



Johannesburg Roads Agency  
SOC Limited (JRA)

**ROADS & STORMWATER  
MANUAL**

**VOLUME 2**  
**STANDARD DESIGN DETAILS FOR  
ROADS & STORMWATER**

**PART 2 – STORMWATER**  
**JUNE 2015**

# **PART 2 – STORMWATER**

**JUNE 2015**

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See index in section.

## **DISCLAIMER**

The drawings in this document are intended as Standard Design Details. As such their principles should be adhered to.

However, designers are responsible for their own final designs undertaken on behalf of the Johannesburg Roads Agency SOC Limited, and as such they should amend or supplement the Standard Design Details according to specific design requirements

## 2.1 INTRODUCTION

The Johannesburg Roads Agency's "*Roads & Stormwater Manual*" comprises two volumes:

- Volume 1: Code of Procedure;
- Volume 2: Standard Design Details for Roads & Stormwater:
  - ❖ Part 1: Roads; and
  - ❖ **Part 2: Stormwater.**

The original source document for Stormwater Standard Details was "*Review Document: April 2003*", which included handwritten annotations relevant to updating, made by Mr Graham Thompson. A later version of this document, dated November 2004, became available and this in turn had been annotated with comments dated October 2007. Many of the April 2004 comments had been acted upon in the later document which included:

- 4 drawings covering Subsurface Drainage (now included in Section 2.2: Stormwater Design); and
- 3 drawings covering Subsoil Drainage in the context of retaining walls (now comprising Section 2.4).

The Standard Design Details have been grouped into three sets, namely:

- Section 2.2: Stormwater Design covering broadly the following categories of detail:
  - ❖ Network design;
  - ❖ System components – kerb inlets, manholes, junctions etc.;
  - ❖ Inlet and outlet structures;
  - ❖ Stormwater pipe bedding;
  - ❖ Subsurface drainage.
- Section 2.3: Stormwater Maintenance – including details pertaining to existing stormwater installations within the original Johannesburg municipal area and the Sandton area;
- Section 2.4: Retaining Walls/Sub Soil Drainage.

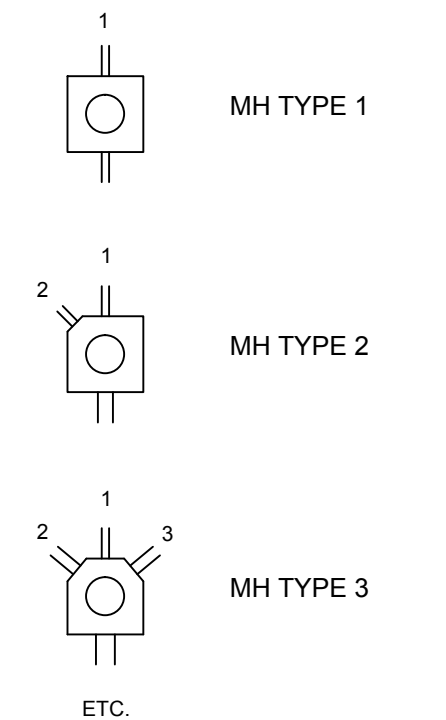
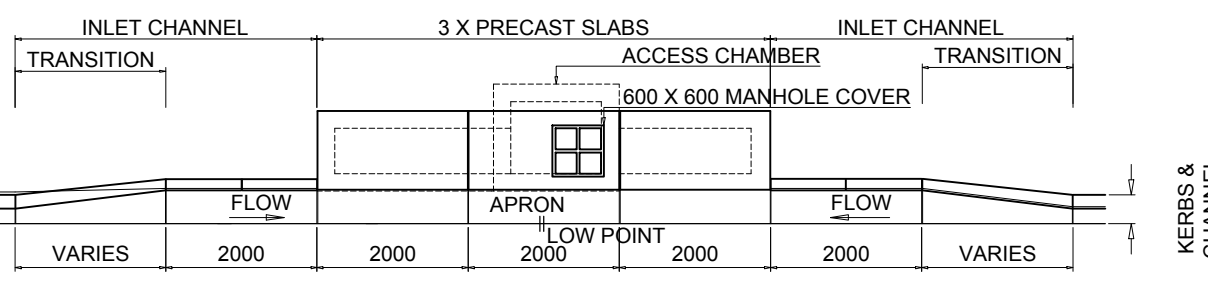
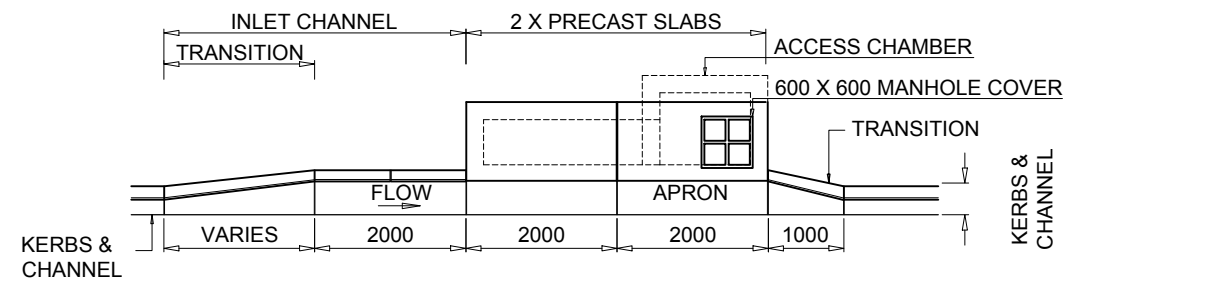
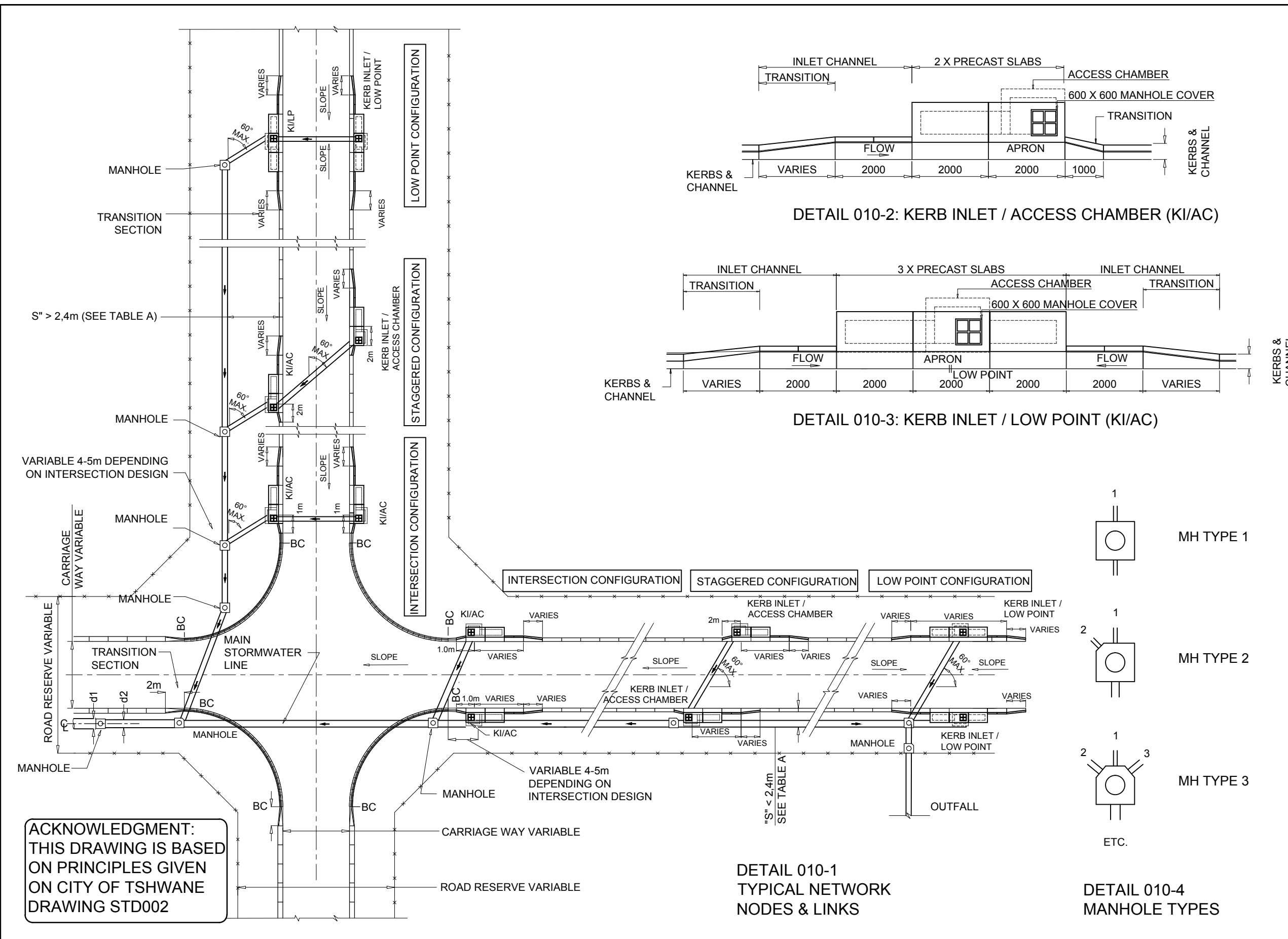
The "*Roads & Stormwater Manual*" will be used within JRA and will be made available to developers and their consultant designers for application within the Greater Johannesburg Metropolitan area, in the interests of the closest possible conformity to roads and stormwater design standards.

The numbering of drawings within sections has been carried out in open ended groups to permit additional drawings to be inserted in future in the most appropriate group. For example, in section 2.2 Stormwater: Design, if an additional manhole detail is required it can be inserted as JRA-SD-SW-053. The index sheet for section 2.2 will be amended accordingly with the drawing issue. The section index may run to extra pages if required.



## 2.2 STORMWATER: DESIGN

DRAWING NUMBER	DRAWING DESCRIPTION	REVISION NUMBER					
		0	1	2	3	4	5
		REVISION DATE					
JRA-SD-SW-010	Typical Stormwater Network Layout: Localised	300615					
JRA-SD-SW-011	Typical Stormwater Network Layout: Catchment Area	300615					
JRA-SD-SW-012	Typical Stormwater Construction Details: Longitudinal Section and Data Table	300615					
JRA-SD-SW-020	Kerb Inlets: Plans and Elevation	300615					
JRA-SD-SW-021	Kerb Inlet Sections	300615					
JRA-SD-SW-022	Kerb Inlet Slab Details	300615					
JRA-SD-SW-023	Kerb Inlet: Kerb, Apron and Slab Front Support Details	300615					
JRA-SD-SW-024	Kerb Inlet/Manhole Combination Details	300615					
JRA-SD-SW-025	Kerb Inlet with Sand Trap Details	300615					
JRA-SD-SW-050	Manhole Details	300615					
JRA-SD-SW-051	Stepped Manhole Design Details	300615					
JRA-SD-SW-052	Deep Manhole Details	300615					
JRA-SD-SW-060	Standard Built-up Sections for Bends & Junctions: Details 1 of 3	300615					
JRA-SD-SW-061	Standard Built-up Sections for Bends & Junctions: Details 2 of 3	300615					
JRA-SD-SW-062	Standard Built-up Sections for Bends & Junctions: Details 3 of 3	300615					
JRA-SD-SW-070	Field Inlet Details	300615					
JRA-SD-SW-071	Grid Inlet	300615					
JRA-SD-SW-080	Typical Brick Outlet Structure: Details 1 of 2	300615					
JRA-SD-SW-081	Typical Brick Outlet Structure: Details 2 of 2	300615					
JRA-SD-SW-082	Erosion Protection at Outlet Structures	300615					
JRA-SD-SW-083	Kerb Outlets	300615					
JRA-SD-SW-090	Bedding of Stormwater Pipes – with Tables	300615					
JRA-SD-SW-091	Reinstatement of Road Layers (Asphalt Surface)	300615					
JRA-SD-SW-100	Subsurface Drainage Types	300615					
JRA-SD-SW-101	Subsurface Drainage Pipe Junctions	300615					
JRA-SD-SW-102	Subsurface Drain Outlet Detail	300615					
JRA-SD-SW-103	Subsurface Drain Manhole Detail	300615					



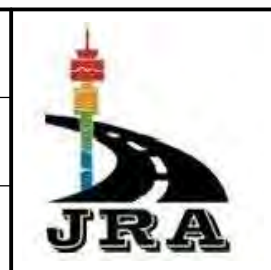
LEGEND	
	KI MANHOLE COVER
MH	MANHOLE
MH T3	MANHOLE TYPE 1,2,3, etc
Fall	KERB INLET
	KERB INLET/ ACCESS CHAMBER
Fall	KERB INLET/ LOW POINT
FI	FIELD INLET
GI	GRID INLET
AP	ATTENUATION POND
ST	SAND TRAP
RE	RODDING EYE
FO	FIELD OUTLET

**NOTES**

- FOR DETAILS OF ALL ELEMENTS OF A STORMWATER NETWORK REFER TO JRA-SD-SW-011.
- DETAIL 010-1 SHOWS A TYPICAL STORMWATER NETWORK ON TWO APPROACHES TO AN INTERSECTION.
- NOTE THE INCREASE IN PIPE SIZE FROM  $d_2$  TO  $d_1$  IN THE BOTTOM LEFT CORNER OF THE DETAIL.
- THE STORMWATER NETWORK COMPRISES NODES (MANY TYPES) AND LINKS (PIPES OF DIFFERING TYPES AND DIAMETERS).
- COMBINATIONS OF DIFFERENT NODE TYPES MAY BE REQUIRED THROUGHOUT A LARGE NETWORK E.G. GI/FO - GRID INLET/FIELD OUTLET.

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



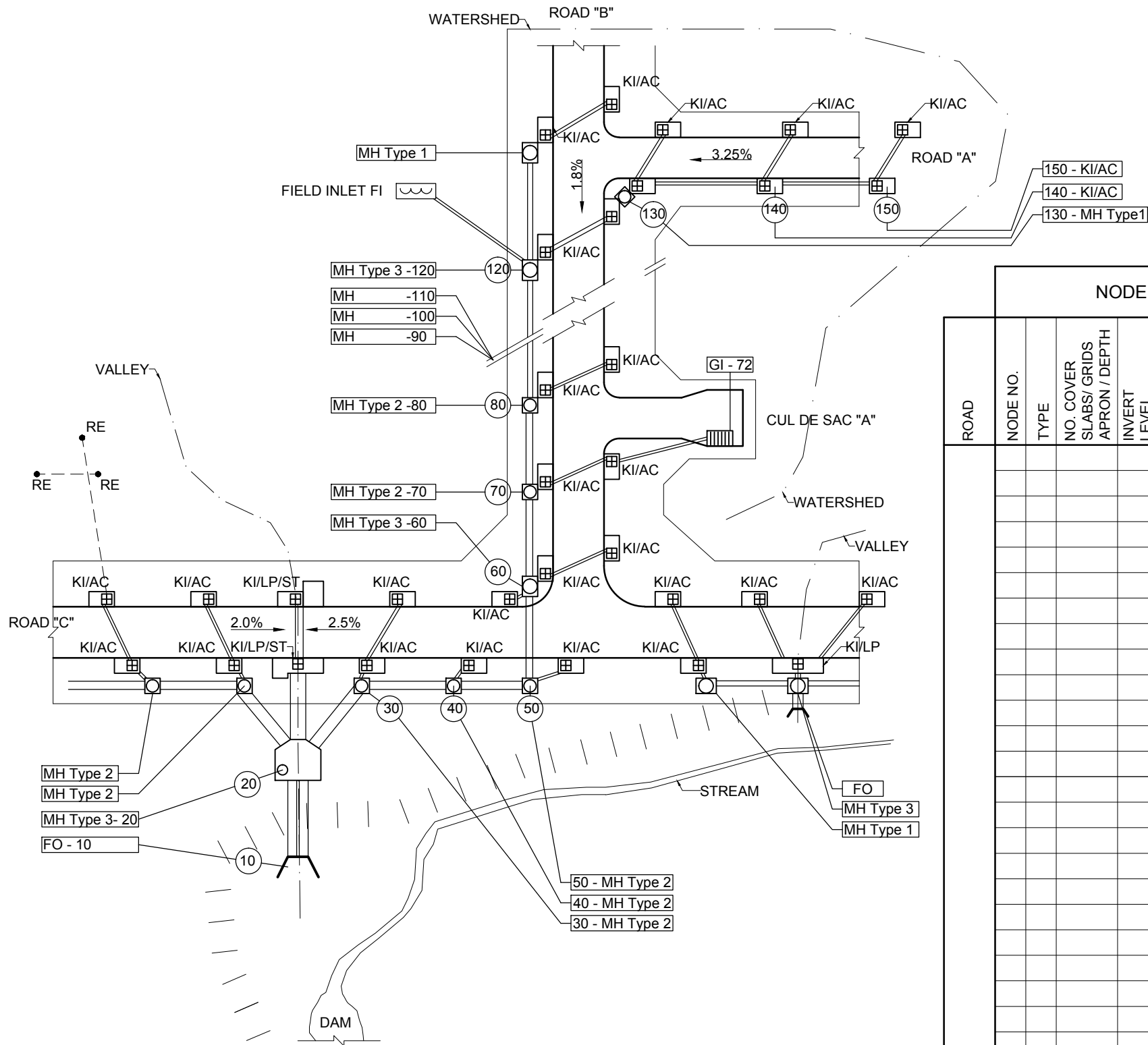
CITY OF JOHANNESBURG

**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set      **STORMWATER : DESIGN**

**TYPICAL STORMWATER NETWORK LAYOUT:  
LOCAL AREA**

SCALE AS SHOWN: NTS	
DATE: 03/05/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD SW-010</b>	
AMENDMENT NUMBER:	



DETAIL 011-1  
SMALL CATCHMENT AREA

ROAD	NODE DATA								LINK DATA (OUTLET PIPE)										
	NODE NO.	TYPE	NO. COVER SLABS/ GRIDS APRON / DEPTH	INVERT LEVEL	APPROX. COVER LEVEL +	DEPTH (m)	DIST. ON $\xi$ (m)	OFFSET L or R OF $\xi$ (m)	SIZE (mm $\phi$ )	LENGTH (m)	GRADE %	PIPE CLASS	BEDDING CLASS	VELOCITY	RUNOFF	CAPACITY	I.L. AT NEXT NODE DOWNSTREAM	REMARKS	

DETAIL 011-2 TYPICAL DATA TABLE

LEGEND	
	KI MANHOLE COVER
MH	MANHOLE
MH T3	MANHOLE TYPE 1,2,3, etc
Fall	KERB INLET
KI	KERB INLET/ ACCESS CHAMBER
Fall	KERB INLET/ LOW POINT
KI/LP	KERB INLET/ LOW POINT
FI	FIELD INLET
GI	GRID INLET
AP	ATTENUATION POND
ST	SAND TRAP
RE	RODDING EYE
FO	FIELD OUTLET

- NOTES**
1. DETAIL 011-1 ILLUSTRATES A SMALL URBAN STORMWATER CATCHMENT AREA.
  2. A LONGITUDINAL STORMWATER SECTION IS GIVEN ON JRA-SD-SW-012 WHICH ILLUSTRATES A NOTIONAL STORMWATER DESIGN FROM FIELD OUTLET NODE 10 TO THE HIGHEST KERB INLET NODE AT 150.
  3. DETAIL 011-2 TABULATES MINOR STORMWATER LINK DATA IN SUPPORT OF THE MAIN LINE LONGITUDINAL SECTIONS.
  4. IN GENERAL TERMS THE DESIGN SHOWN WOULD ACCEPTABLY DEAL WITH A 1 IN 5 YEAR FLOOD. THE INLET DESIGN TO MH20 WOULD EXTEND THIS TO A 1 IN 25 YEAR CAPABILITY.

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

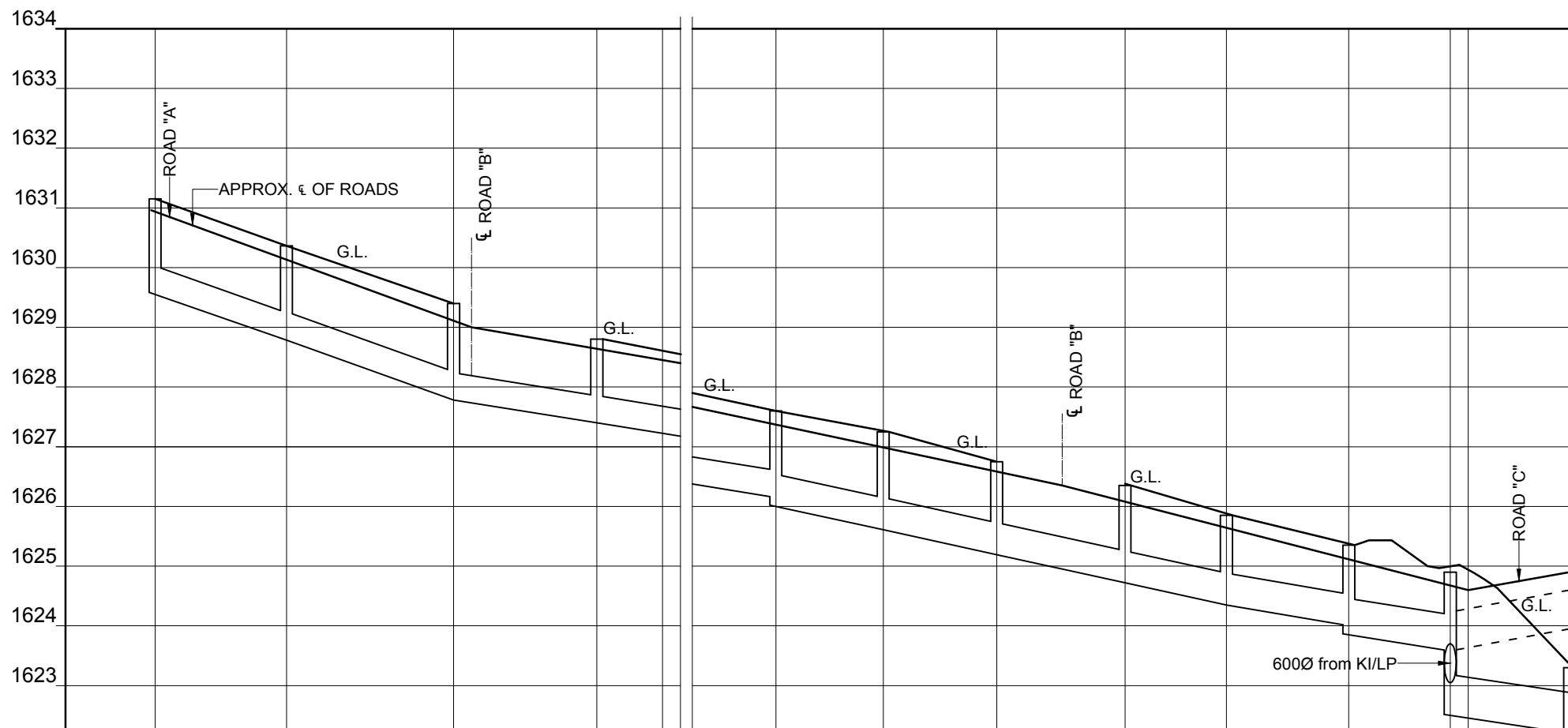
DESIGNED BY: \_\_\_\_\_  
 DRAWN BY: \_\_\_\_\_  
 STRUCTURAL DESIGN BY: \_\_\_\_\_  
 DRAWING CHECKED BY: \_\_\_\_\_  
 CHECKED BY: \_\_\_\_\_  
 DRAWING APPROVED BY: \_\_\_\_\_



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 Drawing Sub-set: **STORMWATER : DESIGN**  
**TYPICAL STORMWATER NETWORK LAYOUT: CATCHMENT AREA**

SCALE AS SHOWN: NTS  
 DATE: 06/05/2015  
 DRAWING NUMBER: **JRA-SD SW-011** EXTN.  
 AMENDMENT NUMBER: \_\_\_\_\_

LEGEND



NODE DATA		150	140	130	120	80	70	60	50	40	30	20	10
TYPE - NODE NO NO COVER SLABS / APRON CLASS DEEP OR SHALLOW		150 KI/AC	140 KI/AC	130 MH	120 MH	80 MH	70 MH	60 MH	50 MH	40 MH	30 MH	20 MH	10 FO
INVERT LEVEL		29.55	28.77	27.78	27.40	26.15	25.61	25.19	24.72	24.35	24.00	23.58	22.20
APPROX. COVER LEVEL & DEPTH (m)		31.15 1.60	30.35 1.58	29.40 1.62	28.80 1.40	27.60 1.45	27.25 1.64	26.75 1.56	26.35 1.63	25.85 1.50	25.35 1.35	24.90 1.32	23.30
DISTANCE ON $\xi$ & OFFSET (m)		285.0 1.5L	263.0 1.5L	235.0 1.5L	211.0 5.0L 200.0	147.0	133.0 5.0L	115.0 5.0L	96.0 5.0L	74.5 5.0L	57.5 5.0L	37.0 5.0L	20.0
PIPE SIZE (mmØ)		450	450	450	450	450	525	525	525	525	525	600	2 X 675
LENGTH (m)		22	28	24		78	18	19	21.5	17	20.5	17	20
GRADE (%)		3.54%	3.54%	1.60%	1.60%	1.60%	2.18%	2.18%	2.18%	2.18%	1.71%	1.59%	1.50%
CLASS													
BEDDING CLASS		B	B	B	B	B	B	B	B	B	B	B	B
VELOCITY													
RUNOFF L/S													
CAPACITY L/S													

NOTES

1. THE LONGITUDINAL STORM-WATER SECTION SHOWN RELATES TO THE PLAN OF A SMALL CATCHMENT AREA SHOWN ON JRA-SD-SW-011.
2. THE SECTION COVERS ONE OF THE MAIN STORMWATER LINES SHOWN ON THE PLAN FROM THE OUTFALL 10 TO THE HIGHEST KERB INLET 150.
3. THE NODE DETAILS GIVEN ARE NOTIONALLY CORRECT BUT DO NOT NECESSARILY REPRESENT A "BEST WORKING DESIGN". THEY ARE GIVEN FOR ILLUSTRATIVE PURPOSES ONLY.
4. DETAILS OF MINOR STORM-WATER LINKS AND CROSSINGS ARE GIVEN IN DETAIL 011-2 ON JRA-SD-SW011.
5. KERB INLET AND MANHOLE SPACING ARE SUBJECT TO ENGINEERING DESIGN BASED ON A WIDE RANGE OF VARIABLES. REFER TO VOLUME 1, CODE OF PROCEDURE, CH.9 - STORMWATER MANAGEMENT.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

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STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



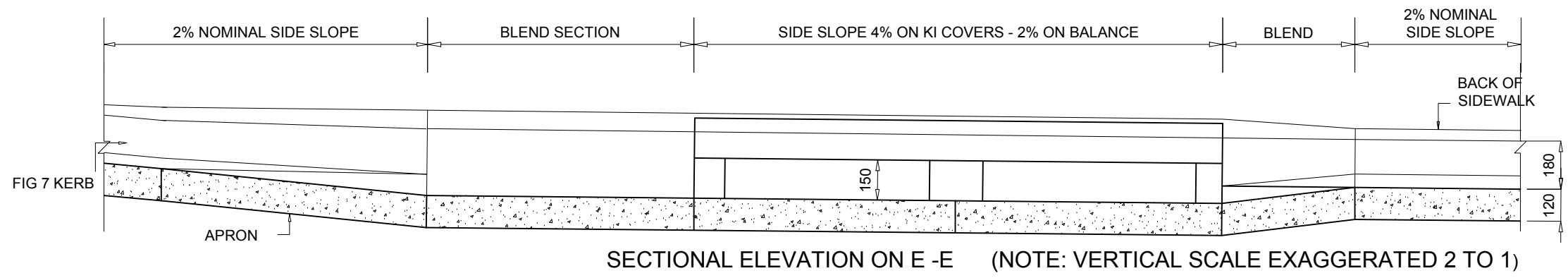
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Drawing Sub-set      **STORMWATER : DESIGN**

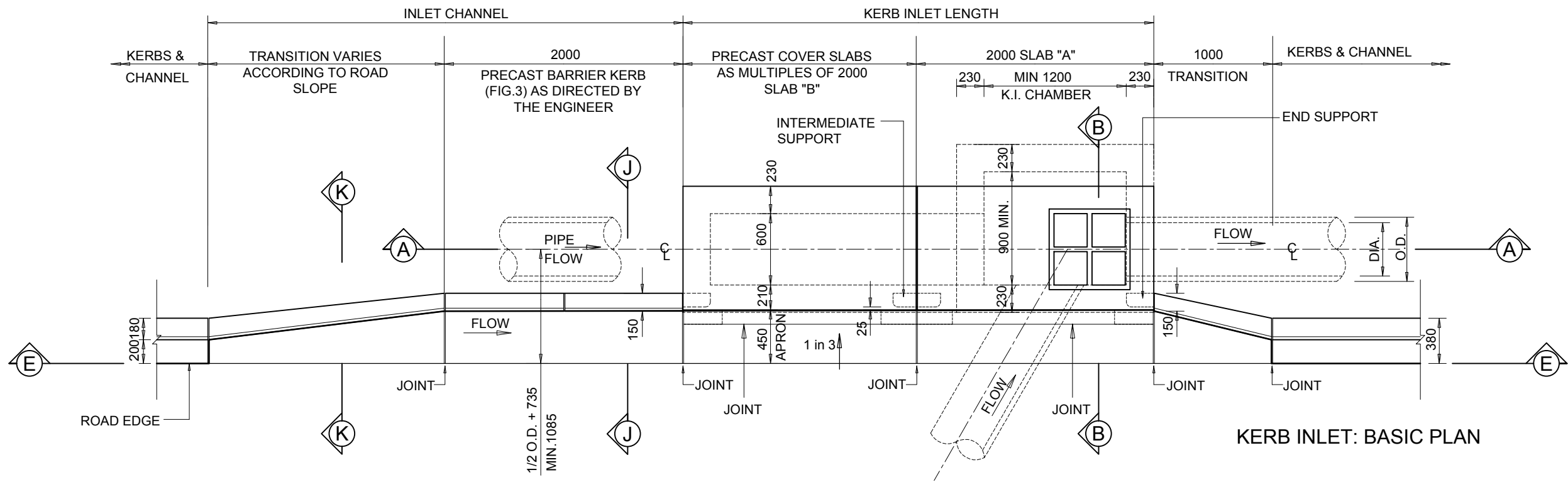
**TYPICAL STORMWATER DETAILS FOR  
 CONSTRUCTION: LONGITUDINAL SECTION**

SCALE AS SHOWN: NTS	
DATE: 04/05/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD SW-012</b>	
AMENDMENT NUMBER:	

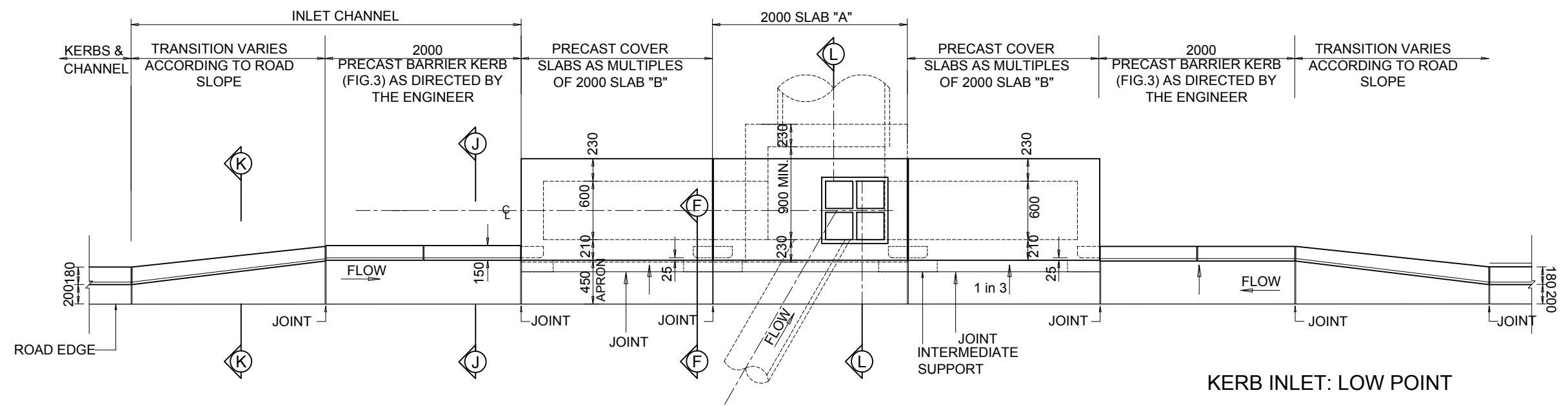




SECTIONAL ELEVATION ON E - E (NOTE: VERTICAL SCALE EXAGGERATED 2 TO 1)



KERB INLET: BASIC PLAN



KERB INLET: LOW POINT

LEGEND

NOTES

1. REFER TO JRA-SD-SW-021 FOR KERB INLET SECTIONS.
2. REFER TO JRA-SD-SW-022 FOR SLAB REINFORCING DETAILS.
3. REFER TO JRA-SD-SW-023 FOR KERB, APRON & SUPPORT DETAILS.
4. SUBJECT TO SYSTEM DESIGN, THE KERB INLET CHAMBER MAY NEED TO BE ENLARGED TO CATER FOR THE OUTFLOW PIPE DESIGN.
5. THE DESIGN OF A LOW POINT KERB INLET MAY BE DETERMINED BY 1 IN 25 YEAR FLOOD EXPECTATIONS TO REDUCE THE RISK OF SIGNIFICANT PONDING IN THE ROAD AT THE LOW POINT.
6. IN TERMS OF THE PROMOTION OF BICYCLE LANES IT IS RECOMMENDED THAT CHANNEL SECTIONS BE LEVEL OR A CONTINUATION OF ROAD CROSSFALLS BETWEEN KERB INLETS. THE CHANNEL SHOULD THEN BE INCREASED TO A MAX. SLOPE OF 1 IN 3 OVER THE CHANNEL TRANSITION AT A KERB INLET.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

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DRAWING APPROVED BY:

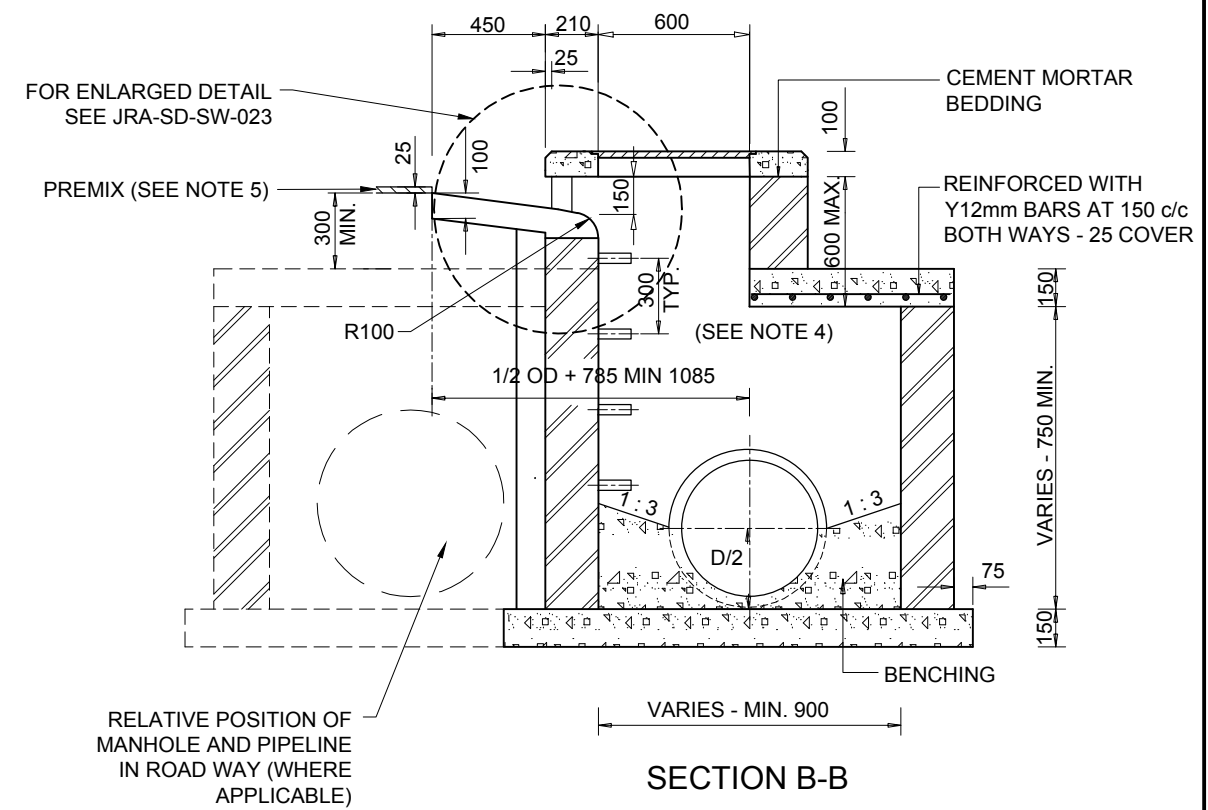
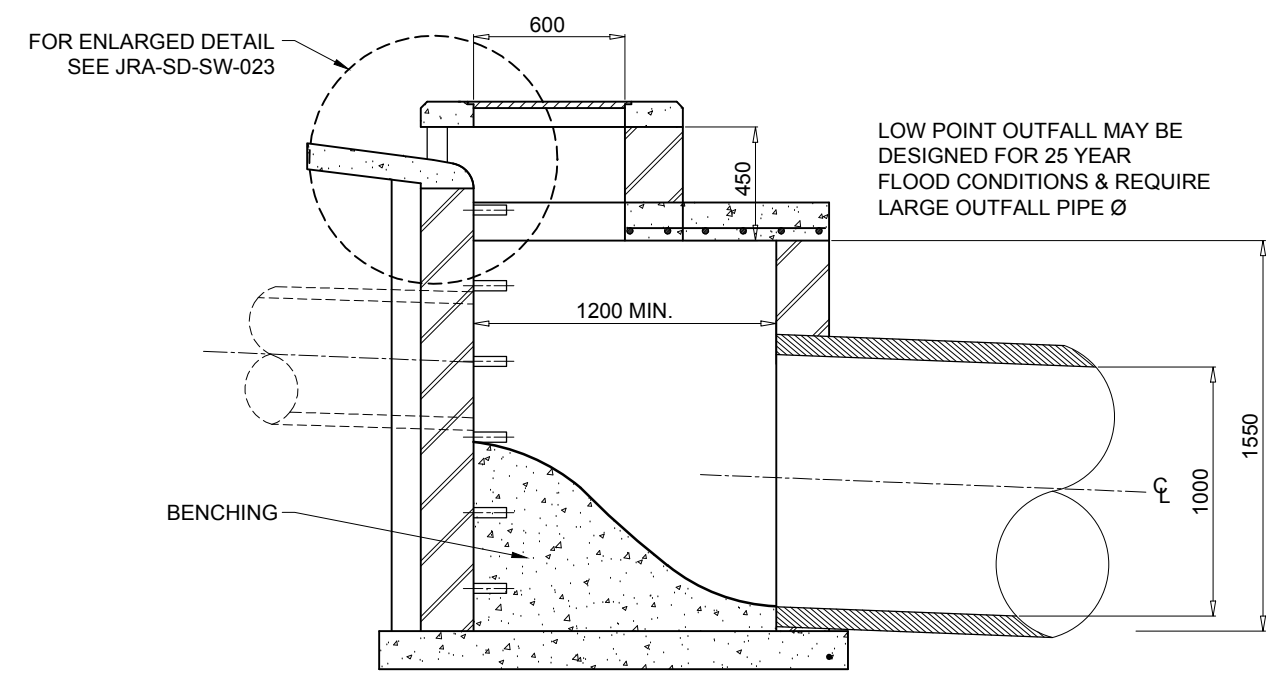
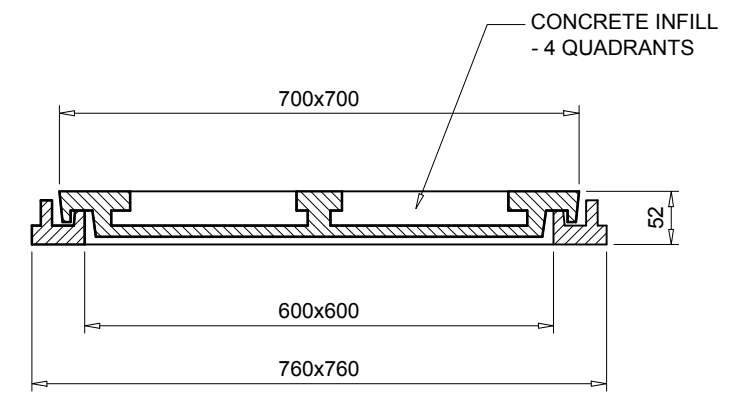
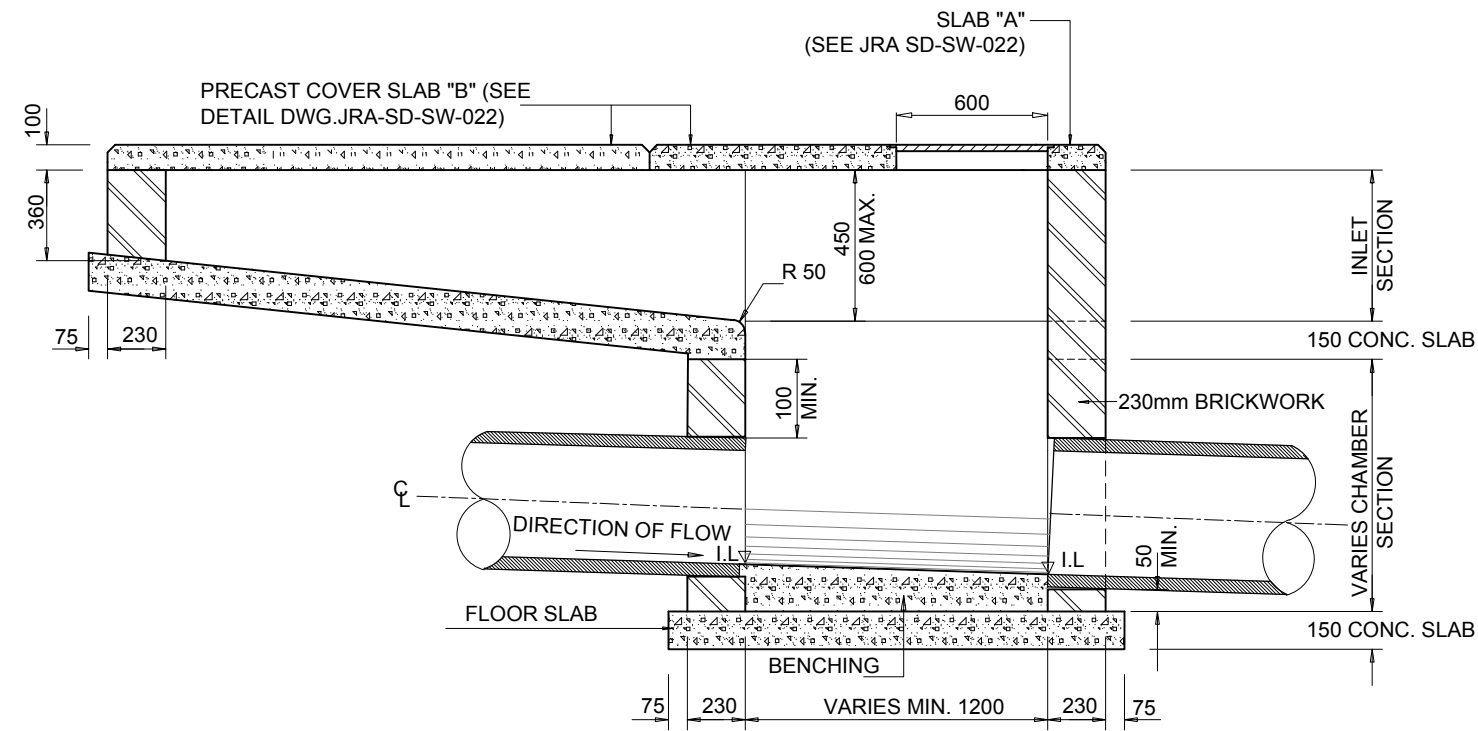


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JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set      STORMWATER : DESIGN

**KERB INLETS  
PLANS & ELEVATION**

SCALE AS SHOWN: NTS  
DATE: 06/05/2015  
DRAWING NUMBER      EXTN.  
**JRA-SD  
SW-020**  
AMENDMENT NUMBER:



LEGEND

NOTES

- SEE DRG. JRA-SD-SW-020 FOR PLAN AND SECTION POSITIONS OF KERB INLET.
- CONCRETE STRENGTH TO BE AS FOLLOWS:
  - MANHOLE SURROUNDS AND BENCHING: CLASS 15/19
  - CAST IN-SITU DECK SLABS & FOUNDATION: CLASS 20/19
  - PRECAST COVER SLABS & OTHER ITEMS: CLASS 25/19
  - CAST IN-SITU KERBS, APRONS ETC.: CLASS 25/19
- ALL FLOORS AND BENCHING TO BE STEEL TROWELLED WITH A SMOOTH RADIUS.
- MANHOLE & KERB INLET INTERNAL WIDTHS AND DEPTHS:
  - WIDTH-
    - 750 mm PIPES AND LESS - 900mm
    - 825 mm PIPES AND MORE - 1200mm.
 SOME MANHOLE SIZES TO BE DETERMINED ON SITE.
  - DEPTH- THE DEPTH INDICATED SHOULD BE INCREASED IF NECESSARY FOR MANHOLES TO PERMIT SUFFICIENT DISCHARGE HEAD TO DEVELOP.
  - MANHOLE DEPTH > 1,75m, WIDTH OF BRICKWORK TO BE INCREASED TO 345mm.
  - BELOW 3m SPECIAL ENGINEERING DESIGN REQUIRED FOR BRICKWORK.
- NO BACKFILL TO BE DONE UNTIL MORTAR IS SEVEN DAYS OLD.
- PROVIDE STEP IRONS WHEN DEPTH > 1,200m.
- PIPES AT INLET AND OUTLET TO BE LAID SOFFIT TO SOFFIT.
- SHOULD THERE BE A CHANGE IN PIPE DIAMETER, THE GREATER OF THE TWO SHOULD BE USED TO DETERMINE THE POSITIONING OF THE PIPES.
- ALL ROADWORKS TO COMPLY WITH THE SANS 1200 SPECIFICATIONS.
- ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
- ALL BRICKWORK TO BE IN ENGLISH BOND.
- SECTION L-L ILLUSTRATES VARIATIONS TO SECTION B-B REQUIRED AT A LOW POINT KERB INLET.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



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Drawing Sub-set	STORMWATER: DESIGN
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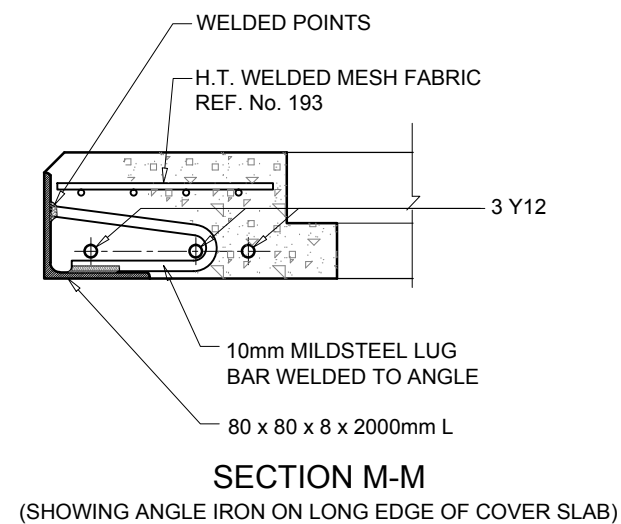
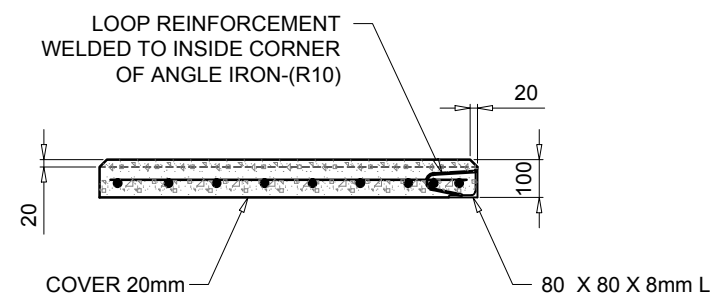
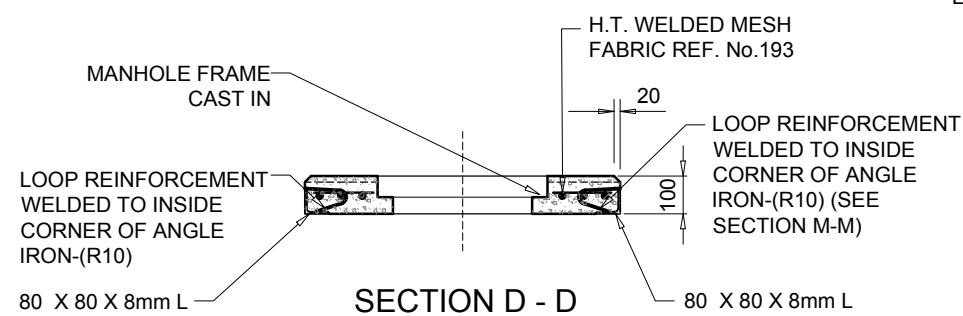
**SECTIONS OF KERB INLET**

SCALE AS SHOWN: NTS	
DATE: 13/05/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD SW-021</b>	
AMENDMENT NUMBER:	

LEGEND

NOTES

1. ALL CONCRETE TO BE CLASS 25/19.
2. ALL REINFORCING BARS IN PRECAST COVER SLABS TO BE DEFORMED HIGH TENSILE STEEL.
3. ALL PRECAST COVER SLABS TO BE BRUSH FINISHED.
4. ANGLE IRON TO BE PAINTED WITH RED OXIDE UNDERCOAT AND BLACK ENAMEL PAINT AS FINAL COAT.
5. ANGLE FACE ON SLAB "B" TO FACE ROADWAY.



LOOP REINFORCEMENT WELDED TO INSIDE CORNER OF ANGLE IRON (R10)(SEE SECTION M-M)

2 Y10-500-50 c

1 Y10-960 LONG

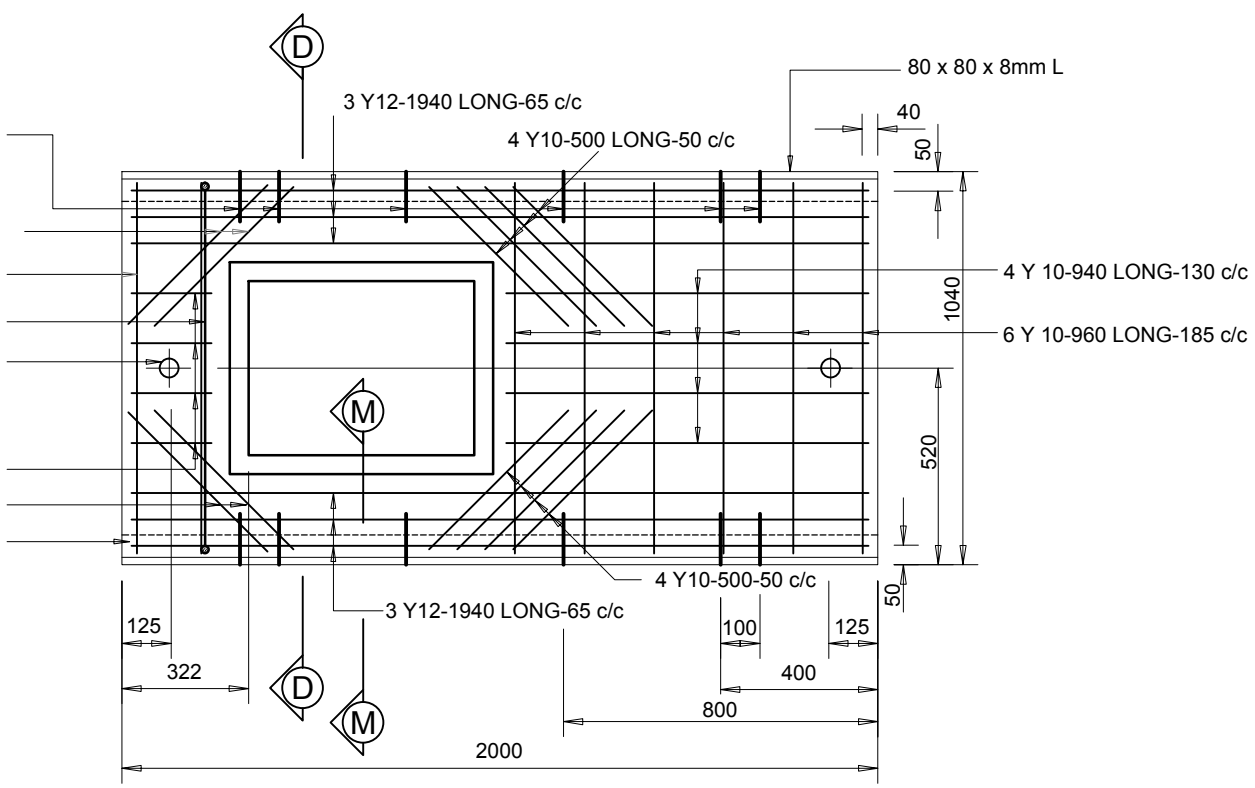
2 Y10-960 LONG

LIFTING HOLE 50 mm

4 Y10-190 LONG-130 c

2 Y10-500-50 c

80 x 80 x 8mm L WITH LOOP REINFORCEMENT



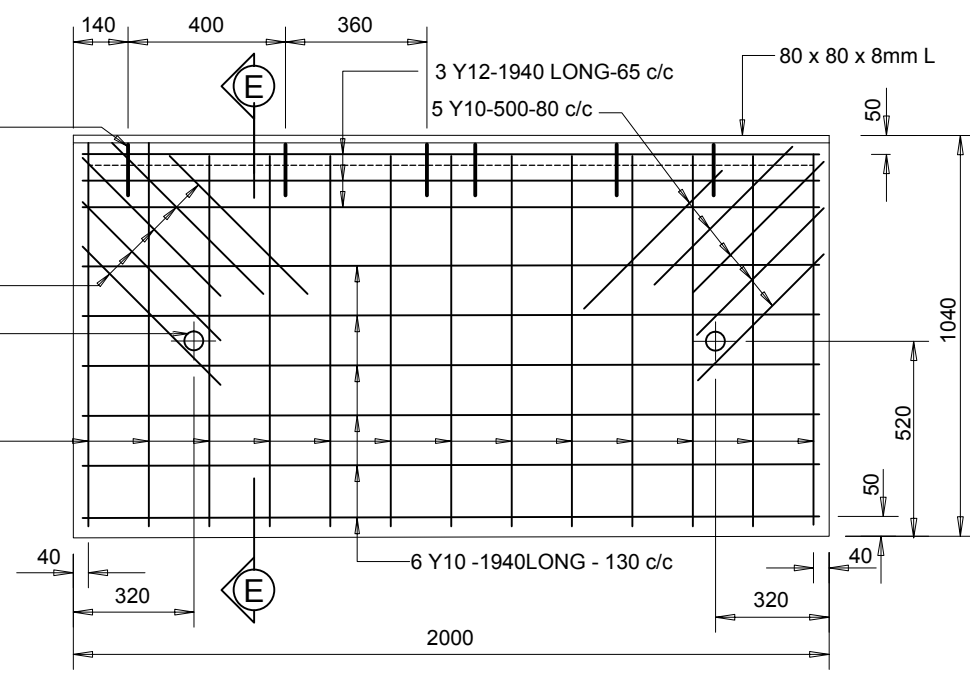
SLAB "A"

LOOP REINFORCEMENT WELDED TO INSIDE CORNER OF ANGLE IRON (R10)

5 Y10-500-80 c/c

LIFTING HOLE 50 mm

13 Y10-960 LONG-160 c/c



SLAB "B"

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

DRAWN BY:

STRUCTURAL DESIGN BY:

DRAWING CHECKED BY:

CHECKED BY:

DRAWING APPROVED BY:



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Drawing Sub-set      **STORMWATER: DESIGN**

**SLAB DETAILS**

SCALE AS SHOWN: NTS

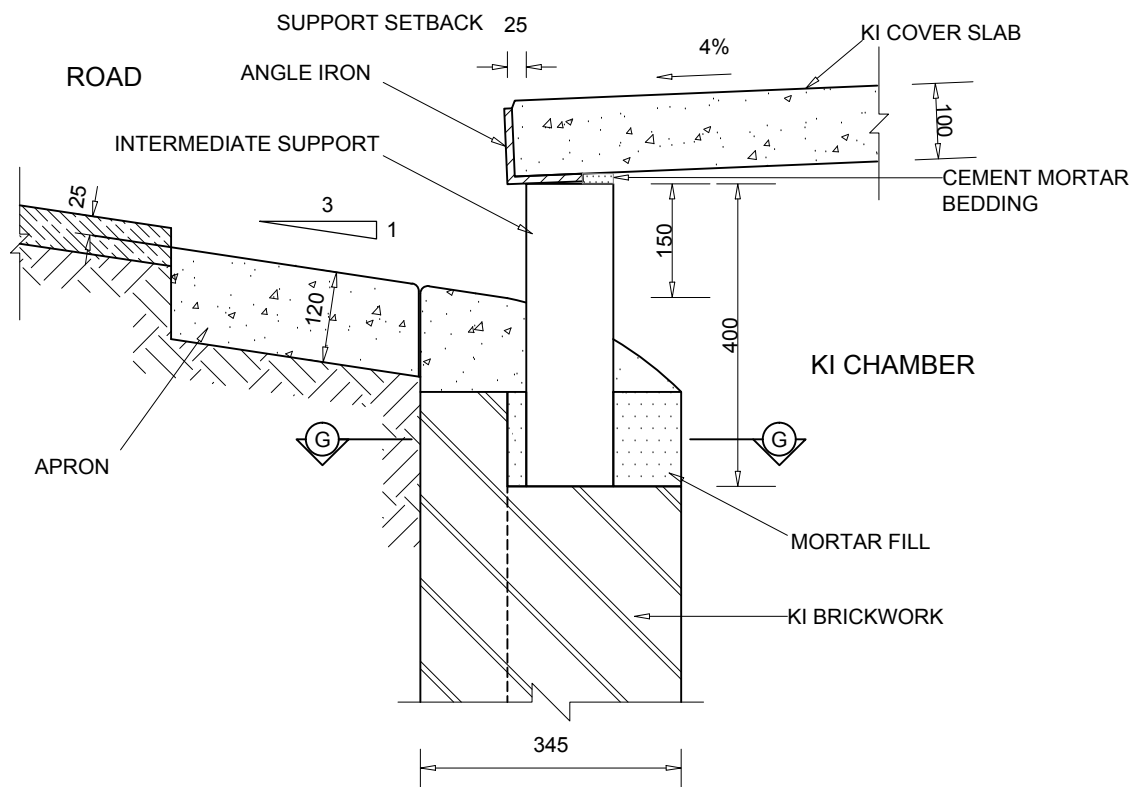
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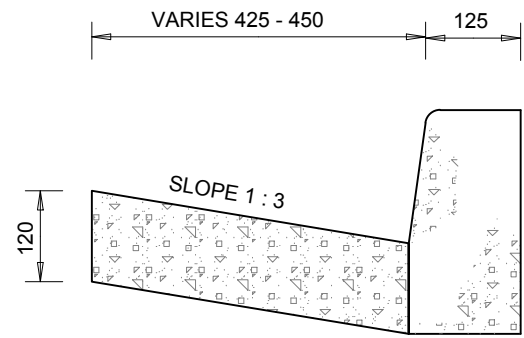
**JRA-SD  
SW-022**

AMENDMENT NUMBER:

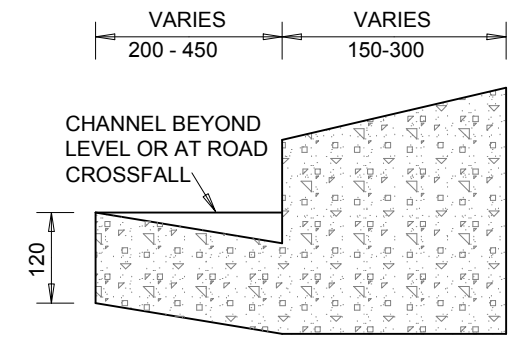
LEGEND



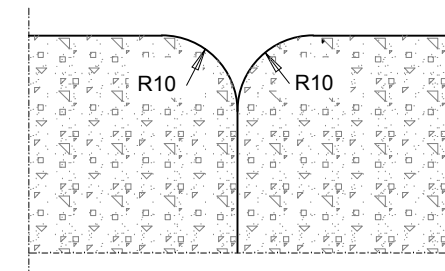
SECTION F-F THROUGH KI APRON & SUPPORT



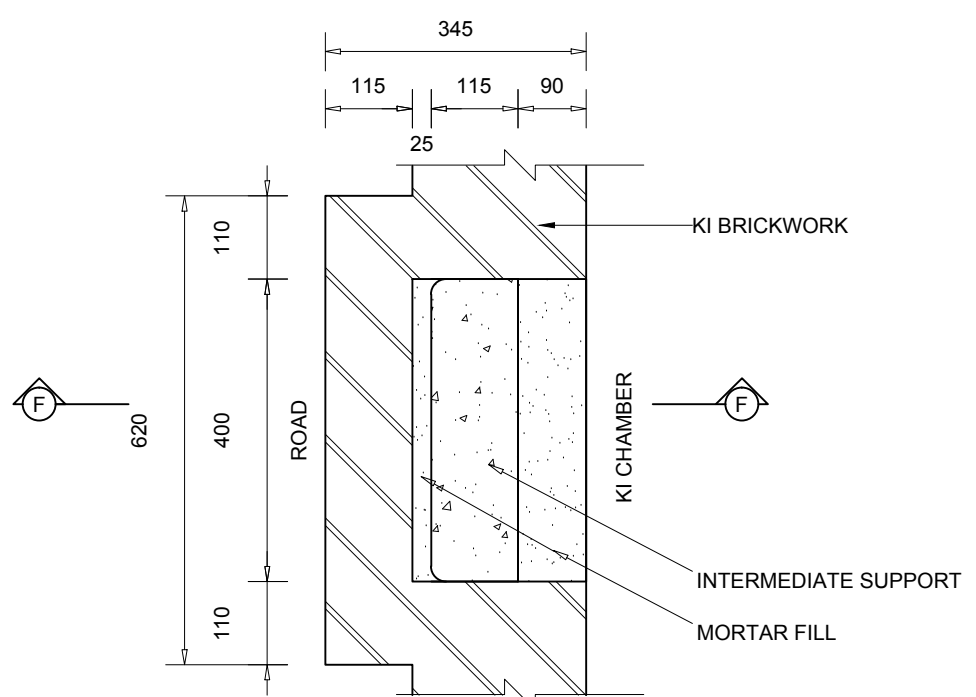
SECTION J - J



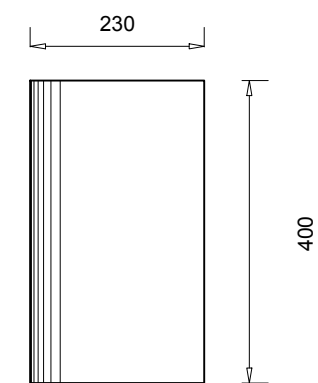
SECTION K - K



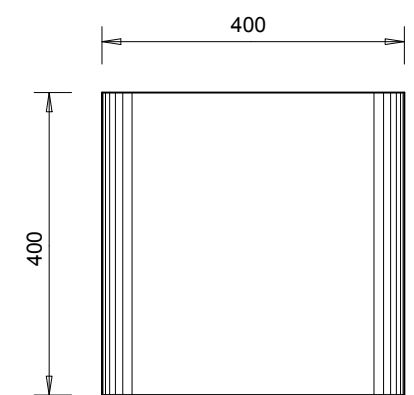
DETAIL OF JOINT IN APRON



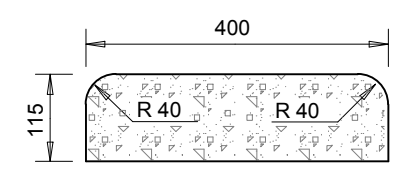
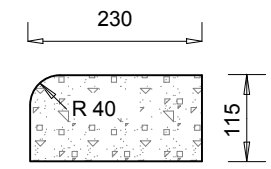
SECTION G-G THROUGH KI SUPPORT



END SUPPORT FOR COVER SLAB



INTERMEDIATE SUPPORT FOR COVER SLAB



NOTES

1. REFER TO JRA-SD-SW-020 FOR POSITION OF SECTION F-F AND FOR END/INTERMEDIATE SUPPORT POSITIONS.
2. REFER TO JRA-SD-SW-020 FOR SECTION J-J AND K-K POSITIONS.
3. REFER TO JRA-SD-SW-021 FOR FULL KERB INLET INTERSECTIONS.
4. THE PRINCIPLES OF SECTION F-F ALSO APPLY TO THE END SUPPORT INSTALLATIONS, SPECIFICALLY REGARDING LOCALISED WIDENING OF THE KI WALL TO 346mm.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

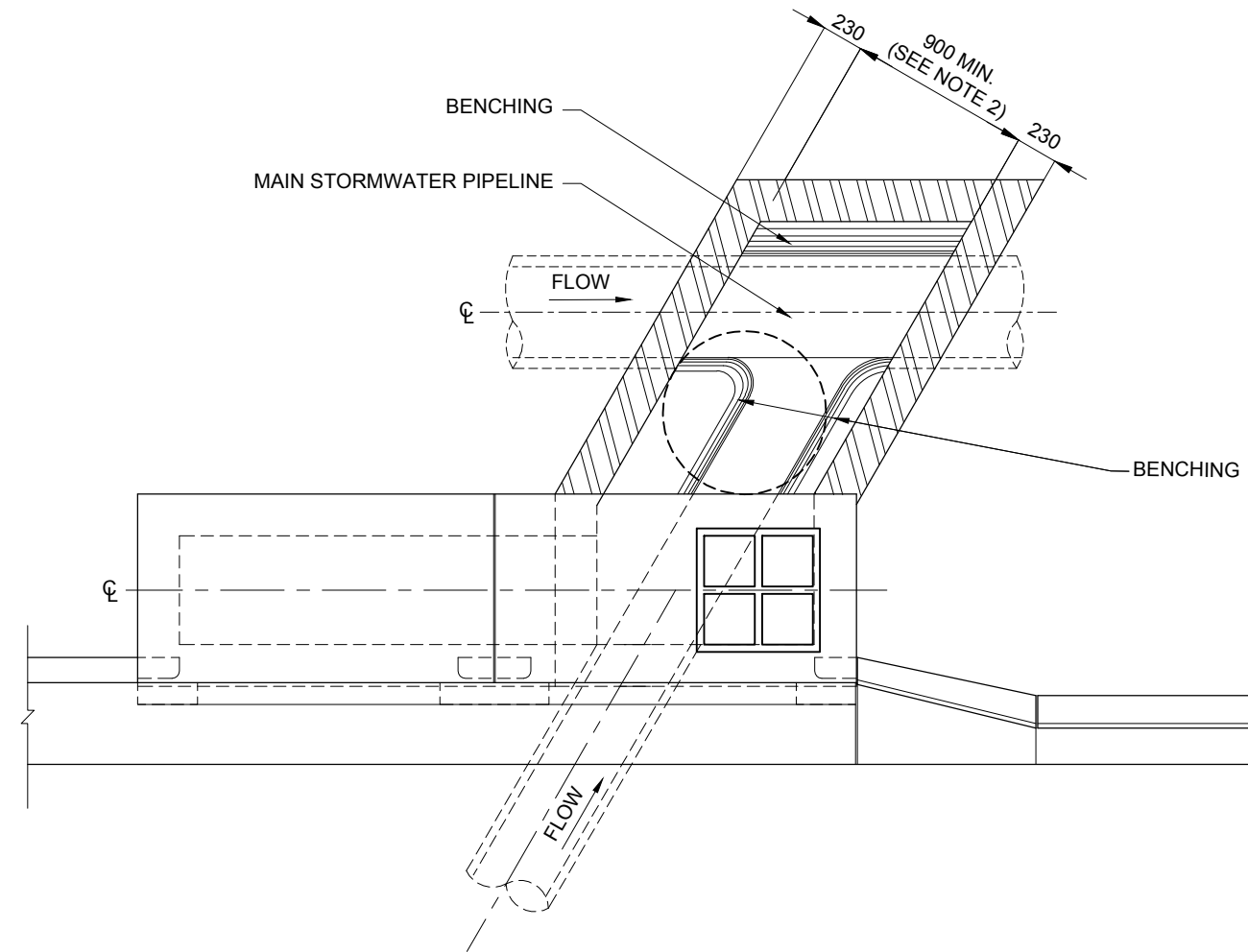
**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set      **STORMWATER : DESIGN**

**KERB INLETS**  
**KERB, APRON & SUPPORT DETAILS**

SCALE AS SHOWN: NTS	
DATE: 06/05/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD</b> <b>SW-023</b>	
AMENDMENT NUMBER:	

LEGEND



SECTIONAL PLAN  
KERB INLET/ MANHOLE CONNECTION  
(ADJACENT MAIN LINE PIPE)

NOTES

1. WHEN THE MAIN STORMWATER LINE IS CLOSE TO A KERB INLET, BUT CANNOT BE INCORPORATED BELOW THE K.I., THE K.I. BRICKWORK CAN BE CONTINUED INTO THE MANHOLE. TO FACILITATE WATER FLOW THE MANHOLE MAY BE ORIENTED AT 60° TO THE K.I.
2. THE INTERNAL WIDTH OF THE MANHOLE SHOULD BE AT LEAST 900mm TO FACILITATE CLEANING.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

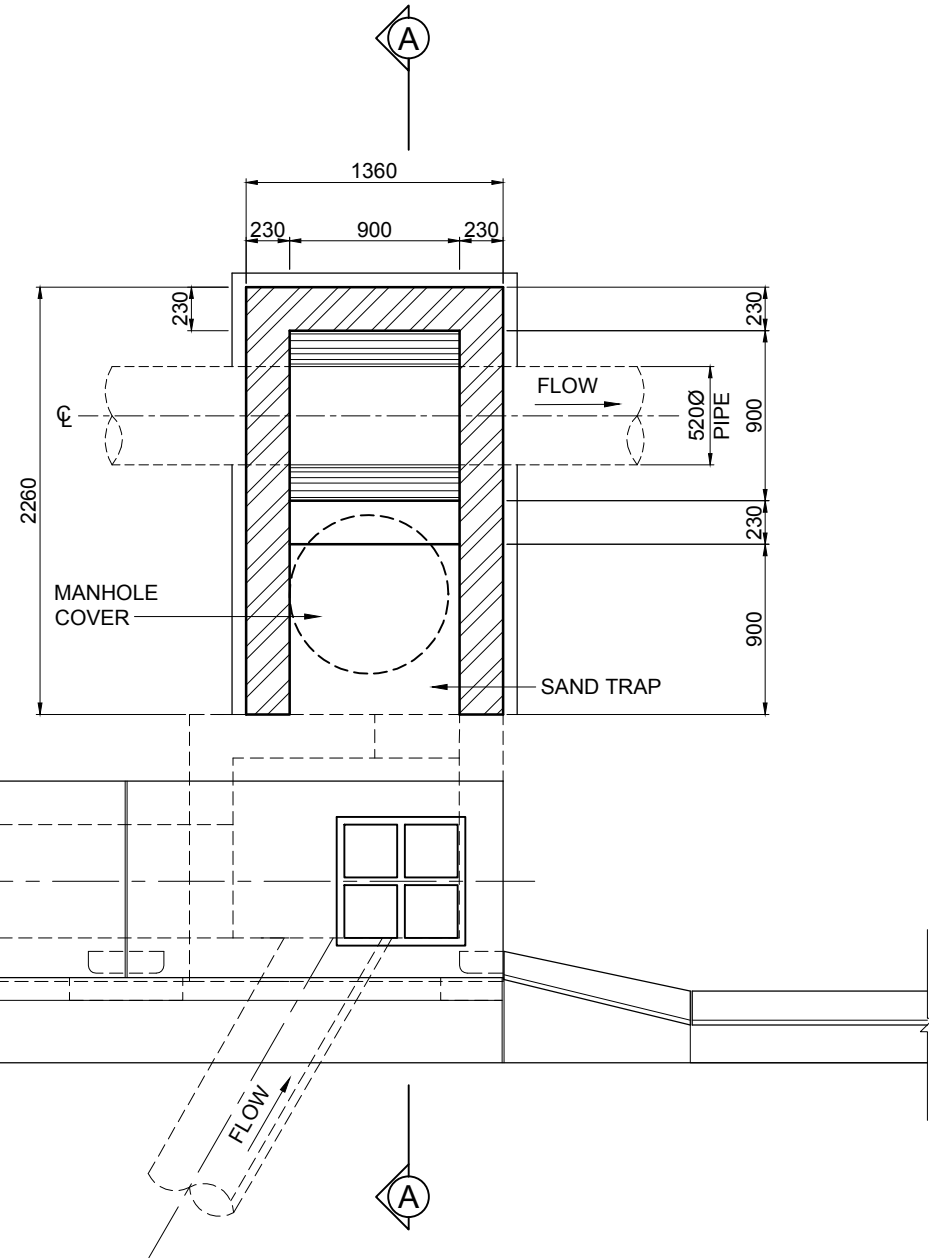
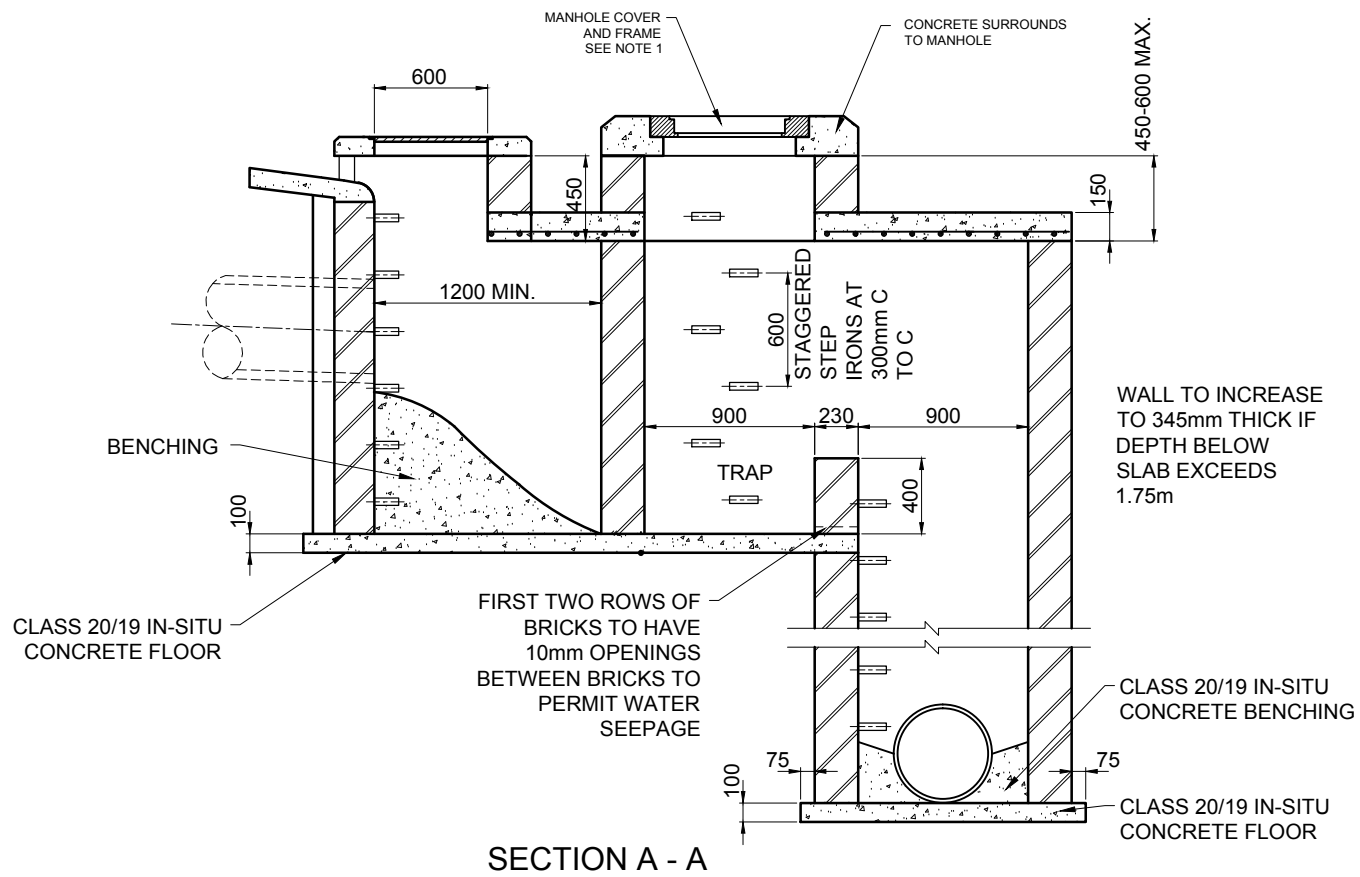
DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
KERB INLET/MANHOLE COMBINATIONS	

