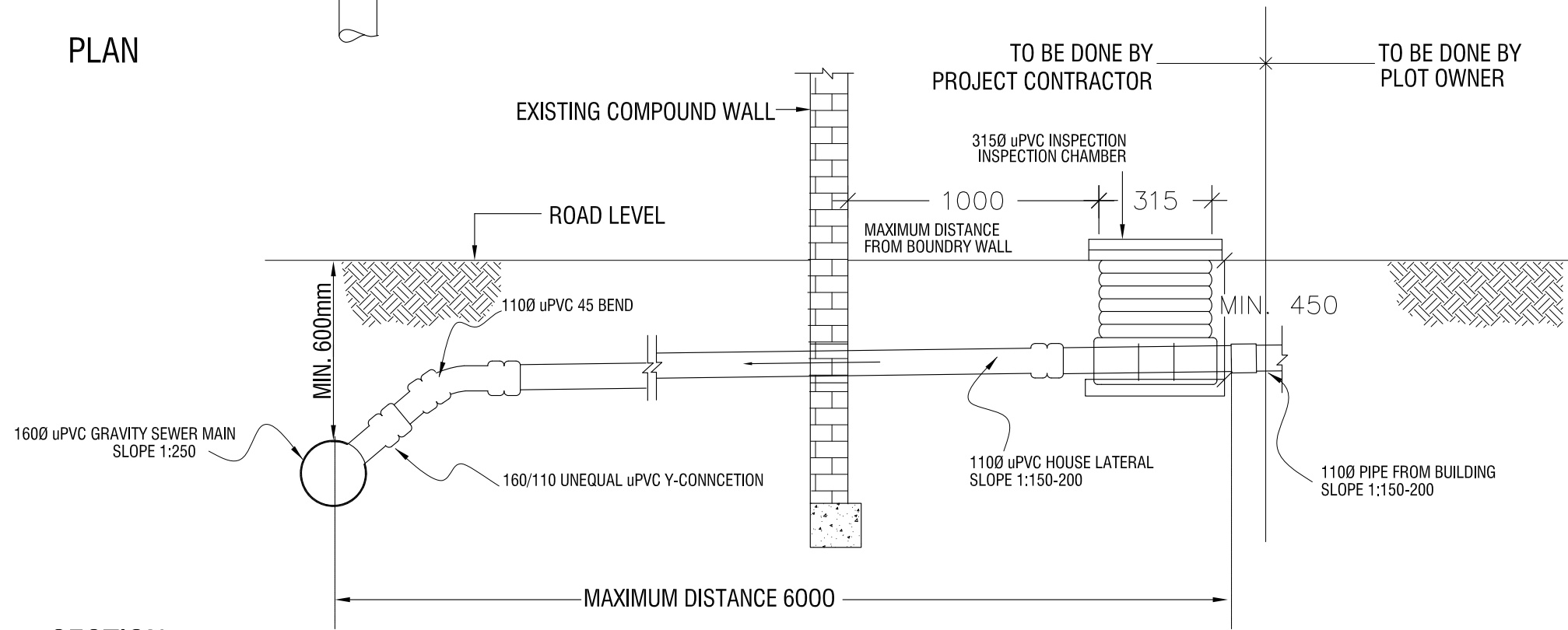


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PLAN



SECTION

**TYPICAL HOUSE CONNECTION DETAIL**  
N.T.S

CONSULTANCY SERVICES FOR SURVEY & DESIGN  
OF SEWERAGE FACILITIES IN HA.BAARAH, MALDIVES  
CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY  
PROJECT NUMBER:  
DATE: MARCH 2017  
ENGINEER: - Mohamed Saif Saeed  
CHECKED BY: - Ihsan Waheed  
DRAWN BY: - Mariyam Irasha Shareef

Rev no	Date

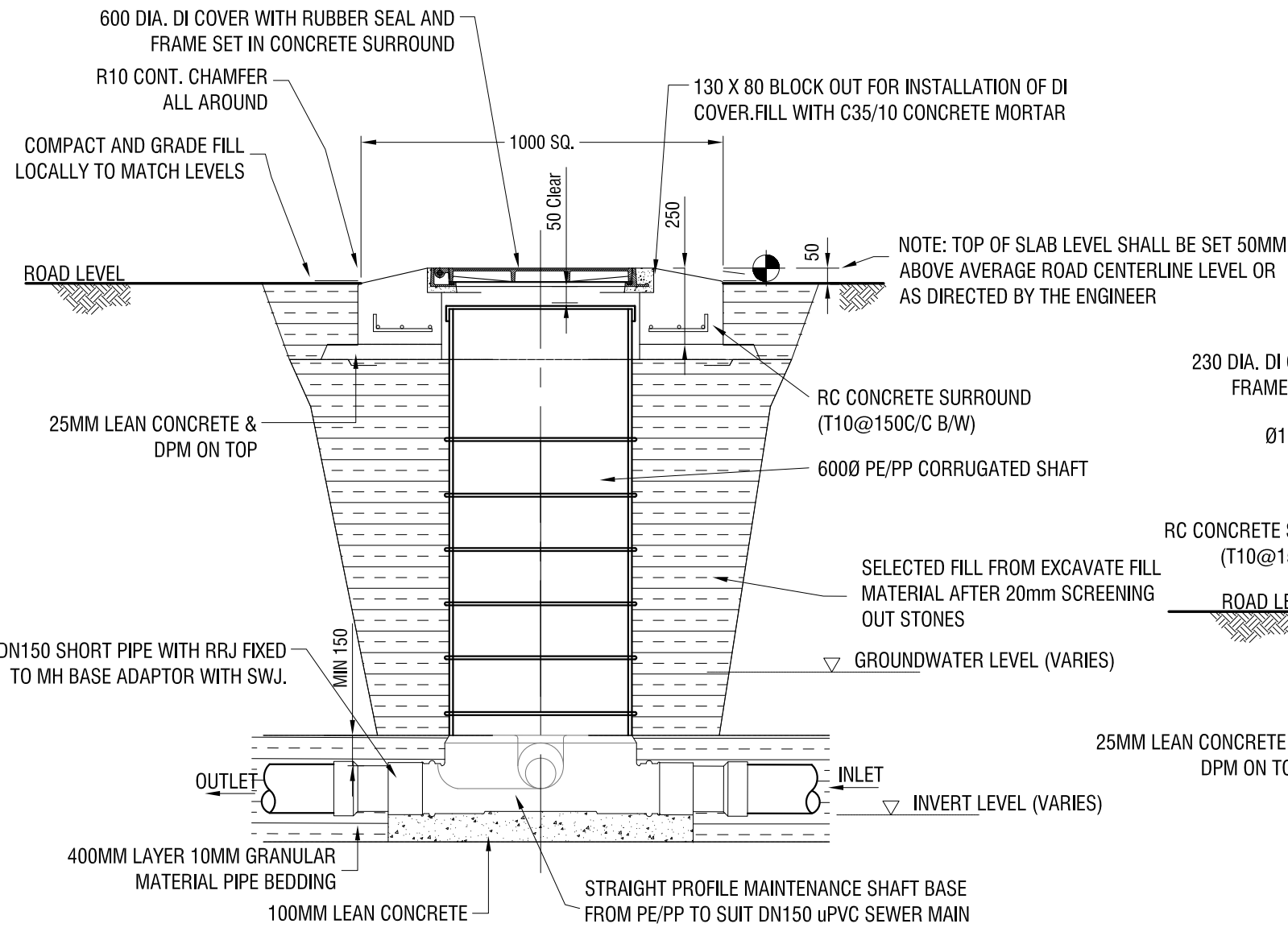


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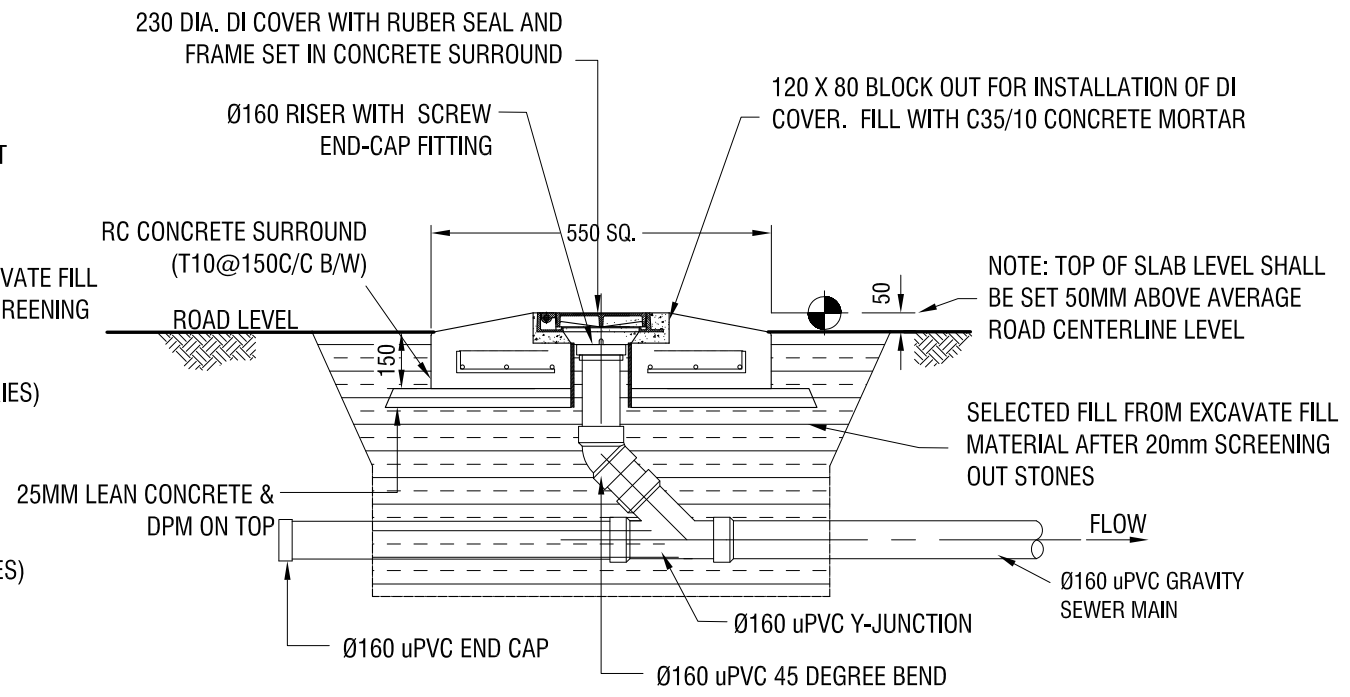
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3rd floor, H. Azam, Alireenmagu, Atolle

Title: House connection detail  
Page: A -02/28

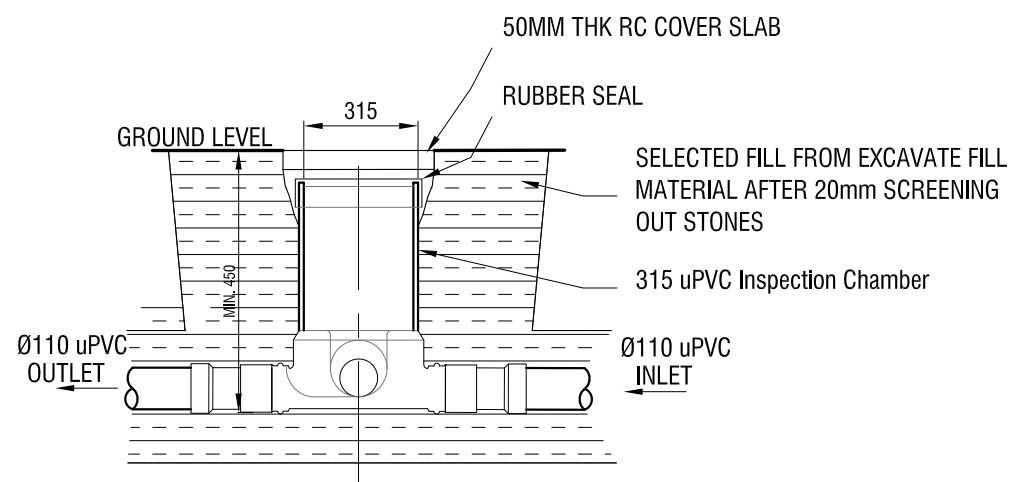
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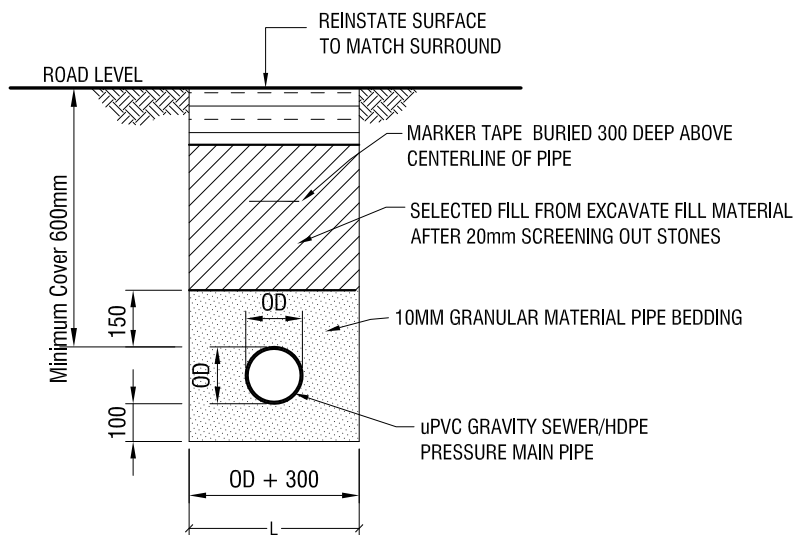
**ELEVATION - MAINTENANCE SHAFT (MH)**  
Scale 1:20



