



PART C5: DRAWINGS

C5.1	TENDER DRAWINGS	290
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BVI CONSULTING ENGINEERS

289

Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2



C5.1: TENDER DRAWINGS

The tender drawings will be available in both hard and soft copies.

- Hardcopies can be obtained from Nala Local Municipality as per the Tender advert.
- Soft copies can be accessed and downloaded via the Dropbox Link or by scanning the QR code below:

Dropbox Link:

<https://www.dropbox.com/scl/fo/bwacwcbzlun4a6ncen3jw/h?rlkey=0kviosptdqvcjyszo7086yre2&dl=0>

Dropbox QR Code:

(Scan by using a mobile phone Camera or download QR scanning on your mobile phone):



Contractor

Witness 1

Witness 2

Employer

Witness 1

Witness 2

NALA LOCAL MUNICIPALITY

BID No. NLM/TS/014/2023-24

KGOTSONG/BOTHAVILLE: UPGRADING OF SEWER OUTFALL
REMAINING PHASES

TENDER DRAWINGS



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Bothaville
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Contact Person: Mr. IJ Mokotedi
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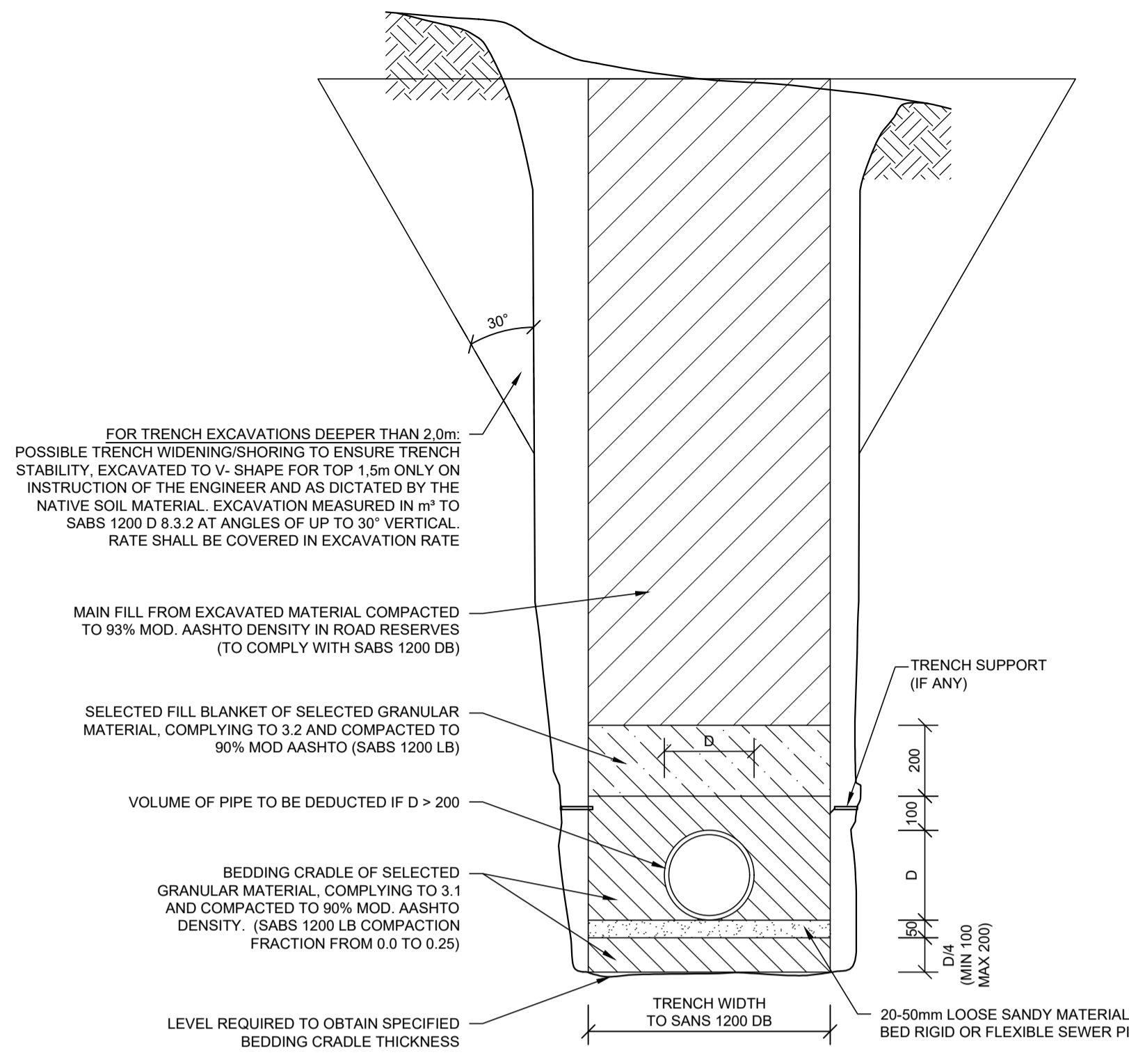
BVi Consulting Engineers (Central)
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9301
Tel: 051 447 2137

Contact Person: Mr. JL Reynders
Email: janr@bvi.co.za

NALA LOCAL MUNICIPALITY

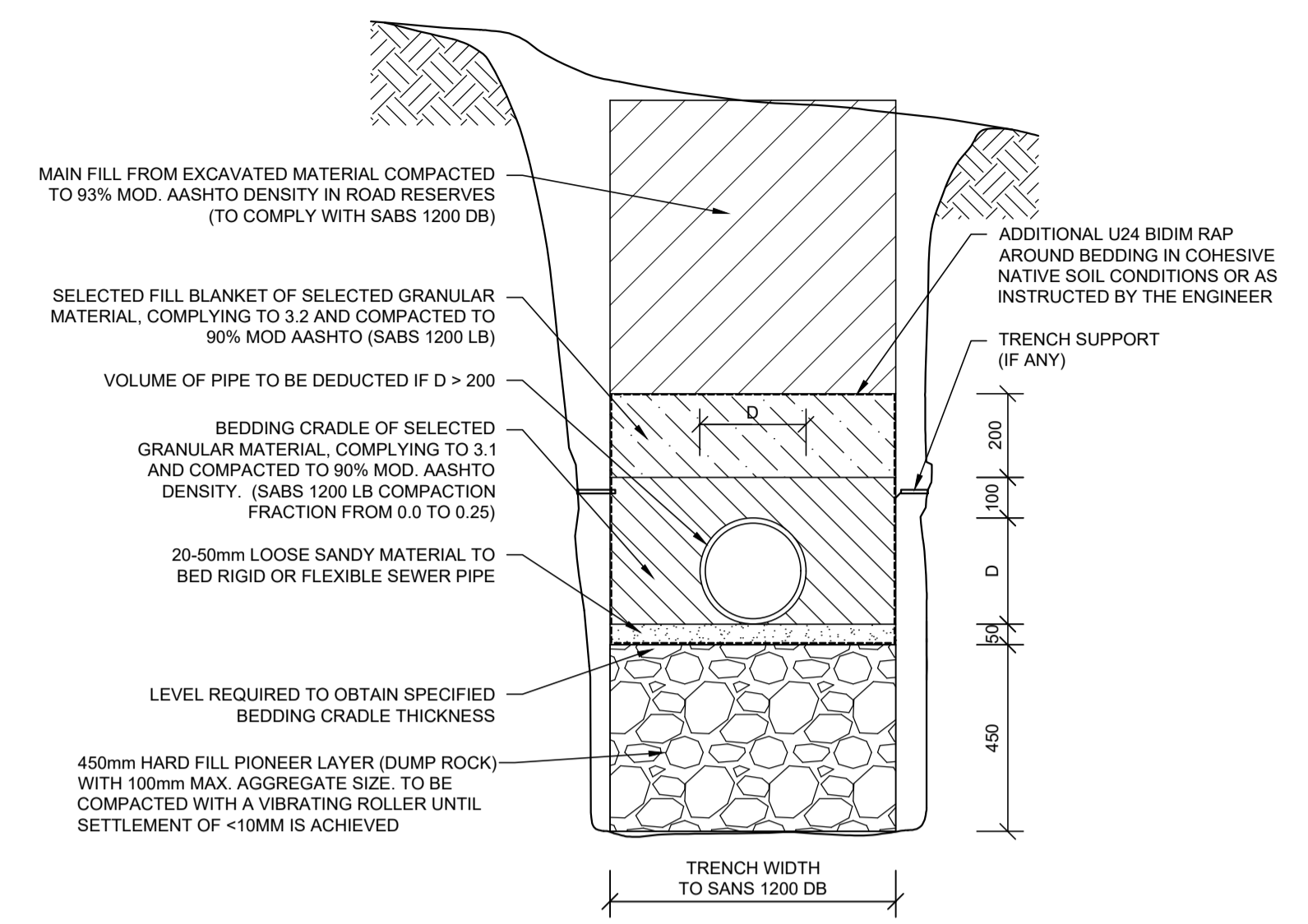
BID No. NLM/TS/014/2023-24 KGOTSONG/BOTHAVILLE: UPGRADING OF SEWER OUTFALL REMAINING PHASES

ITEM No.	DWG. No.	DRAWING TITLE	DRAWING ISSUE DATES					
			ISSUE FOR TENDER	ISSUE "1" FOR CONSTRUCTION REV 0	ISSUE "2" REV 1	ISSUE "3" REV 2	ISSUE "4" REV 3	ISSUE "Z" A.B
		DRAWINGS FOR CIVIL WORK						
1	34609-133-1	TYPICAL SEWER TRENCH DETAILS	02/04/2024					
2	34609-133-2	TYPICAL SEWER MANHOLE DETAILS	02/04/2024					
3	34609-133-3	TYPICAL SEWER ERF CONNECTION DETAILS	02/04/2024					
4	34609-133-4	TYPICAL ROAD CROSSING PIPE SLEEVE DETAILS	02/04/2024					
5	34609-133-5	ADDITIONAL SEWER MANHOLE DETAILS	02/04/2024					
6	34609-133-6	TYPICAL TRENCHLESS INSTALLATION METHODOLOGIES	02/04/2024					