SCALE AS SHOWN: NTS	
DATE: 03/02/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD SW-024</b>	
AMENDMENT NUMBER:	

LEGEND



SECTIONAL PLAN  
KERB INLET/ SAND TRAP

NOTES

1. FOR NEW INSTALLATION AND REPLACEMENT MANHOLE SPECIFICATIONS USE APPROVED NON-METALLIC MANHOLE COVERS AND FRAMES IN COMPLIANCE WITH SANS 1882-2003 OR SANS 50124-1994 (EN124-1994)
2. THE KERB INLET, MANHOLE, SAND TRAP COMBINATION MAY VARY ACCORDING TO SPECIFIC SITES, IN PARTICULAR WHEN CONNECTING A NEW K.I./SAND TRAP TO AN EXISTING STORMWATER PIPE.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



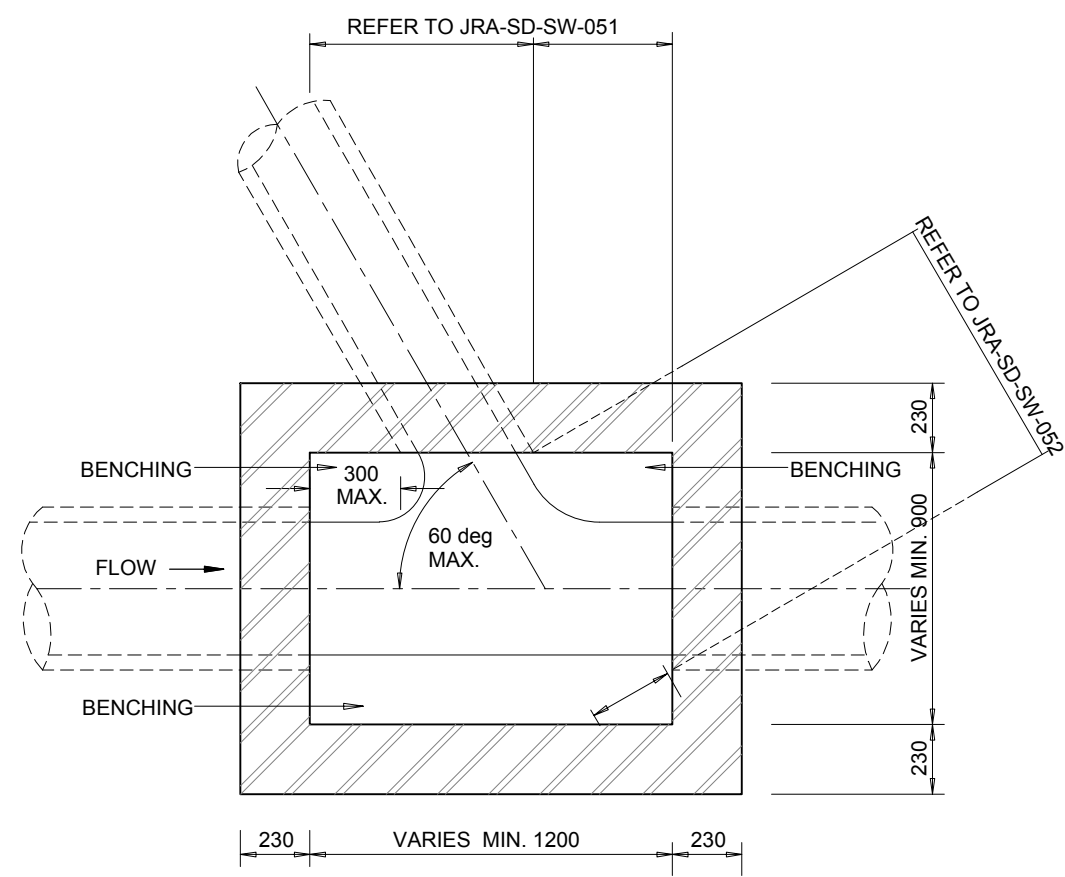
CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
KERB INLET WITH SAND TRAP	

SCALE AS SHOWN: NTS	
DATE: 29/02/2015	
DRAWING NUMBER	EXTN.
JRA-SD SW-025	
AMENDMENT NUMBER:	

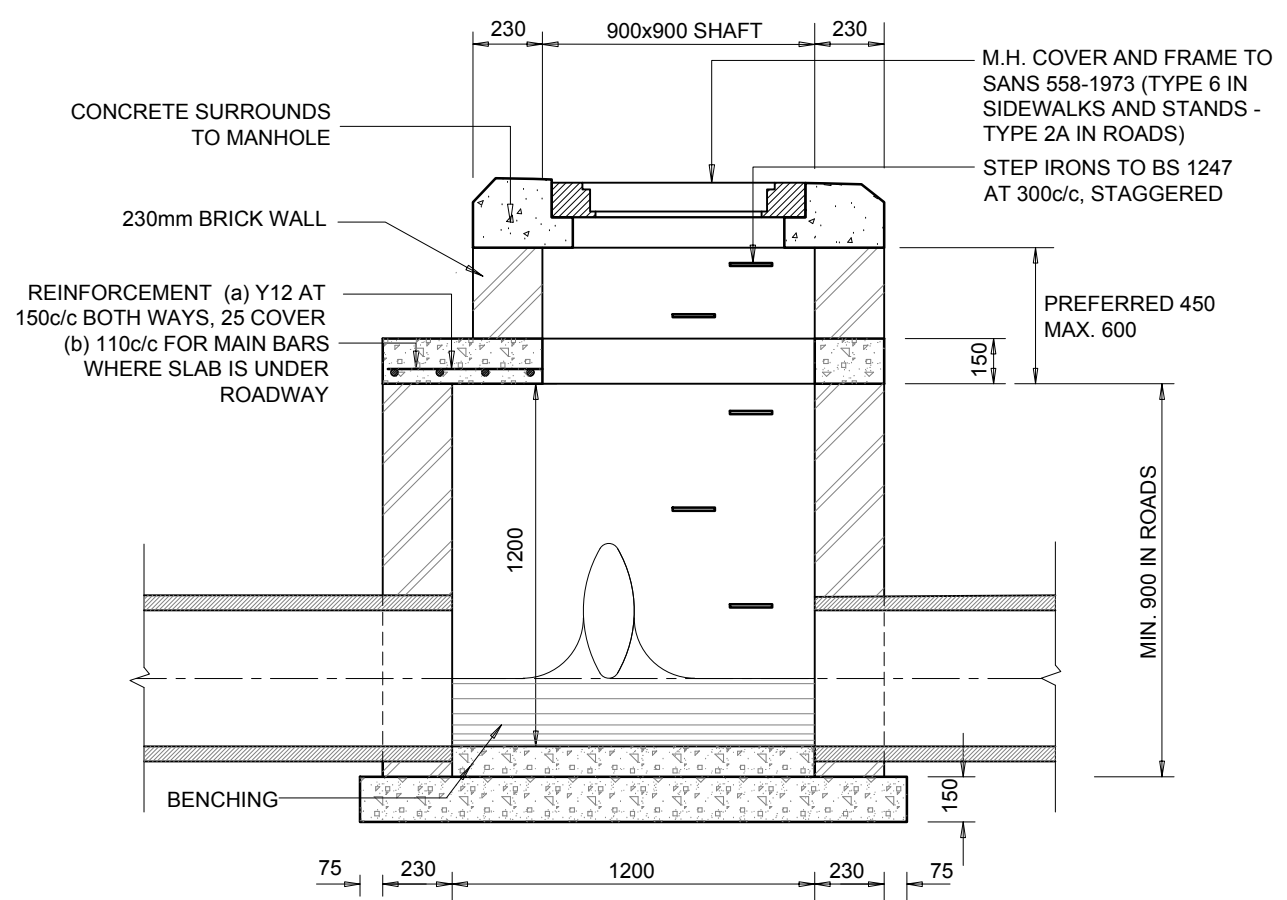
LEGEND

NOTES

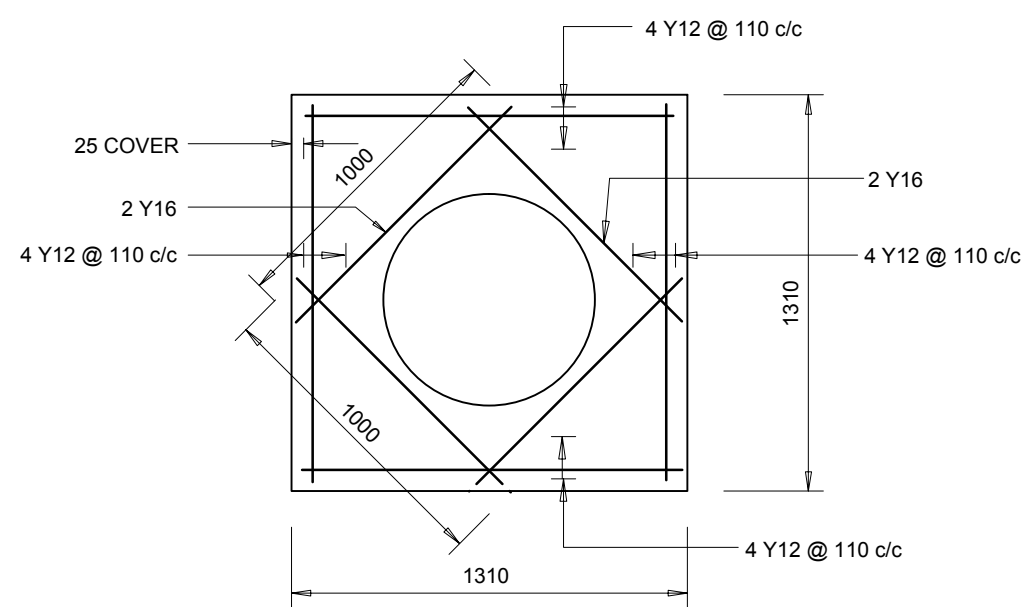
1. CONCRETE STRENGTH TO BE AS FOLLOWS:
  - a. MANHOLE SURROUNDS AND BENCHING: CLASS 15/19
  - b. CAST IN-SITU DECK SLABS AND FOUNDATION: CLASS 20/19
  - c. PRECAST COVER SLABS AND OTHER ITEMS: CLASS 25/19
  - d. CAST IN-SITU KERBS, APRONS ETC.: CLASS 25/19
2. ALL FLOORS AND BENCHING TO BE STEEL TROWELLED WITH A SMOOTH RADIUS.
3. ALL BRICKS TO BE OF QUALITY FBSE 30 TO SANS 227-2007, WITH WATER ABSORPTION < 14% AND EFFLORESCENCE < 10.
4. ALL BRICKWORK TO BE IN ENGLISH BOND.
5. MANHOLE AND KERB INLETS WIDTHS AND DEPTH:
  - a. WIDTH:-
    - 750 mm PIPES AND LESS - 900mm
    - 825 mm PIPES AND MORE - 1200mm .
  - b. SOME JUNCTION MANHOLE SIZES TO BE DETERMINED ON SITE
  - c. DEPTH:-
    - THE DEPTH INDICATED SHOULD BE INCREASED IF NECESSARY FOR ANGLE AND JUNCTION MANHOLES TO PERMIT SUFFICIENT DISCHARGE HEAD TO DEVELOP.
    - d. MANHOLE DEPTH > 1,75m, WIDTH OF BRICKWORK TO BE INCREASED TO 330mm.
6. FOR DEEP MANHOLES SEE JRA-SD-SW-051.
7. SEE JRA-SD-SW-060-062 FOR NON-TYPICAL DESIGNS.
8. FOR NEW INSTALLATION AND REPLACEMENT MANHOLE SPECIFICATIONS USE APPROVED NON-METALLIC MANHOLE COVERS AND FRAMES IN COMPLIANCE WITH SANS 1882 - 2003 OR SANS 50124 - 1994 (EN 124 - 1994).



SECTIONAL PLAN



SECTION THROUGH SHALLOW MANHOLE WITH SHAFT (SEE NOTE 6)



REINFORCEMENT DETAIL FOR COVER SLAB

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set      **STORMWATER : DESIGN**

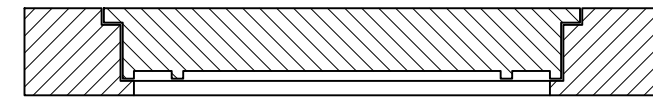
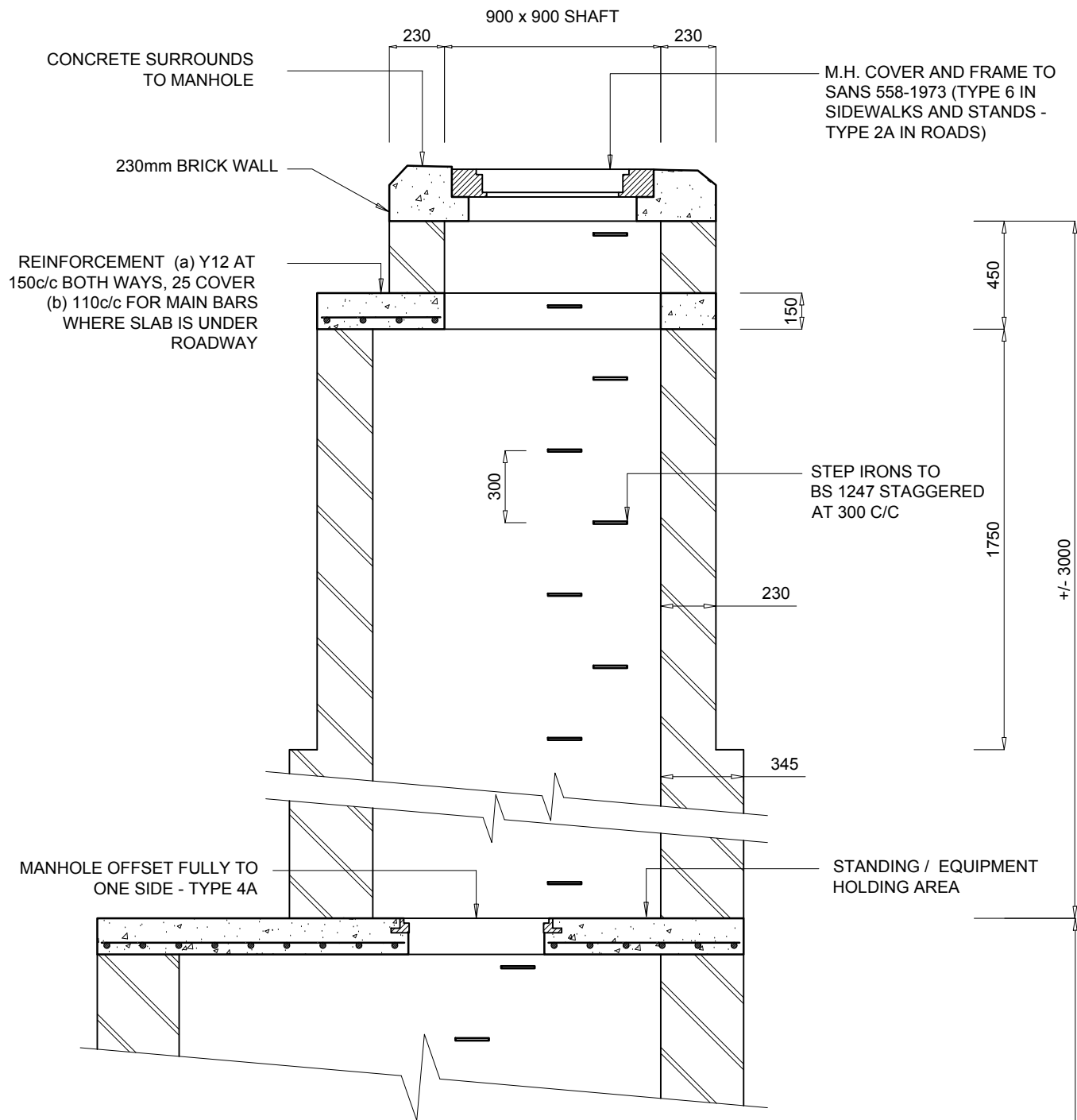
**MANHOLE DETAILS**  
FOR CONDUITS < 750mmØ

SCALE AS SHOWN: NTS	
DATE: 11/05/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD</b> <b>SW-050</b>	
AMENDMENT NUMBER:	

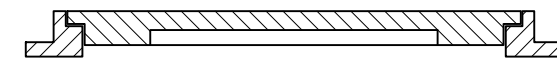
LEGEND

NOTES

1. DETAIL 051 - 1 SHOWS A DEEP MANHOLE. BELOW 3m, THE MANHOLE IS SUBJECT TO SITE SPECIFIC / DEPTH ENGINEERING DESIGN. THE DETAIL GIVEN HERE OF THE LOWER SLAB IS FOR ILLUSTRATION PURPOSES ONLY.
2. THE SALIENT DESIGN FEATURES OF A DEEP MANHOLE WITH AN INTERMEDIATE LANDING / STAGING SLAB, AS SHOWN, INCLUDE:
  - DESCENT/ASCENT STAGING AREA;
  - OFFSET MANHOLE TO THE NEXT LEVEL;
  - OFFSET OF THE LOWER STEP IRONS.
3. FOR SPECIFIC MANHOLE DETAILS REFER TO SANS 558 - 1973.
4. FOR NEW INSTALLATION AND REPLACEMENT MANHOLE SPECIFICATIONS USE APPROVED NON-METALLIC MANHOLE COVERS & FRAMES IN COMPLIANCE WITH SANS 1882 - 2003 OR SANS 50124 - 1994 (EN 124 - 1994).



DETAIL A  
HEAVY DUTY MANHOLE (SIMPLIFIED)



DETAIL B  
LIGHT DUTY MANHOLE (SIMPLIFIED)

ALL DETAIL IN THIS SECTION - SEE NOTE 1

DETAIL 051 - 1

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER : DESIGN
MANHOLES : FURTHER DETAILS	

SCALE AS SHOWN: NTS	
DATE: 22/05/2015	
DRAWING NUMBER	EXTN.
JRA-SD SW-051	
AMENDMENT NUMBER:	



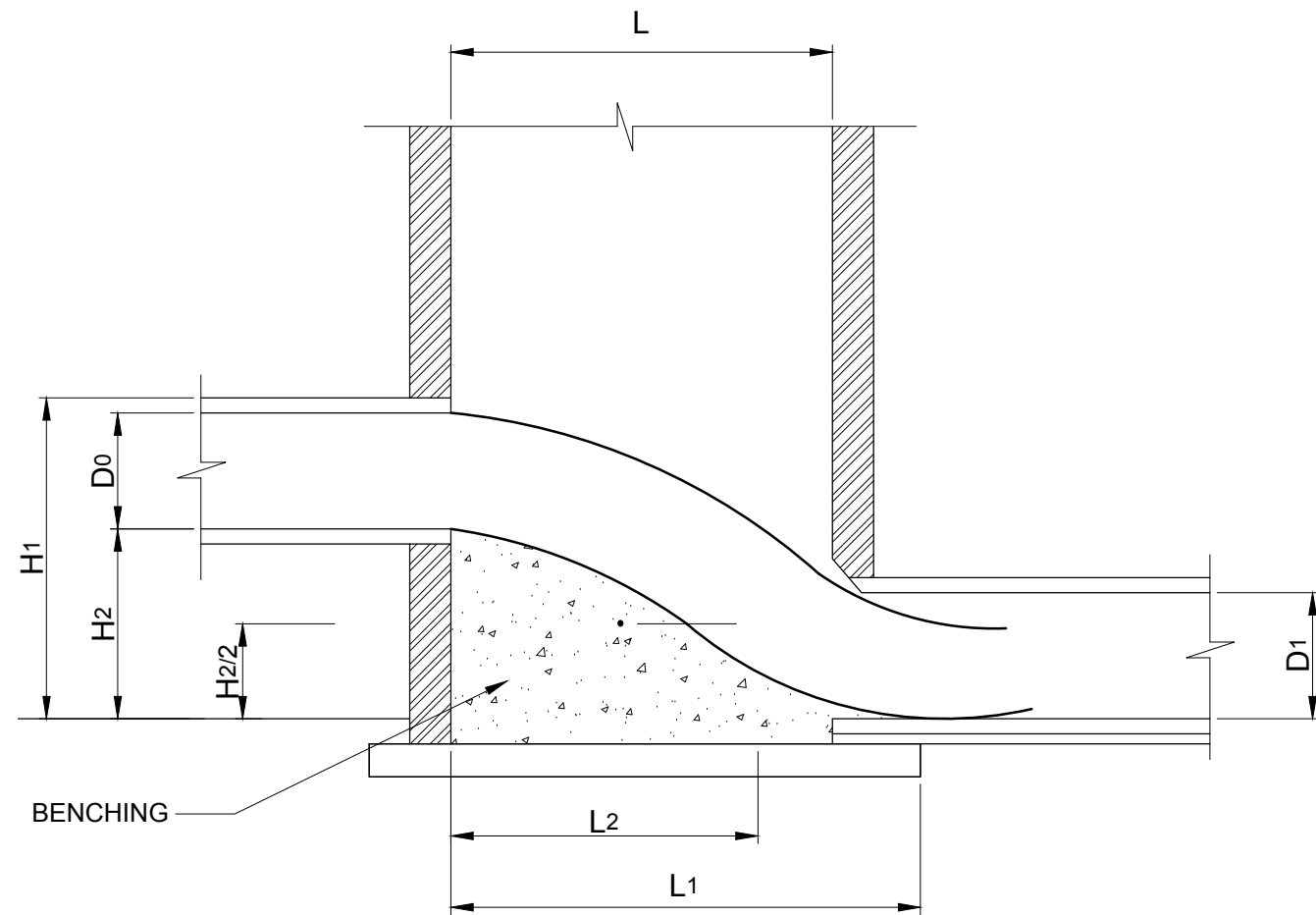


FIGURE 1

FORMULAE:

- \$D\_0\$ = DISCHARGE DIAMETER
- \$D\_1\$ = OUTLET DIAMETER
- \$V\_0\$ = DISCHARGE VELOCITY
- \$V\_1\$ = LANDING VELOCITY IN CHAMBER
- \$L\_1\$ = LENGTH OF TOP WATER PROFILE OF JET
- \$L\_2\$ = LENGTH OF BOTTOM PROFILE OF JET
- \$H\_1\$ = HEIGHT BETWEEN SOFFIT OF INLET TO INVERT OF OUTLET
- \$H\_2\$ = HEIGHT BETWEEN INVERT OF INLET TO INVERT OF OUTLET
- \$L\$ = LENGTH OF STEPPED MANHOLE

NOTES

1. TOPOGRAPHY OFTEN REQUIRES STEPPED MANHOLES TO REDUCE THE VELOCITY IN THE PIPED STORMWATER SYSTEM.
2. THESE STRUCTURES REQUIRE CAREFUL CONSIDERATION TO AVOID DESTRUCTION OF THE CHAMBER WALL OPPOSITE THE DISCHARGE POINT. THERE IS NO MORTAR THAT CAN STAND UP TO THE EROSION FORCE OF WATER POUNDING ON THE JOINTS OF THE BRICKWORK IN THE CHAMBER, IN FACT OVER A PERIOD OF TIME, EVEN CONCRETE WILL DETERIORATE. THE TROUBLE IS THAT BY THE TIME THE DEGRADATION BECOMES APPARENT, MUCH DAMAGE HAS BEEN DONE.
3. THE JRA HAS ADOPTED DESIGN CRITERIA THAT WILL LIMIT THE DAMAGE TO STEPPED MANHOLES AND IS DESCRIBED ON THIS DRAWING.

1. ADJUSTING MANHOLE LENGTH TO AVOID EROSION:

THE JET OF WATER DISCHARGED FROM THE UPSTREAM PIPES LOSES VELOCITY AND THEREFORE EXPANDS. THE DISCHARGE REMAINS THE SAME AND THUS \$Q = AV\$ APPLIES. THE DISTANCE FROM THE INLET TO THE OUTLET TO THE CHAMBER MUST TAKE THIS INTO ACCOUNT, EITHER IN HEIGHT TO ACCOMMODATE THE VELOCITY HEAD OR IN INCREASED DIAMETER LEADING TO THE DOWNSTREAM PIPE.

$$V_1 = (2g(H_1 - D_0/2))^{0.5}$$

$$L_1 = V(2H_1/g)^{0.5}$$

$$L_2 = V(2H_2/g)^{0.5}$$

$$L = L_1 - D_1/4$$

2. BENCHING FOR STEPPED MANHOLES:

BENCHING IN THE MANHOLE IS TO FOLLOW THE BOTTOM PROFILE OF THE FREE JET UP TO \$H\_2/2\$, BEYOND WHICH THE PROFILE IS REVERSED. THE COORDINATES OF THE PROFILE ARE DETERMINED BY CALCULATING \$\Delta L\$ VS \$\Delta H\$ USING THE FORMULA FOR \$L\_2\$. THE ENTRANCE SHOULD BE ROUNDED TO AVOID ENTRY LOSSES AS MUCH AS 50% OF THE ENERGY HEAD, RESULTING IN AN EVEN HIGHER WATER LEVEL IN THE CHAMBER. IN THIS SITUATION \$h = (V^2/2G)^{0.5}\$ STILL APPLIES.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



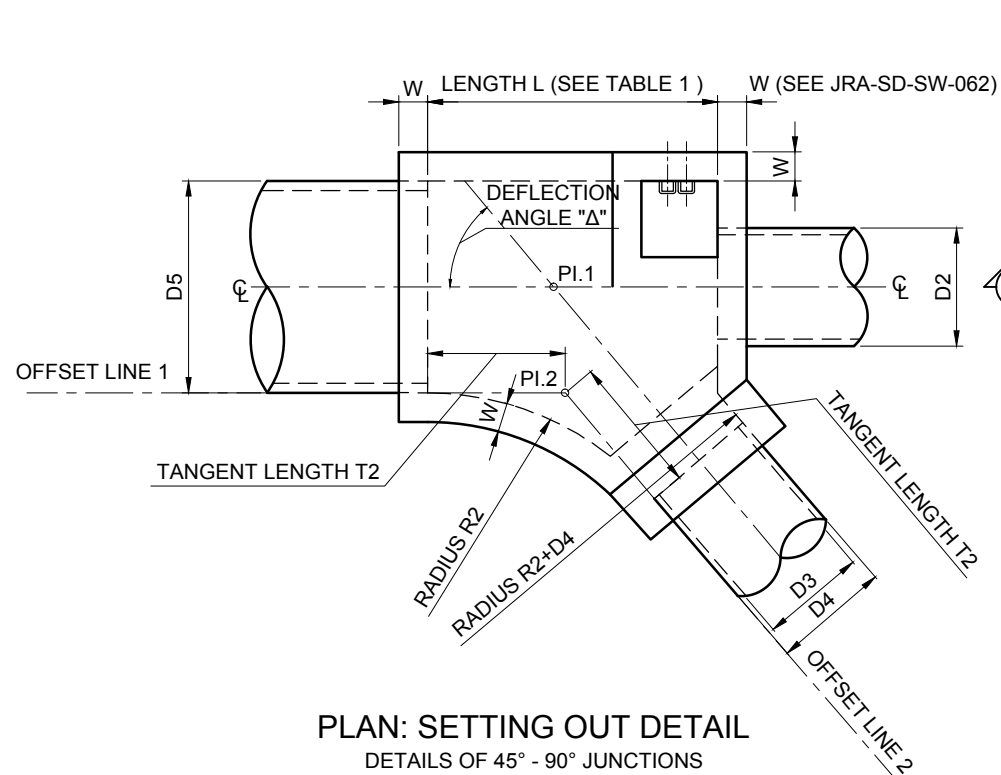
CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
DESIGN OF STEPPED MANHOLES	

SCALE AS SHOWN: NTS	
DATE: 10/05/2015	
DRAWING NUMBER	EXTN.
JRA-SD SW-052	
AMENDMENT NUMBER:	

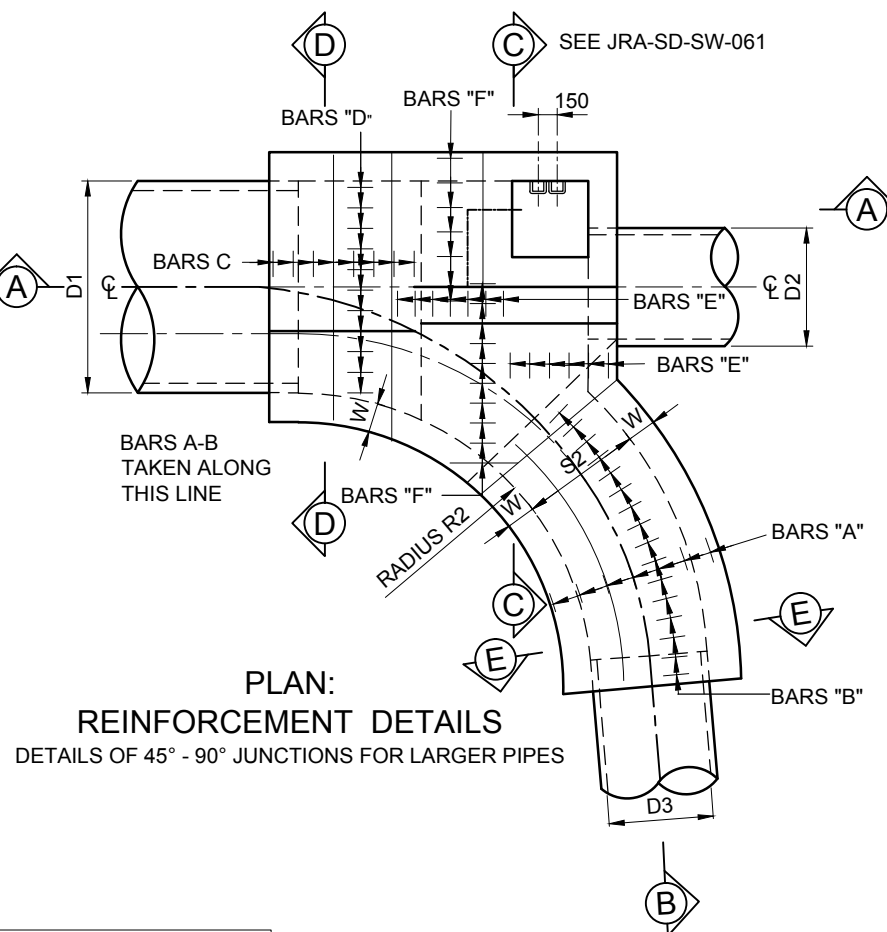
LEGEND

NOTES

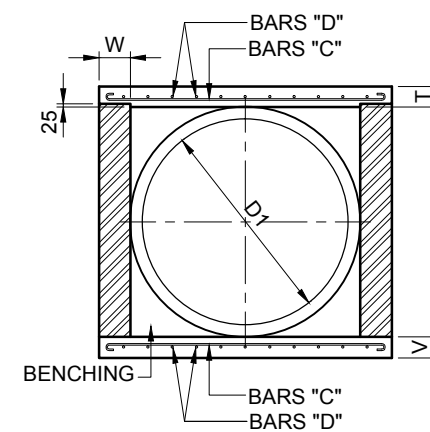
1. POINT PI.2 LOCATED ON THE INTERSECTION OFFSET LINES 1 & 2 TO HALF THE EXTERNAL PIPE DIAMETERS ie D5/2 & D4/2 RESPECTIVELY.
2. REFER TO JRA-SD-SW-062 FOR VALUES OF W - SEE TABLES AND NOTE 2.
3. REFER TO JRA-SD-SW-061 FOR SECTION C-C.
4. ALL BRICKS TO BE OF QUALITY FBSE 30 TO SANS 227-2007 WATER ABSORPTION <14% AND EFFLORESCENCE <10.
5. ALL BRICKWORK TO BE ENGLISH BOND.
6. REFER TO JRA-SD-SW-062 FOR BENDING SCHEDULES
7. DIMENSION D4 VARIES DEPANDANT ON TYPE AND CLASS OF PIPE - VALUE GIVEN IS FOR GUIDANCE ONLY - SHOULD BE MEASURED ON SITE.
8. IF THE CHAMBER INVERT IS MORE THAN 1.98m BELOW GROUND LEVEL THE 1300 MIN CHAMBER HEIGHT MUST BE INCREASED AS NECESSARY, WITH AN APPROPRIATE INCREASE IN WALL THICKNESS W AS SHOWN ON JRA-SW-SD-062.



