

EXAMPLE ONLY

PROPERTY CONNECTIONS HAVE BEEN DESIGNED TO CONTROL THE REQUIRED SERVICE AREA OF EACH LOT AT A GRADE OF 1:40 AND A MAXIMUM DEPTH OF PROPERTY CONNECTION AT 1.5m UNLESS OTHERWISE STATED.



Armidale Dept of Public
Regional Council Infrastructure

SCALES
1:1000

APPROVED D. MAUNDER 31/08/2016
MANAGER ENGINEERING AND STANDARDS SUPPORT DATE

SHEET 1 OF 1

TYPICAL GRAVITY SEWER DESIGN LAYOUT

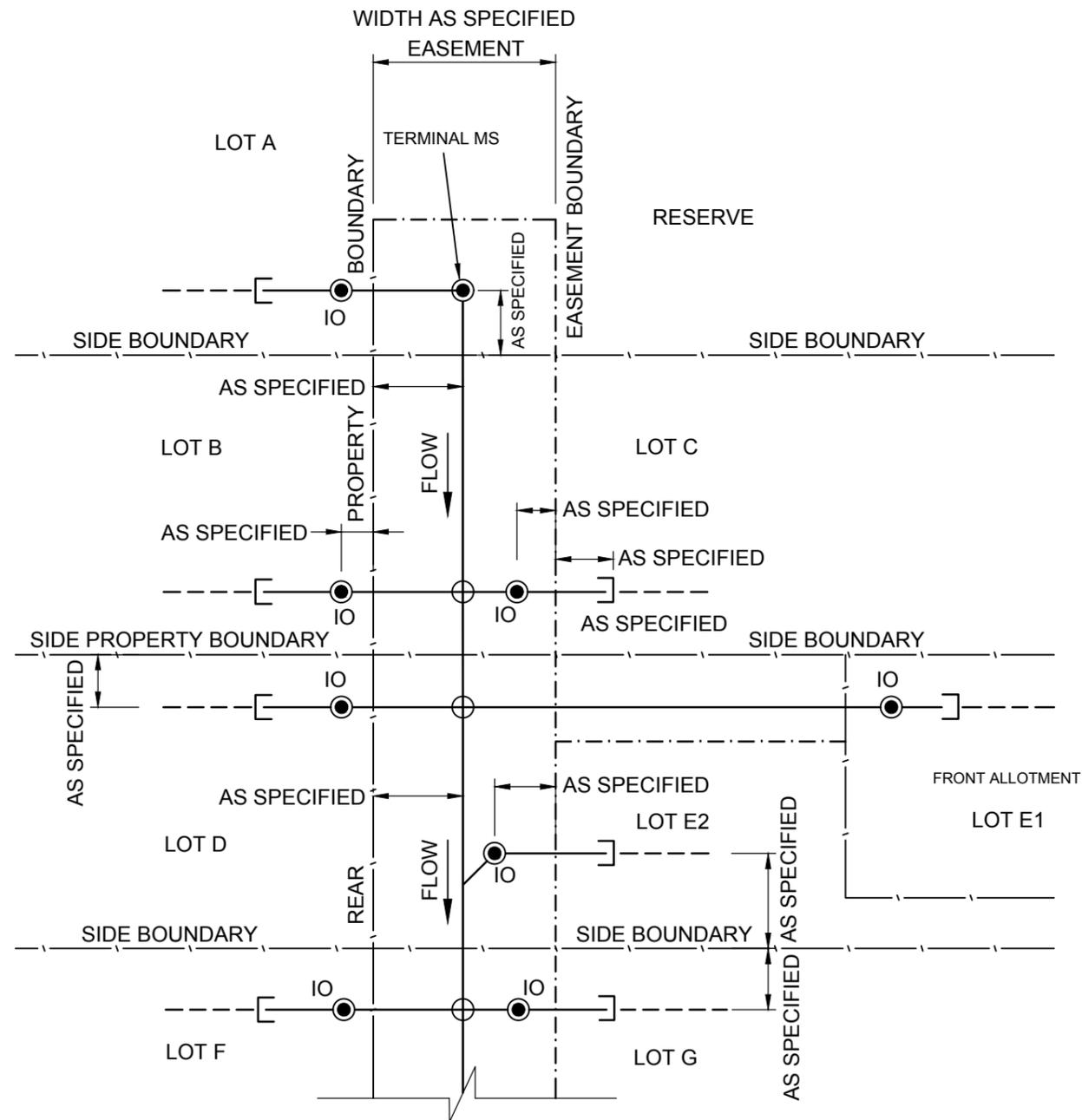
SURV
DRWN VC
DES
CHKD MW

AS SHEET SIZE
A3

DRAWING No
010-019

AMDT No

CADFILE 010-019.dwg DATE 31/08/2016



TYPICAL CONNECTION METHODS FOR SEWERS
IN EASEMENTS (REAR OR SIDE BOUNDARIES)

INSPECTION OPENING (IO) INTERFACE METHOD

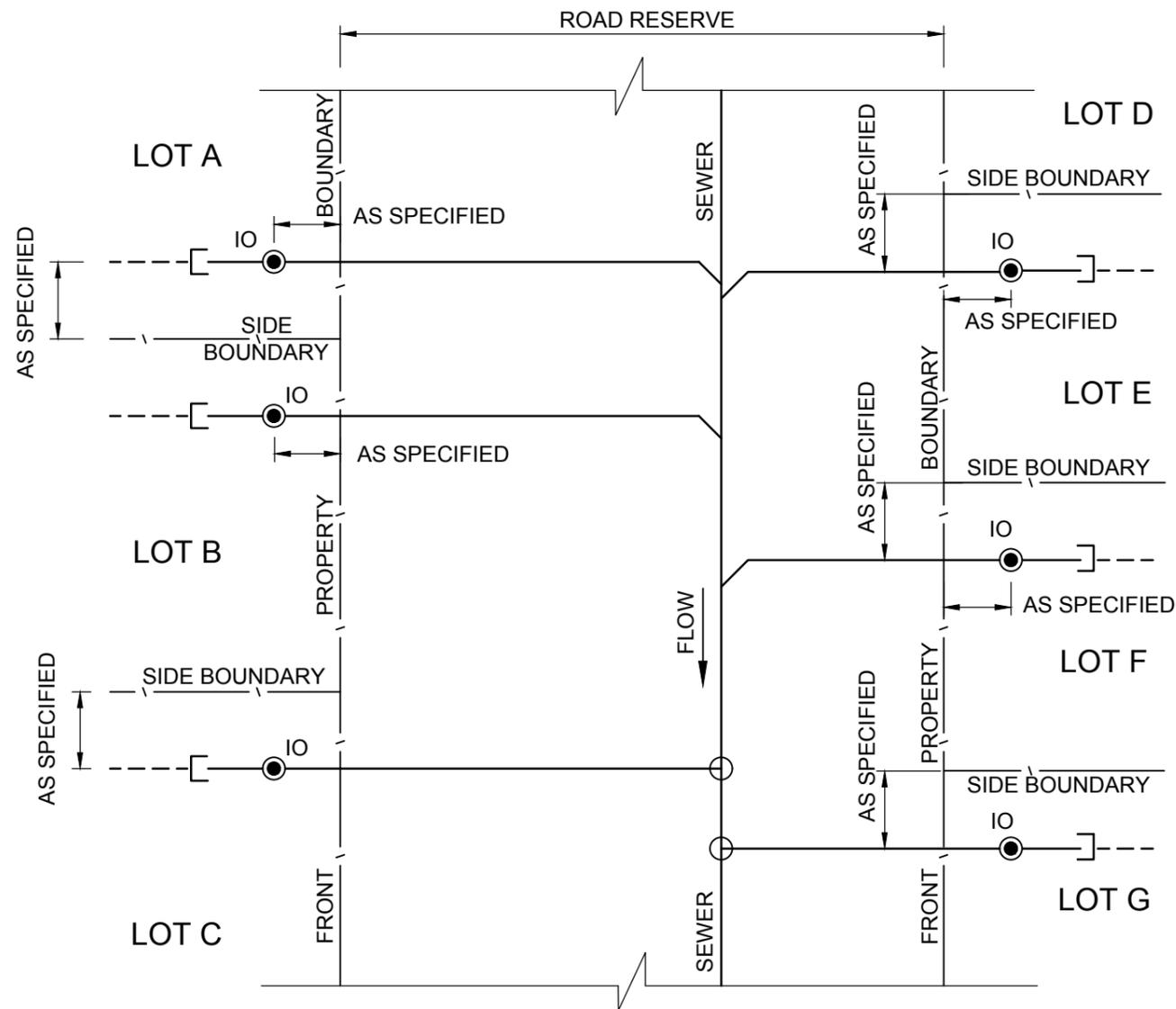
NOTES

1. LOCATE SEWERS AND INSPECTION OPENINGS (IO'S) AS SHOWN IN DESIGN DRAWINGS.
2. "AS SPECIFIED" MEANS AS SPECIFIED BY THE WATER AGENCY.
3. RAISE IO TO SURFACE IN ACCORDANCE WITH WATER AGENCY REQUIREMENTS.

LEGEND

- IO ● INSPECTION OPENING (RAISED TO SURFACE)
-] SEALED BURIED CONNECTION POINT
- - - - FUTURE PROPERTY DRAIN
- — — — PROPERTY BOUNDARY
- · - · - · EASEMENT BOUNDARY

Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES N.T.S	APPROVED D. MAUNDER 31/08/2016 <small>MANAGER ENGINEERING AND STANDARDS SUPPORT</small> DATE	SHEET 1 OF 1	
	PROPERTY CONNECTION DETAILS SEWER IN EASEMENTS & INSIDE PROPERTY		SURV DRWN VC DES MW CHKD MW	AS SHEET SIZE A3
		CADFILE 010-020.dwg		AMDT No DATE 31/08/2016



INSPECTION OPENING (IO) INTERFACE METHOD

SEWER MAY BE IN ROAD OR FOOTPATH AS SPECIFIED BY ARMIDALE REGIONAL COUNCIL

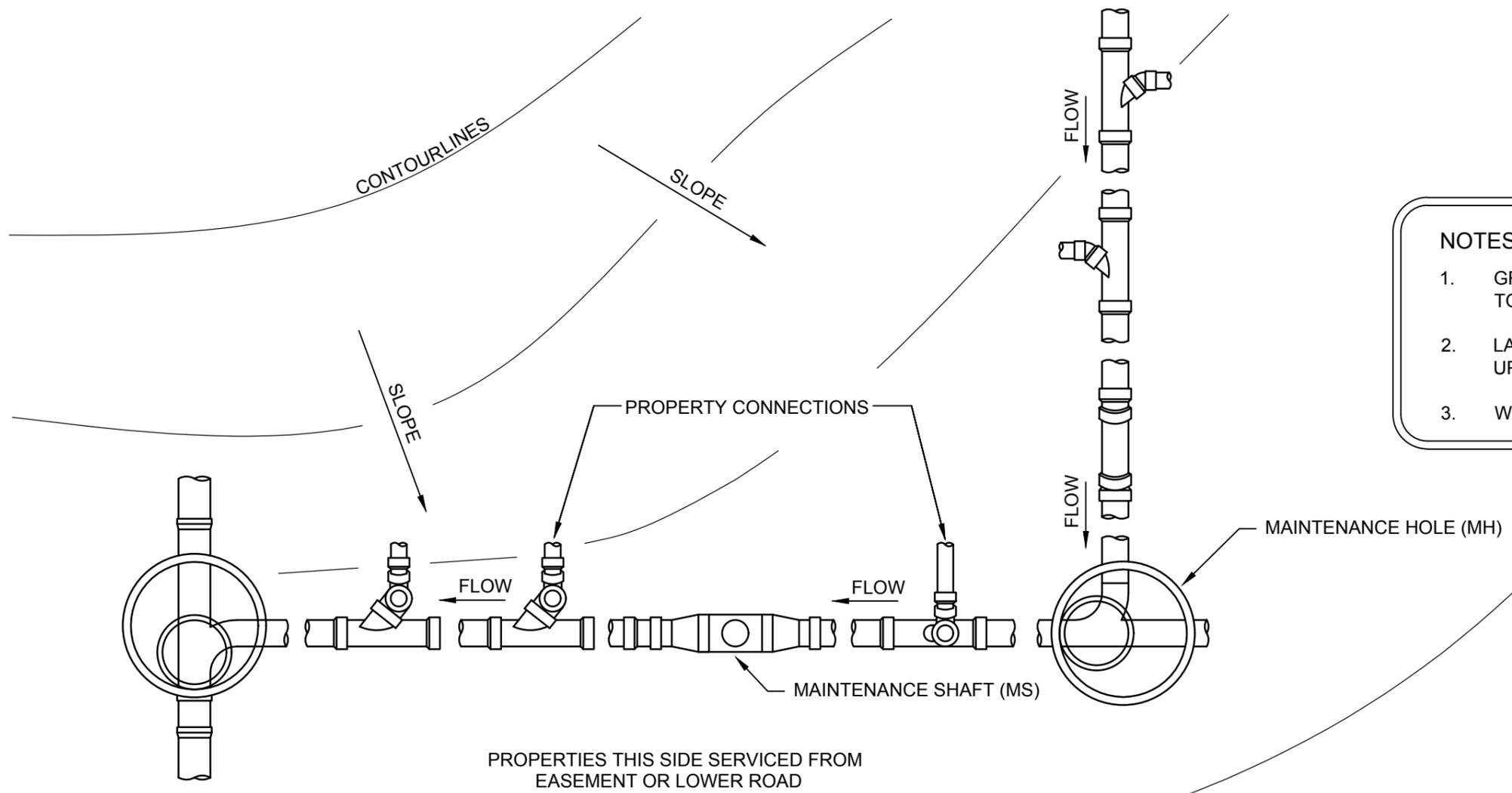
NOTES

1. LOCATE SEWERS AND INSPECTION OPENINGS (IO'S) AS SHOWN IN DESIGN DRAWINGS.
2. "AS SPECIFIED" MEANS AS SPECIFIED BY THE WATER AGENCY.
3. RAISE IO TO SURFACE IN ACCORDANCE WITH WATER AGENCY REQUIREMENTS.
4. CONNECTIONS AT 45° OR 90° MAY BE ACCEPTED WITH WATER AGENCY APPROVAL.

LEGEND

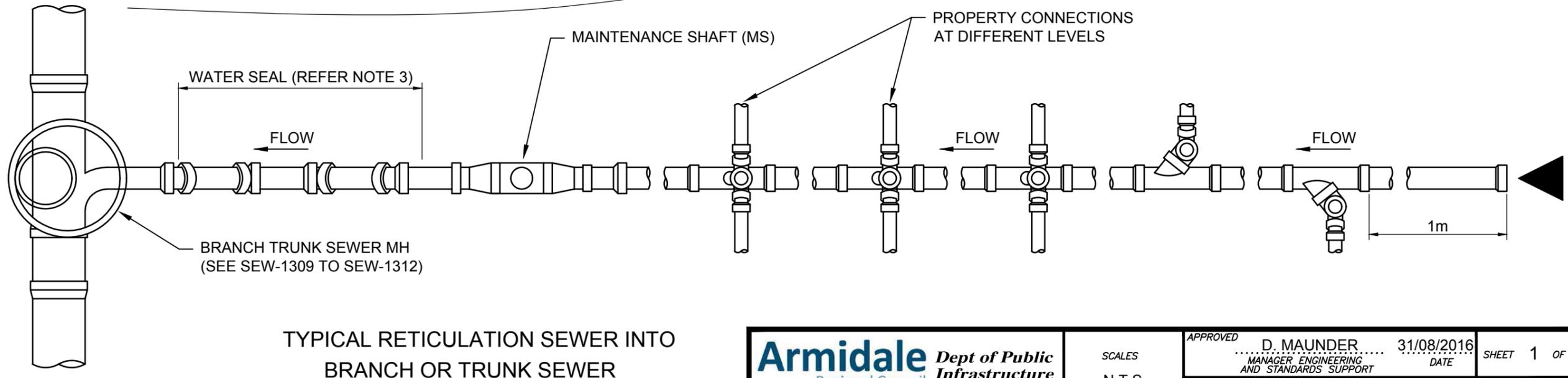
- IO ● INSPECTION OPENING (RAISED TO SURFACE)
-] SEALED BURIED CONNECTION POINT
- - - - - FUTURE PROPERTY DRAIN
- · - · - · - PROPERTY BOUNDARY

Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES N.T.S	APPROVED D. MAUNDER MANAGER ENGINEERING AND STANDARDS SUPPORT	31/08/2016 DATE	SHEET 1 OF 1	
	PROPERTY CONNECTION DETAILS SEWER IN ROAD RESERVE		SURV DRWN VC DES MW CHKD MW	AS SHEET SIZE A3	DRAWING No 010-021
		CADFILE 010-021.dwg		DATE 31/08/2016	



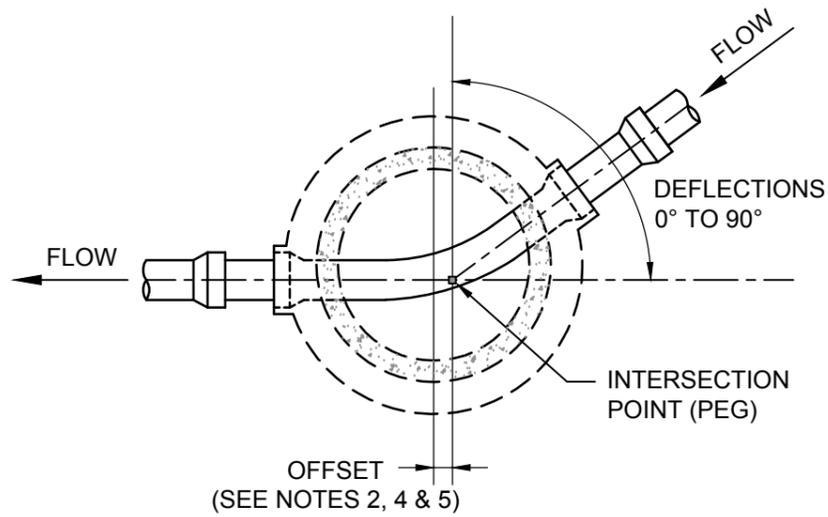
- NOTES**
1. GRADE SEWER EVENLY BETWEEN MH/MS TO LEVELS SHOWN IN DESIGN DRAWINGS.
 2. LAY PIPES AND FITTINGS WITH SOCKETS UPSTREAM WHEREVER PRACTICABLE.
 3. WATER SEALS TYPICALLY NOT REQUIRED.

PROPERTIES THIS SIDE SERVICED FROM EASEMENT OR LOWER ROAD
TYPICAL RETICULATION SEWER

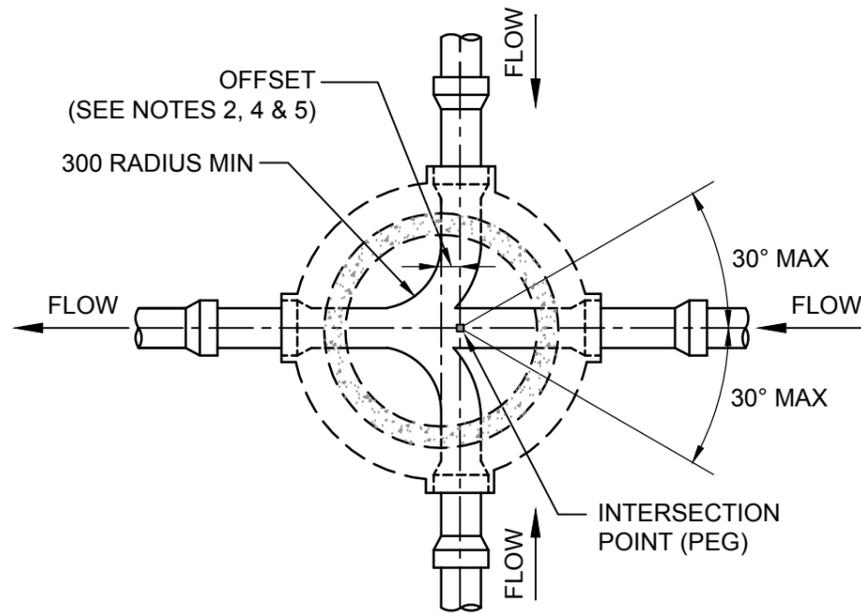


TYPICAL RETICULATION SEWER INTO BRANCH OR TRUNK SEWER

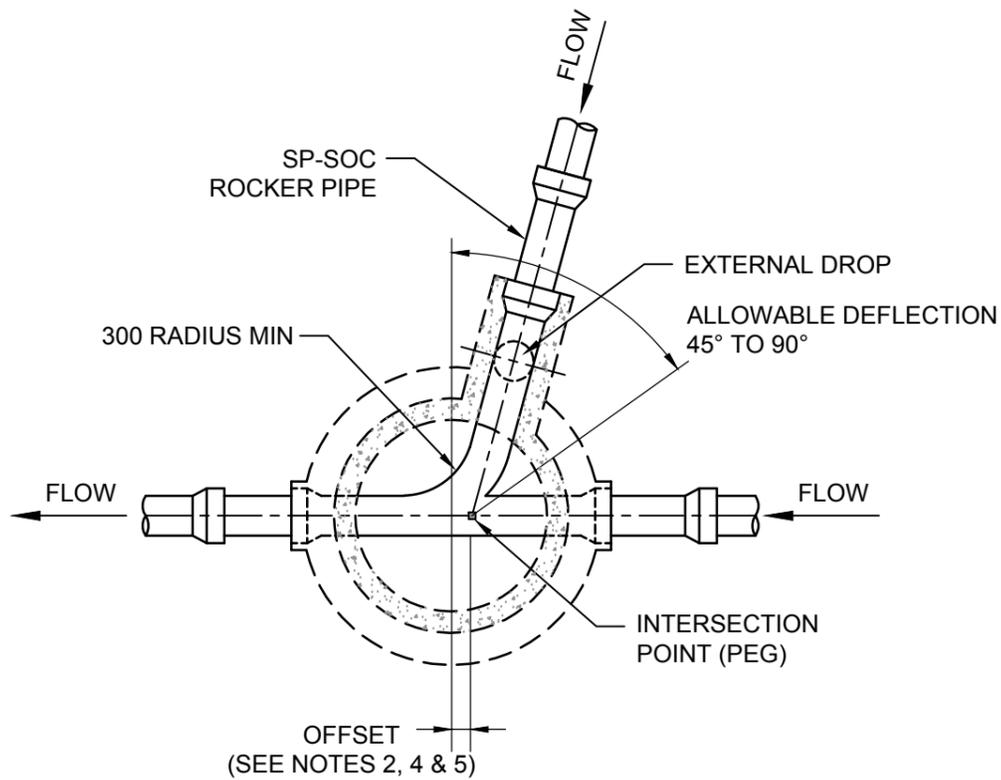
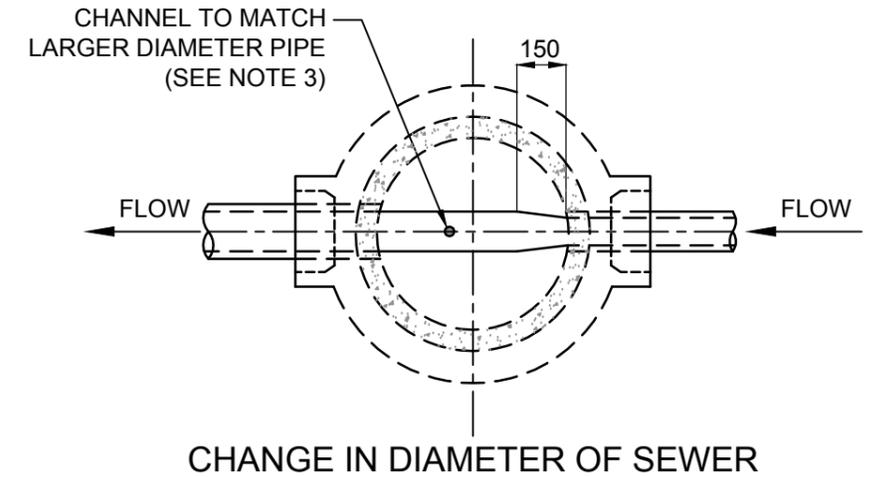
Armidale <i>Dept of Public Infrastructure</i> <small>Regional Council</small>	SCALES N.T.S	APPROVED D. MAUNDER 31/08/2016 <small>MANAGER ENGINEERING AND STANDARDS SUPPORT</small> DATE	SHEET 1 OF 1		
	TYPICAL PIPE LAYING ARRANGEMENT	SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN JB	A3	010-024	
		DES			CADFILE 010-024.dwg
CHKD MW					



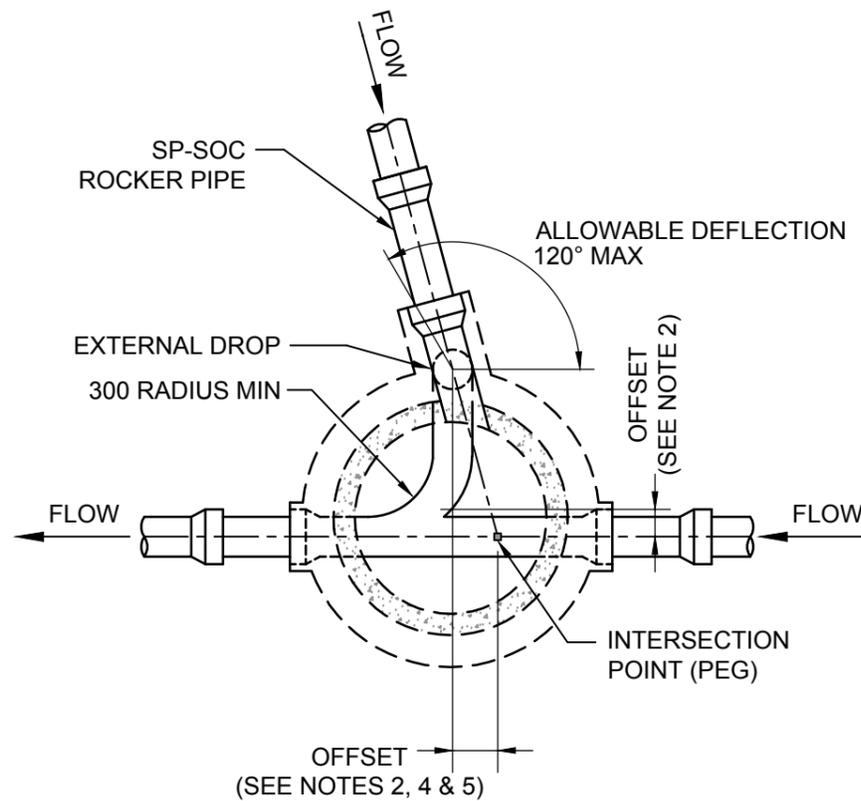
CHANGE IN DIRECTION OF SEWER



MULTIPLE INCOMING SEWER



INCOMING SEWER HAVING EXTERNAL DROP



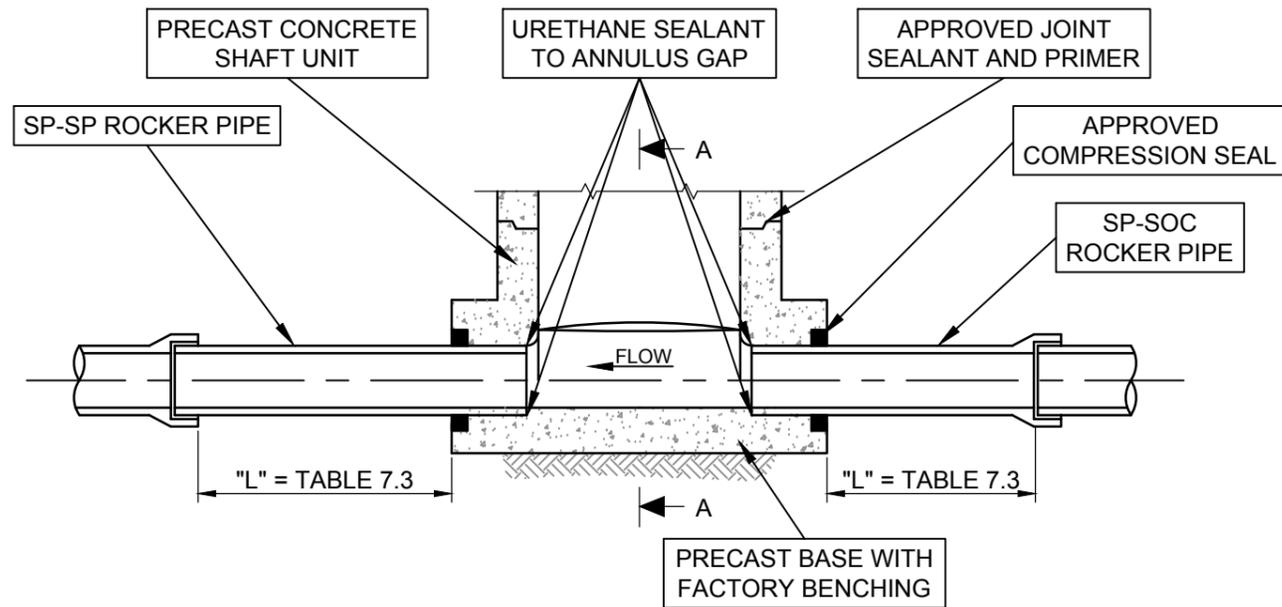
NOTES

1. ALL DIMENSIONS IN MILLIMETRES.
2. WHERE NECESSARY PULL MH OFF CENTRELINE OF SEWER (MAX 200) TO IMPROVE FLOW AND ACCESSIBILITY. OFFSET AS SPECIFIED.
3. EACH MH SHALL HAVE:
 - CHANNELS WITH THE MAXIMUM POSSIBLE RADIUS OF CURVATURE PROVIDED THAT THE TANGENT POINTS AT EACH END OF THE CURVE ARE LOCATED WITHIN THE INSIDE DIAMETER OF THE MH. THE MINIMUM RADIUS OF CURVATURE (TO THE INSIDE CHANNEL WALL) SHALL BE NOT LESS THAN 300mm OR THE DIAMETER OF THE SEWER, WHICHEVER IS GREATER.
 - TWO UNOBSTRUCTED AREAS OF AT LEAST 250mm DIAMETER, ONE LOCATED DIRECTLY IN FRONT OF THE STEP IRONS OR LADDER AND SUITABLY SPACED TO ALLOW A MAINTENANCE PERSON TO STAND WITHOUT OBSTRUCTION BY DROPS, STEP IRONS AND/OR LADDERS.
 - A MINIMUM 750mm DIAMETER WORKING AREA CLEAR OF ANY INTERNAL OBSTRUCTION SUCH AS DROPS, LADDERS AND STEP IRONS.
 - CHANNELS AT THE BASE OF AN MH DROP SHALL BE STRAIGHT SIDED AND POINTED DIRECTLY AT THE OUTLET.
4. INVERT LEVELS TO BE AS SHOWN IN DESIGN DRAWINGS.
5. REFER TO ALTERNATE MH BASE DETAILS FOR SPECIFIC INLET / OUTLET DETAILS.
6. FOR SEWERS ON STEEP GRADES OR WHERE THE INTERSECTION ANGLE IS <math><45^\circ</math> USE DROP JUNCTION AS SHOWN ON 010-037.

