SDCS-02-16

REV. 0

CONSTRUCTION STANDARD FOR UNDERGROUND DISTRIBUTION NETWORK PART 16: MANHOLE

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1. Scope

This standard specifies the design, and installation practices to be applied in the construction of concrete manhole in distribution system. It is intended to assist the engineers and field personnel to achieve standardization in construction and to ensure a satisfactory and economical level of service without operating restrictions so that the operational errors should be minimum for safety and reliability.

2. Service Condition and Construction Parameters

For construction and operation of concrete manhole, the service conditions and system requirements shall be as given in the latest revision of SEC General Specification No.01-SDMS-01 (latest revision).

3. Revision and Additions

This standard is subject to revision as new materials and methods of construction are developed. The latest revision of this standard shall be applicable. Revised sheets shall be issued from time to time and should be inserted as soon as these are received. Superseded or obsolete sheets shall be removed immediately upon receipt of revised sheets. The date of the latest issue of each sheet is printed at the top corner under the standard number.

4. Design for Manhole

4.1. The minimum inside dimensions for a manhole is 3000mm x 3000mm wide, and 2500 mm high with sufficient and suitable spaces for cables and associated equipment to be installed during the life of manhole.

4.2. Support the heaviest anticipated vehicular traffic weight.

4.3. The minimum size for a concrete electric Manhole is referenced in file Electric Manhole Detail Drawing. Manhole shall be sized and designed to the application.

4.4. Manholes shall be designed in compliance with ASTM C857-87, "Standard Practice for Minimum Structural Design Loading for Underground Pre-cast Concrete Utility Structures". Wheel loading shall be HS-20.

4.5. Shall be designed per ACI 318-02 "Building Code Requirements for Structural Concrete."

4.6. Design loads shall consist of dead load, live load, impact, surcharge load, and any other loads which may be imposed upon the structure.

4.7. Application of manhole type relative to site condition and soil bearing capacity shall be specified.

4.8. Contractor shall verify all dimension and site condition prior to construction and fabrication.

4.9. Structural calculation shall be prepared by the contractor and submit to SEC for review and approval.

5. Materials for Manhole

5.1. Minimal Concrete Specifications

5.1.1. Cast-in-Place or Pre-Cast concrete may be used.

5.1.2. The minimum 28 day concrete compressive strength for concrete shall be 5000 psi.

5.1.3. Only ready mixed concrete shall be used. Ready mixed concrete shall be mixed and transported to the job site in accordance with ASTM C94 "Specifications for Ready Mixed Concrete".

5.1.4. Manholes shall be manufactured in accordance with ASTM C858-83, "Standard Specifications for Underground Pre-cast Concrete Utility Structures".

5.1.5. Admixtures

5.1.5.1. Air-entraining mixture shall be used for all exterior concrete and shall conform to ASTM C260.

5.1.5.2. All concrete shall be compacted by the use of poker type vibrator until a dense solid mass without voids is obtained.

5.2. Sump

5.2.1. The sump shall have a concrete bottom and shall be 457.2 mm as shown on Manhole Detail Drawing.

5.2.2. The manhole floor is to be sloped to the sump pit.

5.2.3. Sump pit is to be located in the middle of the floor below the entry hole.

5.2.4. There is to be no grating over the sump pit.

5.3. Reinforcement

5.3.1. All concrete used in the construction of the manholes shall contain steel reinforcing bars to conform to all applicable building codes. All reinforcing steel shall conform to SASO 2/1979, grade 60 with minimum yield strength of 420MPa. Deformation shall conform to ASTM A615M.

5.3.2. Re-bars shall be cut only by bar cutter or hacksaw.

5.4. Accessories

5.4.1. Cable pulling-in irons shall be Base on IEEE std. 576-2000 or approved equal.

5.4.2. Manhole Covers and Frames

5.4.2.1. Manhole Cover size shall be 1000mm diameter.

5.4.2.2. Manhole access is to be in the corner side of the manhole. (see Manhole Detail Drawing for reference).

5.4.2.3. Manhole covers shall consist of a solid circular gravity lid and frame. The lid and frame shall be heavy duty type, fabricated from gray cast iron.

5.4.2.4. Manhole lids shall have a checkered design with the standard LOGO of the company with the word SEC DISTRIBUTION MANHOLE cast into the top surface.