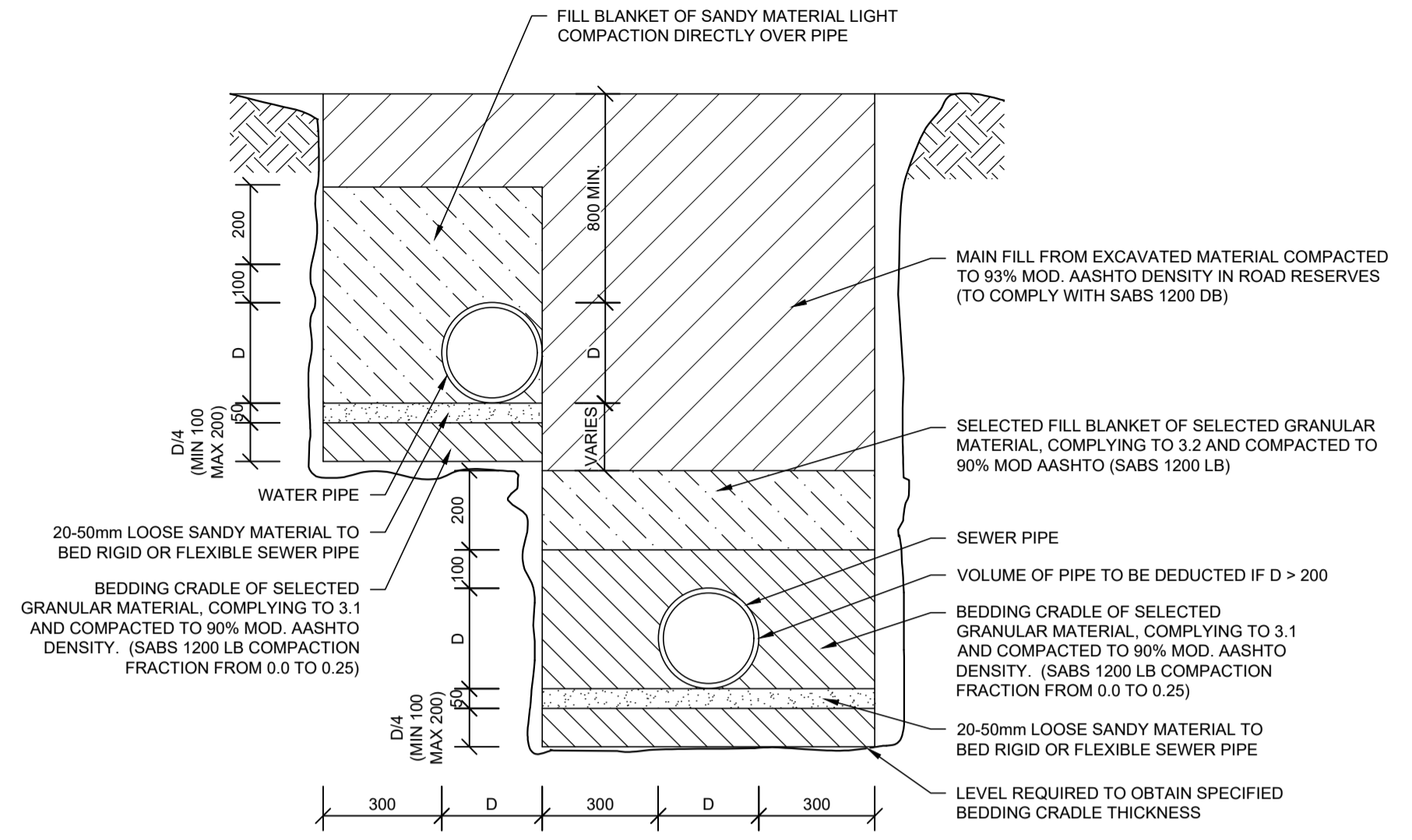
DETAIL F1:
BEDDING FOR FLEXIBLE SEWER PIPES

SCALE 1:15



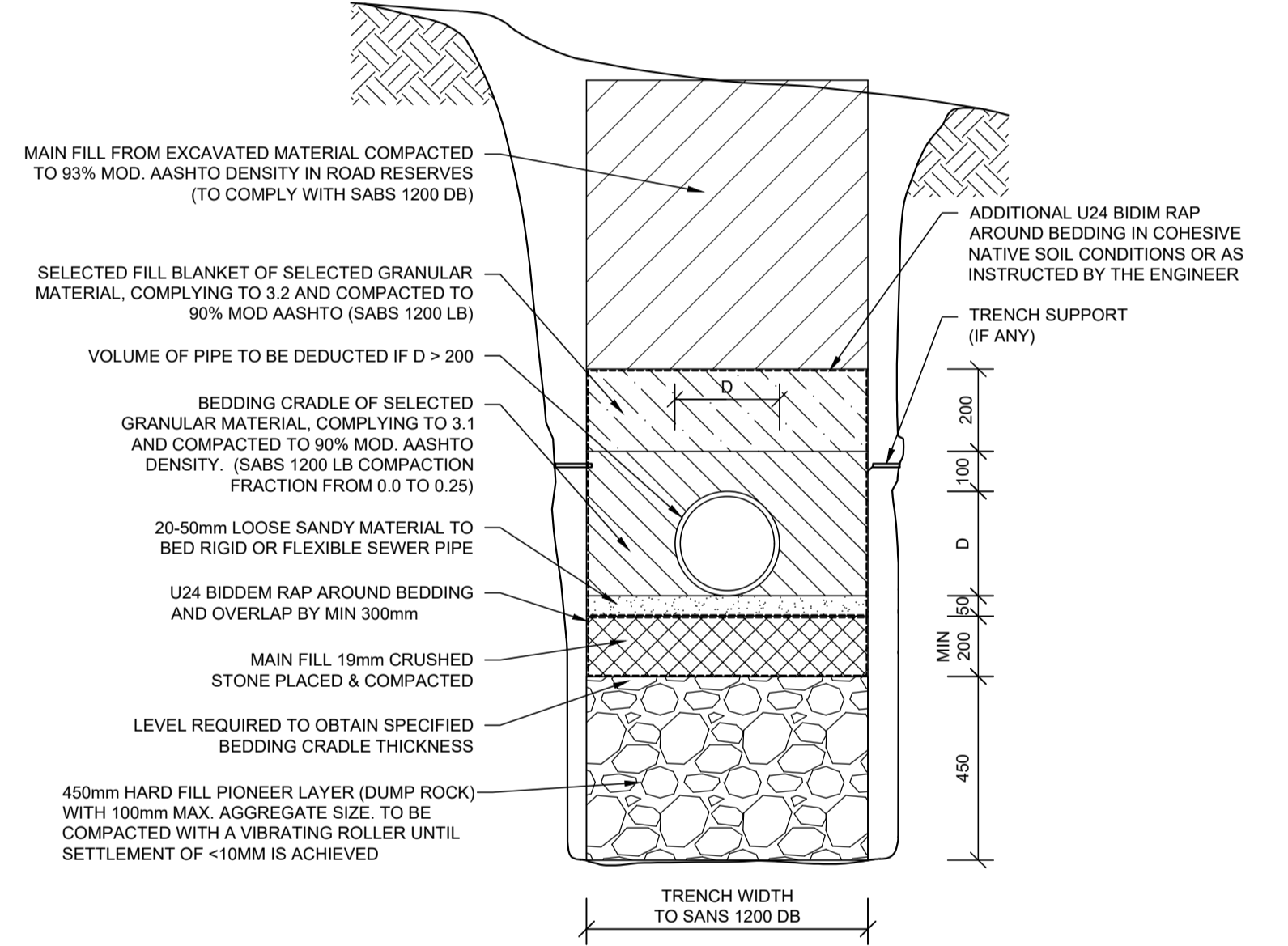
DETAIL F2:
BEDDING FOR POOR NATIVE SOIL FOUNDING CONDITIONS

SCALE 1:15



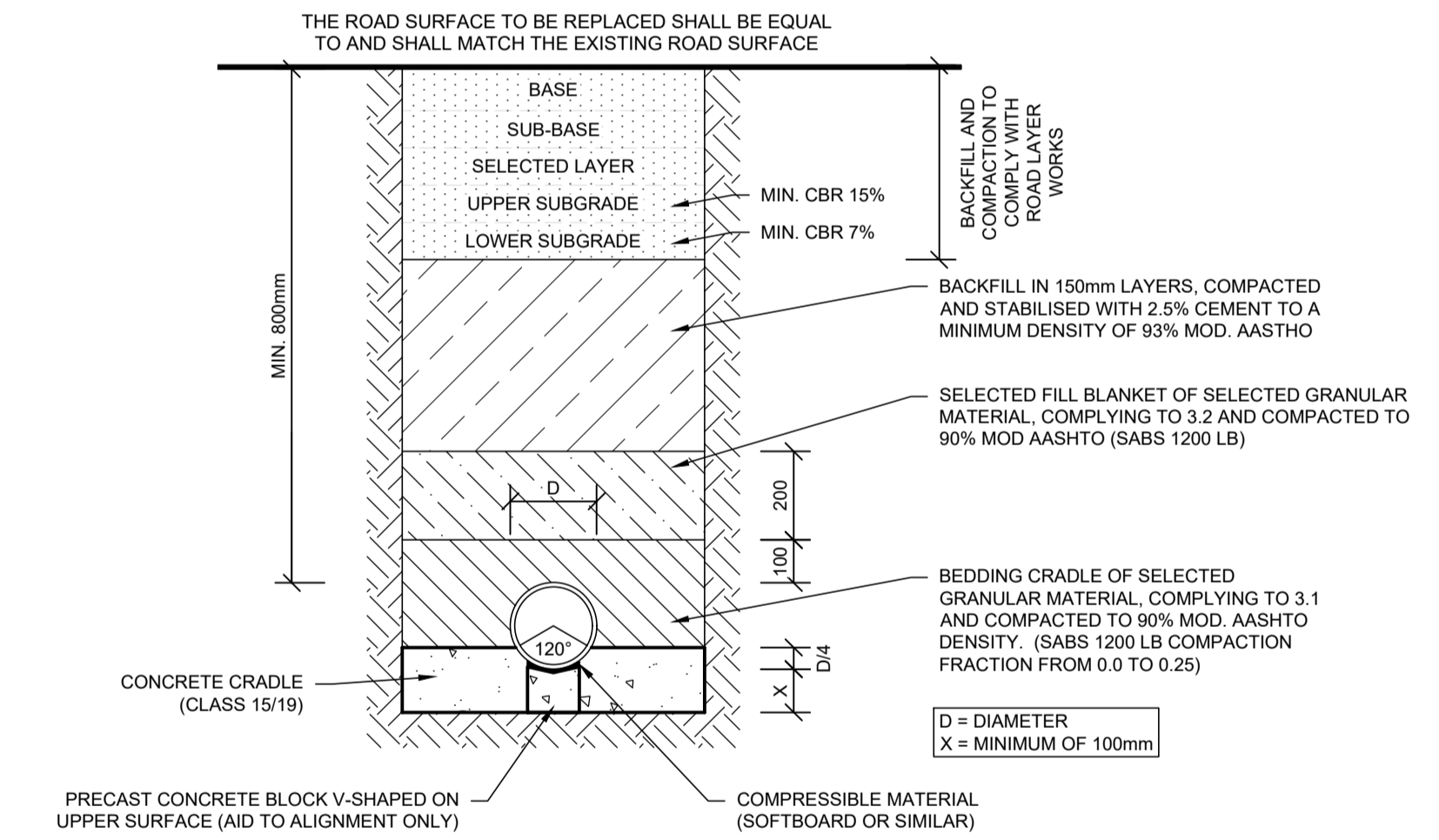
DETAIL CT1:
COMBINED TRENCHES

SCALE 1:15



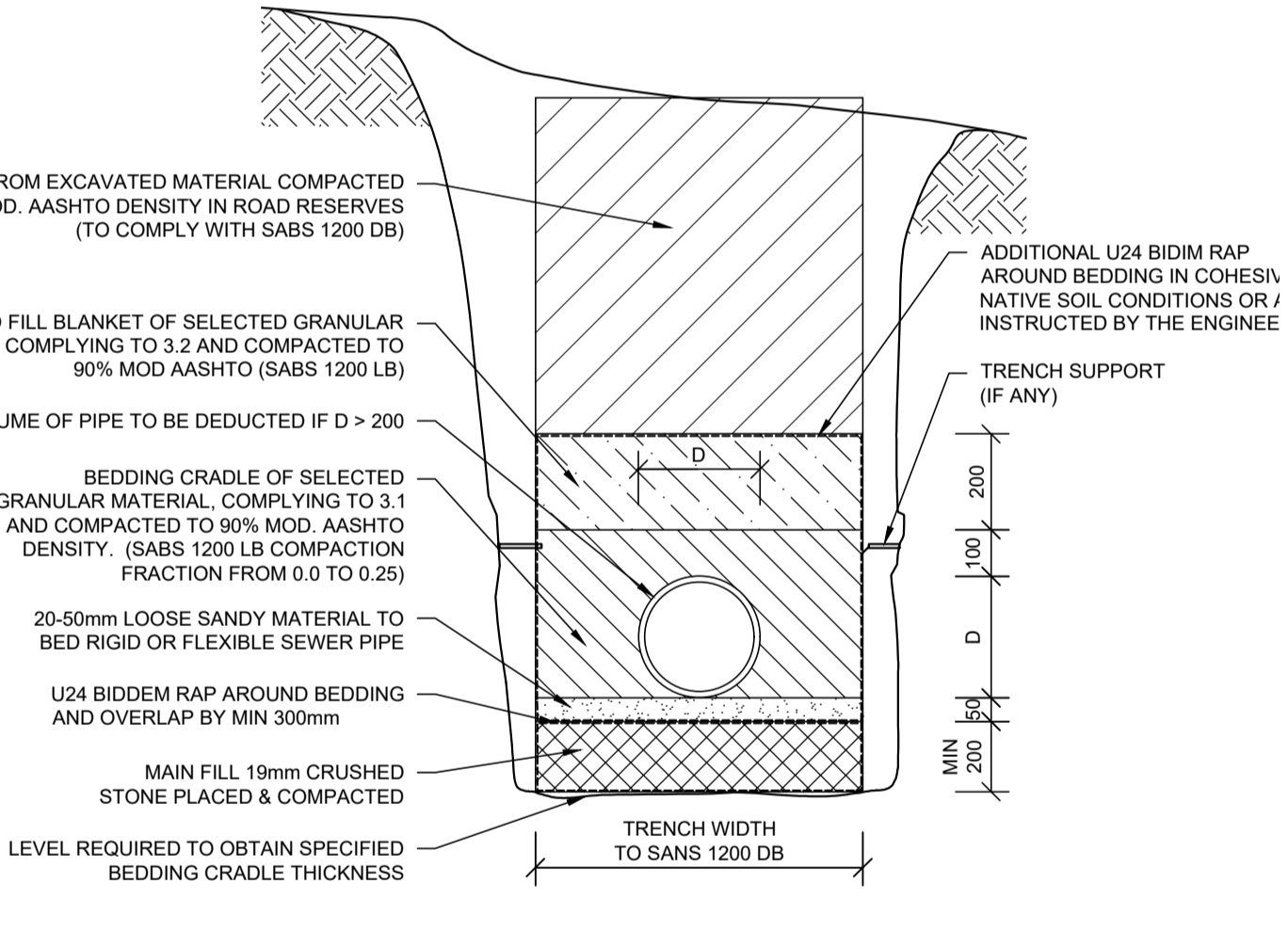
DETAIL F3:
BEDDING FOR POOR NATIVE SOIL FOUNDING CONDITIONS:
PIPES LOCATED BELOW THE WATER TABLE / IN WATERCOURSES

SCALE 1:15



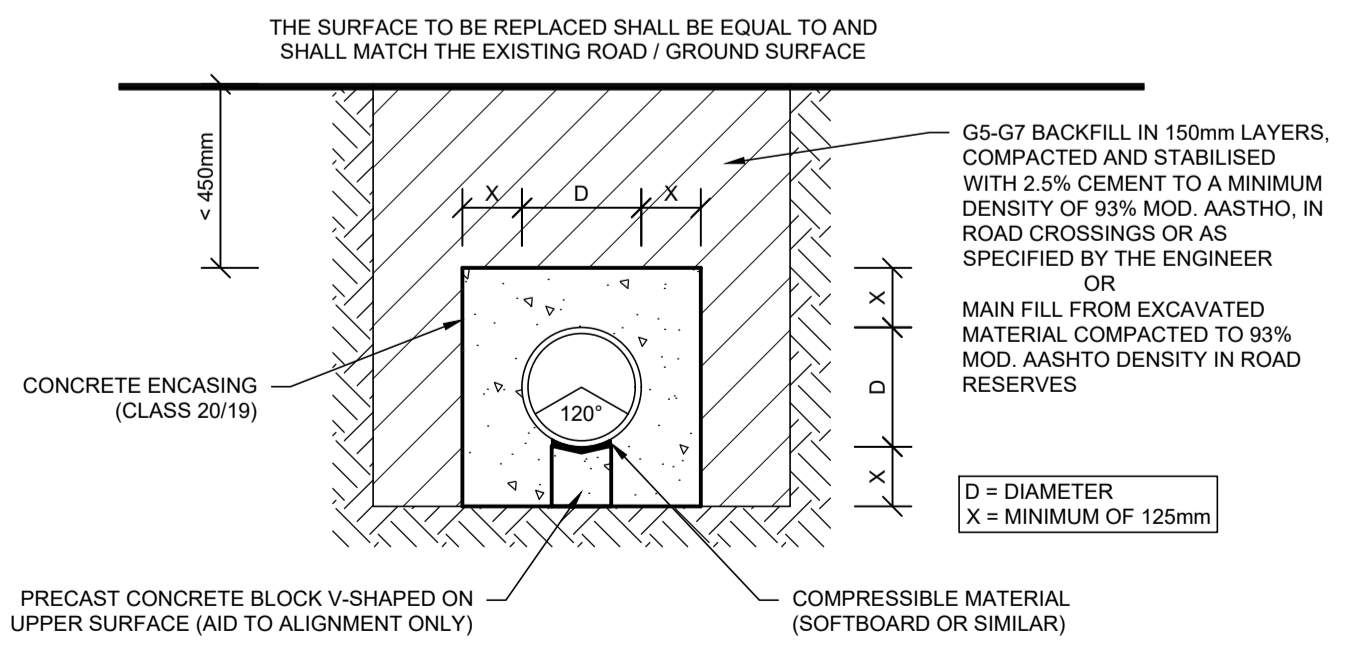
DETAIL C3:
ROAD CROSSING: COVER > 800mm

SCALE 1:15



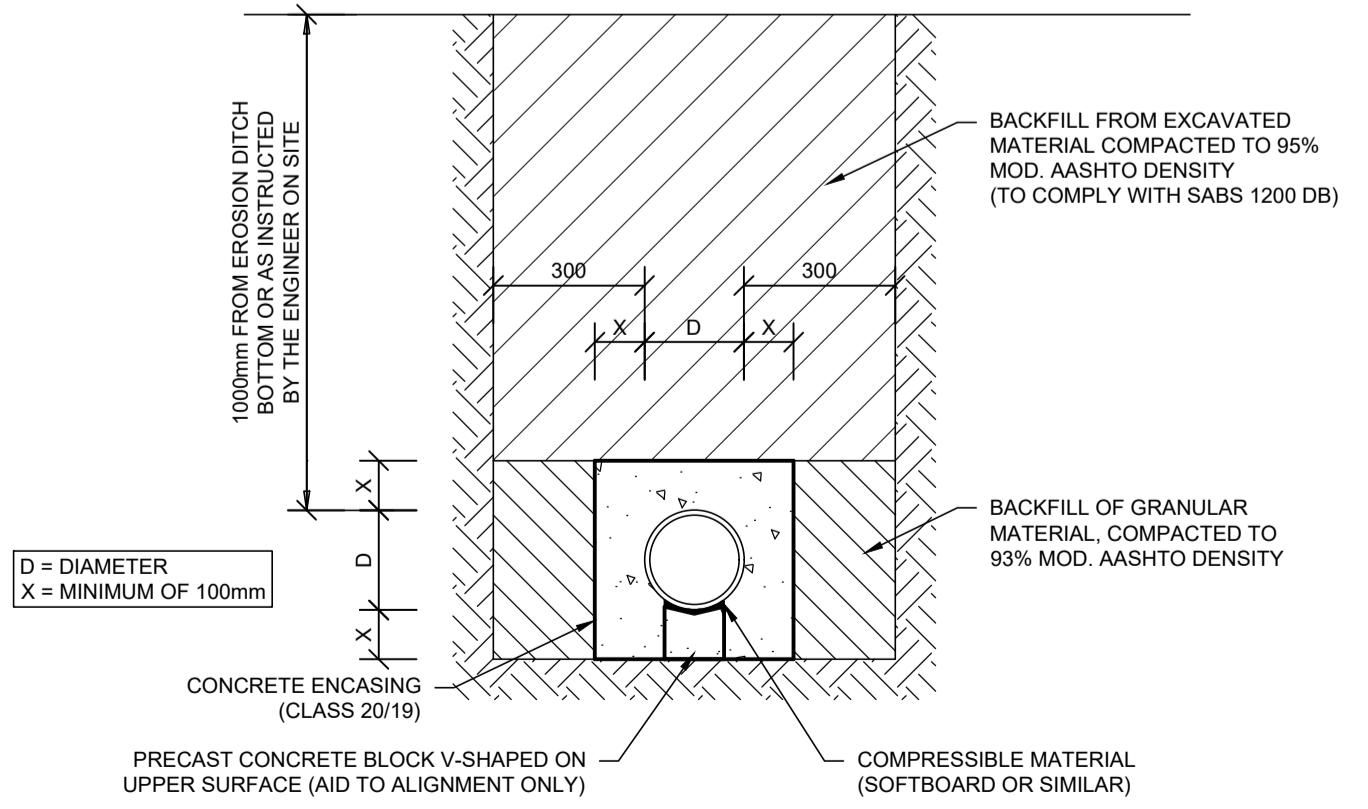
DETAIL U1:
UNDERDRAIN BEDDING

SCALE 1:15



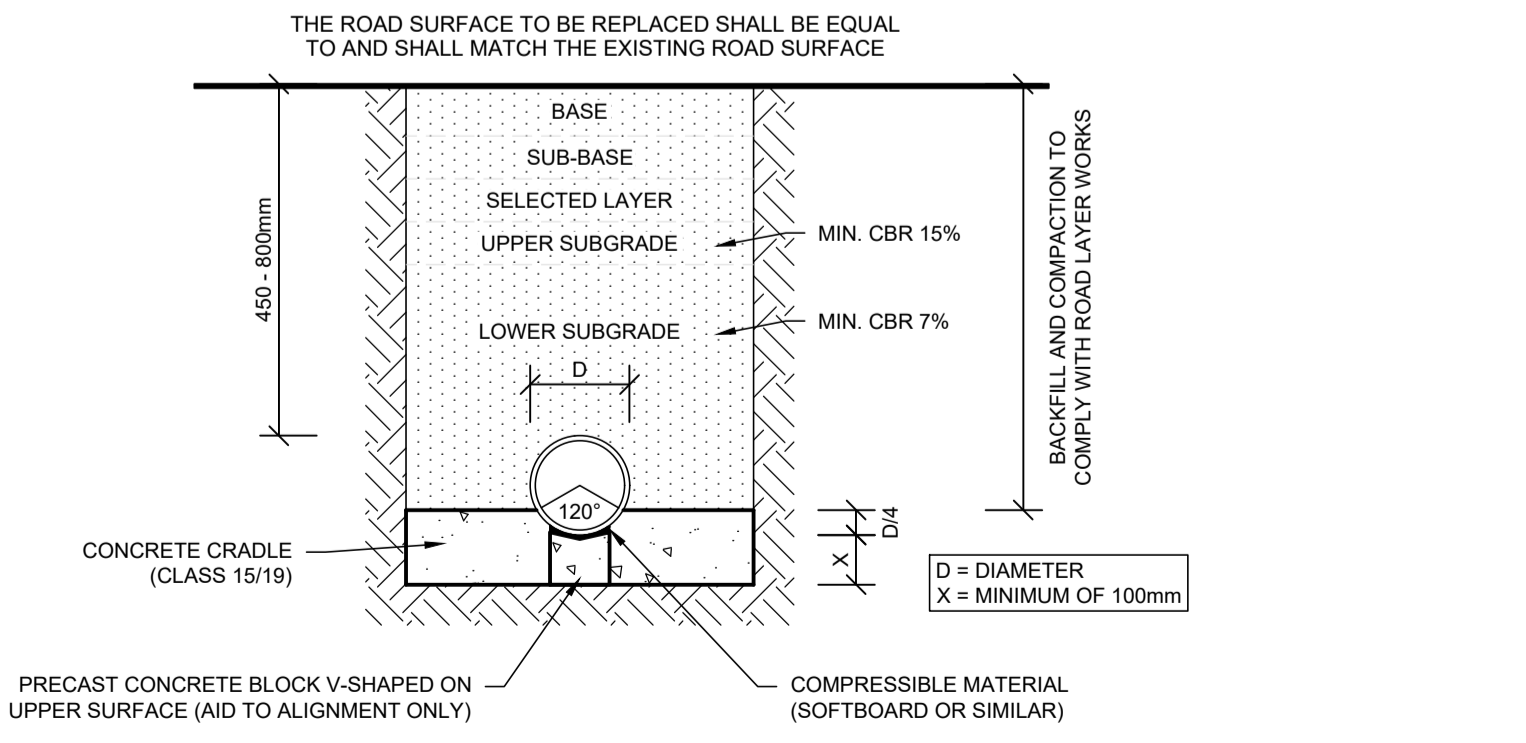
DETAIL C1:
CONCRETE ENCASEMENT /
ROAD CROSSING: COVER < 450mm

SCALE 1:15



DETAIL E1:
EROSION DITCH CROSSING

SCALE 1:15



DETAIL C2:
ROAD CROSSING: COVER 450 - 800mm

SCALE 1:15

NOTES / LEGEND

COVER ON SEWER PIPES SHALL BE:

- 1) UNDER WALKWAYS = 800
- 2) UNDER PERMANENT SURFACED ROADWAYS = 1000
- 3) UNDER GRAVEL SURFACED ROADWAYS = 1150 PIPE

BEDDING AND BLANKET MATERIAL SHALL CONFORM TO SABS 1200 LB.

3.1 SELECTED GRANULAR MATERIAL FOR BEDDING CRADLE

- a) GRADING 0.6 - 18mm
- b) NON CORROSIVE, FREE DRAINING
- c) COMPACTABILITY FACTOR MAX. 0.25
- d) PI MAX. 9

3.2 SELECTED FILL MATERIAL FOR SELECTED FILL BLANKET:

- a) MAXIMUM PARTICLE SIZE 30mm
- b) PI MAX. 6

GENERAL

- THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL MATERIALS AND WORKMANSHIP CONFORM WITH THE DETAILS AND SPECIFICATIONS SHOWN ON THIS DRAWING, AND ALL RELEVANT SABS SPECIFICATIONS, IRRESPECTIVE OF WHETHER THE ENGINEER HAS INSPECTED THE WORKS ON SITE OR NOT.
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ISSUE DATE: 02/04/2024	DRAWING SIZE: A1	REVISION: 0
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Civil, Structural & Electrical Engineers, Environmental & Project Management

REGISTRATION NO. 1561058/07

CLIENT

NALA LOCAL MUNICIPALITY

PROJECT

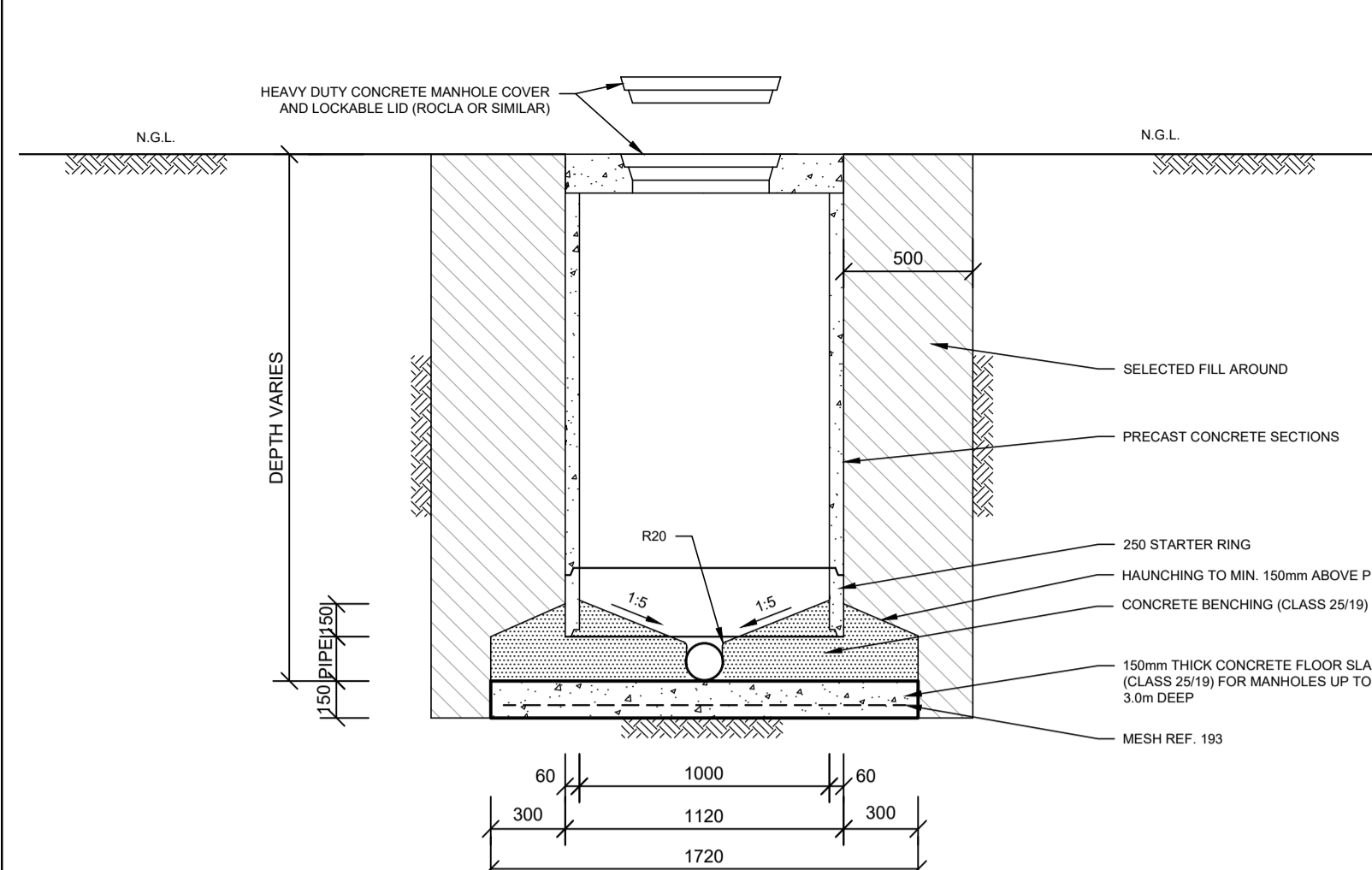
**KGOTSONG/BOTHAVILLE:
UPGRADING OF SEWER OUTFALL
REMAINING PHASES**

DRAWING TITLE

**TYPICAL SEWER
TRENCH DETAILS**

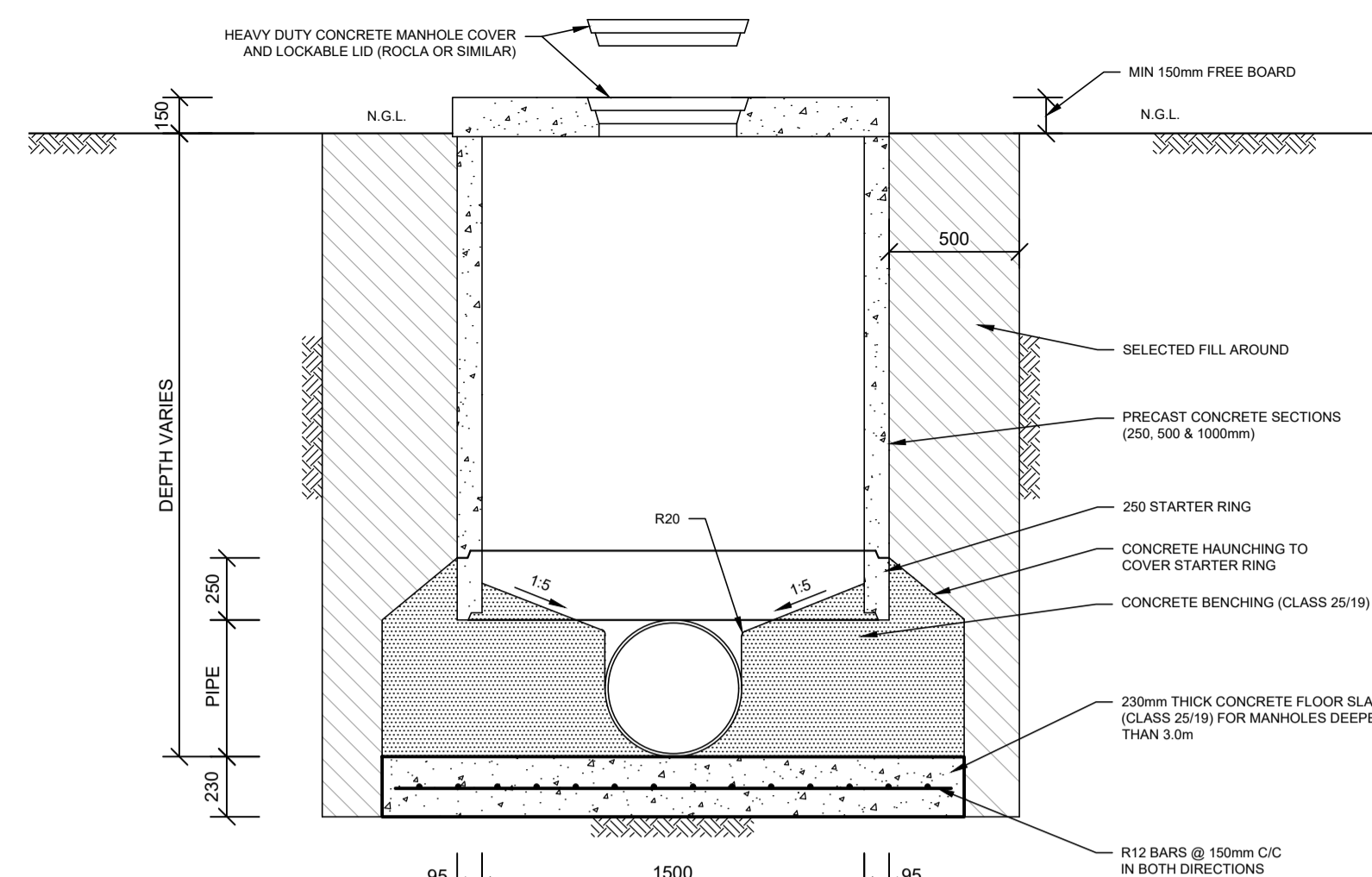
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JL REYNDERS	2020300701	02/04/2024
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DESIGNED	DJ COETZEE	CHECKED
PLAN NUMBER		REVISION NO.
34609-133-1		1