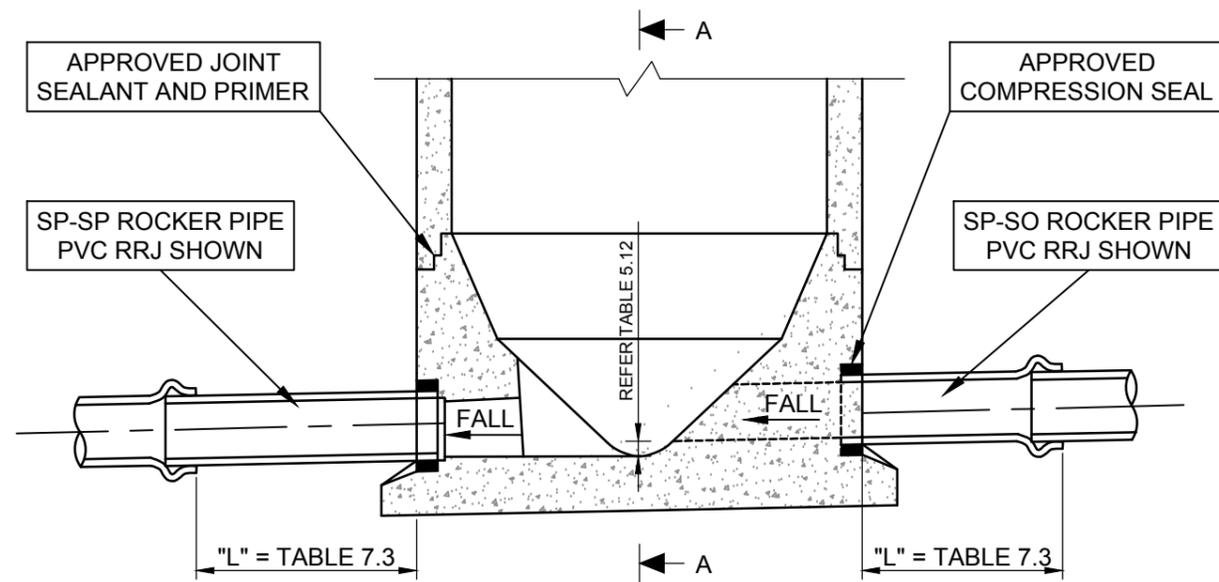
LEGEND:

- INTERSECTION POINT
- CENTRELINE OF MH

Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
MAINTENANCE HOLES SEWERS \leq DN 300 TYPICAL ARRANGEMENTS	SURV	AS SHEET SIZE	DRAWING No	AMDT No	
	DRWN VC	A3	010-025		
	DES				
	CHKD MW	CADFILE 010-025.dwg	DATE 31/08/2016		



TYPICAL PRE-CAST MH BASE WITH PRE-FORMED BENCHING



TYPICAL PRE-CAST CONCRETE MH BASE WITH CONICAL BENCHING

DEFLECTION ANGLE AT MH (DEGREES)	MINIMUM INTERNAL FALL (mm)
0 TO 90	30
90 TO 120	80*

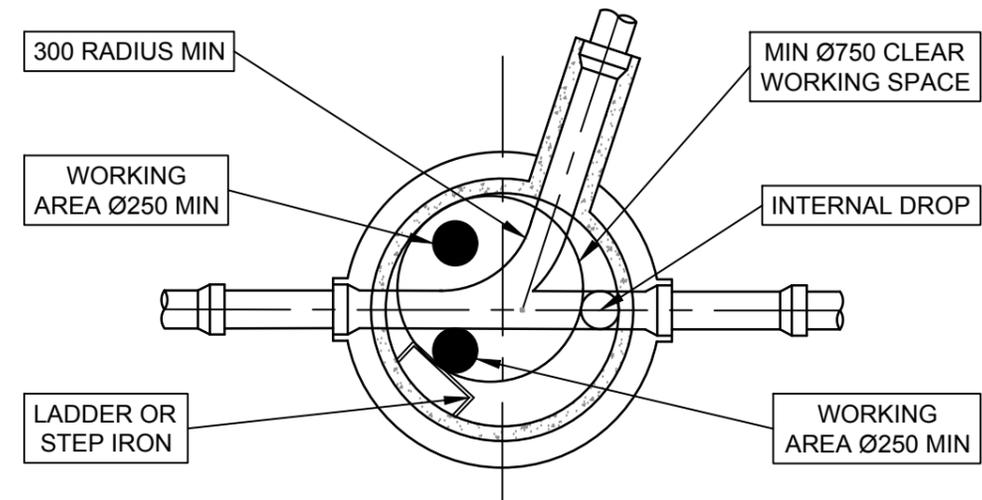
WSA TABLE 5.12

MINIMUM INTERNAL FALL THROUGH AN MH JOINING RETICULATION SEWERS OF SAME DIAMETER

* WHERE AN INTERNAL OR EXTERNAL DROP IS PROVIDED TO CATER FOR A LARGE FALL BETWEEN THE MH INLET AND OUTLET SEWERS, THE INTERNAL FALL THROUGH THE MH SHOULD BE TAKEN AS THE LEVEL DIFFERENCE BETWEEN THE OUTLET IL OF THE DROP STRUCTURE AND THE IL OF THE MH OUTLET SEWER. ILS ARE CALCULATED AT THE CENTER OF THE MH.

SEWER SIZE DN	PVC		VC, RC	DI	GRP	
	"L" MIN	"L" MAX	"L"	"L"	"L" MIN	"L" MAX
150	300	450	600	1500	500	1000
225	450	650	600	1500	500	1000
300	600	900	700	1500	500	1000
375	750	1125	700	1500	500	1000

TABLE 7.3
ROCKER PIPE DIMENSIONS



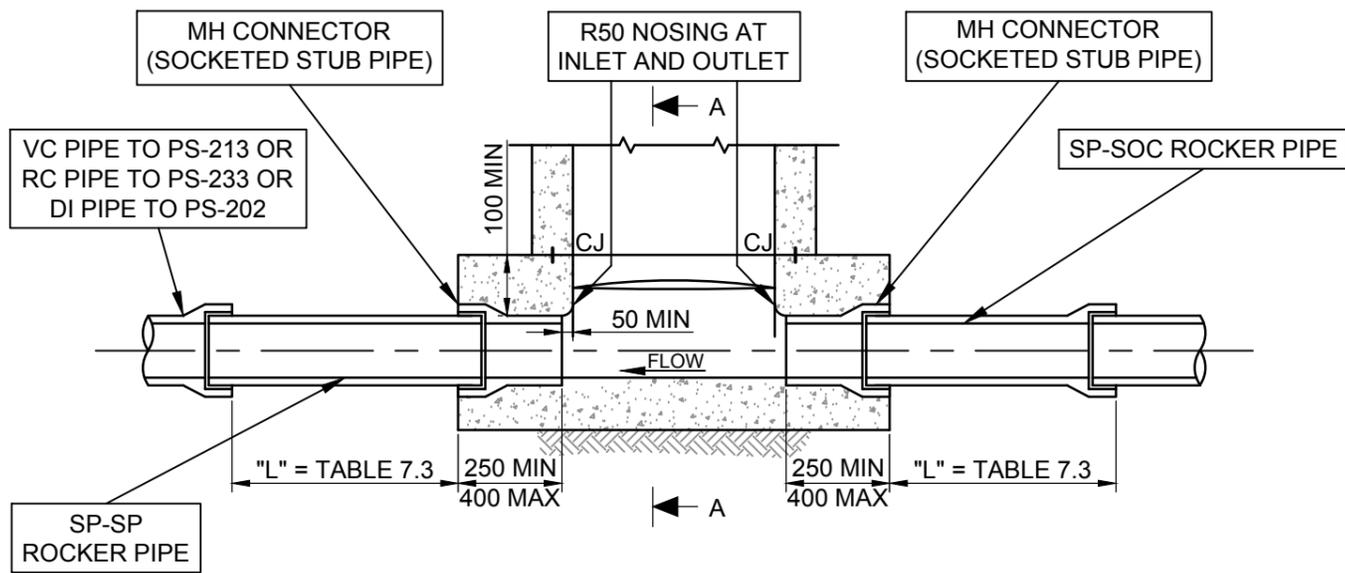
TYPICAL MH BASE DESIGN

NOTES

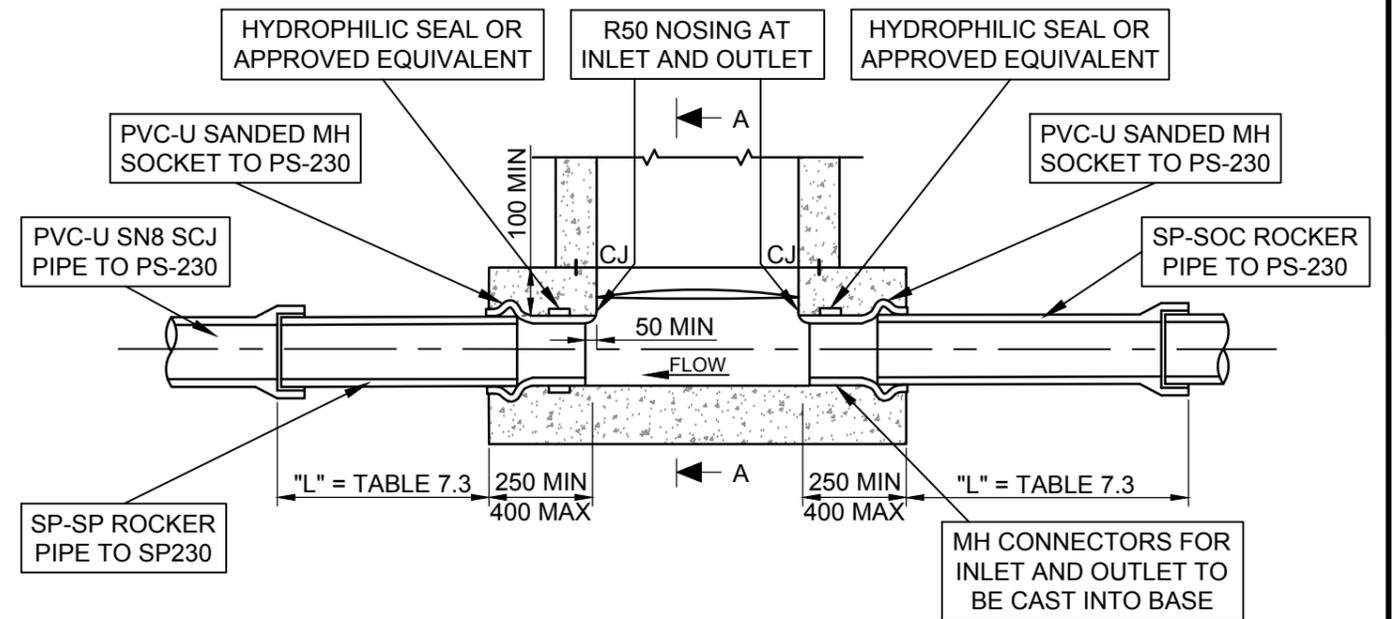
EACH MH SHALL HAVE:

- CHANNELS WITH THE MAXIMUM RADIUS OF CURVATURE PROVIDED THAT THE TANGENT POINTS AT EACH END OF THE CURVE ARE LOCATED WITHIN THE INSIDE DIAMETER OF THE MH. THE MINIMUM RADIUS OF CURVATURE (TO THE INSIDE CHANNEL WALL) SHALL BE NOT LESS THAN 300mm OR THE DIAMETER OF THE SEWER, WHICHEVER IS GREATER; AND
- TWO (2) UNOBSTRUCTED AREAS OF AT LEAST 250 mm DIAMETER, ONE LOCATED DIRECTLY IN FRONT OF THE STEP IRONS OR LADDERS AND SUITABLY SPACED TO ALLOW A MAINTENANCE PERSON TO STAND WITHOUT OBSTRUCTION BY DROPS, STEP IRONS AND/OR LADDERS; AND
- A MINIMUM 750mm DIAMETER WORKING AREA CLEAR OF ANY INTERNAL OBSTRUCTION SUCH AS DROPS, LADDERS AND STEP IRONS; AND
- CHANNELS AT THE BASE OF AN MH DROP SHALL BE STRAIGHT SIDED AND POINTED DIRECTLY AT THE OUTLET.
- FOR FURTHER MAINTENANCE HOLE INSTALLATION SPECIFICATIONS REFER DRAWINGS 010-035_2 AND 010-035_3.
- FOR SHALLOW SEWER MAINTENANCE HOLES <3m TYPICAL CONCRETE STRENGTH FOR CAST IN-SITU 32MPa, SLUMP 80mm. FOR DEEPER MAINTENANCE HOLES REFER TO WSA.

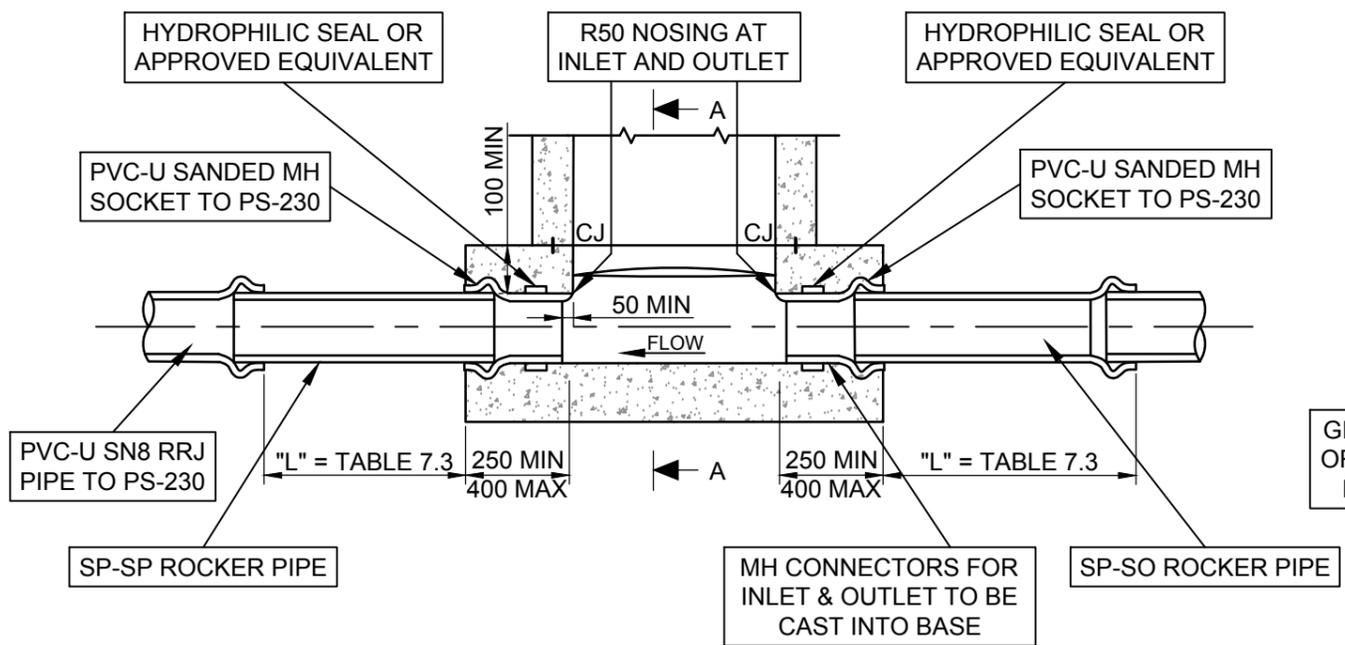
Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 3
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE HOLES MANHOLE BASES AND PIPE CONNECTION DETAILS		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	A3	010-026	
		DES			
		CHKD			



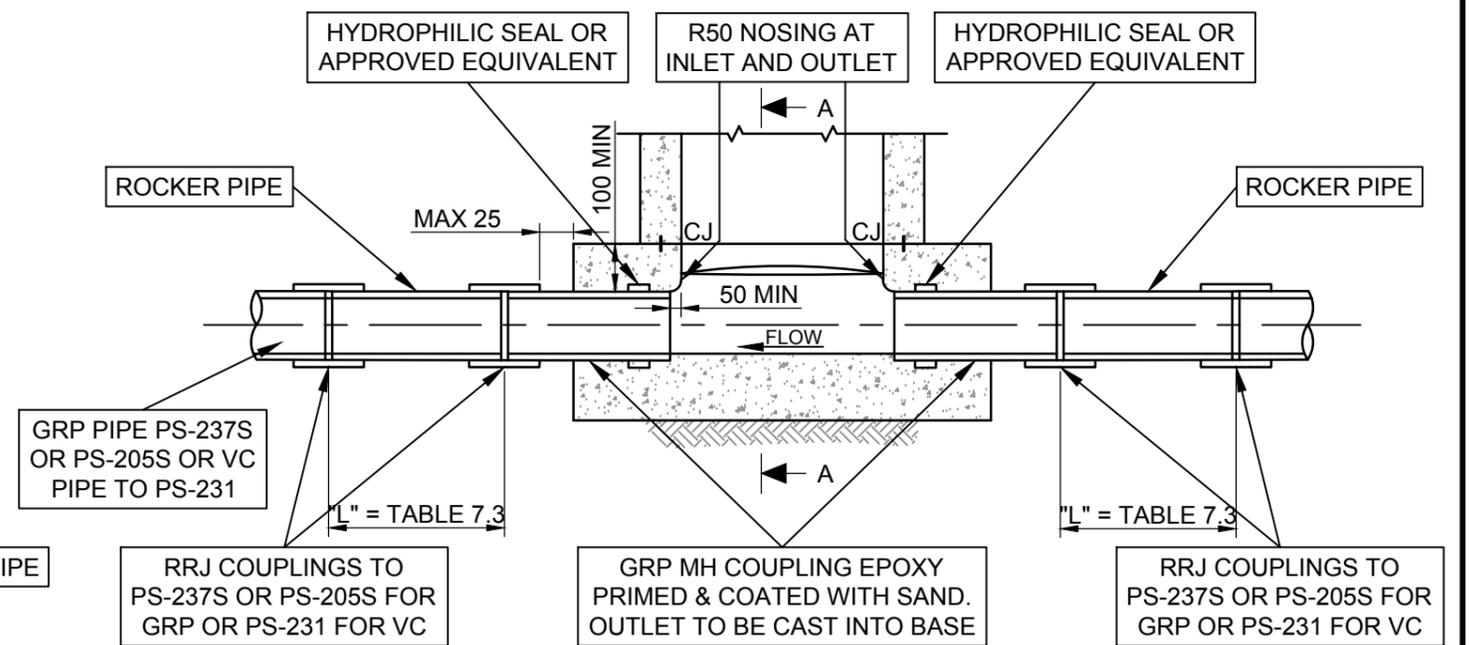
TYPICAL CAST IN-SITU CONCRETE MH BASE FOR VC, RC, AND DI RRJ SEWERS



TYPICAL CAST IN-SITU CONCRETE MH BASE FOR PVC-U SCJ



TYPICAL CAST IN-SITU CONCRETE MH BASE FOR PVC RRJ SEWERS

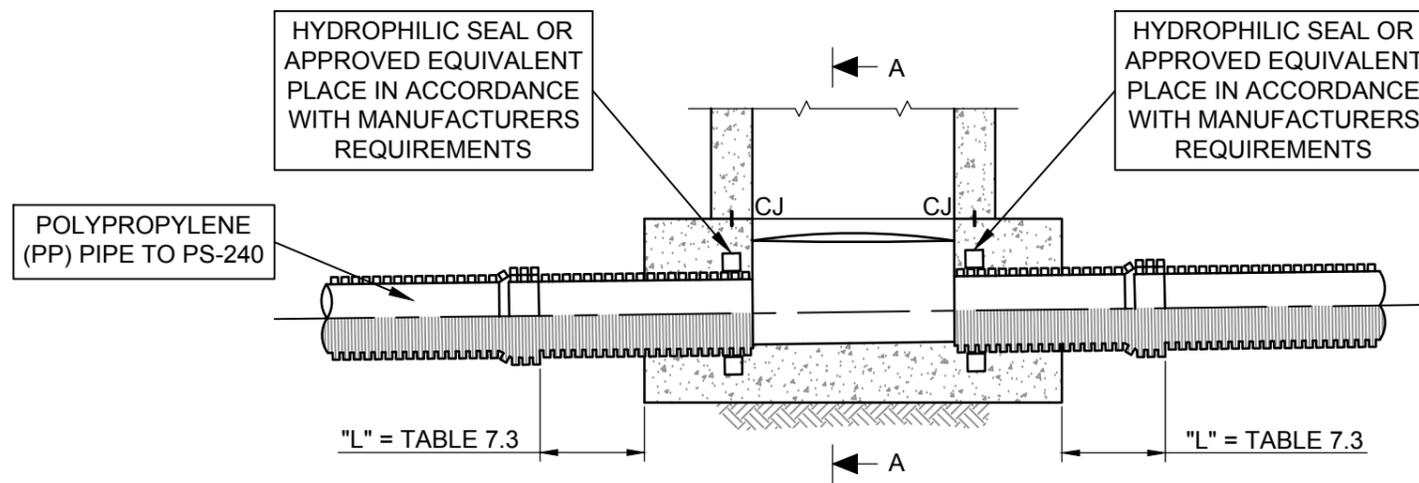


TYPICAL CAST IN-SITU CONCRETE MH BASE FOR VC AND GRP SLEEVED COUPLE SEWERS

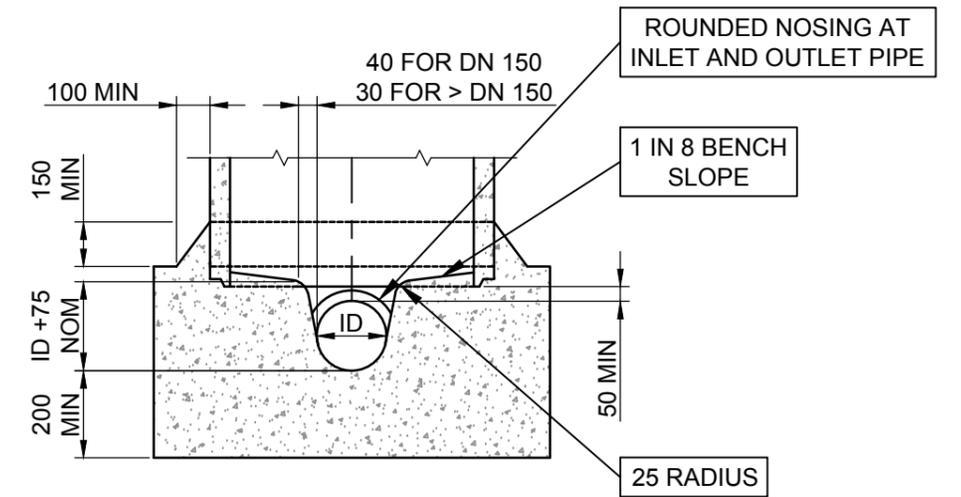
NOTES

- FOR FURTHER MAINTENANCE HOLE INSTALLATION SPECIFICATIONS REFER DRAWINGS 010-035_1 AND 010-035_3.

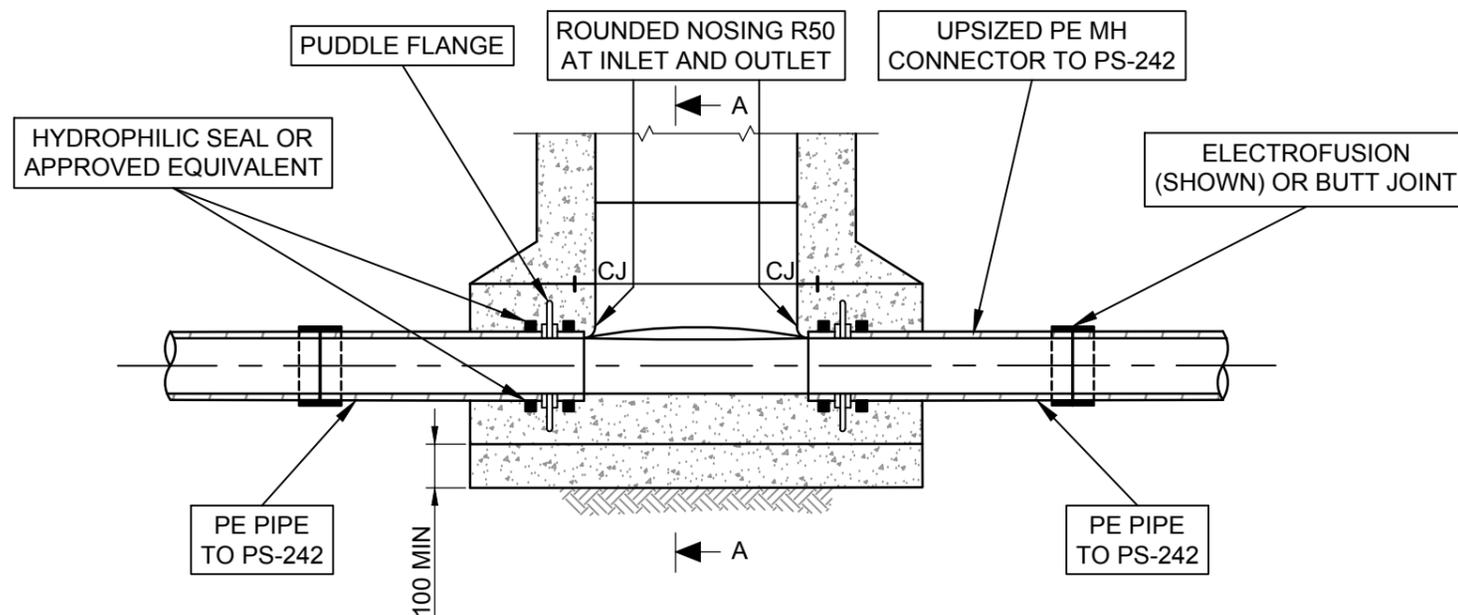
Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 2 OF 3	
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE		
	SEWER MAINTENANCE HOLES MANHOLE BASES AND PIPE CONNECTION DETAILS		SURV	AS SHEET SIZE	DRAWING No	AMDT No
			DRWN ST	A3	010-026	
		DES MW	CADFILE 010-026_2.dwg		DATE 31/08/2016	
		CHKD MW				



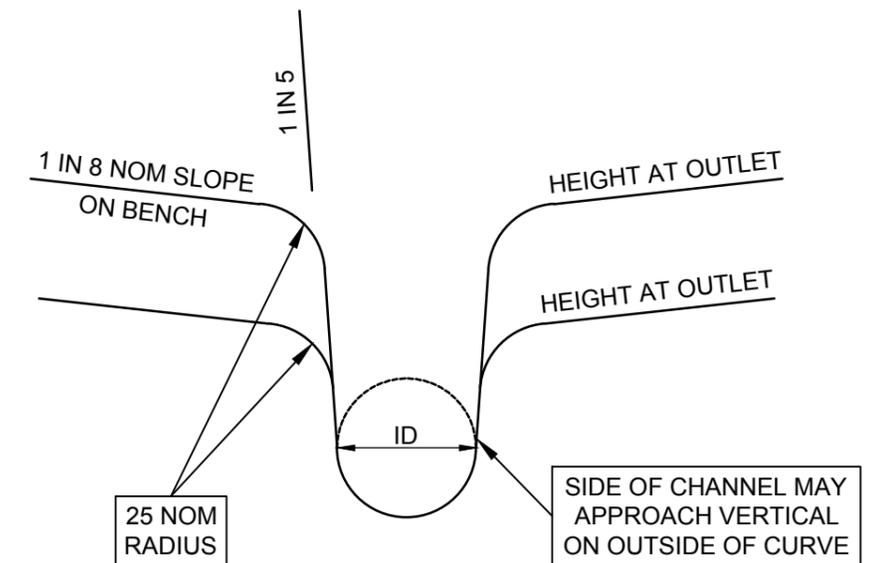
TYPICAL CAST IN-SITU CONCRETE MH BASE FOR PROFILE WALL PP SEWERS



SECTION A-A



TYPICAL CAST IN-SITU CONCRETE MH BASE FOR SOLID WALL PE SEWERS

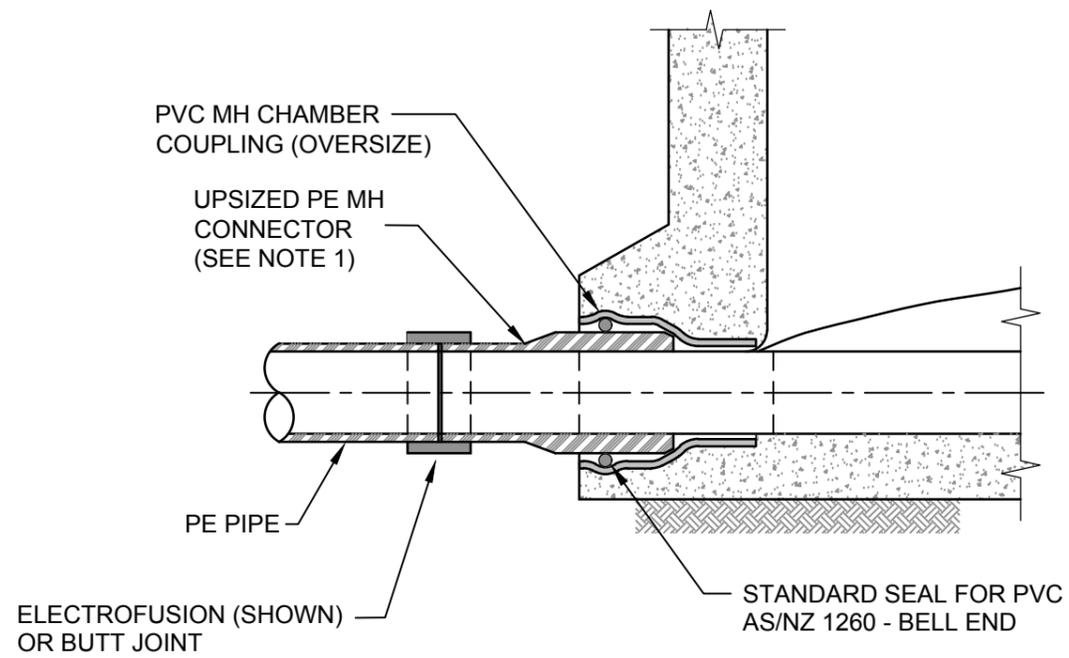


TYPICAL CHANNEL DETAILS

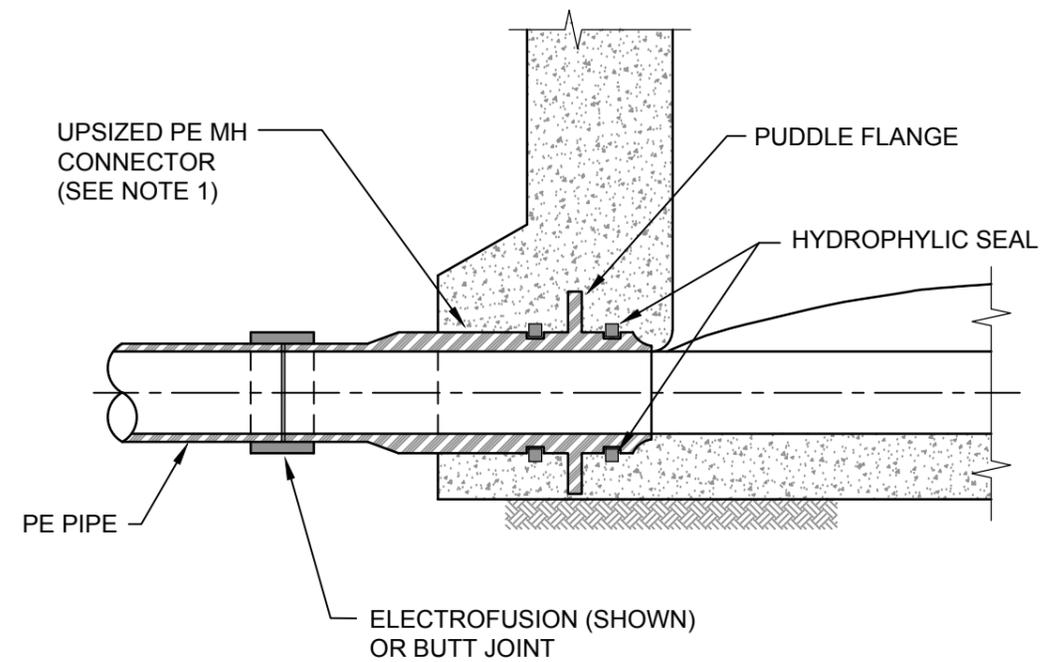
NOTES

- FOR FURTHER MAINTENANCE HOLE INSTALLATION SPECIFICATIONS REFER DRAWINGS 010-035_1 AND 010-035_2.