5.4.2.5. Manhole frames shall provide a 1200mm diameter opening. (see Manhole Detail Drawing for reference).

5.4.2.6. Manhole frames and covers shall be approved material by SEC. The cover shall have two (2) pick holes 25.4mm diameter located 180° apart.

5.5. Conduit and End Bells

5.5.1. All conduit and end bells shall be 200mm^2 diameter, and use polyvinyl chloride (PVC), cast in place in the concrete wall of the manhole.

5.5.2. End bell shall be glued to the front and back of each PVC conduit.

5.5.3. Manhole cable duct interface shall be sealed with approved sealant prior to waterproofing.

5.6. Cable Racks

5.6.1. Cable racks shall be heavy duty type fabricated from 50% glass-reinforced nylon or a non-metallic material having equal mechanical.

5.6.2. Strength, thermal resistance, chemical resistance, dielectric strength and physical properties.

5.7. Cable Support Arms

5.7.1. Cable support arms shall be heavy duty type fabricated from 50% glass-reinforced nylon or a non-metallic material having equal mechanical

strength, thermal resistance, chemical resistance, dielectric strength and physical properties.

5.7.2. Provide a positive locking clip for each and every cable support arm supplied to prevent disengagement of the cable support arm from the cable rack due to upward force on the support arm.

5.8. Ladder

5.8.1. Ladder minimum diameter 19.05mm (round metal rungs).

5.8.2. Finished ladder shall be Hot-Dip galvanized conforming to ASTM .A123.

5.9. Cable Ties

5.9.1. Cable ties shall be weather resistant self-locking high strength UV-resistant black nylon, having a Breaking load of 535N, Diameter range of 40mm to 230mm, width 7.8mm and service temperature of -18˚C to 93 ˚C.

5.10. Grounding

5.10.1. The grounding rod shall be made of solid steel core bonded uniformly with copper through an electrolytic process. The copper shall be deposited over a layer of nickel to ensure adherence between the copper layer and the steel core. The steel core shall not be less than 98% iron and when tested in accordance with ASTM A370 shall have mechanical tensile strength of not less than 650 N/mm². The copper coating shall be 99.5% pure copper with minimum coating thickness of 0.25 mm per ASTM E376. The inter-layer of nickel is 99.5% nickel and a minimum thickness of 3.0µm.

5.11. Waterproofing

5.11.1. All manholes shall be waterproofed according to the Electric Manhole Waterproofing spec. by the Company.

5.11.2. All interior surfaces (walls and bottom surface of top slab base) of concrete shall be coated with two coats of elastomeric cementitious impermeable membrane after 35 days of concrete placement. The total wet film thickness shall not be less than 1mm.

6. Installation for Manholes

6.1. Cast-in-Place or Pre-cast Concrete Manholes

6.2. Concrete work excavations shall not be backfilled until the concrete has cured, or a minimum of seven (7) days after concrete placement.

6.3. The subgrade walls, roof, and risers of all new manholes shall be waterproofed.

6.4. All concrete work for the manholes shall be formed, using proper concrete forms.

6.5. The inside surfaces of manhole walls and ceilings shall have a smooth finish. Manhole floors shall have a non-slip broom finish.

6.6. Furnish and install all required appurtenances for each manhole, such as cast iron cable pulling-in irons, cast iron frame and cover, conduit end bells, cable racks, grounding rods, etc. Set them into position in forms before pouring concrete.

6.7. Cable rack stanchions shall be installed on each wall of every manhole. Maximum spacing of stanchions shall be 914.4mm on center. Stanchions shall be bolted to manhole walls using stainless steel expansion anchors in accordance with the cable rack manufacturer's recommendations.

6.8. Provide a minimum of three (3) cable support arms for every stanchion supplied.

6.9. Pulling-in Irons

6.9.1. Furnish and install the pulling-irons opposite each duct-bank entry.

6.9.2. The sub-grade walls, roof, and risers of all new manholes shall be waterproofed.

6.9.3. Pre-cast concrete manholes shall be installed in accordance with the Company standard procedures.

6.10. Waterproofing

6.10.1. Follow all manufacturers' requirements for the installation of the waterproofing. Pay particular attention to insure the waterproofing

properly adheres to the concrete and all areas receive the required waterproofing prior to backfill.