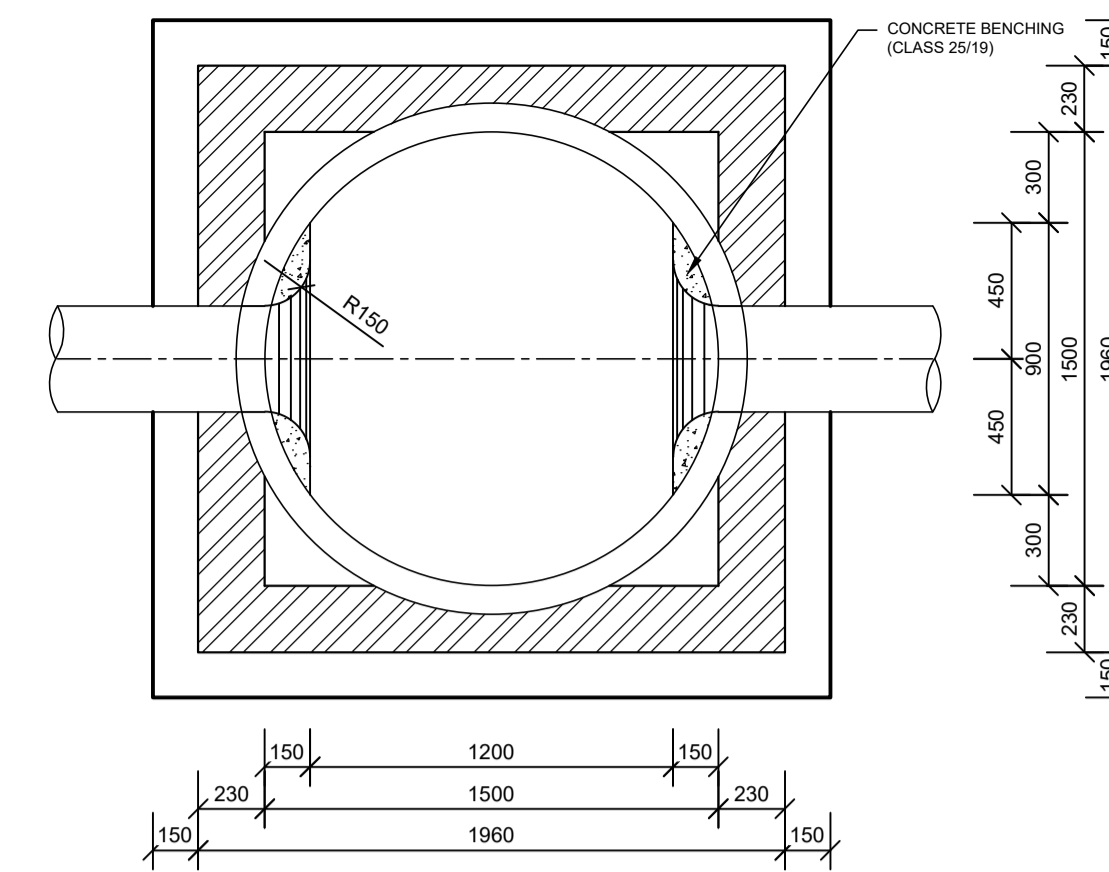
SECTION ELEVATION AT RIGHT ANGLES TO INTERNAL SEWER

SCALE 1:25



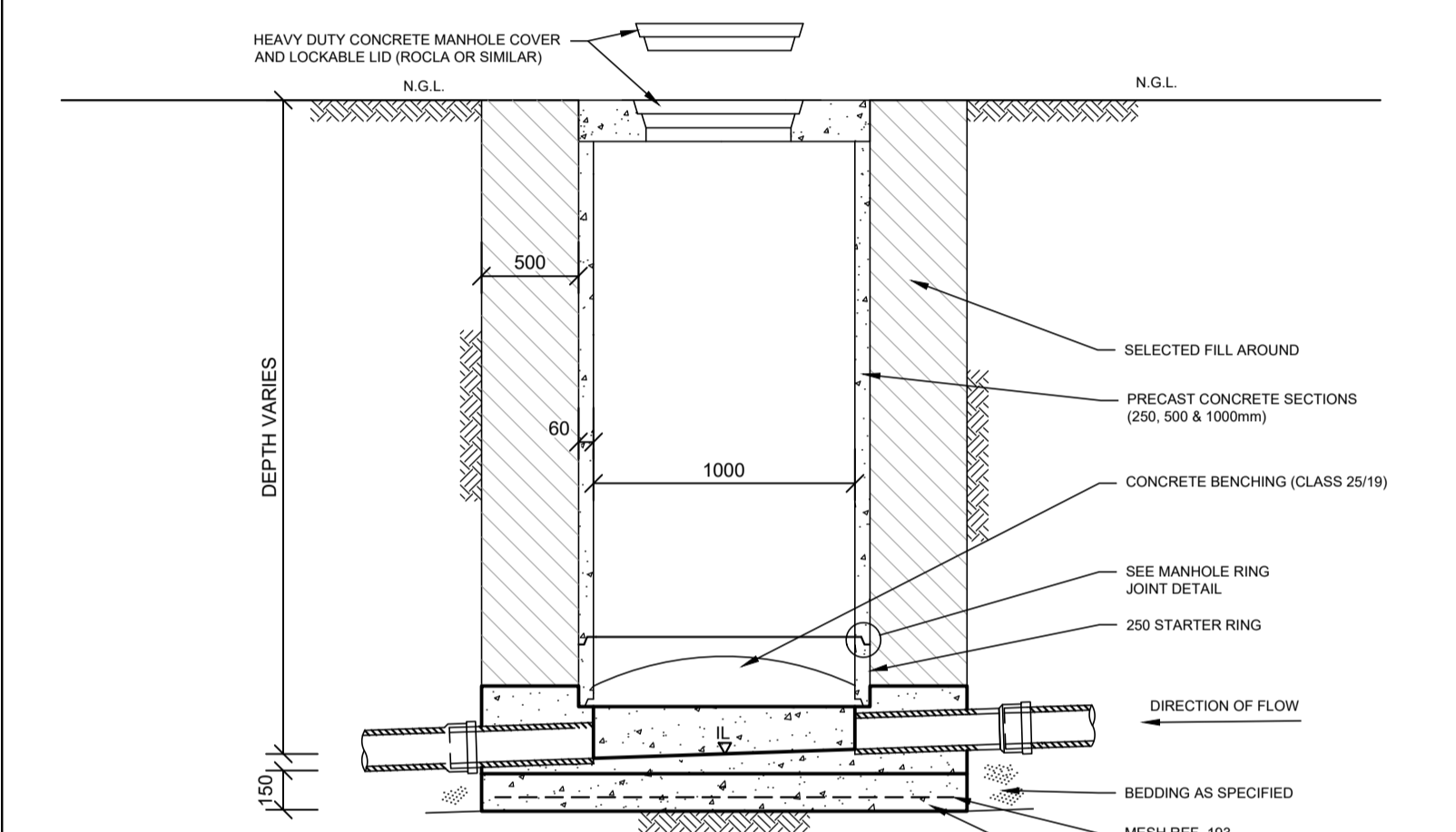
SECTION ELEVATION AT RIGHT ANGLES TO OUTFALL SEWER

SCALE 1:25



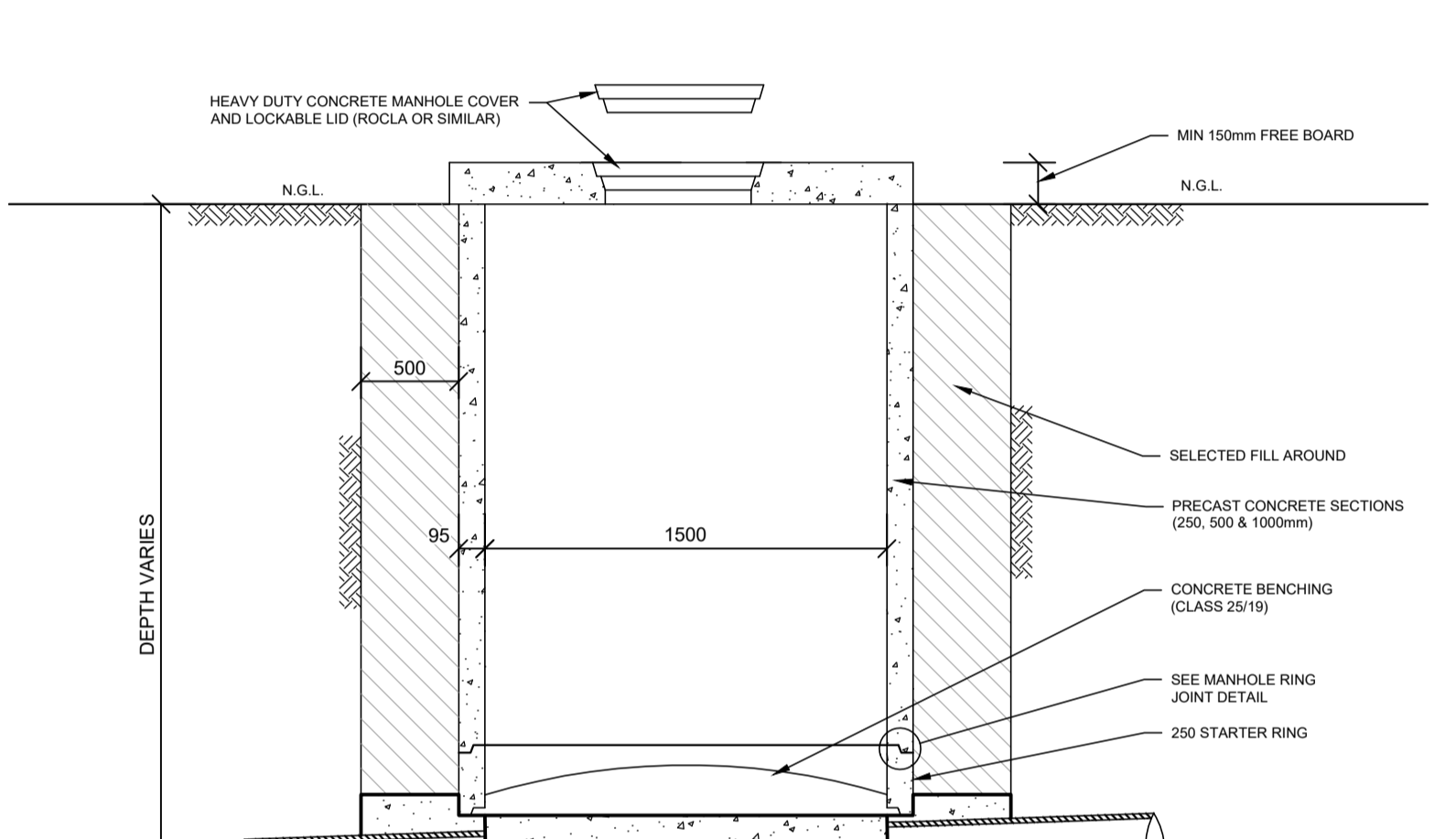
DETAIL M3: TYPICAL PLAN VIEW OF A GRIT-TRAP MANHOLE

SCALE 1:25



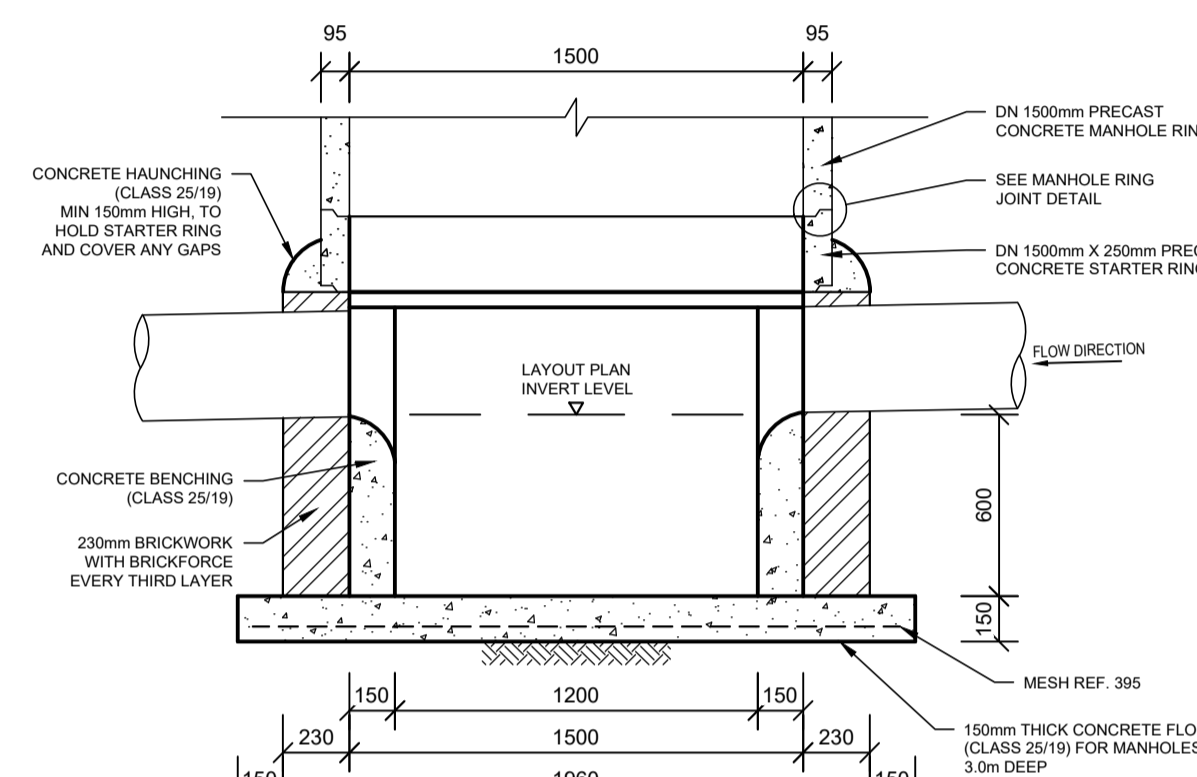
SECTION ELEVATION ALONG CENTER OF INTERNAL SEWER

SCALE 1:25



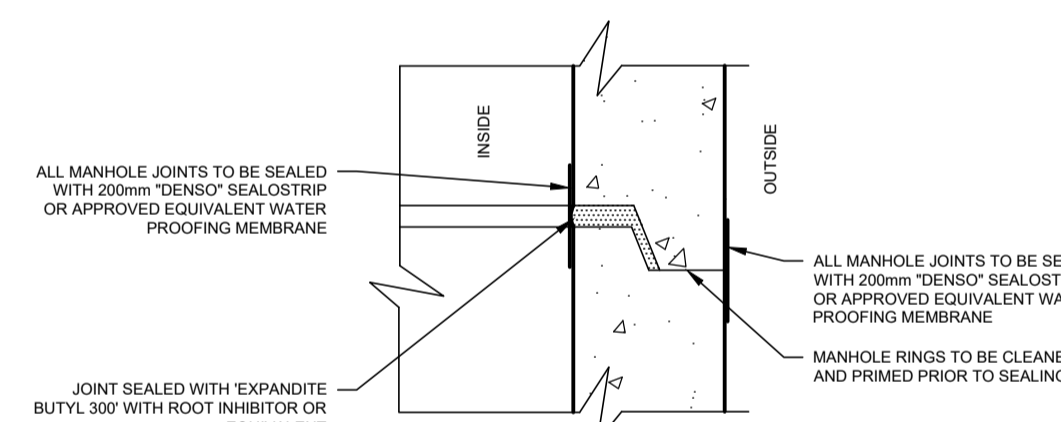
SECTION ELEVATION ALONG CENTER OF OUTFALL SEWER

SCALE 1:25



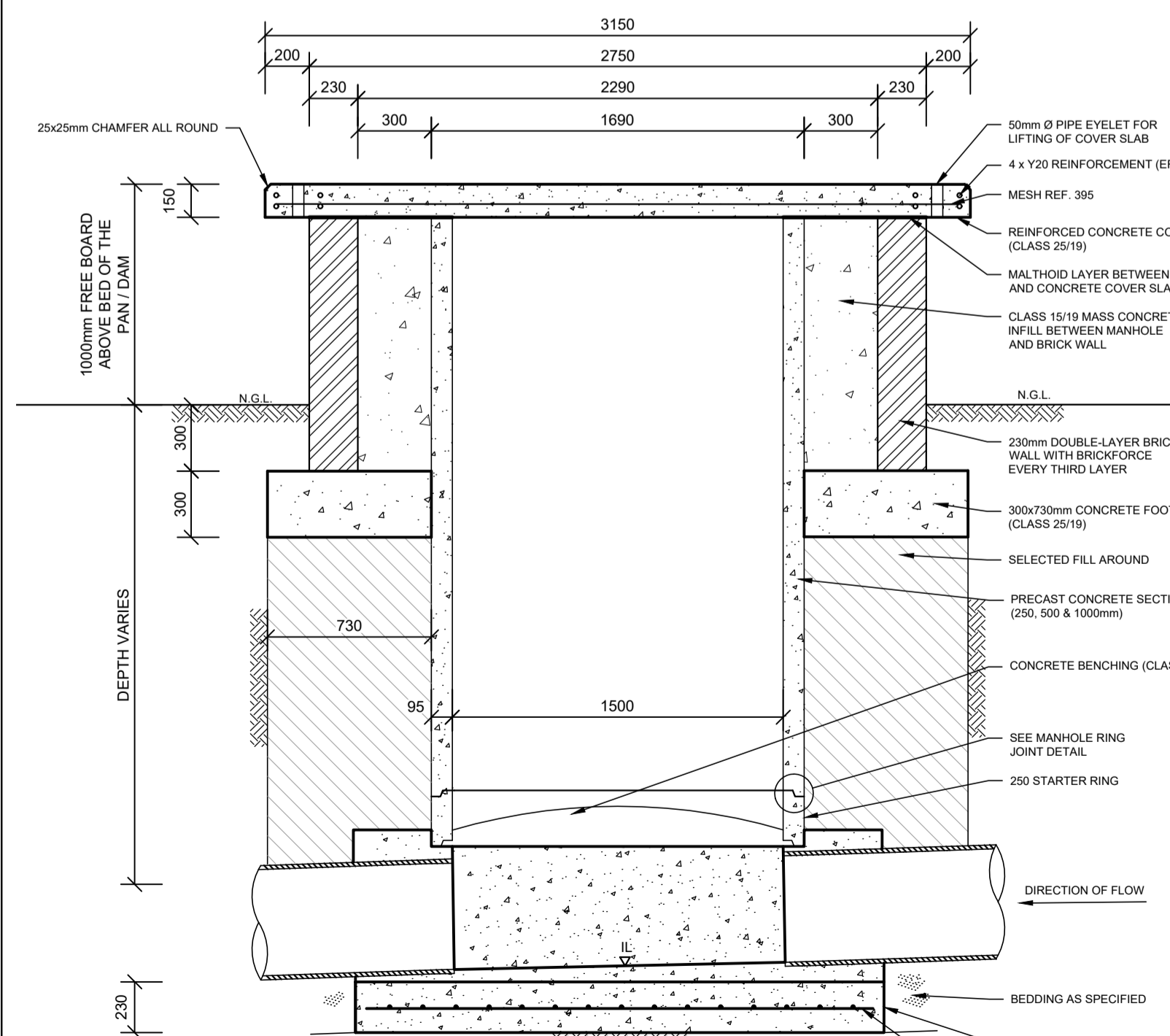
SECTION ELEVATION ALONG CENTER OF A GRIT-TRAP MANHOLE

SCALE 1:25



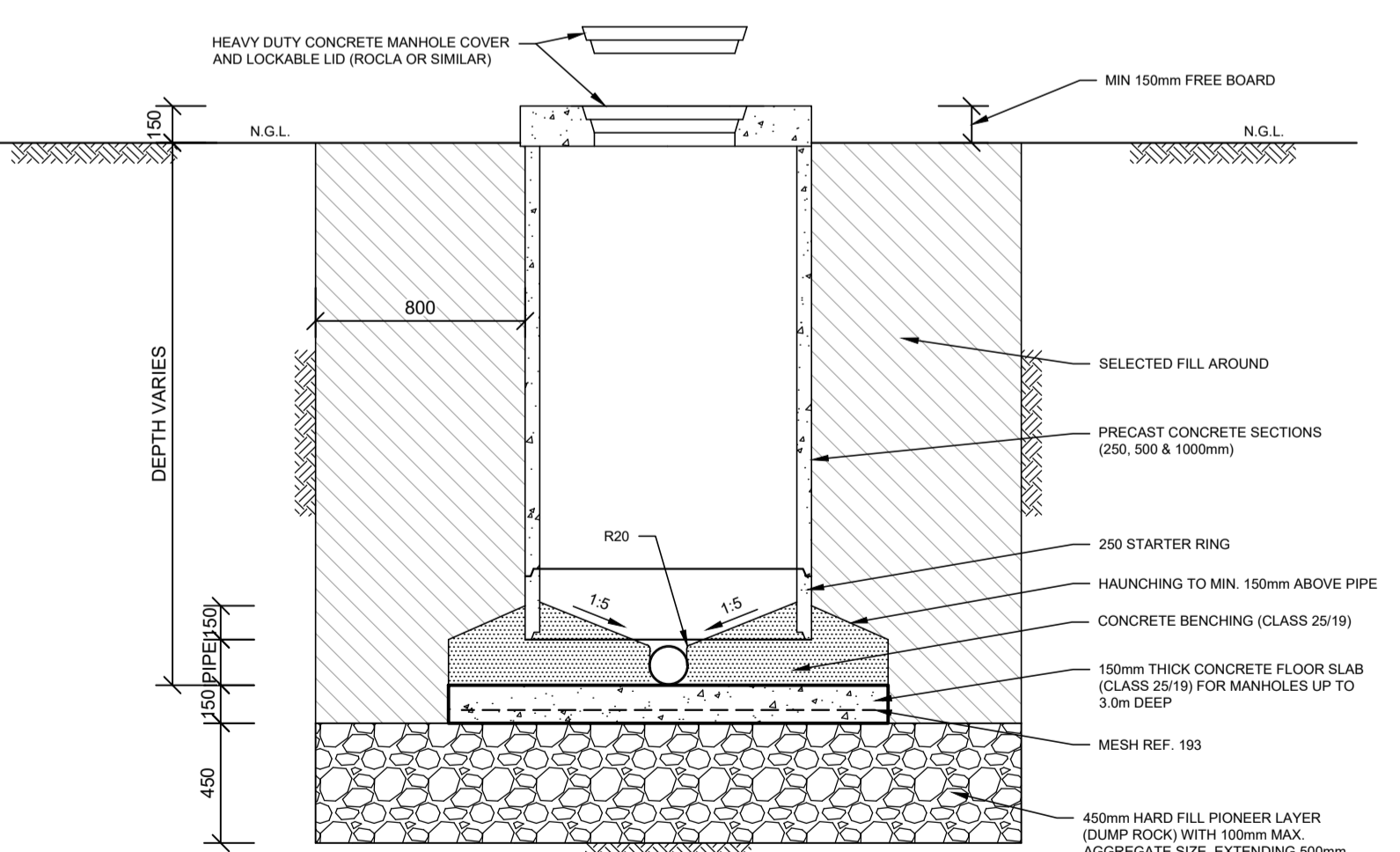
DETAIL OF MANHOLE PRECAST RING JOINT N.T.S.