**ELEVATION - CLEANOUT (CO)**  
Scale 1:20



**HOUSE ISPECTION CHAMBER (IC)**  
Scale 1:20



**TRENCH & BEDDING DETAILS**  
Scale 1:20

CONSULTANCY SERVICES FOR SURVEY & DESIGN  
OF SEWERAGE FACILITIES IN HA.BAARAH, MALDIVES  
CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY  
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ENGINEER: - Mohamed Saif Saeed  
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DRAWN BY: - Mariyam Irasha Shareef

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CHECKED BY: - Ihsan Waheed  
DRAWN BY: - Mariyam Irasha Shareef

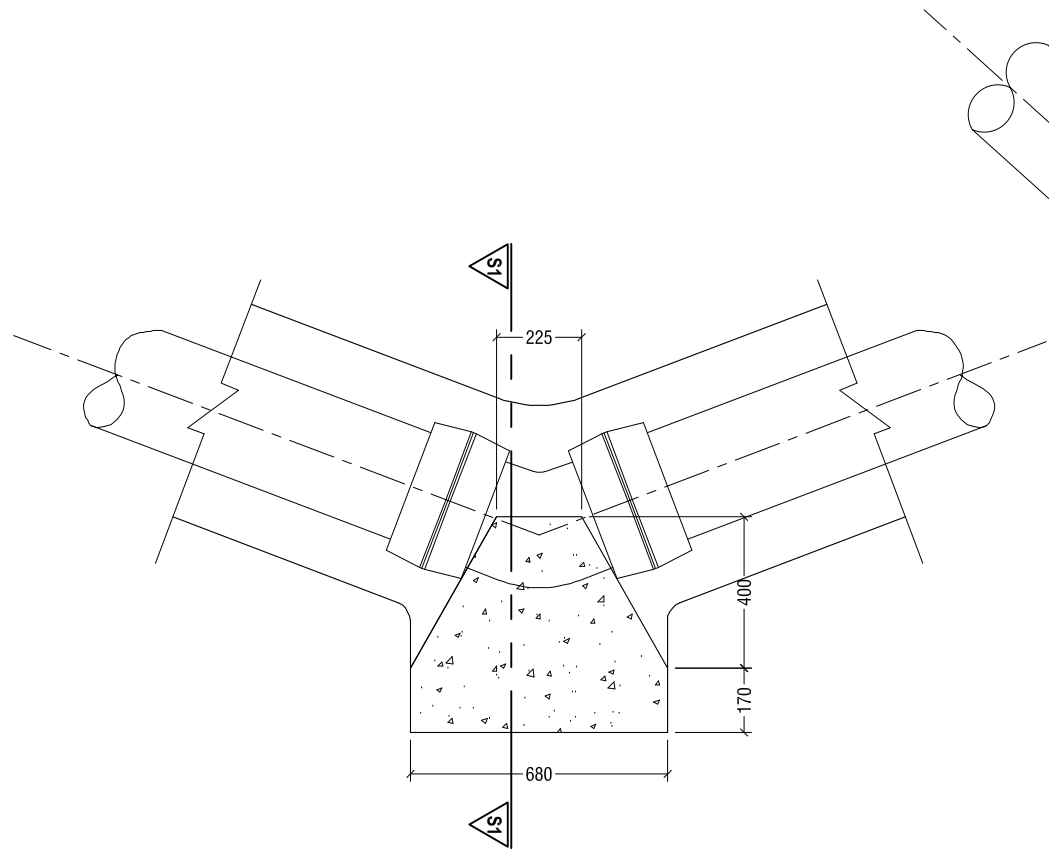


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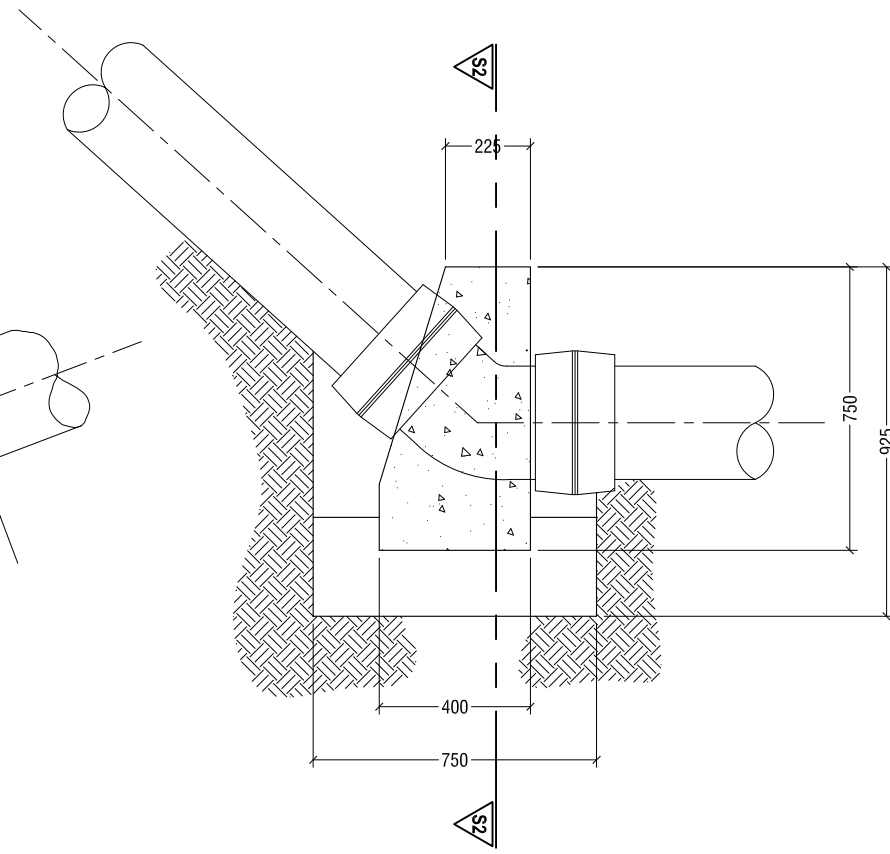
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3rd floor, H. Azam, Alweerenuqoo, Male'

Title: Maintenance shaft, cleanout house inspection chamber, trench and bedding details  
Page: A - /28

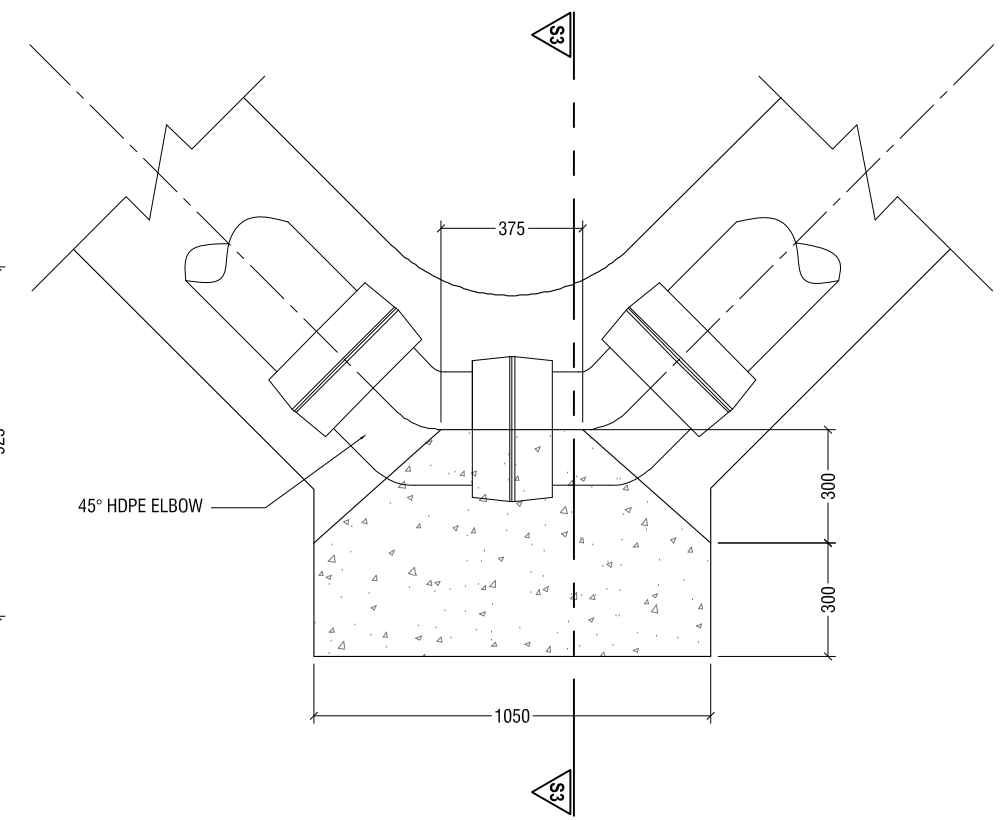
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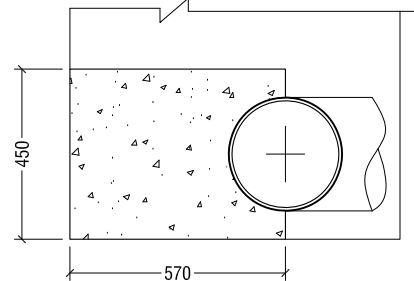
**HORIZONTAL 45° BEND**  
NTS



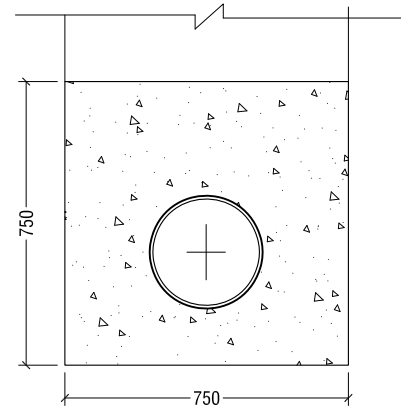
**VERTICAL 45° BEND**  
NTS



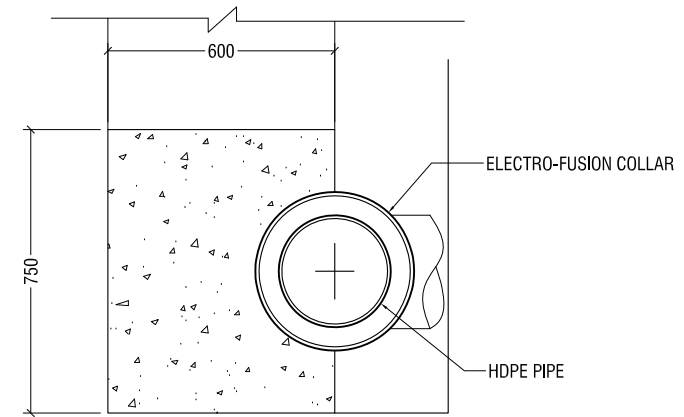
**HORIZONTAL 90° BEND**  
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**SECTION S1-S1**  
NTS

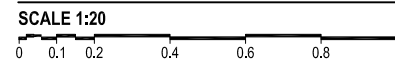


**SECTION S2-S2**  
NTS



**SECTION S3-S3**  
NTS

**THRUST BLOCK DETAIL - FORCE MAINS ONLY**



CONSULTANCY SERVICES FOR SURVEY & DESIGN  
OF SEWERAGE FACILITIES IN HA.BAARAH, MALDIVES  
CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY

PROJECT NUMBER: \_\_\_\_\_  
DATE: MARCH 2017  
ENGINEER: - Mohamed Saif Saeed  
CHECKED BY: - Insan Waheed  
DRAWN BY: - Mariyam Irasha Shareef

Rev no	Date



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Title: Thrust block detail

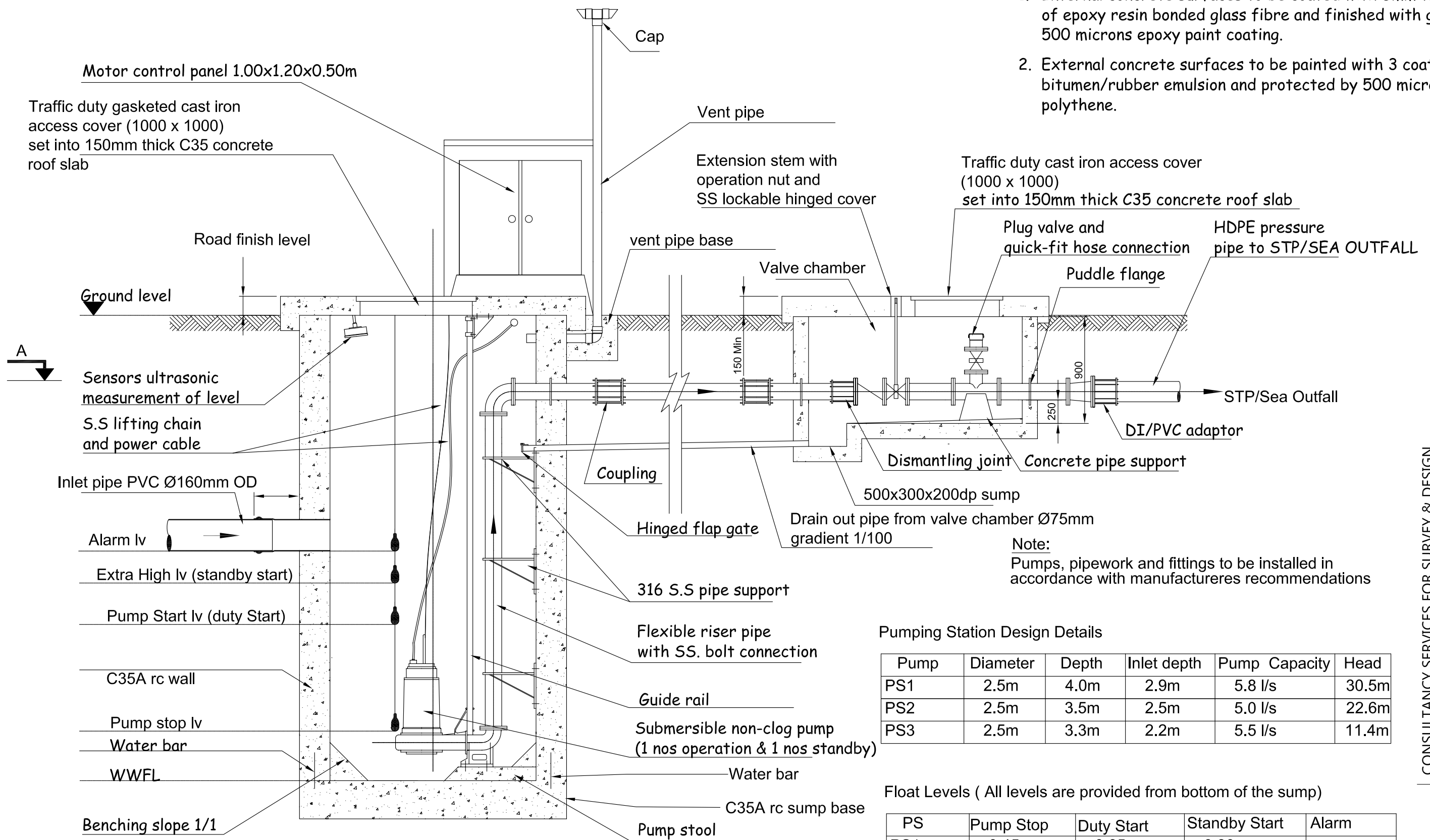
Page: A -04/28

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Note: Concrete surface protection to pump well /valve chamber

1. Internal concrete surfaces to be coated with 5mm thickness of epoxy resin bonded glass fibre and finished with gel coat or 500 microns epoxy paint coating.
2. External concrete surfaces to be painted with 3 coats of bitumen/rubber emulsion and protected by 500 micron polythene.