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	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE		
	SEWER MAINTENANCE HOLES MANHOLE BASES AND PIPE CONNECTION DETAILS		SURV	AS SHEET SIZE	DRAWING No	AMDT No
			DRWN ST	A3	010-026	
		DES MW	CADFILE 010-026_3.dwg			
		CHKD MW				



CONNECTION PE - PVC

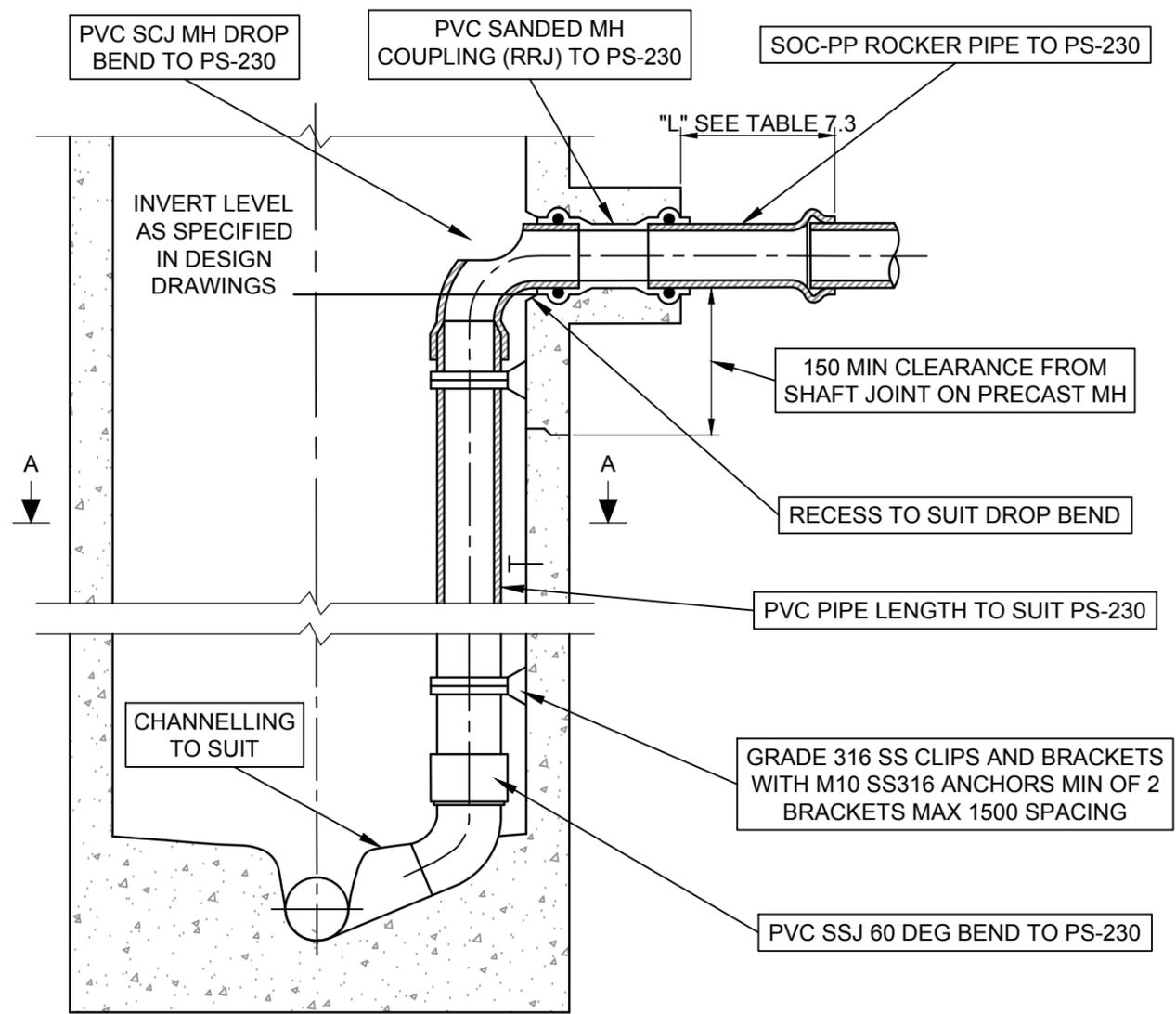


CONNECTION PE - PE

NOTE

1. USE UPSIZED PE SECTIONS TO PREVENT PE CONTRACTING DUE TO CONTINUED LOADING
2. FOR CONNECTIONS TO OTHER PIPE MATERIALS SEE 010-035_2

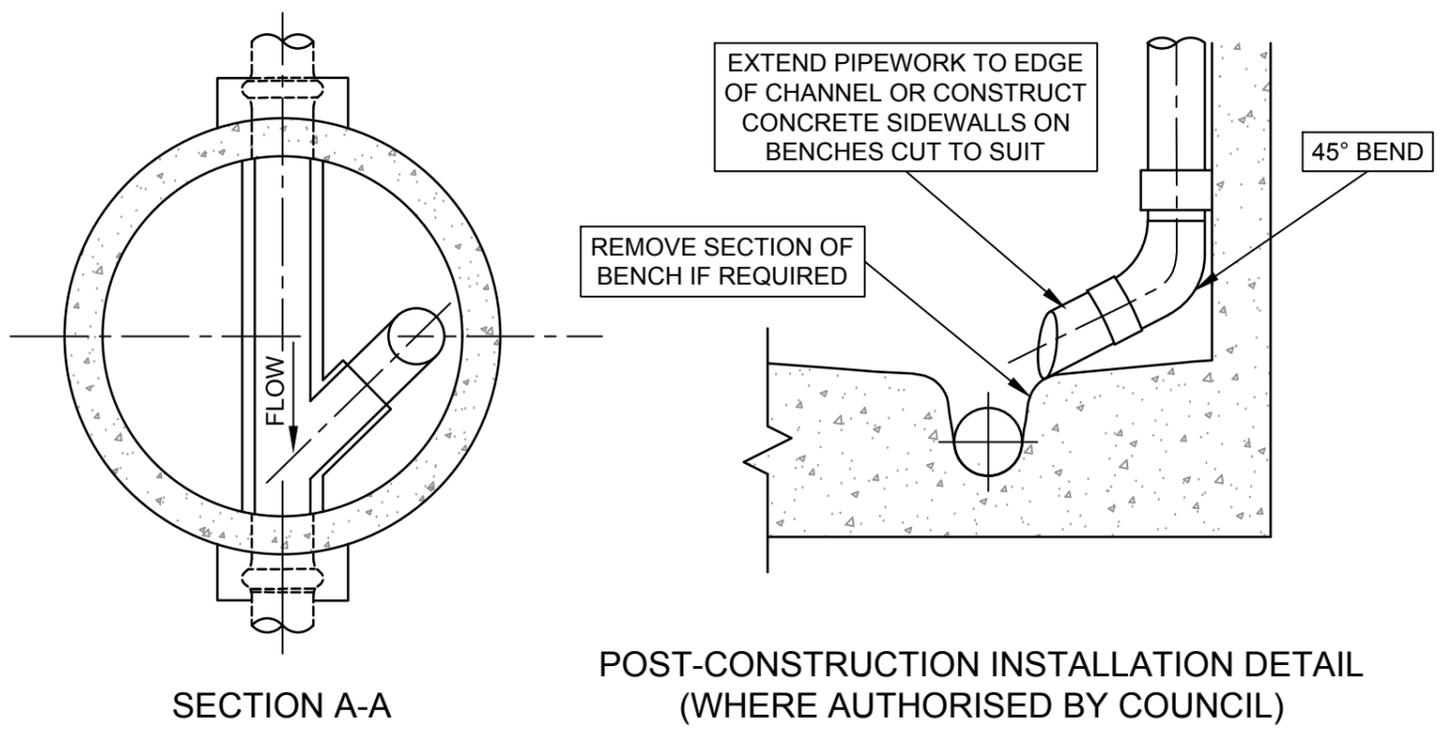
Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE HOLES CONNECTION DETAILS DN 110 TO DN 450PE PIPE		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN TY	A3	010-027	
		DES			
		CHKD MW	CADFILE 010-027.dwg	DATE 31/08/2016	



TYPICAL CAST IN-SITU CONCRETE MH WITH INTERNAL DROP PIPE
(PVC-U DWV SEWER PIPE SHOWN)

SEWER SIZE DN	PVC		VC, RC	DI	GRP	
	"L" MIN	"L" MAX	"L"	"L"	"L" MIN	"L" MAX
150	300	450	600	1500	500	1000
225	450	650	600	1500	500	1000
300	600	900	700	1500	500	1000
375	750	1125	700	1500	500	1000

WSA TABLE 7.3
ROCKER PIPE DIMENSIONS

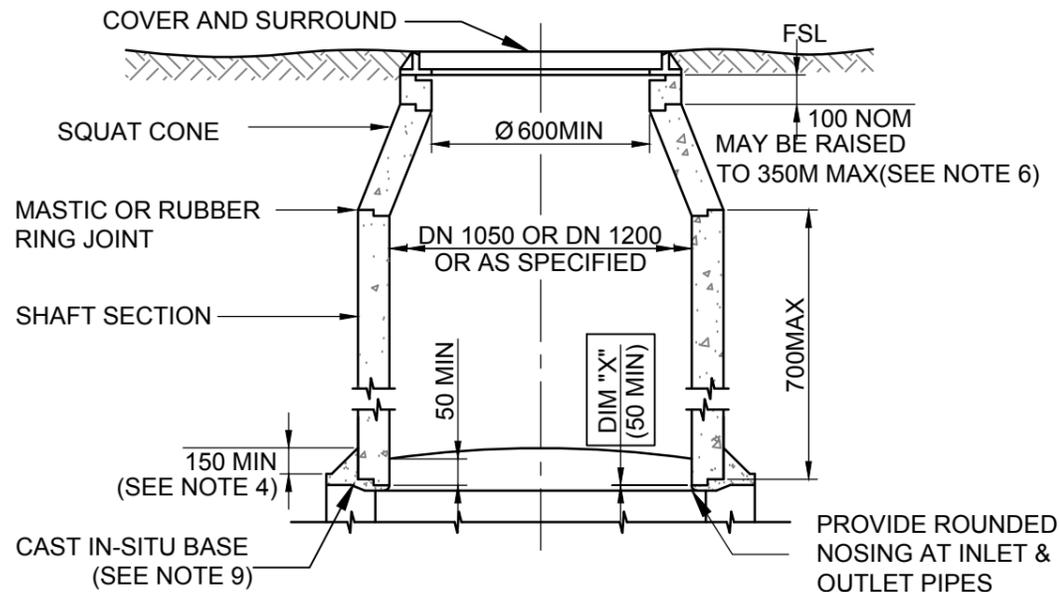


POST-CONSTRUCTION INSTALLATION DETAIL
(WHERE AUTHORISED BY COUNCIL)

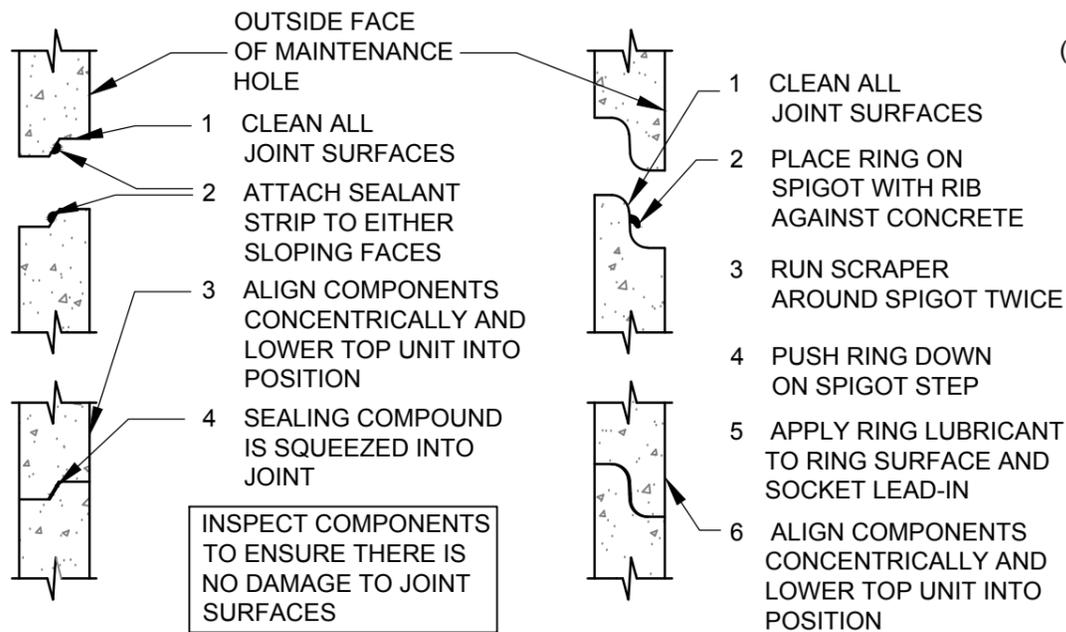
NOTES

- FOR RETICULATION SEWERS ($\leq DN300$) WHERE INLET AND OUTLET SEWERS ARE THE SAME DIAMETER, COMPENSATION FOR THE FRICTION HEAD LOSS THROUGH BENDS WITHIN MHS SHALL BE PROVIDED BY MEANS OF FALL TO THE DESIGN GRADE, EVENLY DISTRIBUTED ALONG THE CHANNEL WITHIN THE MH. THE MINIMUM INTERNAL FALL THROUGH AN MH FOR A DEFLECTION SHALL BE NOT LESS THAN THE VALUES NOMINATED IN TABLE 5.12.
- WHERE AN INTERNAL OR EXTERNAL DROP IS PROVIDED TO CATER FOR A LARGE FALL BETWEEN THE MH INLET AND OUTLET SEWERS, THE INTERNAL FALL THROUGH THE MH SHOULD BE TAKEN AS THE LEVEL DIFFERENCE BETWEEN THE OUTLET IL OF THE DROP STRUCTURE AND THE IL OF THE MH OUTLET SEWER. ILS ARE CALCULATED AT THE CENTRE OF THE MH.
- ON RETICULATION SEWERS WHERE THE INTERNAL FALL ACROSS THE BASE OF THE MH IS NOT ACHIEVABLE DUE TO A LARGE DIFFERENCE BETWEEN THE LEVELS OF INCOMING AND OUTGOING SEWERS, INTERNAL OR EXTERNAL DROPS SHALL BE PROVIDED WITHIN THE LIMITATIONS OF TABLE 5.13.
- WHERE "GRADING-OUT" IS NOT PRACTICAL, A DROP STRUCTURE SHALL BE PROVIDED AT THE JUNCTION OF A SHALLOW AND A DEEP SEWER. IN SEVERE CHANGE OF LEVELS, VERTICALS MAY BE USED WITH THE MINIMUM DROP OF THE VERTICAL AT MHS BEING GOVERNED BY THE DIMENSIONS OF AVAILABLE PIPE FITTINGS.

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	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE HOLES EXTERNAL AND INTERNAL DROPS THROUGH MH		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	ST	010-028	
		DES	MW		
		CHKD	MW	CADFILE 010-028_2.dwg	DATE 31/08/2016



PRECAST MAINTENANCE HOLE FOR COMPONENT DEPTH ≤ 1200

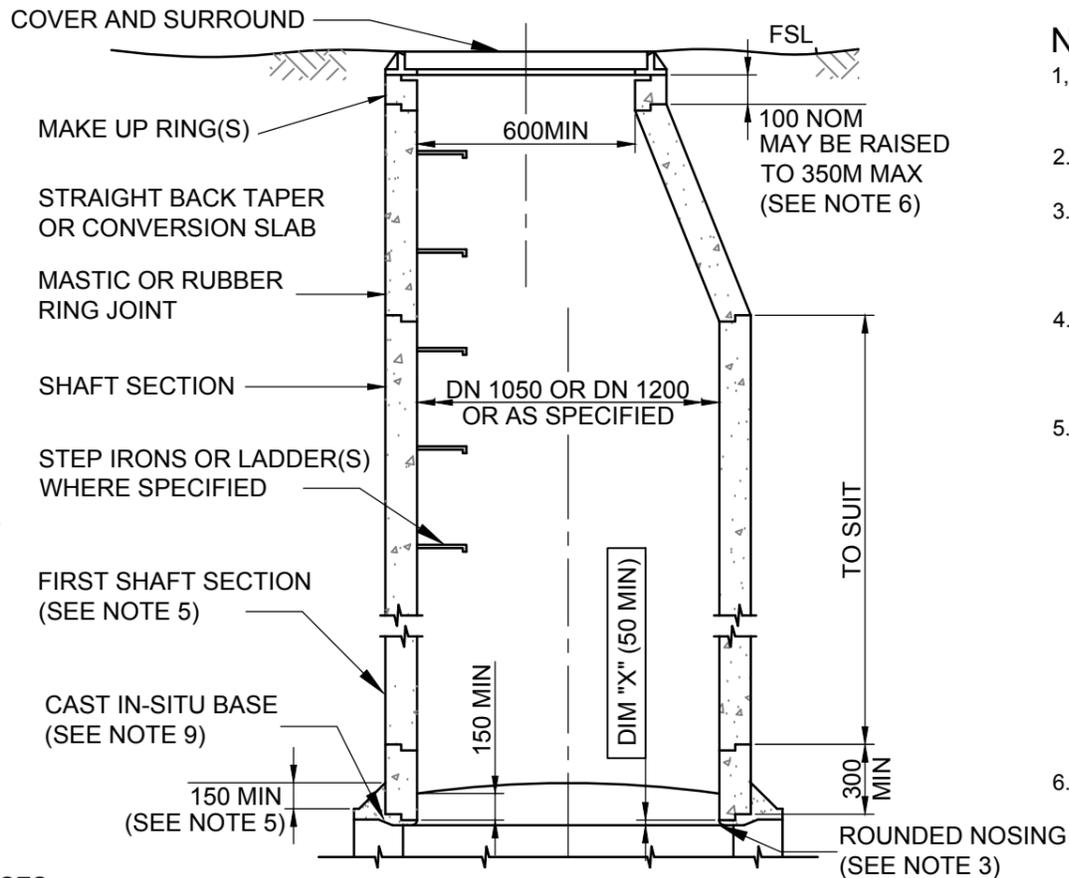


MASTIC JOINT DETAILS

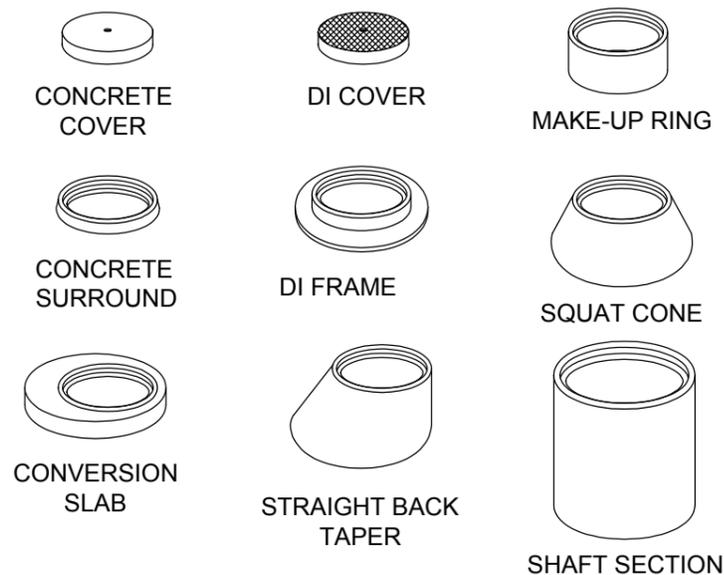
RUBBER RING JOINT DETAILS

CALCULATING TOTAL PRECAST COMPONENT DEPTH (REFER NOTE 5)

$$\text{TOTAL DEPTH OF PRECAST COMPONENT} = \text{DEPTH TO INVERT OF HIGHEST NON-DROP INLET PIPE MINUS (ID OF INLET PIPE + PIPE WALL THICKNESS + DIM "X")}$$



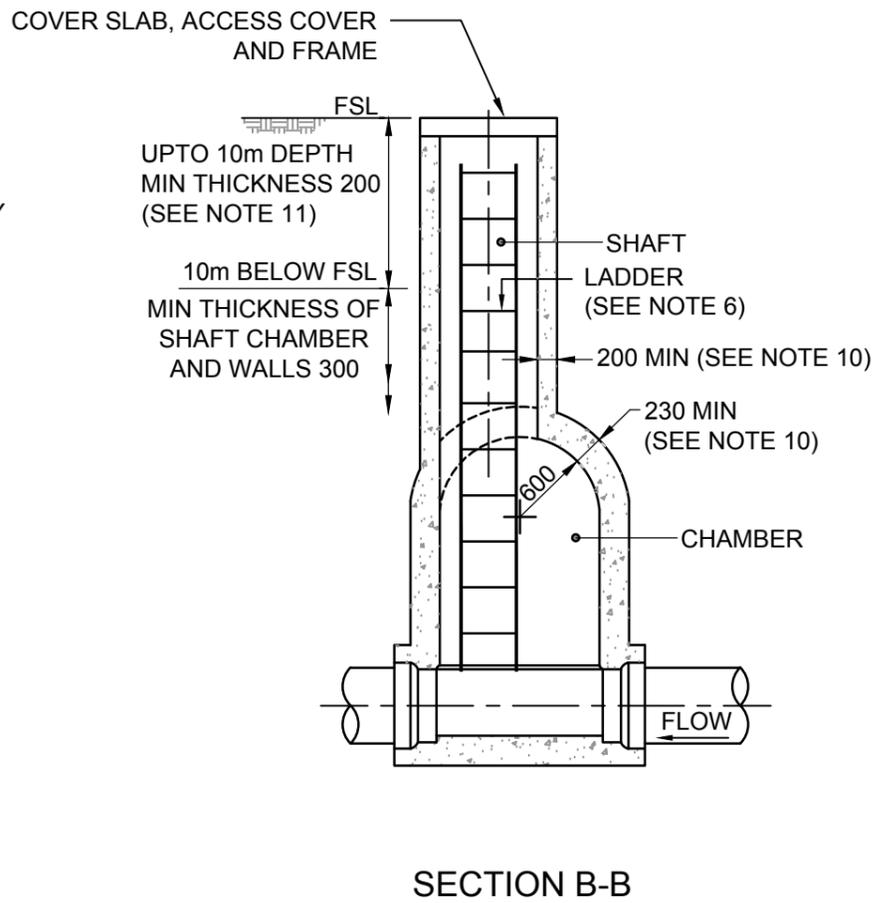
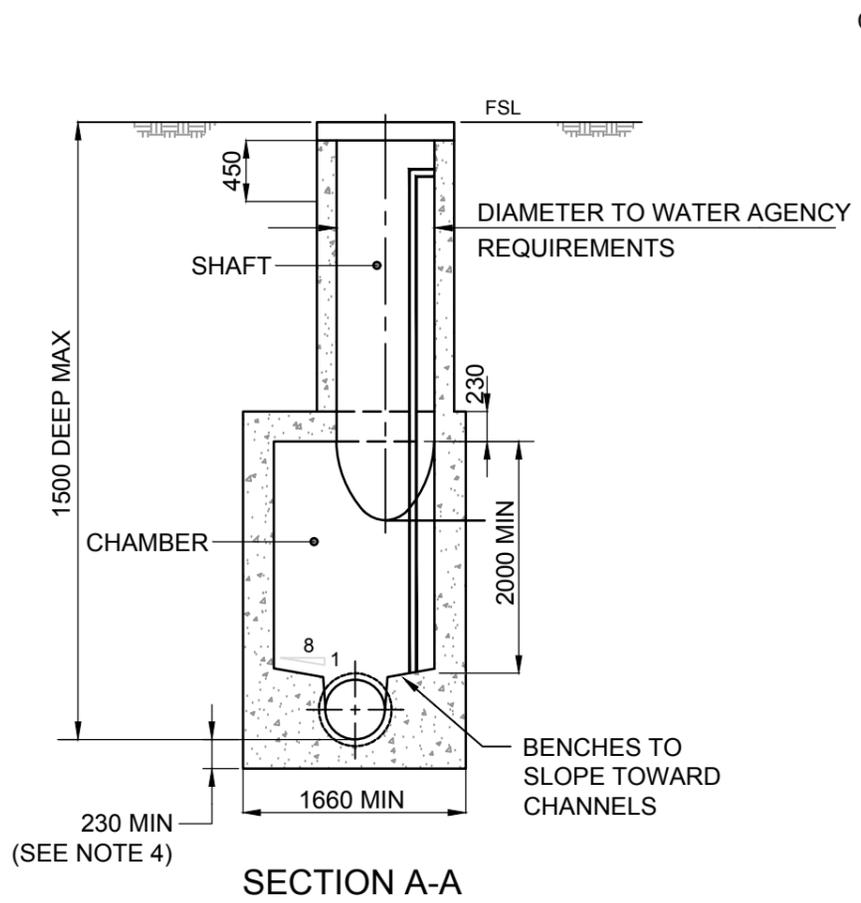
PRECAST MAINTENANCE HOLE FOR COMPONENT DEPTH 1200 TO 6000



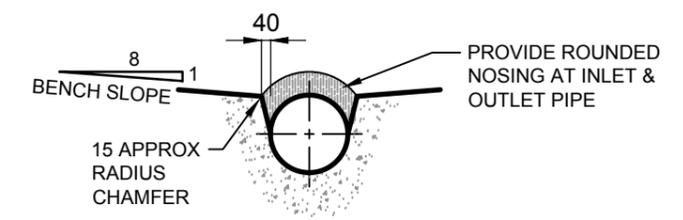
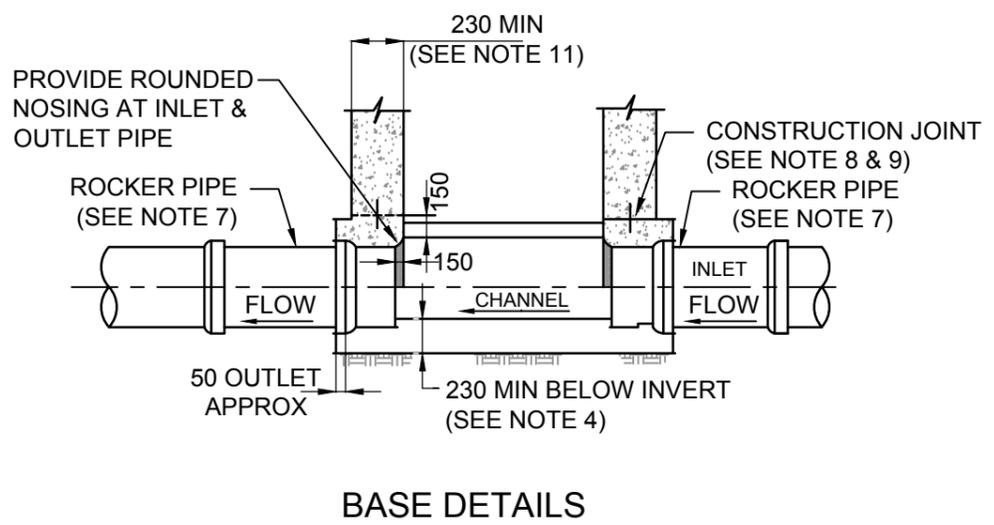
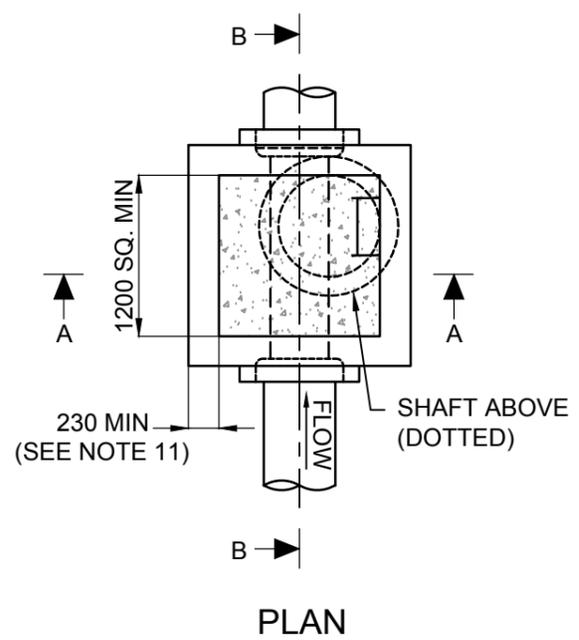
NOTES:

- ALL PRECAST COMPONENTS TO BE WSA COMPLIANT.
- ALL DIMENSIONS IN MILLIMETRES.
- PROVIDE ROUNDED NOSING ON INLET AND OUTLET PIPE TO PREVENT DAMAGE BY JETTING EQUIPMENT AND CCTV GUIDES AND CABLES.
- CONSTRUCTION MAY BE A COMBINATION OF PRECAST AND IN-SITU TO SUIT APPLICATION AUTHORISATION REQUIRED.
- LOCATION OF THE FIRST SHAFT SECTION:
 - FIRST SHAFT SECTION TO BE BETWEEN 300-600 LONG TO ALLOW FORMING OF CHANNEL AND BENCH.
 - WHERE STEP IRONS ARE USED, CORRECTLY ORIENTATE BOTTOM STEP.
 - PRIME COMPONENT 200 FROM BOTTOM WITH CEMENT SLURRY OR WITH WET AND DRY BONDING AGENT.
 - FORM CHANNEL IN THE BASE.
 - ALLOW BASE TO CURE 7 DAYS BEFORE PLACING ADDITIONAL CHAMBER UNITS.
- MAKE-UP RINGS:
 - USE MINIMUM ONE MAKE-UP RING (PREFERABLY 100 OR 150) PER MANHOLE DURING CONSTRUCTION TO ALLOW FOR FUTURE SURFACE ADJUSTMENT WITHOUT AFFECTING THE SHAFT SECTION.
 - USE TAPERED MAKE-UP RING ON SLOPING GROUND.
- BACKFILL AROUND MH:
 - THE METHOD OF BACKFILL AND COMPACTION AROUND MH TO BE GENERALLY AS FOR PIPE EMBEDMENT.
 - TAKE CARE TO RAISE SELECT FILL EQUALLY ALL AROUND THE MH TO AVOID UNBALANCED LATERAL LOADING.
- FOR MH >1200 INSTALL STEP IRONS OR LADDER.
- CONCRETE BASE TO BE SPECIAL CLASS.
- WHERE THERE IS SUFFICIENT RISK OF INFILTRATION OR TREE ROOT INTRUSION APPLY AN EXTERNAL BITUMASTIC SEAL TAPE 150 WIDE OVER THE COAT OF MANUFACTURERS RECOMMENDED PRIME SEAL TO ALL JOINTS.
- ALL NEW MH SHALL HAVE CAST DI COVERS WITH CONCRETE SURROUNDS. ALL INSTALLATIONS SHALL BE CLASS D, ALTERNATE OPTIONS REQUIRE COUNCIL APPROVAL.

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	PRECAST SEWER MAINTENANCE HOLES SEWERS ≤ DN300 DEPTH ≤ 1200 AND 1200-6000		SURV	AS SHEET SIZE	DRAWING No	AMDT No
			DRWN GW	A3	010-029	
		DES	CADFILE 010-029.dwg		DATE 31/08/2016	
		CHKD MW				

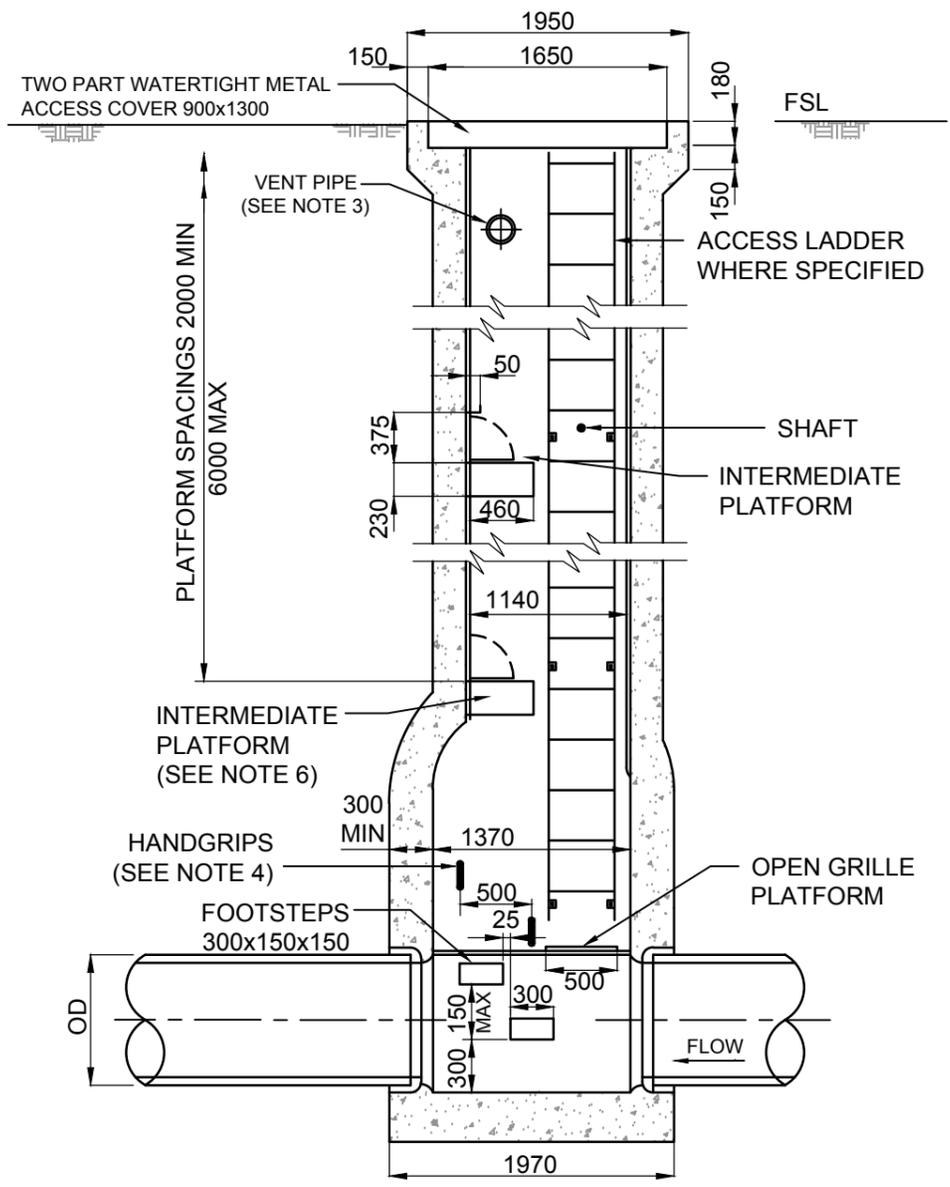


- NOTES**
1. ALL DIMENSIONS IN MILLIMETERS.
 2. LOCATION OF TYPE S1 MH TO BE AS SHOWN IN DESIGN DRAWINGS.
 3. DETAILS OF DROPS AND CHANNEL INTERSECTIONS TO BE SHOWN ON DESIGN DRAWINGS.
 3. CONCRETE TO BE SPECIAL CLASS AS PER WSA PS 358.
 4. IN BAD OR WATERCHARGED GROUND CONDITIONS INCREASE BASE THICKNESS TO 300 MIN.
 5. ALL BENCHES TO SLOPE TOWARDS CHANNEL. BENCH LEVEL TO BE APPROXIMATELY AT TOP OF INLET.
 6. LOCATE LADDER IN STRAIGHT WALL TO ONE SIDE OF OUTLET.
 7. FOR INSTALLATIONS OTHER THAN IN ROCK, SHALE OR VERY STIFF CLAY, INSTALL A ROCKER PIPE IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MH TO ALLOW FOR MOVEMENT BETWEEN THE MH AND THE PIPELINE.
 8. SCABBLE AND BRUSH CLEAN BASE JOINT THEN PRIME WITH CEMENT SLURRY IMMEDIATELY BEFORE PLACING CONCRETE.
 9. INSERT WATERSTOP AT CONSTRUCTION JOINT.
 10. DESIGN OF MH TO BE IN ACCORDANCE WITH AS3735. EXPOSURE CONDITION AS DEFINED IN AS3735 TO BE NOT LESS THAN CONDITION C AND SHOWN ON DESIGN DRAWING.
 - 300 MIN THICK CHAMBER AND SHAFT WALLS WHERE IN CONTACT WITH AGGRESSIVE SOILS.
 - CHAMBER WALLS AT BASE TO BE LOCALLY THICKENED TO ENSURE CAST IN-SITU SOCKETS ARE FULLY SUPPORTED.
 11. WHERE EXCAVATION FOR A MH EXTENDS BEYOND THE NEAT LINES OF STRUCTURE (i.e. OPEN CUT TRENCH CONSTRUCTION METHOD) PROVIDE ANY PIPELINE WITHIN THE OVER-EXCAVATED AREA WITH SPECIAL SUPPORT (e.g. SAND/CEMENT ENCASEMENT).
 12. METHOD OF BACKFILL AND COMPACTION AROUND MH TO BE GENERALLY AS FOR TRENCHES. PLACE FILL EVENLY AROUND THE MH SHAFT TO AVOID UNBALANCED LATERAL LOADING.
 13. REINFORCEMENT TO BE AS DETAILED IN DESIGN DRAWINGS.
 14. CONSTRUCTION DETAILS e.g. CONCRETE THICKNESS, REINFORCEMENT, HORIZONTAL AND VERTICAL ALIGNMENT TO BE SHOWN ON DESIGN DRAWING.