RECOMMENDED MANHOLE SIZES		
MANHOLE SIZE	RECOMMENDED PIPE SIZE RANGE	RECOMMENDED MANHOLE DEPTH RANGE
1000mm Ø	100 - 300mm	UP TO 2.0m
1200mm Ø	350 - 500mm	2.1 - 3.0m
1500mm Ø	500 - 800mm	3.1 - 4.0m
1800mm Ø	>800mm	>4.0m



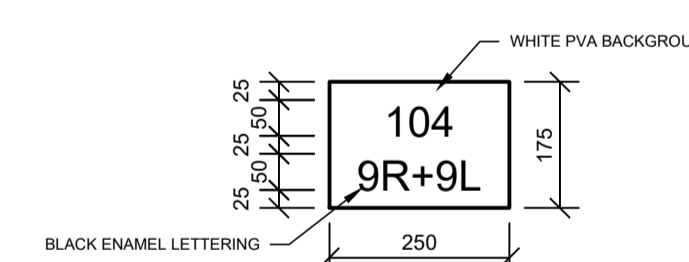
DETAIL M1: TYPICAL DETAIL OF EXTENDED MANHOLE WITH COVER SLAB IN A DRY PAN OR DAM AREA

SCALE 1:25



DETAIL M2: TYPICAL DETAIL OF HARD FILL (DUMP ROCK) PIONEER LAYER UNDER MANHOLE FOUNDATION

SCALE 1:25

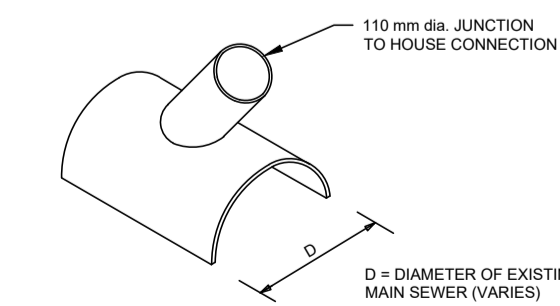


PAINT MARKER ON COVER SLAB OF MAIN SEWER

SCALE 1:10

FIXING DETAILS FOR SADDLES

- CUT 100mm dia HOLE THROUGH EXISTING PIPE. SPECIAL CARE MUST BE TAKEN TO PREVENT DEBRIS FROM FALLING INTO THE EXISTING PIPE.
- FIX SADDLE TO EXISTING PIPE WITH PROSTRUCT 617 EPOXY, OR OTHER SIMILAR APPROVED + STRAPPING.



FIXING DETAILS OF SADDLE ON EXISTING MAIN SEWER N.T.S.

NOTES:

- CONCRETE FOR MANHOLES MUST BE OF DOLOMITIC ORIGIN.
- FLEXIBLE uPVC PIPES TO SANS 1601 1994; PIPES TO BE CLASS 400, HEAVY DUTY STRUCTURED WALL IN LENGTHS OF 6m MAX. AND EACH PIPE FITTED WITH INTEGRAL CUFF JOINTS. CUFF JOINTS TO USE A RUBBER COMPRESSION SEAL IN THE 2nd TROUGH FROM THE SPIGOT END.
- FLEXIBLE JOINTS TO SANS 1601, 1994 AMENDED; ALL NON STANDARD PIPE SECTIONS TO BE JOINED WITH DOUBLE & KIMBERLEY/REPAIR COUPLINGS.
- FIELD TESTS:
 - AIR TESTS ACCORDING TO CLAUSE 7.2 OF SANS 1200 LD MUST BE CARRIED OUT BETWEEN MANHOLES DURING THE FOLLOWING PHASES OF CONSTRUCTION:
 - AFTER THE PIPES HAVE BEEN LAID.
 - AFTER THE INITIAL BACKFILLING HAS BEEN COMPLETED.
 - THE AIR TEST IS ONLY AN INDICATION OF ACCEPTANCE OF A COMPLETED PORTION OF THE LINE AND IN ANY DISPUTE ARISING THE OUTCOME OF A WATER TEST WILL BE BINDING.
- TRENCHES:
 - EXCAVATION AND BACKFILLING OF TRENCHES TO COMPLY WITH SANS 1200 DB.
 - BEDDING OF PIPES TO COMPLY WITH SANS 1200 LB FOR FLEXIBLE PIPES.
 - TRENCHES DEEPER THAN 2.0m TO BE EXCAVATED IN V-SHAPE FOR TOP 1.5m AS SAFETY PRECAUTION, ONLY ON INSTRUCTION OF THE ENGINEER AS DETERMINED ON SITE AND BY THE IN-SITU MATERIAL.
 - SEWERS TO BE PROTECTED AT ROAD CROSSINGS AS SHOWN ON THE TYPICAL PLAN FOR PIPE BEDDING.
 - TRENCHES TO BE PROTECTED FROM STORMWATER INFLOW.
 - OVER EXCAVATION MAY ONLY BE FILLED AFTER APPROVAL BY THE ENGINEER WITH GRADE 20/19 CONCRETE OR SUITABLE MATERIAL AS DIRECTED BY THE ENGINEER.
- MANHOLES AND FITTINGS:
 - ALL CONCRETE, BENCHING AND SEALERS SHALL COMPLY WITH SANS 1200 GA OR SANS 1200 LD AS APPLICABLE.
 - PRECAST CONCRETE SECTIONS TO COMPLY WITH SANS 1294.
 - CONCRETE MANHOLE SECTIONS MUST BE FIXED WITH AN EPOXY SEALER SUCH AS EPIDERMIX 344 OR PRO-STRUCT 687 OR SIMILAR APPROVED.
 - CLASSES OF CONCRETE:
 - PRECAST CONCRETE SECTIONS - 30/19.
 - BEDDING CRADLE - 15/19.
 - ALL OTHER CONCRETE - 25/19.
 - CHANNELING:
 - $\phi \leq 300\text{mm}$: CLAY / DOLOMITIC CONCRETE / NUTEC CEMENT
 - $\phi > 300\text{mm}$: IN-SITU CAST DOLOMITIC CONCRETE
 - STEP IRONS SHALL NOT BE INSTALLED IN MANHOLES.
 - FREEBOARD: MIN. 150mm FOR OUTFALL SEWERS OR IN RURAL AREAS.
 - CLEANING: THE MANHOLE IN TOTAL, BUT THE CHANNELS IN PARTICULAR, MUST BE RUBBED AND CLEANED OUT PROPERLY TO A SMOOTH FINISH BEFORE THE MANHOLE WILL BE INSPECTED FOR APPROVAL.

NOTES / LEGEND

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Civil, Structural & Electrical Engineers, Environmental & Project Management
Registration No: 16010/2007

NALA LOCAL MUNICIPALITY

PROJECT

KGOTSONG/BOTHAVILLE:
UPGRADING OF SEWER OUTFALL
REMAINING PHASES

DRAWING TITLE

TYPICAL SEWER
MANHOLE DETAILS

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JL REYNDERS	2020300701	02/04/2024
ENGINEER/TECHNOLOGIST	REG. NO.	DATE

SCALE	AS SHOWN	DRAWN	DJ COETZEE
DESIGNED	DJ COETZEE	CHECKED	JL REYNDERS

PLAN NUMBER REVISION NO.

34609-133-2 0

NOTES / LEGEND

1. SHORT FUTURE CONNECTIONS:
1.0m PIPE + 1 x JUNCTION + 1 x END CAP + 1 x MARKER
2. LONG FUTURE CONNECTION:
1.5m PIPE + 1 x JUNCTION + 1 x END CAP + 1 x MARKER
3. SHORT CONNECTION:
1.25m PIPE + 1 x JUNCTION
4. LONG CONNECTION:
1.8m PIPE + 1 x JUNCTION
5. SHORT SHORT FUTURE CONNECTION:
0.5m PIPE + 1 x JUNCTION + 1 x END CAP + 1 x MARKER

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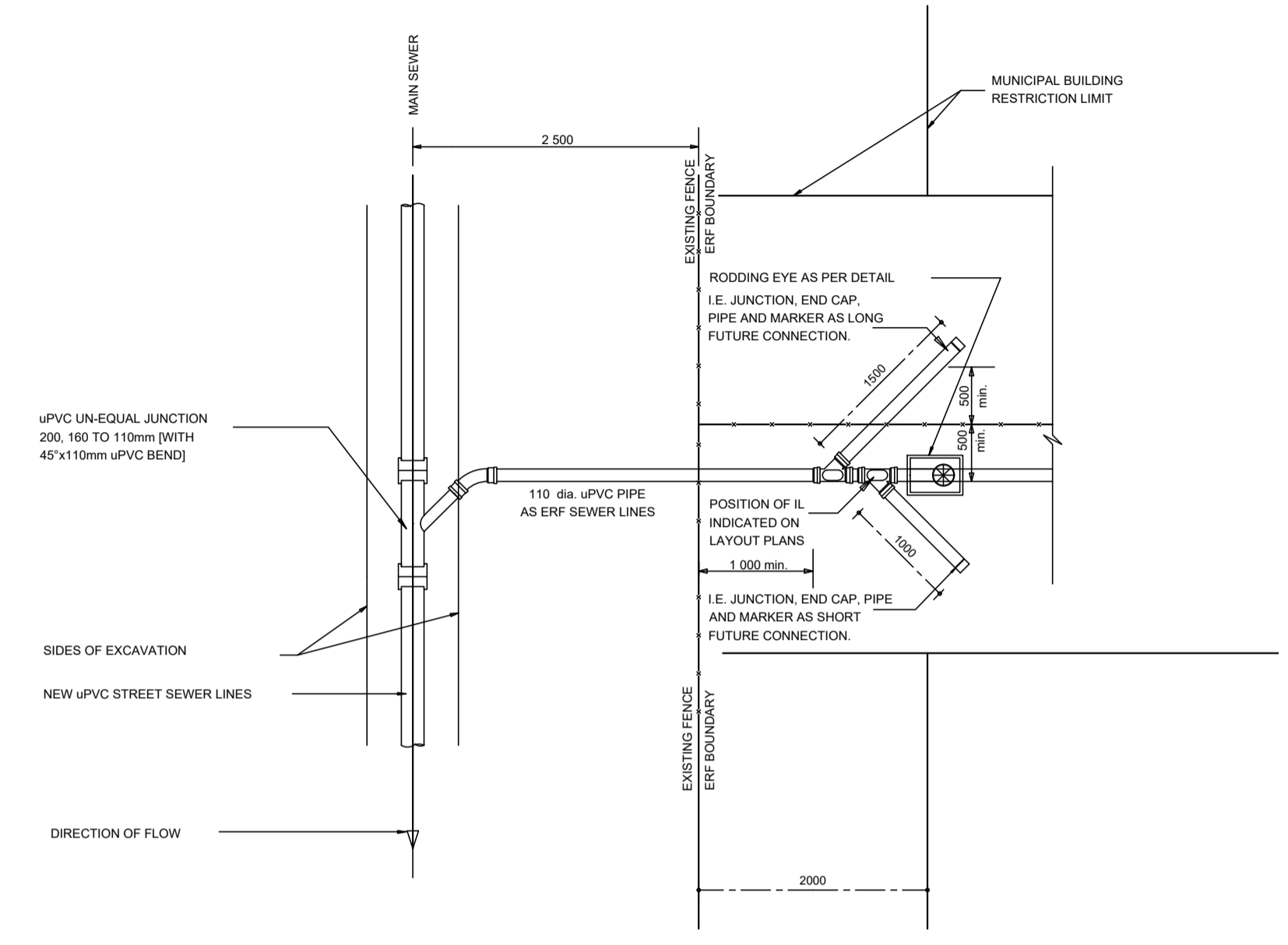
NALA LOCAL MUNICIPALITY

PROJECT
KGOTSONG/BOTHAVILLE:
UPGRADING OF SEWER OUTFALL
REMAINING PHASES

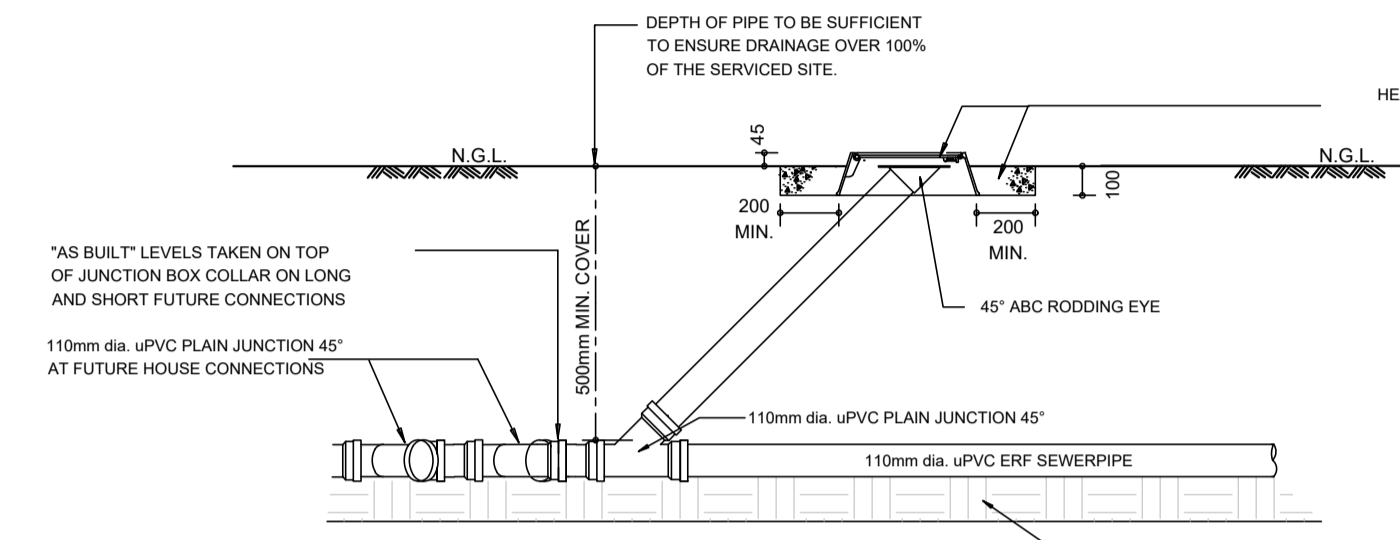
DRAWING TITLE
TYPICAL SEWER ERF
CONNECTION DETAILS

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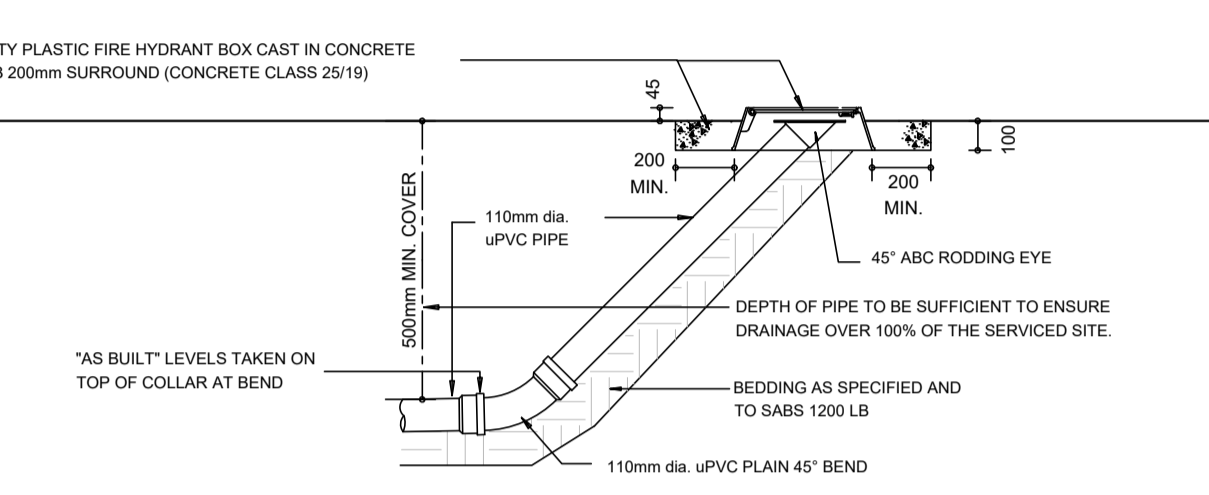
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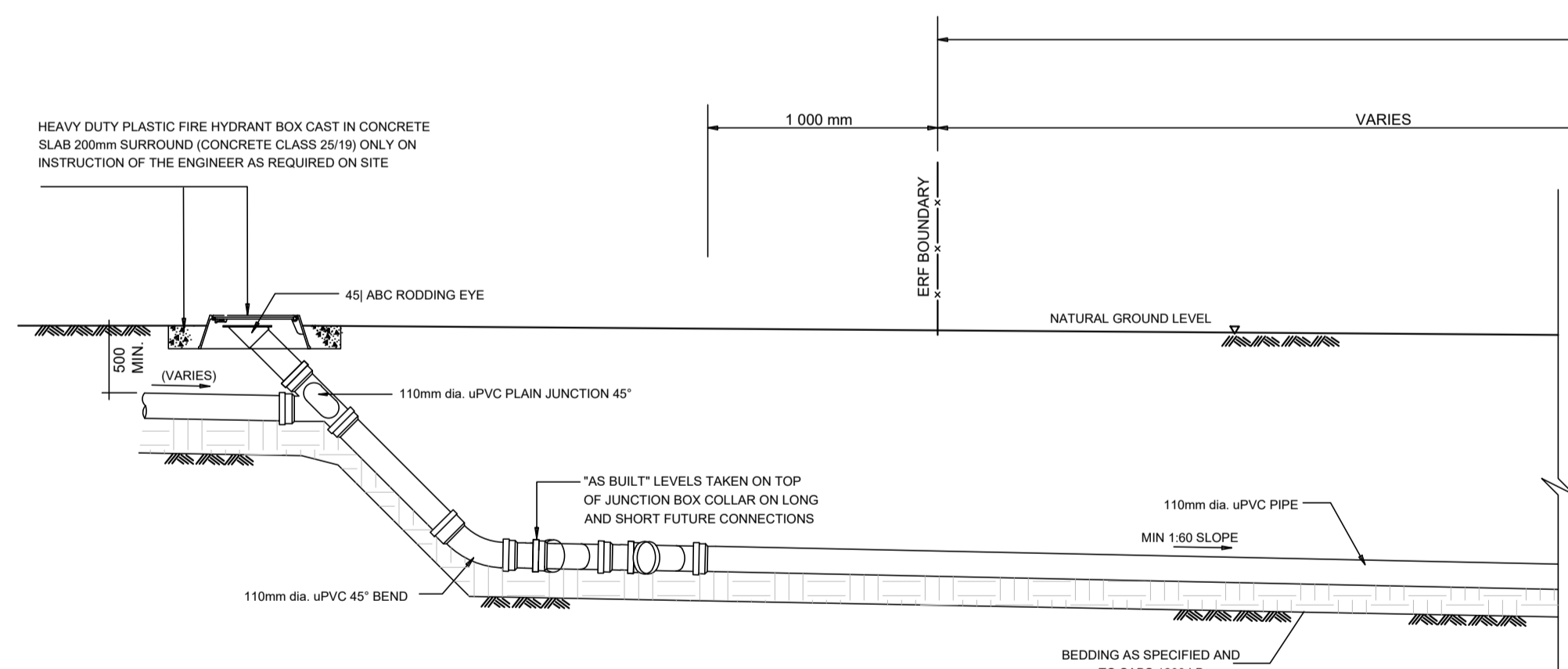
TYPICAL LAYOUT OF ERF SEWER COLLECTOR WITH FUTURE AND CONNECTIONS
SCALE 1:20