Note:  
Pumps, pipework and fittings to be installed in accordance with manufactureres recommendations

Pumping Station Design Details

Pump	Diameter	Depth	Inlet depth	Pump Capacity	Head
PS1	2.5m	4.0m	2.9m	5.8 l/s	30.5m
PS2	2.5m	3.5m	2.5m	5.0 l/s	22.6m
PS3	2.5m	3.3m	2.2m	5.5 l/s	11.4m

Float Levels ( All levels are provided from bottom of the sump)

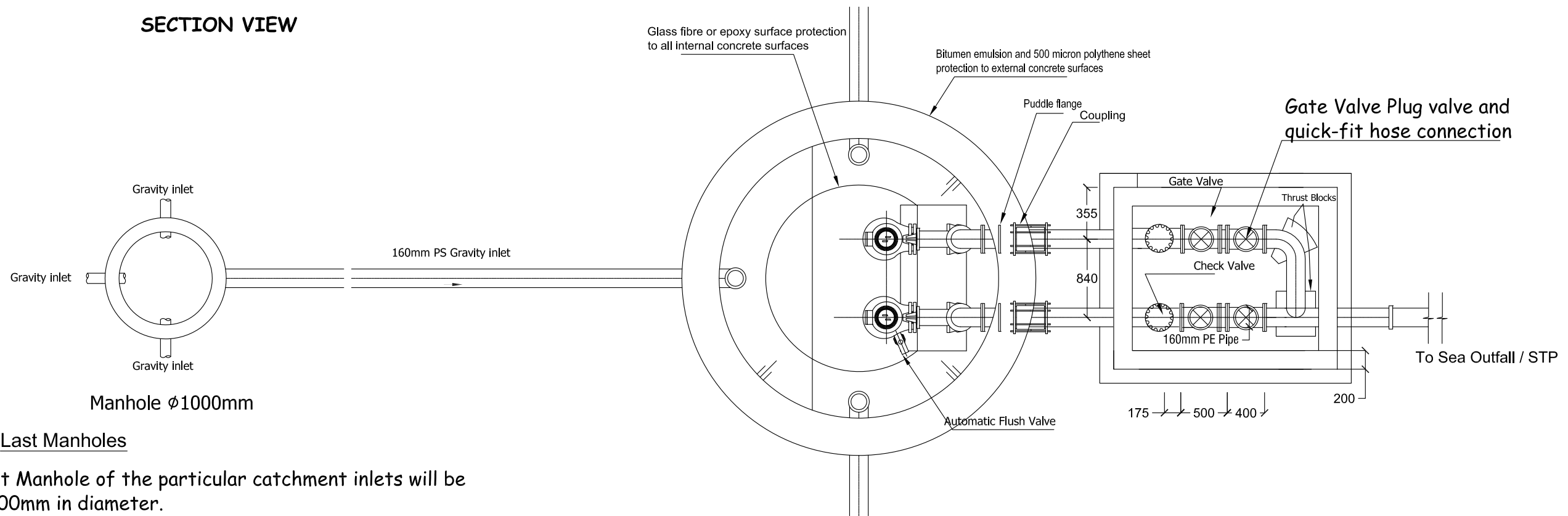
PS	Pump Stop	Duty Start	Standby Start	Alarm
PS1	0.45m	0.65m	0.80m	0.95m
PS2	0.45m	0.65m	0.80m	0.95m
PS3	0.45m	0.65m	0.80m	0.95m

TYPICAL PUMPING STATION DETAIL - LONGITUDINAL SECTION

Scale: N.T.S

CONSULTANCY SERVICES FOR SURVEY & DESIGN  
 OF SEWERAGE FACILITIES IN HA.BAARAH, MALDIVES  
 CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY  
 PROJECT NUMBER:  
 DATE: MARCH 2017  
 ENGINEER: - Mohamed Saif Saeed  
 CHECKED BY: - Ihsan Waheed  
 DRAWN BY: - Mariyam Idrasha Shareef

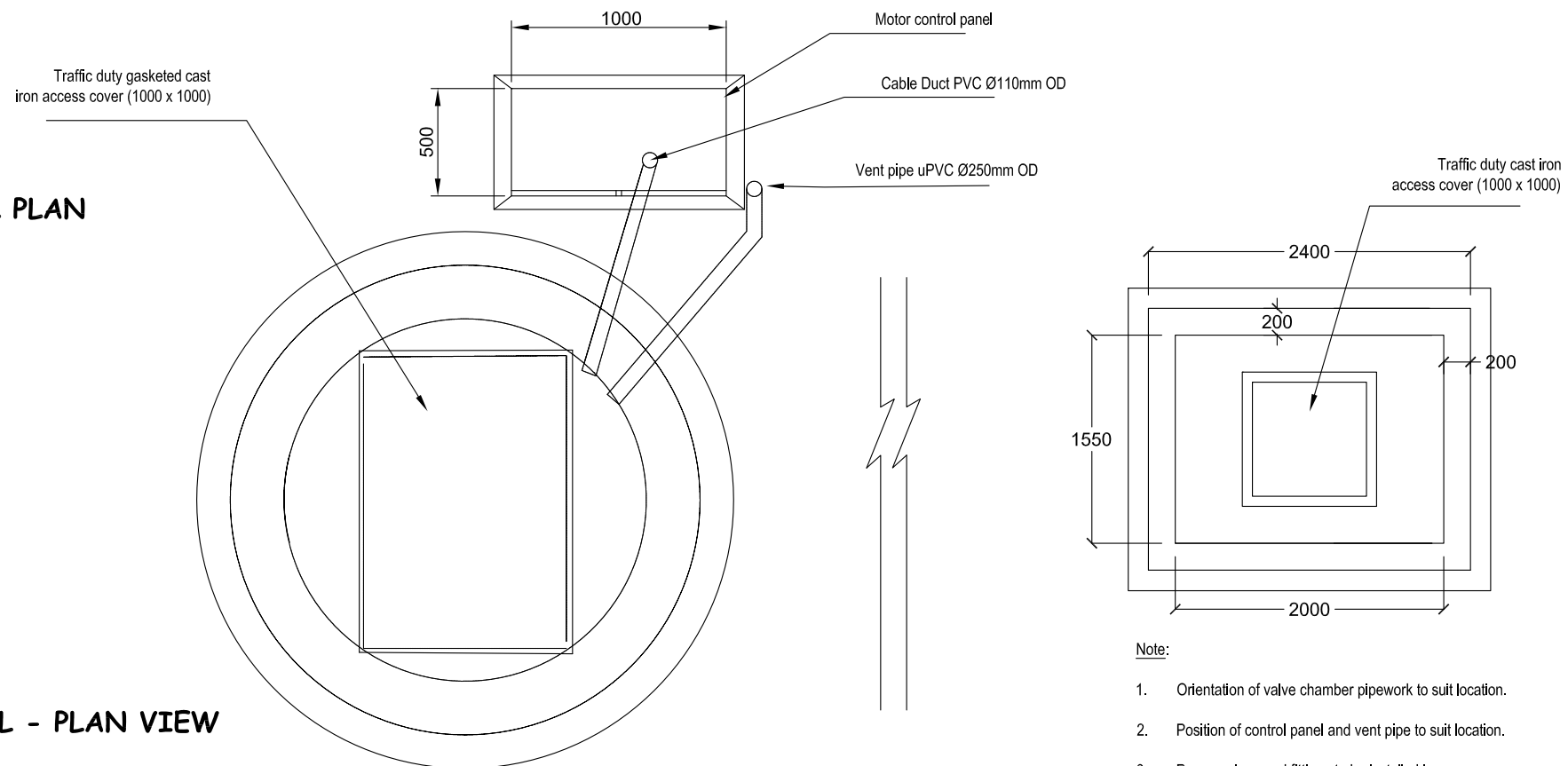
**SECTION VIEW**



Note: Last Manholes

1. last Manhole of the particular catchment inlets will be 1000mm in diameter.
2. Backup pumps with provision of Hose for connection to valve chamber in an emergency should be provided.

**GROUND LEVEL PLAN**



**TYPICAL PUMPING STATION DETAIL - PLAN VIEW**

Scale: N.T.S

Note:

1. Orientation of valve chamber pipework to suit location.
2. Position of control panel and vent pipe to suit location.
3. Pumps, pipes and fittings to be installed in accordance with manufacturers recommendations.

CONSULTANCY SERVICES FOR SURVEY & DESIGN  
OF SEWERAGE FACILITIES IN HA.BAARAH, MALDIVES  
CLIENT: MINISTRY OF ENVIRONMENT AND ENERGY  
PROJECT NUMBER:  
DATE: MARCH, 2017  
ENGINEER: - Mohamed Saif Saeed  
CHECKED BY: - Ihsan Waheed  
DRAWN BY: - Mariyam Irashu Shareef

Rev no	Date



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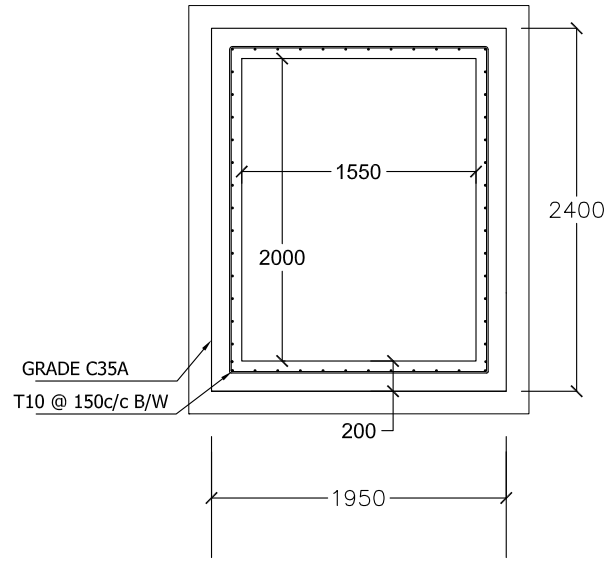
t: +9603315049 f: +9603310776  
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w: www.riyan.com.mv  
3rd floor, H. Azam, Alreeneemagu, Male'

Title: TYPICAL PUMPING STATION DETAIL - PLAN

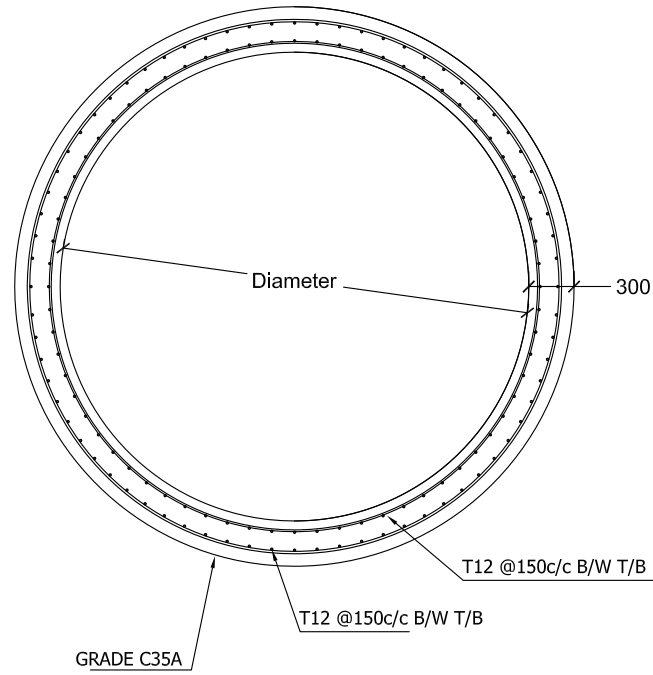
Page: A -06/28

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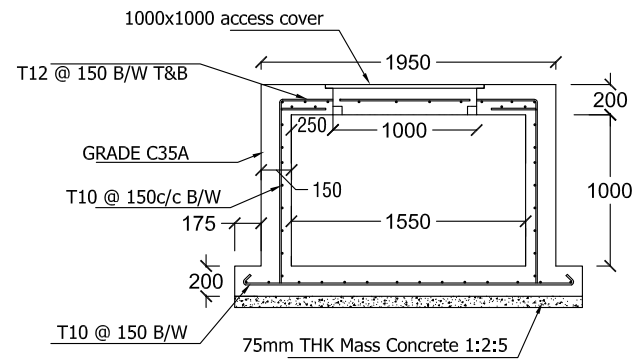