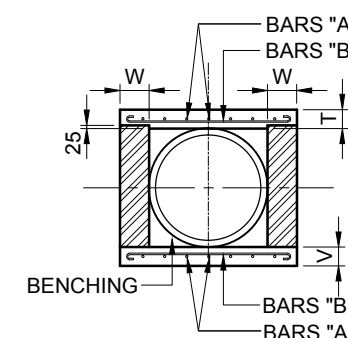
PLAN: SETTING OUT DETAIL  
DETAILS OF 45° - 90° JUNCTIONS



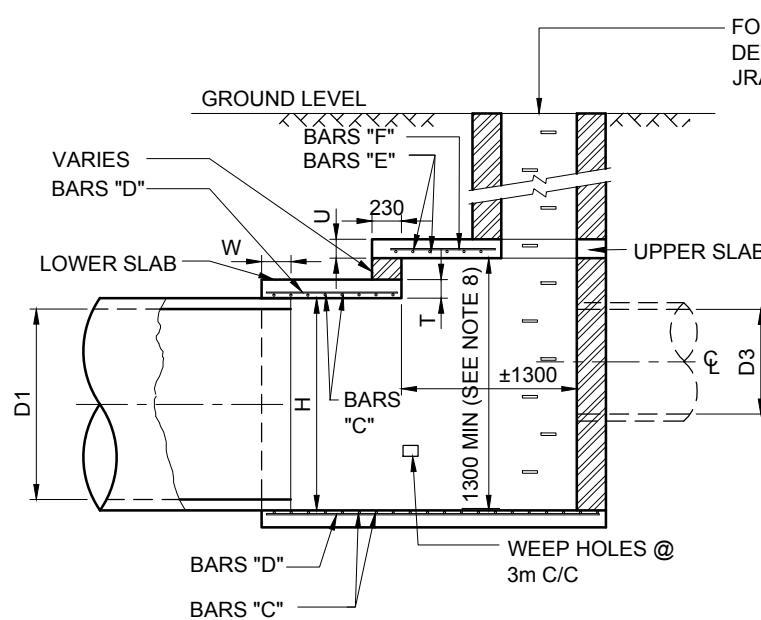
PLAN:  
REINFORCEMENT DETAILS  
DETAILS OF 45° - 90° JUNCTIONS FOR LARGER PIPES



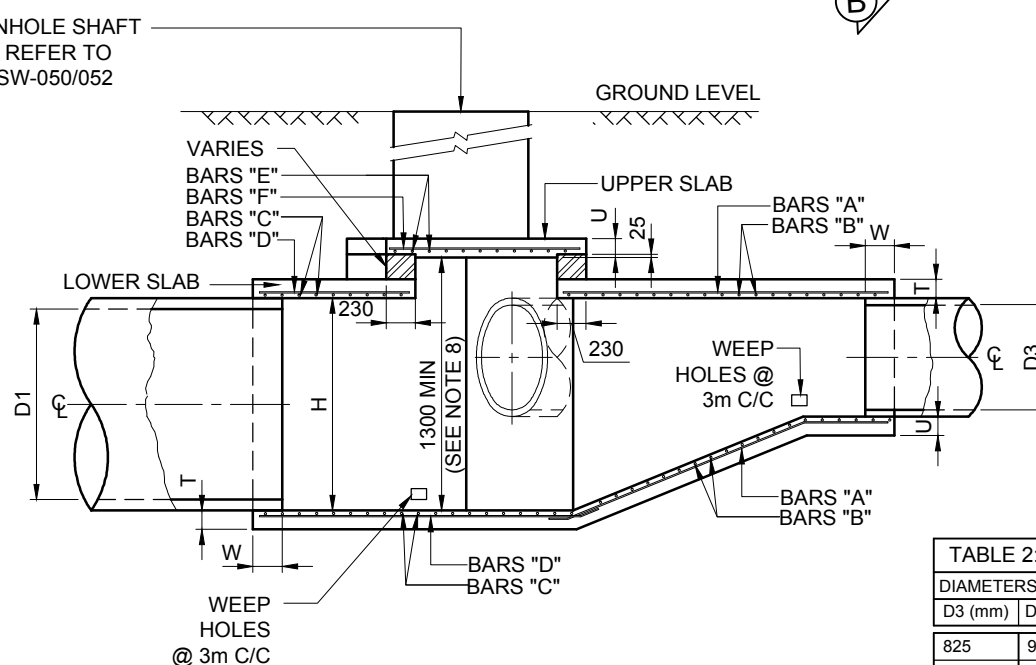
SECTION D - D  
DETAILS OF 45° - 90° JUNCTIONS



SECTION E - E  
DETAILS OF 45° - 90° JUNCTIONS



SECTION A - A  
DETAILS OF 45° - 90° JUNCTIONS



SECTION A - B  
DETAILS OF 45° - 90° JUNCTIONS

TABLE 1: VALUES OF L AND R2

NOMINAL Ø 03(mm)	825	900	1050	1200	1350	1500	1650	1800
L(m)	2.29	2.48	2.90	3.31	3.71	4.10	4.49	4.85
R(m)	2.33	2.54	2.96	3.38	3.79	4.18	4.57	4.95

TABLE 2: TANGENT LENGTHS, T2

DIAMETERS		DEFLECTION ANGLE "Δ"									
D3 (mm)	D4 (mm)	90	85	80	75	70	65	60	55	50	45
825	933	2.33	2.14	1.96	1.79	1.63	1.48	1.35	1.21	1.09	0.97
900	1014	2.54	2.33	2.13	1.95	1.78	1.62	1.47	1.32	1.18	1.05
1050	1185	2.96	2.71	2.48	2.27	2.07	1.89	1.71	1.54	1.38	1.23
1200	1352	3.38	3.10	2.84	2.59	2.37	2.15	1.95	1.76	1.58	1.40
1350	1516	3.79	3.47	3.18	2.91	2.65	2.41	2.19	1.97	1.77	1.57
1500	1672	4.18	3.83	3.51	3.21	2.93	2.66	2.41	2.18	1.95	1.73
1650	1828	4.57	4.19	3.83	3.51	3.20	2.91	2.64	2.38	2.13	1.89
1800	1978	4.95	4.54	4.15	3.80	3.47	3.15	2.86	2.58	2.31	2.05

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

STRUCTURAL DESIGN BY:

CHECKED BY:

DRAWN BY:

DRAWING CHECKED BY:

DRAWING APPROVED BY:



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set: STORMWATER: DESIGN  
 DETAILS OF STANDARD BUILT UP SECTIONS FOR BENDS AND  
 JUNCTIONS FOR CONDUITS > 750mmØ (SHEET 1 OF 3)

SCALE AS SHOWN: NTS

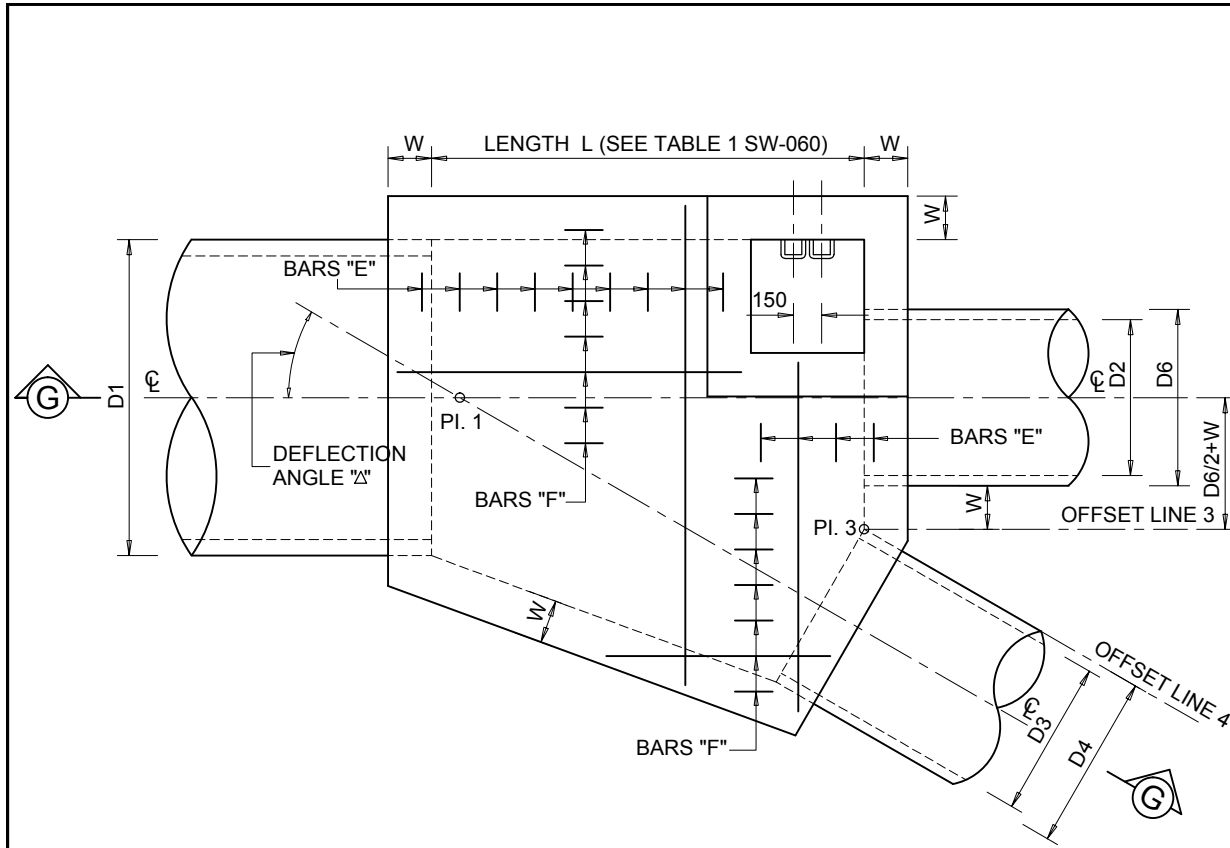
DATE: 15/05/2015

DRAWING NUMBER

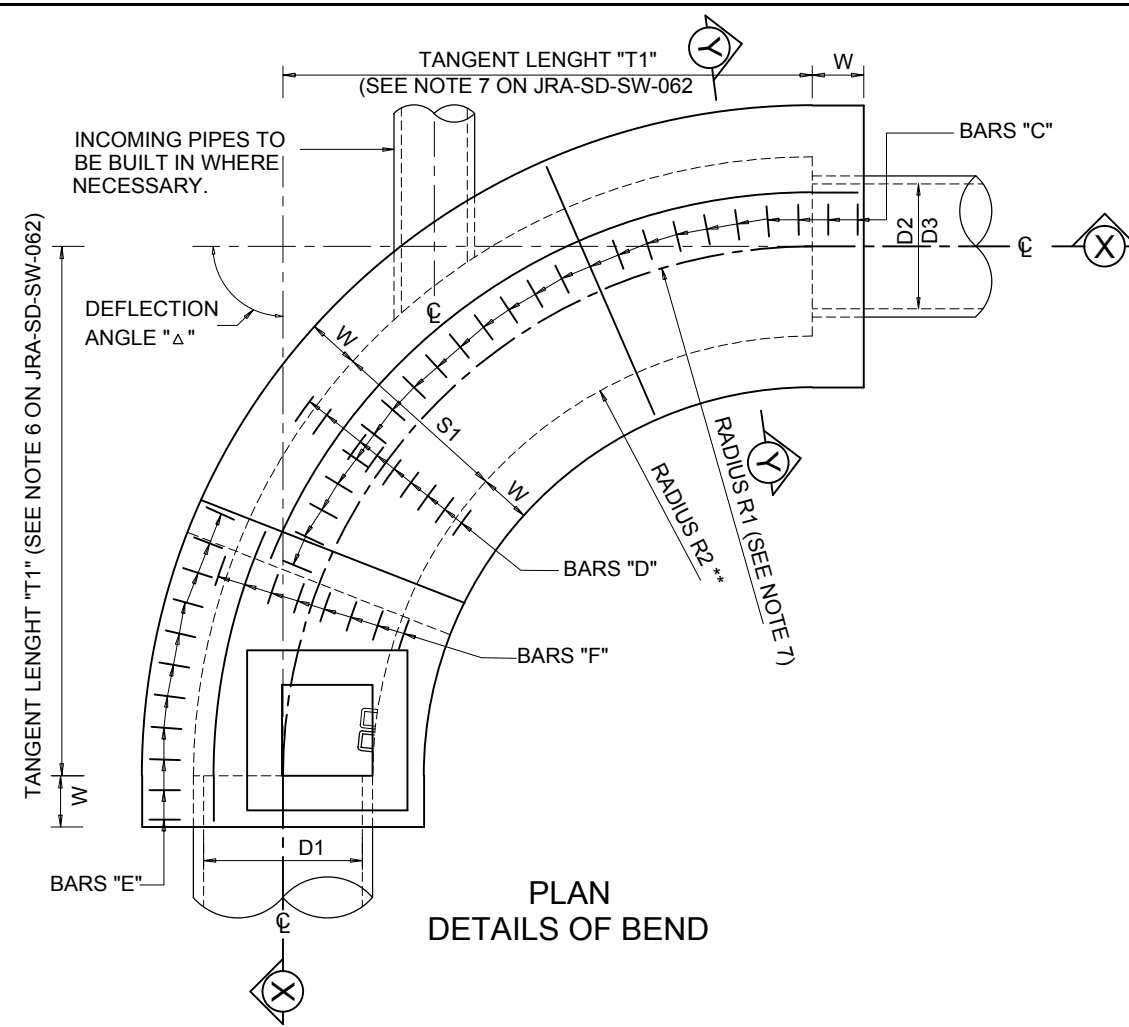
EXTN.

JRA-SD  
SW-060

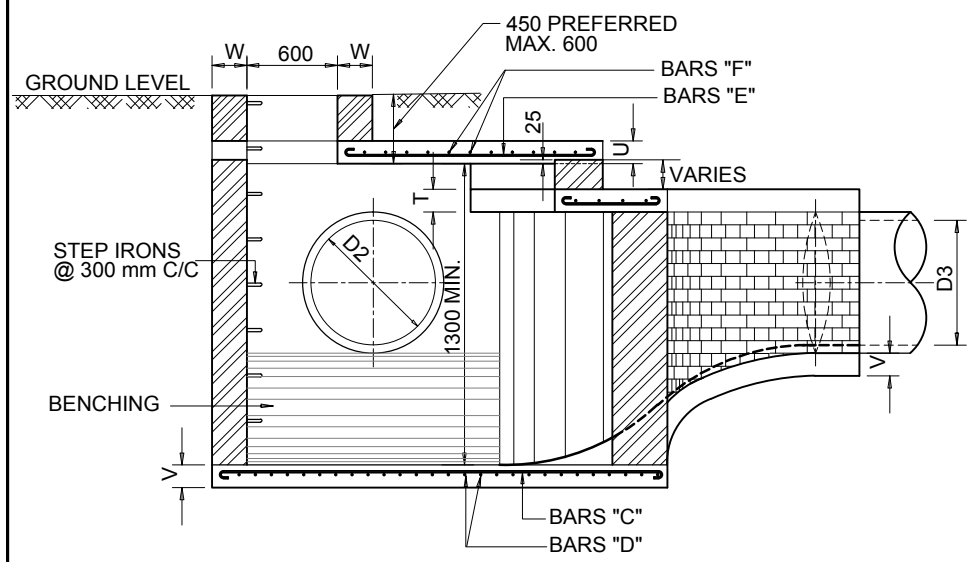
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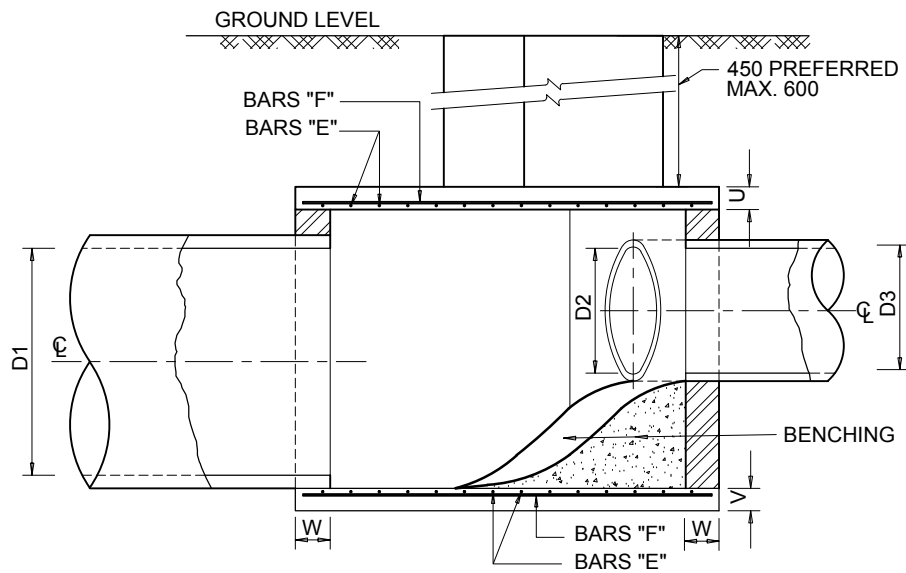
PLAN: SETTING OUT DETAIL  
DETAILS OF JUNCTIONS LESS THAN 45°



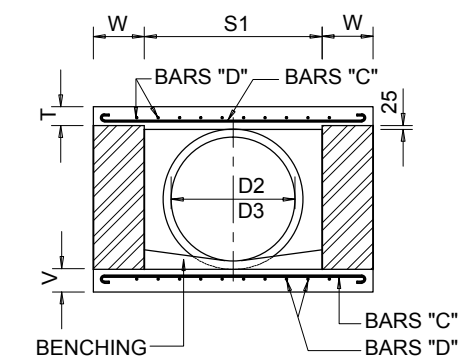
PLAN  
DETAILS OF BEND



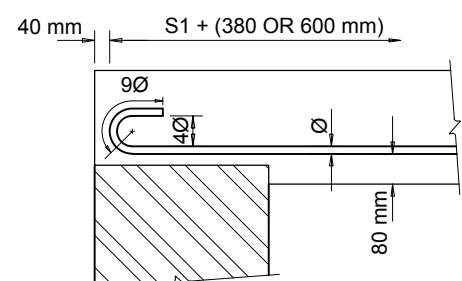
SECTION C-C  
DETAILS OF 45° - 90° JUNCTIONS  
(SEE JRA-SD-SW-060)



SECTION G-G  
DETAILS OF JUNCTIONS LESS THAN 45°



SECTION Y-Y  
DETAILS OF BEND



DETAIL OF HOOKS

LEGEND

NOTES

1. \*\* REFER TO NOTE 6 ON JRA-SD-SW-062.
2. DESIGNER'S NOTE: SPECIFY T1, R1, WIDTH AND OUTSIDE ARC LENGTH ON WORKING DRAWING.
3. POINT PI.3 IS LOCATED ON THE INTERSECTION OF OFFSETS OF OFFSET LINES 3 & 4 WITH OFFSETS FROM CENTRELINE EQUAL TO (D6/2+W) AND D4/2 RESPECTIVELY.
4. REFER TO JRA-SD-SW-060 FOR SECTION C-C.
5. REFER TO JRA-SD-SW-062 FOR POSITION OF SECTION X-X.
6. ALL BRICKS TO BE QUALITY FBSE 30 TO SANS 227-2007 WATER ABSORPTION < 14% AND EFFLORESCENCE < 10.
7. ALL BRICKWORK TO BE ENGLISH BOND.
8. REFER ALSO TO NOTES ON JRA-SD-SW-062.

SCALE AS SHOWN: NTS

DATE: 15/05/2015

DRAWING NUMBER

EXTN.

**JRA-SD  
SW-061**

AMENDMENT NUMBER:

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

DRAWN BY:

STRUCTURAL DESIGN BY:

DRAWING CHECKED BY:

CHECKED BY:

DRAWING APPROVED BY:



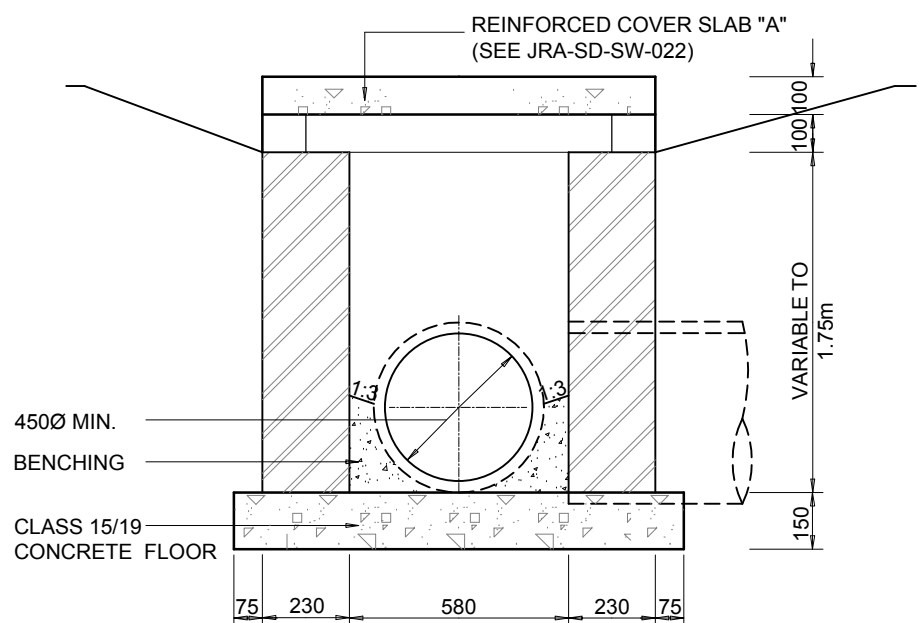
CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

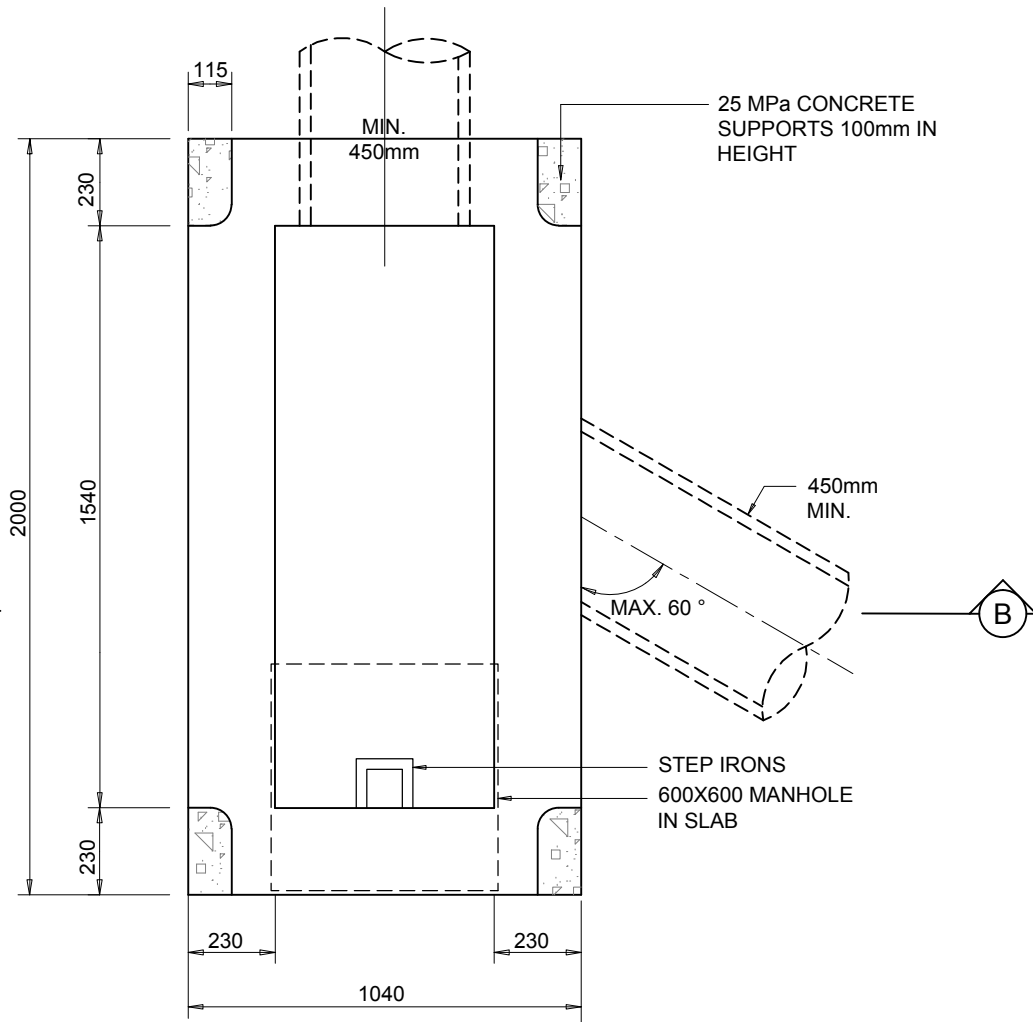
Drawing Sub-set

STORMWATER: DESIGN

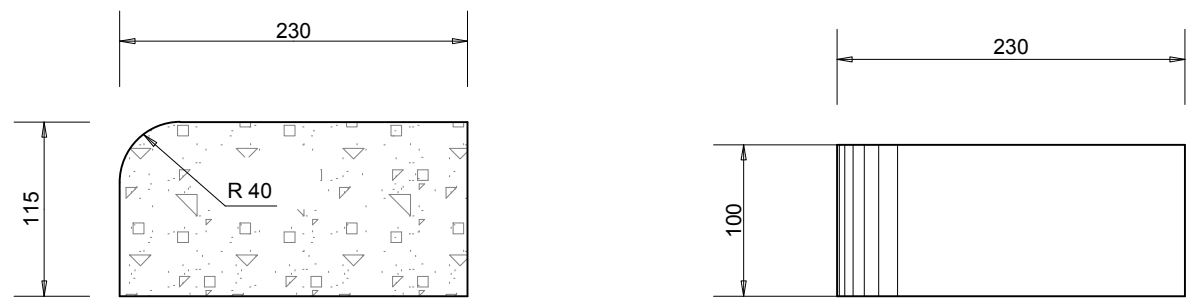
DETAILS OF STANDARD BUILT UP SECTIONS FOR BENDS AND  
JUNCTIONS (SHEET 2 OF 3)



SECTION B-B



PLAN OF FIELD INLET (WITHOUT LID)



SECTION

ELEVATION

END SUPPORT FOR COVER SLAB

LEGEND

NOTES

1. ALL BRICKS TO BE QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
2. ALL BRICK WORK TO BE ENGLISH BOND.
3. REINFORCED CONCRETE SLAB AND SUPPORTS AS PER JRA-SD-SW-022 AND 023, SLAB TYPE "A" WITH SQUARE MANHOLE.
4. STEP IRONS TO BE 1247 AT 300c/c, STAGGERED.
5. FOR DEEPER OR LARGER FIELD INLETS DESIGN ACCORDING TO DRAWING JRA-SD-SW-050.

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



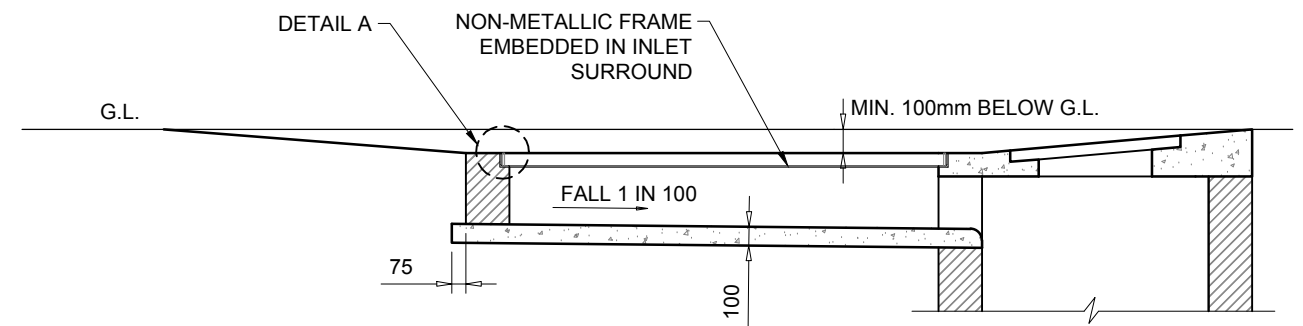
CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
DETAILS OF FIELD INLET	

SCALE AS SHOWN: NTS	
DATE: 17/05/2015	
DRAWING NUMBER	EXTN.
JRA-SD SW-070	
AMENDMENT NUMBER:	

LEGEND

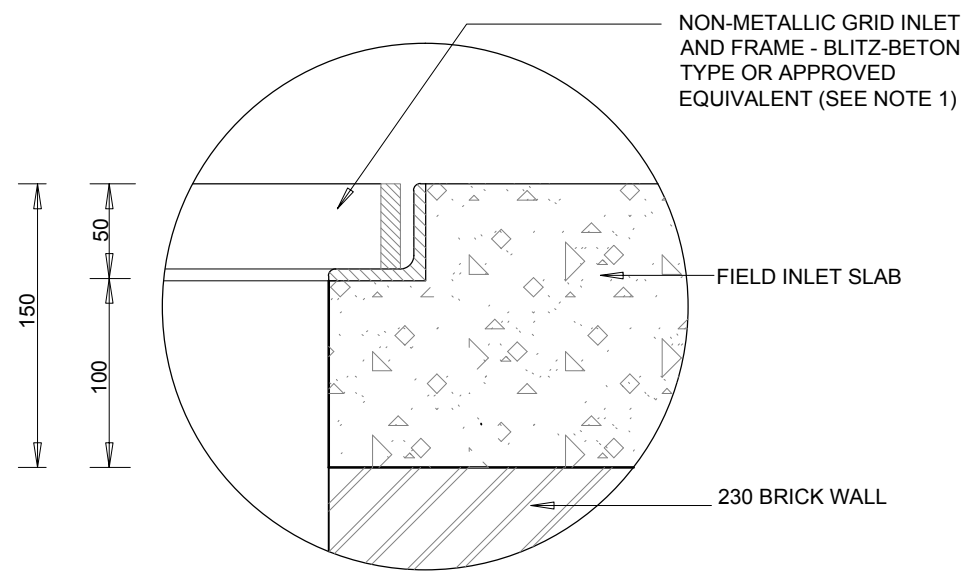
NOTES

1. THE NUMBER OF GRID UNITS HAVE BEEN TAKEN AS AN EXAMPLE ONLY. GRID INLET TO BE NON METALLIC AND SIZE OF OPENING TO BE DETERMINED BY THE DESIGNER IN TERMS OF PRODUCT TO BE USED.
2. FOR GRID INLET GRATING AND FRAME USE BLITZ-BETON TYPE OR AN APPROVED EQUIVALENT.
3. STONE PITCHING IS AN OPTIONAL FINISH, SUBJECT TO THE ENVIRONMENT. GRID INLETS MAY COMMONLY BE LOCATED IN PARKING AREAS WHERE THE SURFACE CAN BE APPROPRIATELY SHAPED TO DRAIN TO THE INLET.
4. ALL BRICKS TO BE OF QUALITY SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
5. ALL BRICKWORK TO BE IN ENGLISH BOND.

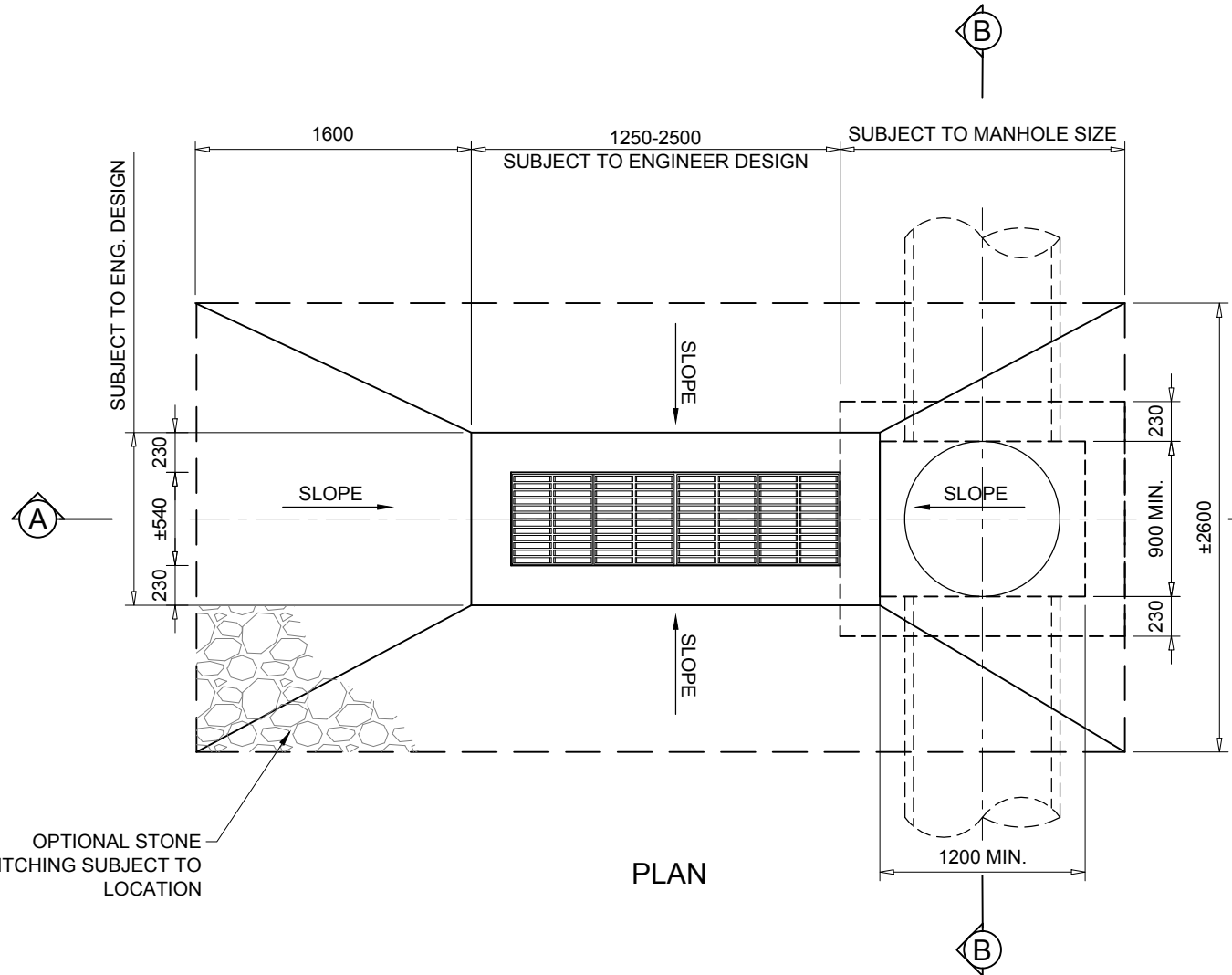


SECTION A-A

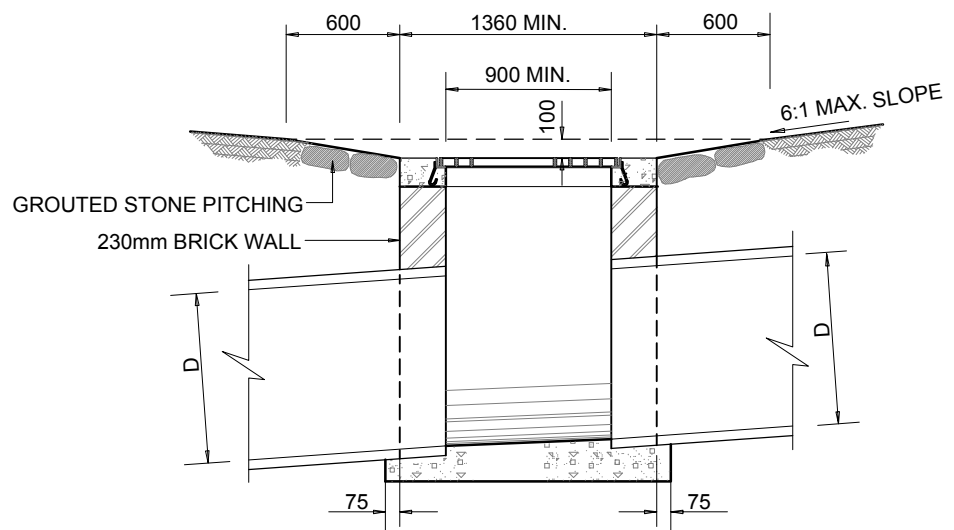
REFER TO DWGS. JRA-SD-SW-050 TO 052 FOR MANHOLE CRITERIA



DETAIL A



PLAN



SECTION B-B

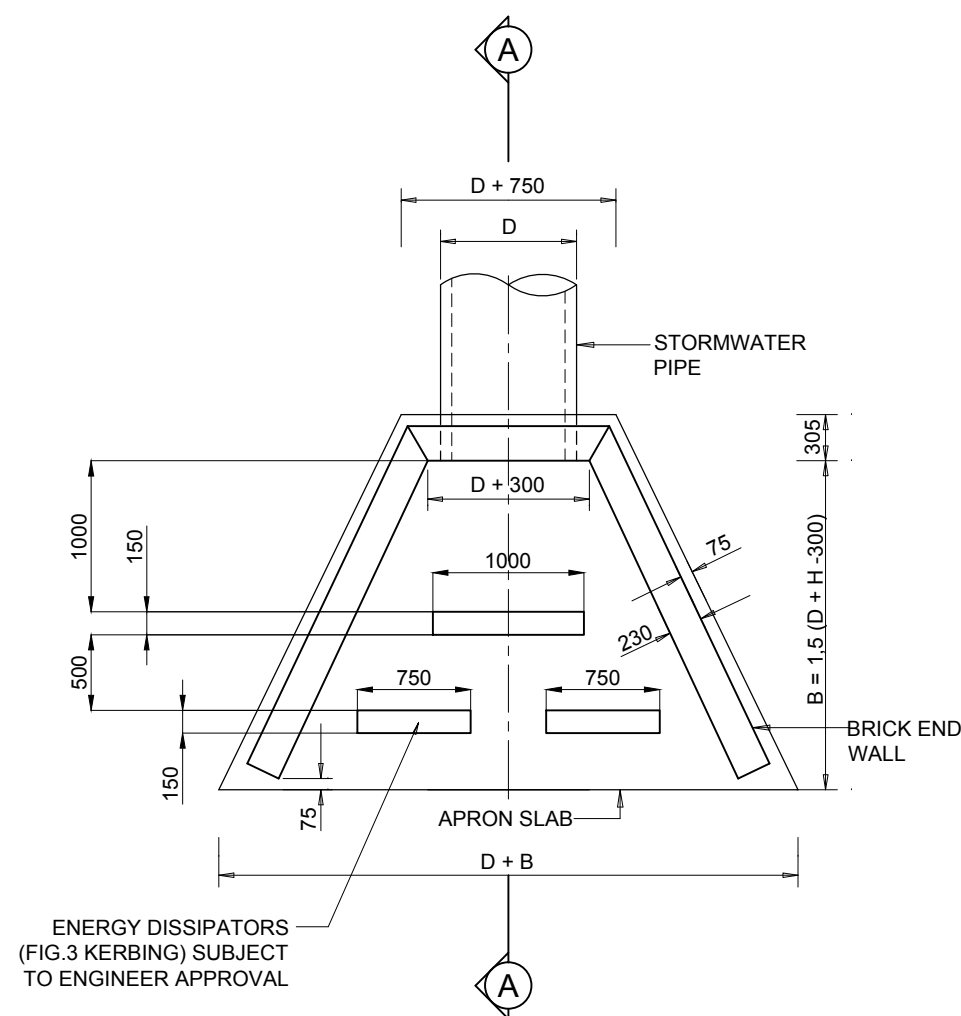
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No.	DATE	APPROVED	DESCRIPTION	

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STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:

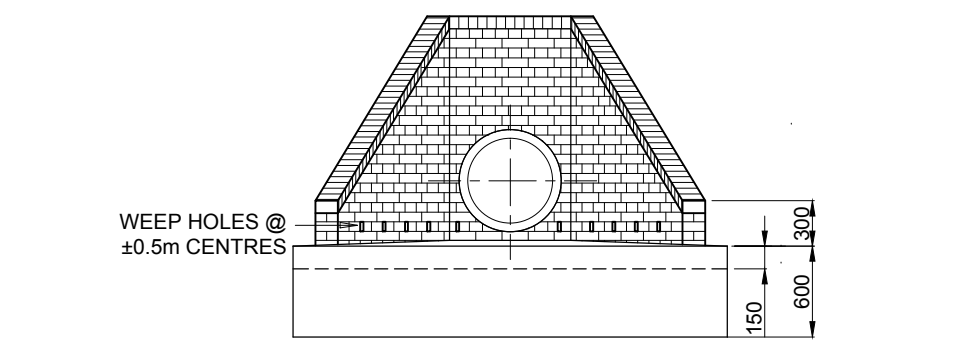


CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
DETAILS OF GRID INLET - 1	

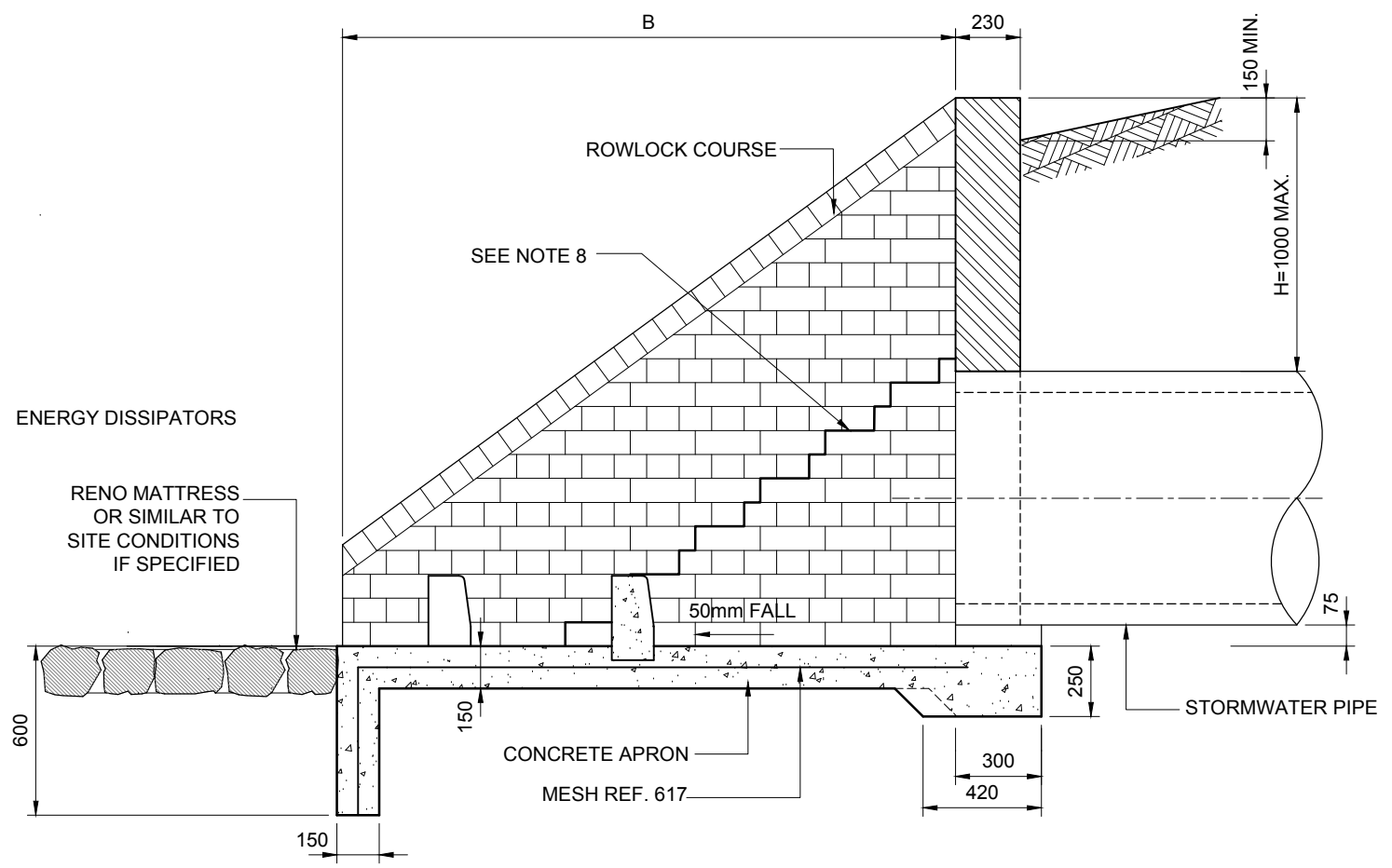
SCALE AS SHOWN: NTS	
DATE: 20/05/2015	
DRAWING NUMBER	EXTN.
JRA-SD SW-071	
AMENDMENT NUMBER:	



OUTLET PLAN



FRONT ELEVATION



SECTION A-A

LEGEND	
D	PIPE OUTSIDE DIAMETER
H	HEIGHT OF HEADWALL ABOVE PIPE
B	LENGTH OF APRON SLAB

- NOTES**
1. THE MATERIAL FOR A DEPTH OF 150mm UNDER THE APRON SLAB MUST BE COMPACTED TO A MINIMUM DENSITY OF 90 % OF THE MOD. AASHTO DENSITY.
  2. ALL CONCRETE TO BE CLASS 20/19.
  3. ENERGY BREAKERS MUST BE PROVIDED WHEN REQUIRED BY THE ENGINEER.
  4. THIS OUTLET STRUCTURE ONLY TO BE USED WHEN PIPE SIZE IS LESS THAN 600 mm Ø.
  5. ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
  6. ALL BRICKWORK TO BE IN ENGLISH BOND.
  7. NO PLASTERING OF BRICKWORK WILL BE ALLOWED.
  8. THE LOWER PORTION OF ANY BRICKWORK GREATER THAN 1m IN HEIGHT SHALL BE INCREASED TO 345mm TO A MAX. OVERALL HEIGHT OF 1.75m.
  9. BRICK SAMPLES SHALL BE SUBMITTED FOR TESTING.
  10. IN TERMS OF THE NATIONAL WATER ACT, 36 OF 1998, A RATE OF DISCHARGE FROM AN OUTLET STRUCTURE SHALL NOT EXCEED 1m/SEC AND SHALL NOT BE GREATER THAN 100mm IN DEPTH. IF DESIGN INDICATIONS ARE THAT THESE FIGURES WILL BE EXCEEDED, ADDITIONAL ENERGY DISSIPATION MEASURES WILL BE REQUIRED.
  11. REFER TO DWGS JRA-SD-SW-081 & 082 FOR FURTHER INFORMATION.