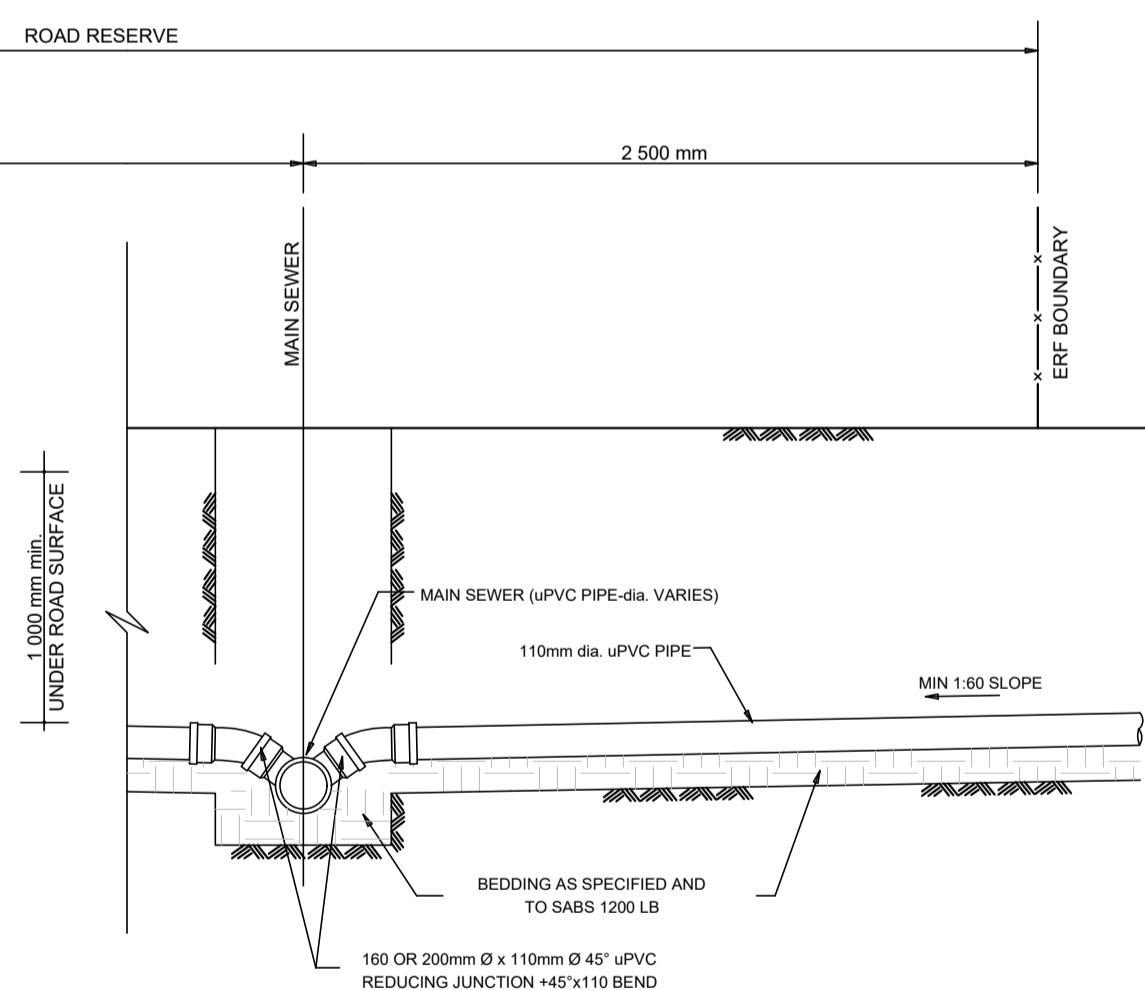
TYPICAL DETAIL OF RODDING EYE AT THE FUTURE HOUSE CONNECTIONS ON THE ERF SEWER LINE
SCALE 1:20



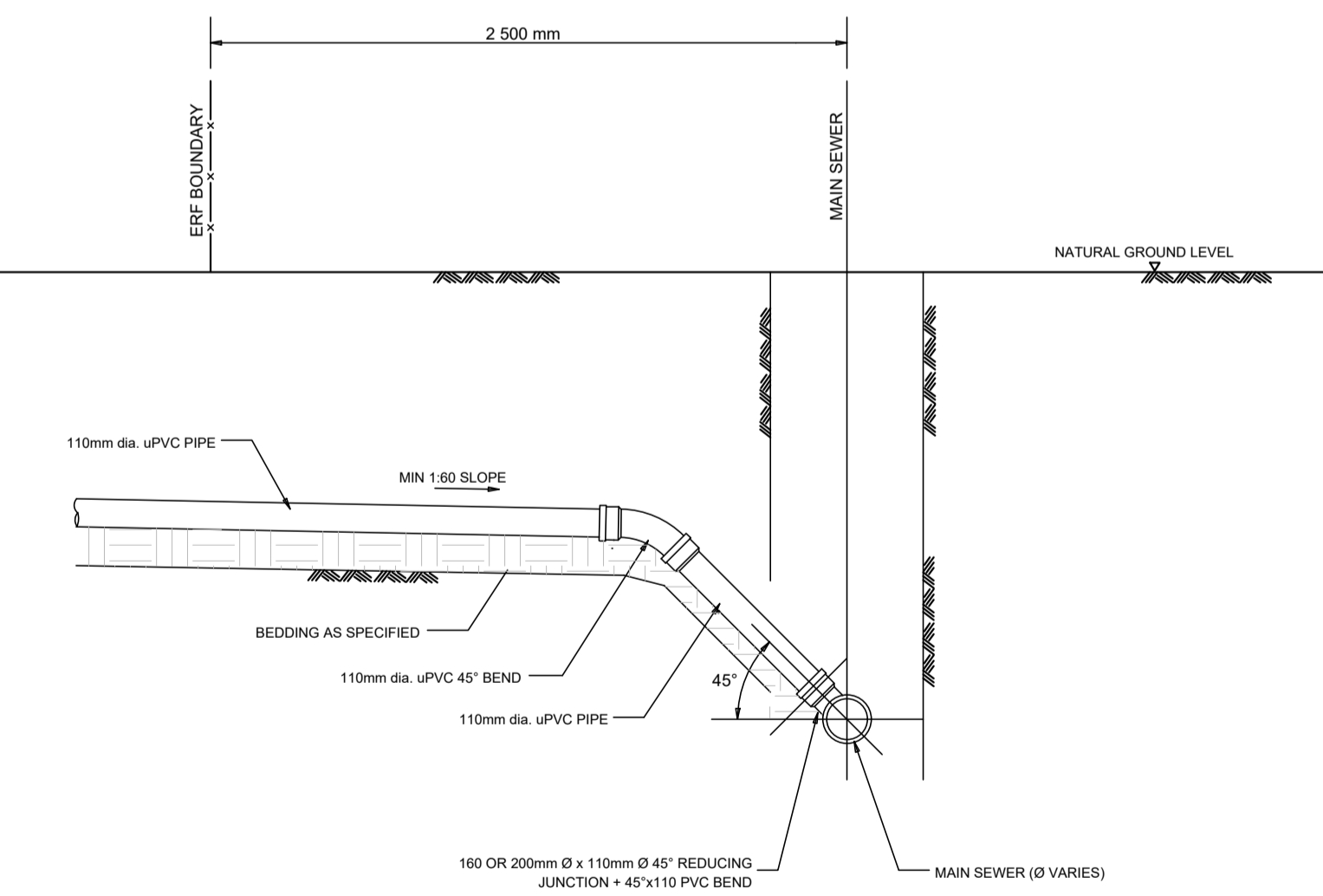
TYPICAL DETAIL OF RODDING EYE AT THE HEAD OF THE ERF SEWER LINE
SCALE 1:20



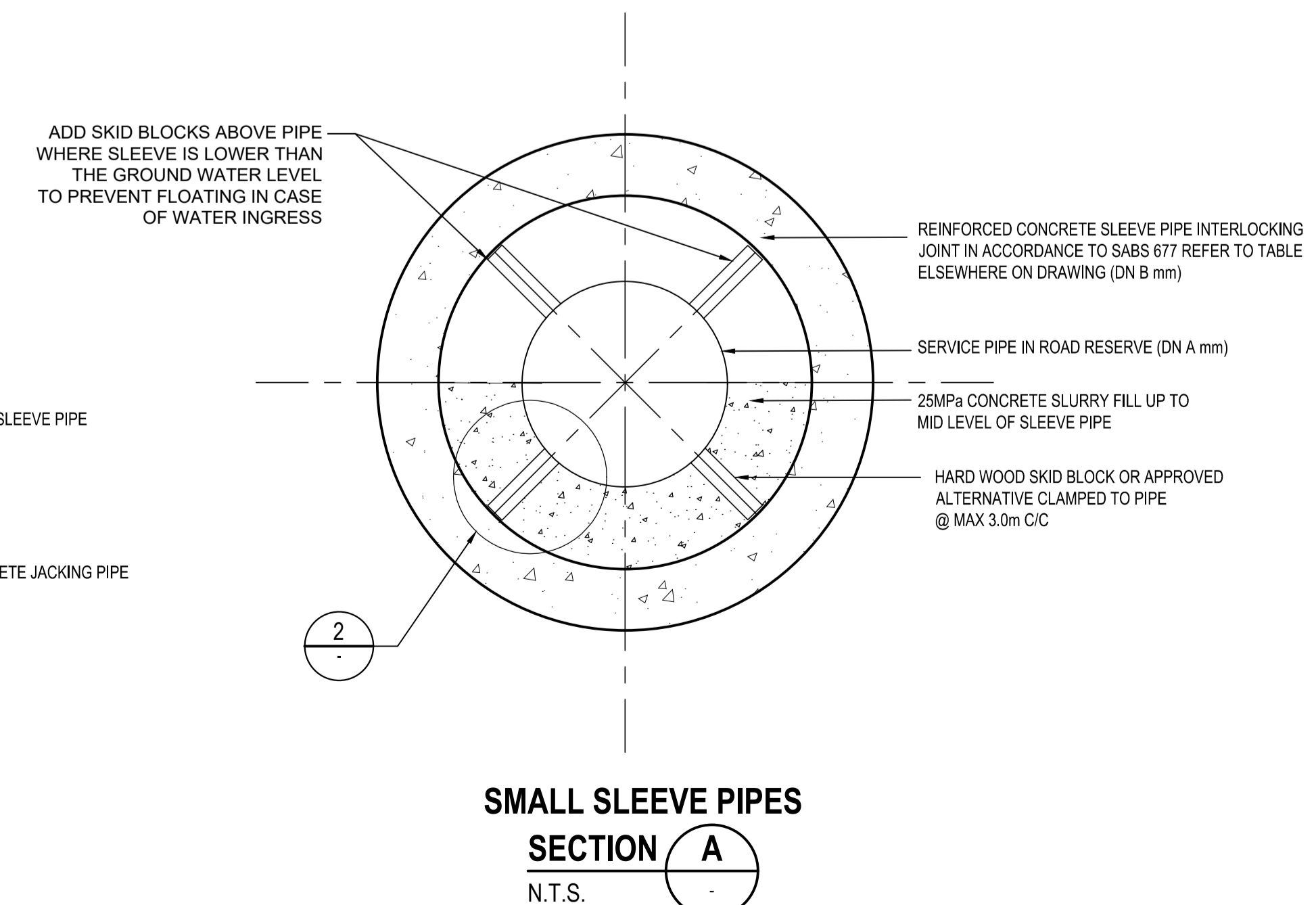
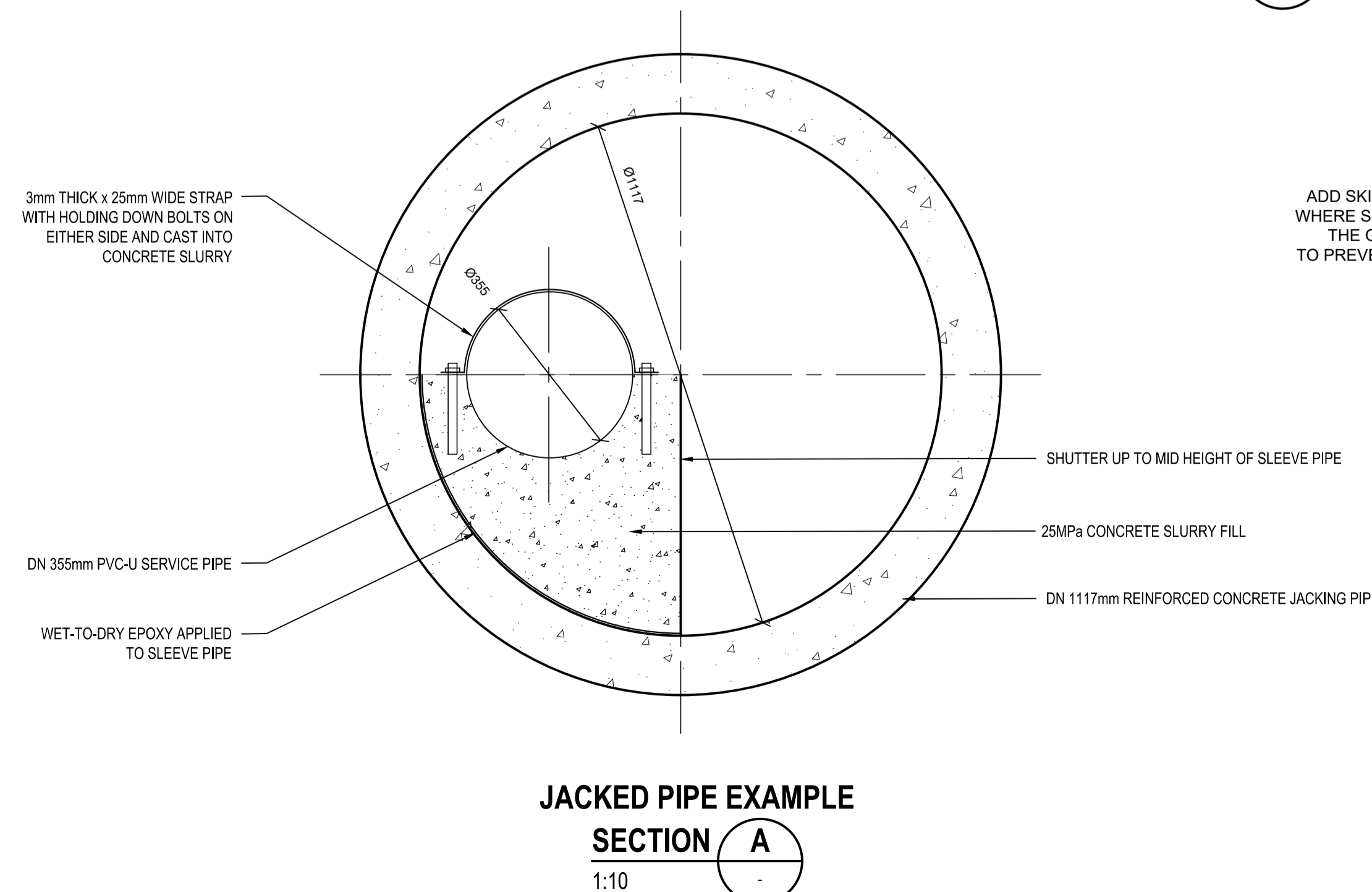
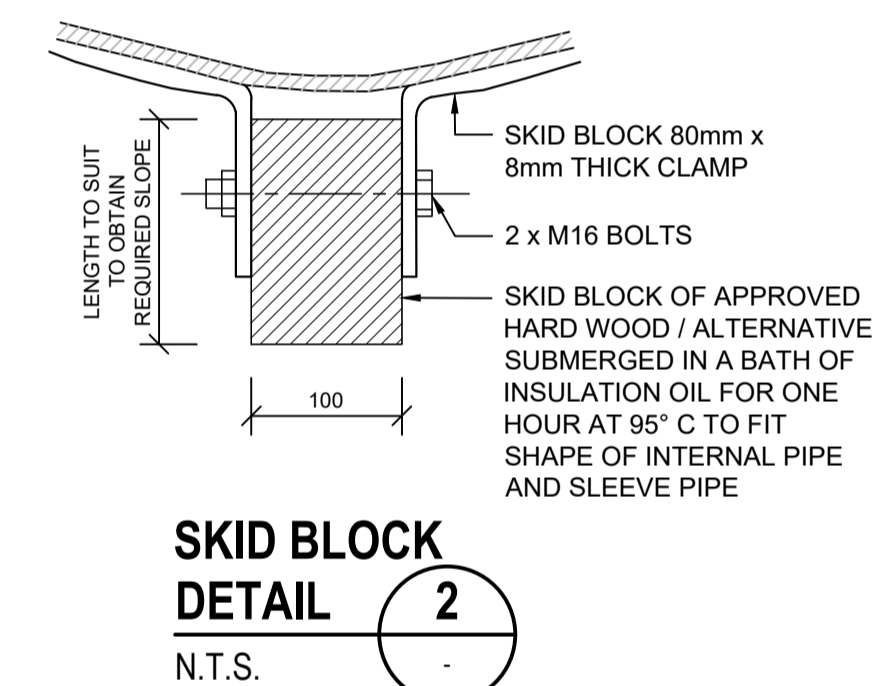
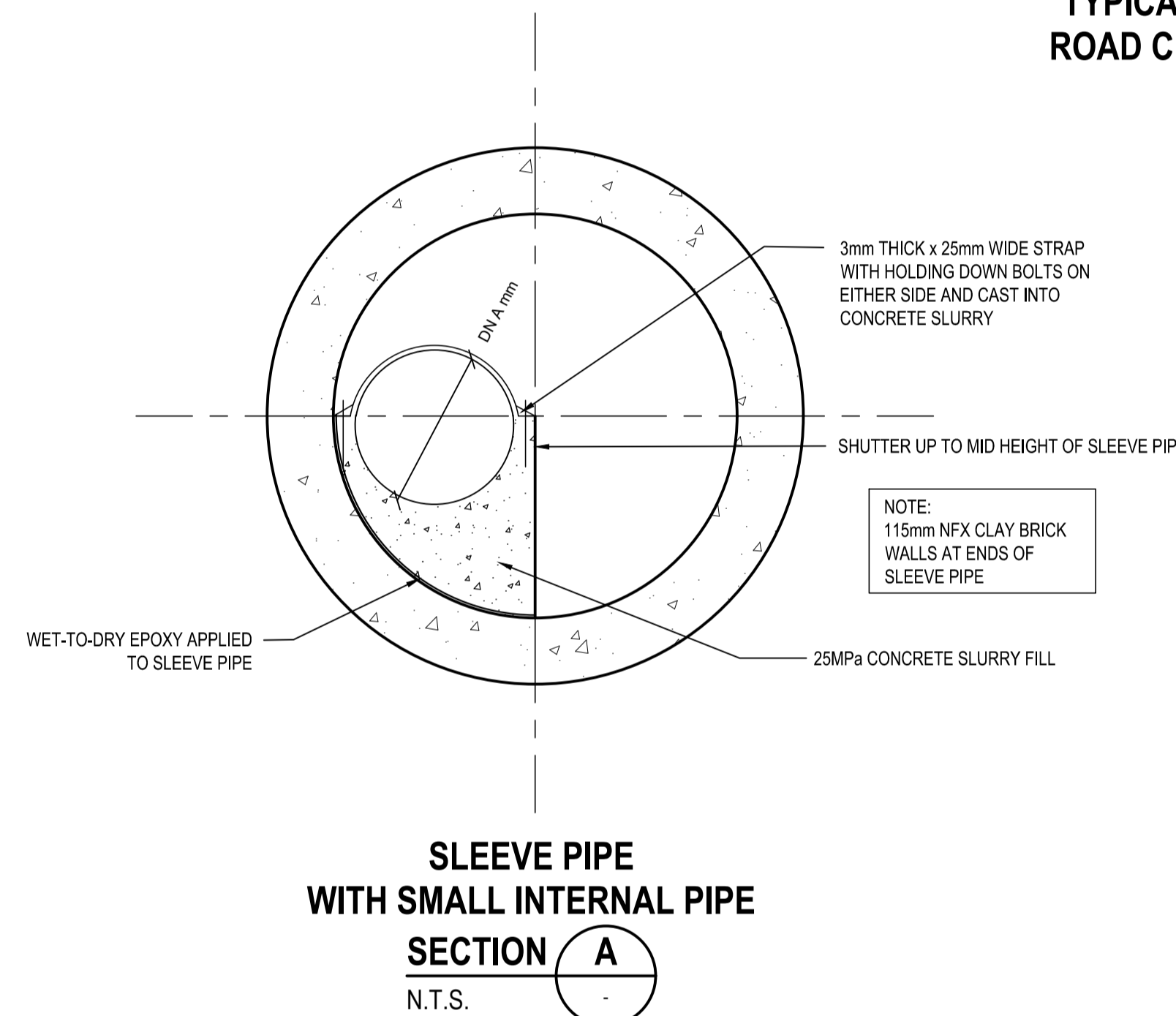
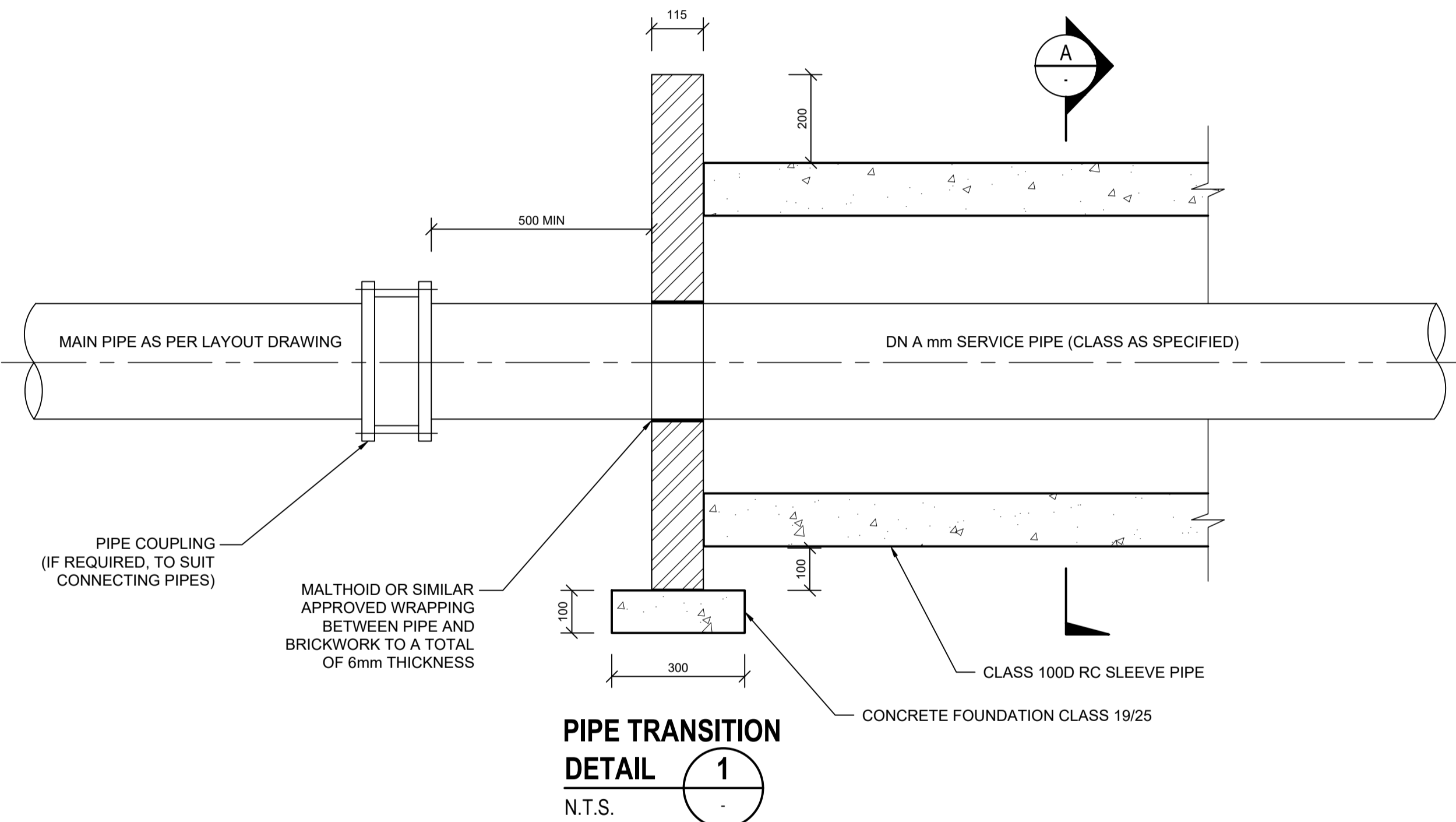
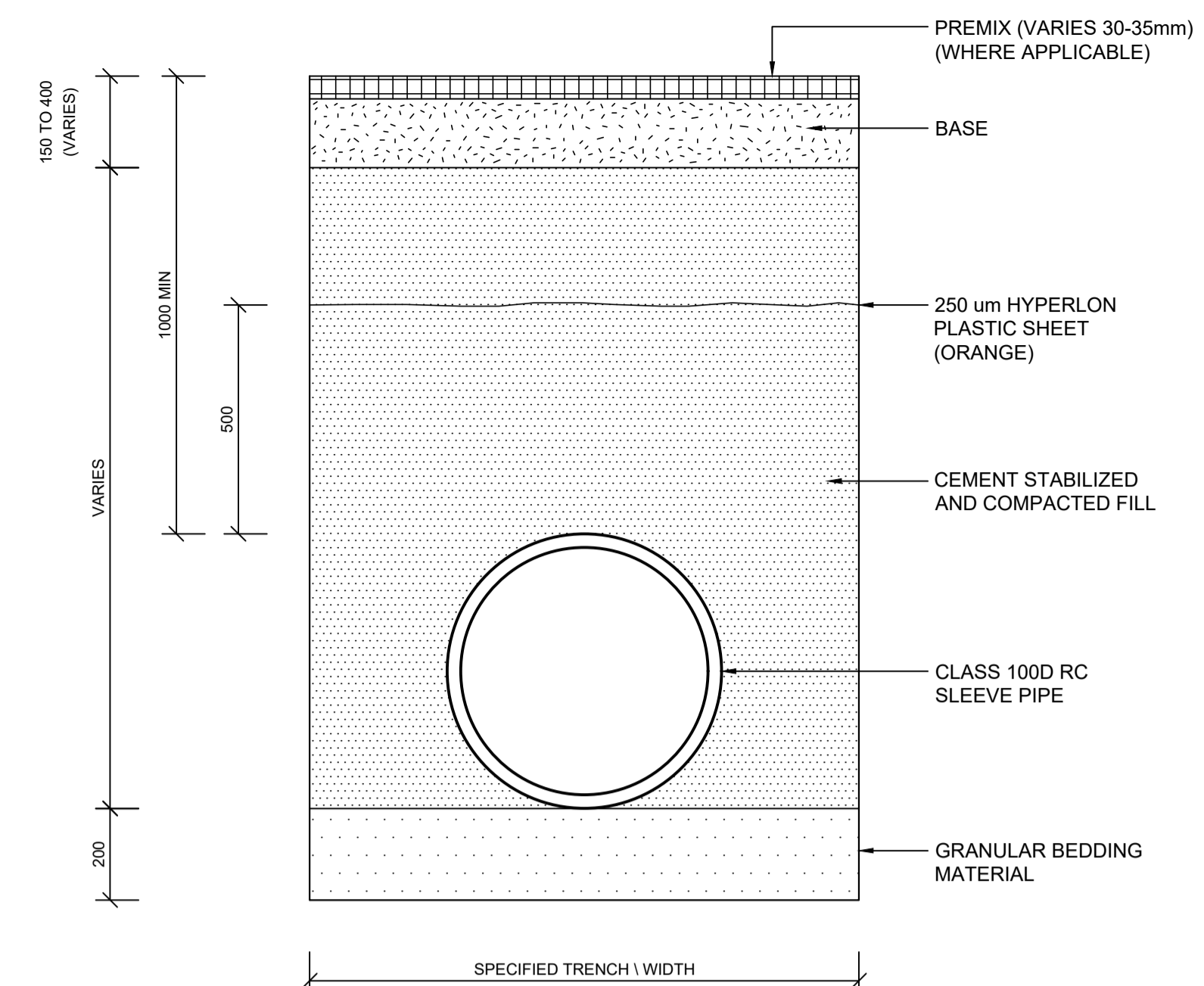
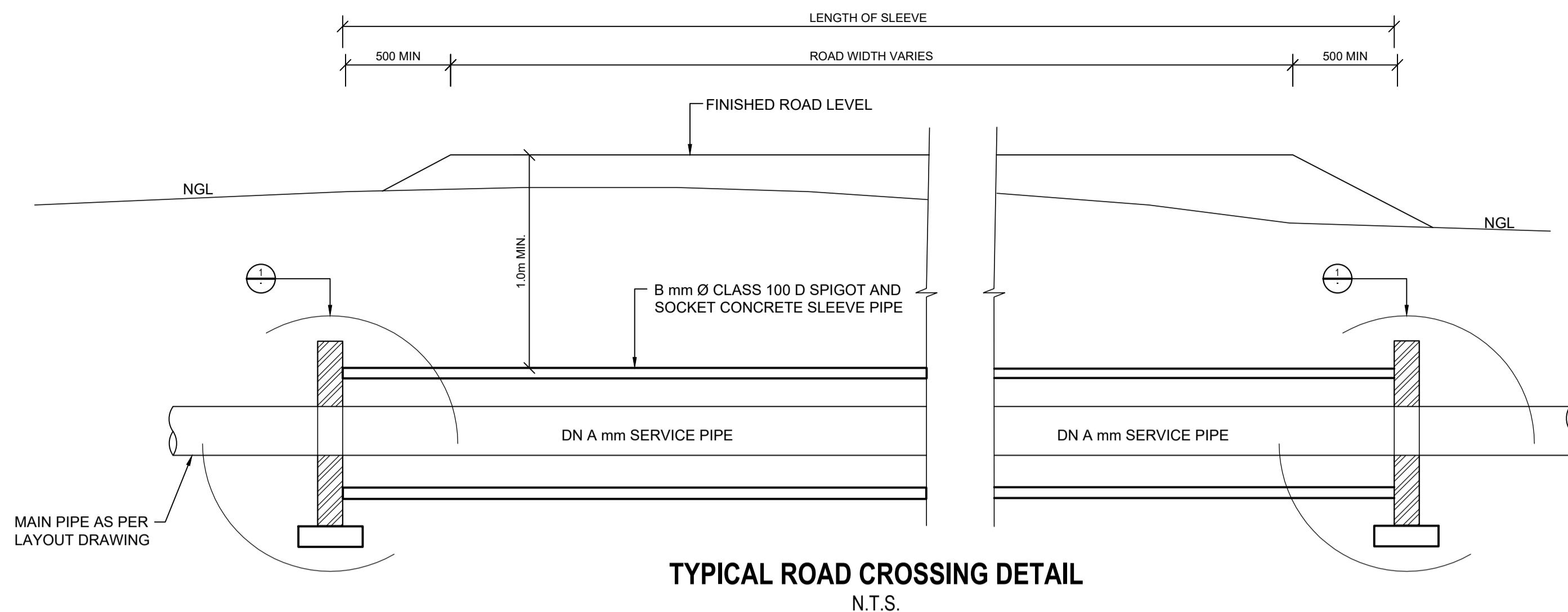
STREET CROSSING