PLAN



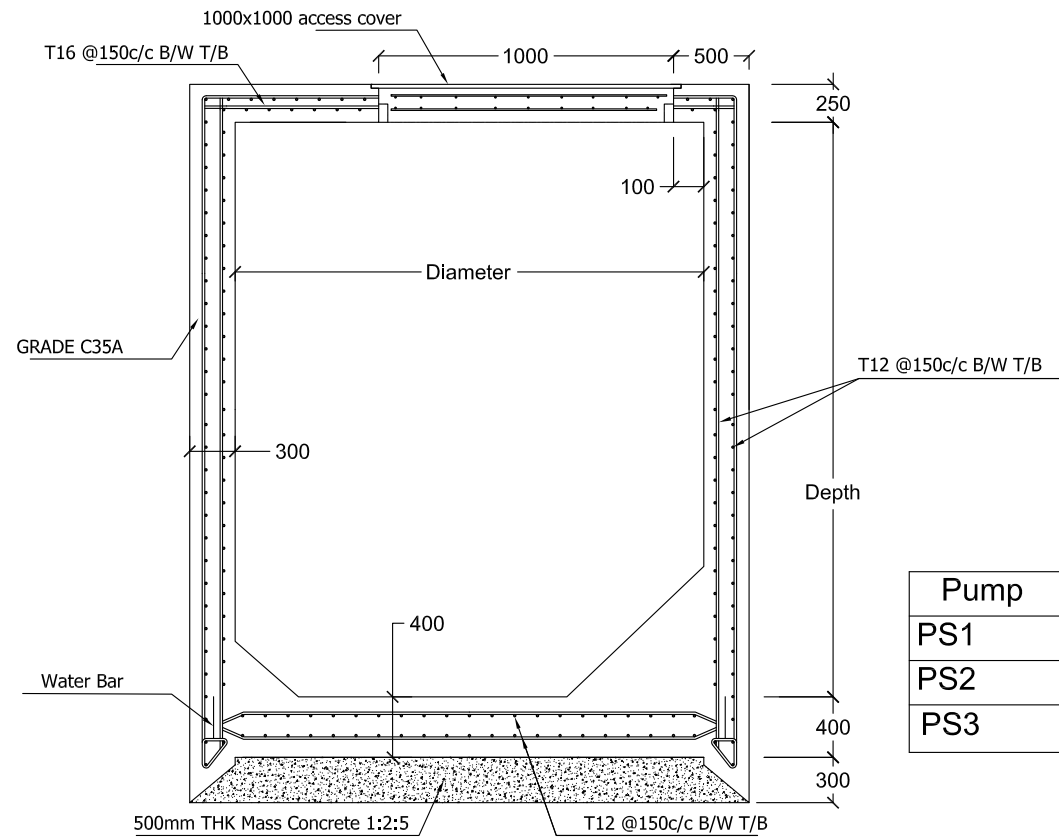
Note:

1. All structural concrete shall be of grade C35A.
2. All castings shall be done using Sulpahte Resistant Portland Cement to BS 4027:1996.
3. All structural reinforcement shall be epoxy coating of non-pre-stressed reinforcement to ASTM-A775/A775M.



SECTION

VALVE CHAMBER DETAIL



PUMP STATION DETAIL

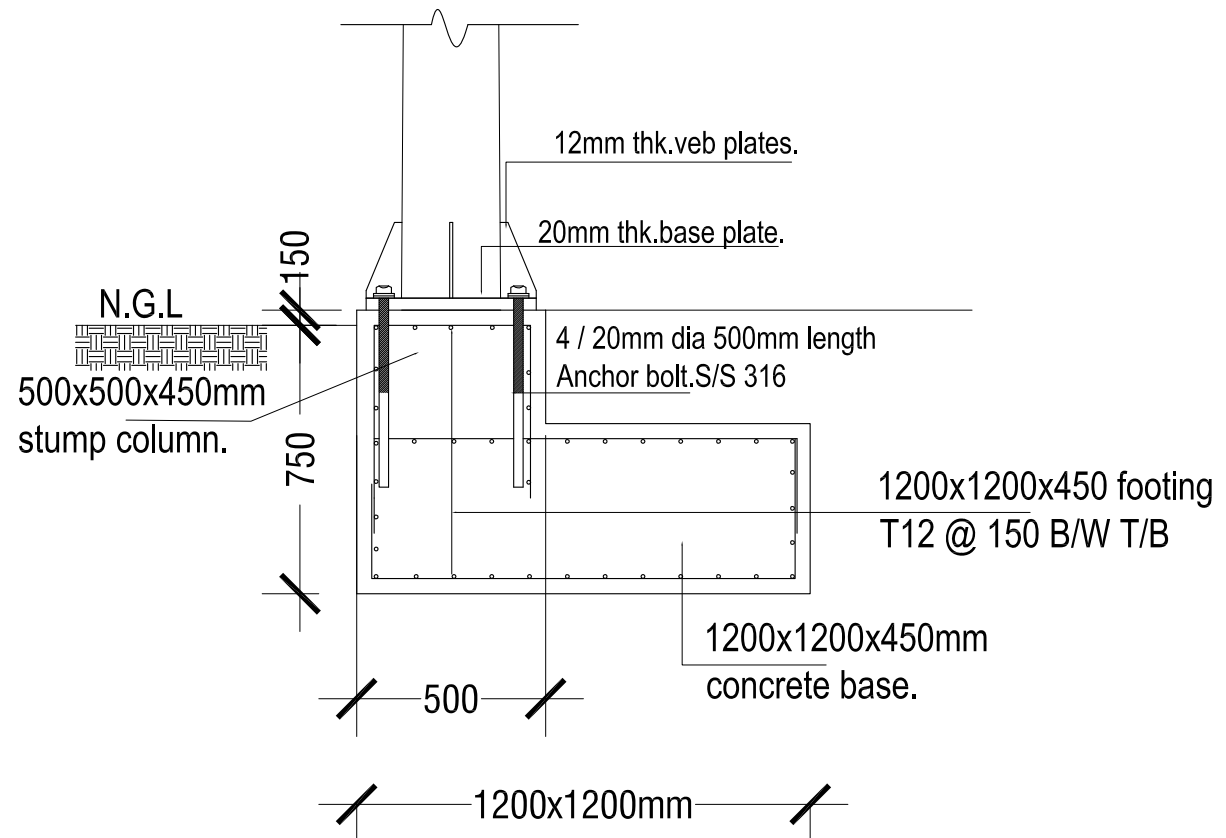
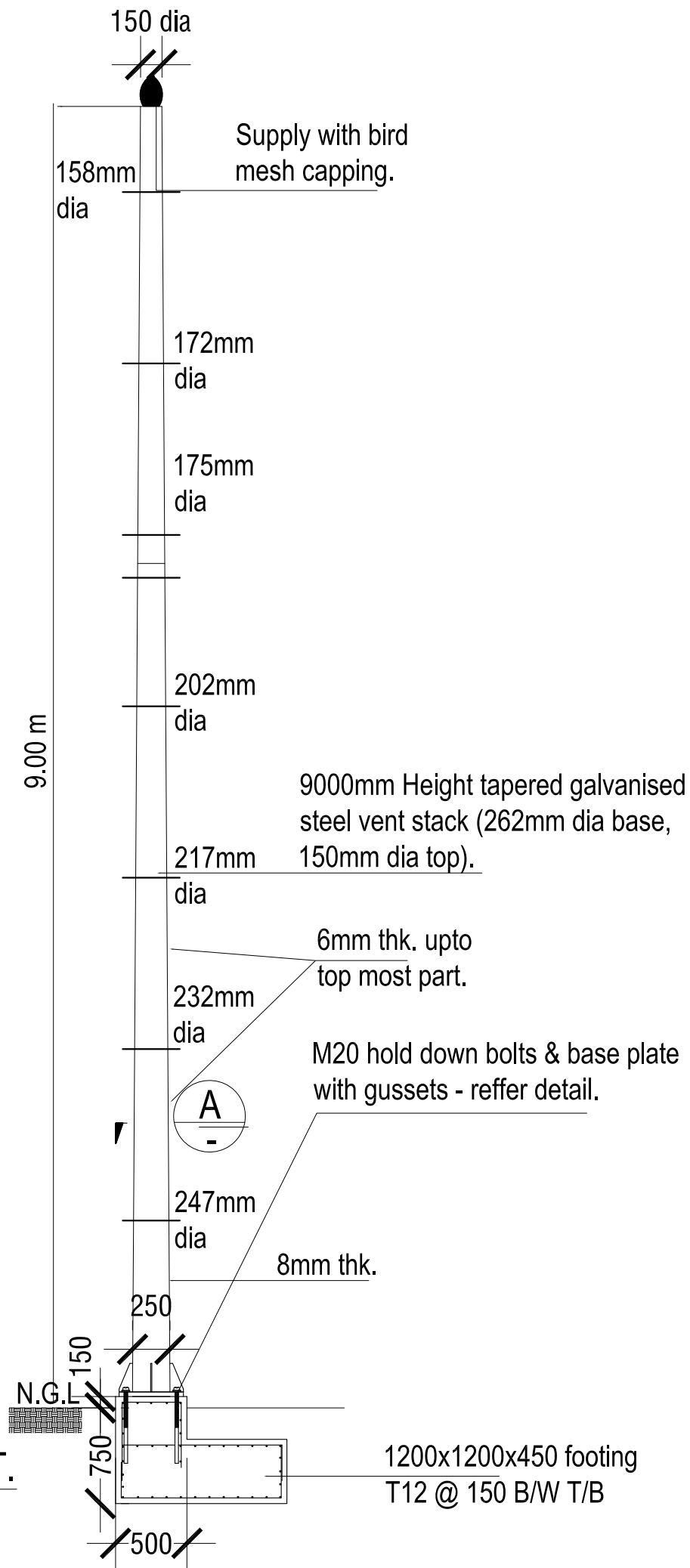
Pump	Diameter	Depth	Inlet depth
PS1	2.5m	4.0m	2.92m, 2.61m,
PS2	2.5m	3.5m	2.49m, 2.47m,
PS3	2.5m	3.3m	1.68m, 2.19m,