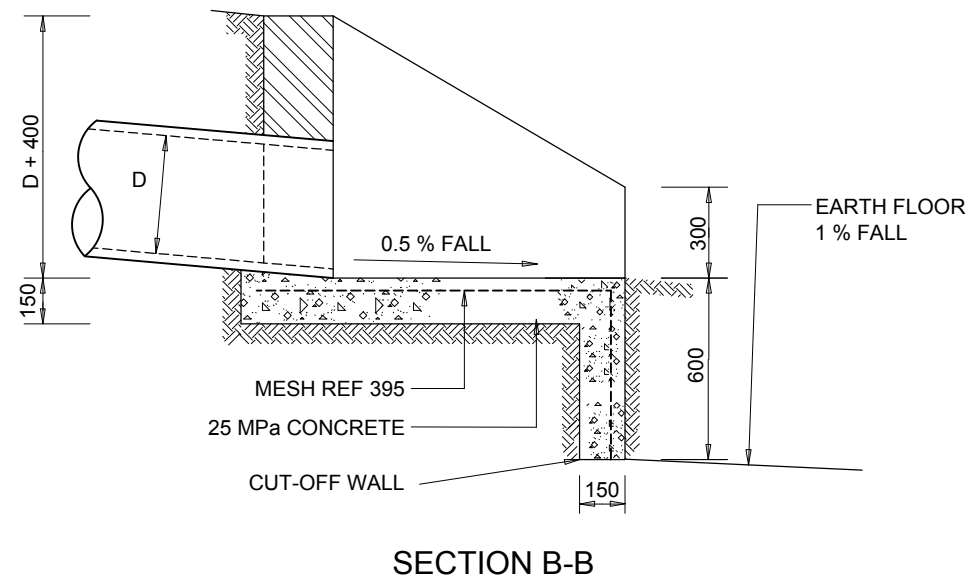
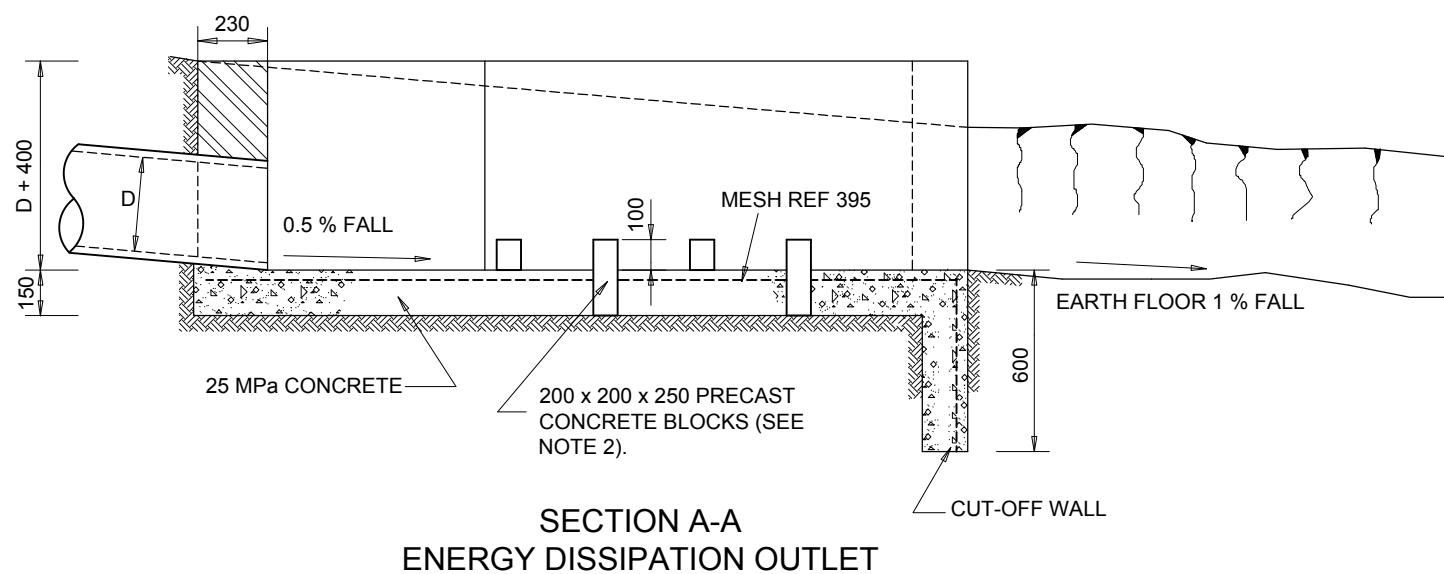
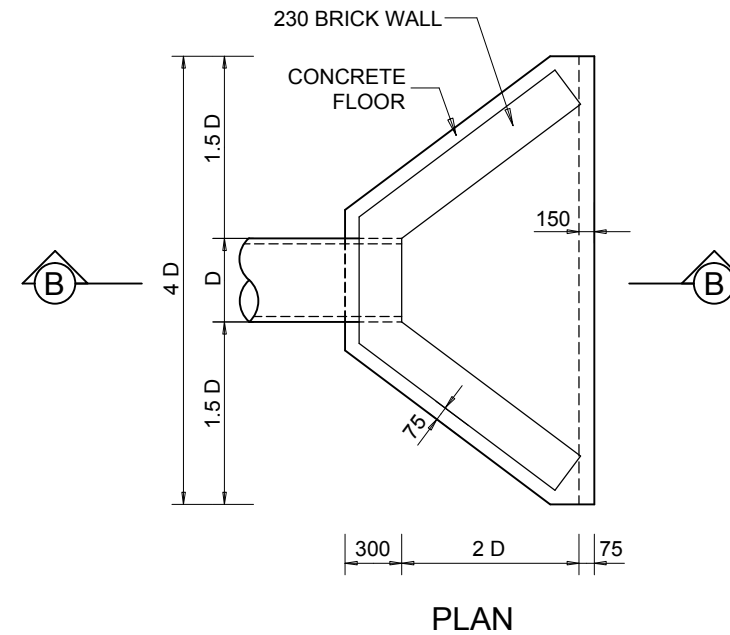
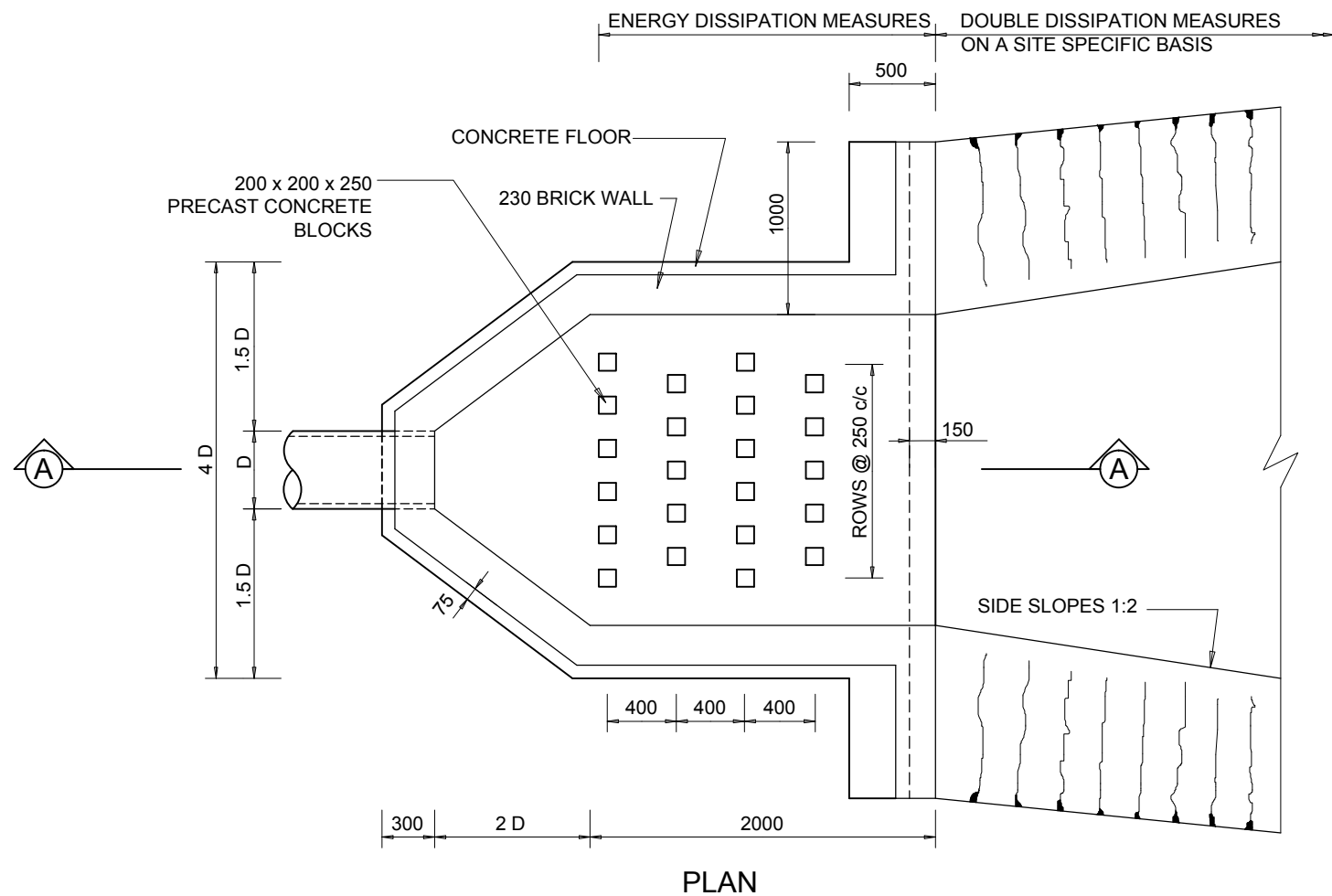
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No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
DETAIL OF TYPICAL BRICK OUTLET STRUCTURE	

SCALE AS SHOWN: NTS	
DATE: 18/05/2015	
DRAWING NUMBER	EXTN.
JRA-SD SW-080	
AMENDMENT NUMBER:	



LEGEND

NOTES

1. REFER TO DWGS. JRA-SS080 & 082 FOR ADDITIONAL OUTLET STRUCTURE NOTES.
2. ONE LAYER OF MESH REF 395 TO BE PLACED ON FLOOR AND CUT-OFF WALL AS SHOWN WITH 40mm COVER AND MIN. LAP LENGTH OF 350mm.
3. ALL CONCRETE INCLUDING PRECAST CONCRETE BLOCKS IN ENERGY DISSIPATING OUTLETS TO BE CHAMFERED 25 x 25 ON EXPOSED EDGES.
4. ALL BRICKWORK TO BE IN ENGLISH BOND.
5. NO PLASTERING OF BRICKWORK WILL BE ALLOWED. ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
6. THE LOWER PORTION OF ANY BRICKWORK GREATER THAN 1m IN HEIGHT SHALL BE INCREASED IN WIDTH TO 345mm TO A MAX. OVERALL HEIGHT 1.75m.
10. IN TERMS OF THE NATIONAL WATER ACT, 36 OF 1998, A RATE OF DISCHARGE FROM AN OUTLET STRUCTURE SHALL NOT EXCEED 1m/SEC AND SHALL NOT BE GREATER THAN 100mm IN DEPTH. IF DESIGN INDICATIONS ARE THAT THESE FIGURES WILL BE EXCEEDED, ADDITIONAL ENERGY DISSIPATION MEASURES WILL BE REQUIRED.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



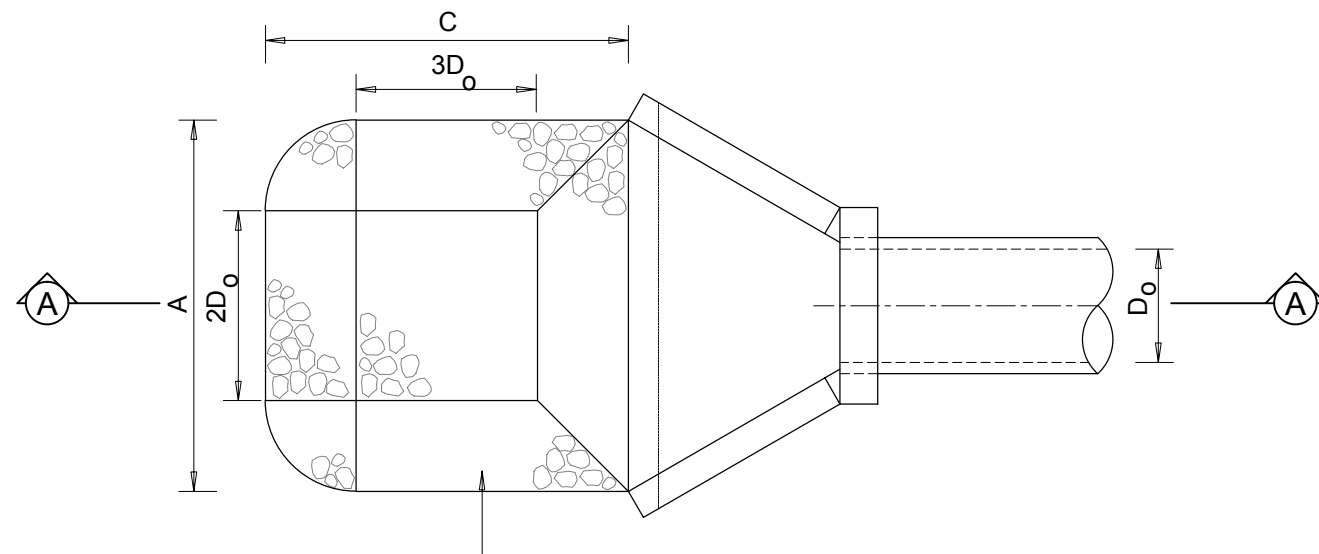
CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
TYPICAL OUTLET STRUCTURE DETAILS	

SCALE AS SHOWN: NTS	
DATE: 18/05/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD SW-081</b>	
AMENDMENT NUMBER:	

LEGEND

NOTES

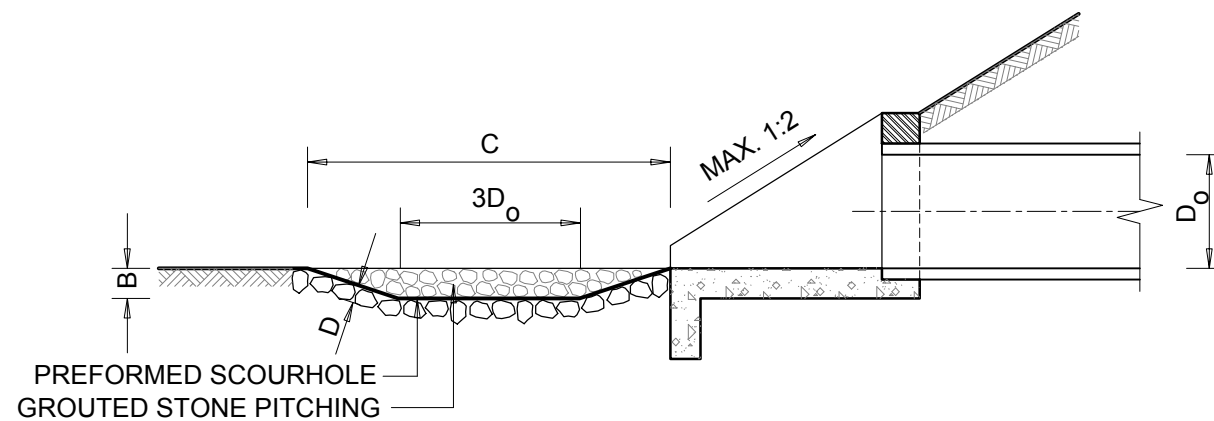
1. REFER TO DRG. JRA-SD-SW-080 OR JRA-SD-SW-081 FOR DETAILS OF THE OUTLET STRUCTURE.
2. GROUTED STONE PITCHING TO BE DONE ACCORDING TO THE SABS 1200 STANDARDIZED SPECIFICATIONS.
3.  $D_o$  = HEIGHT OF OUTLET PIPE CULVERT/BOX CULVERT.
4. REFER TO THE SANRAL DRAINAGE MANUAL 6TH EDITION 2013 AND THE DRAINAGE MANUAL APPLICATION GUIDE 6TH EDITION 2013 FOR THE APPLICABILITY OF THE VARIOUS TYPES OF EROSION PROTECTION.



GROUTED STONE PITCHING  
PLAN

DIMENSIONS

FOR SHALLOW STILLING BASIN (SEE NOTE)	DIMENSIONS	FOR DEEP STILLING BASIN (SEE NOTE)
$\frac{0,0552 (Q^{1,333})}{D_o^{2,333}}$ (m)	$D_{50}$	$\frac{0,0362 (Q^{1,333})}{D_o^{2,333}}$ (m)
$5D_o$ (m)	A	$8D_o$ (m)
$0,5 D_o$ (m)	B	$D_o$ (m)
$6D_o$ (m)	C	$9D_o$ (m)
$2D_{50}$ (m)	D	$2D_{50}$ (m)



SECTION A-A

THIS TYPE OF EROSION PROTECTION IS NOT TO BE USED IN DOLOMITIC AREAS

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

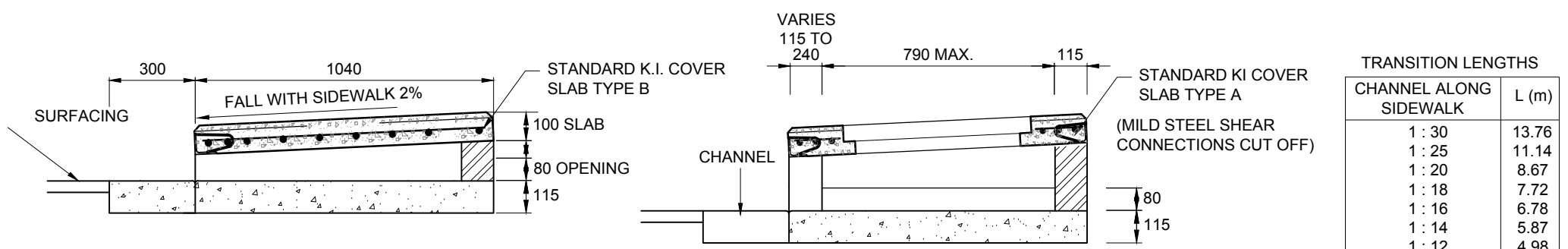
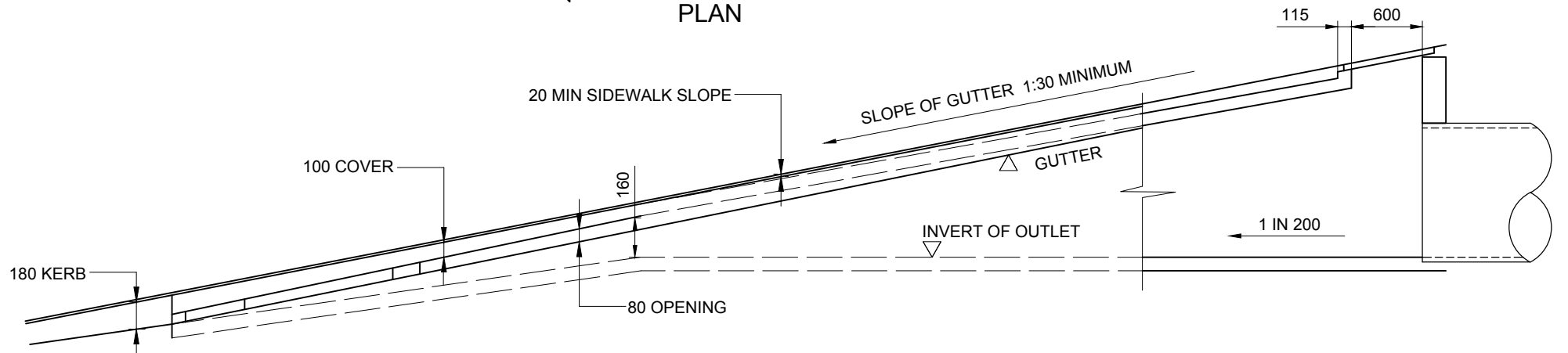
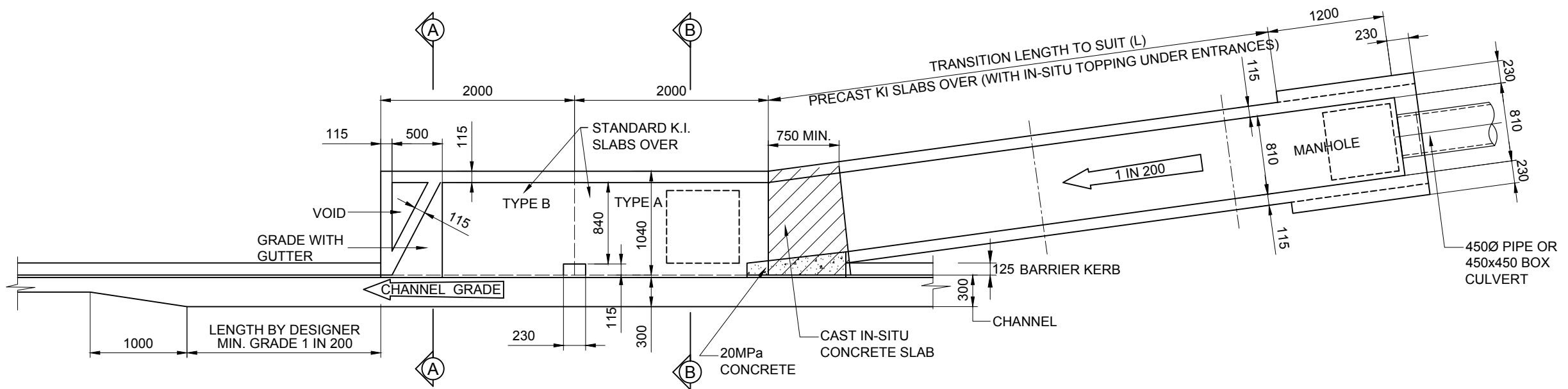
DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER: DESIGN
EROSION PROTECTION AT OUTLET STRUCTURES	

SCALE AS SHOWN: NTS	
DATE: 18/05/2015	
DRAWING NUMBER	EXTN.
JRA-SD SW-082	
AMENDMENT NUMBER:	





TRANSITION LENGTHS

CHANNEL ALONG SIDEWALK	L (m)
1 : 30	13.76
1 : 25	11.14
1 : 20	8.67
1 : 18	7.72
1 : 16	6.78
1 : 14	5.87
1 : 12	4.98
1 : 10	4.10

KERB OUTLETS

LEGEND

- K.I. KERB INLET
- L. TAPER LENGTH

NOTES

1. KERB OUTLETS ARE NOT TO BE CONSTRUCTED WHERE THE GUTTER GRADE IS LESS THAN 1 IN 30.
2. USE STANDARD TYPE A AND B KI SLABS TO MATCH TO CAST IN-SITU SLAB. MANHOLE AND SECOND OUTLET SLABS TO BE TYPE A.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY: \_\_\_\_\_  
 DRAWN BY: \_\_\_\_\_  
 STRUCTURAL DESIGN BY: \_\_\_\_\_  
 DRAWING CHECKED BY: \_\_\_\_\_  
 CHECKED BY: \_\_\_\_\_  
 DRAWING APPROVED BY: \_\_\_\_\_



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set

STORMWATER: DESIGN

KERB OUTLETS

SCALE AS SHOWN: NTS

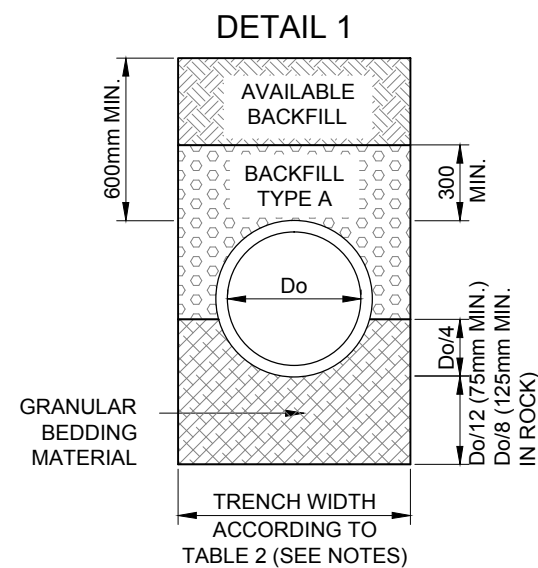
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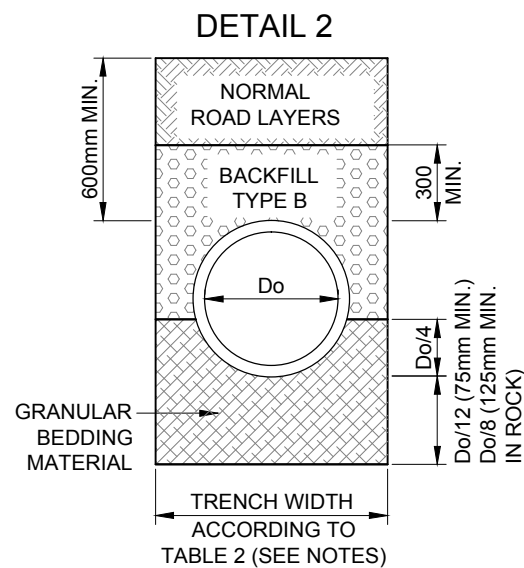
EXTN.

JRA-SD  
SW-083

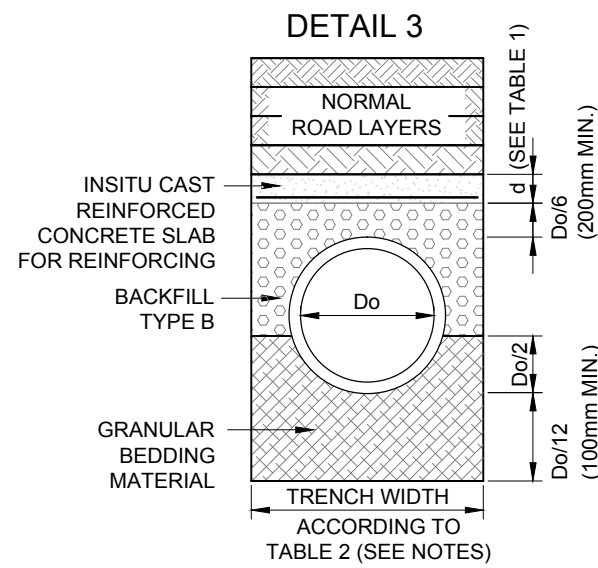
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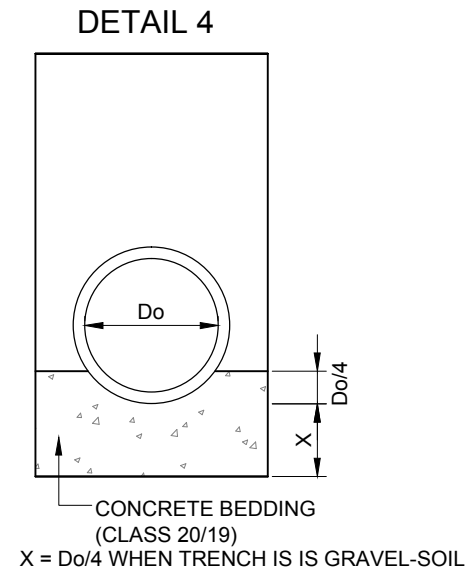
STORMWATER PIPES UNDER SIDEWALK



STORMWATER PIPES UNDERNEATH ROADS, ACCESS ROADS & PARKING AREAS



SITUATIONS WHERE A CONCRETE SLAB IS REQUIRED  
STORMWATER PIPES UNDERNEATH MAIN ROUTES UNDER THE FOLLOWING CIRCUMSTANCES  
1. COVER < 800mm FOR Do ≤ 750mm  
2. COVER < 900mm FOR Do ≥ 750mm



SITUATIONS WHERE A CONCRETE BEDDING IS REQUIRED

LEGEND	
D = PIPE CLASS	
Do = INTERNAL PIPE DIAMETER	

NOTES

- ALL PIPES BELOW SIDEWALKS & OPEN AREAS TO BE CLASS 50 'D' EXCEPT WHERE COVER < 2.m ON 1200mm Ø AND GREATER THE CLASS OF THE PIPES ARE TO BE INCREASED TO 75 'D'.
- FOR STORMWATER PIPES BELOW STREETS & MAIN ROUTES SEE TABLE 2.
- THE CONTRACTOR SHALL AT ALL TIMES ADHERE TO THE SAFETY PRECAUTIONS AS SET OUT IN SANS 1200 D-1988.
- IF TRENCHES ARE 200mm WIDER THAN THE SPECIFIED WIDTH IN TABLE 2 IT MAY BE NECESSARY TO CHANGE THE PIPE CLASS.
- BEDDING:
  - NORMAL BEDDING ACCORDING TO DETAIL 1.
  - BEDDING ACCORDING TO DETAIL 2.
  - CONCRETE SLAB OVER PIPE ACCORDING TO DETAIL 3.
  - CONCRETE BEDDING ACCORDING TO DETAIL 4.
- BEDDING MATERIAL: THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6, MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS. THE BEDDING MATERIAL AT THE SIDES OF THE PIPE MUST BE COMPACTED TO 90% MOD. AASHTO DENSITY AFTER THE PIPE HAS BEEN LAID.
- BACKFILL TYPE A: THE MATERIAL USED MUST BE UNIFORM AND MUST BE COMPACTED TO 90% MOD AASHTO DENSITY IN LAYERS NOT MORE THAN 100mm AND MUST BE FREE OF:
  - ROOTS OF TREES, BUILDING RUBBLE AND ORGANIC MATERIAL.
  - CLAY LUMPS LARGER THAN 75mm.
  - STONES LARGER THAN 20mm.
- BACKFILL TYPE B: MINIMUM G9 MATERIAL ACCORDING TO TRH14 CLASSIFICATION COMPACTED TO A MIN. OF 90% MOD. AASHTO DENSITY IN LAYERS NOT MORE THAN 150mm.
- MINIMUM PIPE SIZE TO BE 450mm DIAMETER.
- CONNECTIONS FROM ERVEN TO MUNICIPAL SYSTEM TO BE 450mm.

CONCRETE SLAB: CLASS 25/19 CONCRETE	DEPTH (d)	REINFORCING	MIN. COVER
Do < 900mm	150mm	REF. No 245 WELDED MESH	40mm
900mm < 0 < 1800mm	200mm	REF. No 311 WELDED MESH	40mm

PIPE CLASSES FOR PIPES UNDER SECONDARY STREETS, LIGHT ACCESS ROADS, PARKING AREAS, PRIVATE ENTRANCES AND SIDEWALKS FOR 40kN WHEEL LOAD WITH DUE ALLOWANCE FOR IMPACT LOADS.														PIPE CLASSES FOR PIPES UNDER ROUTES FOR H8 - WHEEL LOADS OF EIGHT 80kN WHEEL LOADS WITH DUE ALLOWANCE FOR IMPACT LOADS.													
Ø	TRENCH WIDTH	COVER (m)												Ø	TRENCH WIDTH	COVER (m)											
		0.6	0.9	1.0	1.2	1.5	1.8	2.0	2.5	3.0	4.0	5.0	6.0			0.6	0.9	1.0	1.2	1.5	1.8	2.0	2.5	3.0	4.0	5.0	6.0
450	950	75D	75D	75D	75D	50D	50D	50D	75D	75D	75D	75D	75D	450	950	75D	100D	100D	100D	100D	100D	100D	100D	100D	75D	75D	75D
525	1020	75D	75D	50D	50D	50D	50D	50D	75D	75D	75D	75D	75D	525	1020	75D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
600	1620	75D	50D	50D	50D	50D	50D	75D	75D	75D	100D	100D	100D	600	1620	75D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
675	1710	75D	75D	75D	75D	75D	75D	75D	75D	75D	100D	100D	100D	675	1710	75D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
750	1790	75D	50D	50D	50D	50D	75D	75D	75D	75D	100D	100D	75D	750	1790	75D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
825	1870	75D	50D	50D	50D	50D	50D	75D	75D	75D	100D	100D	100D	825	1870	75D	50D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
900	1950	75D	50D	50D	50D	50D	75D	75D	75D	75D	100D	100D	100D	900	1950	75D	50D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
1050	2120	75D	75D	75D	75D	75D	75D	75D	75D	75D	75D	100D	100D	1050	2120	75D	50D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
1200	2280	75D	50D	50D	50D	50D	50D	50D	75D	75D	75D	100D	100D	1200	2280	75D	50D	100D	100D	100D	100D	100D	100D	100D	100D	100D	100D
1350	2450	50D	50D	50D	50D	50D	50D	50D	75D	75D	75D	100D	100D	1350	2450	75D	50D	100D	100D	100D	75D	75D	100D	100D	100D	100D	100D
1500	2610	50D	50D	50D	50D	50D	50D	50D	75D	75D	75D	100D	100D	1500	2610	75D	50D	100D	100D	100D	75D	75D	100D	100D	100D	100D	100D
1650	2760	50D	50D	50D	50D	50D	50D	50D	75D	75D	100D	100D	100D	1650	2760	50D	50D	100D	100D	100D	100D	100D	75D	100D	75D	75D	75D
1800	3260	50D	50D	50D	50D	50D	50D	50D	50D	75D	75D	100D	100D	1800	3260	50D	50D	100D	50D	75D	75D	75D	75D	100D	100D	100D	100D

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG  
JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set      STORMWATER: DESIGN

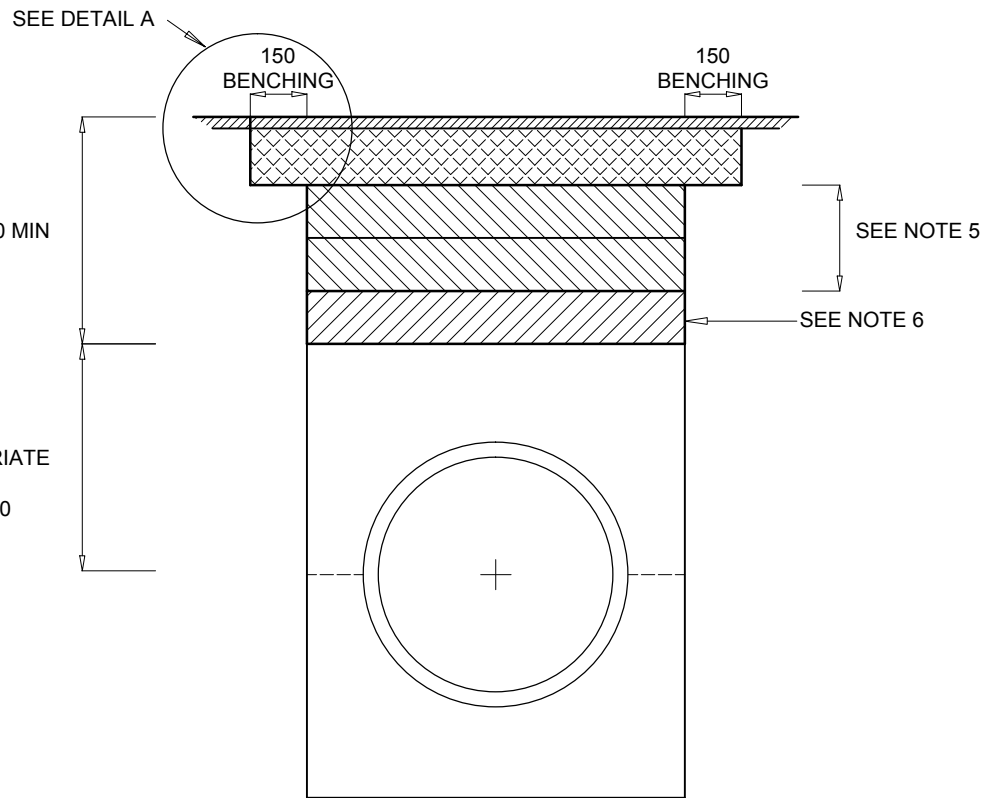
BEDDING OF STORMWATER PIPES WITH TABLES

SCALE AS SHOWN: NTS	
DATE: 23/10/2014	
DRAWING NUMBER	EXTN.
<b>JRA-SD SW-090</b>	
AMENDMENT NUMBER:	

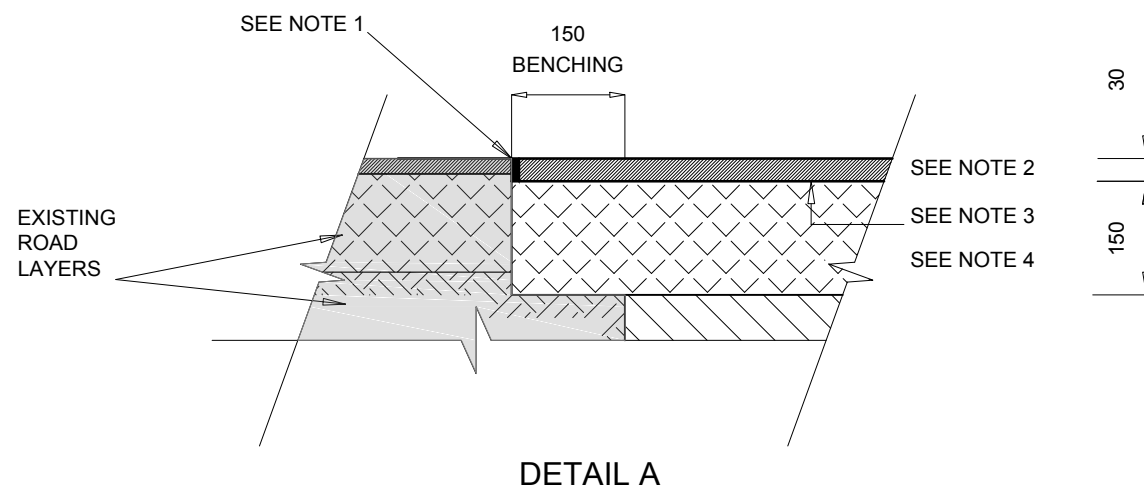
LEGEND

NOTES

1. SAWCUT JOINT PAINTED WITH A TACK COAT PRIOR TO REINSTATEMENT OF ASPHALT.
2. 30mm MIN. ASPHALT TO MATCH EXISTING SURFACING TYPE.
3. PRIME & TACK COAT.
4. 150mm CRUSHED STONE BASE COMPACTED TO 88% ARD MINIMUM, OR BASE TO MATCH EXISTING ROAD BASE.
5. 2 X 150mm C3 LAYERS COMPACTED TO 95% MOD. AASHTO MIN, OR AS SPECIFIED BY THE ENGINEER.
6. 150mm G6 COMPACTED TO 93% MOD. AASHTO MIN. OR AS SPECIFIED BY THE ENGINEER.
7. ALTERNATIVELY TO 5 & 6 ABOVE: USE 7% SOIL-CRETE IF APPROVED BY THE ENGINEER.