6.10.2. Cleaning and Protection: Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

6.11. Grounding

6.11.1. Manhole shall have two grounding rods in each electric manhole. Grounding rods shall be driven into the soil beneath the manhole and cast in place with the installation of the concrete floor of the manhole. Grounding rods shall be located in diagonally opposite corners of the manhole, located 127mm out from each wall, and projecting 152.4mm above the finished floor level.

6.11.2. The copper grounding conductor shall be connected to each grounding rod by means of exothermic welding.

6.12. Sump

6.12.1. Provide a concrete sump in the center of the floor of each manhole for the collection of any water which might enter the manhole.

7. Commissioning

7.1. Manhole

7.1.1. All soil and debris shall be removed from manholes.

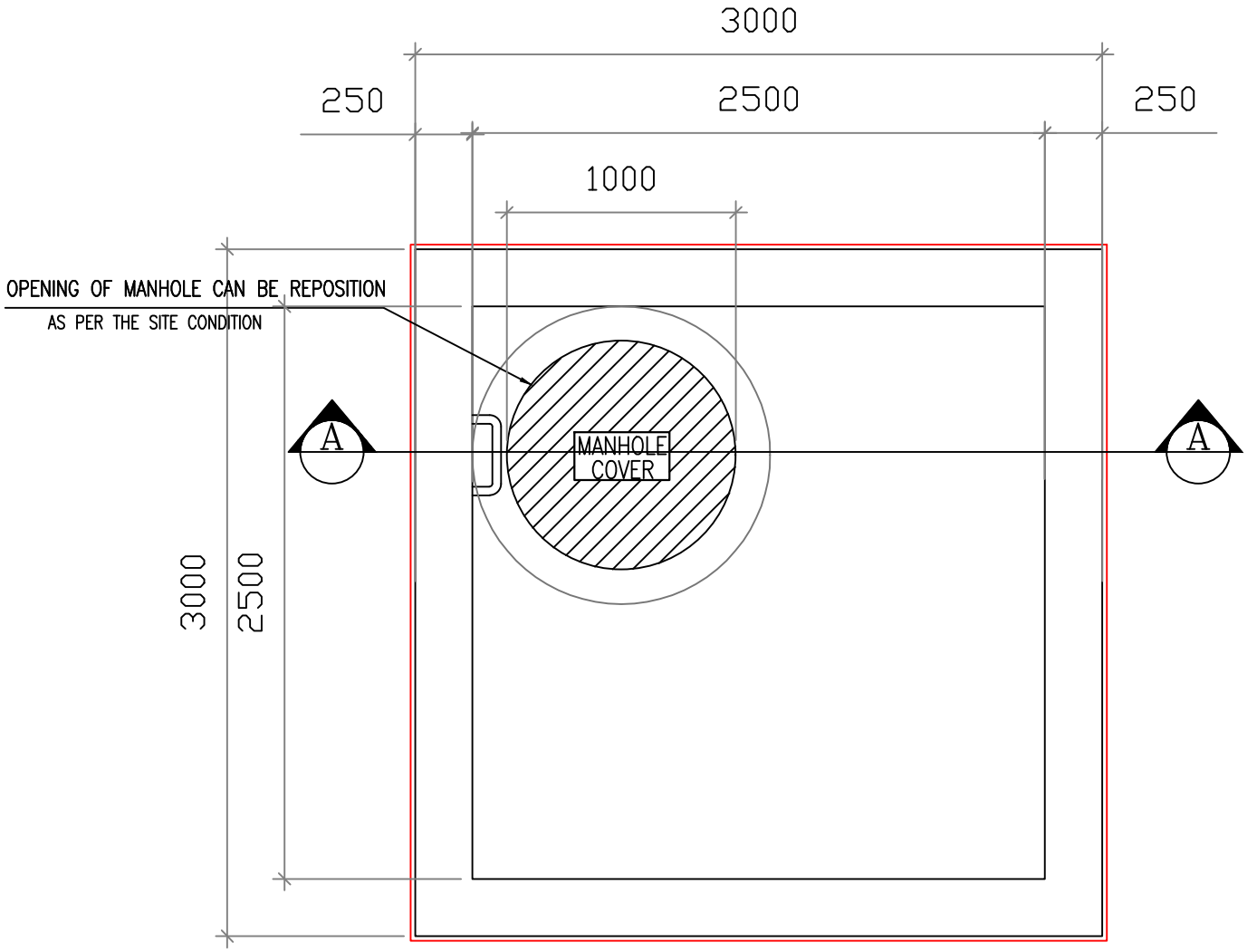
7.1.2. Verify all pull strings and caps are installed.