PUMPING STATION STRUCTURAL DETAILS  
Scale: N.T.S

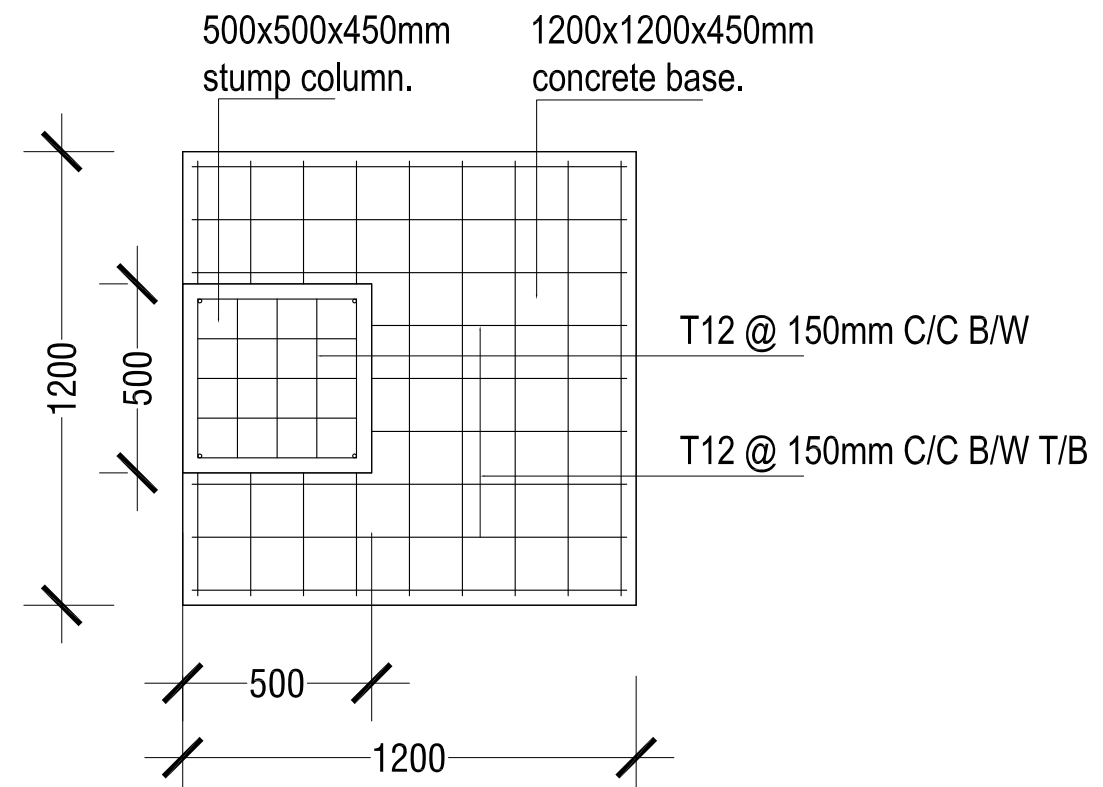


# ELEVATION - PUMPSTATION VENT.

Scale: N.T.S



## SECTION.



## FOOTING DETAIL PLAN.

Scale: N.T.S

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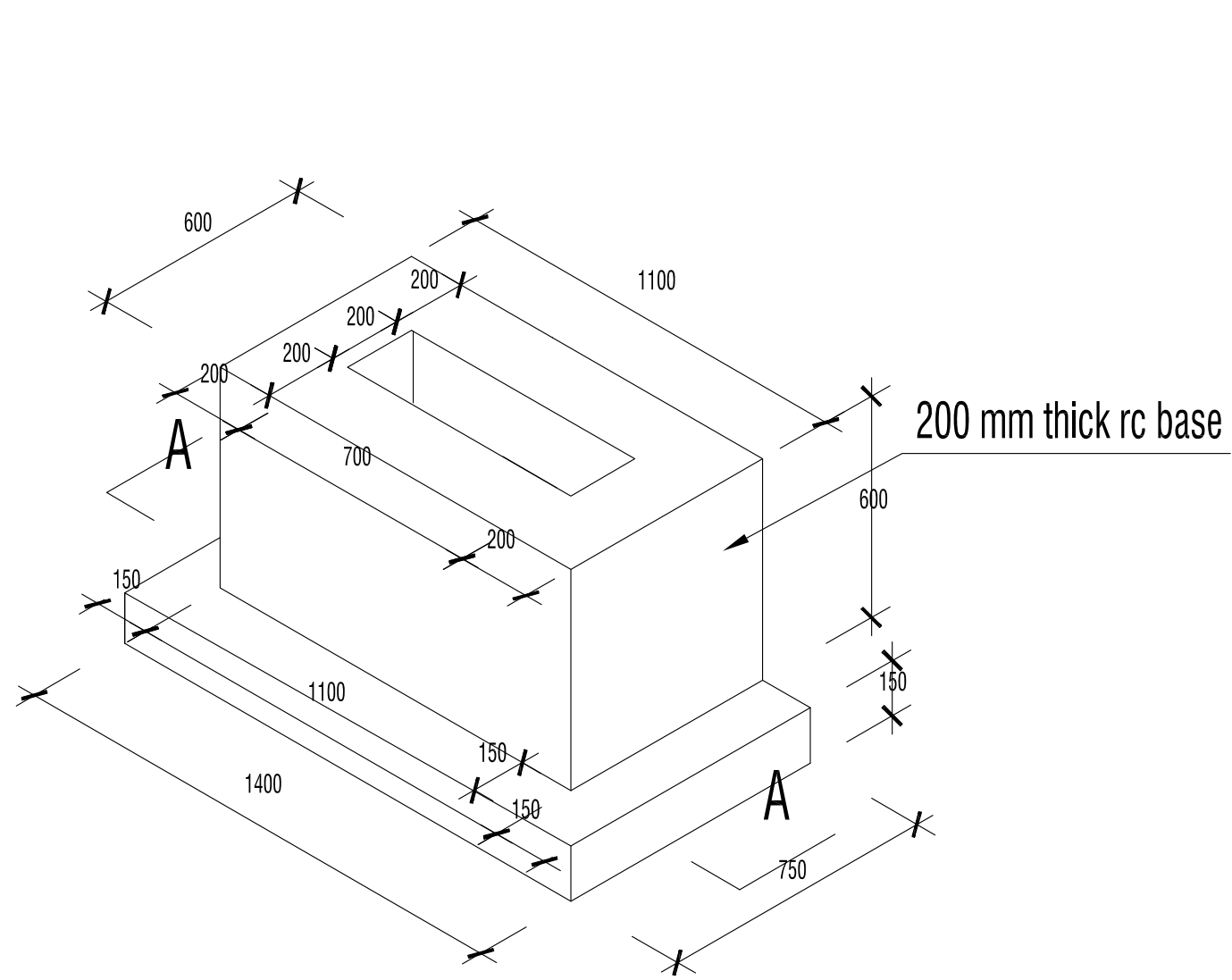
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 3rd floor, H. Azam, Alireenmagu, Atoll

Title: Pump Station Vent Elevation  
 Footing Detail Plan

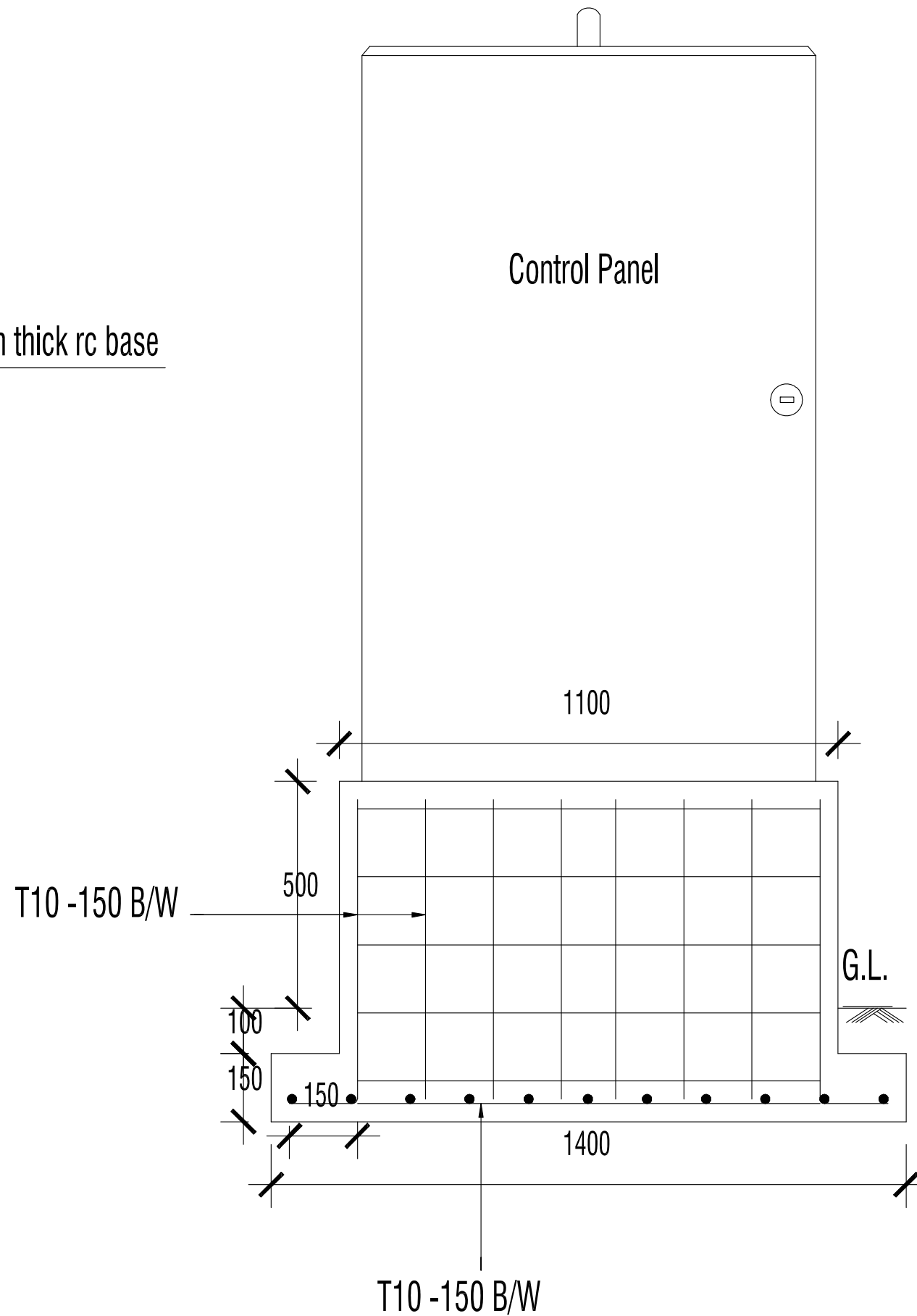
Page: A -08/28

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ISOMETRIC VIEW

Scale: N.T.S



T10 -150 B/W

SECTION A - A

Scale: N.T.S

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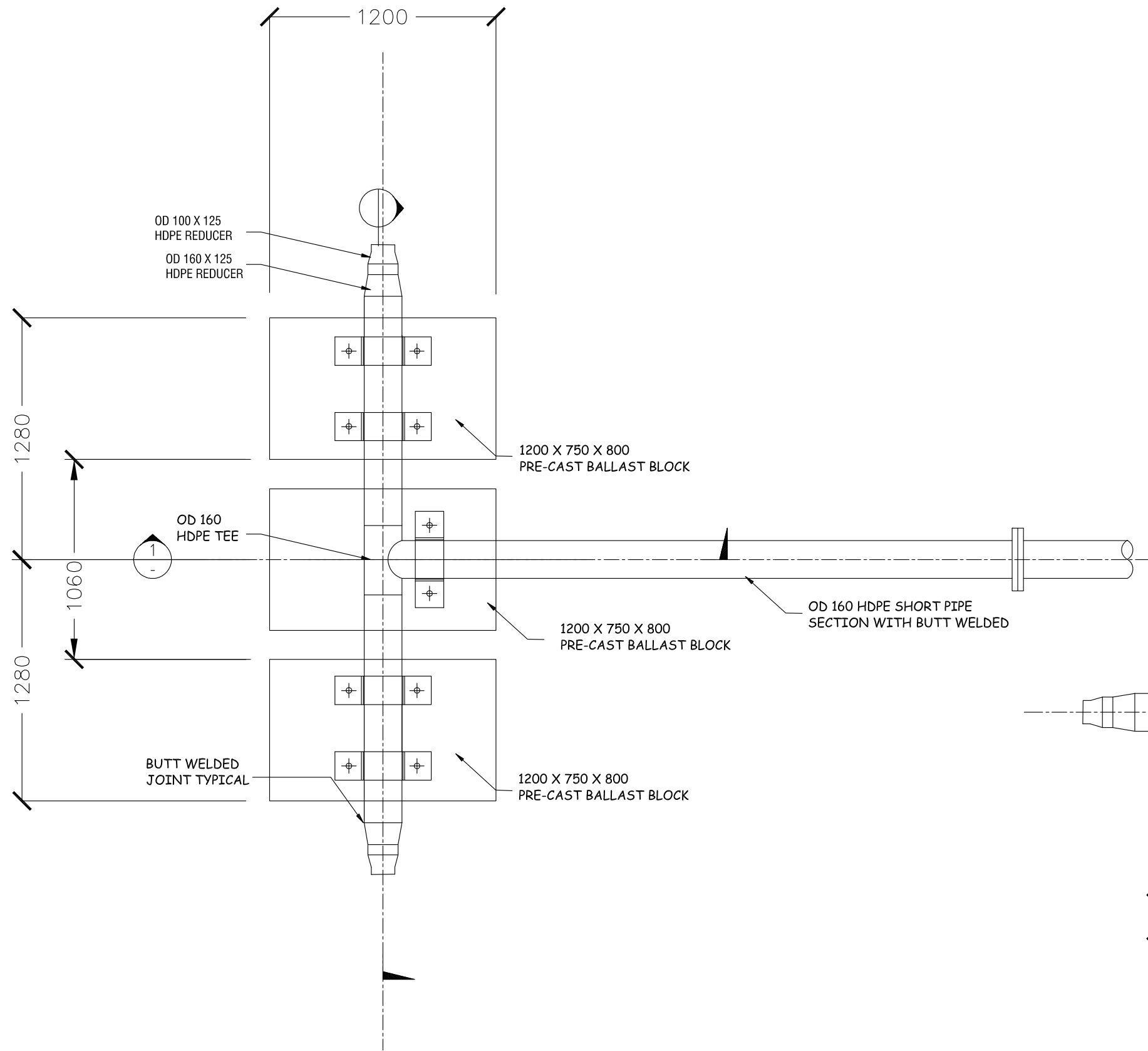


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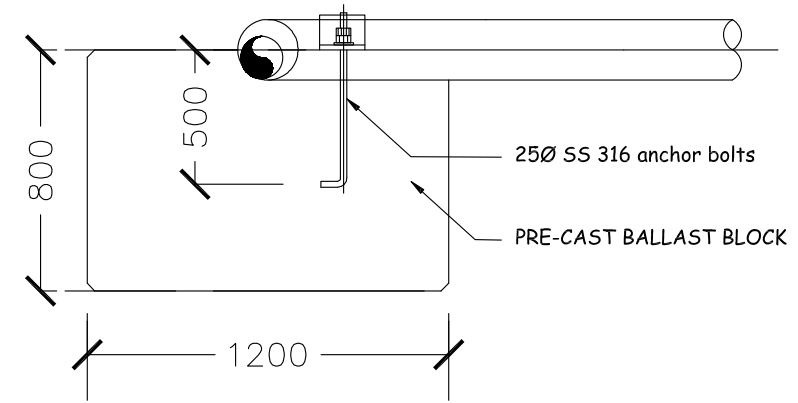
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Title: Control Panel Base  
Section A-A  
Page: A -09/28