BACKFILL & BEDDING AS PER APPROPRIATE DETAIL ON JRA-SD-SW-090



DETAIL A

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:  
  
STRUCTURAL DESIGN BY:  
  
CHECKED BY:

DRAWN BY:  
  
DRAWING CHECKED BY:  
  
DRAWING APPROVED BY:

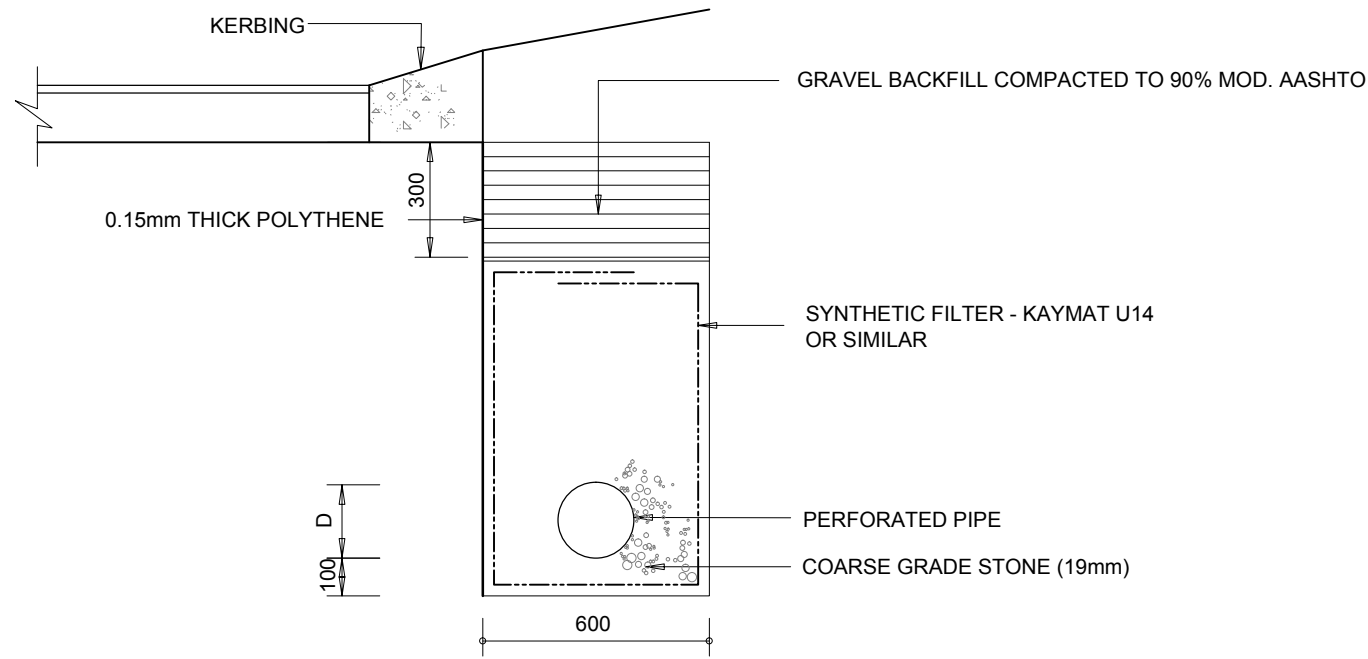


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JOHANNESBURG ROADS AGENCY (PTY) LTD

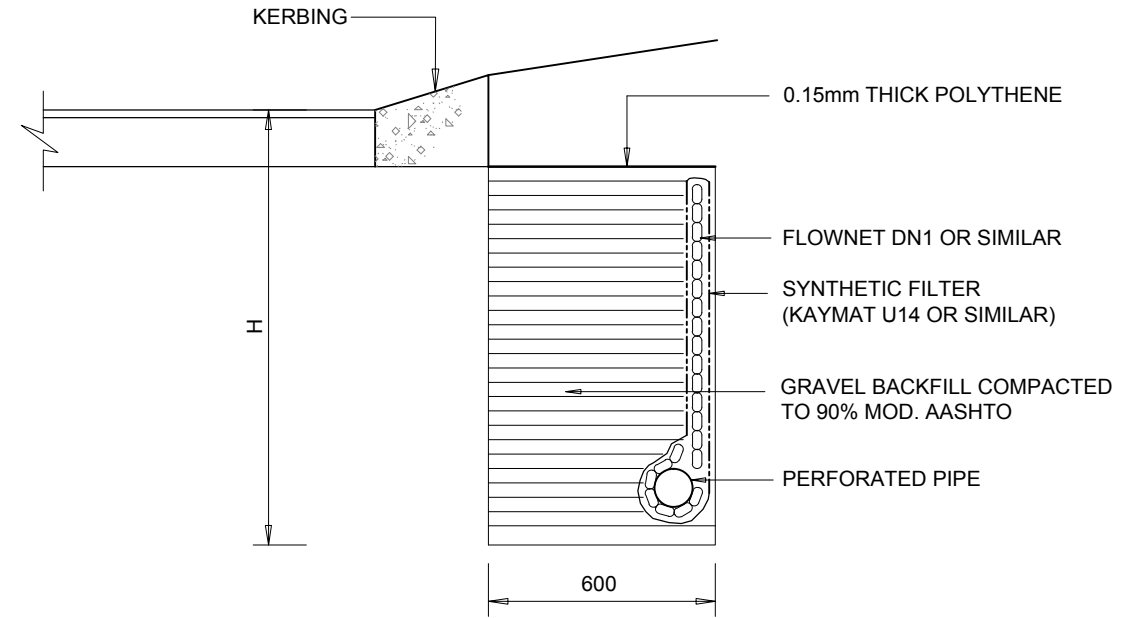
Drawing Sub-set      STORMWATER : DESIGN

**REINSTATEMENT  
OF STORMWATER TRENCHES IN ROADS**

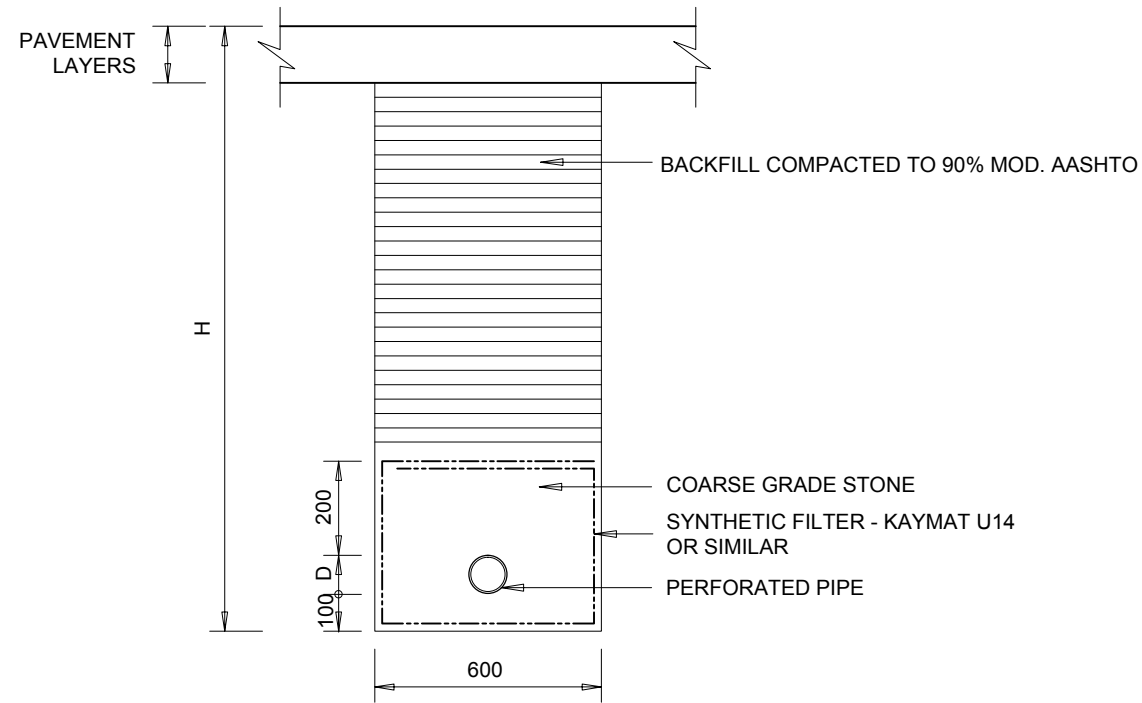
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DATE: 27/05/2015	
DRAWING NUMBER	EXTN.
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AMENDMENT NUMBER:	



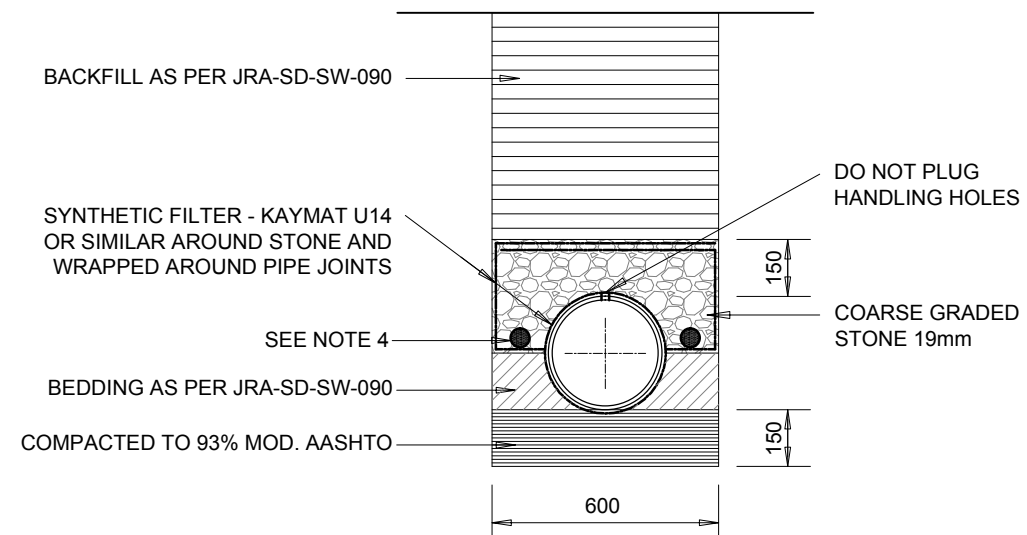
TYPE A: SUBSURFACE DRAIN



TYPE B: SUBSURFACE DRAIN



TYPE C: SUBSURFACE DRAIN



TYPE D: SUBSURFACE DRAIN COMBINED WITH STORMWATER PIPE

LEGEND

- D = DIAMETER AS SPECIFIED BY THE ENGINEER
- H = DEPTH AS SPECIFIED BY THE ENGINEER

NOTES

1. THE APPLICABLE TYPE OF SUBSURFACE DRAIN TO BE USED MUST BE SPECIFIED BY THE ENGINEER. REFER TO TRH 15.
2. THE DESIGN OF SUBSURFACE DRAIN INSTALLATIONS MUST TAKE LOCAL CONDITIONS INTO ACCOUNT, SPECIFICALLY WITH RESPECT TO LOCAL SOIL CONDITIONS.
3. USE WITH CARE IN DOLOMITIC CONDITIONS.
4. WEEPHOLES FOR TYPE D INSTALLATIONS AT MANHOLES.
5. A COST COMPARISON OF TYPES A, B, & C TO ESTABLISH THE MOST ECONOMICAL SOLUTION IS RECOMMENDED.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

DRAWN BY:

STRUCTURAL DESIGN BY:

DRAWING CHECKED BY:

CHECKED BY:

DRAWING APPROVED BY:



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set

STORMWATER: DESIGN

TYPES OF SUBSURFACE DRAINAGE

SCALE AS SHOWN: NTS

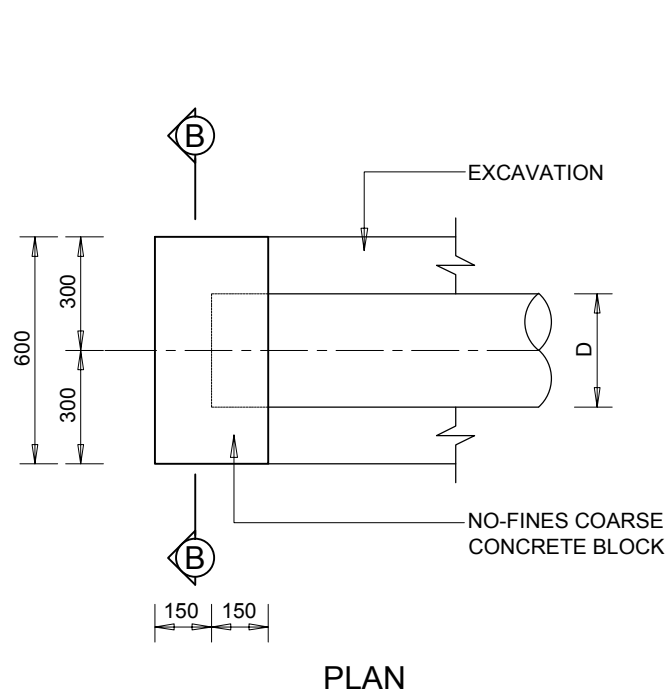
DATE: 18/05/2015

DRAWING NUMBER

EXTN.

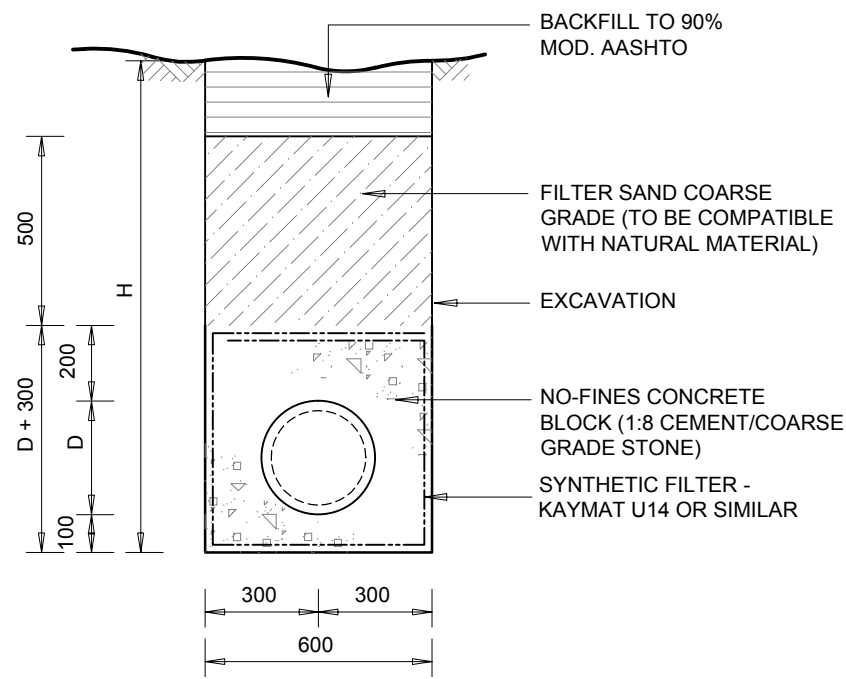
JRA-SD  
SW-100

AMENDMENT NUMBER:

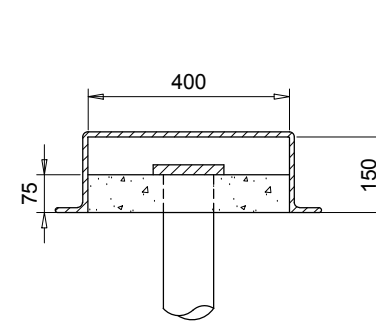


PLAN

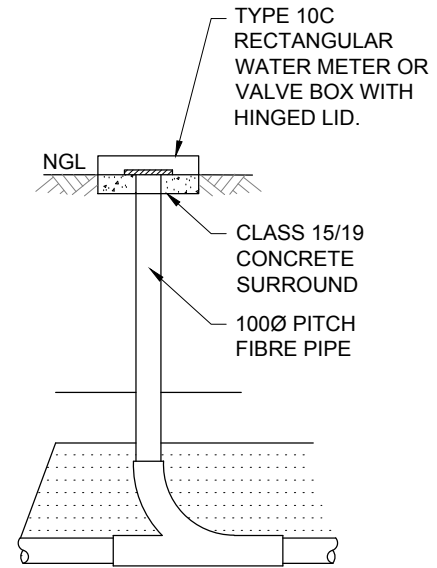
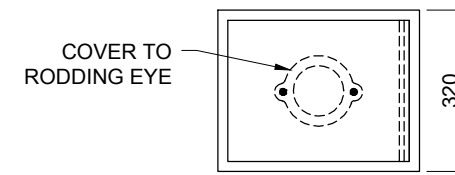
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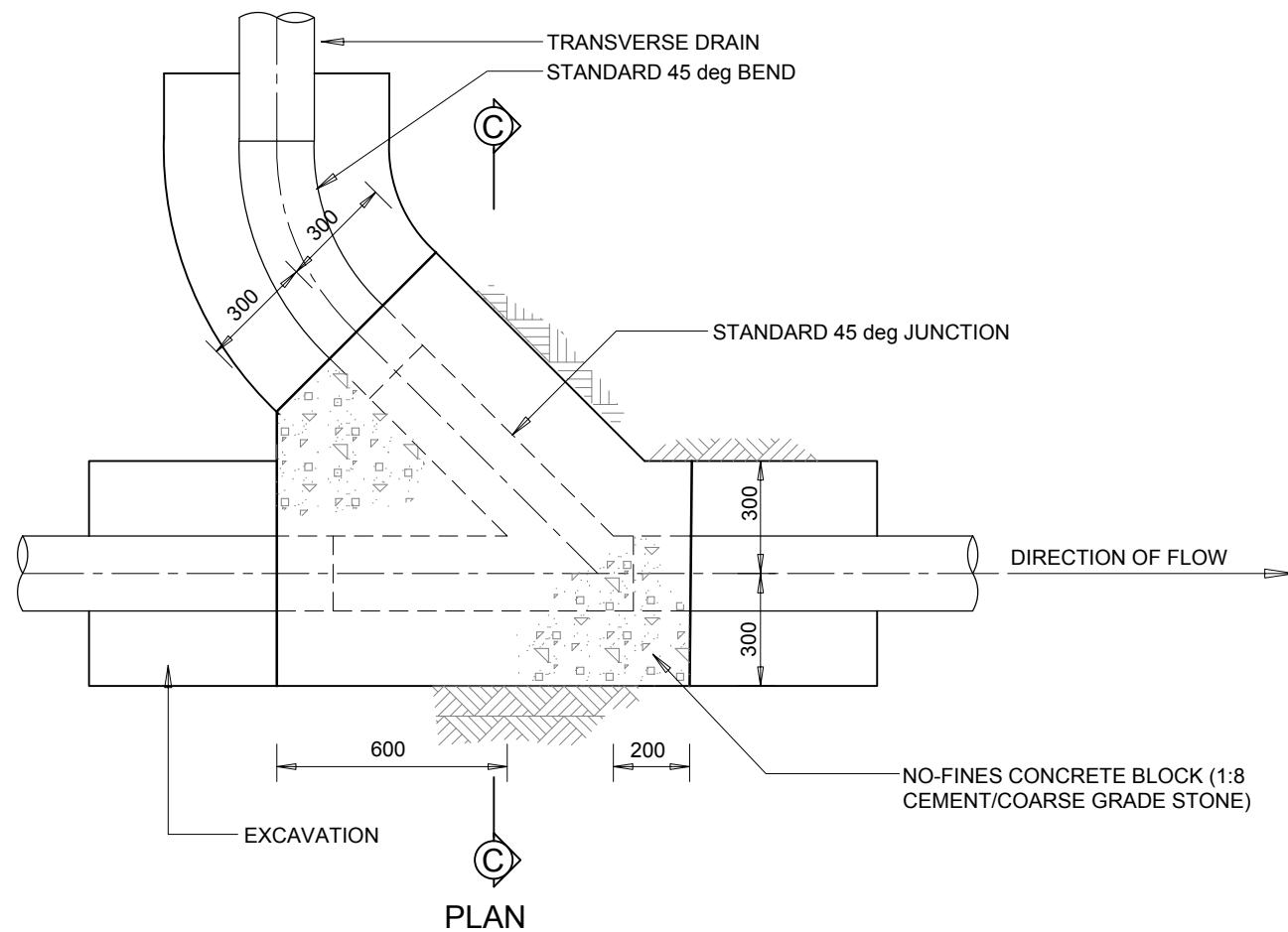
SECTION B-B



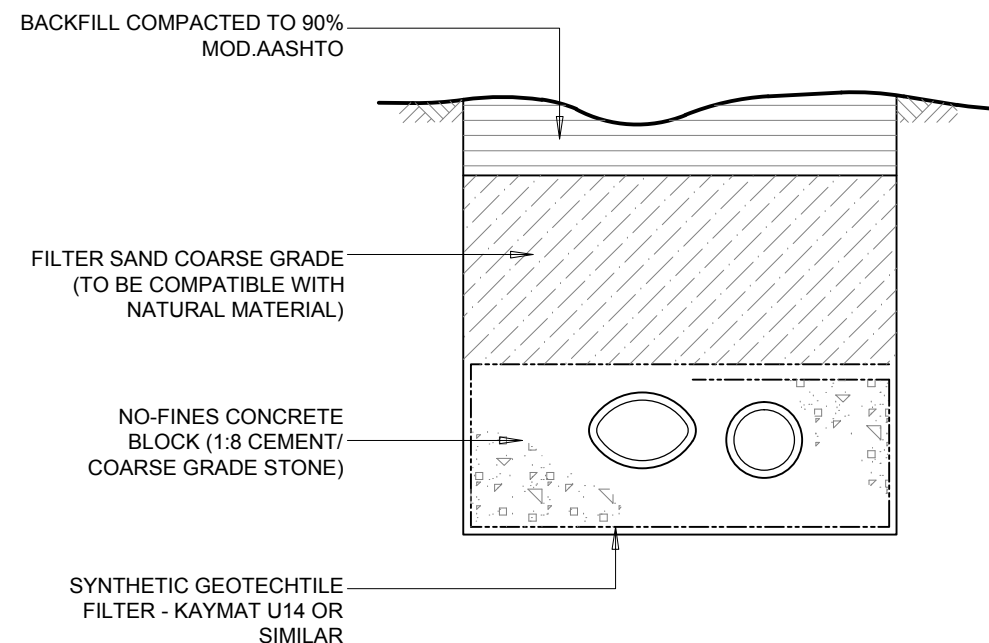
TYPE 10C RECTANGULAR WATER METER OR VALVE BOX WITH HINGED LID



DETAIL OF RODDING EYE



PLAN



SECTION C-C

LEGEND

D= DIAMETER AS SPECIFIED BY THE ENGINEER  
H= DEPTH AS SPECIFIED BY THE ENGINEER

NOTES

1. THE APPLICABLE TYPE OF SUBSURFACE DRAIN TO BE USED MUST BE SPECIFIED BY THE ENGINEER. REFER TO TRH 15.
2. THE DESIGN OF SUBSURFACE DRAIN INSTALLATIONS MUST TAKE LOCAL CONDITIONS INTO ACCOUNT, SPECIFICALLY WITH RESPECT TO LOCAL SOIL CONDITIONS.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

STRUCTURAL DESIGN BY:

CHECKED BY:

DRAWN BY:

DRAWING CHECKED BY:

DRAWING APPROVED BY:



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set

STORMWATER: DESIGN

SUBSURFACE DRAINAGE PIPE JUNCTIONS

SCALE AS SHOWN: NTS

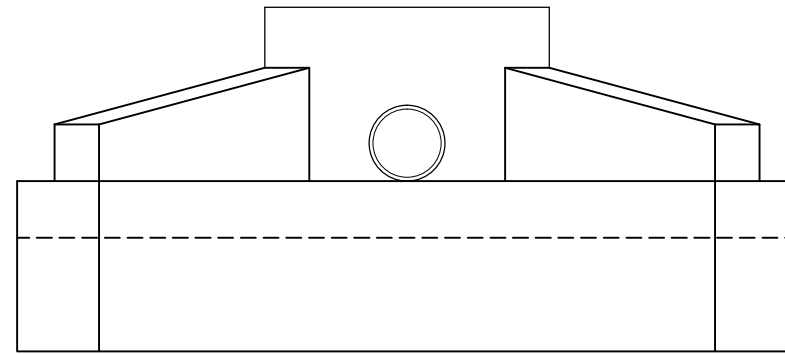
DATE: 18/05/2015

DRAWING NUMBER

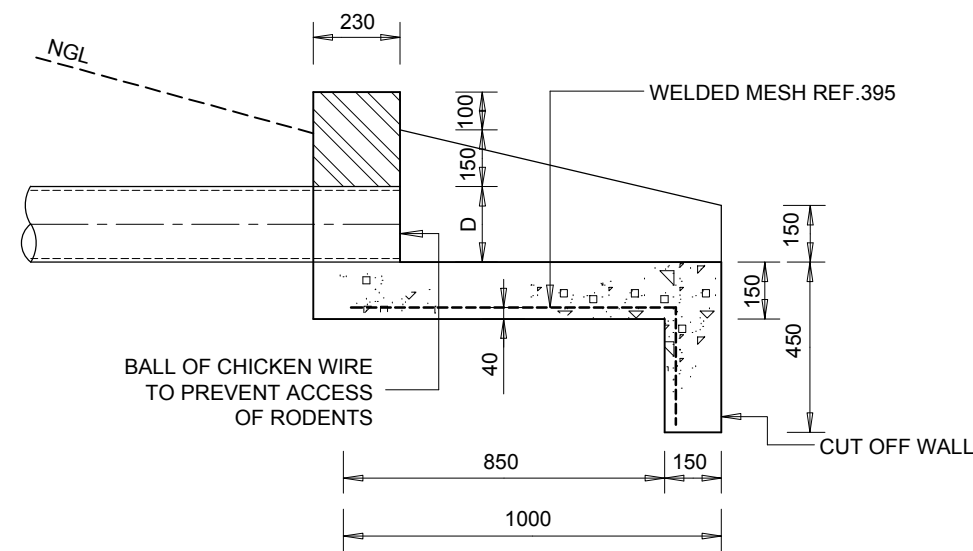
EXTN.

JRA-SD  
SW-101

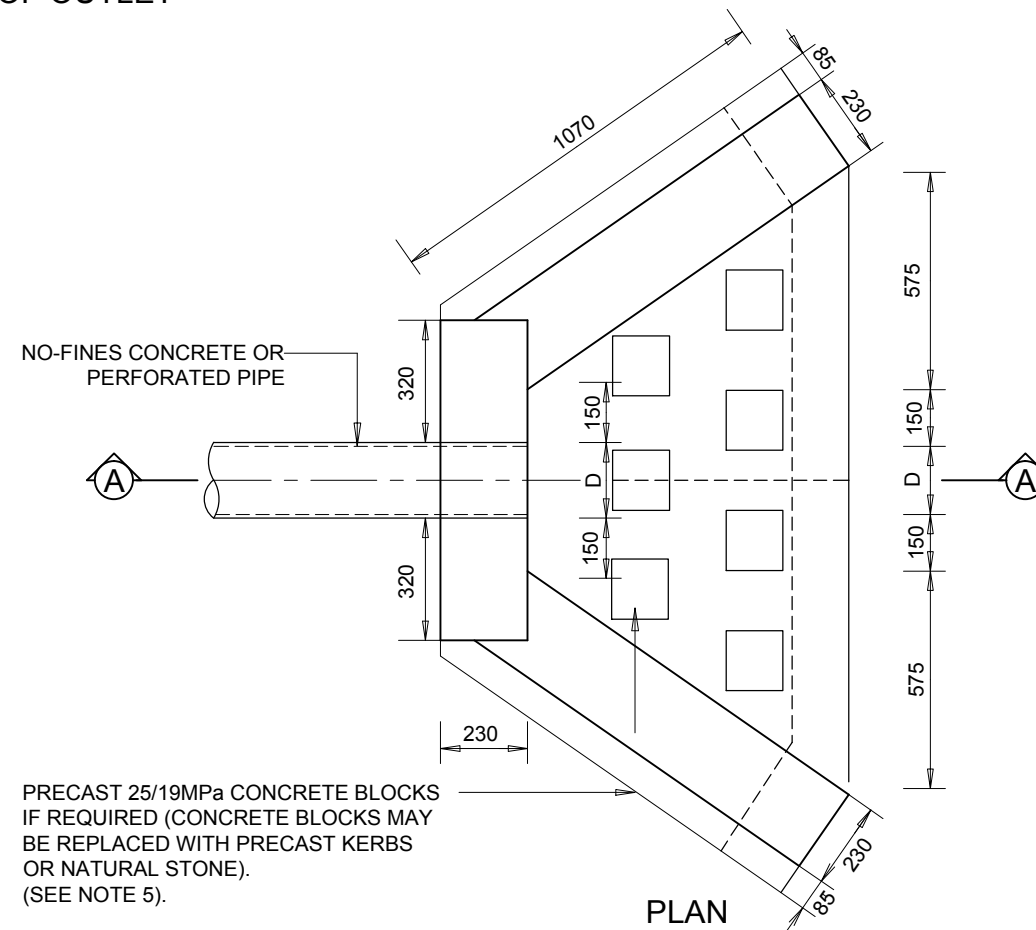
AMENDMENT NUMBER:



FRONT ELEVATION OF OUTLET



SECTION A-A



PLAN

NO-FINES CONCRETE OR PERFORATED PIPE  
 PRECAST 25/19MPa CONCRETE BLOCKS IF REQUIRED (CONCRETE BLOCKS MAY BE REPLACED WITH PRECAST KERBS OR NATURAL STONE). (SEE NOTE 5).

LEGEND

NOTES

1. ALL CONCRETE TO BE CLASS 20/19
2. CONCRETE FINISH SHOULD BE AS PER WOODEN SHUTTER.
3. WING WALLS AND HEADWALLS TO BE CONSTRUCTED OUT OF ENGINEERING CLASS BRICK. ALL BRICKS TO BE QUALITY FBS30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
4. ALL BRICKWORK TO BE ENGLISH BOND.
5. EROSION PROTECTION IS ONLY REQUIRED WITH OUTFLOW VELOCITIES IN EXCESS OF 1m/SEC.
6. SUBSURFACE DRAINS ARE NOT RECOMMENDED IN DOLOMITIC AREAS.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

DRAWN BY:

STRUCTURAL DESIGN BY:

DRAWING CHECKED BY:

CHECKED BY:

DRAWING APPROVED BY:



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set

STORMWATER: DESIGN

DETAIL OF SUBSURFACE DRAIN OUTLET

SCALE AS SHOWN: NTS

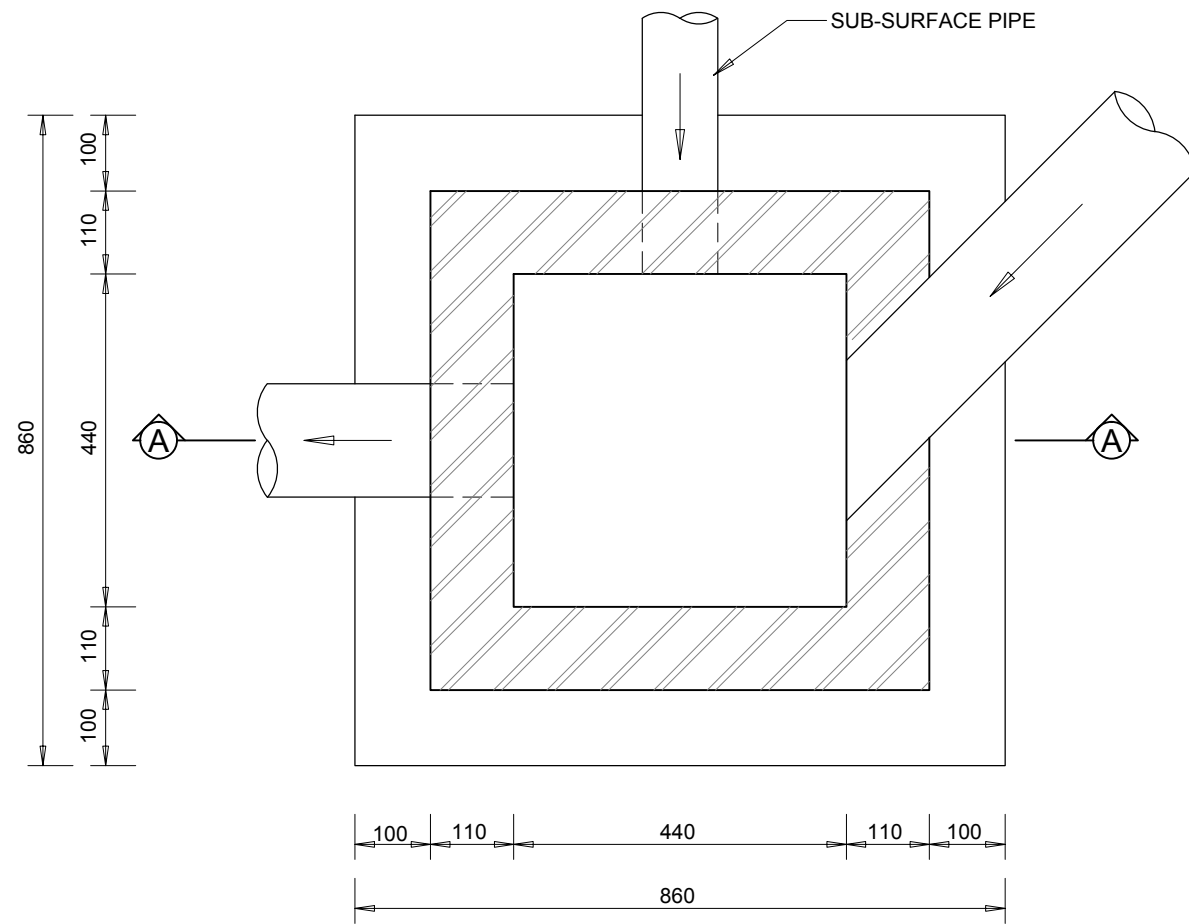
DATE: 18/05/2015

DRAWING NUMBER

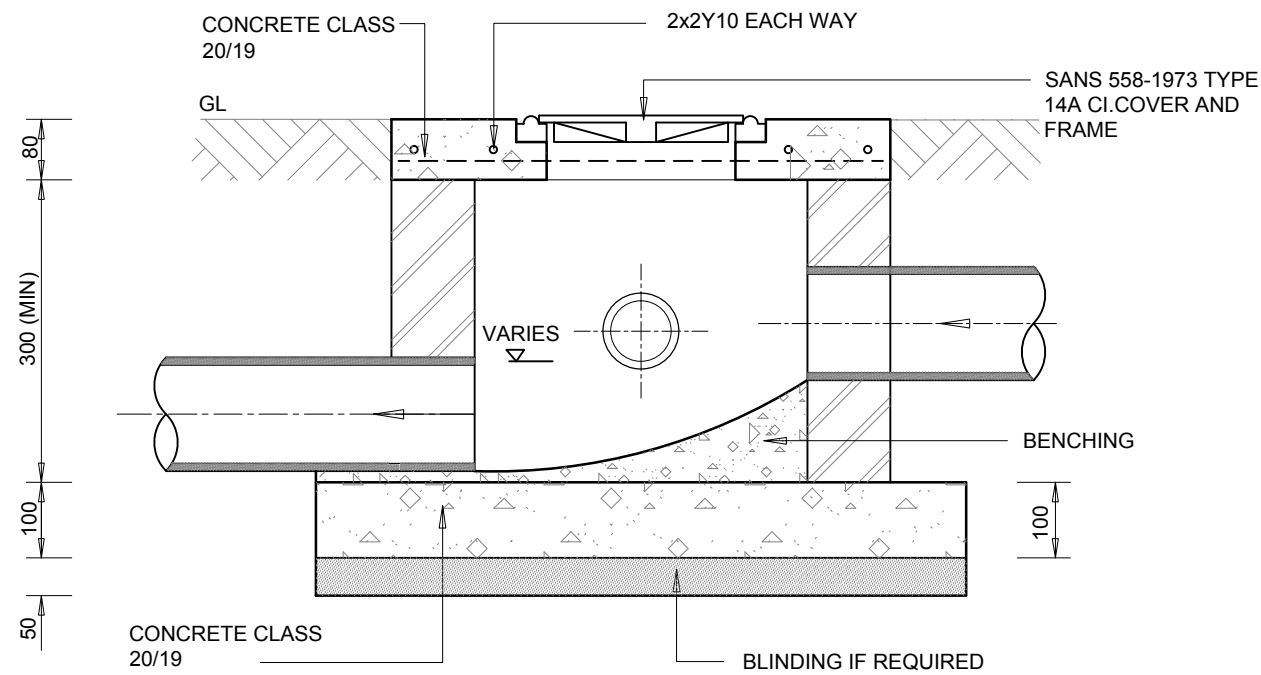
EXTN.