CONNECTION OF ERF SEWER COLLECTOR TO MAIN SEWER
SCALE 1:25



D > 1200



CONVENTIONAL CONSTRUCTION METHOD	
HDPE PE 100 / PVC-U SERVICE PIPE DN A mm	CLASS 100 D RC PIPES DN B mm
110	300
160	375
200	525
315	675
355	750
400	750
500	900
630	1050
700	1050
800	1200
900	1350
1000	1500
1100	1650
1200	1650

JACKED PIPE SLEEVE METHOD	
HDPE PE 100 / PVC-U SERVICE PIPE DN A mm	CLASS 100 D RC JACKING PIPE DN B mm
355 TO 630	1117
HDPE 8kN/m² STRUCTURED WALL PIPE DN A mm	CLASS 100 D RC JACKING PIPE DN B mm
700	1117
800	1117
900	1473
1000	1473
1200	1678

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NALA LOCAL MUNICIPALITY

PROJECT

**KGOTSONG/BOTHAVILLE:
UPGRADING OF SEWER OUTFALL
REMAINING PHASES**

DRAWING TITLE

**TYPICAL ROAD CROSSING
PIPE SLEEVE DETAILS**

APPROVED BY BVI

JL REYNDERS 2020300701 02/04/2024

ENGINEER/TECHNOLOGIST REG. NO. DATE

SCALE AS SHOWN DRAWN DJ COETZEE

DESIGNED DJ COETZEE CHECKED JL REYNDERS

PLAN NUMBER REVISION NO.

34609-133-4 0

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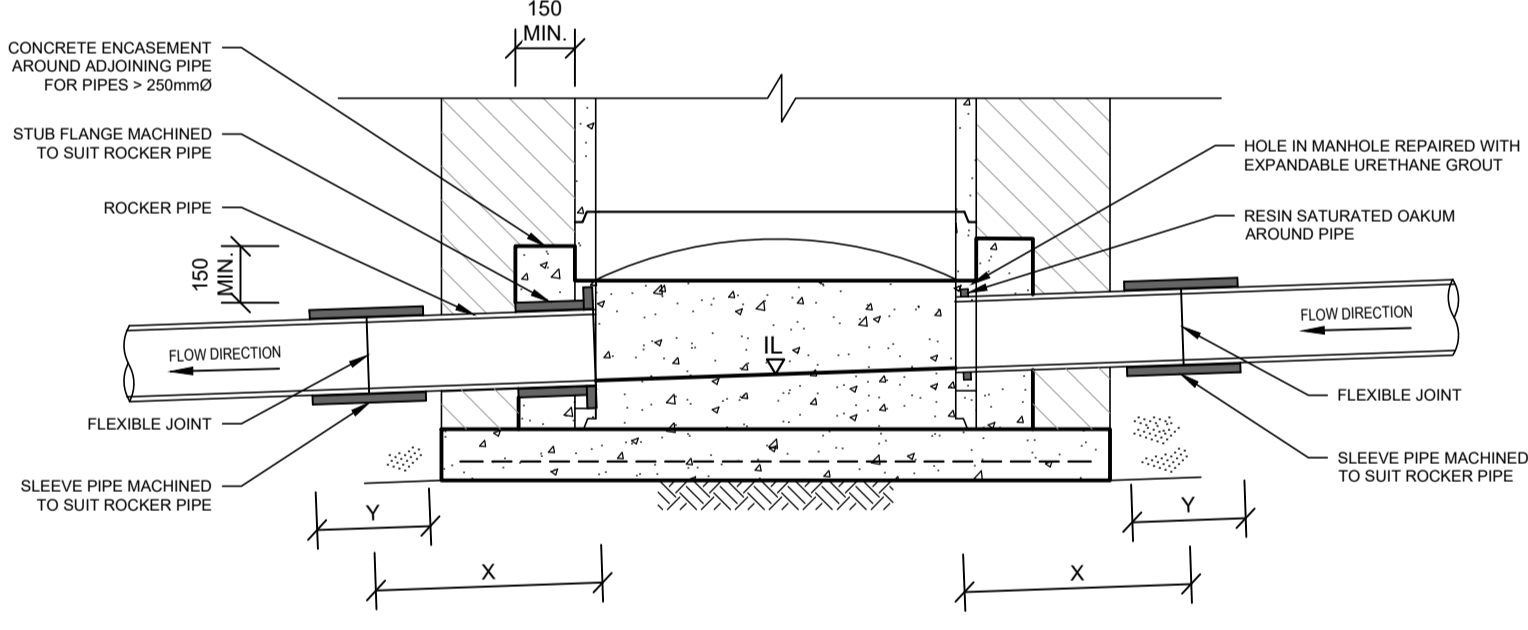
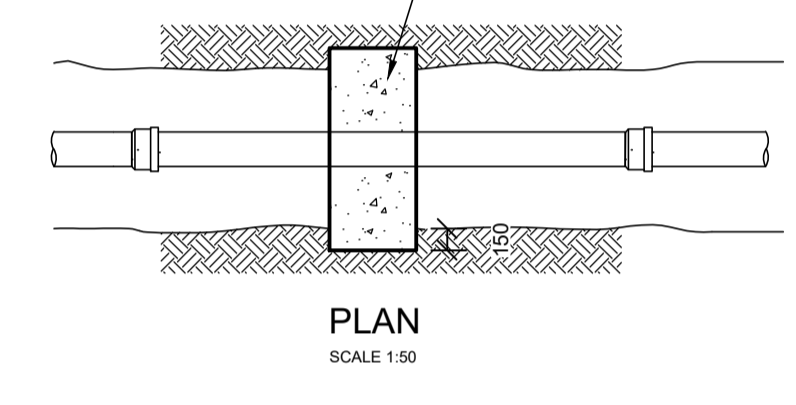
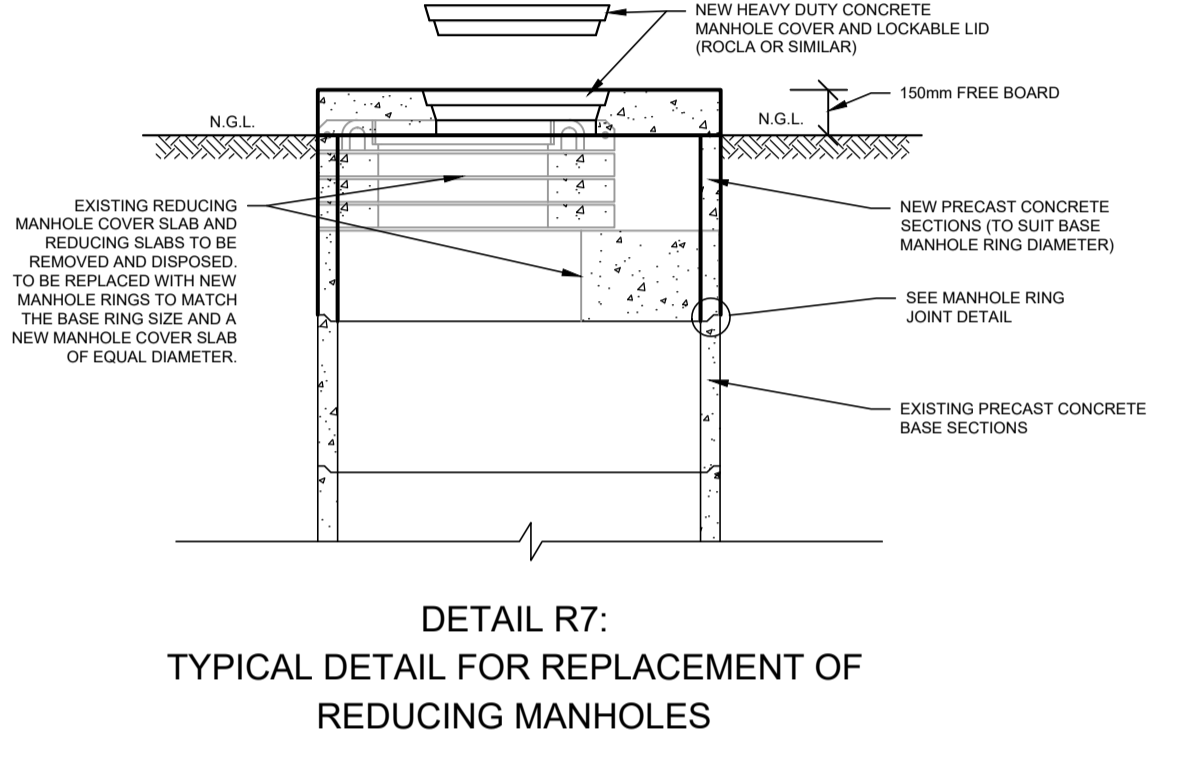
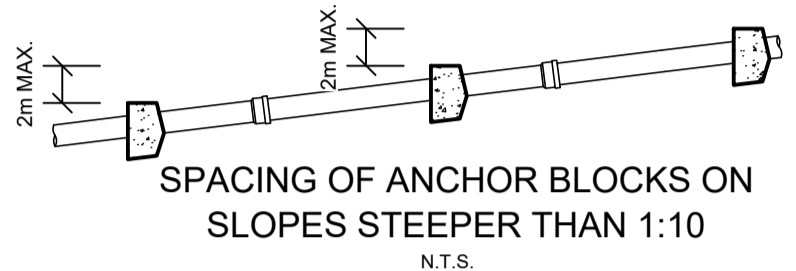
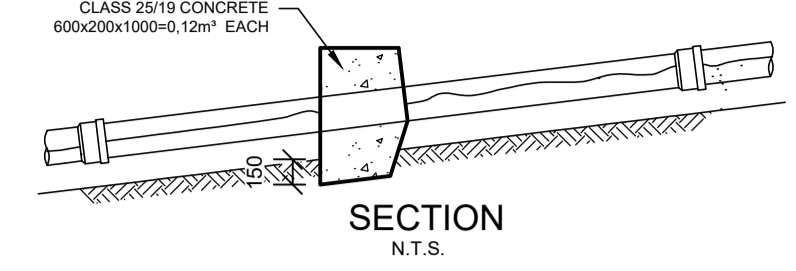
NALA LOCAL MUNICIPALITY

KGOTSONG/BOTHAVILLE: UPGRADING OF SEWER OUTFALL REMAINING PHASES

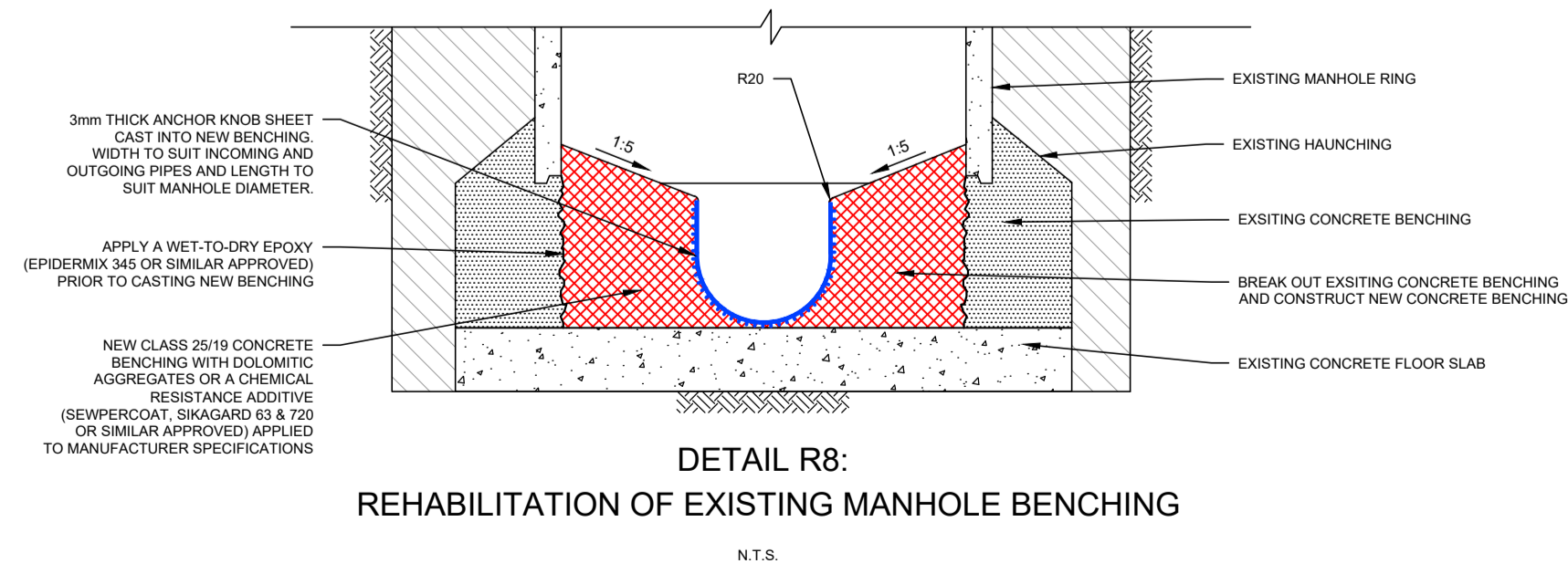
DRAWING TITLE
ADDITIONAL SEWER MANHOLE DETAILS

APPROVED BY BVI

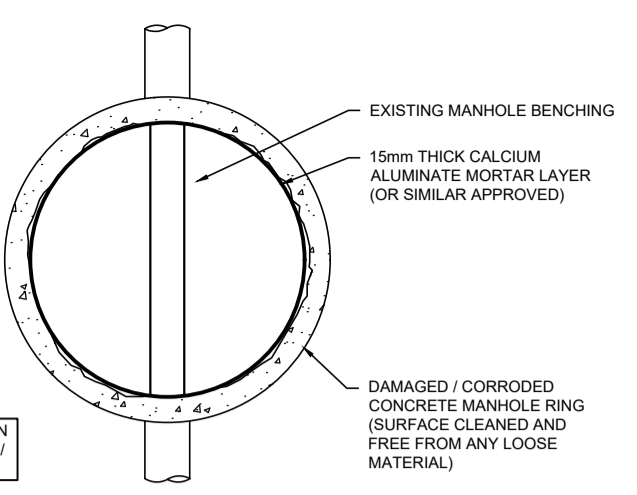
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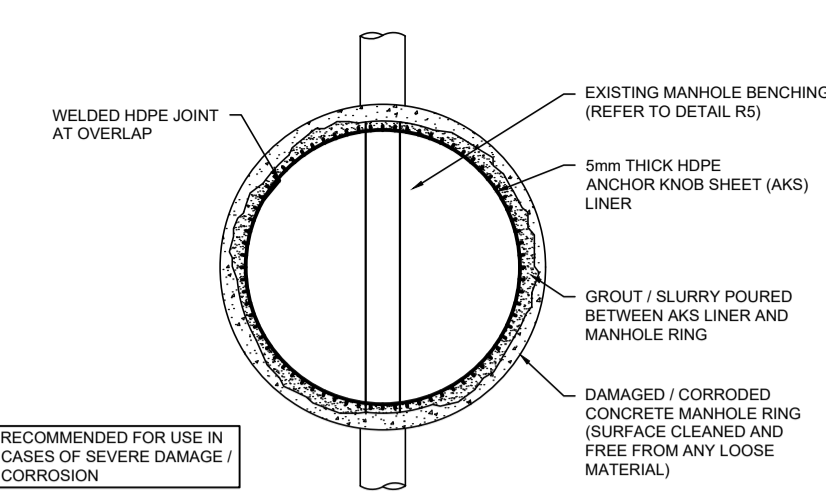
PIPE DIAMETER	PIPE MATERIAL	ROCKER PIPE LENGTH (X)	CONNECTION DESCRIPTION	CONNECTION LENGTH (Y)
160mm	PVC-U	0.6m	MACHINE OUT A 200Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 164mm	300mm
200mm	PVC-U	0.6m	MACHINE OUT A 250Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 204mm	300mm
250mm	HDPE	0.6m	MACHINE OUT A 315Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 254mm	400mm
315mm	HDPE	0.8m	MACHINE OUT A 355Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 313mm	400mm
355mm	HDPE	0.8m	MACHINE OUT A 400Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 359mm	500mm
400mm	HDPE	0.8m	MACHINE OUT A 450Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 404mm	500mm
450mm	HDPE	0.8m	MACHINE OUT A 500Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 454mm	600mm
500mm	HDPE	1.0m	MACHINE OUT A 560Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 504mm	600mm
560mm	HDPE	1.0m	MACHINE OUT A 630Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 564mm	700mm
630mm	HDPE	1.0m	MACHINE OUT A 710Ø Pn10 SDR17 HDPE 100 STUB FLANGE & SLEEVE PIPE TO HAVE AN INSIDE DIAMETER OF 634mm	700mm