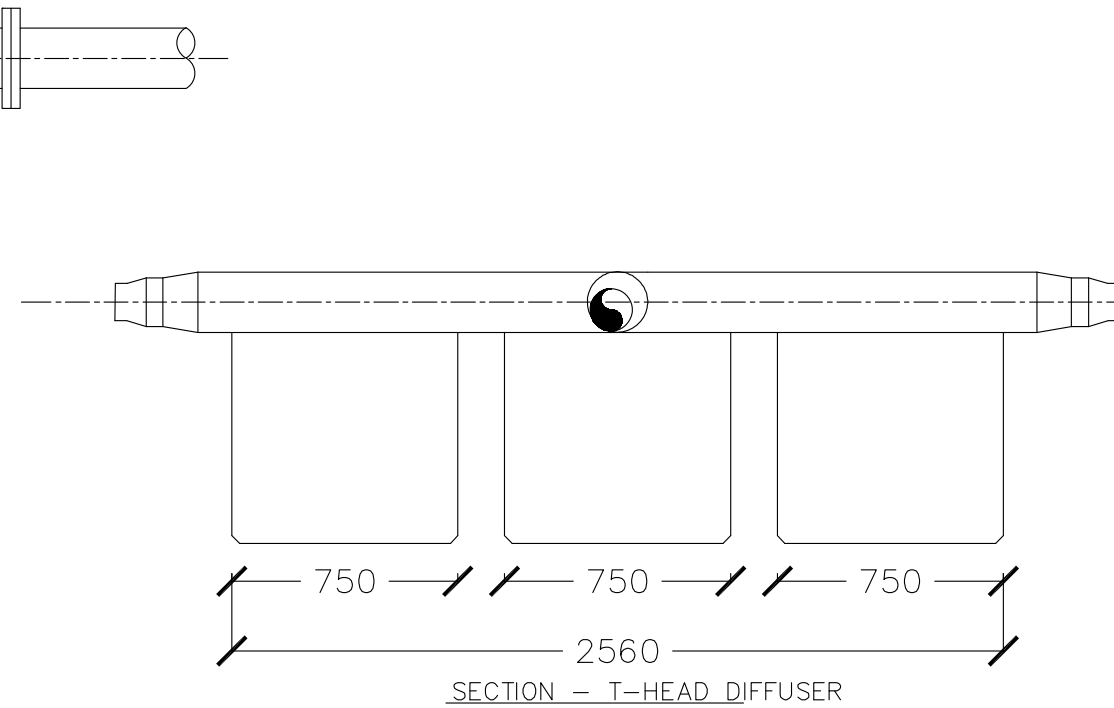
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PLAN – T-HEAD DIFFUSER  
Scale: N.T.S



SECTION – T-HEAD DIFFUSER  
Scale: N.T.S



SECTION – T-HEAD DIFFUSER

- NOTES:
1. ALL BACKING RINGS FOR STUB FLANGES, NUTS AND BOLTS SHALL BE GRADE 316 STAINLESS STEEL.
  2. ALL PIPEWORK SHALL BE BEDDED ON 10MM THICK NEOPRENE RUBBER SEAT IN SEMICIRCULAR RECESS MATCHING THE O.D OF THE PIPE.
  3. FABRICATE SPECIFIC PIPE CLAMPS TO PROVIDE FIRM CLAMPING ACTION ACCORDING TO PIPE O.D .

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DATE: MARCH 2017  
ENGINEER :- Mohamed Saif Saeed  
CHECKED BY :- Insan Waheed  
DRAWN BY :- Mariyam Irasha Shareef

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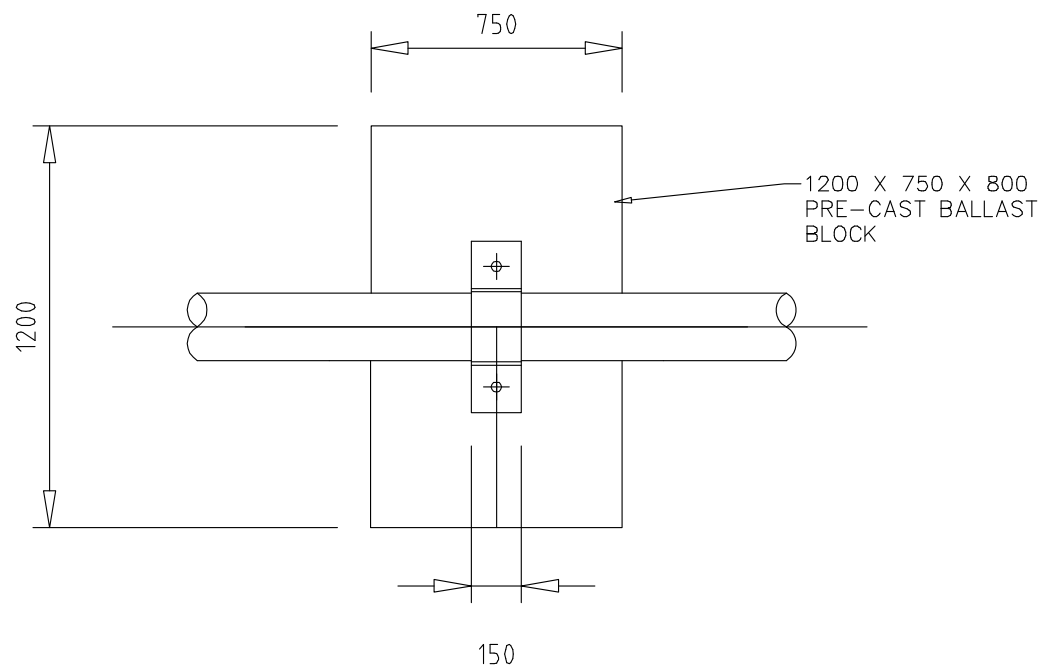


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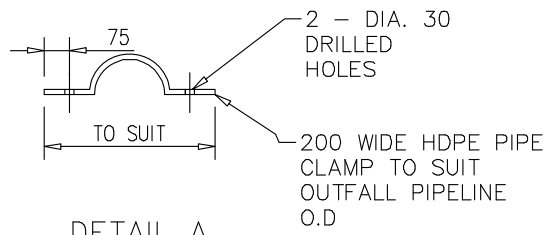
Title: T-Head Diffuser  
Plan & Section

Page: A -10/28



PLAN PRE-CAST BALLAST BLOCK

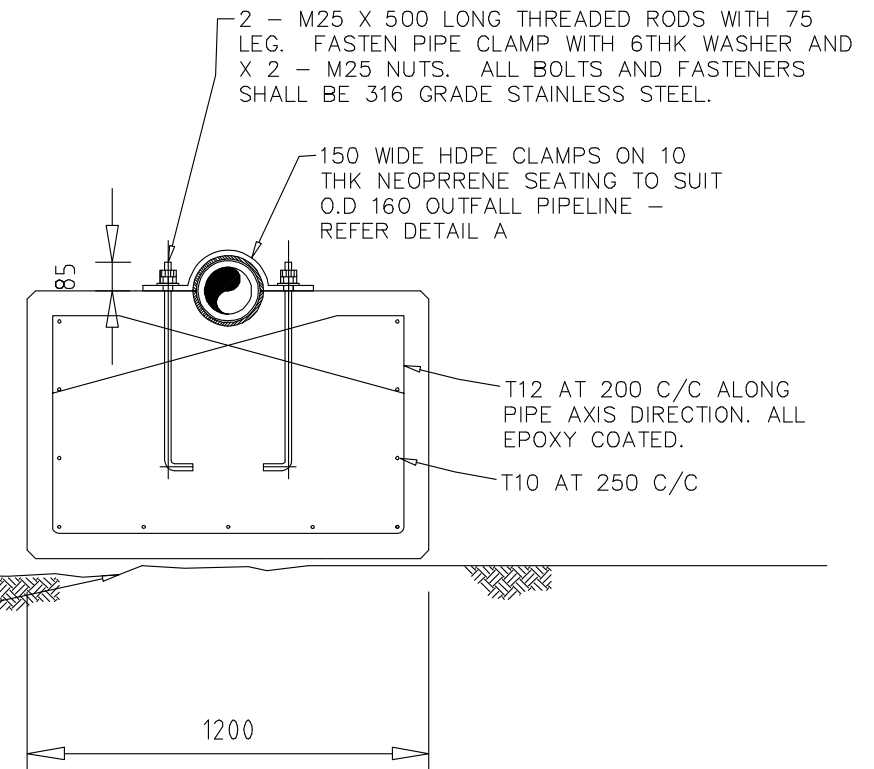
Scale: N.T.S



DETAIL A

PRE-CAST BALLAST BLOCK

PREPARE SEABED PRIOR TO PLACEMENT OF BALLAST BLOCKS MAX. +/- 25MM AMPLITUDE

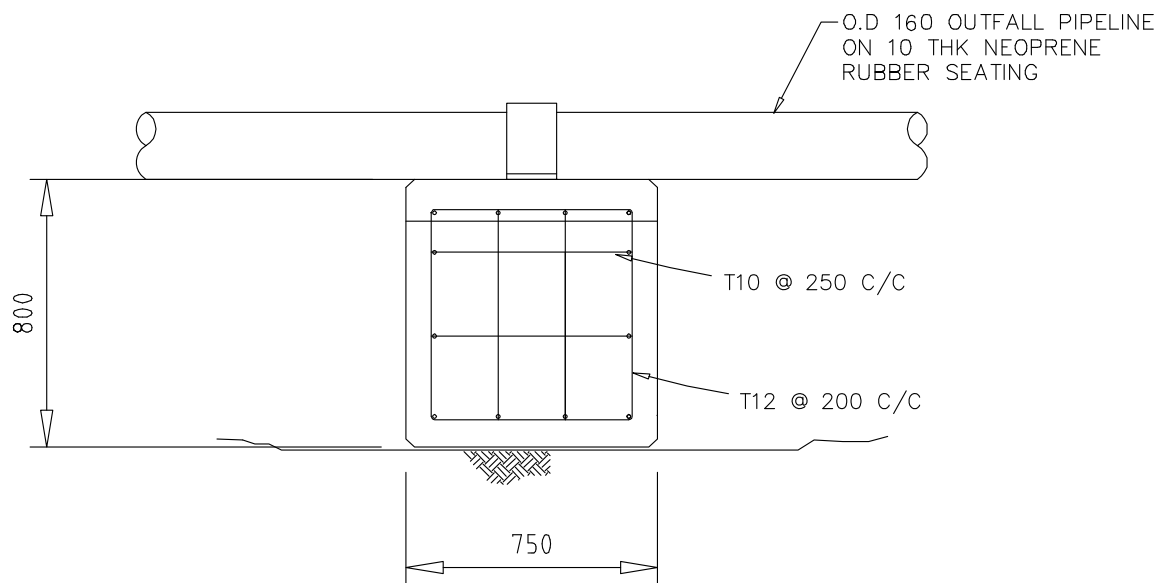


SECTION - PRE-CAST BALLAST BLOCK ASSEMBLY

Scale: N.T.S

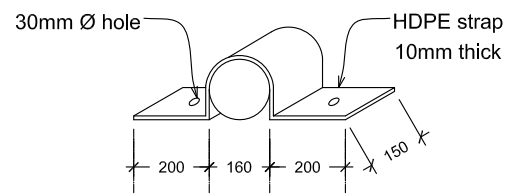
NOTES:

1. MIN 75MM COVER TO ALL REINFORCEMENT BARS.
2. ALL REINFORCEMENT SHALL BE EPOXY COATED PRIOR TO PLACEMENT OF CONCRETE.
3. PRE-CAST BALLAST BLOCKS SHALL BE FABRICATED WITH N40 / 20 CONCRETE.

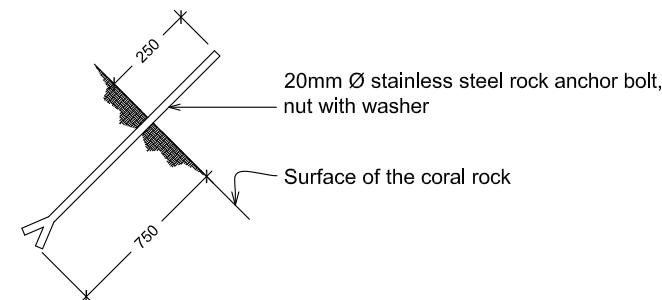


ELEVATION

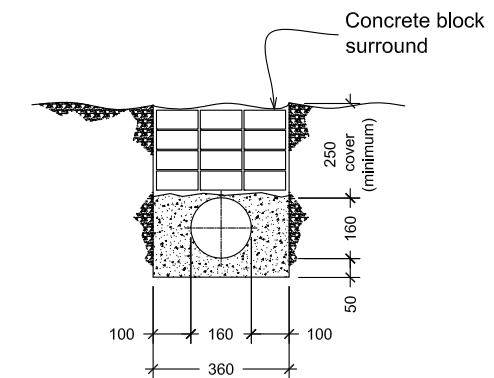
Scale: N.T.S



Straps at every one metre  
DETAIL OF FIXING PIPE ON REEF FACE



ANCHOR BOLT DETAIL FOR FIXING OUTFALL PIPE ON STEEP REEF SLOPES



BURIED SECTION DETAIL

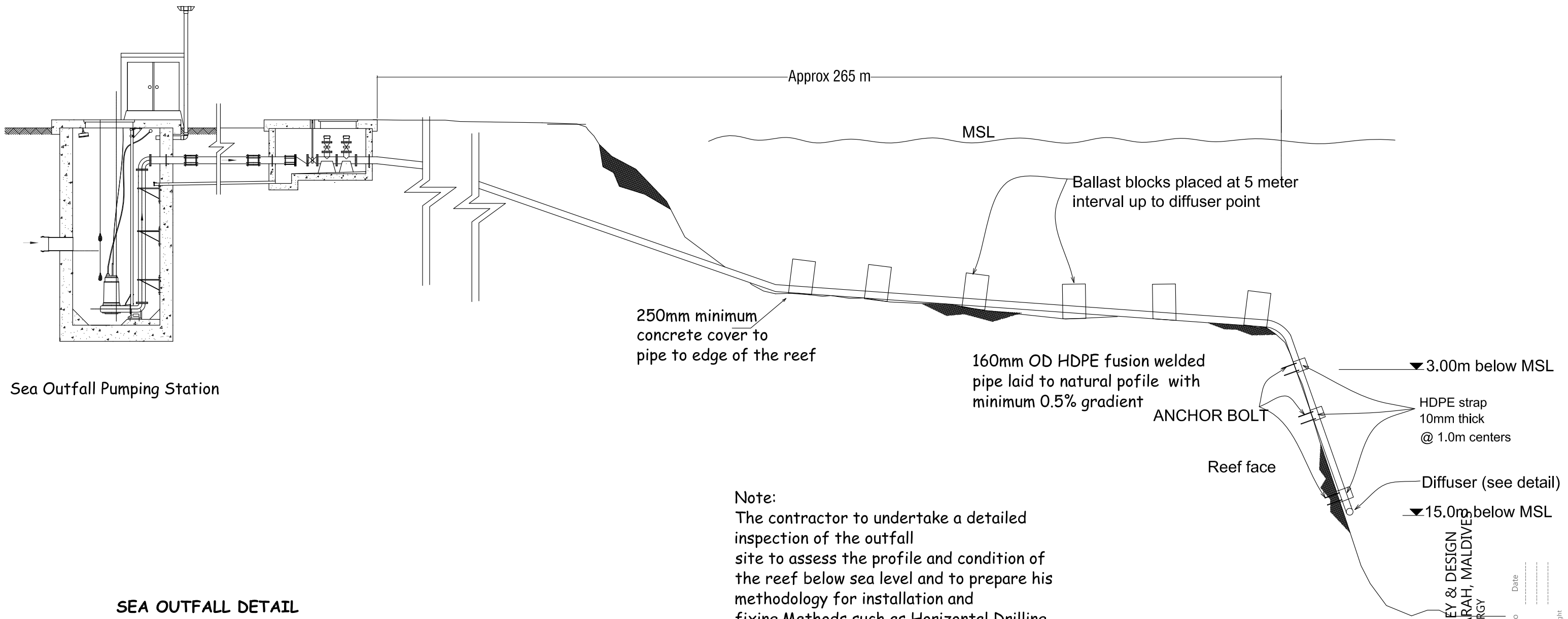
Note: To be provided where cover is not achieved and from Vegetation line to beach toe (low tide line)