JRA-SD  
SW-102

AMENDMENT NUMBER:



PLAN (COVER NOT SHOWN)



SECTION A-A

LEGEND

NOTES

1. MAXIMUM DEPTH. OF MANHOLE IS 750mm.
2. ALL BRICKWORK TO BE IN ENGLISH BOND.
3. ALL BRICKS TO BE FBSE 30 TO SANS 227-2007 WITH WATER ABSORPTION < 14% AND EFFLORESCENCE <10.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

STRUCTURAL DESIGN BY:

CHECKED BY:

DRAWN BY:

DRAWING CHECKED BY:

DRAWING APPROVED BY:



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set

STORMWATER: DESIGN

SUBSURFACE DRAIN MANHOLE DETAIL

SCALE AS SHOWN: NTS

DATE: 17/09/2014

DRAWING NUMBER

EXTN.

JRA-SD  
SW-103

AMENDMENT NUMBER:

### 2.3 STORMWATER: MAINTENANCE

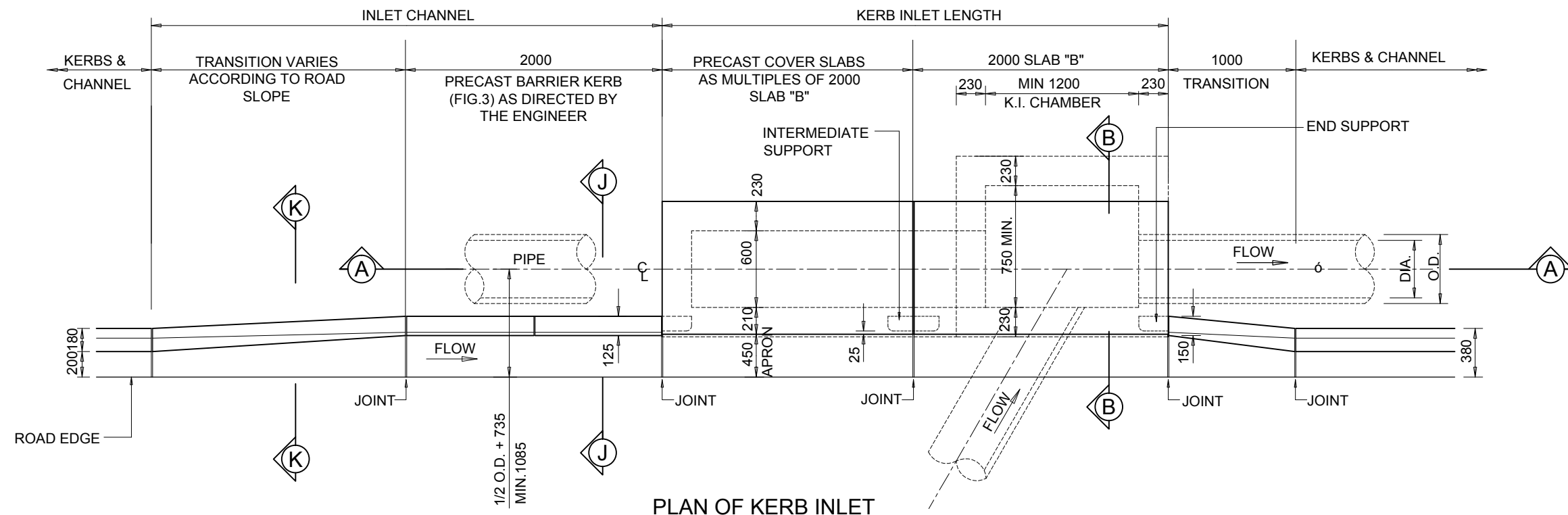
DRAWING NUMBER	DRAWING DESCRIPTION	REVISION NUMBER					
		0	1	2	3	4	5
		REVISION DATE					
JRA-SD-SW-M001	Sandton Stormwater Structures for Maintenance: Plan of Kerb Inlet (1 of 4)	300615					
JRA-SD-SW-M002	Sandton Stormwater Structures for Maintenance: Sections of Kerb Inlet (2 of 4)	300615					
JRA-SD-SW-M003	Sandton Stormwater Structures for Maintenance: Slab Details (3 of 4)	300615					
JRA-SD-SW-M004	Sandton Stormwater Structures for Maintenance: Manhole Details (4 of 4)	300615					
JRA-SD-SW-M005	Johannesburg Stormwater Structures for Maintenance: Details of Precast Cover Slabs for Wide Type Kerb Inlets – 1 (1 of 6)	300615					
JRA-SD-SW-M006	Johannesburg Stormwater Structures for Maintenance: Details of Precast Cover Slabs for Wide Type Kerb Inlets – 2 (2 of 6)	300615					
JRA-SD-SW-M007	Johannesburg Stormwater Structures for Maintenance: Layout Plan & Sections-1 (3 of 6)	300615					
JRA-SD-SW-M008	Johannesburg Stormwater Structures for Maintenance: Layout Plan & Sections-2 (4 of 6)	300615					
JRA-SD-SW-M009	Johannesburg Stormwater Structures for Maintenance: Layout Plan & Sections-3 (5 of 6)	300615					
JRA-SD-SW-M010	Johannesburg Stormwater Structures for Maintenance: Additional Section Details (6 of 6)	300615					

### 2.3 STORMWATER: MAINTENANCE

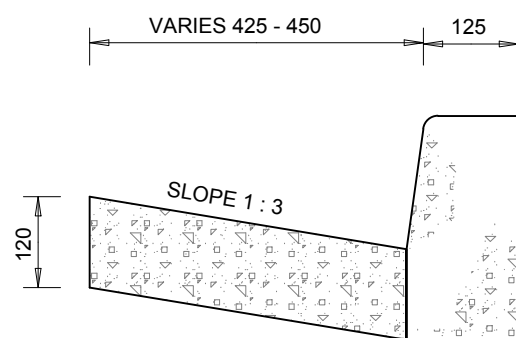
### 2.3 STORMWATER: MAINTENANCE



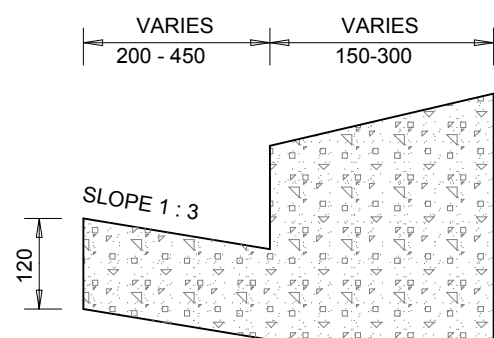
LEGEND



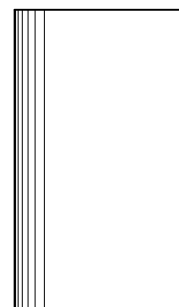
PLAN OF KERB INLET



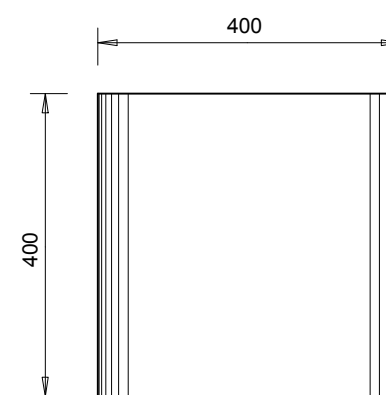
SECTION J - J



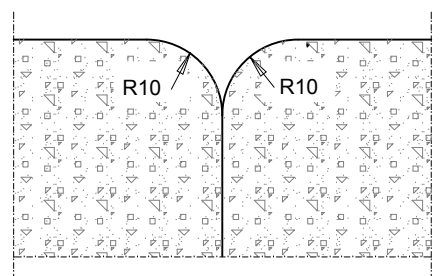
SECTION K - K



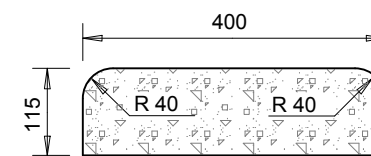
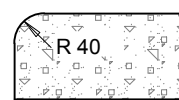
END SUPPORT FOR COVER SLAB



INTERMEDIATE SUPPORT FOR COVER SLAB



DETAIL OF JOINT IN APRON



NOTES

- 1. FOR SECTIONS A-A AND B-B REFER TO DRG. JRA-SD-SW-M002

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:

DRAWN BY:

STRUCTURAL DESIGN BY:

DRAWING CHECKED BY:

CHECKED BY:

DRAWING APPROVED BY:



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set

STORMWATER MAINTENANCE

SANDTON SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET1 OF 4)

PLAN OF KERB INLET

SCALE AS SHOWN: NTS

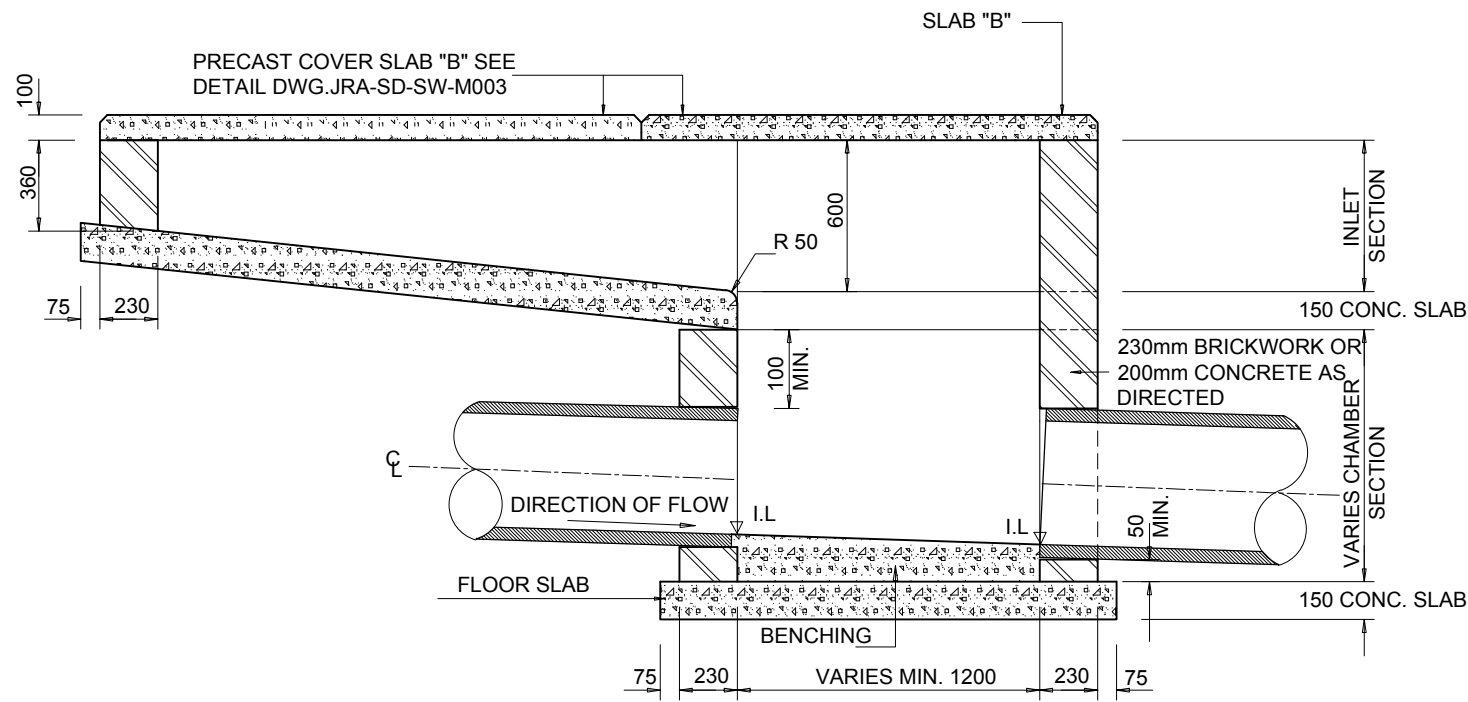
DATE: 17/09/2014

DRAWING NUMBER

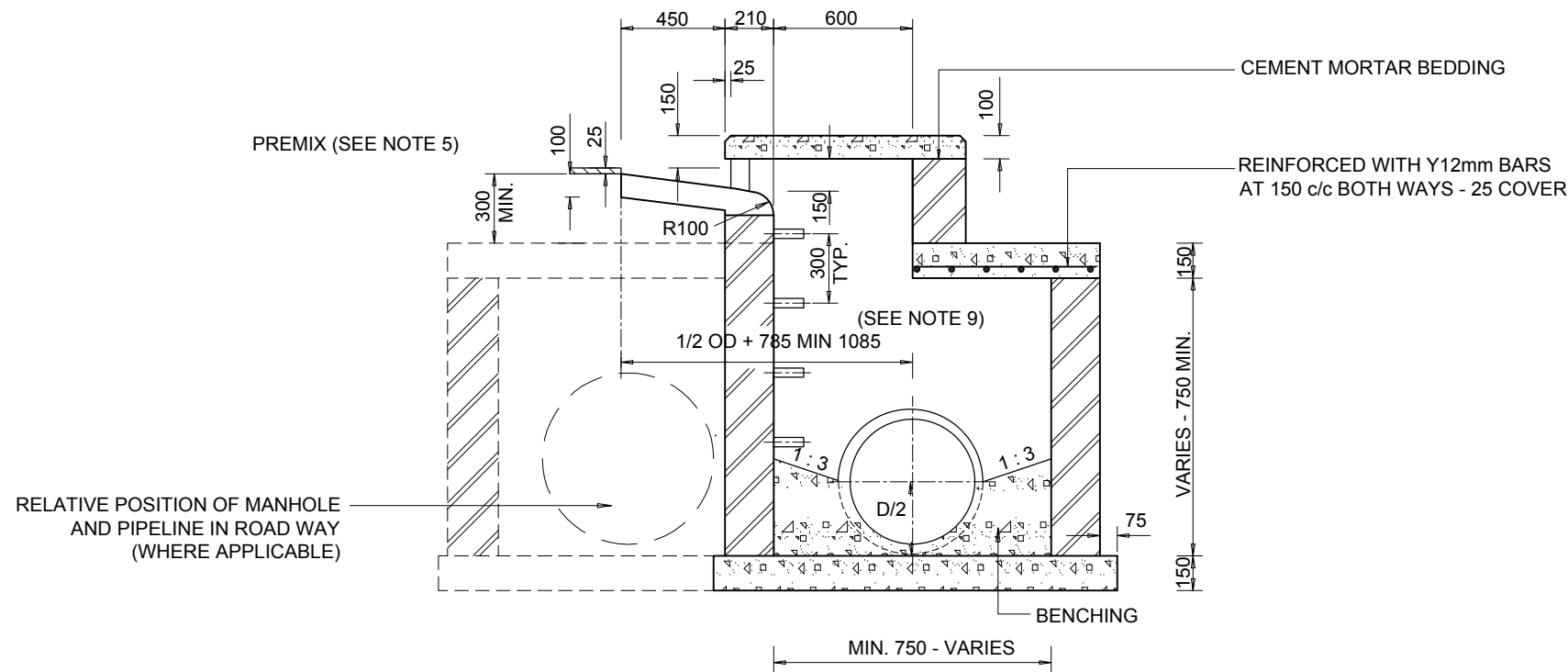
EXTN.

JRA-SD  
SWM-001

AMENDMENT NUMBER:



SECTION A-A



SECTION B-B

LEGEND

NOTES

1. SEE DRG. JRA-SD-SW-M001 FOR PLAN AND SECTION POSITIONS OF KERB INLET.
2. CONCRETE STRENGTH TO BE AS FOLLOWS:
  - a) MANHOLE SURROUNDS AND BENCHING: CLASS 15/19
  - b) CAST IN-SITU DECK SLABS & FOUNDATION: CLASS 20/19
  - c) PRECAST COVER SLABS & OTHER ITEMS: CLASS 25/19
  - d) CAST IN-SITU KERBS, APRONS ETC.: CLASS 25/19
3. ALL FLOORS AND BENCHING TO BE STEEL TROWELLED WITH A SMOOTH RADIUS.
4. MANHOLE & KERB INLET WIDTHS AND DEPTHS:
  - a. WIDTH-
    - 750 mm PIPES AND LESS - 900mm
    - 825 mm PIPES AND MORE - 1200mm.
 SOME JUNCTION MANHOLE SIZES TO BE DETERMINED ON SITE.
  - b. DEPTH- THE DEPTH INDICATED SHOULD BE INCREASED IF NECESSARY FOR MANHOLES TO PERMIT SUFFICIENT DISCHARGE HEAD TO DEVELOP.
  - c. MANHOLE DEPTH > 1,75m, WIDTH OF BRICKWORK TO BE INCREASED TO 330mm.
5. KERB INLET - THE APRON OVER THE LENGTH OF THE KERB INLET AND THE TRANSITION TO BE LOWERED BY 25mm.
6. NO BACKFILL TO BE DONE UNTIL MORTAR IS SEVEN DAYS OLD.
7. PROVIDE STEP IRONS WHEN DEPTH > 1,200m.
8. PIPES AT INLET AND OUTLET TO BE LAID SOFFIT TO SOFFIT.
9. SHOULD THERE BE A CHANGE IN PIPE DIAMETER, THE GREATER OF THE TWO SHOULD BE USED TO DETERMINE THE POSITIONING OF THE PIPES.
10. ALL ROAD WORKS TO COMPLY WITH THE SANS 1200 SPECIFICATIONS.
11. ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-1986 WITH WATER ABSORTION <14% AND EFFLORESCENE <10. 1
12. ALL BRICKWORK TO BE IN ENGLISH BOND.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



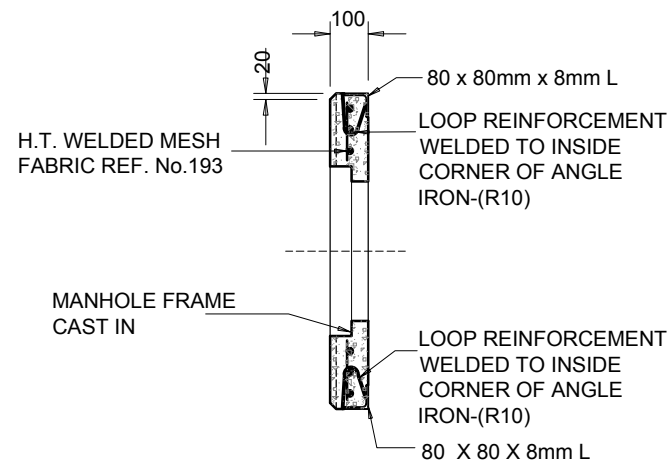
CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER MAINTENANCE
SANDTON SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 2 OF 4)	
SECTIONS OF KERB INLET	

SCALE AS SHOWN: NTS	
DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
<b>JRA-SD SWM-002</b>	
AMENDMENT NUMBER:	

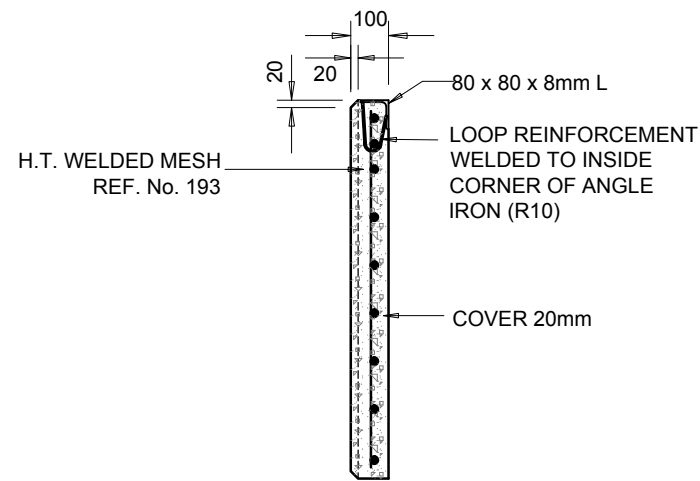
LEGEND

NOTES

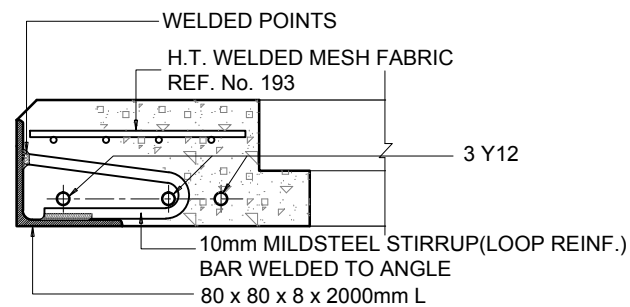
1. ALL CONCRETE TO BE CLASS 25/19.
2. ALL REINFORCING BARS IN PRECAST COVER SLABS TO BE DEFORMED HIGH TENSILE STEEL.
3. ALL PRECAST COVER SLABS TO BE BRUSH FINISHED.
4. ANGLE IRON TO BE PAINTED WITH RED OXIDE UNDERCOAT AND BLACK ENAMEL PAINT AS FINAL COAT.
5. ANGLE FACE ON SLAB "B" TO FACE ROADWAY.



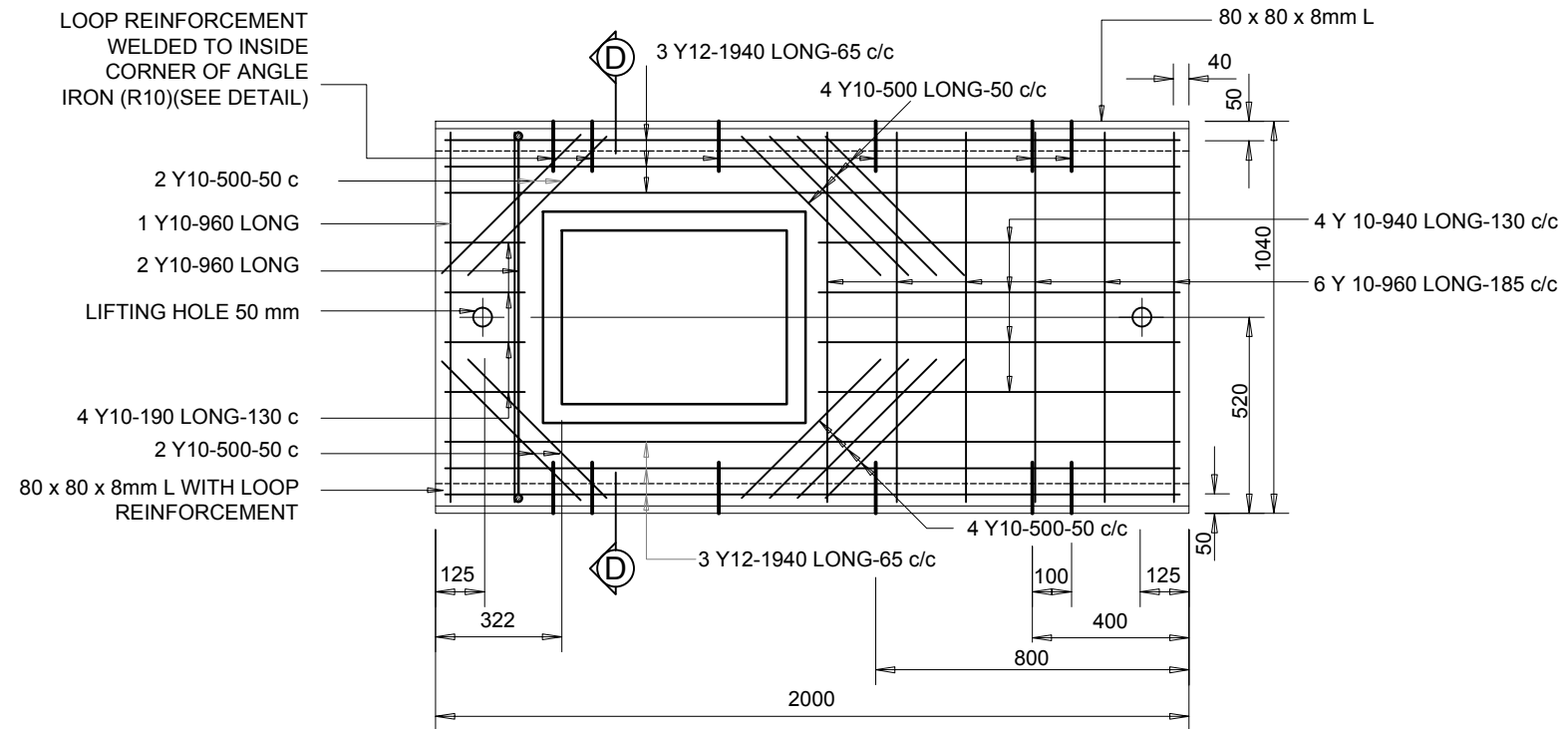
SECTION D - D



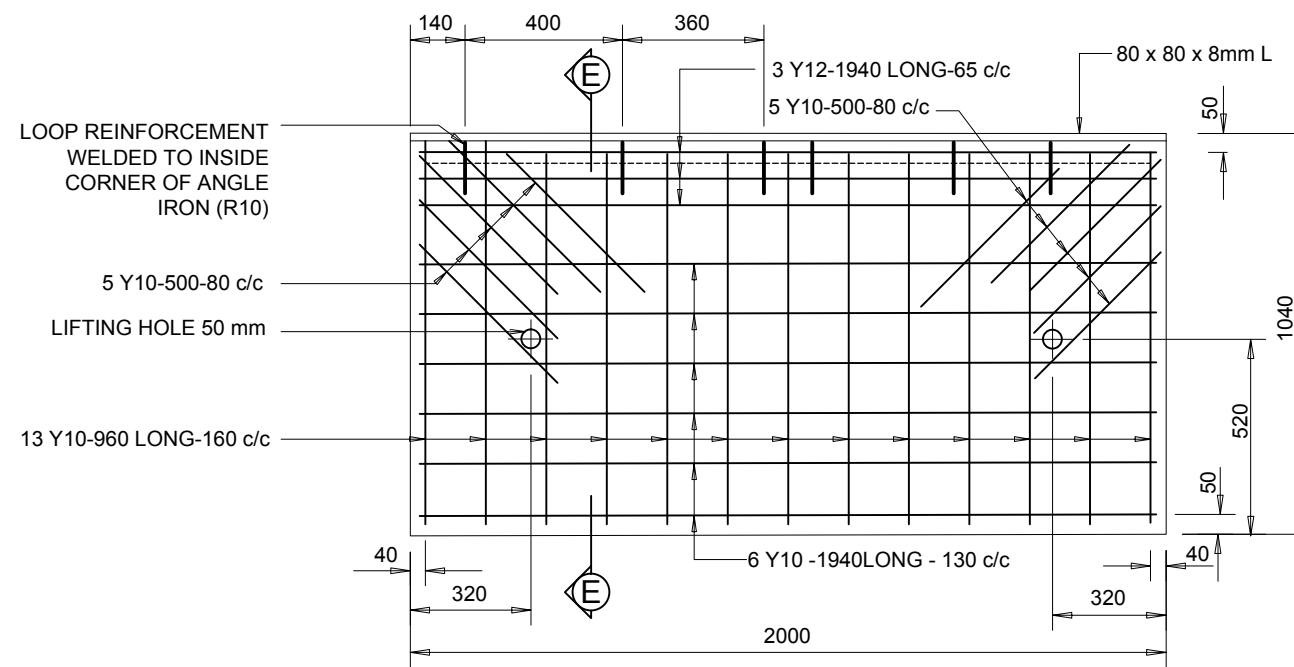
SECTION E - E



STIRRUP DETAIL



SLAB "A"



SLAB "B"

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



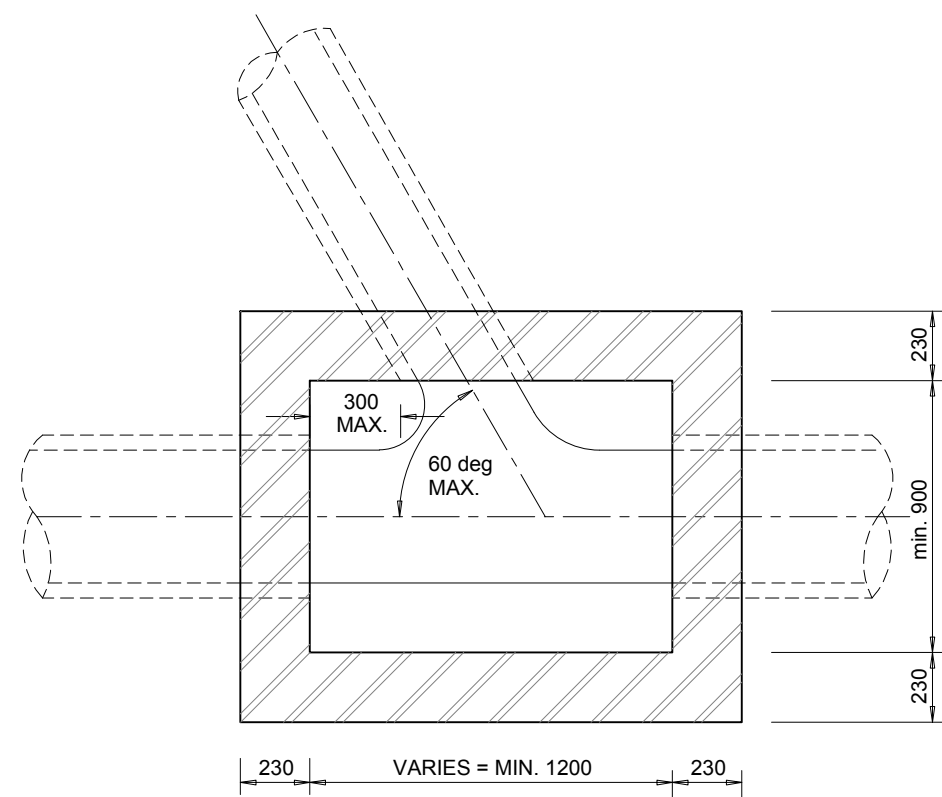
CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER MAINTENANCE
SANDTON SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 3 OF 4)	
SLAB DETAILS	

SCALE AS SHOWN: NTS	
DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
JRA-SD SWM-003	
AMENDMENT NUMBER:	

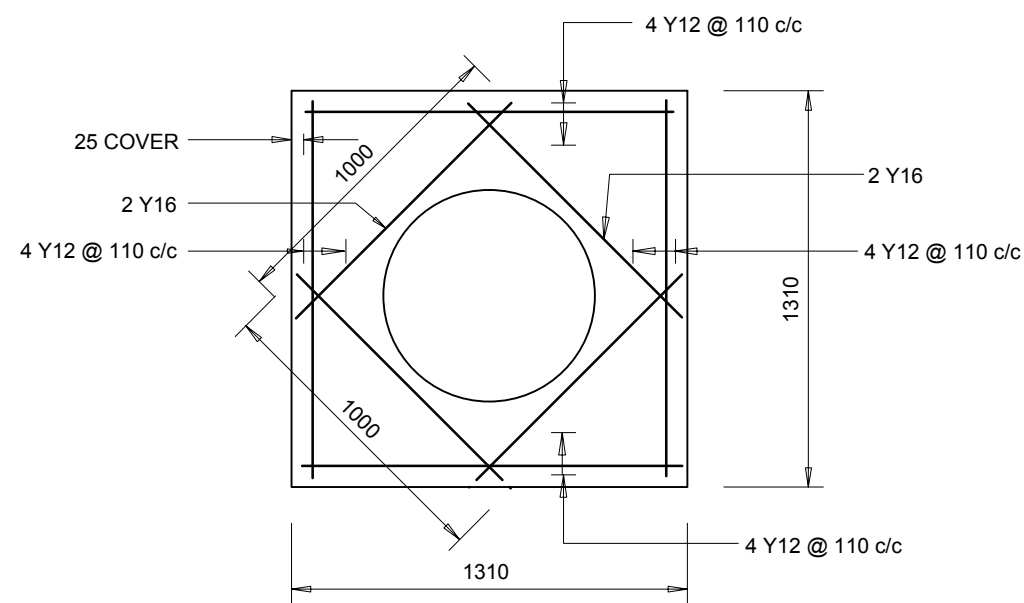
LEGEND

NOTES

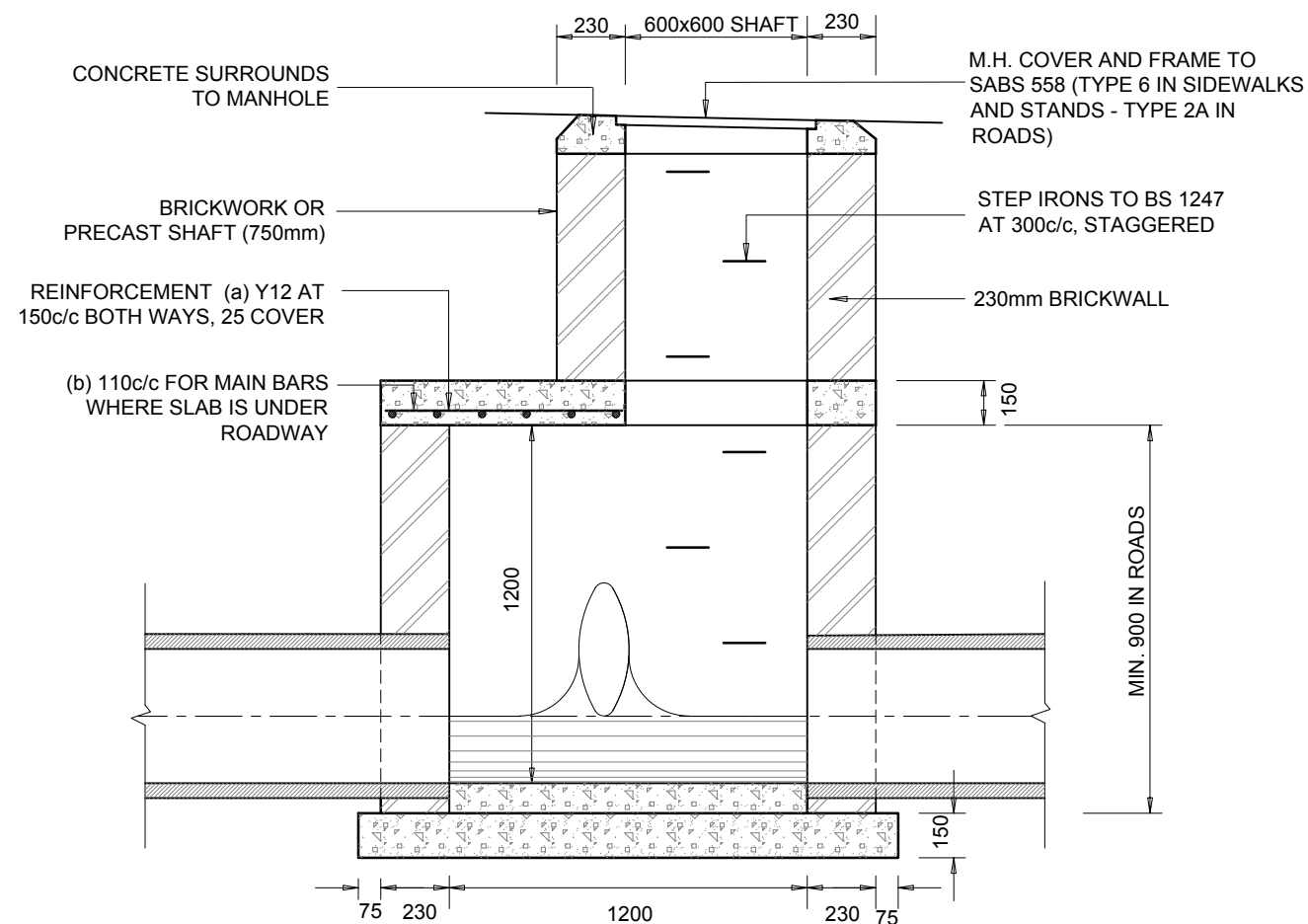
- CONCRETE STRENGTH TO BE AS FOLLOWS:
  - MANHOLE SURROUNDS AND BENCHING: CLASS 15/19
  - CAST IN-SITU DECK SLABS AND FOUNDATION: CLASS 20/19
  - PRECAST COVER SLABS AND OTHER ITEMS: CLASS 25/19
  - CAST IN-SITU KERBS, APRONS ETC.: CLASS 25/19
- ALL FLOORS AND BENCHING TO BE STEEL TROWELLED WITH A SMOOTH RADIUS.
- ALL BRICKS TO BE OF QUALITY FBSE 30 TO SANS 227-2007, WITH WATER ABSORPTION < 14% AND EFFLORESCENCE < 10.
- ALL BRICKWORK TO BE IN ENGLISH BOND.
- MANHOLE AND KERB INLETS WIDTHS AND DEPTH:
  - WIDTH:-
    - 750 mm PIPES AND LESS - 900mm
    - 825 mm PIPES AND MORE - 1200mm .
  - SOME JUNCTION MANHOLE SIZES TO BE DETERMINED ON SITE
  - DEPTH:-
    - THE DEPTH INDICATED SHOULD BE INCREASED IF NECESSARY FOR ANGLE AND JUNCTION MANHOLES TO PERMIT SUFFICIENT DISCHARGE HEAD TO DEVELOP.
    - MANHOLE DEPTH > 1,75m, WIDTH OF BRICKWORK TO BE INCREASED TO 330mm.