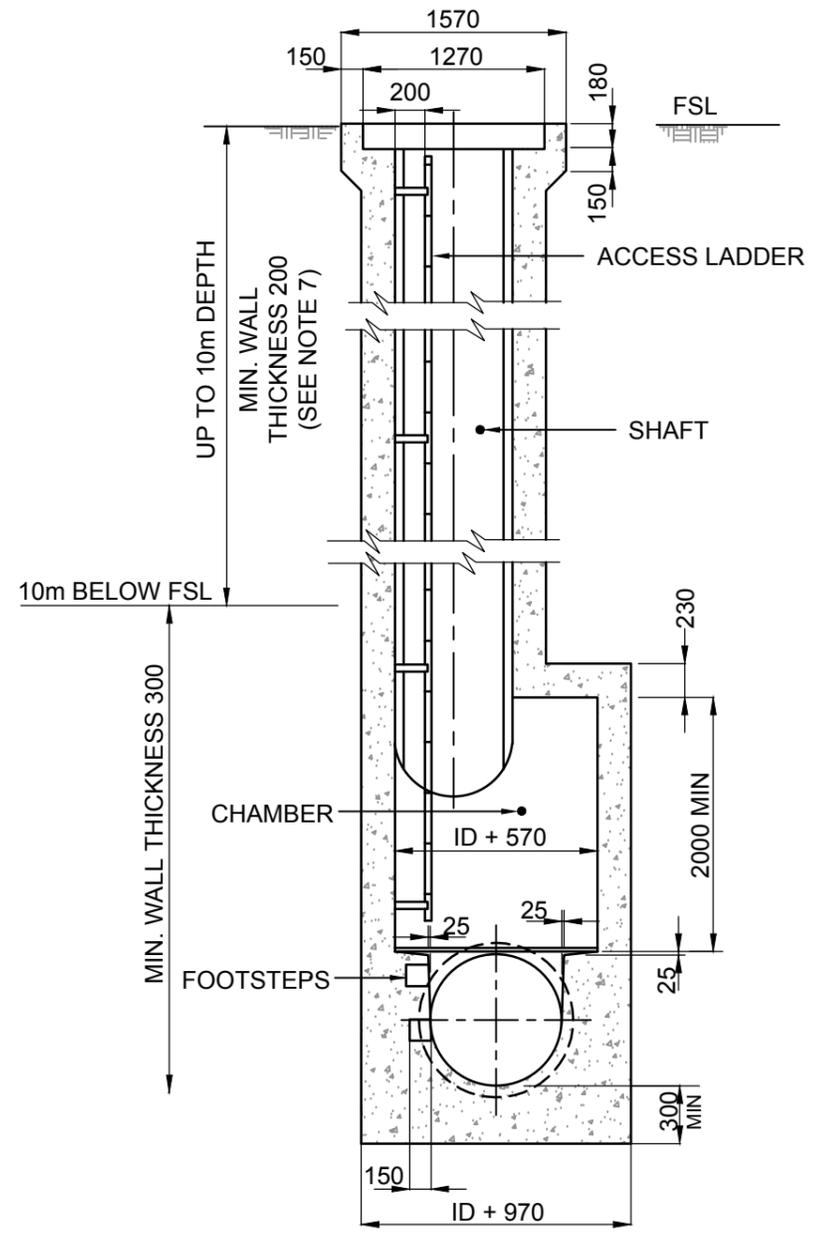


**MAINTENANCE HOLE
TYPE 'S1'**

Armidale <i>Dept of Public Regional Council Infrastructure</i>	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE HOLES DEPTH TO INVERT 6m TO 15m	SURV	AS SHEET SIZE	DRAWING No	AMDT No	
	DRWN VC	A3	010-030		
	DES				
	CHKD MW	CADFILE 010-030.dwg	DATE 31/08/2016		



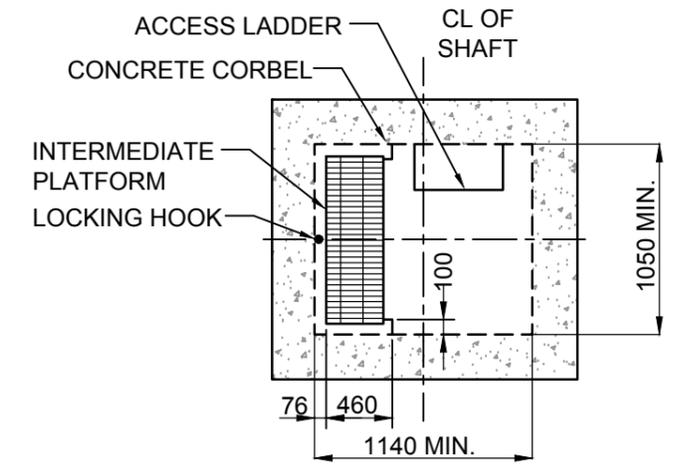
SECTION A-A



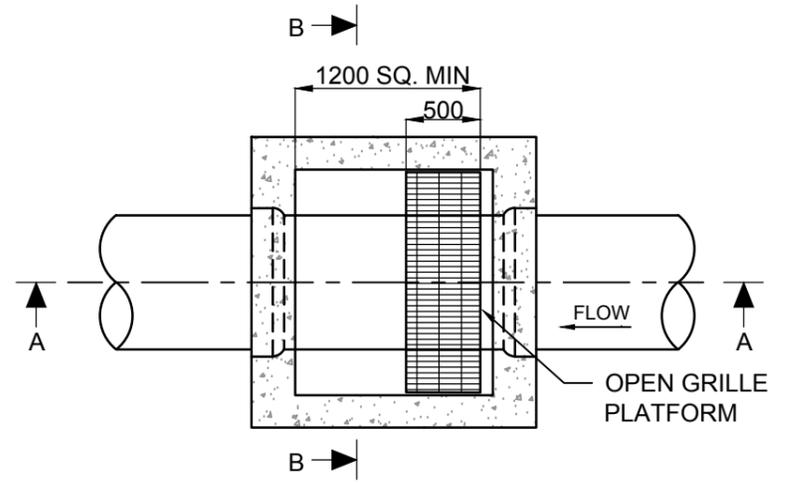
SECTION B-B

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. LOCATE TYPE S2 MH AS SHOWN IN DESIGN DRAWINGS.
3. CONCRETE TO BE SPECIAL CLASS AS PER WSA PS 358.
3. INSTALL VENTING WHERE INDICATED IN DESIGN DRAWINGS.
4. INSTALL HANDGRIPS WHERE INDICATED IN DESIGN DRAWINGS.
5. INTERMEDIATE PLATFORMS TO BE DESIGNED TO FOLD BACK FOR EQUIPMENT ACCESS.
6. DESIGN OF MH TO BE IN ACCORDANCE WITH AS3735. EXPOSURE CONDITION AS DEFINED IN AS3735 TO BE NOT LESS THAN CONDITION C AND SHOWN ON DESIGN DRAWING.
7. SHAFT WALLS TO BE MIN. 300 THICK WHERE IN CONTACT WITH AGGRESSIVE SOILS.
8. CONSTRUCTION DETAILS e.g. CONCRETE THICKNESS, REINFORCEMENT, HORIZONTAL AND VERTICAL ALIGNMENT TO BE SHOWN ON DESIGN DRAWING.



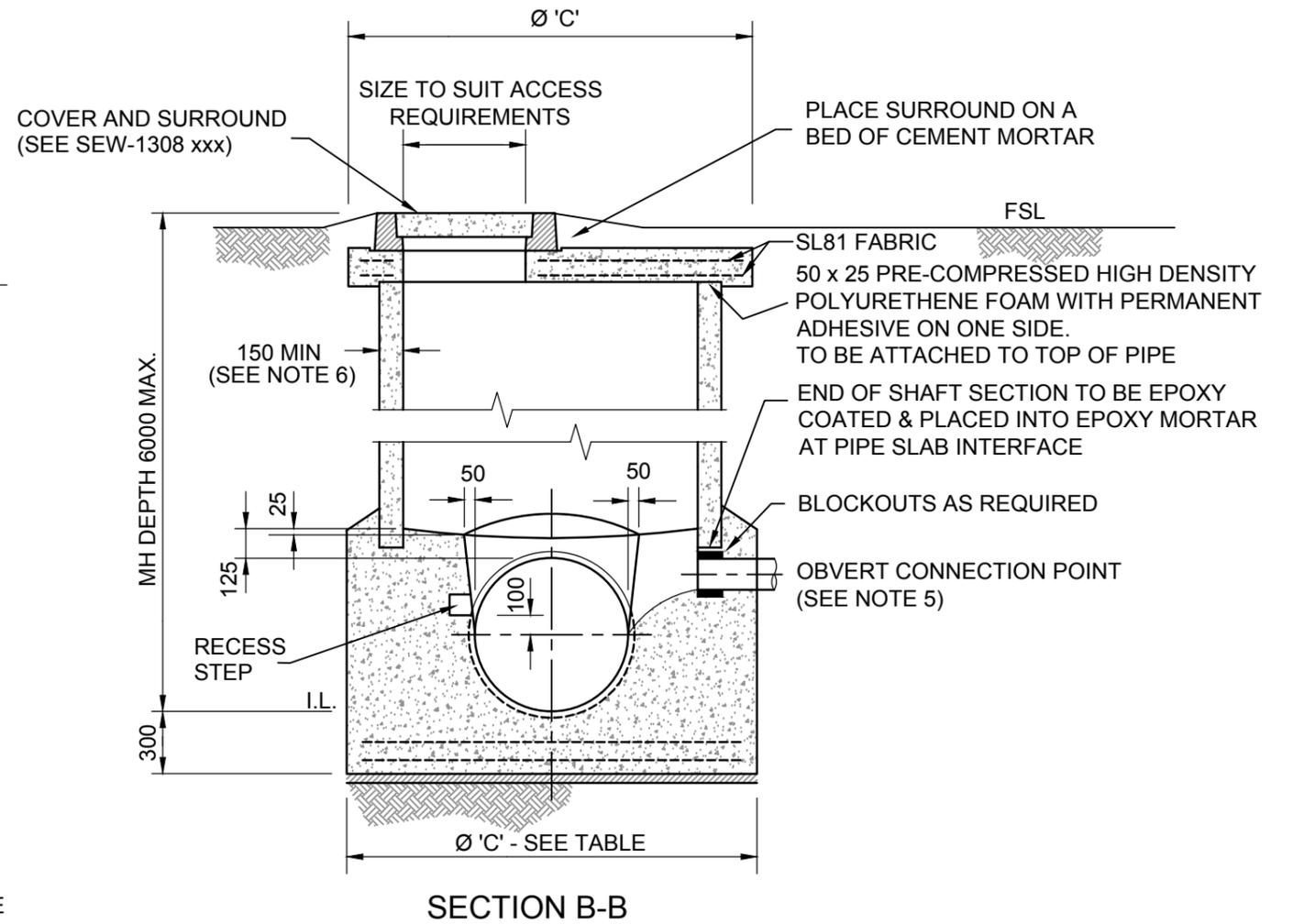
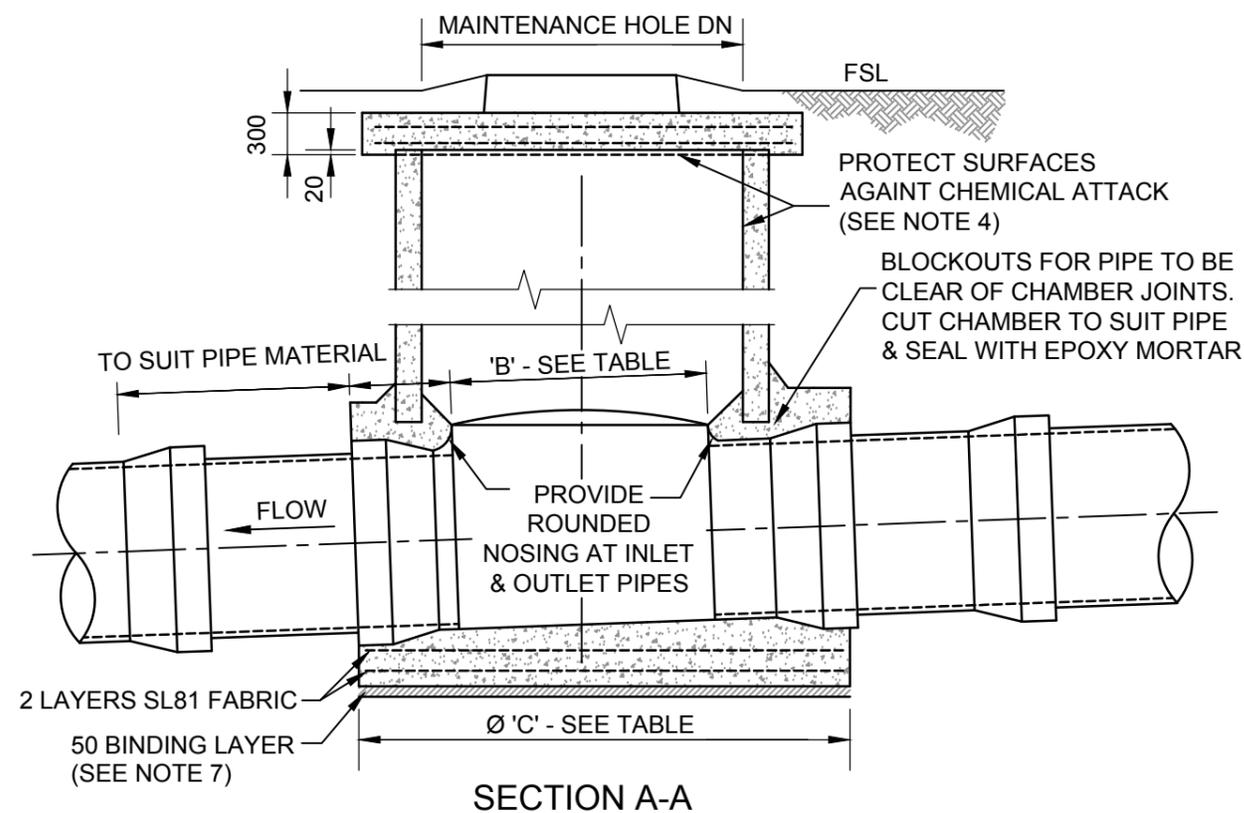
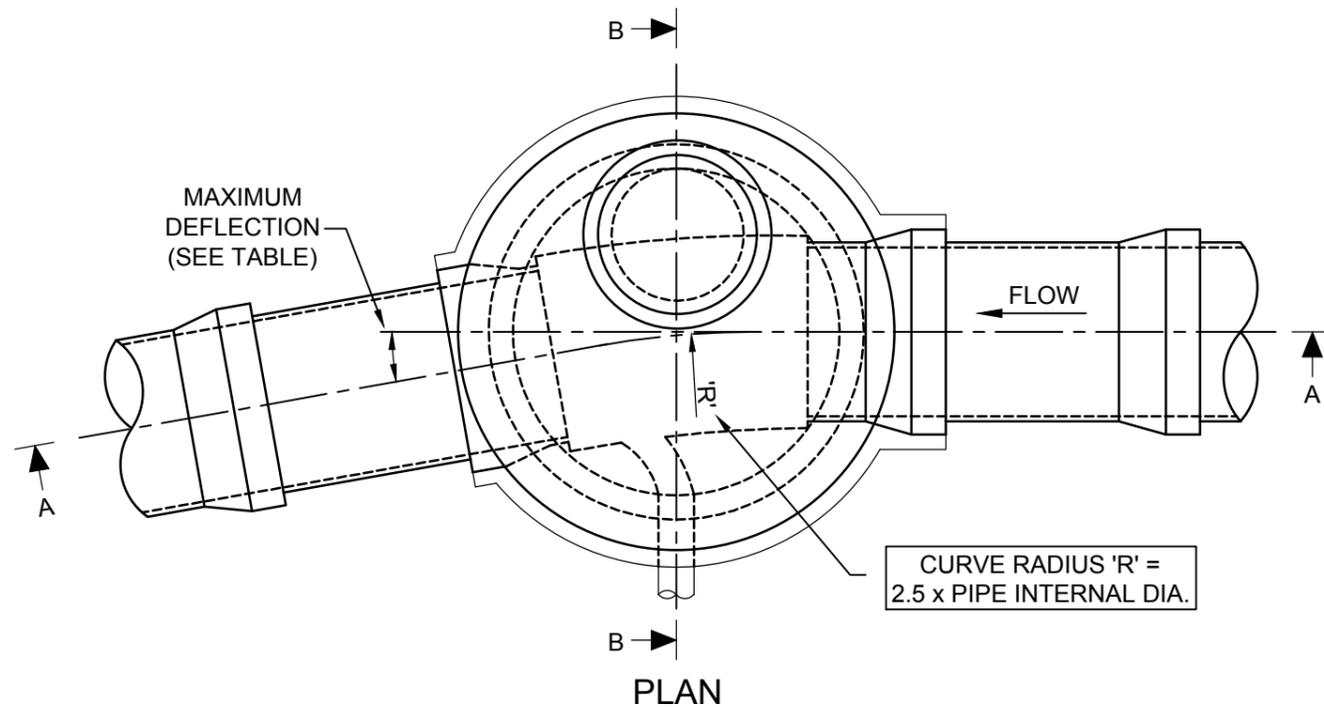
TYPICAL SECTION OF SHAFT
(MAY BE CIRCULAR IF SUITABLE)



BASE PLAN

MAINTENANCE HOLE
TYPE 'S2'

Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE HOLES DEPTH TO INVERT > 15m	SURV	AS SHEET SIZE	DRAWING No	AMDT No	A3 010-031
	DRWN VC	A3	010-031		
	DES				
	CHKD MW				



NOTES

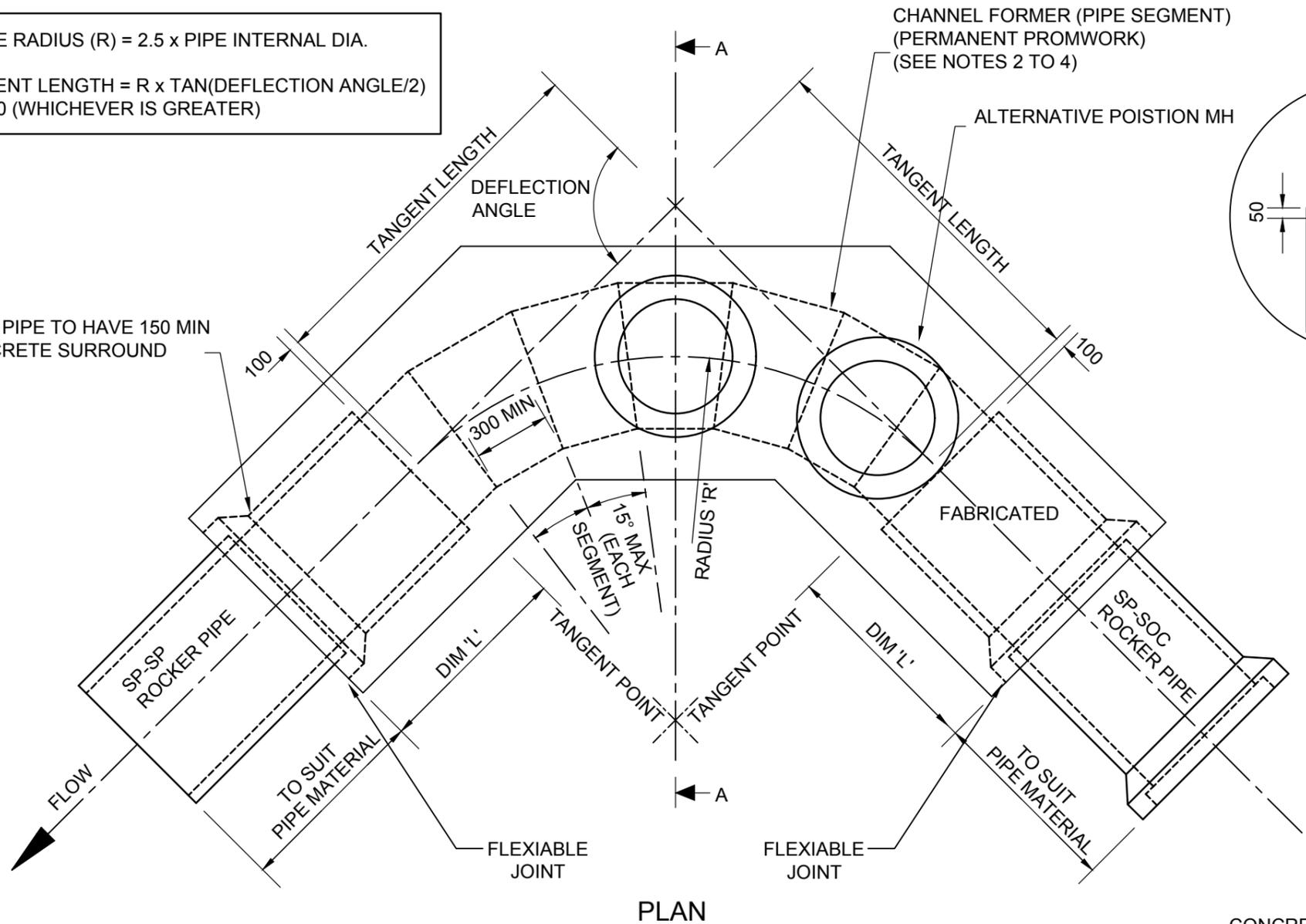
1. ALL DIMENSIONS IN MILLIMETERS.
2. STRUCTURAL CONCRETE TO BE S40 MINIMUM. MASS CONCRETE TO BE SPECIAL CLASS.
3. REINFORCEMENT AS PER STRUCTURAL DESIGN WITH 65 MINIMUM COVER.
4. INSIDE SURFACE OF MH AND UNDERSIDE OF ROOF TO HAVE EPOXY COATING, PVC LINING OR PE LINING TO WATER AGENCY REQUIREMENTS.
5. ALTERNATIVELY INCORPORATE VERTICAL DROP FOR HIGH LEVEL SEWERS.
6. WALL THICKNESS TO BE 150 MIN OR 225 MIN IN AGGRESSIVE SOILS, HIGH WATER TABLE AND SALINE ENVIRONMENTS.
7. FOUNDATION DETAILS TO BE AS PER DESIGN DRAWINGS.

SEWER SIZE	MAXIMUM HORIZONTAL DEFLECTION AT CHAMBER	NOMINAL MH DIAMETER	'B'	Ø'C'
DN 375 TO 450	45°	DN 1200	800	1700
DN 500 TO 675	35°	DN 1500	1100	2000
	45°	DN 1800	1400	2300
DN 750	40°	DN 1800	1400	2300

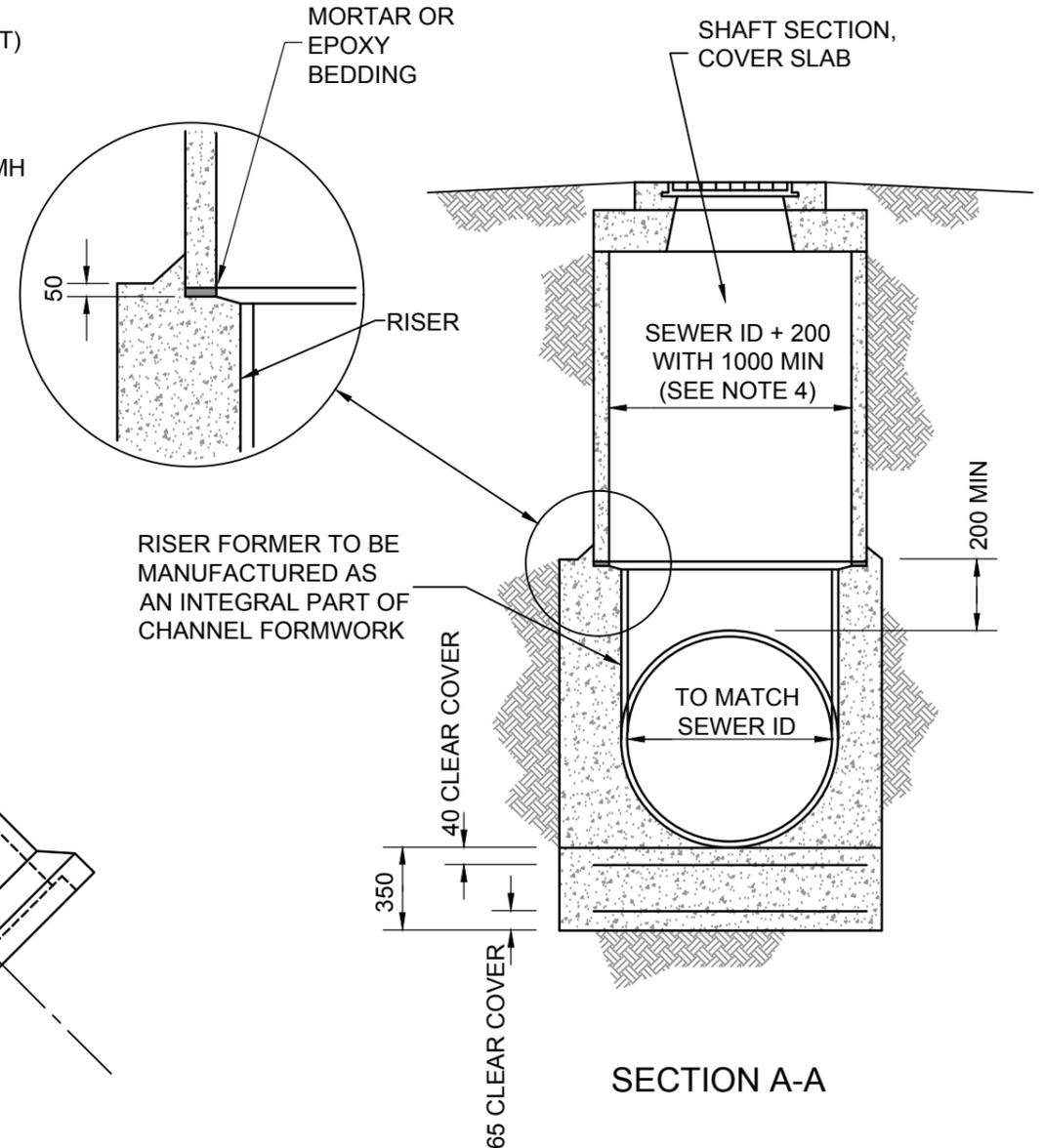
Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE HOLES SEWERS DN 375 TO DN 750	SURV	AS SHEET SIZE	DRAWING No	AMDT No	
	DRWN TY	A3	010-032		
	DES				
	CHKD MW	CADFILE 010-032.dwg	DATE 31/08/2016		

CURVE RADIUS (R) = 2.5 x PIPE INTERNAL DIA.
 TANGENT LENGTH = R x TAN(DEFLECTION ANGLE/2)
 OR 500 (WHICHEVER IS GREATER)

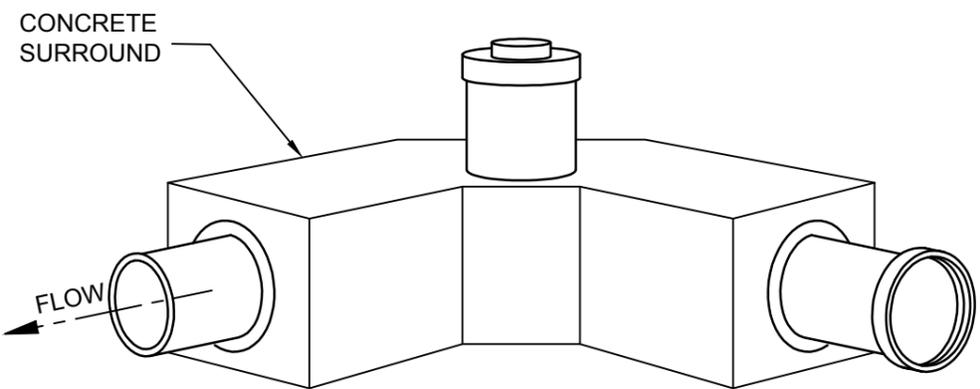
STUB PIPE TO HAVE 150 MIN
 CONCRETE SURROUND



PLAN



SECTION A-A

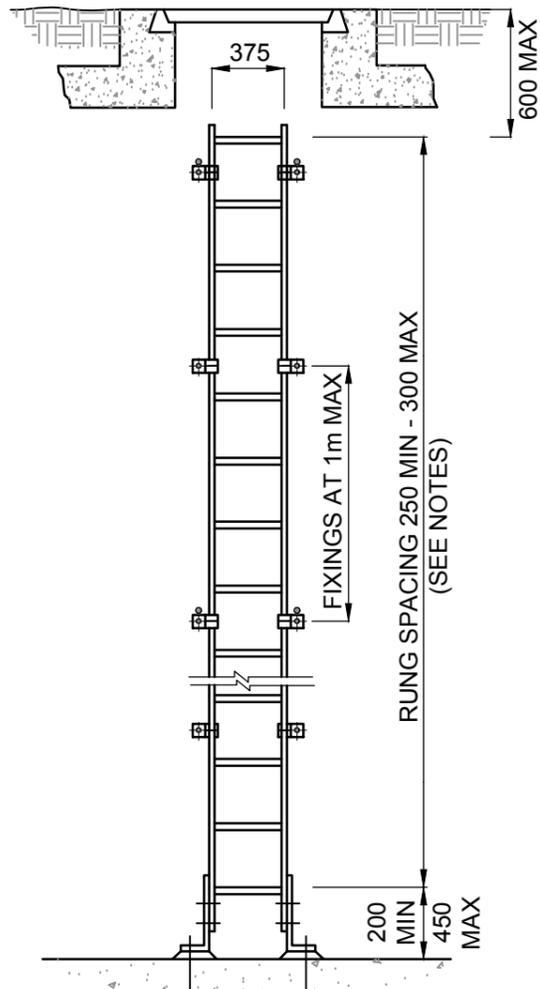


PERSPECTIVE

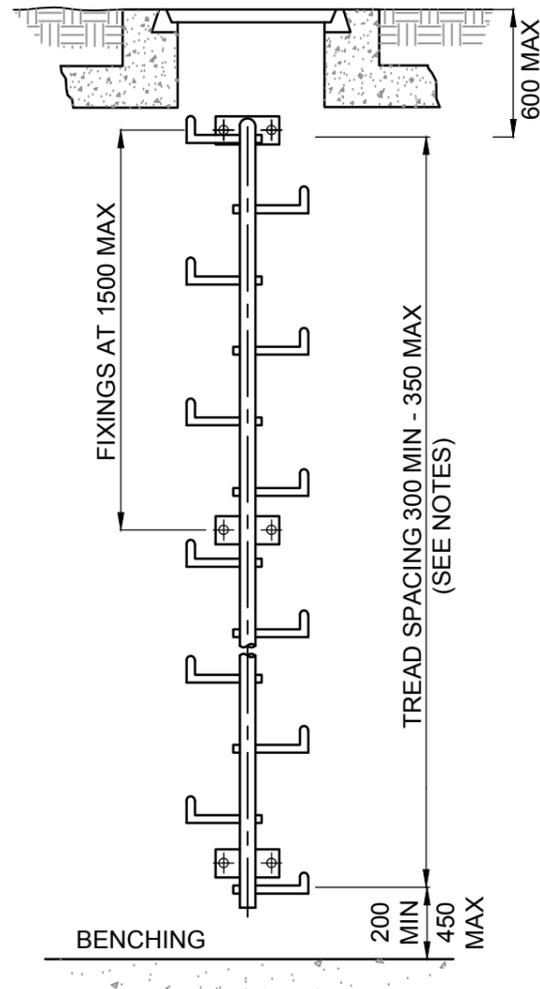
NOTES

1. ALL DIMENSIONS IN MILLIMETERS.
2. FABRICATE CHANNEL FORMERS USED AS PERMANENT FORMWORK FROM MATERIALS NOT SUBJECT TO CORROSION FROM SEWAGE. EG. PVC, PE OR GRP PIPE.
3. PERMANENT FORMWORK METHOD CAN BE USED FOR;
 - STRAIGHT THROUGH MH
 - MH WITH DIRECTIONAL CHANGE.
4. THE MH SHAFT MUST STRADDLE THE SEWER AND BE SUPPORTED ON STRUCTURAL CONCRETE EITHER SIDE OF SEWER.
5. DIMENSIONS 'L' AND 'R' TO BE DETAILED IN DESIGN DRAWINGS.
6. WALL THICKNESS TO BE 150 MIN OR 225 MIN IN AGGRESSIVE SOILS, HIGH WATER TABLE AND SALINE ENVIRONMENTS.