7.2. Electric Underground Ducts

7.2.1. All soil and debris shall be removed from manholes and equipment pads where duct banks terminate.

7.2.2. Verify all pull strings and caps are installed.

8. Drawings



Note: FOR CONDUIT POSITIONS, PLEASE REFER TO THE OPTIONS TYPE–A, B & C FOR DIFFERENT SITE CONDITION.

A PLAN
SCALE : NTS

ALL DIMENSION ARE IN MILLIMETER

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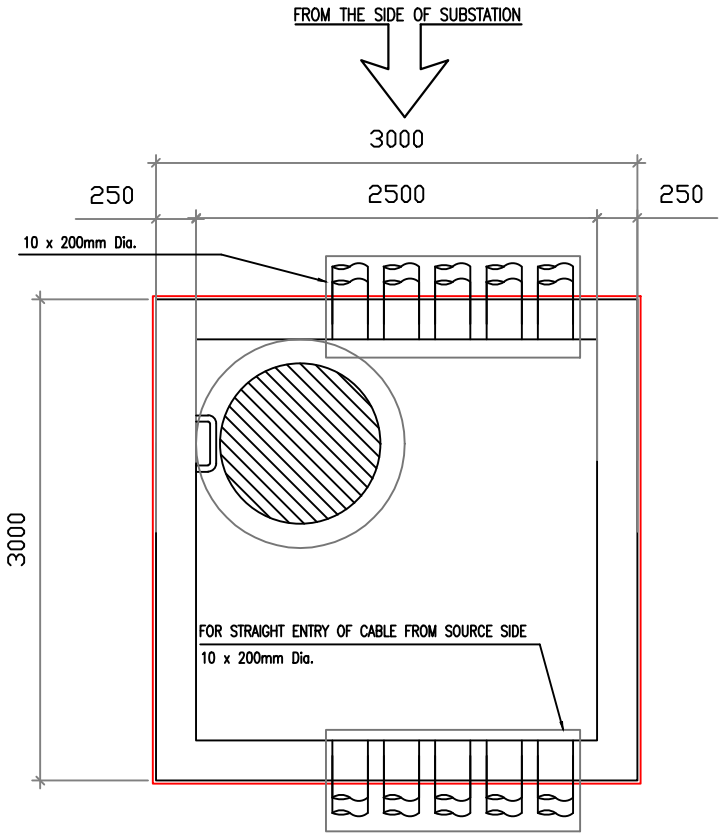
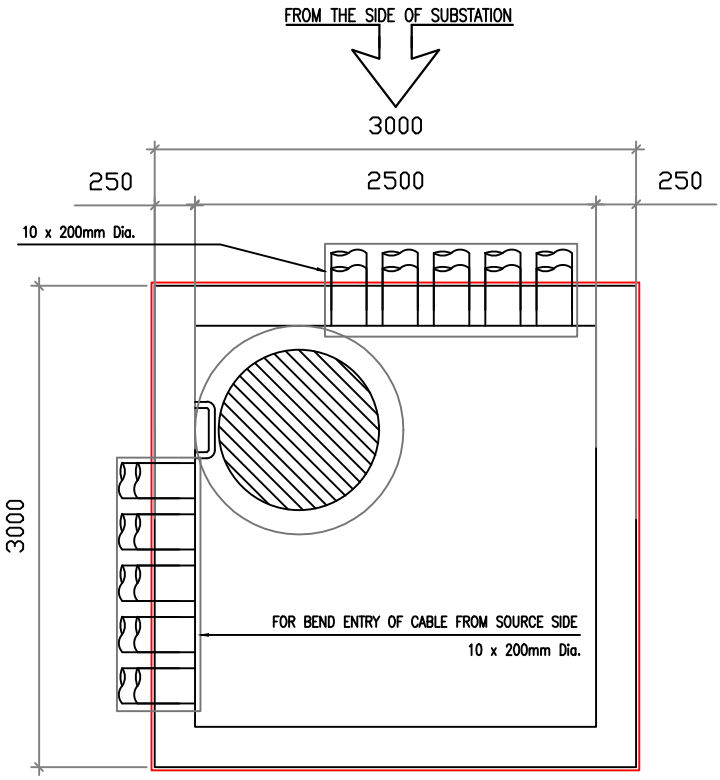
Dated: 2019–8