SEA OUTFALL FIXING DETAIL

Scale: N.T.S

Rev no	Date
1	
2	
3	





Sea Outfall Pumping Station

**SEA OUTFALL DETAIL**

Scale: N.T.S

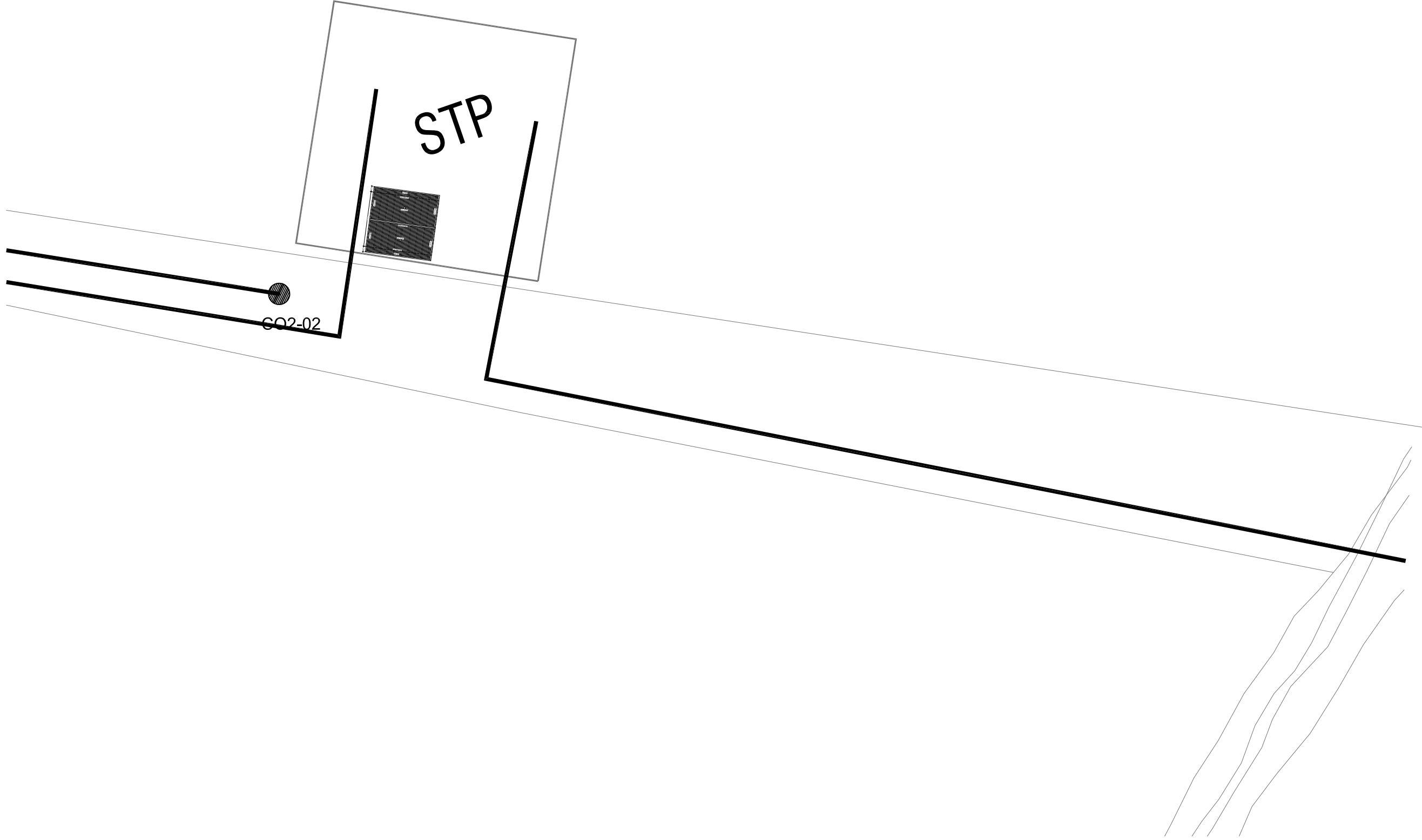
Note:  
 The contractor to undertake a detailed inspection of the outfall site to assess the profile and condition of the reef below sea level and to prepare his methodology for installation and fixing. Methods such as Horizontal Drilling can be used subject to approval by Engineer.

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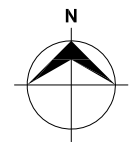
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**SITE PLAN**  
SCALE 1:500



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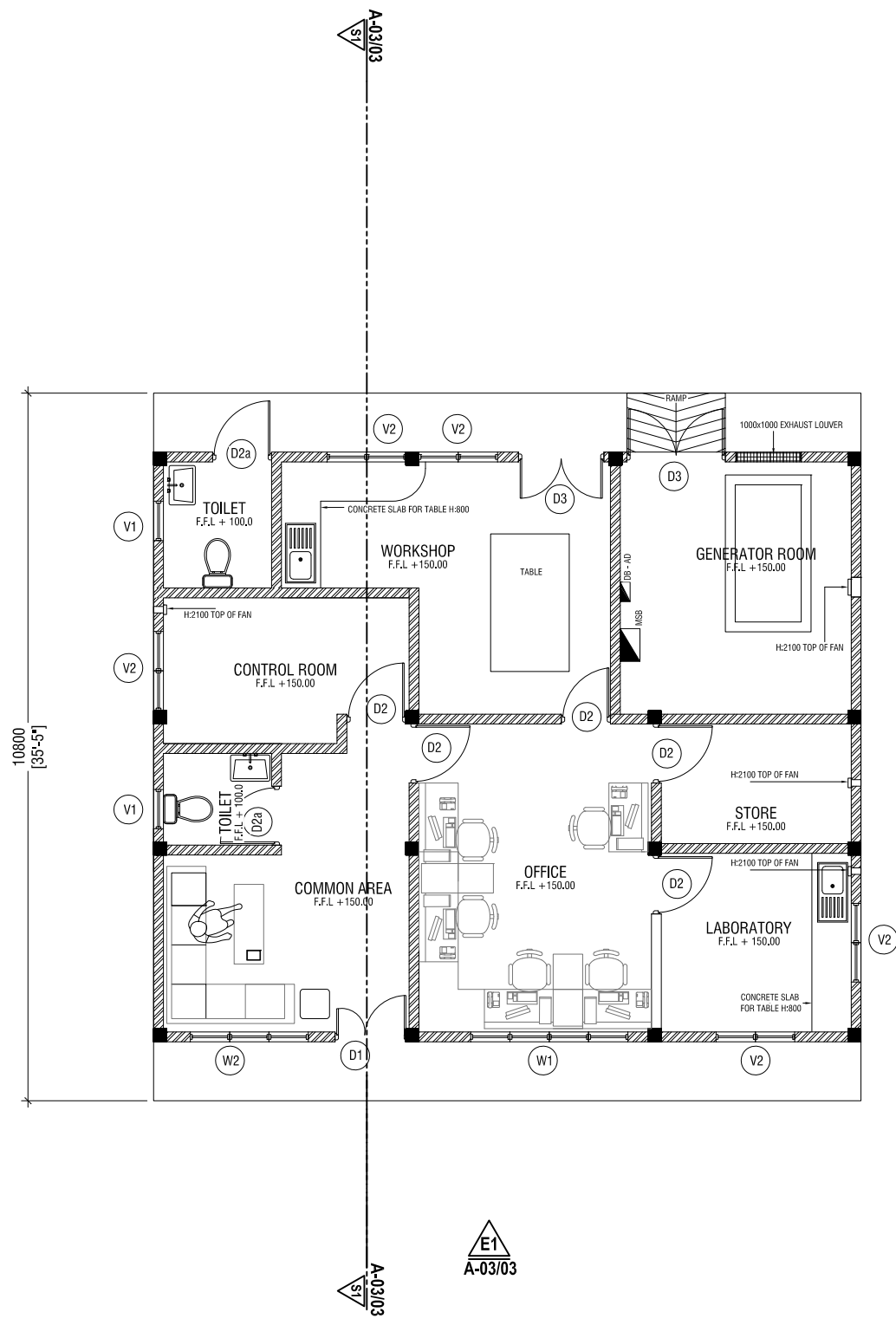
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02	2017-03-01
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09	2017-03-01
10	2017-03-01
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12	2017-03-01
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20	2017-03-01
21	2017-03-01
22	2017-03-01
23	2017-03-01
24	2017-03-01
25	2017-03-01



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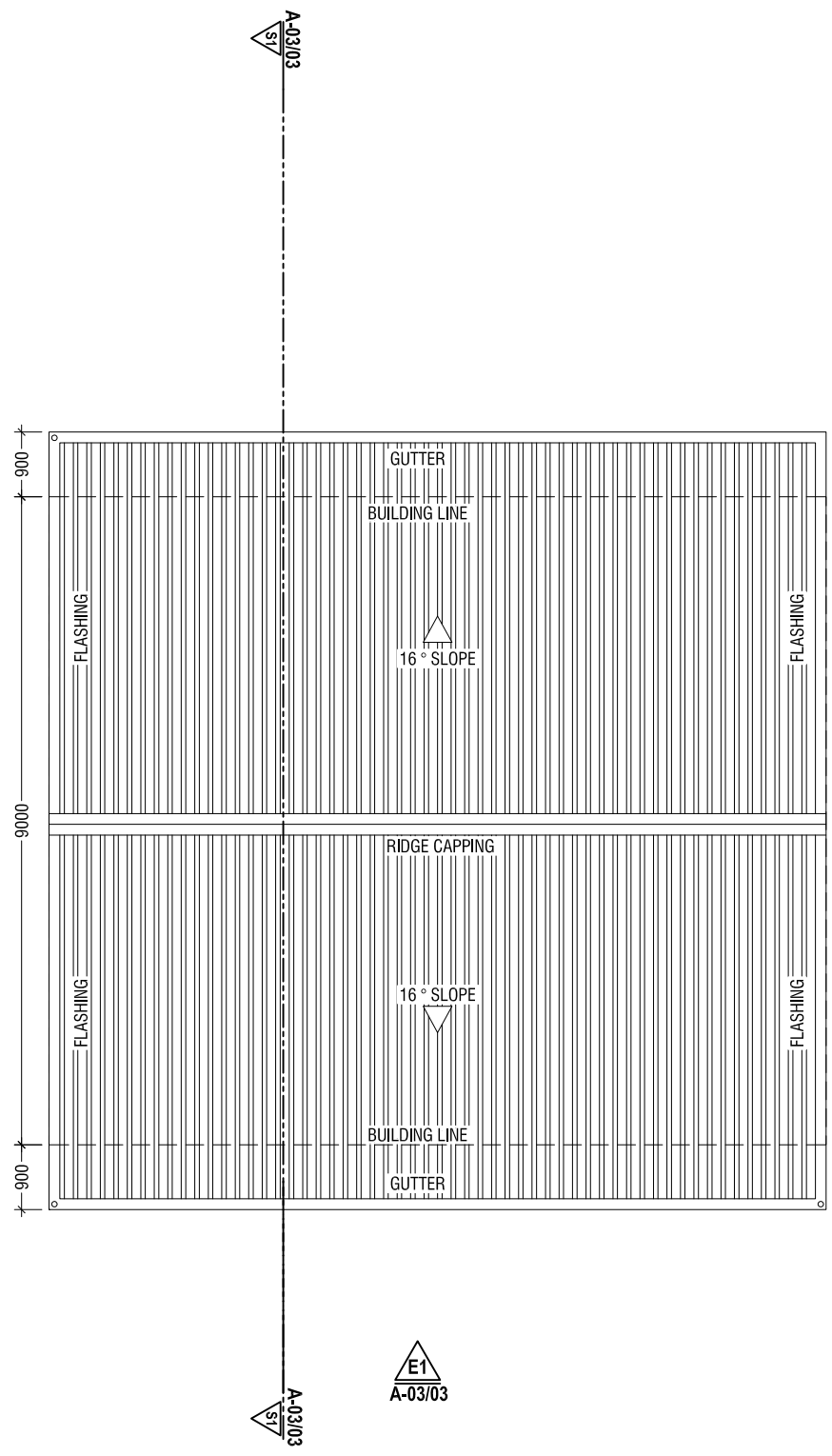
Title: Admin Building Site Plan  
Page: A -13/28