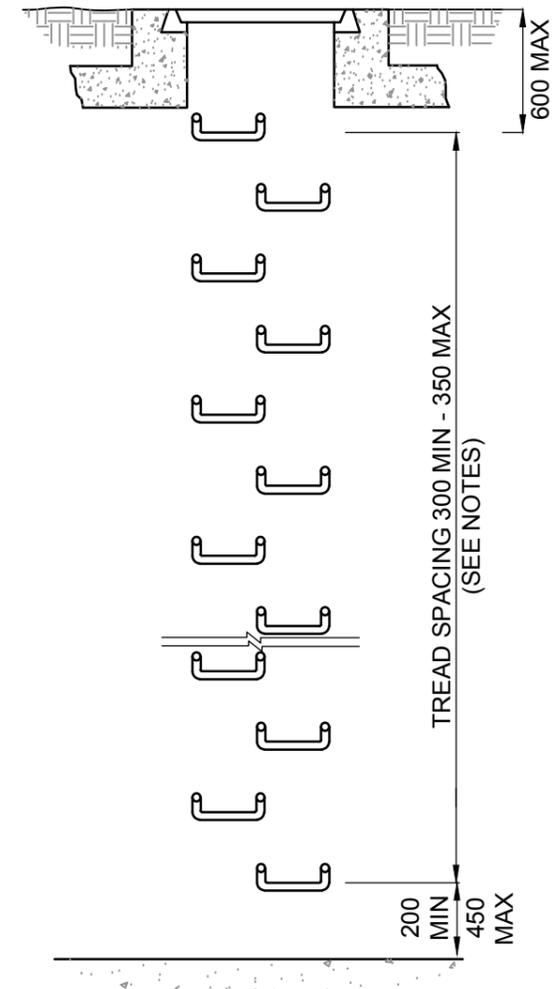
Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE HOLES PERMANENT FORMWORK > DN 375		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	A3	010-033	
		DES			
		CHKD	CADFILE 010-033.dwg	DATE 31/08/2016	



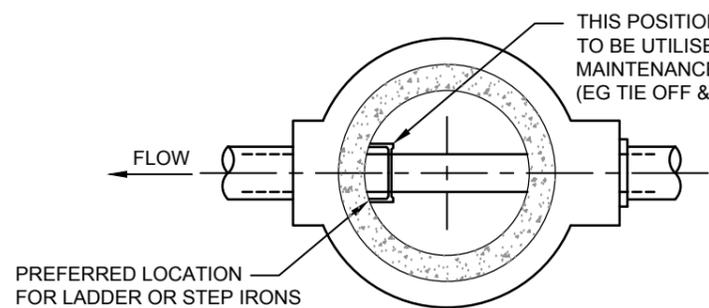
STANDARD LADDER



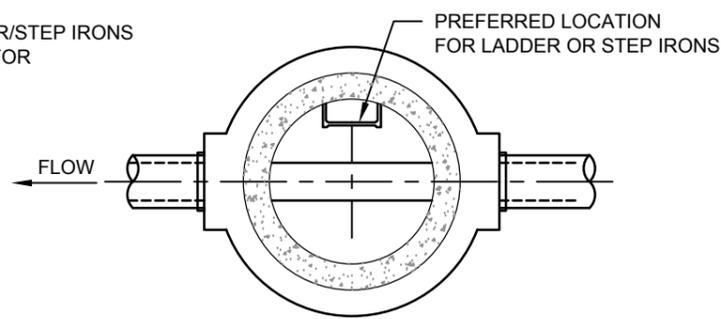
MONORAIL LADDER



STEP IRONS
INLINE OR STAGGERED AS SPECIFIED



FOR SEWERS ≤ DN 300



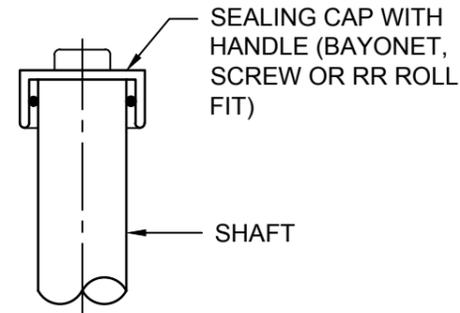
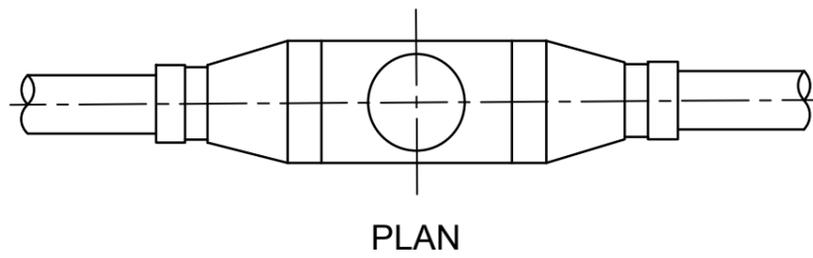
FOR SEWERS > DN 300

PREFERRED LADDER
OR STEP IRON LOCATION

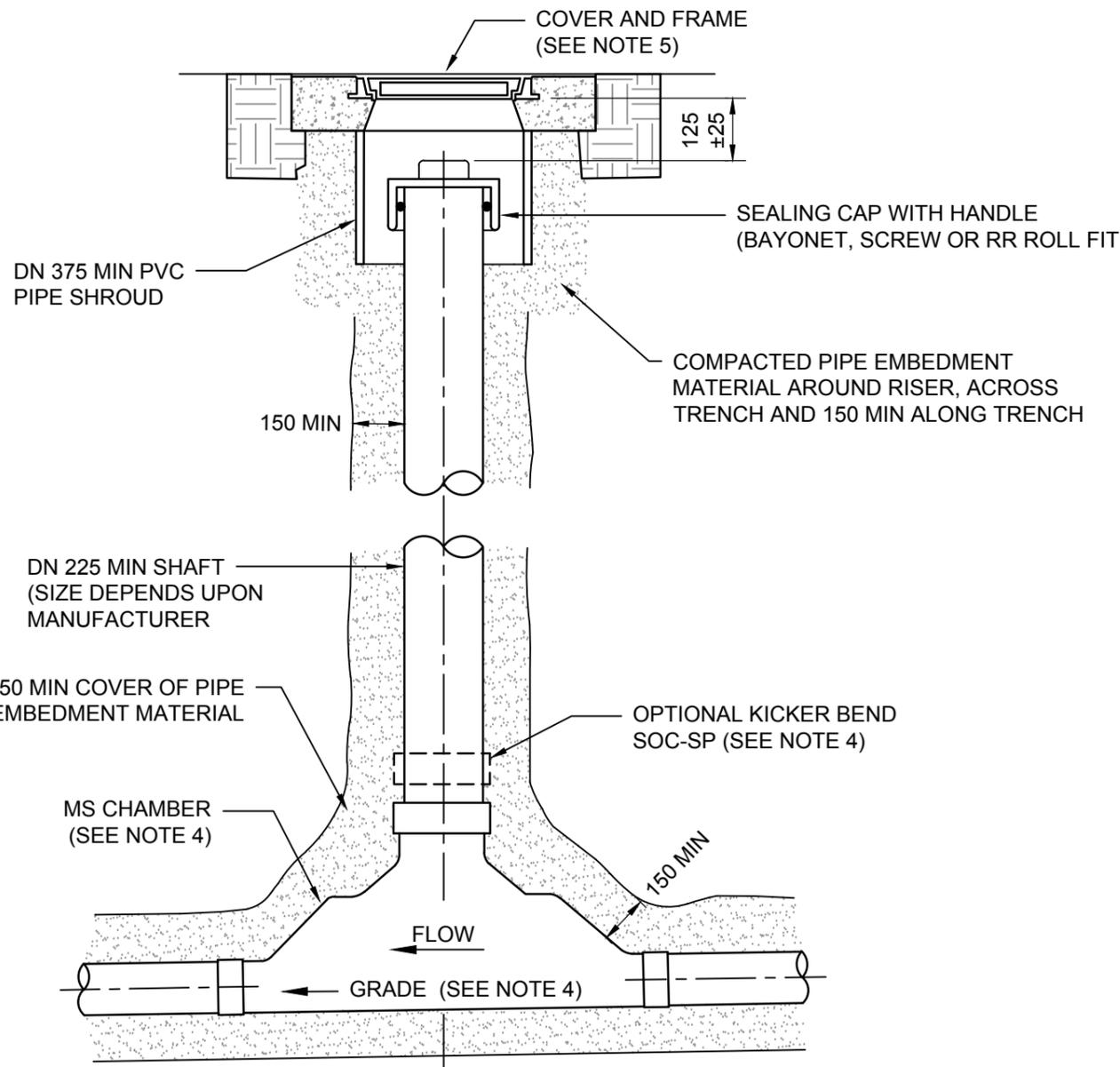
NOTES

1. ALL DIMENSIONS IN MILLIMETRES.
2. POSITION ALL LADDER/STEP IRONS TO WATER AGENCY REQUIREMENTS.
3. LADDERS AND STEP IRONS TO BE IN ACCORDANCE WITH WSA 02 CL 7.6.9.
4. COMPLETE LADDER OR STEP IRON FIXING TO WATER AGENCY REQUIREMENTS.

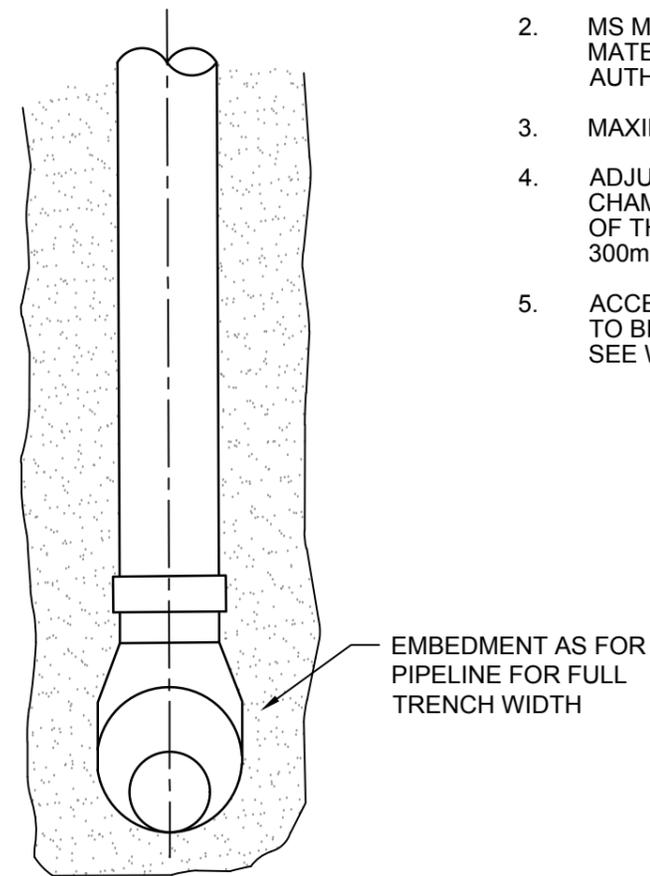
Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1	
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE		
	SEWER MAINTENANCE HOLES STEP IRONS & LADDERS		SURV	AS SHEET SIZE	DRAWING No	AMDT No
			DRWN VC	A3	010-034	
DES			CADFILE 010-034.dwg			
	CHKD MW					



RISER SHAFT CAP



SIDE ELEVATION MAINTENANCE SHAFT

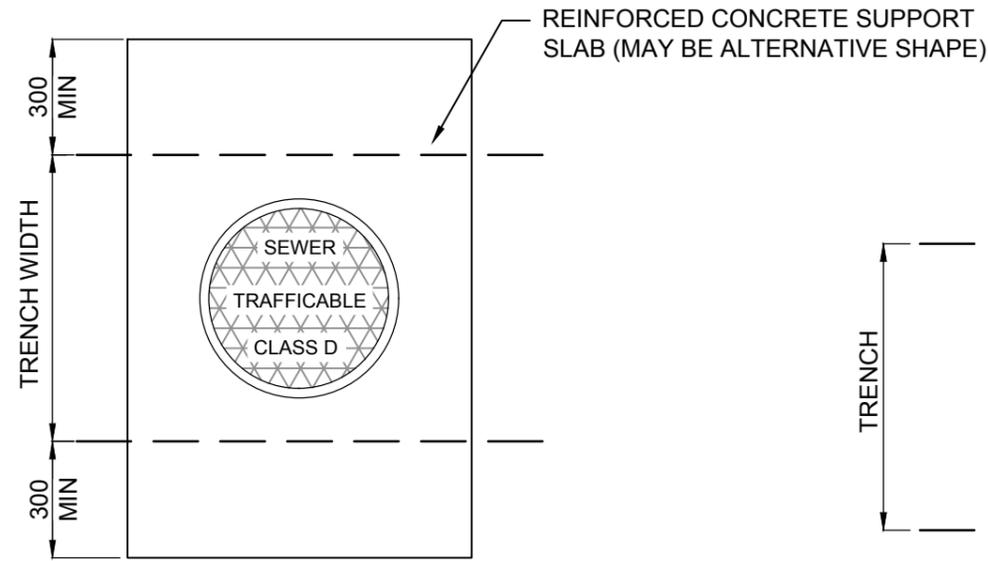


END ELEVATION PLAIN RISER SHAFT

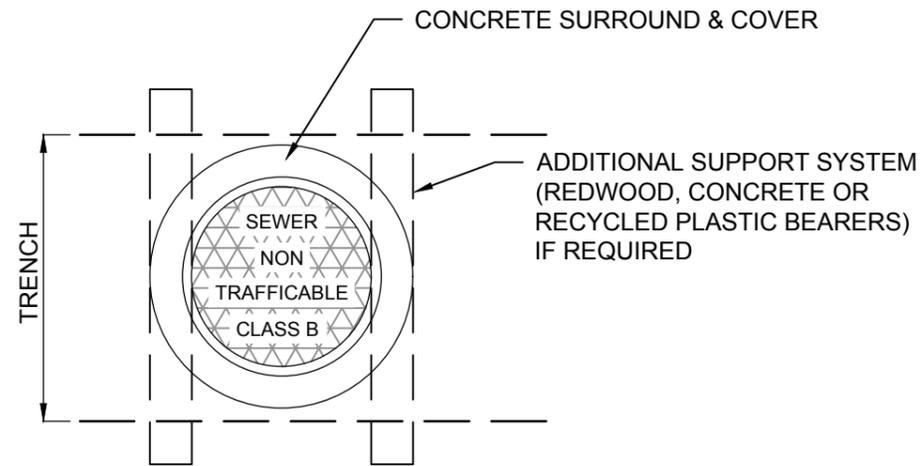
NOTE

1. ALL DIMENSIONS IN MILLIMETRES.
2. MS MAY BE MANUFACTURED USING VARIOUS MATERIALS AND JOINTING SYSTEMS AS AUTHORISED BY WATER AGENCY.
3. MAXIMUM DEPTH TO INVERT 5000.
4. ADJUST MS TO PIPE GRADE BY TILTING CHAMBER. MAX DEVIATION FROM VERTICAL OF THE RISER TO BE 1:10 OR A MAXIMUM OF 300mm AT SURFACE.
5. ACCESS COVER, FRAME AND SUPPORT SLAB TO BE AS AUTHORISED BY WATER AGENCY SEE WSA PLAN SEW-1317.

Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE SHAFTS TYPICAL INSTALLATION		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN VC	A3	010-035	
		DES			
		CHKD MW	CADFILE 010-035.dwg	DATE 31/08/2016	

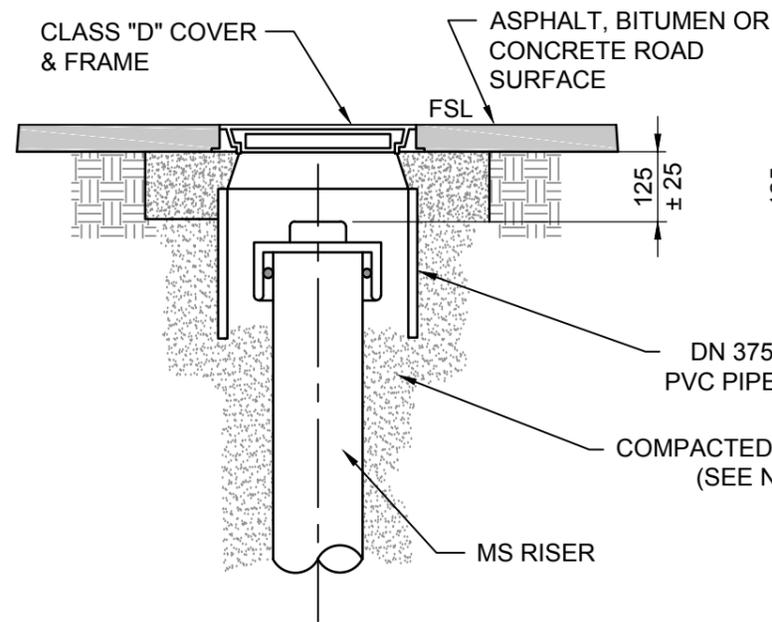


PLAN

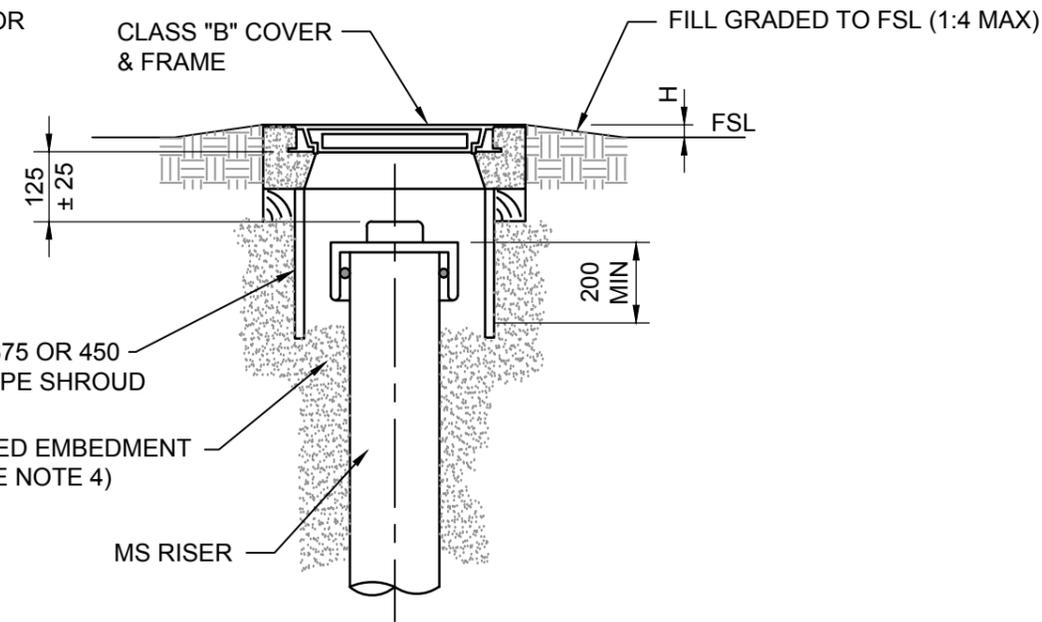


PLAN

FINISHED LEVELS OF MS COVERS	
LOCATION	H
UNDEVELOPED AREAS	100
NEW SUBDIVISIONS	75
ROADS, LANE WAYS, FOOTWAYS & DRIVEWAYS	FLUSH
EXISTING BUILT UP AREAS	25



ELEVATION
TRAFFICABLE COVER
(CLASS D)



ELEVATION
NON TRAFFICABLE COVER
(CLASS B)

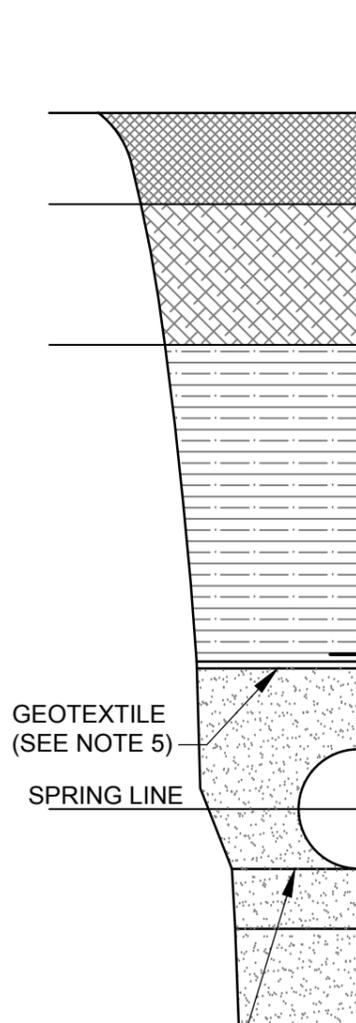
NOTES

- ALL DIMENSIONS IN MILLIMETRES.
- COVER PLACEMENT:
 - CLASS "B" FOR FOOTWAYS, PARKS AND EASEMENTS.
 - CLASS "D" FOR TRAFFICABLE AREAS.
- COVERS AND MEANS OF SUPPORT TO BE AS AUTHORISED BY THE WATER AGENCY.
- COMPACT BACKFILL UNDER ACCESS COVER CONCRETE SUPPORT SLABS AND SURROUNDS IN ACCORDANCE WITH DESIGN DRAWINGS.

Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER MAINTENANCE SHAFTS AND CHAMBERS TYPICAL MS AND MC COVER ARRANGEMENTS	SURV	AS SHEET SIZE	DRAWING No	AMDT No	
	DRWN VC	A3	010-036		
	DES				
	CHKD MW	CADFILE 010-036.dwg	DATE 31/08/2016		

MATERIAL		ZONE	
ROAD SURFACE	VERGE & TRACK		
ROAD SURFACE LAYER	TO MATCH EXISTING	SURFACE COURSE	
TO MATCH EXISTING ROAD BASE OR TO ROAD OWNER REQUIREMENTS	TRENCH FILL TO ROAD OWNER REQUIREMENTS OR INORGANIC FILL MATERIAL WITH 75 MAXIMUM STONE SIZE	ROAD BASE	
TRENCH FILL TO ROAD OWNER REQUIREMENTS OR INORGANIC FILL MATERIAL WITH 75 MAXIMUM STONE SIZE		TRENCH FILL (AS SPECIFIED IN DESIGN DRAWINGS)	
EMBEDMENT MATERIAL IN ACCORDANCE WITH DESIGN DRAWINGS AND COUNCIL REQUIREMENTS (SEE NOTE 4)		OVERLAY (300mm in Rock)	EMBEDMENT
		SIDE SUPPORT	
		BEDDING	
		OVER - EXCAVATION	

VEHICULAR LOADING



DESIGN INVERT LEVEL

MINIMUM PIPE COVER

LOCATION	MINIMUM COVER #
PRIVATE PROPERTY NON VEHICULAR NEW DEVELOPEMENT	600
PRIVATE PROPERTY NON VEHICULAR EXISTING DEVELOPEMENT	450
PRIVATE PROPERTY VEHICULAR	750
FOOTPATH, SEALED ROADS (NON ARTERIAL)	900
UNSEALED ROADS	1200
ARTERIAL ROADS	1200

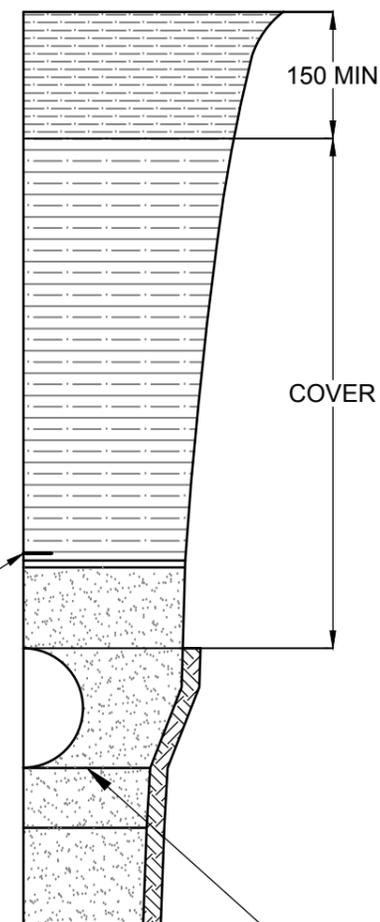
WHERE MINIMUM COVER CAN NOT BE ACHIEVED. PROVIDE ALTERNATIVE PROTECTION OF THE PIPELINE

MARKING TAPE #

SPRING LINE TRENCH CLEARANCE

NOMINAL DIAMETER DN	MINIMUM CLEARANCE "Lc"
≤ 150	≤ 100
>150 - ≤ 300	150
>300 - ≤ 450	200
>450 - ≤ 900	300
>900 - ≤ 1500	350

TRENCH WIDTH TO BE SUFFICIENT TO SAFELY LAY PIPE AND COMPACT THE SIDE SUPPORT ZONE



HAUNCH SUPPORT

ZONE		MATERIAL
TOPSOIL OR PAVEMENT		ORIGINAL OR IMPORTED MATERIAL TO MATCH EXISTING
TRENCH FILL		INORGANIC FILL MATERIAL WITH 75 MAXIMUM STONE SIZE
OVERLAY (300mm Rock)	EMBEDMENT	EMBEDMENT MATERIAL IN ACCORDANCE WITH DESIGN DRAWINGS AND COUNCIL REQUIREMENTS (SEE NOTE 4)
SIDE SUPPORT		
BEDDING		
OVER - EXCAVATION		

NO VEHICULAR LOADING

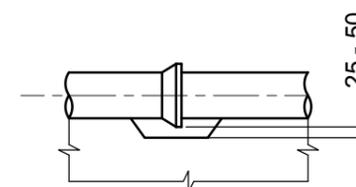
INCLUDES LOCATIONS WHERE OCCASSIONAL VEHICLE LOADING OCCURS eg RESERVE AND FOOTWAYS

LEGEND

SPECIFIED BY DESIGNER IN DESIGN DRAWINGS

NOTES:

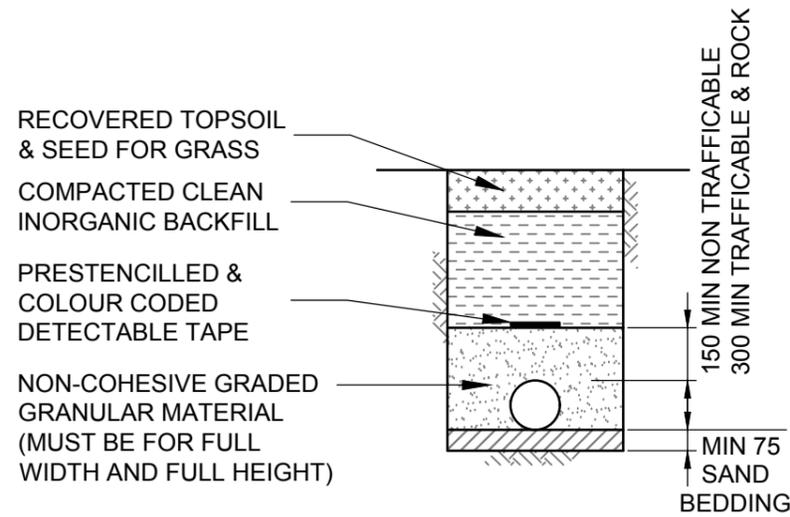
- ALL DIMENSIONS IN MILLIMETRES.
- SPECIFY SPECIAL BEDDING TO SUIT THE CONDITIONS IF THE TRENCH FLOOR HAS:
 - IRREGULAR OUTCROPS OF ROCK.
 - AHBP OF <50 kpa, OR
 - BEEN DISTURBED BY UNCONTROLLED GROUND WATER
- COMPACT AND EVENLY GRADE FINISHED TRENCH FLOOR.
- EMBEDMENT, TRENCH FILL AND COMPACTION TO MEET THE REQUIREMENT OF DESIGN DRAWINGS AND WSA_02.
- USE GEOTEXTILE FILTER FABRIC WHERE SPECIFIED.
- SIDES OF EXCAVATION TO BE KEPT VERTICAL TO AT LEAST 150 ABOVE PIPE.
- MARKER TAPE NOT REQUIRED FOR GRAVITY MAINS.



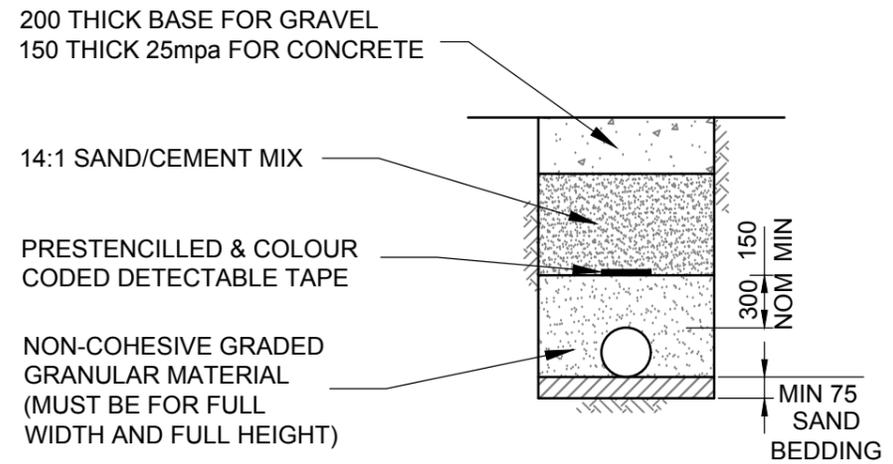
PIPE JOINT BEDDING POCKET FOR JOINT PROJECTIONS (SOCKETS, FLANGES etc)

PROVIDE POCKETS IN BEDDING AT JOINTS PRIOR TO LAYING PIPES. FILL VOID DURING COMPLETION OF EMBEDMENT

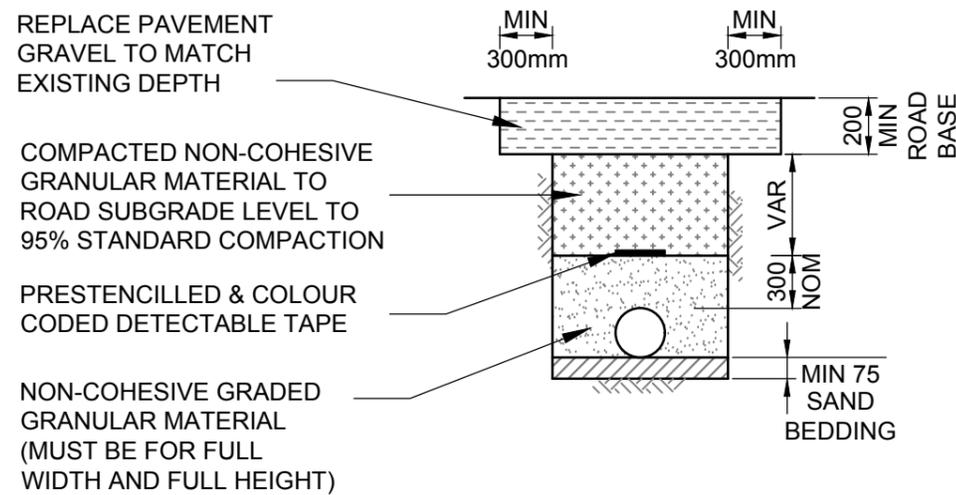
Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT	DATE	DATE	
SEWER MAIN EMBEDMENT & TRENCH FILL TYPICAL ARRANGEMENT		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	A3	010-037	
		DES			
		CHKD	CADFILE 010-037.dwg	DATE 31/08/2016	