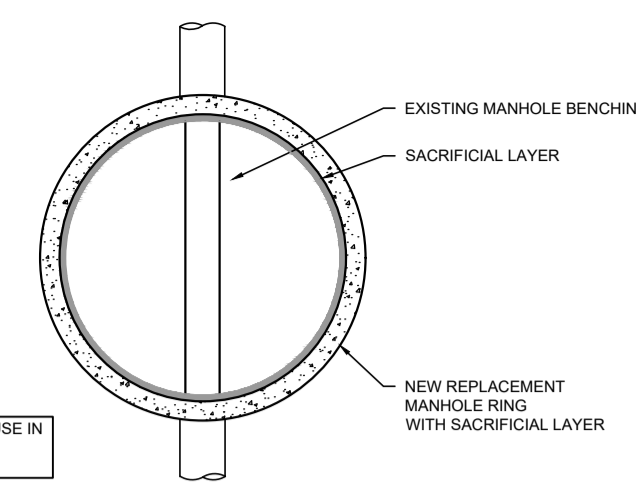
NOTES:
1. DRAWING TO BE READ IN CONJUNCTION WITH DRAWING NO. 34875-133-02.



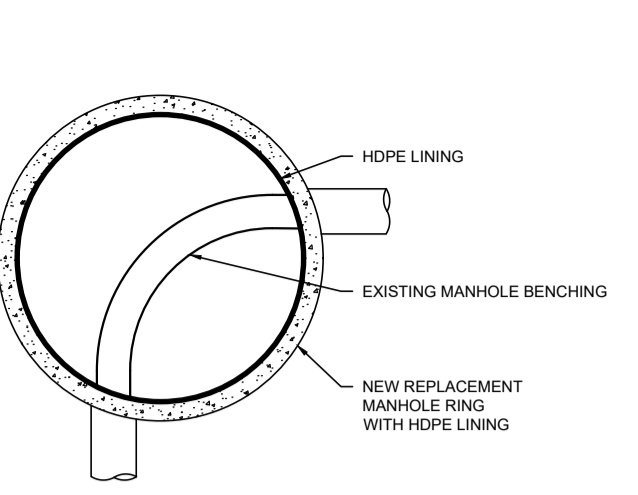
DETAIL R1:
TYPICAL DETAIL OF MANHOLE REHABILITATION USING A CALCIUM ALUMINATE MORTAR
SCALE 1:25



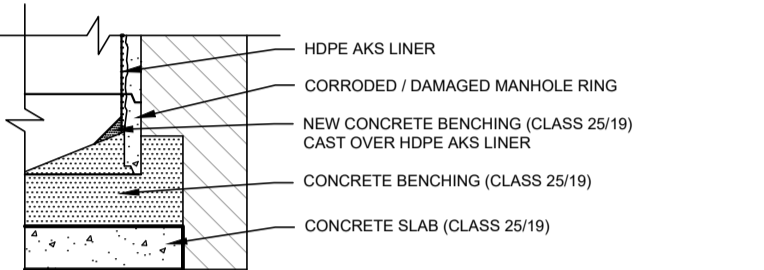
DETAIL R2:
TYPICAL DETAIL OF MANHOLE REPAIR USING AN HDPE ANCHOR KNOB SHEET (AKS) LINER
SCALE 1:25



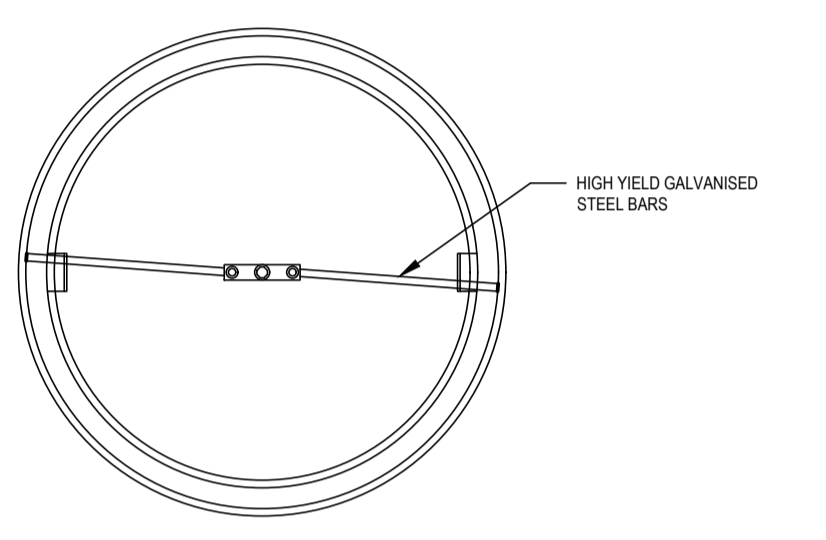
DETAIL R3:
TYPICAL DETAIL OF MANHOLE REPLACEMENT USING COMPONENTS WITH A SACRIFICIAL LAYER
SCALE 1:25



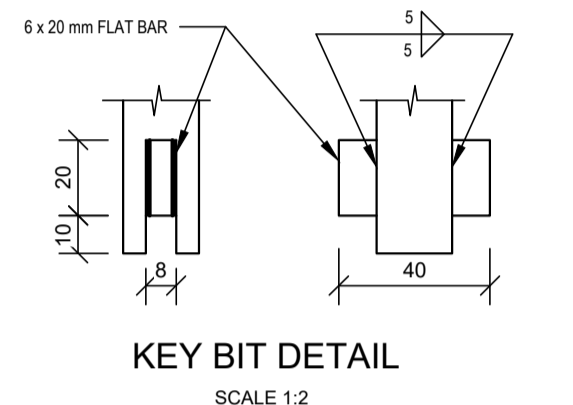
DETAIL R4:
TYPICAL DETAIL OF MANHOLE REPLACEMENT USING HDPE LINED MANHOLE COMPONENTS
SCALE 1:25



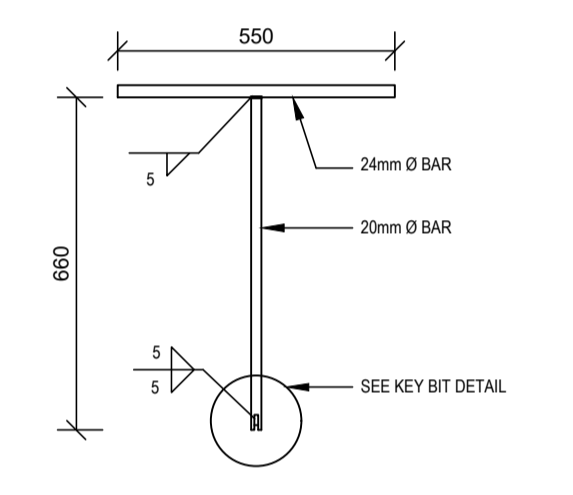
DETAIL R5:
BENCHING TO BE CAST AGAINST AKS LINER (R2)
N.T.S.



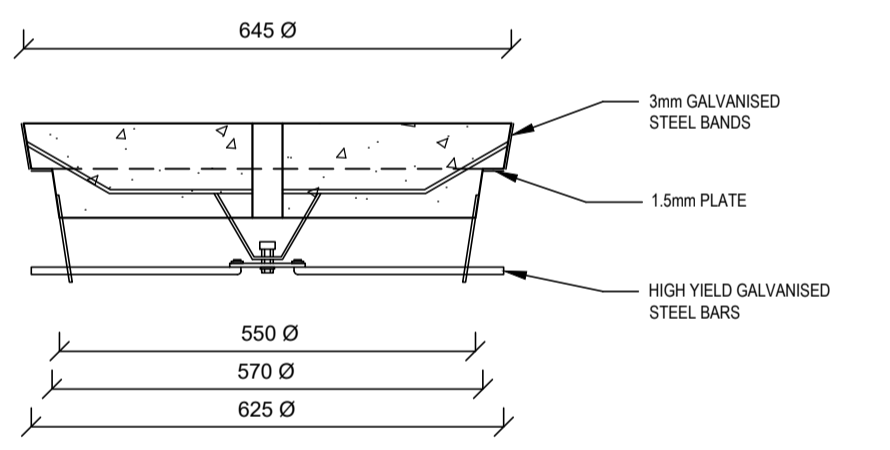
BOTTOM VIEW OF MANHOLE LID WITH LOCKING DEVICE
SCALE 1:10



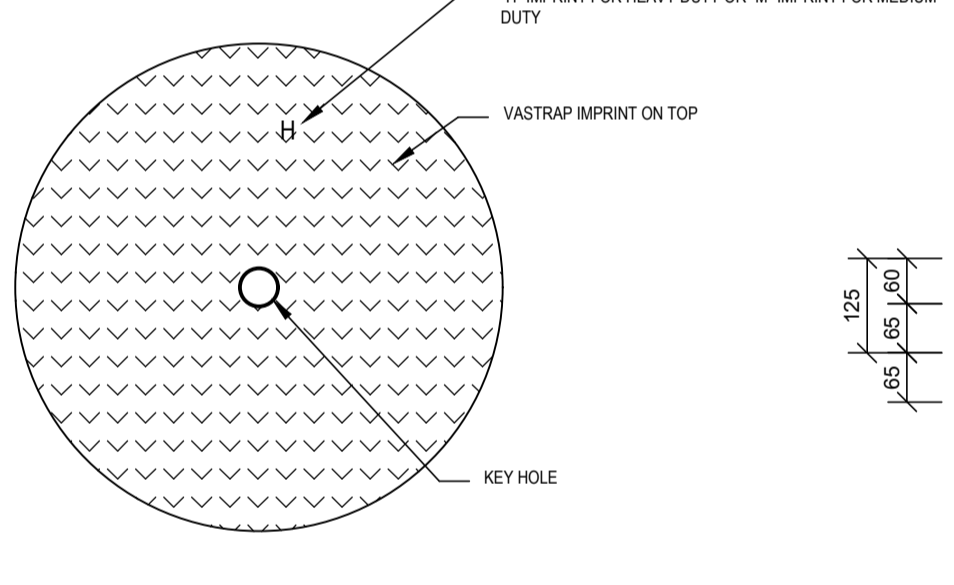
KEY BIT DETAIL
SCALE 1:2



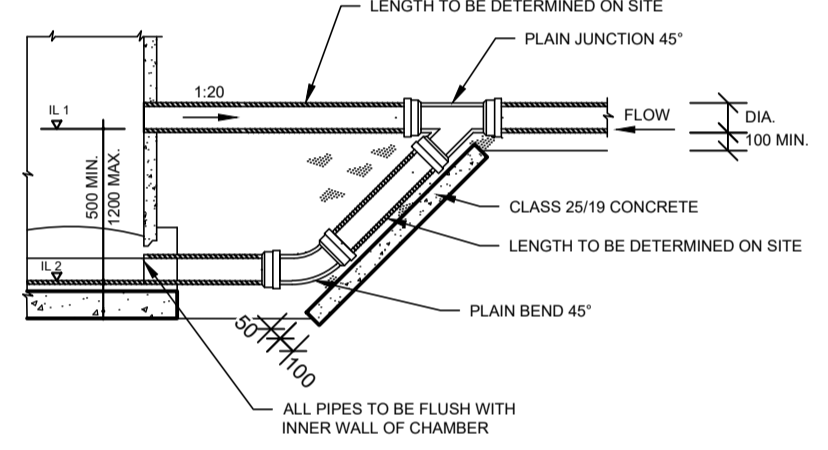
LOCKING AND LIFTING KEY DETAIL
SCALE 1:15



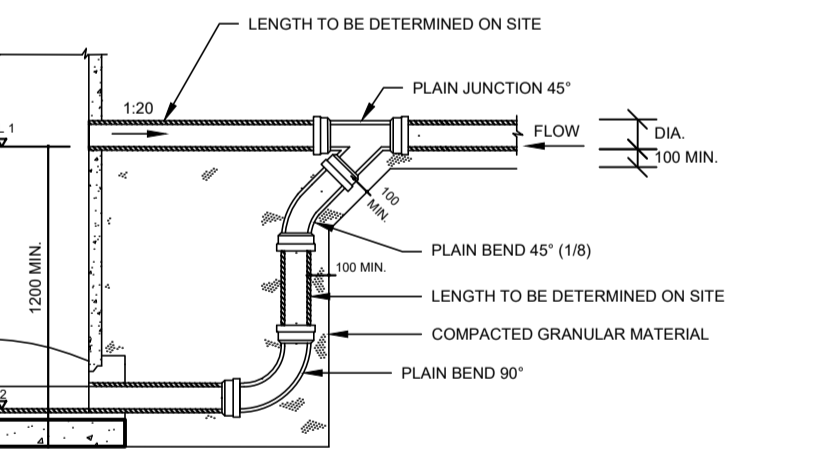
SECTION THROUGH MANHOLE LID
SCALE 1:10



TOP VIEW OF MANHOLE LID
SCALE 1:10

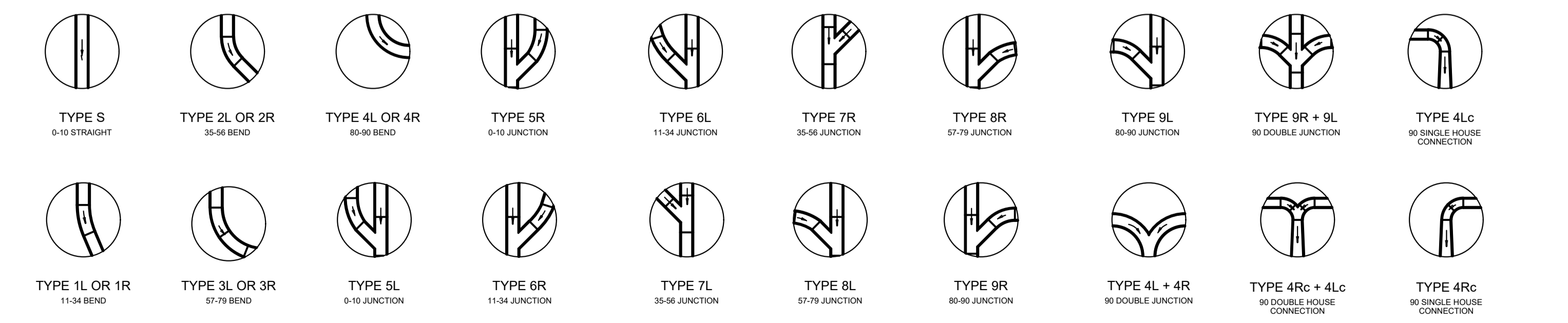


MANHOLE WITH HIGH INLET RAMP TYPE
N.T.S.



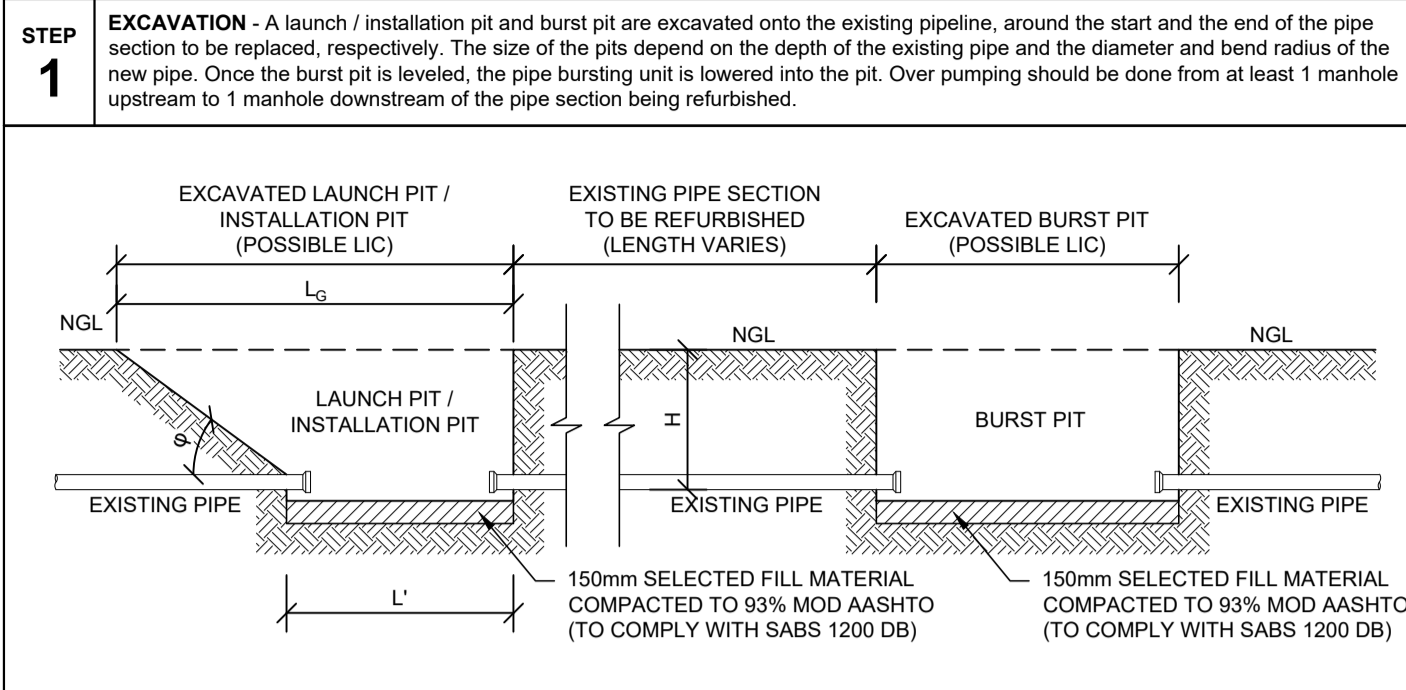
MANHOLE WITH HIGH INLET VERTICAL DROP TYPE
N.T.S.