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**GROUND FLOOR PLAN**

SCALE 1:100



**ROOF PLAN**

SCALE 1:100



GROUND FLOOR PLAN & ROOF PLAN

CONSULTANCY SERVICES FOR SURVEY & DESIGN  
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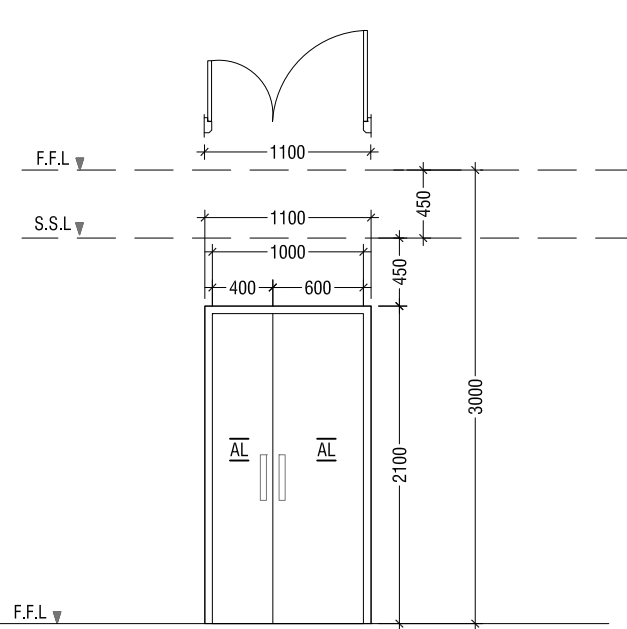
PROJECT NUMBER: \_\_\_\_\_  
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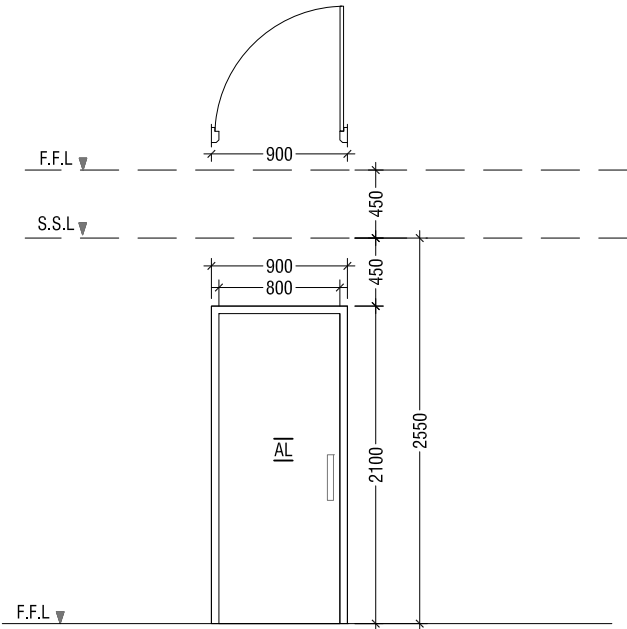
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Title: Admin Building Ground Floor Plan & Roof plan  
 Page: A -14/28

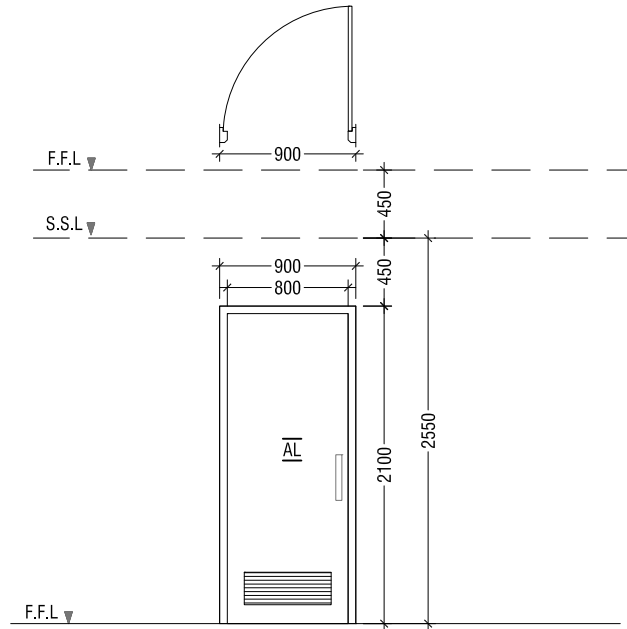
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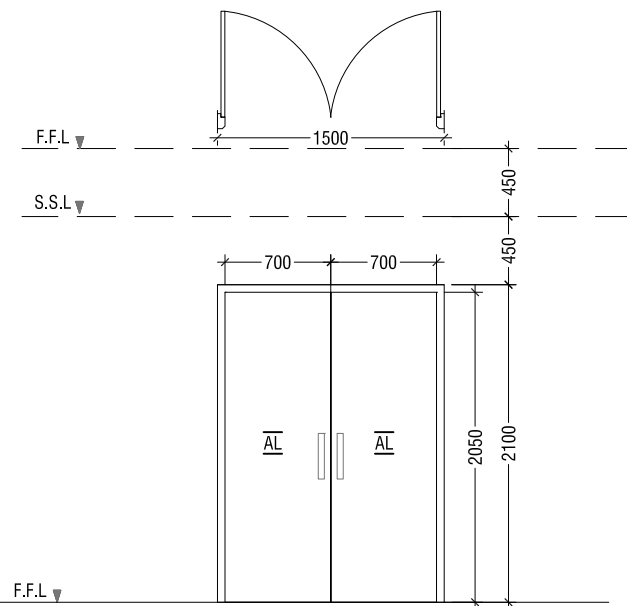
D1	SWING-TYPE DOOR
REMARKS	AL FRAMED DOOR WITH AL PANELS
LOCATION	COMMON AREA ENTRANCE
QUANTITY	01 NO.
OPEN AREA	2.05 SQM.



D2	SWING-TYPE DOOR
REMARKS	AL FRAMED DOOR WITH AL PANELS
LOCATION	ENTRANCE DOOR
QUANTITY	05 NO.
OPEN AREA	1.64 SQM.



D2a	SWING-TYPE DOOR
REMARKS	AL FRAMED DOOR WITH AL PANELS
LOCATION	TOILET
QUANTITY	02 NO.
OPEN AREA	1.64 SQM.



D3	SWING-TYPE DOOR
REMARKS	AL FRAMED DOOR WITH AL PANELS
LOCATION	WORKSHOP & GENERATOR ROOM ENTRANCE
QUANTITY	02 NO.
OPEN AREA	3.48 SQM.

### DOOR WINDOW SCHEDULE 01

SCALE 1:50



**LEGEND:-**  
 AL - ALUMINIUM LOUVERS  
 FR-G - FROSTED GLASS  
 RG - REFLECTIVE GLASS  
 FRG - FIXED REFLECTIVE GLASS

**NOTE:-**  
 -ALL DOORS & WINDOWS TO BE CHECKED ON SITE BEFORE FABRICATION.  
 -ALL DOOR & WINDOWS VIEWED FROM EXTERIOR, FOR DOOR SWING, REFER TO FLOOR PLANS.  
 -THE DOORS / WINDOWS WHICH DOES NOT TOUCH THE BEAM PLEASE PUT A LINTEL BEAM (LB) ABOVE THE DOOR / WINDOW.

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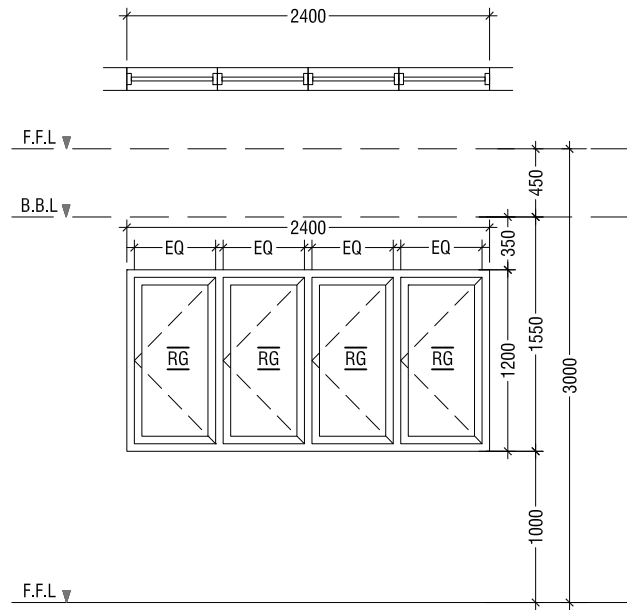
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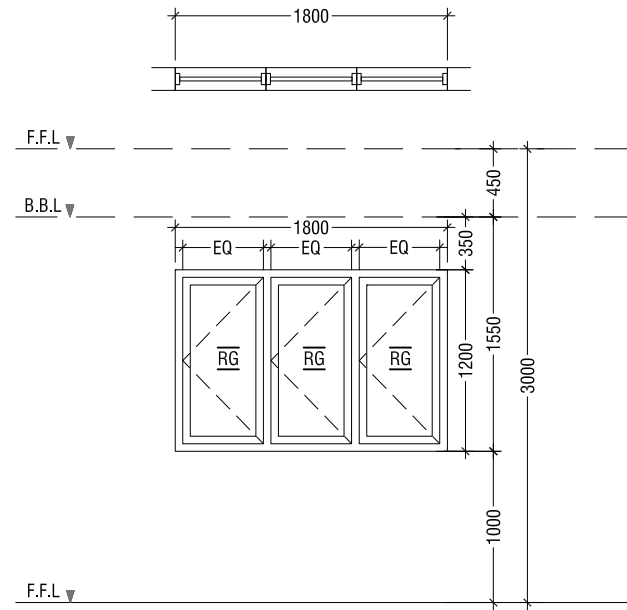
Title: DOOR & WINDOW SCHEDULE 01

Page: A -15/28

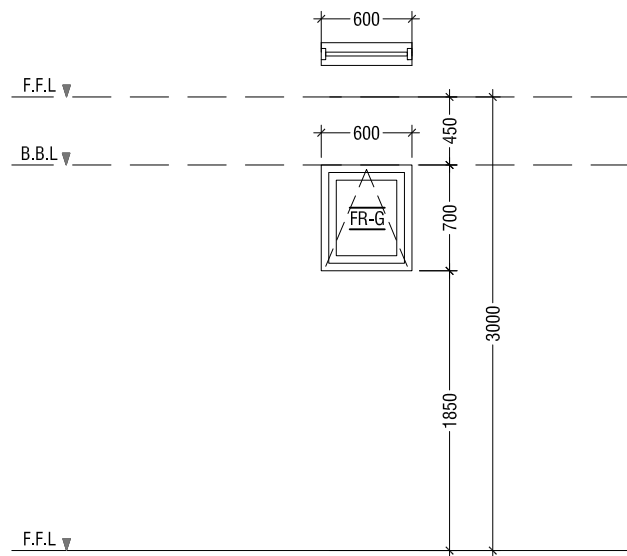
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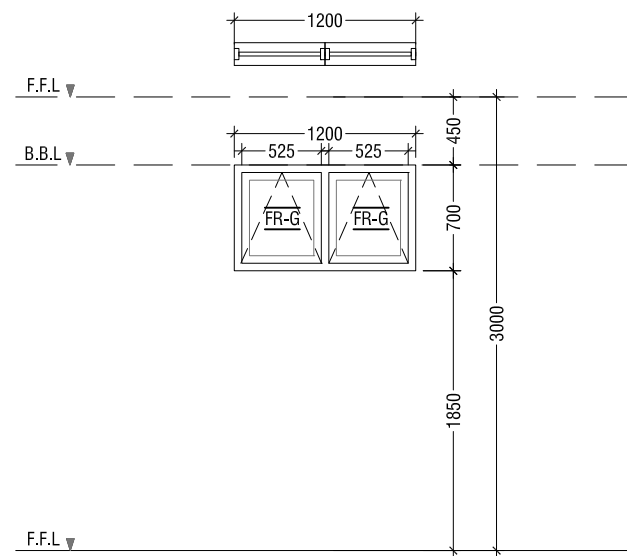
W1	SWING TYPE WINDOW
REMARKS	WHITE POWDER COATED ALUMINIUM WINDOW WITH REFLECTIVE DOUBLE GLAZED GLASS PANELS
LOCATION	COMMOM AREA
QUANTITY	01 NOS
OPEN AREA	2.82 SQM.



W2	SWING TYPE WINDOW
REMARKS	WHITE POWDER COATED ALUMINIUM WINDOW WITH REFLECTIVE DOUBLE GLAZED GLASS PANELS
LOCATION	LAB & OFFICE AREA
QUANTITY	04 NOS
OPEN AREA	2.82 SQM.



V1	SWING TYPE WINDOW
REMARKS	WHITE POWDER COATED ALUMINIUM WINDOW WITH FROSTED GLASS PANELS
LOCATION	TOILET
QUANTITY	01 NOS
OPEN AREA	0.35 SQM.



V2	SWING TYPE WINDOW
REMARKS	WHITE POWDER COATED ALUMINIUM WINDOW WITH FROSTED GLASS PANELS
LOCATION	MACHINE / PUMP / WORKROOM
QUANTITY	12 NOS
OPEN AREA	0.64 SQM.

## DOOR WINDOW SCHEDULE 02

SCALE 1:50



**LEGEND:-**  
 AL - ALUMINIUM LOUVERS  
 FR-G - FROSTED GLASS  
 RG - REFLECTIVE GLASS  
 FRG - FIXED REFLECTIVE GLASS

**NOTE:-**  
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Title: Door window  
 schedule 02  
 Page: A -16/28