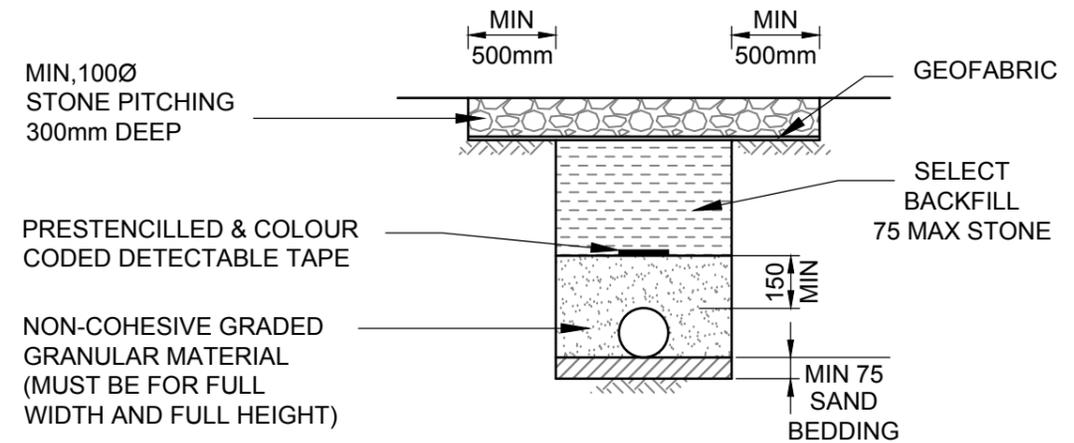
SEWER IN NON TRAFFICABLE LOCATIONS



PVC SEWER PIPE UNDER GRAVEL / CONCRETE DRIVEWAYS



SEWER ROAD CROSSING

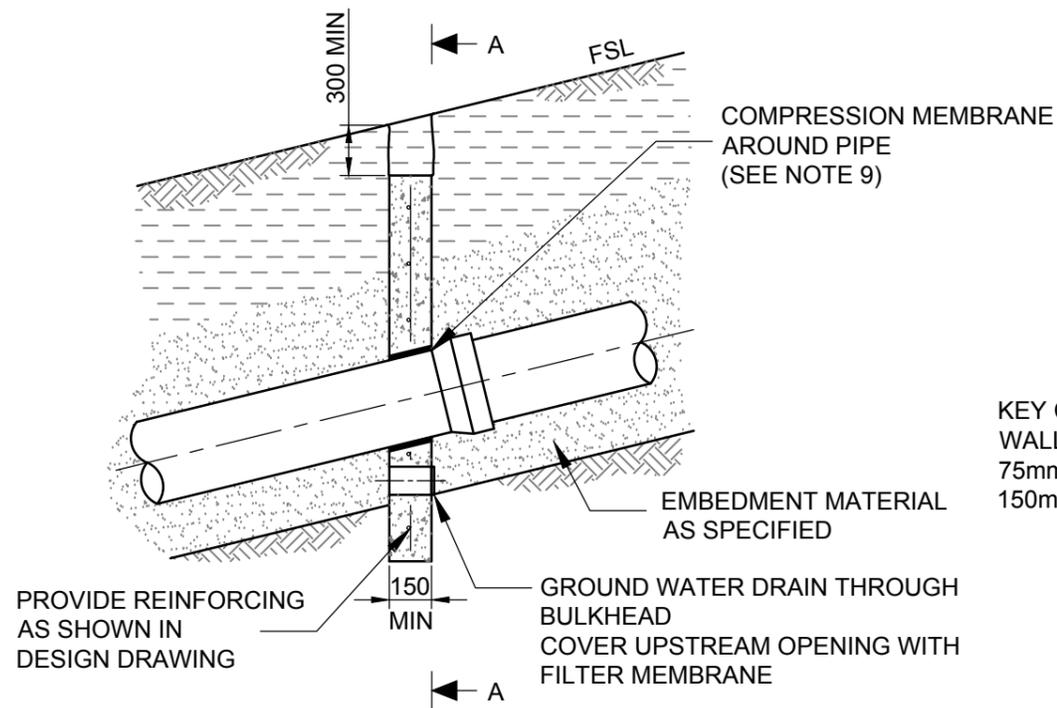


SEWER WATERCOURSE CROSSING

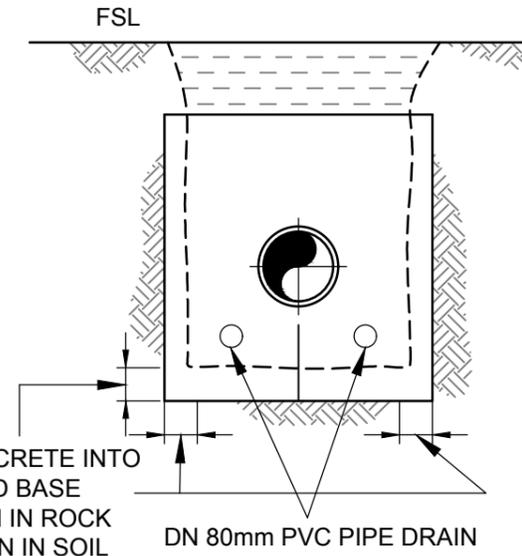
NOTE:

1. DETECTABLE TAPE NOT REQUIRED FOR SEWER GRAVITY MAINS.

Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
STANDARD SEWER TRENCH DETAILS		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	A3	010-038	
		DES			
		CHKD	CADFILE 010-038.dwg	DATE 31/08/2016	



CONCRETE BULKHEAD DETAIL



SECTION A-A

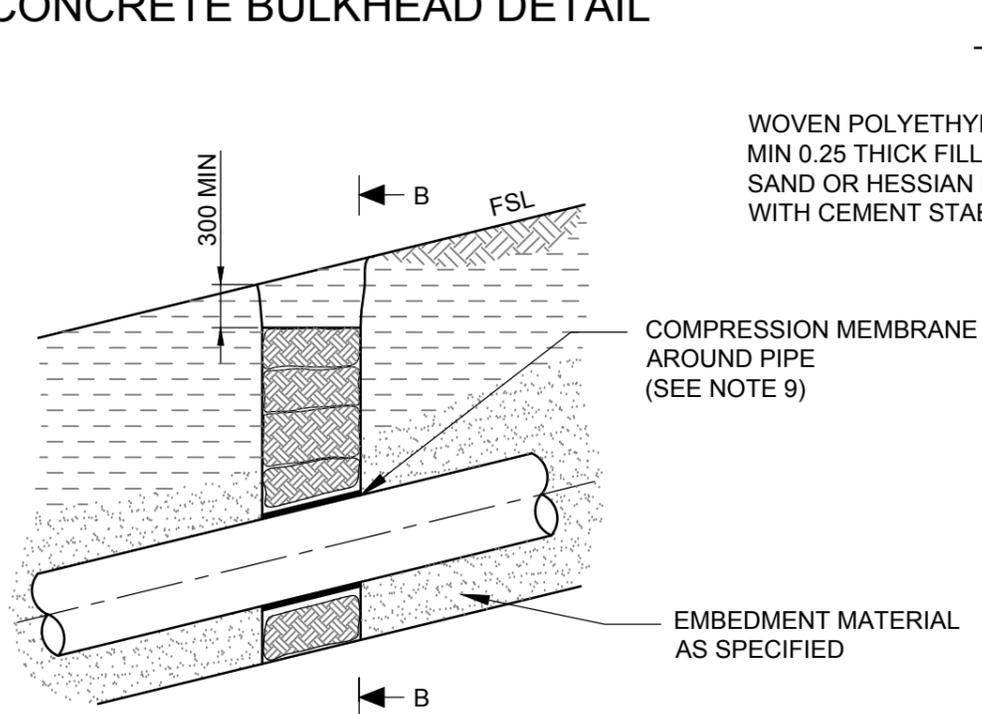
GRADE %	REQUIREMENT	SPACING S m
5 - 14	TRENCHSTOPS	$S = 100/\text{GRADE} (\%)$
15 - 29	CONCRETE BULKHEAD	$S = L_p/\text{Grade} (\%)$, WHERE $L_p = 80 \times \text{PIPE LENGTH}^*$, m (450 m MAX) WHERE $L_p > 100$ m - USE INTERMEDIATE TRENCHSTOPS AT SPACING $< 100/\text{GRADE} (\%)$
30 - 50	CONTINUOUS CONCRETE ENCSEMENT OF PIPELINE AND CONCRETE BULKHEADS	$S = 100/\text{GRADE} (\%)$
> 50	SPECIAL DESIGN	

WSA TABLE 9.1

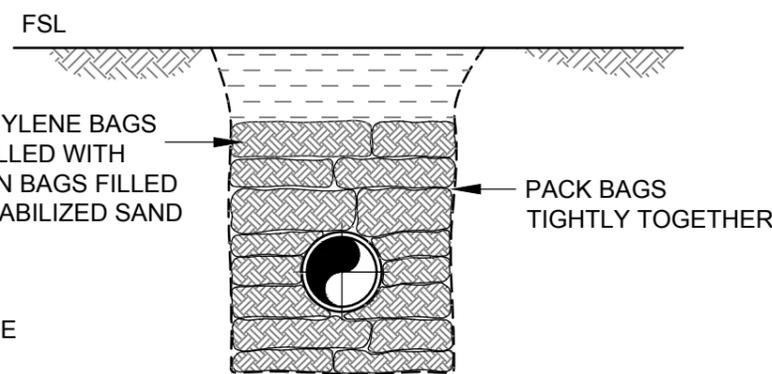
REQUIREMENTS FOR BULKHEADS AND TRENCHSTOPS

NOTES:

- ALL DIMENSIONS IN MILLIMETRES.
- CONSTRUCT CONCRETE BULKHEADS AND TRENCHSTOPS AT LOCATION SPECIFIED IN THE DESIGN DRAWINGS.
- LOCATE BULKHEADS AT A RETAINING WALL UNDER THE WALL.
- KEY CONCRETE BULKHEADS INTO SIDES AND BOTTOM OF TRENCH AGAINST A BEARING SURFACE OF UNDISTURBED SOIL.
- CONCRETE THE BE CLASS N25.
- DO NOT DEFORM PIPING DURING PLACEMENT OF CONCRETE.
- SEAL BAGS TO PREVENT LEAKAGE OF CONTAINED MATERIAL.
- PROVIDE CONTINUOUS DRAINAGE PATH
 - THROUGH BULKHEADS AND TRENCHSTOPS
 - AROUND MAINTENANCE HOLES
 - IN TRENCH EXCAVATIONS ACROSS ROADWAYS
- COMPRESSIBLE MEMBRANE AROUND PIPE TO BE 10mm EXPANSION FOAM or 3mm MIN THICK RUBBER FOR BULKHEADS AND TRENCHSTOPS ON SLOPES.

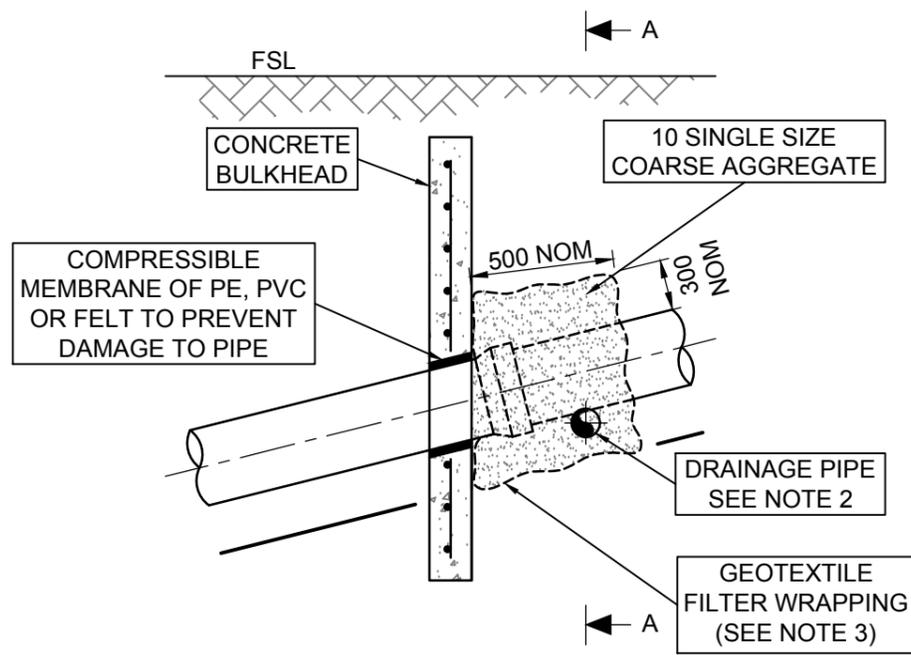


TRENCHSTOP DETAIL

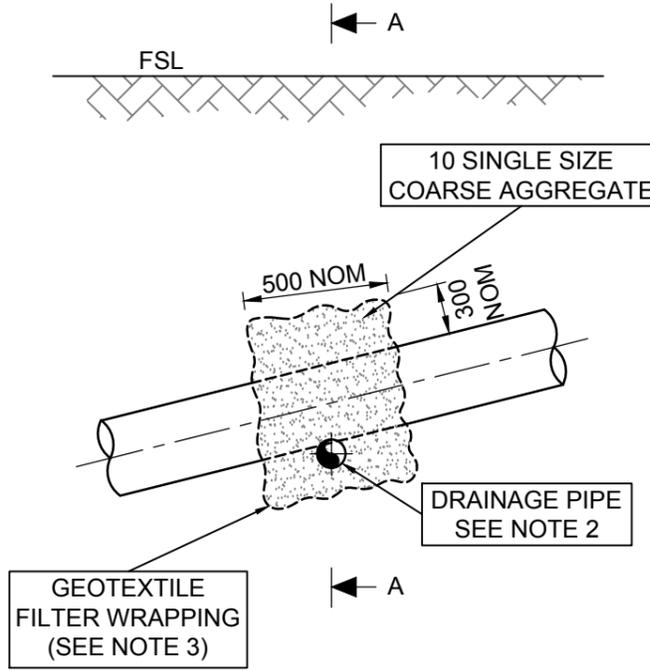


SECTION B-B

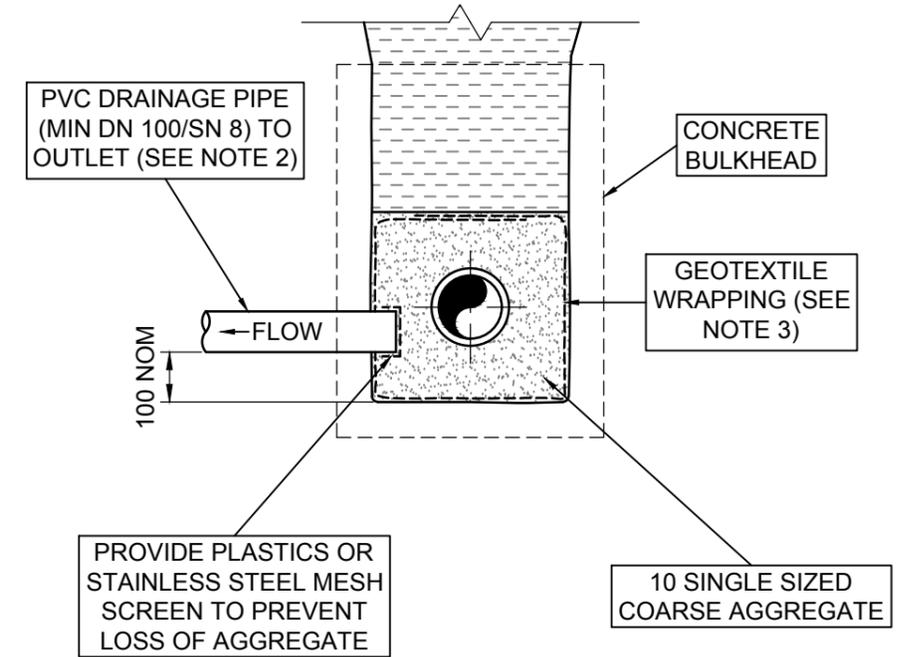
Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES NTS	APPROVED D. MAUNDER 31/08/2016 <small>MANAGER ENGINEERING AND STANDARDS SUPPORT</small>	SHEET 1 OF 1
		SURV DRWN GW DES CHKD MW	AS SHEET SIZE A3
SEWER MAIN EMBEDMENT & TRENCH FILL TYPICAL ARRANGEMENT		CADFILE 010-039.dwg	DATE 31/08/2016



WSA FIGURE 9.18 TYPICAL TRENCH DRAINAGE DETAIL AT BULKHEAD

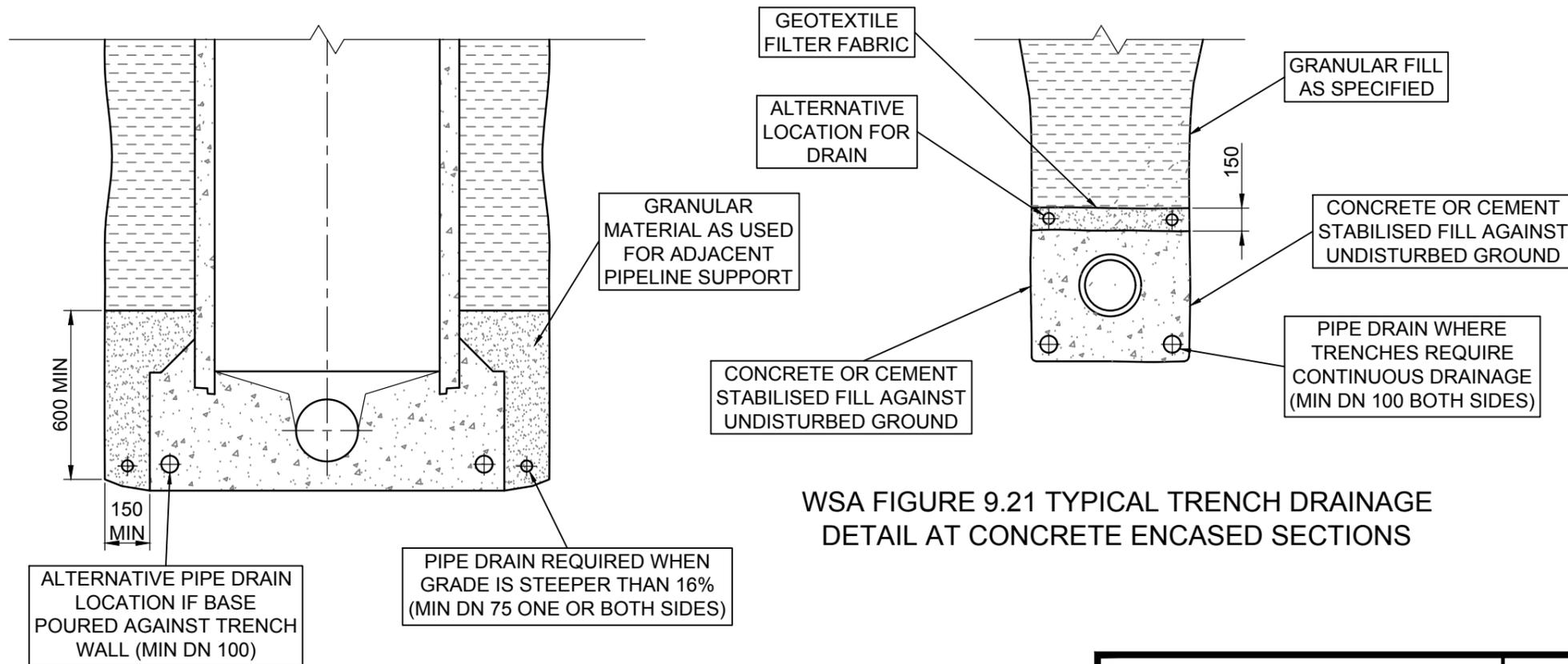


DRAINAGE SYSTEM WITHOUT BULKHEADS



DETAIL A-A

TYPICAL DISCHARGE SYSTEM FOR PIPE TRENCHES



WSA FIGURE 9.21 TYPICAL TRENCH DRAINAGE DETAIL AT CONCRETE ENCASED SECTIONS

WSA FIGURE 9.19 TYPICAL TRENCH DRAINAGE DISCHARGE

NOTES:

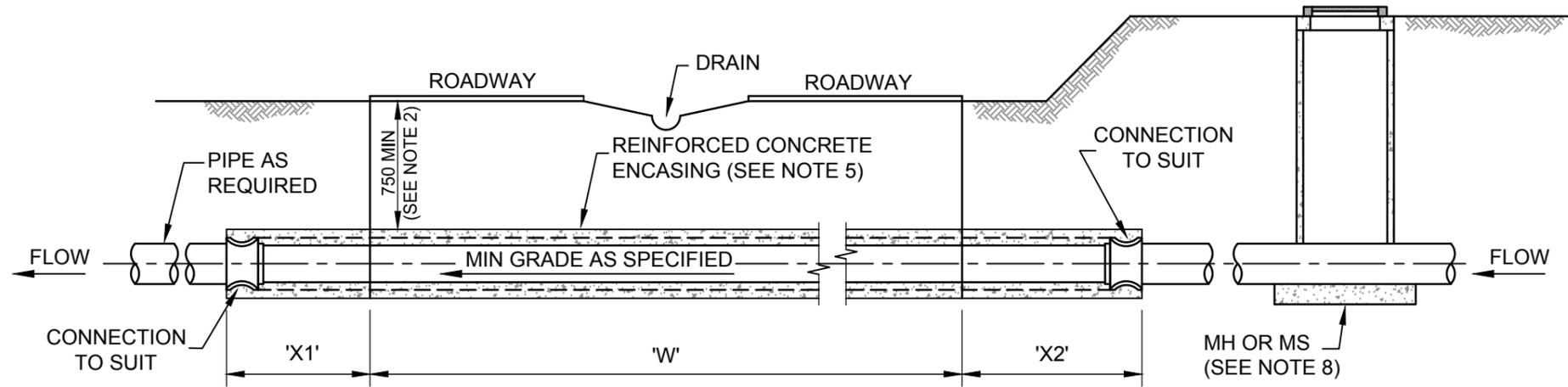
1. ALL DIMENSIONS IN MILLIMETERS
2. DRAINAGE PIPES TO DISCHARGE INTO AUTHORISED WATER DISCHARGE AREAS AS DETAILED IN DESIGN DRAWINGS
3. LAY GEOTEXTILE FABRIC IN TRENCH TO FULLY ENCAPSULATE THE DRAINAGE MATERIAL (COARSE AGGREGATE). PROVIDE MINIMUM OF 250 LAP AT ALL FILTER FABRIC JOINTS. USE DRAINAGE SYSTEMS AS SPECIFIED WHERE SEWER IS LAID AT A GRADE OF $\geq 16\%$
4. PROVIDE CONTINUOUS DRAINAGE PATH
 - THROUGH BULKHEADS
 - AROUND MAINTENANCE STRUCTURES
 - IN TRENCH EXCAVATIONS ACROSS ROADWAYS

WSA FIGURE 9.22 TYPICAL TRENCH DRAINAGE AROUND MHS

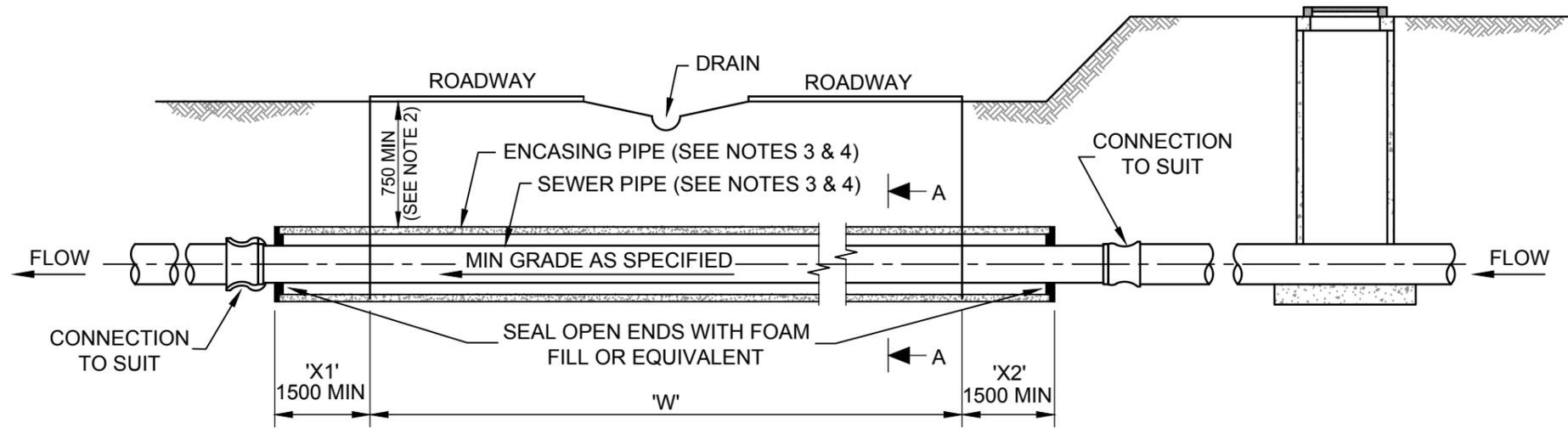
Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS		MANAGER ENGINEERING AND STANDARDS SUPPORT	DATE	
SEWER TRENCH DRAINAGE TYPICAL SYSTEMS		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	ST	010-040	
		DES			
		CHKD	MW	CADFILE 010-040.dwg	DATE 31/08/2016

NOTES

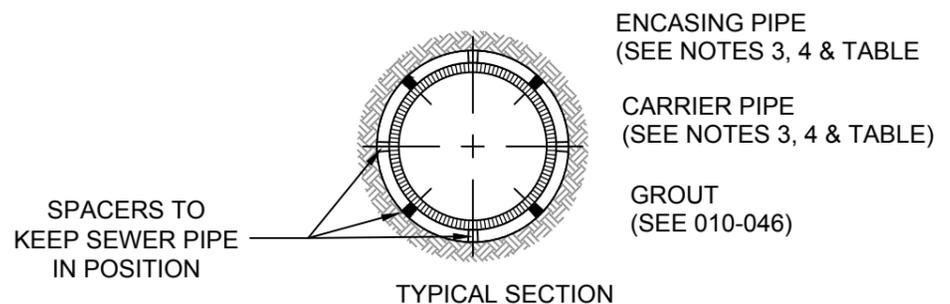
1. ALL DIMENSIONS IN MILLIMETERS.
2. METHODS OF INSTALLATION TO BE SHOWN IN DESIGN DRAWINGS OR AS DIRECTED BY THE WATER AUTHORITY OR THE ROAD AUTHORITY. DIFFICULT CONDITIONS MAY REQUIRE SPECIAL ARRANGEMENTS.
3. HORIZONTAL BORING
 - ENCASING PIPE
 - RC CLASS 4 OR
 - STEEL (BARE) PIPE. WALL THICKNESS TO BE AS SPECIFIED IN THE DESIGN DRAWINGS OR GRP
 - SEWER PIPE
 - DI WITH POLYMERIC LINING 2100 SERIES PN 35
 - PVC CLASS SN 8
 - PE CLASS PN 12.5
 - GRP CLASS SN 5000 MIN
4. JACKING
 - ENCASING PIPE
 - REINFORCING CONCRETE CLASS 4 BUTT JOINT WITH STEEL LOCATING BANDS, STEEL OR GRP JACKING PIPE
 - SEWER PIPE
 - DI WITH POLYMERIC LINING 2100 SERIES PN 35
 - PVC CLASS SN 8
 - PE CLASS PN 12.5
 - GRP CLASS SN 5000 MIN
5. CONCRETE ENCASED
 - PIPE MATERIAL TO BE;
 - STEEL WITH FBPE INTERNAL COATING
 - PE CLASS PN 12.5
 - PVC (SWJ) CLASS SN 8
 - GRP CLASS SN 5000 MIN
 - NO SERVICE CONNECTIONS TO BE MADE TO ENCASED SECTION OF PIPELINE
 - ENCASING AS PER ENGINEERING CODE
 - NO EXTERNAL COATING REQUIRED ON CONCRETE ENCASED WELDED STEEL PIPELINE
6. DIMENSION 'X1' & 'X2' AND LOCATION OF BULKHEADS & REINFORCING TO BE SHOWN ON DESIGN DRAWINGS.
7. FILL VOID BETWEEN BORED HOLE AND CASING PIPE WITH GROUT AS SHOWN ON 010-046.
8. LOCATE MH OR MS AT LEAST 6000 FROM TOP OF BANK .
9. CONSTRUCTION TO BE ACCORDANCE WITH DESIGN DRAWINGS.



CONCRETE ENCASED METHOD
FOR INSTALLATIONS PRIOR TO ROAD CONSTRUCTION
(SEE NOTE 6)



BORED OR JACKED ENCASING PIPE METHOD

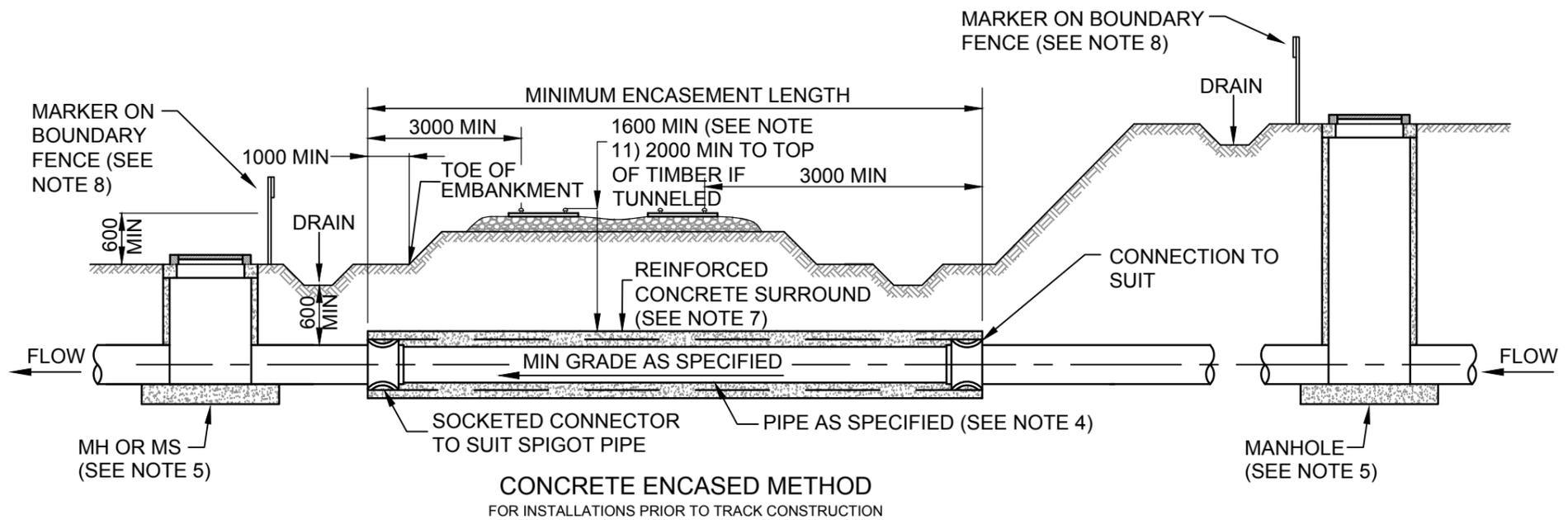


TYPICAL SECTION

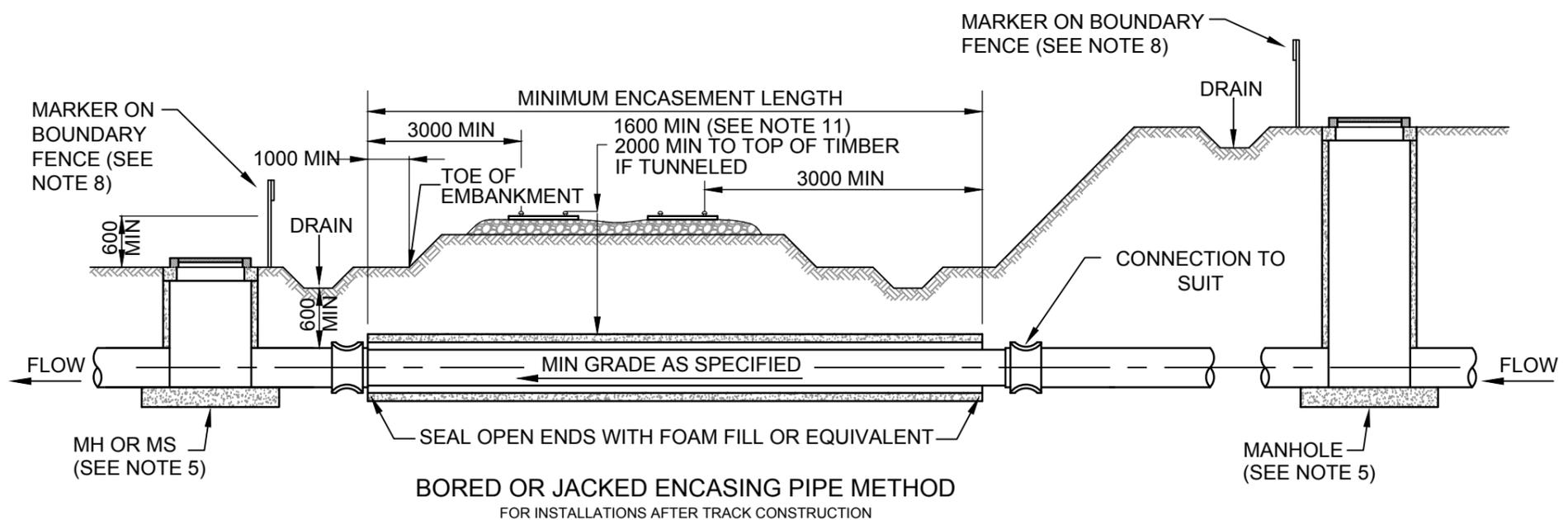
ENCASING & SEWER PIPE ARRANGEMENT

BORED AND JACKED ENCASING / SEWER PIPE SIZES										
SEWER PIPE (DN)	100	150	225	300	375	400	500	550	650	800
BORE ENCASING PIPE MIN (DN)	300	375	425	500	575	600	700	750	850	1000
JACKED ENCASING PIPE (DN)	N/A					1200 MIN				

	SCALES NTS	APPROVED D. MAUNDER 31/08/2016 MANAGER ENGINEERING AND STANDARDS SUPPORT	SHEET 1 OF 1	
		SURV DRWN TY DES CHKD MW	AS SHEET SIZE A3	DRAWING No 010-041
BURIED SEWER CROSSING ROADWAYS		CADFILE 010-041.dwg DATE 31/08/2016		