1 TYPE- A
SCALE : NTS



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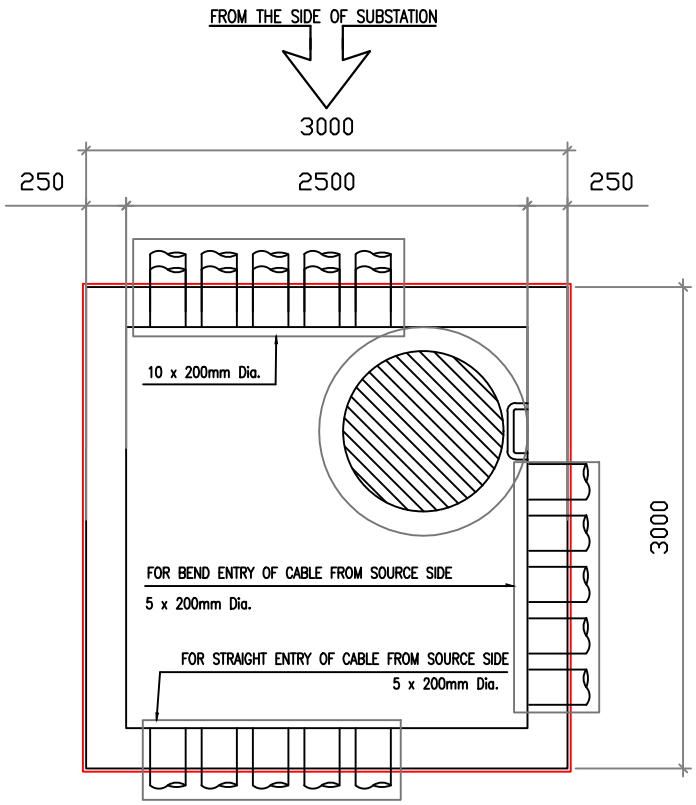