DETAIL R6:
DETAIL OF MANHOLE LID WITH LOCKING DEVICE

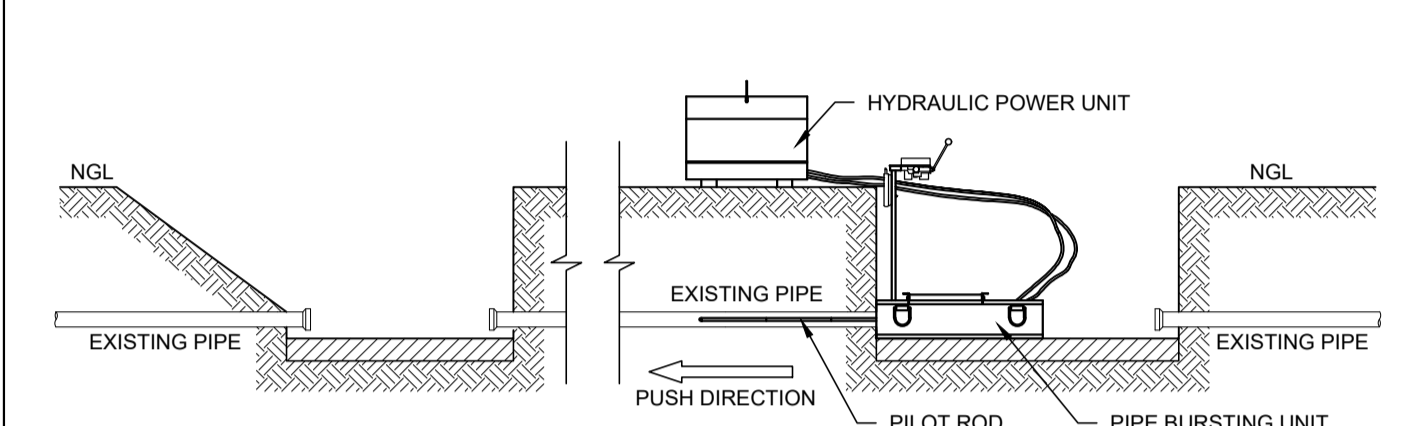


TYPICAL MANHOLE CHANNEL DETAILS

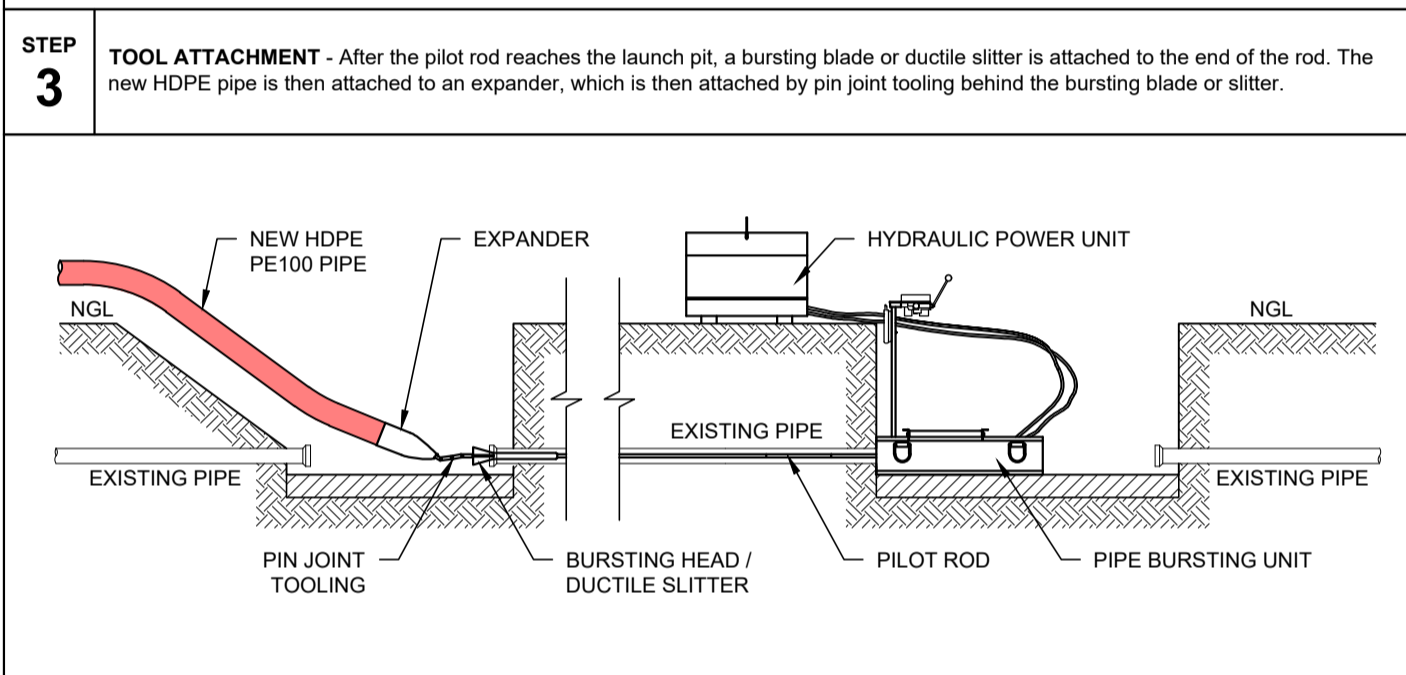
THE PIPE BURSTING / CRACKING PROCESS



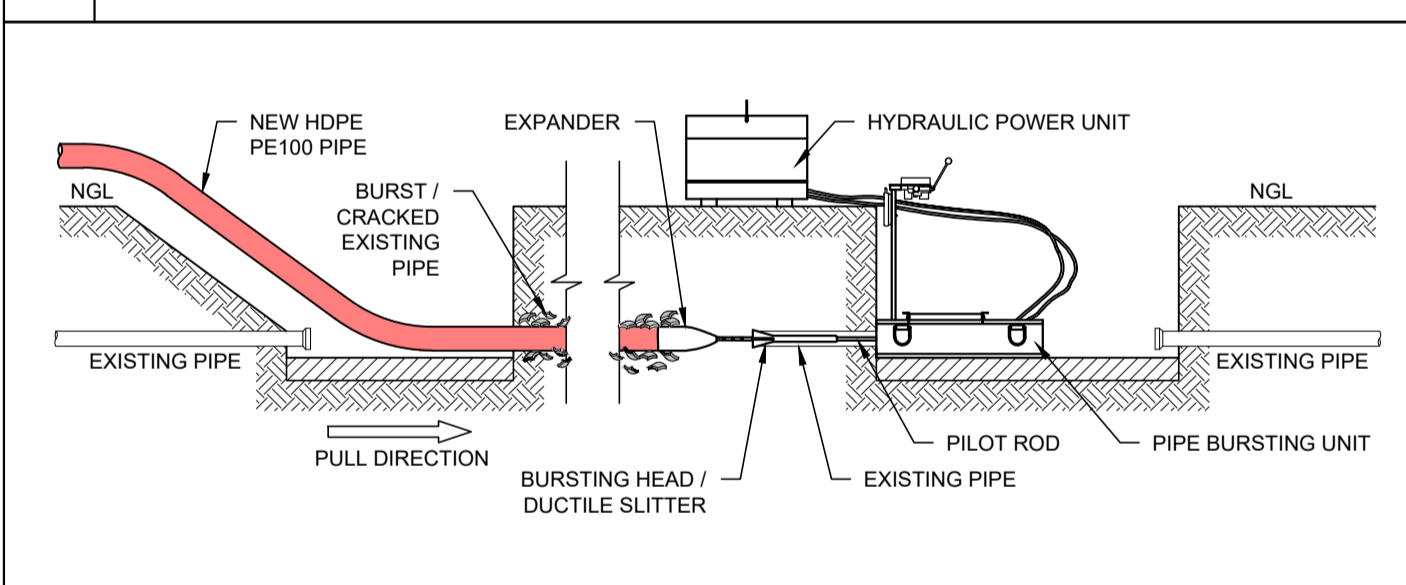
STEP 2 ROD PAYOUT - Once the pipe bursting unit is positioned, a pilot rod is then pushed through the existing pipe. The rod can be pushed through sweeping bends and blockages in the existing pipe. The rod can be pushed at a rate of approximately 100m/hour.



STEP 3 TOOL ATTACHMENT - After the pilot rod reaches the launch pit, a bursting blade or ductile splitter is attached to the end of the rod. The new HDPE pipe is then attached to an expander, which is then attached by pin joint tooling behind the bursting blade or splitter.



STEP 4 PIPE BURSTING / CRACKING - After tool attachment, the pilot rod is pulled back and the old pipe is fractured / split and pushed out into the surrounding soil. The expander and new HDPE pipe are simultaneously pulled directly behind the bursting head / ductile splitter. Cracking / bursting of a 100m pipe section will take approximately 2 hours, depending on the pipe diameter and soil conditions.



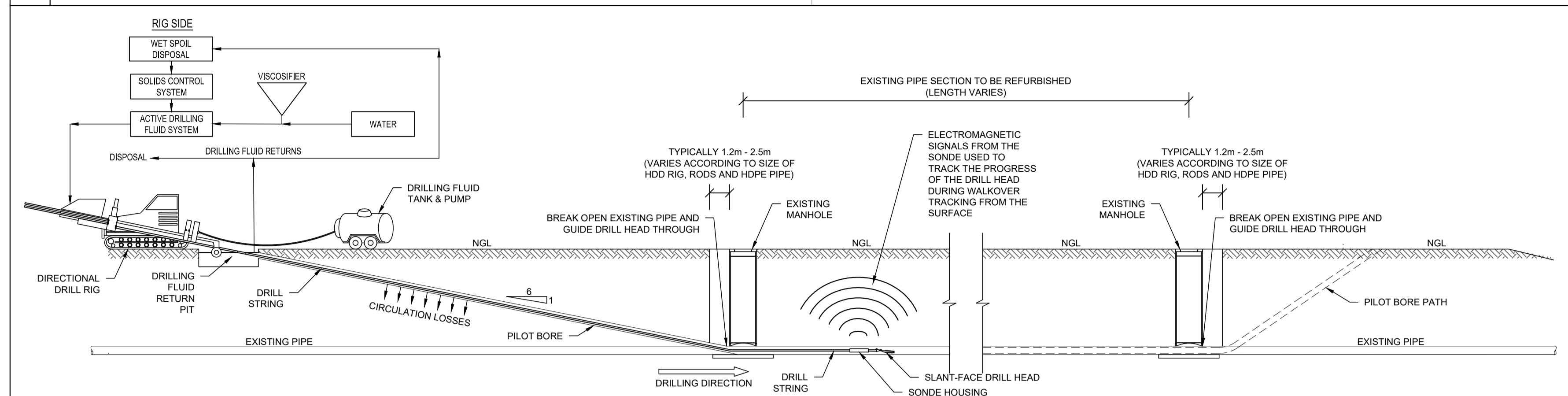
TYPICAL RELINING TRENCH DIMENSION CALCULATIONS

$L_G = (H (4R - H))^{0.5}$	$L' = (D_0 (2R - D_0))^{0.5}$	$\tan \phi = H / (L_G - L')$	MINIMUM BENDING RADIUS FOR HDPE PIPES												
Where: L _G = Length of Relining Trench H = Pipe Invert Depth R = Permissible Radius of Curvature for the Pipe	Where: L' = Length of Trench Bottom D ₀ = Outside Pipe Diameter R = Permissible Radius of Curvature for the Pipe	Where: φ = Slope of Relining Trench H = Pipe Invert Depth L' = Length of Trench Bottom	<table border="1"> <tr><th>SDR</th><th>R</th></tr> <tr><td>33</td><td>30 x D₀</td></tr> <tr><td>26</td><td>25 x D₀</td></tr> <tr><td>21</td><td>22.2 x D₀</td></tr> <tr><td>17</td><td>20 x D₀</td></tr> <tr><td>11</td><td>20 x D₀</td></tr> </table>	SDR	R	33	30 x D ₀	26	25 x D ₀	21	22.2 x D ₀	17	20 x D ₀	11	20 x D ₀
SDR	R														
33	30 x D ₀														
26	25 x D ₀														
21	22.2 x D ₀														
17	20 x D ₀														
11	20 x D ₀														

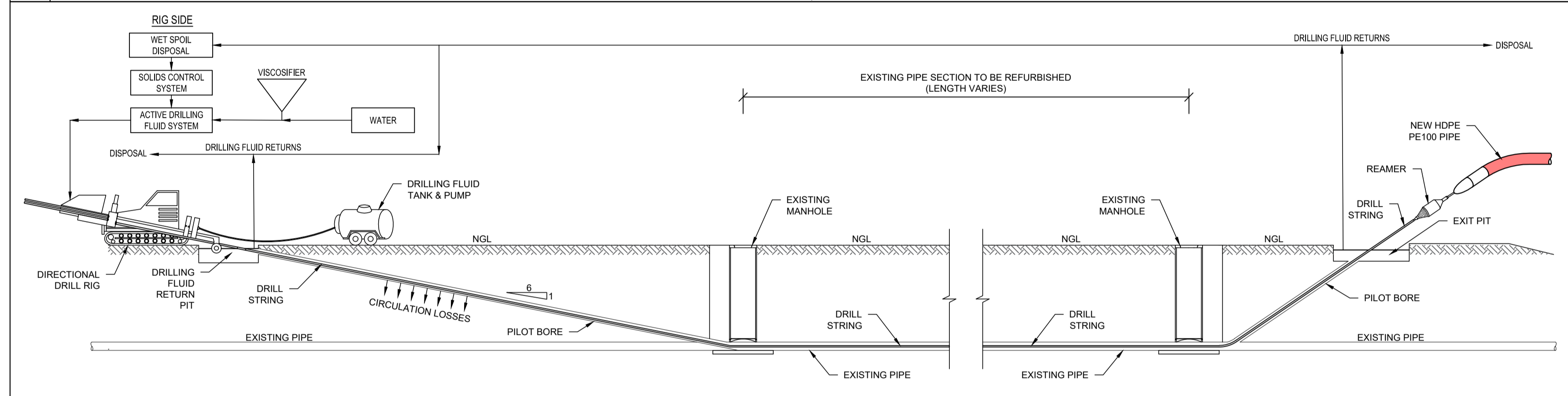
- THE FOLLOWING SHOULD BE PROVIDED BY THE APPOINTED PIPE BURSTING CONTRACTOR:**
- SITE LAYOUT PLANS:**
 - LOCATION AND DIMENSIONS OF INSERTION AND PULLING SHAFTS.
 - TRAFFIC FLOW PLAN AND SAFETY MEASURES.
 - COMMUNICATION PLAN.
 - SEQUENCE OF BURSTING:**
 - DETAILED OPERATION SEQUENCE FOR PIPE BURSTING.
 - SHORING DESIGN:**
 - DRAWINGS DETAILING SHORING DESIGN FOR ALL EXCAVATIONS DEEPER THAN 2m.
 - BYPASS PUMPING PLAN:**
 - STRATEGY FOR TEMPORARY BYPASS PUMPING SERVICES.
 - MANUFACTURERS' SPECIFICATIONS:**
 - DETAILED SPECIFICATIONS FOR THE CHOSEN BURSTING SYSTEM AND COMPONENTS.
 - DEWATERING PLAN:**
 - PROCEDURES FOR WATER MANAGEMENT AND DEWATERING DURING THE PROJECT.
 - LATERAL CONNECTIONS MATERIAL AND PLANS:**
 - SPECIFICATIONS AND PLANS FOR LATERAL CONNECTIONS.
 - SITE RESTORATION AND CLEAN-UP PLANS:**
 - STRATEGIES FOR SITE RESTORATION AND POST-PROJECT CLEANUP.
- OPERATIONAL PROCEDURES:**
- OBTAIN DETAILED INFORMATION ABOUT THE EXISTING PIPE'S CONSTRUCTION AND CONDITION.
 - COORDINATION WITH UTILITY COMPANIES TO PREVENT UNFORESEEN ISSUES.
 - ESTABLISHING A BYPASS SYSTEM AND DISCONNECTING SERVICES AS NEEDED.
 - IDENTIFICATION AND REMOVAL OF OBSTRUCTIONS WITHIN THE PIPE.
 - SELECTION OF APPROPRIATE BURSTING HEAD AND EQUIPMENT BASED ON CONDITIONS.
 - PREPARATION OF INSERTION PITS OR USE OF EXISTING MANHOLES FOR PIPE-BURSTING APPARATUS.
 - PRESSURE TESTING AND INTEGRATION OF NEW PIPE INTO THE EXISTING SEWER SYSTEM.
 - EVALUATION AND MITIGATION OF SOIL AND GROUND MOVEMENT RISKS.
 - CONSIDERATION OF INSTALLATION LENGTH LIMITATIONS AND INNOVATIVE TECHNIQUES.
 - IMPLEMENTATION OF SAFETY MEASURES, ESPECIALLY IN URBAN AREAS.

THE HORIZONTAL DIRECTIONAL DRILLING (HDD) & PIPE REAMING PROCESS

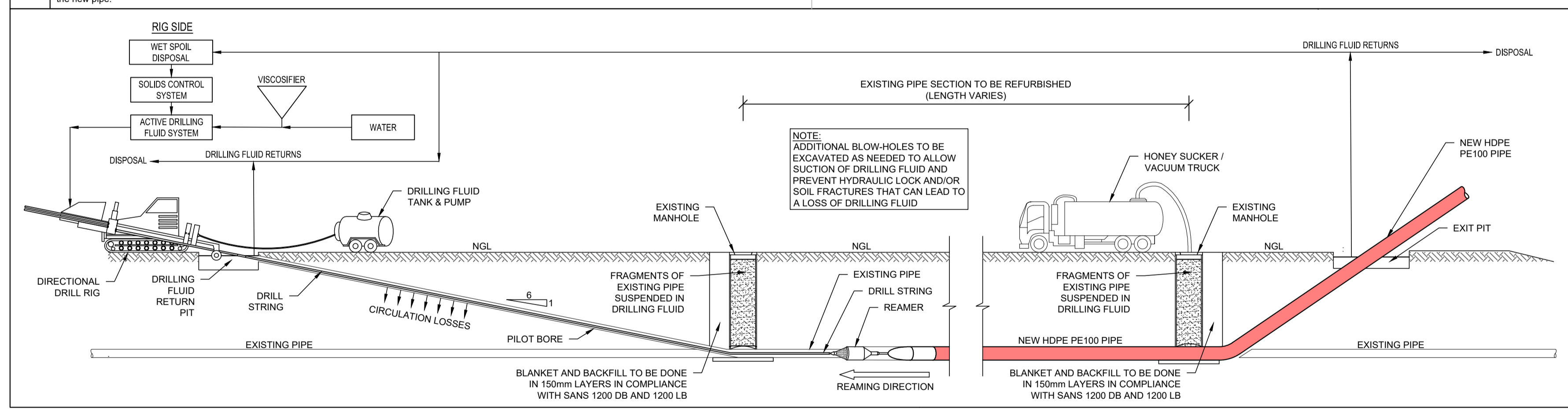
STEP 1 HORIZONTAL DIRECTIONAL DRILLING - The directional drilling rig is set-up at the launch site and positioned to drill a pilot bore along a planned path to an exit pit. The rig is secured and positioned at a distance behind the entry point to allow the drill to enter the ground at the planned location. The entry angle of the drill string is typically 8° - 16°. A pit for capturing drilling fluids (returns) is dug at the point of entry and at the planned exit point. The drill string, comprised of a series of drill rods, is advanced by a combination of rotation and thrust supplied by the rig. The string is initially advanced using both rotational torque and thrust until the drill string has enough down-hole stability to allow the operator to change the direction that the string will advance along a planned bore path. There are many types of bits designed to navigate through different types of soil, from clays and sands to rock. Most drill bits have a slant-face, the orientation of which determines the direction that the bit will advance. To move in a straight line, the rig operator both rotates and pushes the drill string, to change direction, the operator stops rotating the drill string and pushes the string, which allows the drill path to change in the direction that the bit's slant-face is pointing. On-board controls allow the operator to monitor the orientation of the bit and the change in general direction of the bore. A walk-over tracking system is used to help guide and monitor the location of the bore. The system is comprised of a transmitter and receiver. The transmitter or sonde is located in a housing unit near the front of the drill string. The transmitter emits a continuous magnetic signal, which is picked up by a portable hand-held receiver. Data transmitted to the receiver allows the tracking hand to determine position and depth as well as clock-face position of the drill bit. This information allows the operator to track location along the planned bore and to make changes as needed. Drilling fluids, pumped down through the hollow drill rods and holes in the drill bit, are key to keeping the transmitter electronics cool, stabilizing the hole, and extracting returns from the bore hole. Once the pilot bore reaches the exit area, the reaming and installation of the product pipe phase begins.



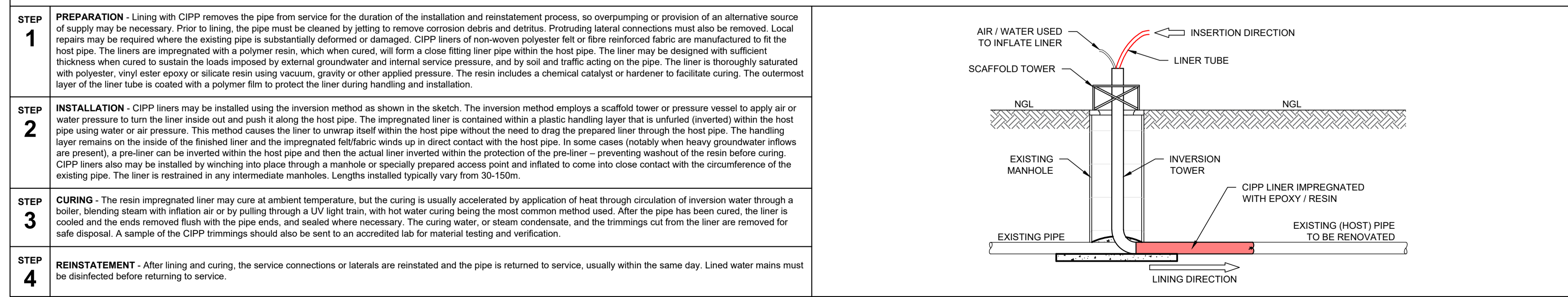
STEP 2 TOOL ATTACHMENT - Once the pilot bore has reached the designated exit area, the slant-face drill bit and other electronics are removed from the drill string and a specialized reaming tool and the replacement pipe are attached to it.



STEP 3 PIPE REAMING - Once the specialized reaming tool and the replacement pipe are then attached to the drill string, the directional drill rig starts to back-ream through the existing pipe, enlarging the hole, while simultaneously grinding up the existing pipe. The fragments of the existing pipe, along with other cuttings, are suspended in drilling fluid and are pushed ahead of the reamer through the existing pipe to a recovery pit or manhole where they can be extracted, separated and disposed. The new replacement pipe attached to the reaming tool is pulled in as the reamer advances. Once the new pipe has been installed in the designated area, the existing pipes are reconnected to it and the manholes are repaired to suit the new pipe.



THE CURED-IN PLACE PIPE LINING (CIPP) PROCESS



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PROJECT

KGOTSONG/BOTHAVILLE: UPGRADING OF SEWER OUTFALL REMAINING PHASES

DRAWING TITLE			
TYPICAL TRENCHLESS INSTALLATION METHODOLOGIES			
APPROVED BY BVI			
JL REYNDERS	2020300701	02/04/2024	
ENGINEER/TECHNOLOGIST	REG. NO.	DATE	
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DESIGNED	DJ COETZEE	CHECKED	JL REYNDERS
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