CONCRETE ENCASED METHOD
FOR INSTALLATIONS PRIOR TO TRACK CONSTRUCTION

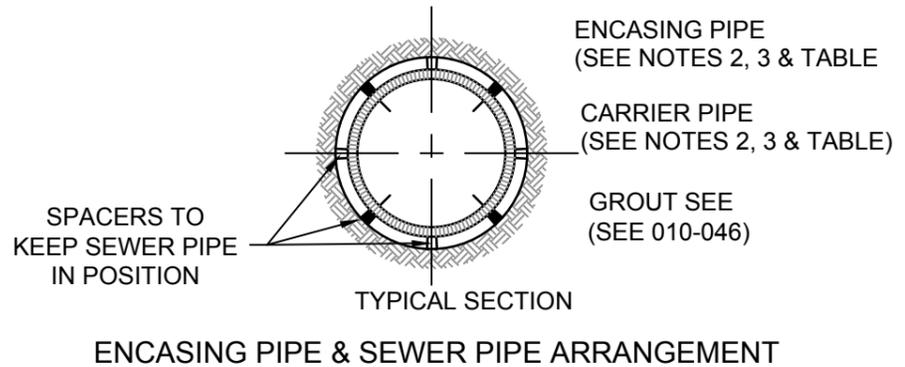


BORED OR JACKED ENCASED PIPE METHOD
FOR INSTALLATIONS AFTER TRACK CONSTRUCTION

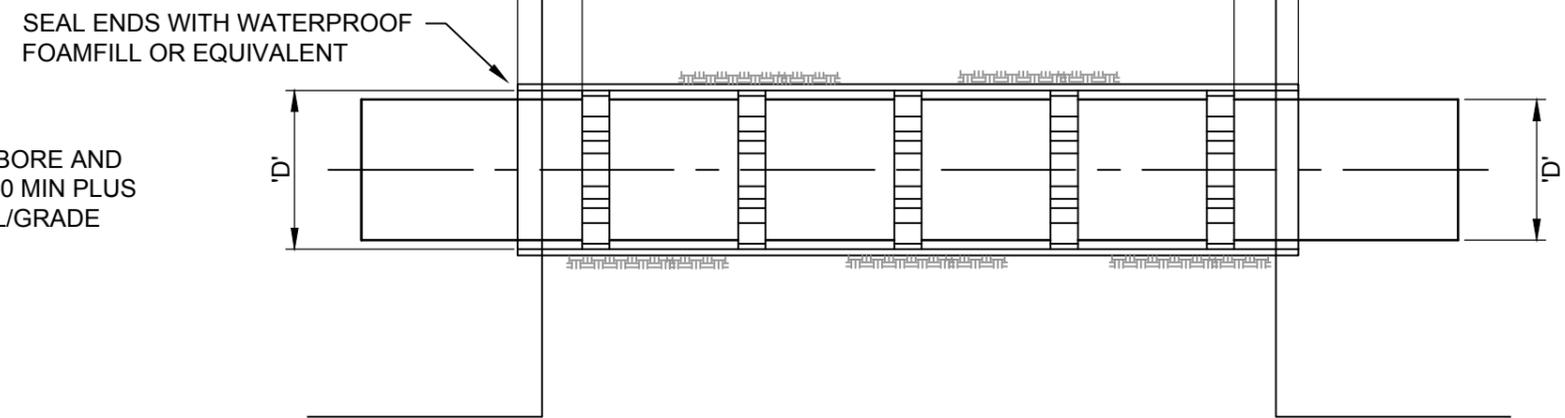
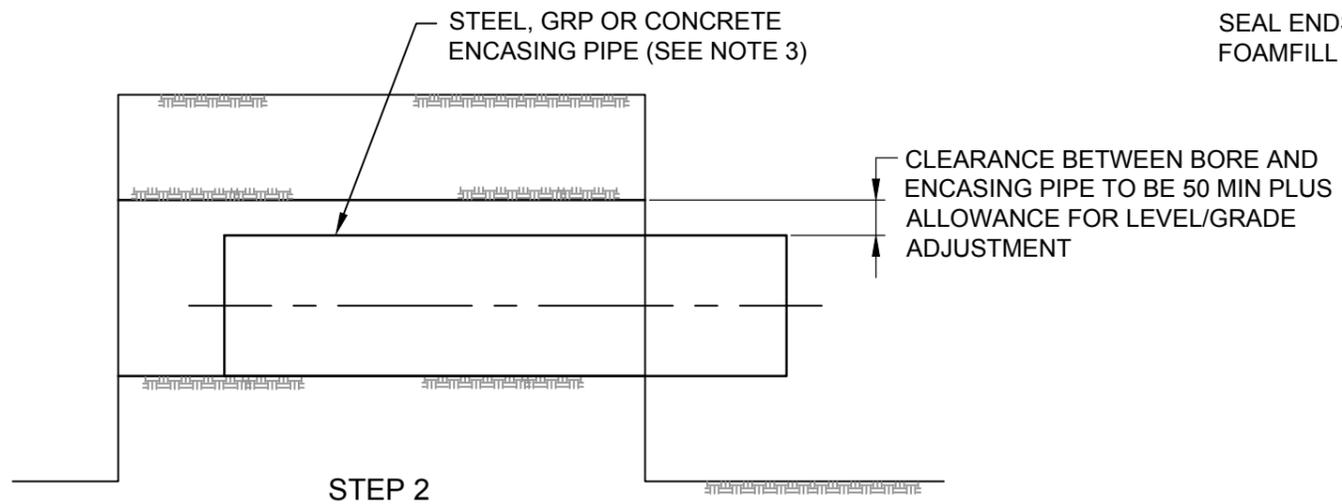
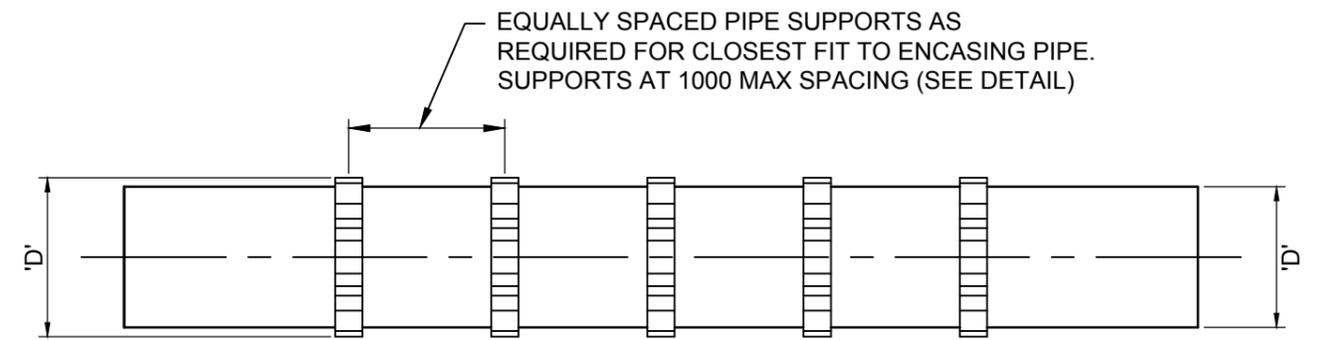
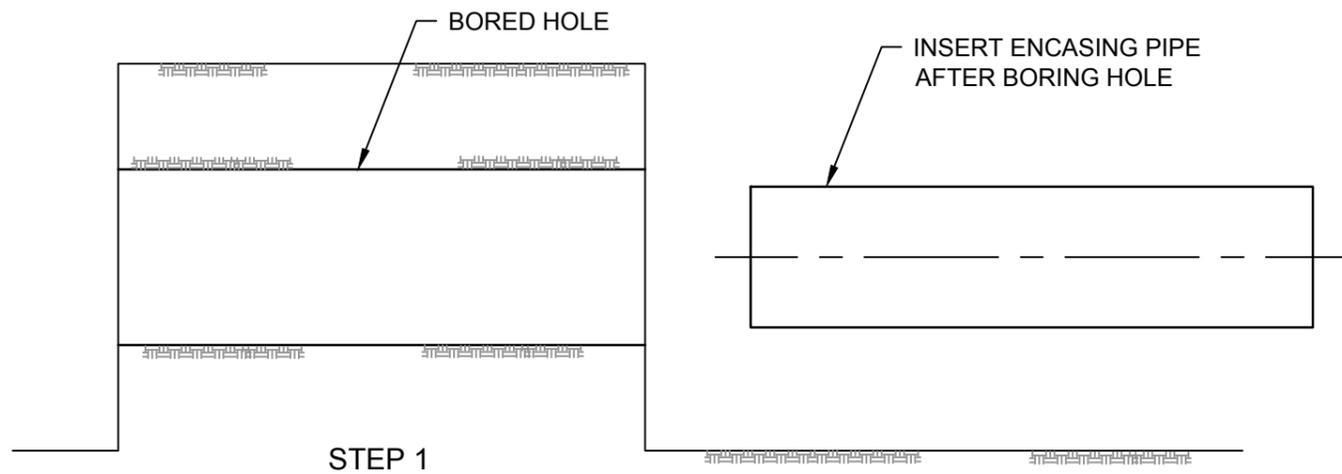
NOTES

1. ALL DIMENSIONS IN MILLIMETERS.
2. HORIZONTAL BORING
ENCASING PIPE
- REINFORCED CONCRETE CLASS 4 BUTT JOINTED WITH STEEL LOCATING BAND OR MILD STEEL OR GRP PIPE
SEWER PIPE
- STEEL CEMENT LINED WITH FUSION BONDED PE COATING
- DI WITH POLYMERIC LINING 2100 SERIES PN 35
- PVC CLASS SN 8
- PE CLASS PN 12.5
- GRP CLASS SN 5000 MIN
3. JACKING
ENCASING PIPE
- REINFORCING CONCRETE CLASS 4 BUTT JOINT WITH STEEL LOCATING BANDS OR GRP JACKING PIPE
SEWER PIPE
- STEEL CEMENT LINED WITH FUSION BONDED PE COATING
- DI WITH POLYMERIC LINING CLASS PN 35
- PVC (SWJ) CLASS SN 8
- PE CLASS PN 12.5
- GRP CLASS SN 5000 MIN
4. CONCRETE ENCASED
- THE PIPE MATERIAL TO BE;
 • STEEL WITH FBPE INTERNAL COATING
 • PE CLASS PN 12.5
 • PVC (SWJ) CLASS SN 8
 • GRP CLASS SN 5000 MIN
- NO SERVICE CONNECTIONS TO BE MADE TO ENCASED SECTION OF PIPELINE
- ENCASING AS SHOWN 010-046.
5. MANHOLE TO BE LOCATED AT LEAST 6000 FROM THE TOE OF EMBANKMENT OR TOP OF CUT
6. FOR DI MAINS, ALL FITTINGS TO BE FUSION BONDED COATED
7. SEWER PIPE <DN 150 CAN BE DIRECTLY BORED USING PE PIPE
8. PLACE MARKERS ABOVE PIPELINE AT THE POINTS WHERE IT ENTERS AND LEAVES THE PROPERTY
9. PROVIDE CATHODIC PROTECTION AS DIRECTED BY THE RAILWAY AUTHORITY PROVIDE ELECTRICAL CONTINUITY AND INSULATION AS SPECIFIED IN DESIGN DRAWINGS
10. DESIGN TO BE IN ACCORDANCE WITH AS 4799 - RAILWAY REQUIREMENTS
11. MINIMUM COVER FOR ALL PIPELINES BELOW RAIL LINES:
- NOT LESS THAN 1600 BELOW RAIL LEVEL
- NOT LESS THAN 600 BELOW FORMATION LEVEL
 ie THE GROUND LEVEL IMMEDIATELY BELOW THE RAIL BALLAST
- NOT LESS THAN 2000 BELOW RAIL LEVEL TO TOP OF TIMBER FOR TUNNEL
12. FOR ELECTRIFIED RAILWAY SYSTEMS PREFERENCE SHOULD BE GIVEN TO THE USE OF NON-METALLIC PIPES

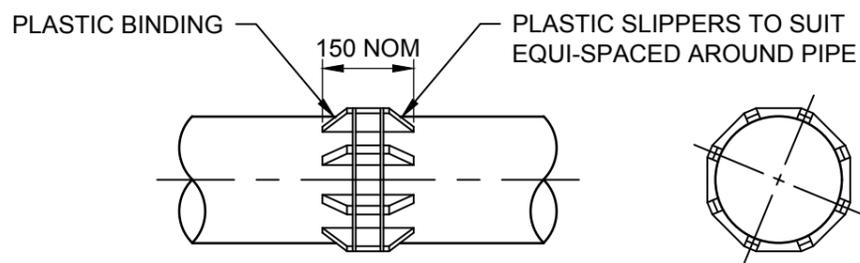
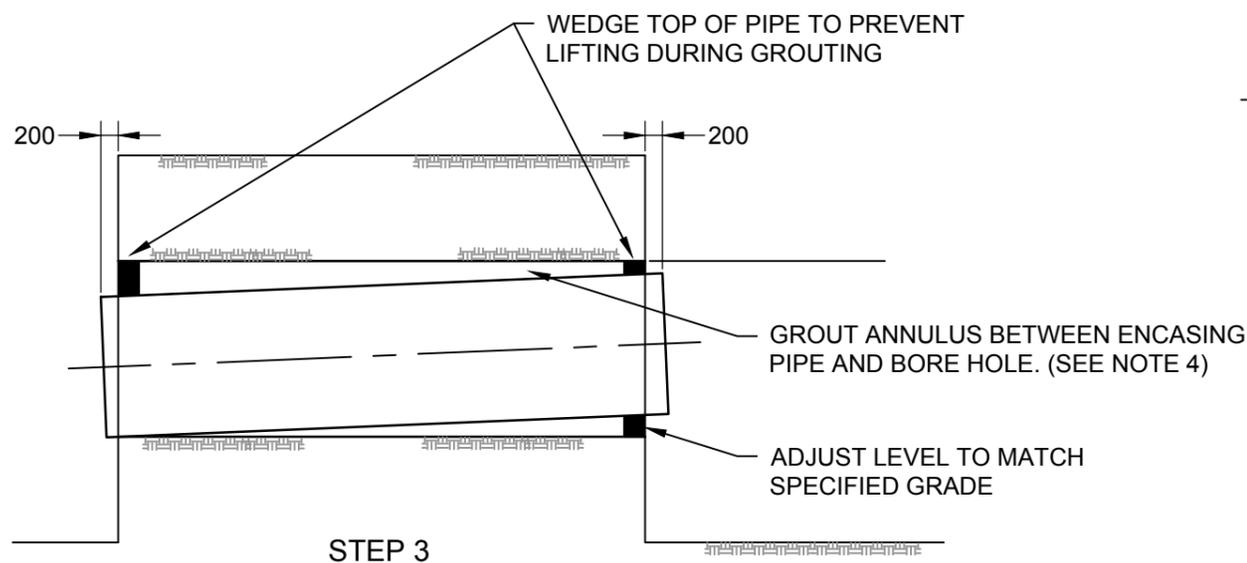
BORED AND JACKED ENCASED / SEWER PIPE SIZES										
SEWER PIPE (DN)	100	150	225	300	375	400	500	550	650	800
BORE ENCASED PIPE MIN (DN)	300	375	425	500	575	600	700	750	850	1000
JACKED ENCASED PIPE (DN)	N/A					1200 MIN				



Armidale Dept of Public Regional Council Infrastructure	SCALES		APPROVED	31/08/2016		SHEET 1 OF 1 DRAWING No 010-042 AMDT No
	NTS		D. MAUNDER		DATE	
			MANAGER ENGINEERING AND STANDARDS SUPPORT			
			AS SHEET SIZE			
BURIED SEWER CROSSING RAILWAYS			A3			
			CADFILE 010-042.dwg			
			DATE 31/08/2016			



TYPICAL FINISHED INSTALLATION



JACKED ENCASING PIPE SYSTEM
STEPS 1, 2 & 3 AS SHOWN.

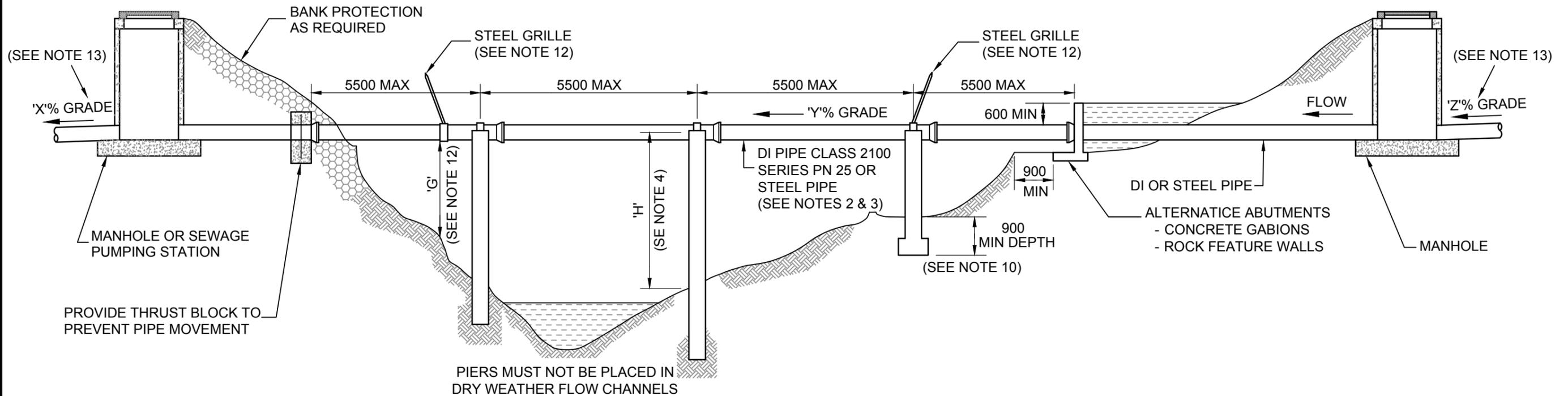
JACKED ENCASING PIPE SYSTEM
INSTALLATION OF JACKED ENCASING PIPE TO BE
CARRIED OUT BY SPECIALIST PIPE JACKING
COMPANY AUTHORIZED BY THE WATER AGENCY.

NOTES

1. ALL DIMENSIONS IN MILLIMETRES.
2. PIPE MATERIALS AND 'D' & 'd' TO BE AS SPECIFIED IN DESIGN DRAWING.
3. FULLY WELD STEEL ENCASING PIPES.
4. GROUTING MIX TO BE 1:1 (SAND:CEMENT) WITH A WATER:CEMENT RATIO 1:0.67 BY WEIGHT USING FINE WELL ROUNDED SAND. PLASTICISERS MAY BE USED OR FLYASH MIXES.

INSTALLATION OF BORED ENCASING PIPE

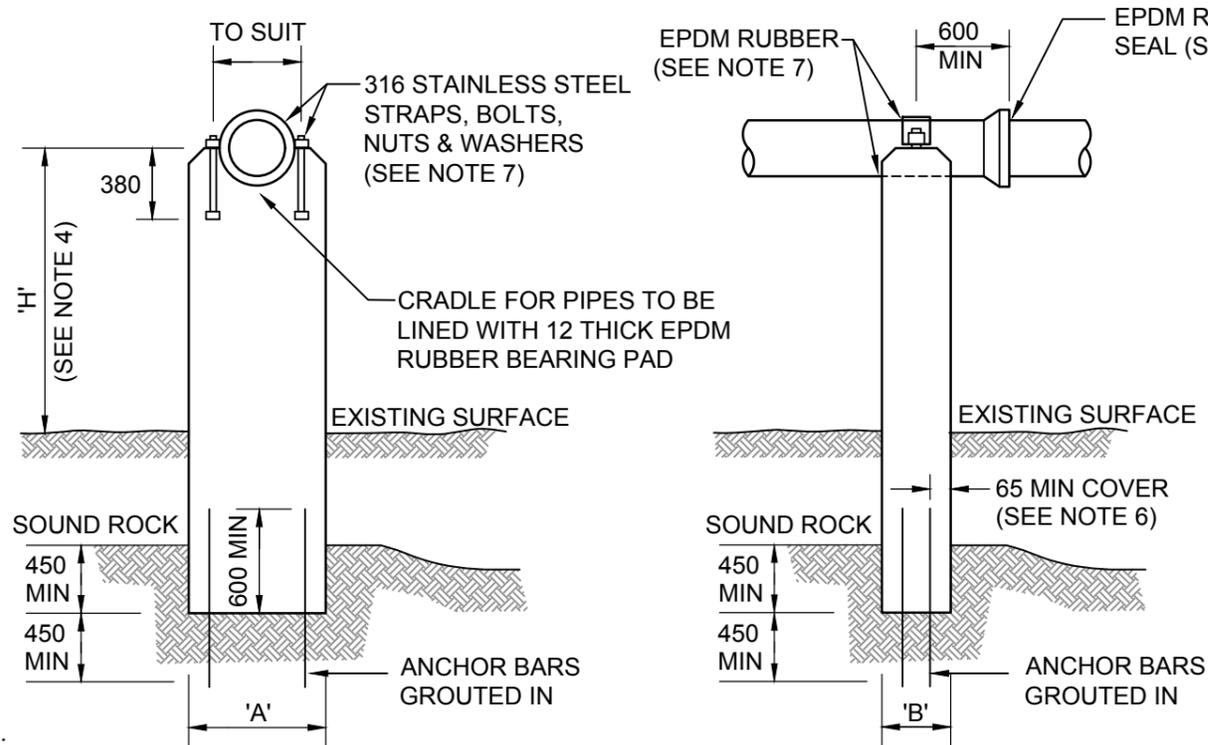
Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	DATE	SHEET	OF
	N.T.S	D. MAUNDER	31/08/2016	1	1
BURIED SEWER CROSSINGS BORED AND JACKED ENCASING PIPE DETAILS	SURV	MANAGER ENGINEERING AND STANDARDS SUPPORT		AS SHEET SIZE	DRAWING No
	DRWN	JB		A3	010-043
	DES				AMDT No
	CHKD	MW	CADFILE 010-043.dwg	DATE 31/08/2016	



TYPICAL AQUEDUCT

NOTES

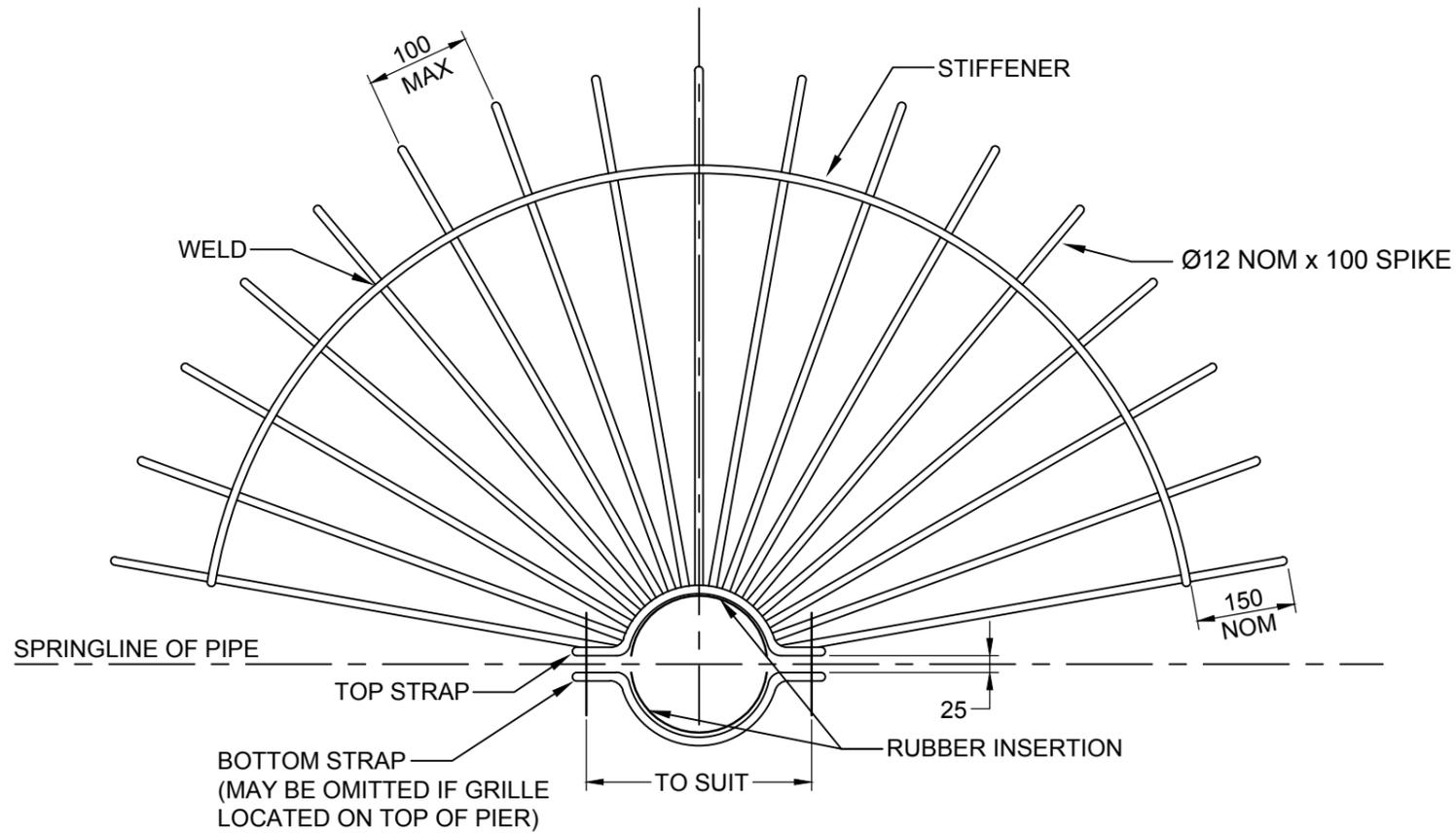
- ALL DIMENSIONS IN MILLIMETERS.
- DI PIPE WITH POLYMERIC LINING SHOWN. STEEL SINTALINED RRJ PIPE MAY BE USED AS AN ALTERNATIVE. AN EXPANSION JOINT IS REQUIRED FOR STEEL PIPE.
- MINIMUM SIZE OF PIPE AS AQUEDUCT TO BE DN 150.
- MAXIMUM HEIGHT 'H' OF CONCRETE PIER;
 - IN FLOOD CONDITIONS, SEE TABLE FOR MAXIMUM HEIGHT
 - IN NO FLOOD CONDITIONS, 5000 MAXIMUM
 - WHERE AQUEDUCT NEEDS TO BE HIGHER, SPECIFIC DESIGN CALCULATIONS NEED TO BE CARRIED OUT.
- CONCRETE TO N32 FOR PIERS.
- REINFORCEMENT AND CONCRETE DETAILS FOR PIERS AS SPECIFIED IN DESIGN DRAWINGS. 65 MIN COVER TO REINFORCEMENT
- STRAPS TO BE GRADE 316 STAINLESS STEEL. PLACE A 3 THICK x 100 WIDE EPDM RUBBER INSERTION AROUND THE PIPE WHERE IN CONTACT WITH THE STRAP AND CONCRETE.
- UNLESS OTHERWISE SPECIFIED IN THE DESIGN DRAWINGS, NO ADDITIONAL PROTECTION / COATING TO BE PROVIDED EXCEPT TO MAKE PIPES MORE ENVIRONMENTALLY ACCEPTABLE.
- CYLINDRICAL PIERS (Ø600 MIN) OR EQUIVALENT ARE AN ACCEPTABLE ALTERNATIVE.
- PIERS IN SOIL;
 - SPECIFY DEPTH OF PIER IN SOIL IN DESIGN DRAWINGS, BUT NOT LESS THAN 900.
 - SPECIFY TYPE AND SIZE OF FOOTING TO BE USED IN DESIGN DRAWINGS.
 - CONSTRUCT PIERS WITHOUT FOOTINGS TO THE DEPTH SPECIFIED IN DESIGN DRAWINGS.
- ASSEMBLE JOINTS WITH THE SPIGOT END WITHDRAWN 5 TO 10 FROM BACK OF THE SOCKET TO ACCOMMODATE EXPANSION AND CONTRACTIONS RESULTING FROM TEMPERATURE FLUCTUATIONS.
- PROVIDE STEEL GRILLES WHERE THE VERTICAL DISTANCE 'G' EXCEEDS 1800. GRILLE TO BE CLAMPED ON THE PIPELINE TO PREVENT MOVEMENT. SEE 010-048.
- % GRADES 'X', 'Y' AND 'Z' TO BE SHOWN IN DESIGN DRAWINGS.



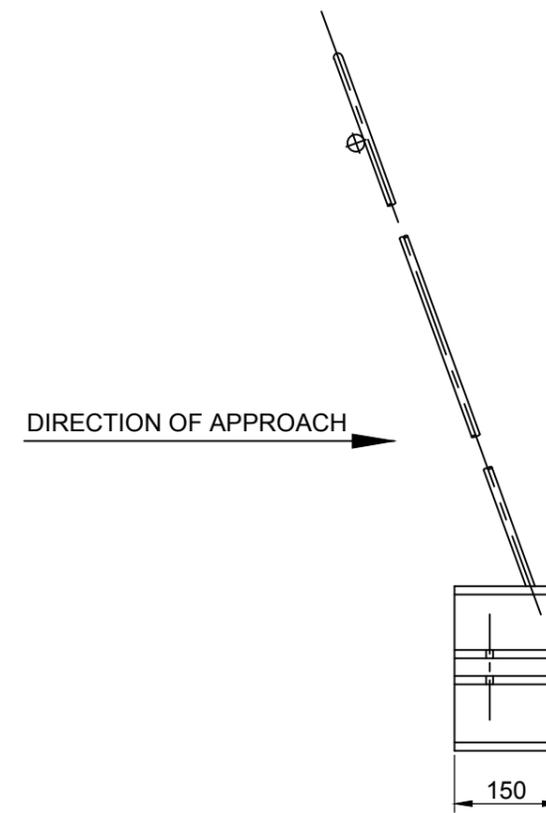
DETAIL OF CONCRETE PIER
(SEE NOTE 9)

DIMENSIONS FOR PIERS (SEE NOTES 4 & 9)			
SEWER PIPE NOMINAL SIZE DN	PIER		
	A	B	'H' MAX
150	450	300	2700
200	600	300	2100
250	600	300	2100
300	750	300	1800
375	750	450	1800
450	915	450	1800
500	915	450	1800
600	1070	450	1800
750	1200	450	1800

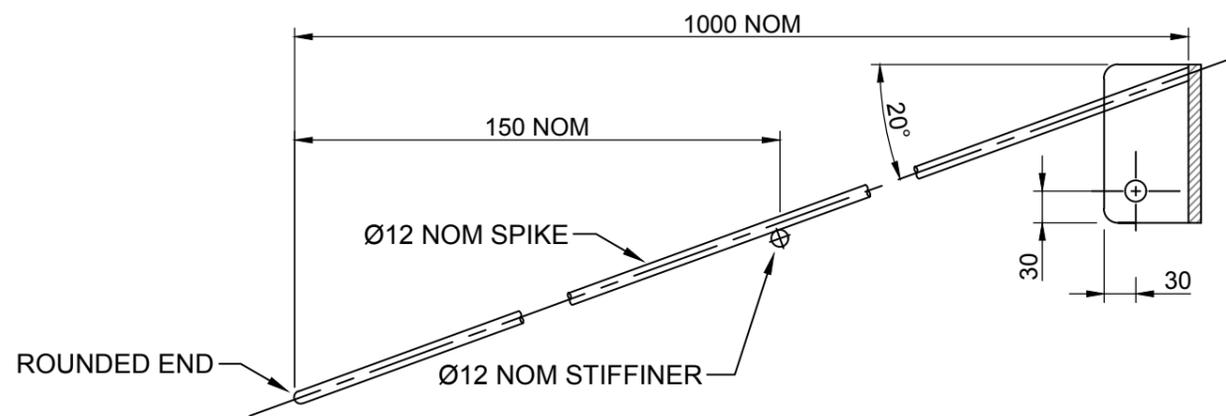
Armidale Dept of Public Regional Council Infrastructure	SCALES NTS	APPROVED D. MAUNDER MANAGER ENGINEERING AND STANDARDS SUPPORT 31/08/2016 DATE	SHEET 1 OF 1
	SEWER AERIAL CROSSINGS AQUEDUCT		AS SHEET SIZE A3 DRAWING No 010-044 AMDT No CADFILE 010-044.dwg DATE 31/08/2016
		SURV	DES
		DRWN GW	CHKD MW



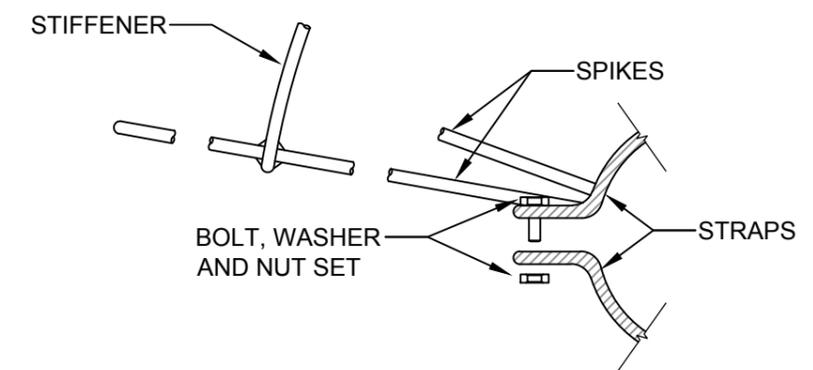
ELEVATION
STEEL PROTECTION GRILLE



END ELEVATION



PART PLAN



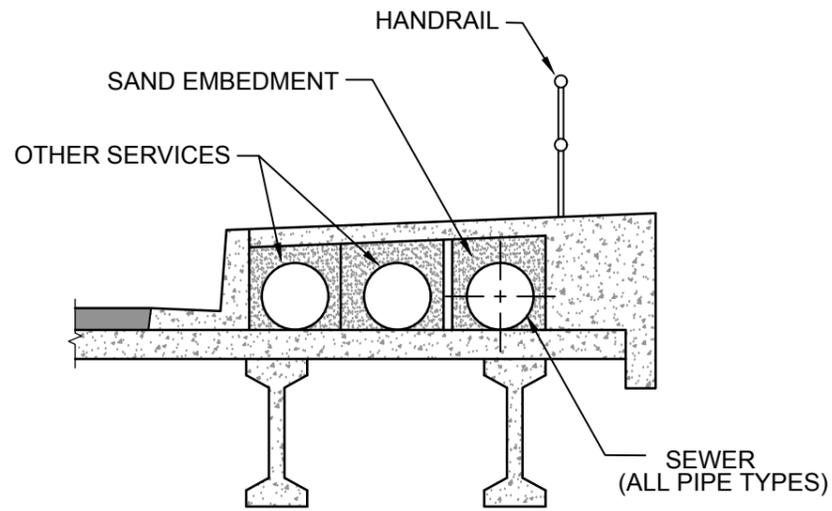
ELEVATION

COMPONENT AND FABRICATION DETAILS

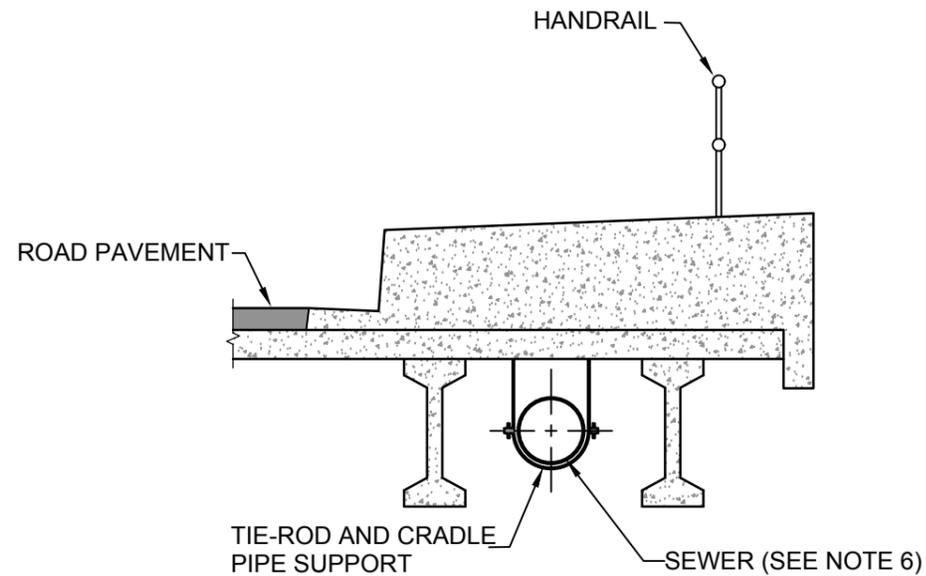
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. ALL ITEMS TO BE STEEL AND HOT DIPPED AFTER FABRICATION.
3. PLACE 3mm THICK RUBBER INSERTION BETWEEN CLAMPS AND PIPELINE.
4. INCLUDE SIGN "DANGER KEEP OFF" WHERE SPECIFIED BY WATER AGENCY.
5. STEEL TO BE GRADE 250 TO AS/NZ 3679.1.