3 TYPE- C
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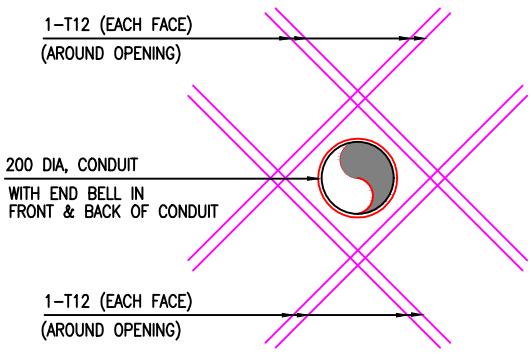

TYP. EXTRA STEEL AT PIPE OPENINGS

C DETAIL - 1
SCALE : NTS

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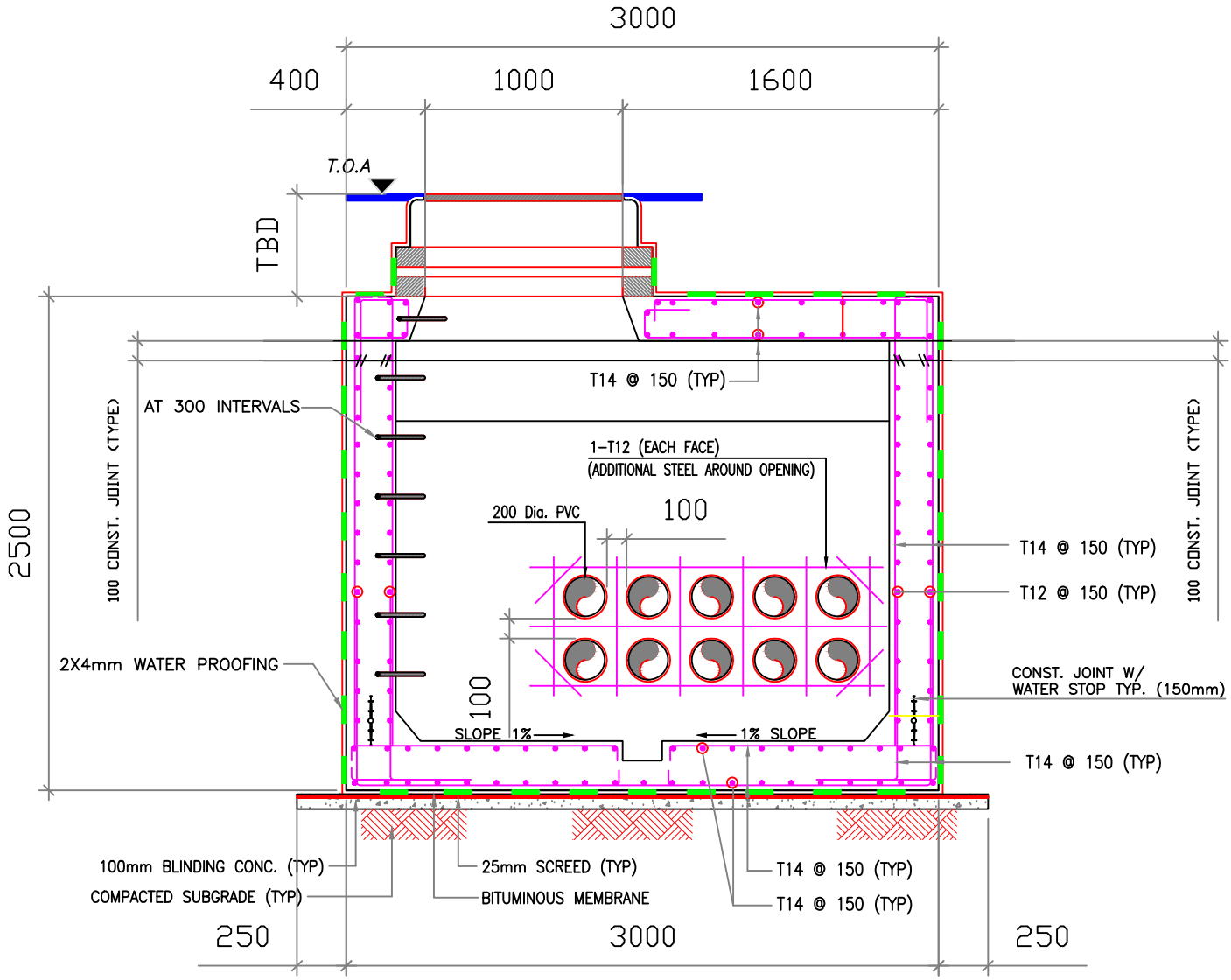

B TYP. SECTION - AA
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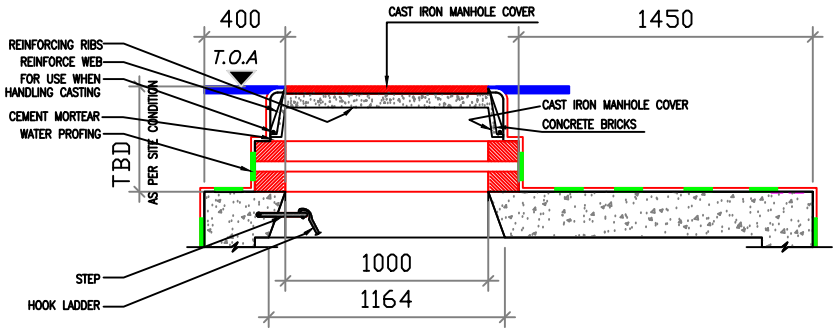
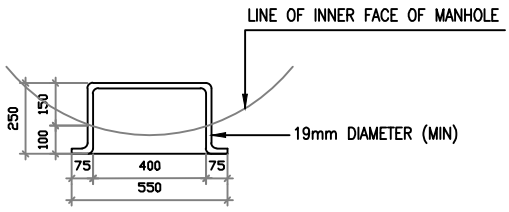


D DETAIL - 2
SCALE : NTS



TYP. DETAIL FOR LADDER RUNGS

E DETAIL - 3
SCALE : NTS

ALL DIMENSION ARE IN MILLIMETER