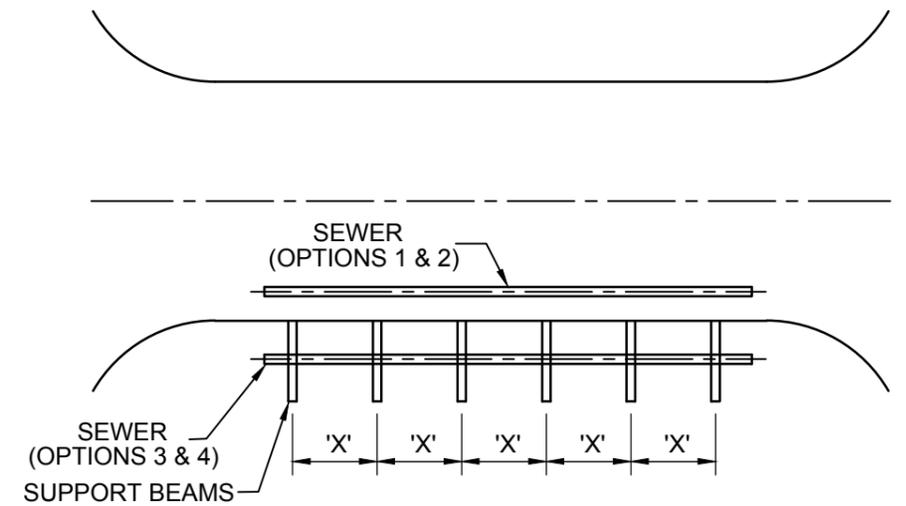
Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
SEWER AERIAL CROSSING AQUEDUCT PROTECTION GRILLE		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	A3	010-045	
		DES			
		CHKD	CADFILE 010-045.dwg	DATE 31/08/2016	



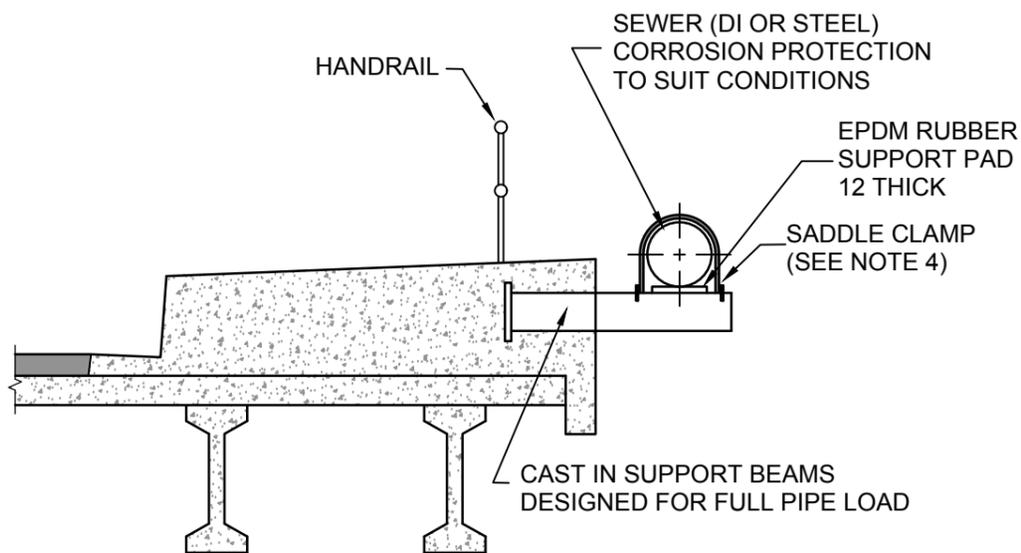
OPTION 1
NEW BRIDGE
(PREFERRED)



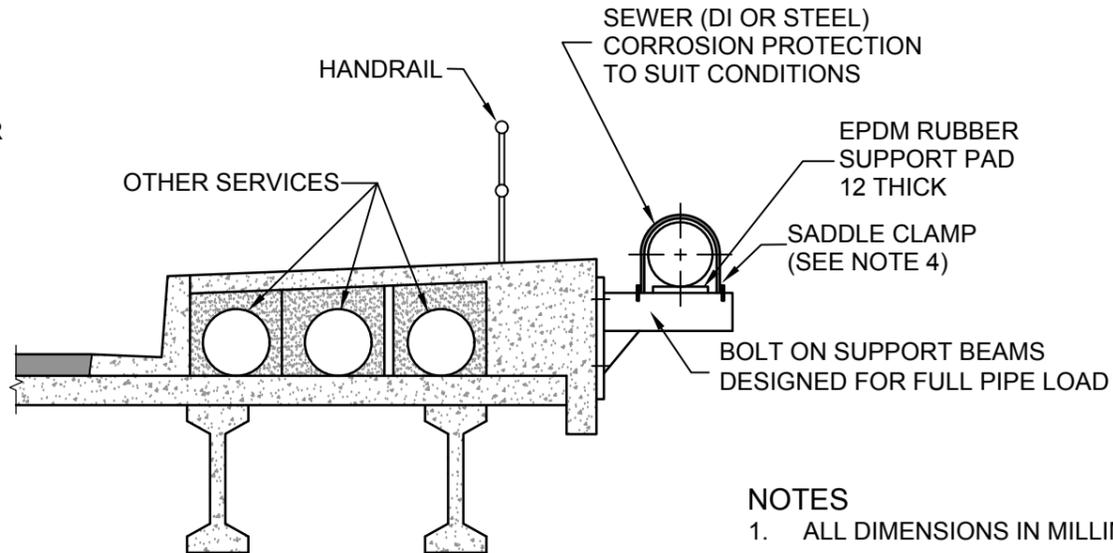
OPTION 2
NEW AND EXISTING BRIDGES
NO SERVICE DUCTS AVAILABLE
(SEE NOTE 6)



BRIDGE CROSSING PLAN
SEE DESIGN DRAWING FOR DIMENSION 'X'



OPTION 3
NEW BRIDGE
NO SERVICE DUCTS
AVAILABLE

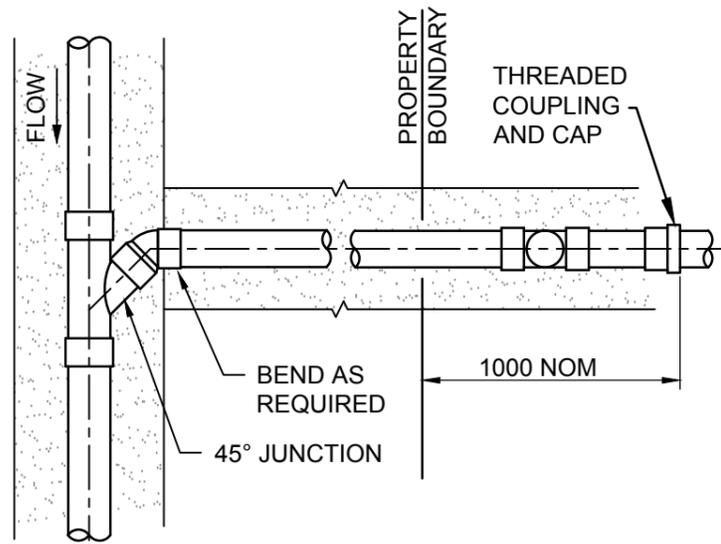


OPTION 4
NEW AND EXISTING BRIDGES
NO SERVICE DUCTS AVAILABLE

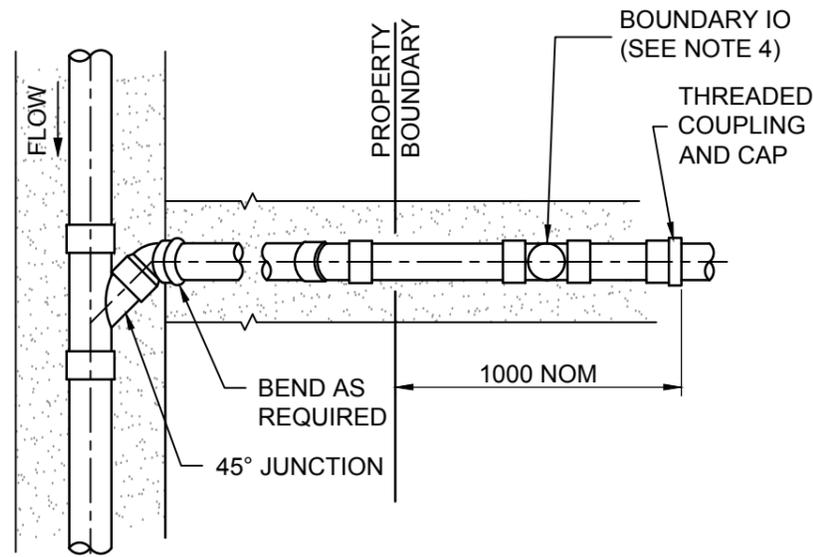
NOTES

1. ALL DIMENSIONS IN MILLIMETERS.
2. OPTION 1 IS PREFERRED OPTION.
3. STEEL SUPPORT BEAMS TO AS / NZS 3679.1 GRADE 250 AND HOT DIPPED GALVANISED.
4. IN MARINE AND HEAVY INDUSTRIAL ENVIRONMENTS USE STAINLESS STEEL FOR TIE-RODS, CRADLE SUPPORTS, SADDLE CLAMPS, BOLTS, NUTS & WASHERS. MIN GRADE TO BE 316.
5. PROVIDE PIPE EXPANSION JOINTS AT EACH OF BRIDGE.
6. DI, STEEL, PE OR PVC MAY BE USED FOR OPTION 2. MATERIAL TYPE DEPENDS ON ENVIRONMENTAL CONDITIONS.

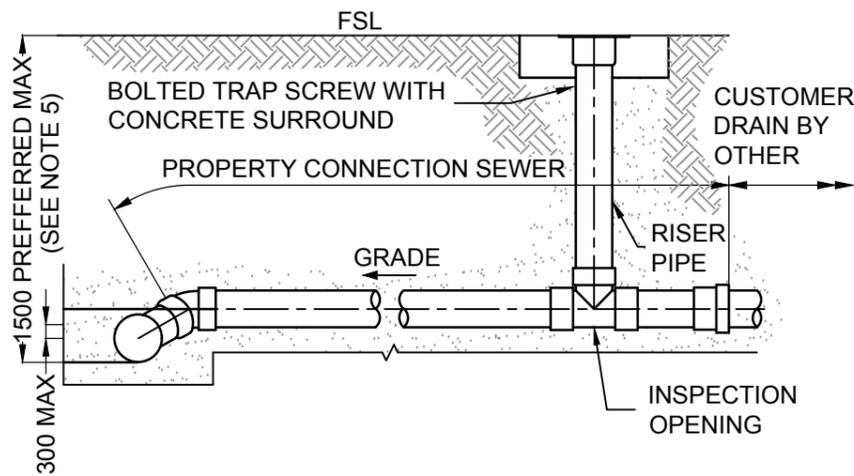
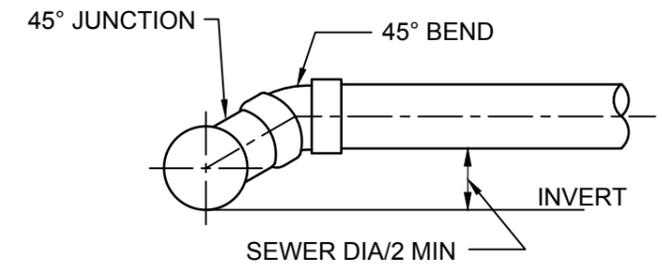
Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
AERIAL CROSSINGS BRIDGE CROSSING CONCEPTS		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	TY	A3	010-046
		DES			
		CHKD	MW	CADFILE 010-046.dwg	DATE 31/08/2016



PLAN

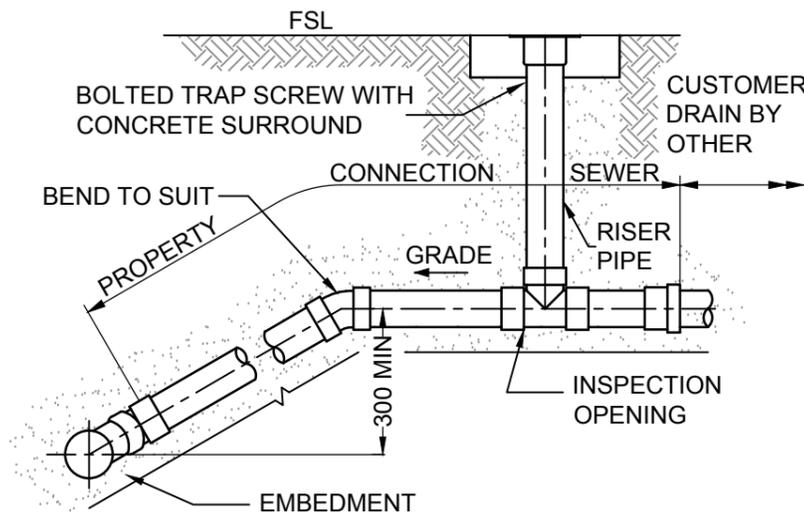


PLAN



ELEVATION

STANDARD CONNECTION
(UP TO 300 VERTICAL DROP)



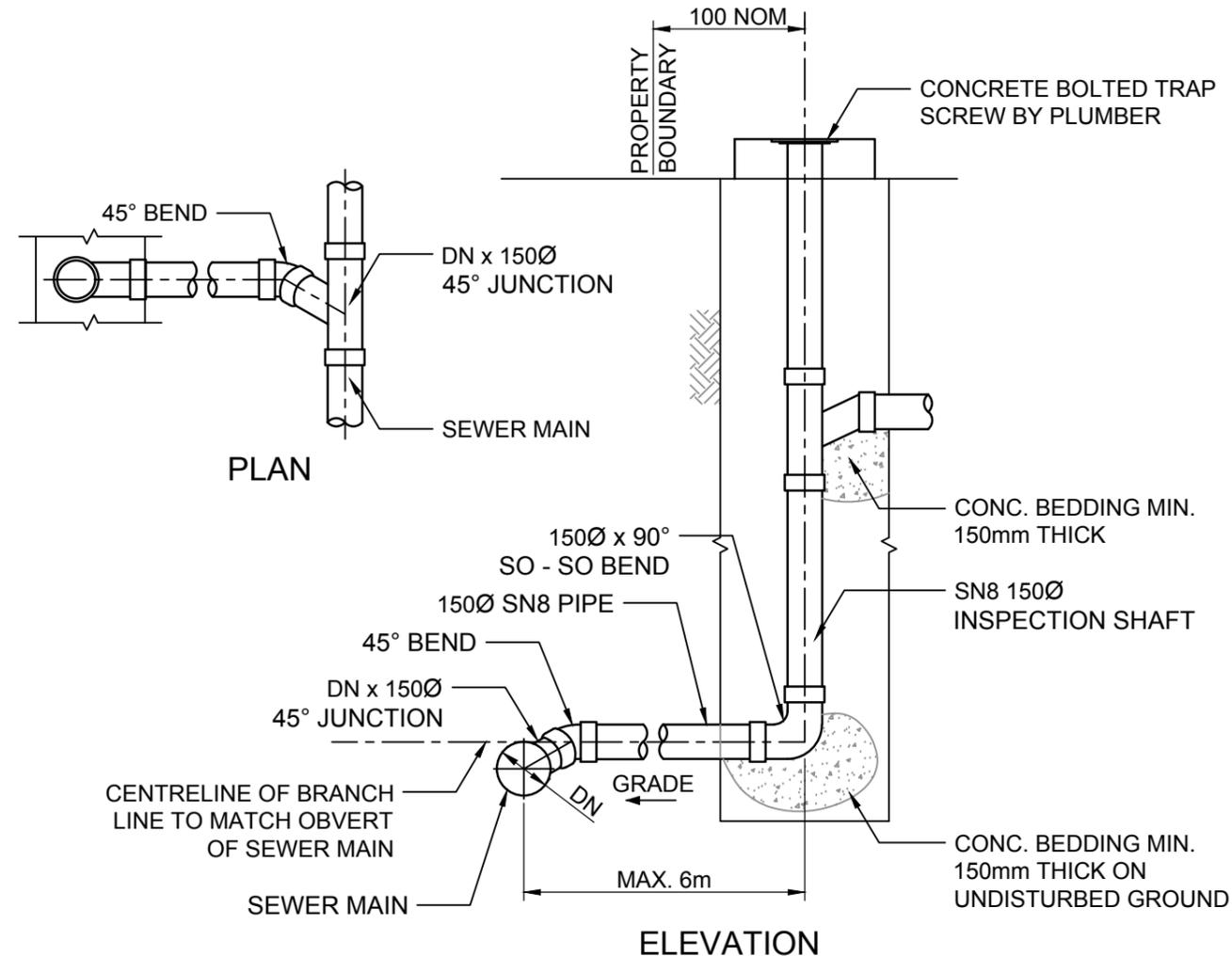
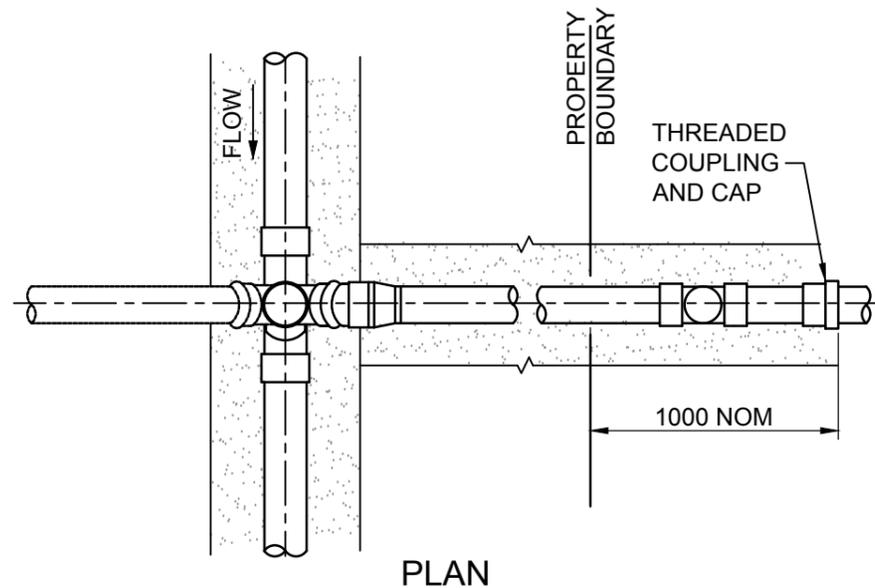
ELEVATION

SLOPED CONNECTION
(VERTICAL DROP > 300 AND EMBANKMENT)

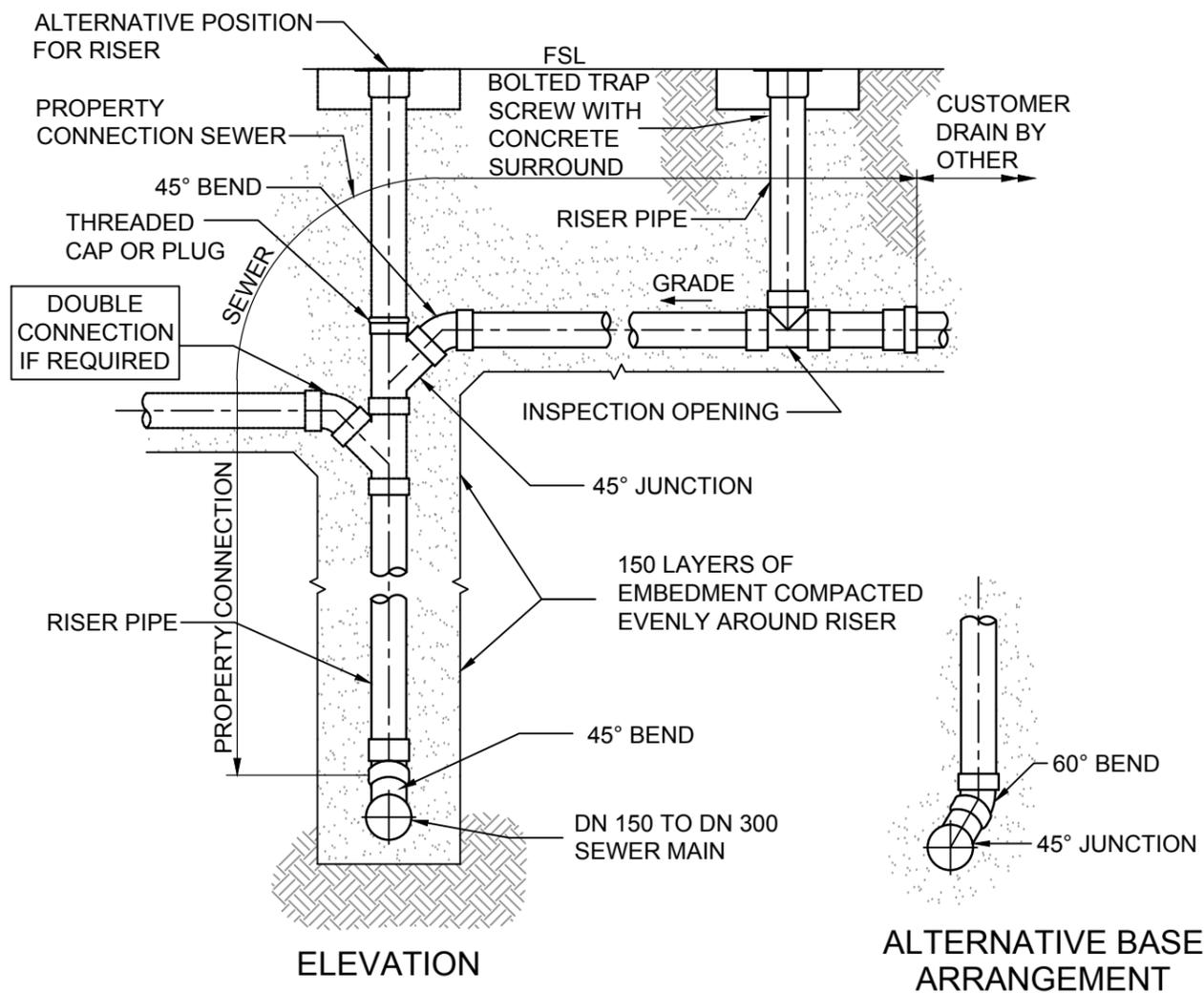
NOTES:

1. ALL DIMENSIONS IN MILLIMETERS.
2. LOCATE INSPECTION OPENINGS IN ACCORDANCE WITH DESIGN DRAWINGS OR WATER AGENCY REQUIREMENTS.
3. ALL CONNECTION TYPES SHOWN ON THIS DRAWING ARE TO BE PVC (RRJ) PIPES UNLESS OTHERWISE PERMITTED.
4. BOUNDARY IO IS THE START OF THE CUSTOMER SEWER. LOCATION, IO COVER, FRAME AND SUPPORT SLAB TO BE AS SPECIFIED BY WATER AGENCY.
5. CONNECTION POINT TO BE $\leq 1.5\text{m}$ BELOW SURFACE.
6. GRADE OF PROPERTY CONNECTION SEWER TO BE NOT LESS THAN;
 - DN 100 1.65%
 - DN 150 1%

Armidale Dept of Public Regional Council Infrastructure	SCALES NTS	APPROVED D. MAUNDER MANAGER ENGINEERING AND STANDARDS SUPPORT	31/08/2016 DATE	SHEET 1 OF 1
	PROPERTY SEWER CONNECTION DETAILS IO INTERFACE METHOD < 1200 DEEP		SURV AS SHEET SIZE A3	DRAWING No 010-047 AMDT No
		DRWN GW DES CHKD MW	CADFILE 010-047.dwg	DATE 31/08/2016



DEEP SEWER JUNCTION TO SIDE OF MAIN (>1.2m)
MARK AS "V" ON W.A.E

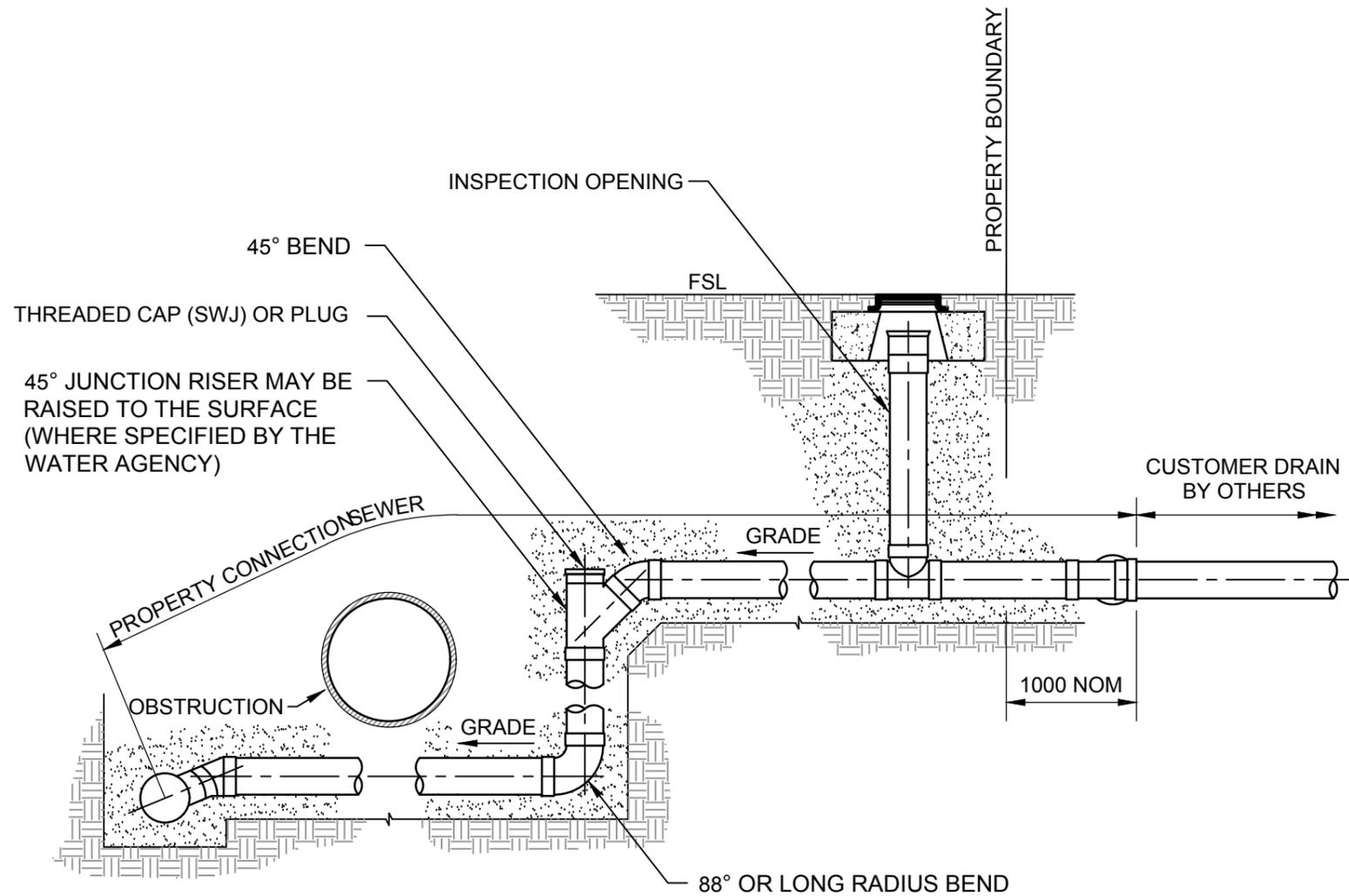


VERTICAL RISER WITH
SINGLE OR DOUBLE CONNECTION
(MAY BE USED WHEN VERTICAL DROP > 1200)

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS.
2. LOCATE INSPECTION OPENINGS IN ACCORDANCE WITH DESIGN DRAWINGS OR WATER AGENCY REQUIREMENTS.
3. ALL CONNECTION TYPES SHOWN ON THIS DRAWING ARE TO BE PVC (RRJ) PIPES UNLESS OTHERWISE PERMITTED.
4. BOUNDARY IO IS THE START OF THE CUSTOMER SEWER. LOCATION, IO COVER, FRAME AND SUPPORT SLAB TO BE AS SPECIFIED BY WATER AGENCY.
5. CONNECTION POINT TO BE $\leq 1.5m$ BELOW SURFACE.
6. GRADE OF PROPERTY CONNECTION SEWER TO BE NOT LESS THAN;
DN 100 1.65%
DN 150 1%

Armidale Dept of Public Regional Council Infrastructure	SCALES	APPROVED	D. MAUNDER	31/08/2016	SHEET 1 OF 1
	NTS	MANAGER ENGINEERING AND STANDARDS SUPPORT		DATE	
PROPERTY SEWER CONNECTION DETAILS IO INTERFACE METHOD > 1200 DEEP		SURV	AS SHEET SIZE	DRAWING No	AMDT No
		DRWN	A3	010-048	
		DES			
		CHKD	CADFILE 010-048.dwg	DATE 31/08/2016	



ELEVATION

STANDARD BRANCH AROUND AN OBSTRUCTION

IO INTERFACE METHOD SHOWN

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. LOCATE INSPECTION OPENINGS IN ACCORDANCE WITH DESIGN DRAWINGS OR WATER AGENCY REQUIREMENTS.
3. ALL CONNECTION TYPES SHOWN IN THIS DRAWING ARE APPLICABLE TO VC AND PVC (RRJ) PIPES.
4. LOCATION, INSPECTION OPENING (IO) COVER, FRAME & SUPPORT SLAB AS SPECIFIED BY WATER AGENCY.
5. PROPERTY CONNECTION TO BE DN 150 WITH A GRADE NOT LESS THAN 1.2%.

Armidale <i>Dept of Public Infrastructure</i> Regional Council	SCALES NTS	APPROVED D. MAUNDER MANAGER ENGINEERING AND STANDARDS SUPPORT	31/08/2016 DATE	SHEET 1 OF 1
	PROPERTY SEWER CONNECTION DETAILS AROUND OBSTRUCTIONS	SURV DRWN JB DES CHKD MW	AS SHEET SIZE A3	DRAWING No 010-049
		CADFILE 010-049.dwg		DATE 31/08/2016