SECTIONAL PLAN



REINFORCEMENT DETAIL FOR COVER SLAB



SECTION THROUGH MANHOLE WITH SHAFT

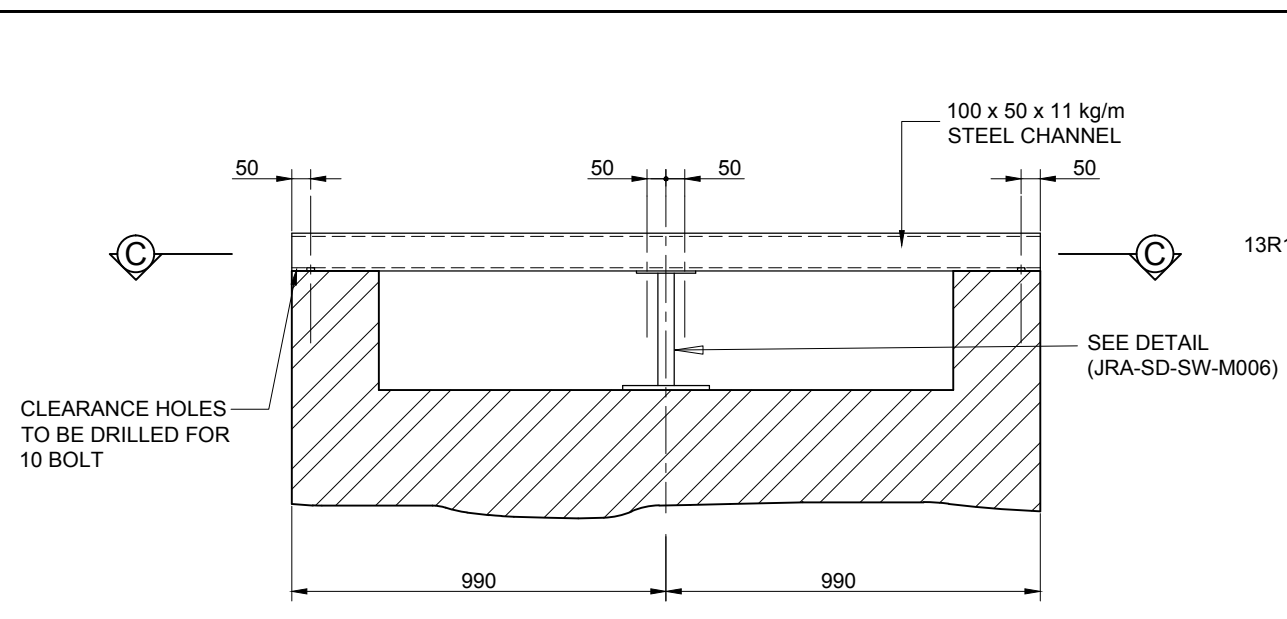
AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:

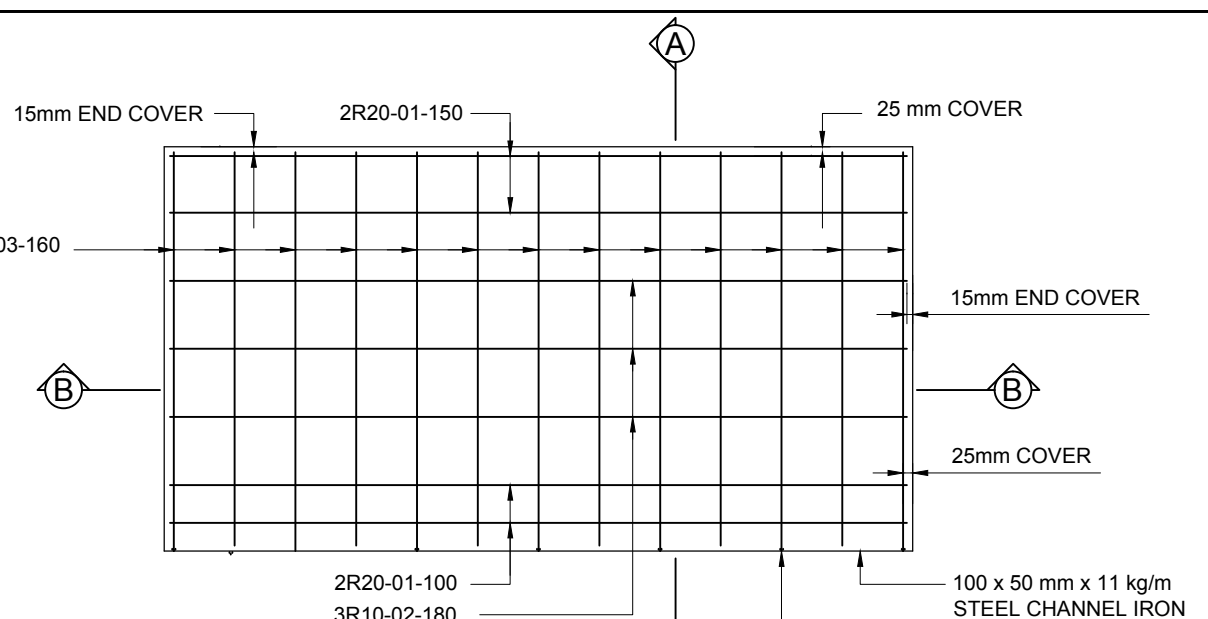


CITY OF JOHANNESBURG	
JOHANNESBURG ROADS AGENCY (PTY) LTD	
Drawing Sub-set	STORMWATER MAINTENANCE
SANDTON SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 4 OF 4)	
MANHOLE DETAILS	

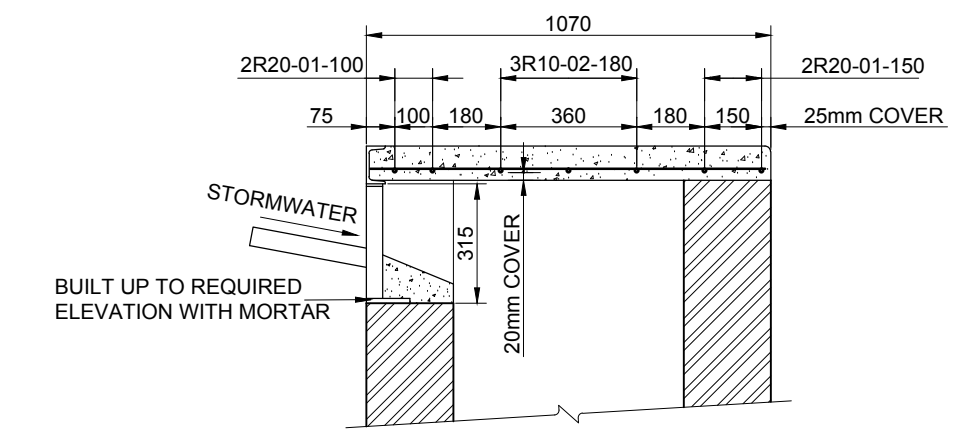
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DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
JRA-SD SWM-004	
AMENDMENT NUMBER:	



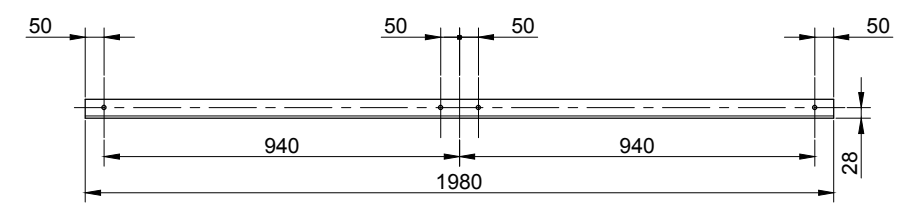
FRONT ELEVATION



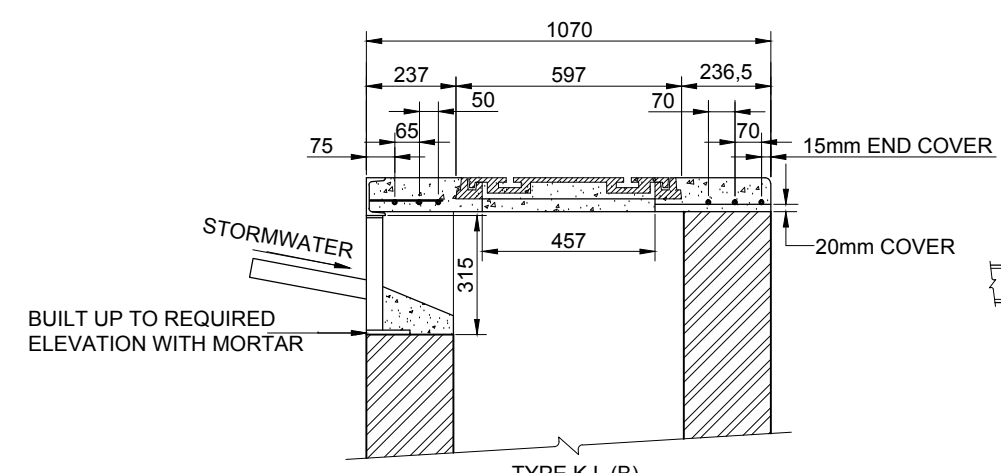
PLAN OF KERB INTAKE TOP



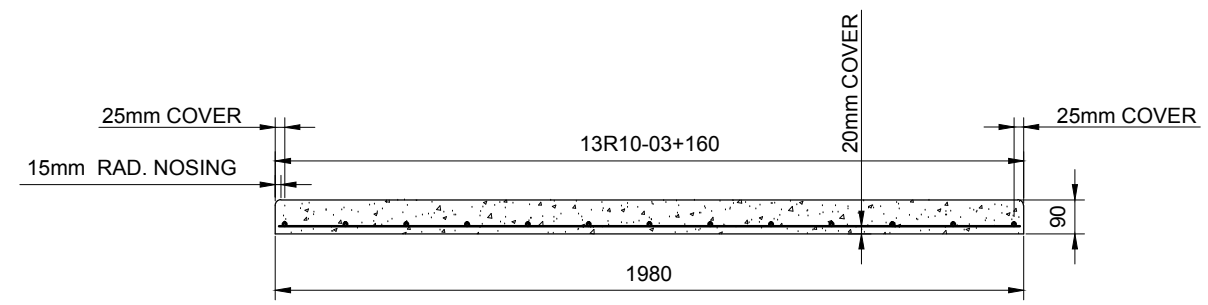
SECTION A-A



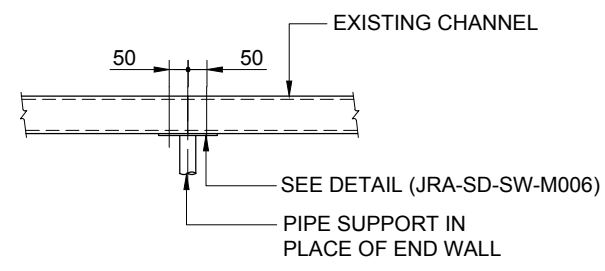
SECTION C-C



SECTION Z-Z



SECTION B-B



EXTENSIONS TO BE AFFECTED AS SHOWN ABOVE FOR BOTH TYPES

STEEL FOR SLAB TOP		TYPE K.I. (A)		
BAR MARK	No. OFF	DIAMETER	LENGTH	SHAPE
01	4	R20	1950	STRAIGHT
02	3	R10	1950	STRAIGHT
03	13	R10	1050	STRAIGHT

BENDING SCHEDULE

LEGEND	
M.K.	MOUNTABLE KERB
B.K.	BARRIER KERB
K.I.	KERB INLET

- NOTES
- ALL BRICKS TO BE OF QUALITY FBSE 30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
  - ALL BRICKWORK TO BE IN ENGLISH BOND.
  - CONCRETE TO BE CLASS 20/19.
  - MINIMUM END COVER 15mm.

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

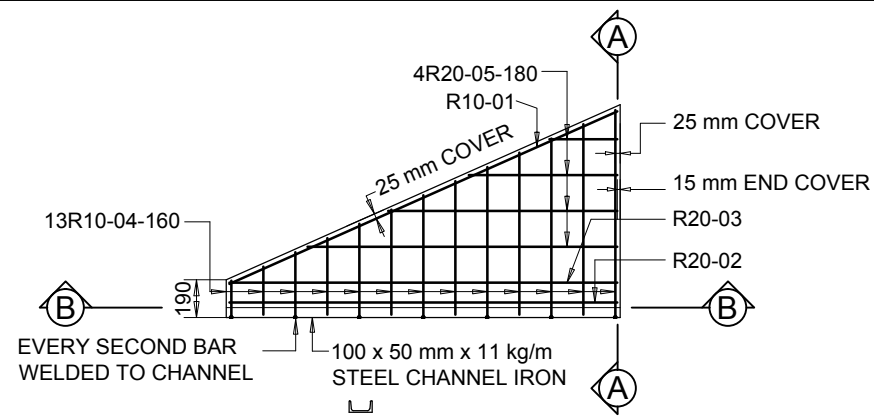
**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set: **STORMWATER MAINTENANCE**

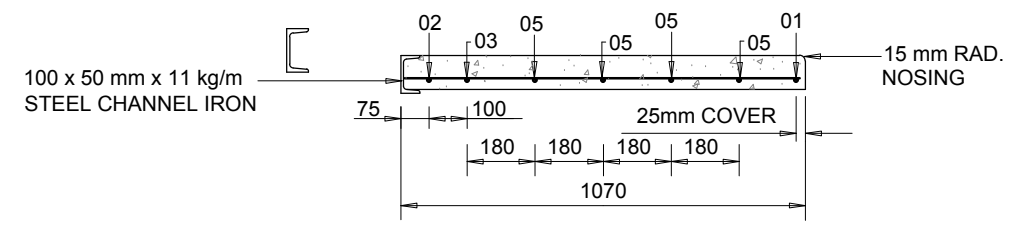
JOHANNESBURG SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 1 OF 6)

**DETAILS OF PRECAST COVER SLABS FOR WIDE TYPE KERB INLETS**

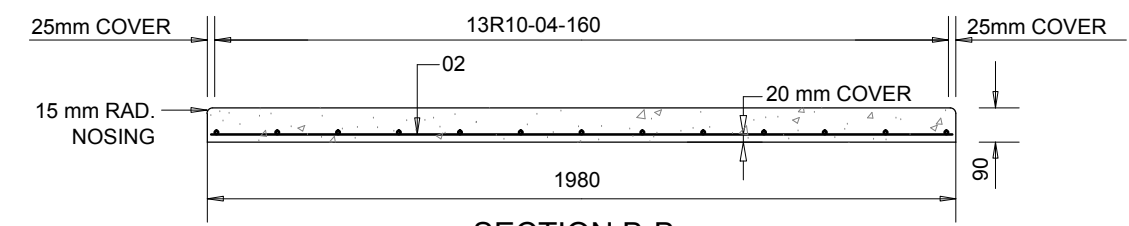
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DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
<b>JRA-SD SWM-005</b>	
AMENDMENT NUMBER:	



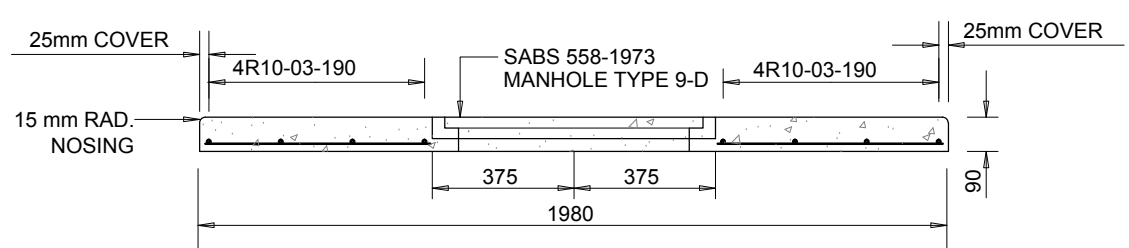
PLAN OF TAPERED KERB INTAKE SLAB



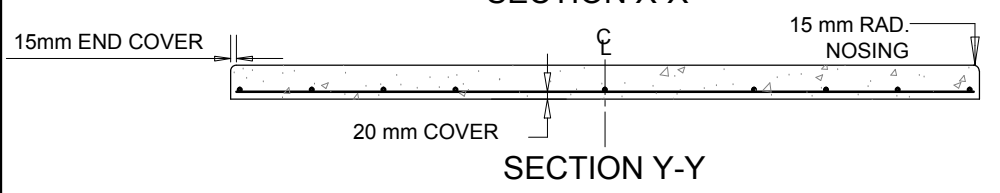
SECTION A-A



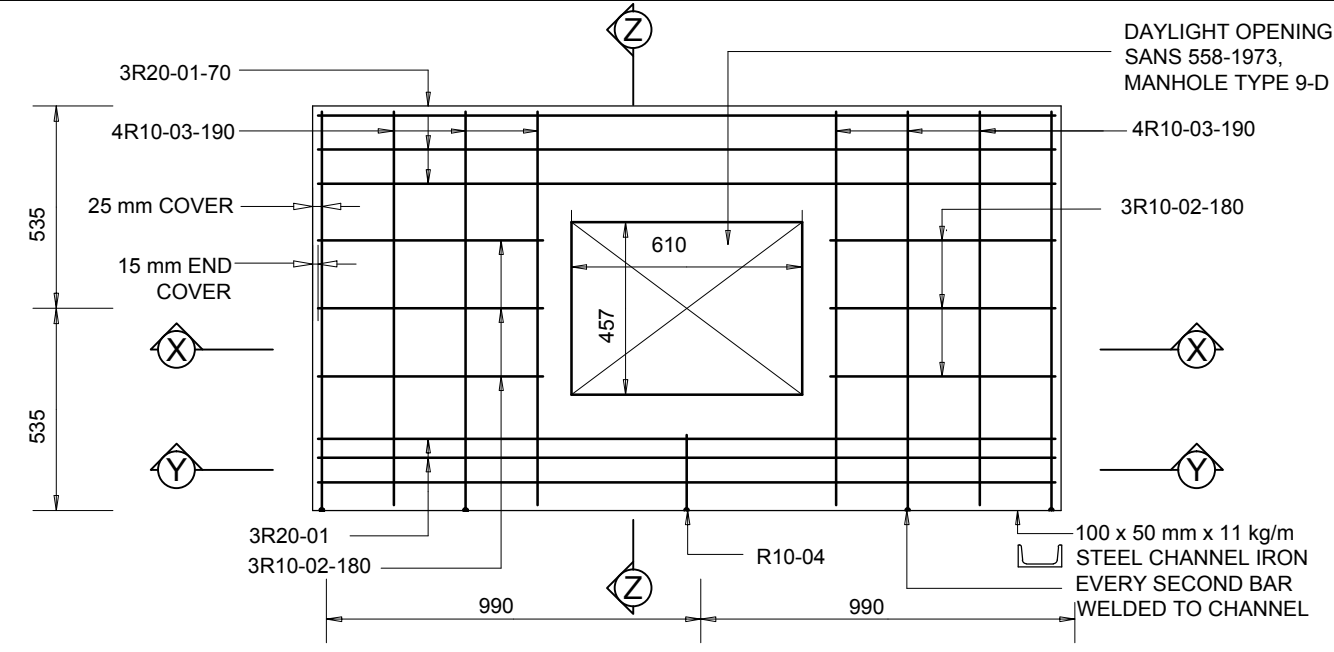
SECTION B-B



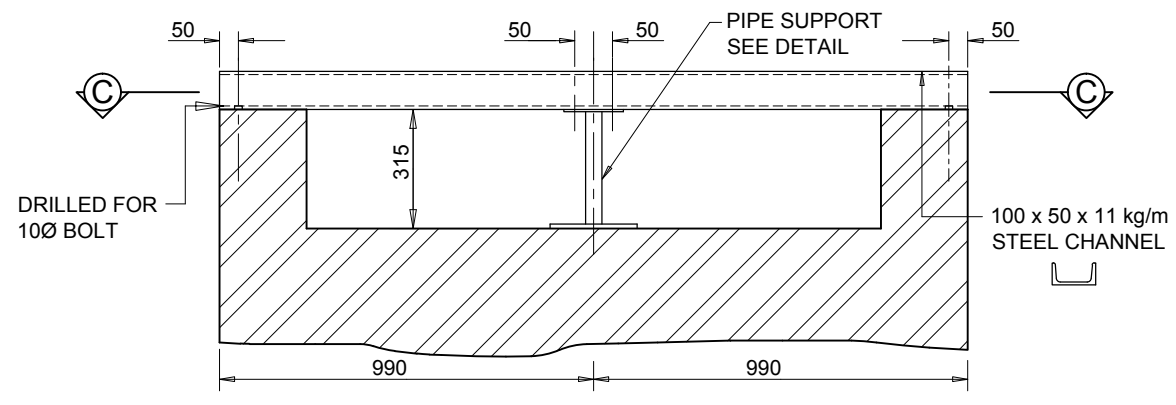
SECTION X-X



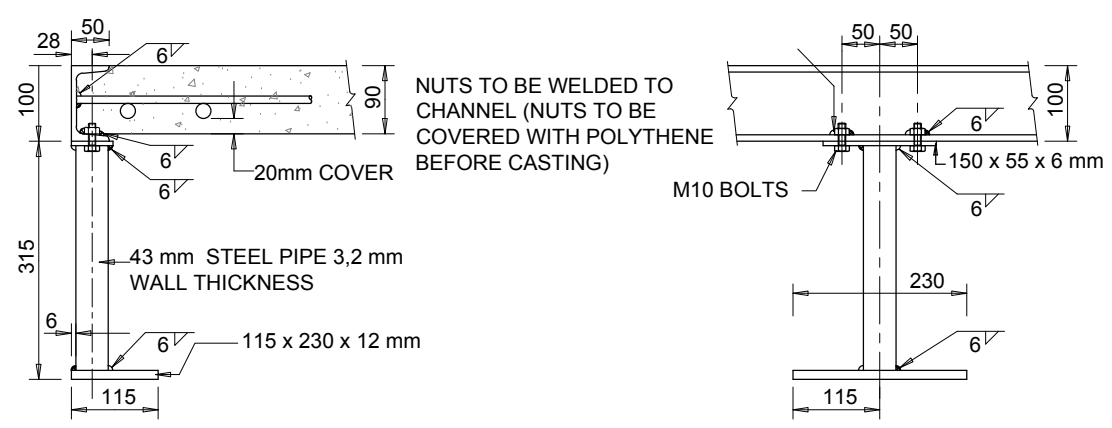
SECTION Y-Y



PLAN OF KERB INTAKE TOP WITH MANHOLE



FRONT ELEVATION



DETAIL OF PIPE SUPPORT

STEEL FOR SLAB TOP		TYPE K.I. (B)		
BAR MARK	No. OFF	DIAMETER	LENGTH	SHAPE
01	6	R20	1950	STRAIGHT
02	6	R10	585	STRAIGHT
03	8	R10	1050	STRAIGHT
04	1	R10	200	STRAIGHT

STEEL FOR SLAB TOP		TYPE K.I. (C)		
BAR MARK	No. OFF	DIAMETER	LENGTH	SHAPE
01	1	R10	2050	STRAIGHT
02	1	R20	1950	STRAIGHT
03	1	R20	1870	STRAIGHT
04	13	R10	140+75 TO 1040	STRAIGHT
05	4	R10	330+380 TO 1470	STRAIGHT

BENDING SCHEDULES

LEGEND	
M.K.	MOUNTABLE KERB
B.K.	BARRIER KERB
K.I.	KERB INLET

NOTES

AMENDMENTS				
No.	DATE	APPROVED	DESCRIPTION	

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

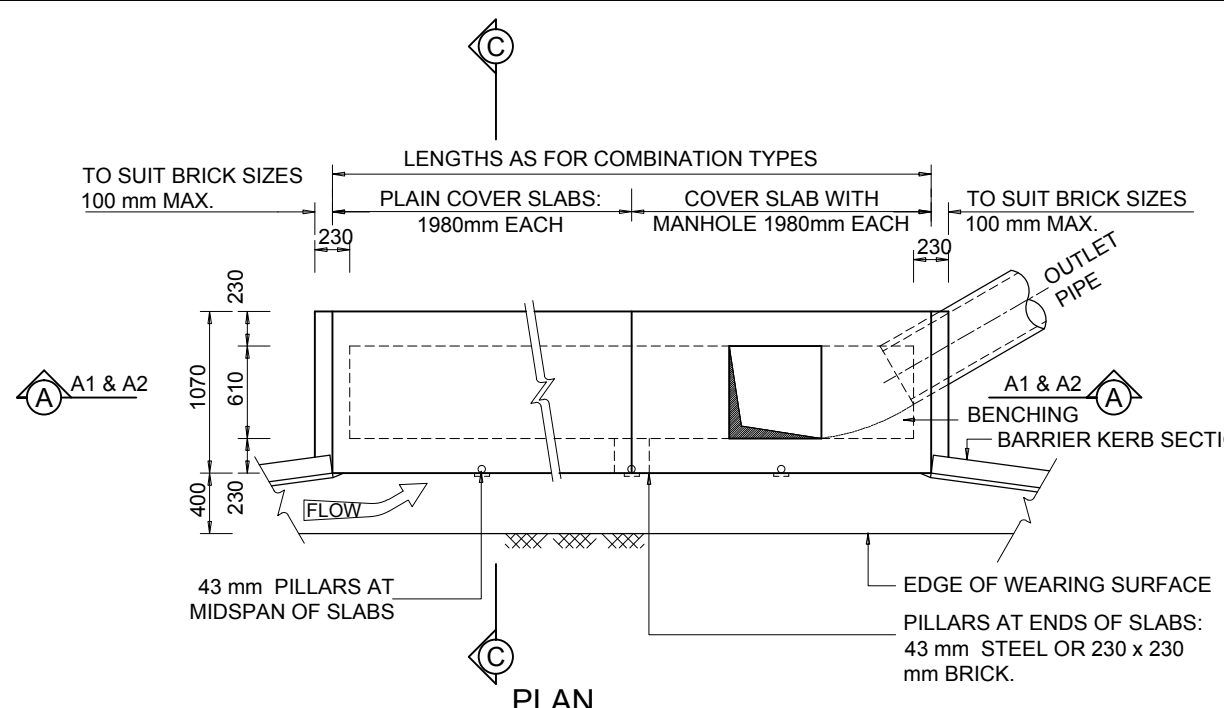
**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set: **STORMWATER MAINTENANCE**

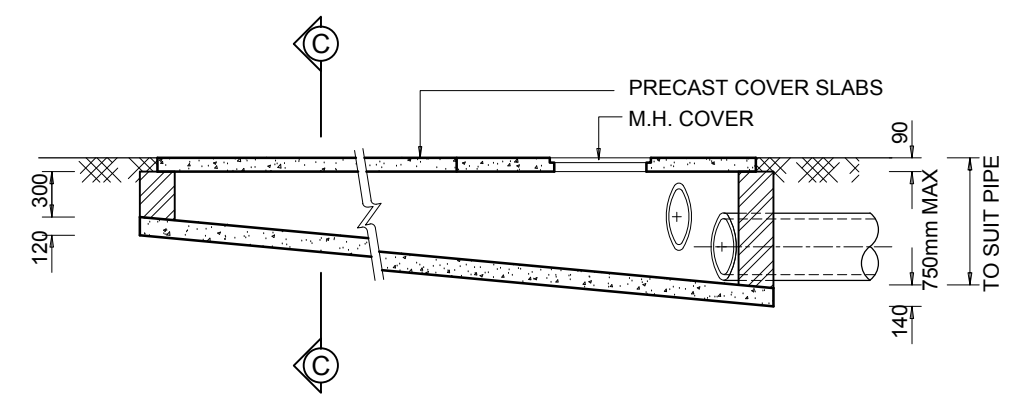
JOHANNESBURG SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 2 OF 6)

**DETAILS OF PRECAST COVER SLABS FOR WIDE TYPE KERB INLETS**

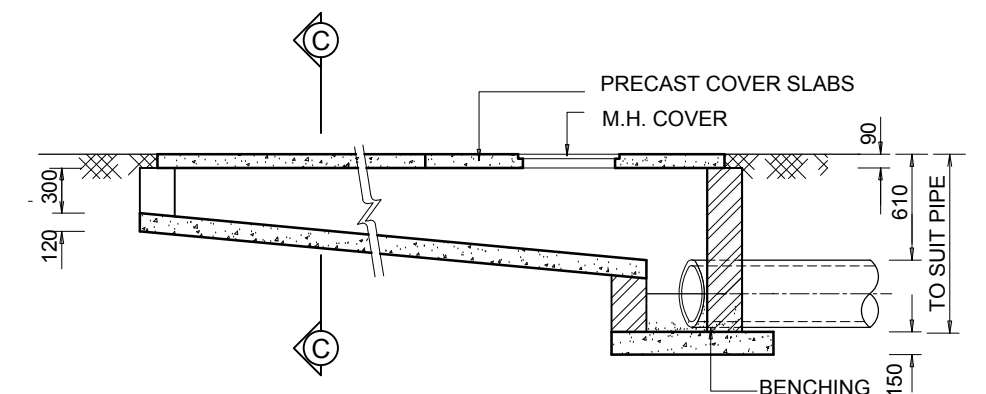
SCALE AS SHOWN: NTS	
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DRAWING NUMBER	EXTN.
<b>JRA-SD SWM-006</b>	
AMENDMENT NUMBER:	



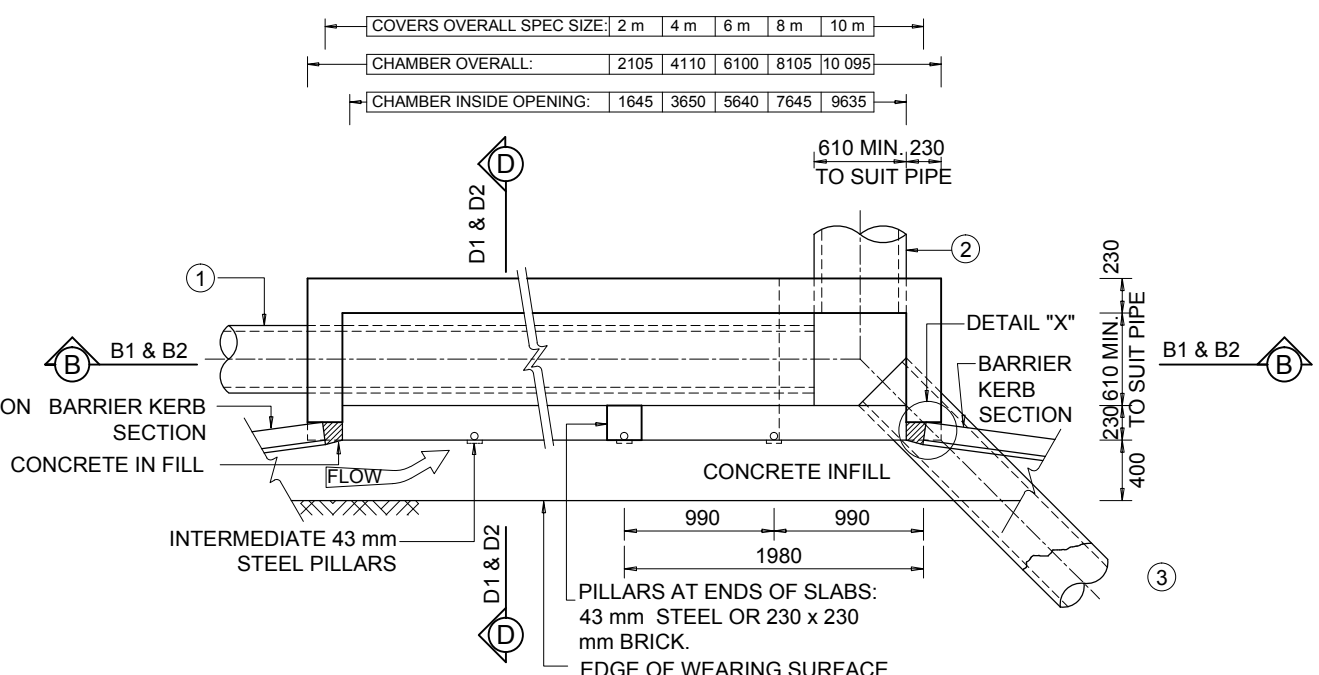
PLAN



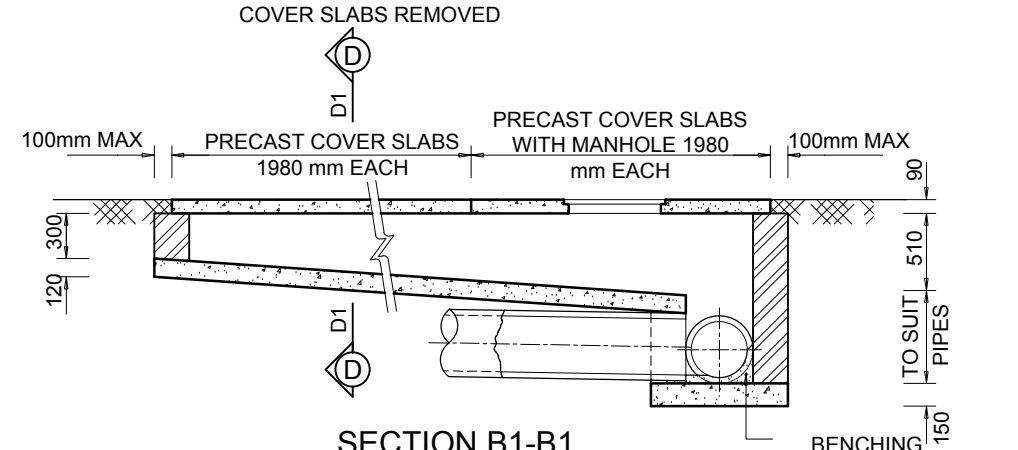
SECTION A1-A1  
OUTLET PIPE UP TO 750 mm DEEP



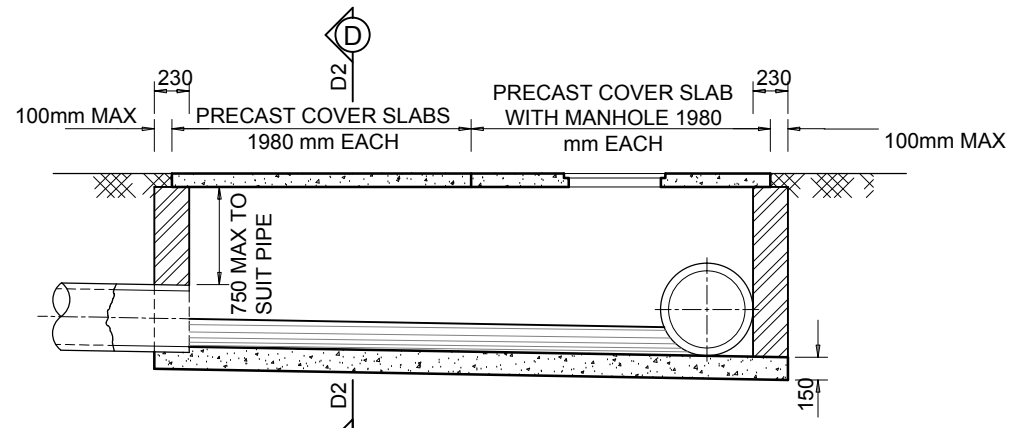
SECTION A2-A2  
OUTLET PIPE MORE THAN 750 mm DEEP (LOCAL SUMP)  
THIS SECTION ALSO APPLIES FOR COMBINATION TYPE INLET/MANHOLE WHERE THERE IS NO PIPE ALONG THE LINE OF THE INLET.



PLAN  
COVER SLABS REMOVED



SECTION B1-B1  
COVER TO PIPE ALONG LINE OF INLET (PIPE No.1) MORE THAN 750 mm (LOCAL SUMP) SEE ALSO SECTION A2-A2 IF THERE IS NO PIPE ALONG THE LINE OF THE INLET.



SECTION B2-B2  
COVER TO PIPE ALONG LINE OF INLET (PIPE No.1) UP TO 750 mm (CHAMBER AT DEPTH OF DRAIN).

COVERS OVERALL SPEC SIZE:	2 m	4 m	6 m	8 m	10 m
CHAMBER OVERALL:	2105	4110	6100	8105	10 095
CHAMBER INSIDE OPENING:	1645	3650	5640	7645	9635

LEGEND

NOTES

- FOR SECTIONS C-C & D-D, AND DETAIL "X" REFER TO DRG, JRA-SD-SW-M008
- ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
- ALL BRICKWORK TO BE IN ENGLISH BOND.

AMENDMENTS

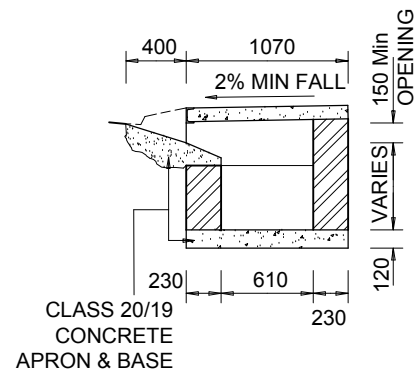
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:

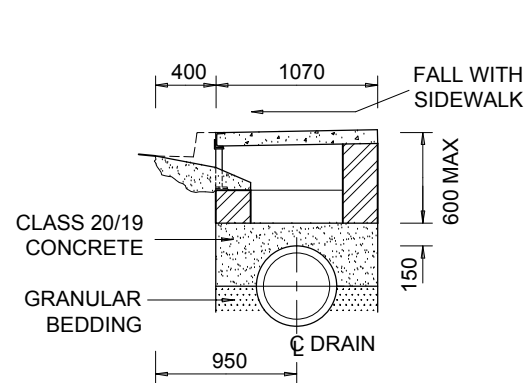


CITY OF JOHANNESBURG  
**JOHANNESBURG ROADS AGENCY (PTY) LTD**  
 Drawing Sub-set: **STORMWATER MAINTENANCE**  
 JOHANNESBURG SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 3 OF 6)  
**LAYOUT PLAN & SECTIONS - 1**

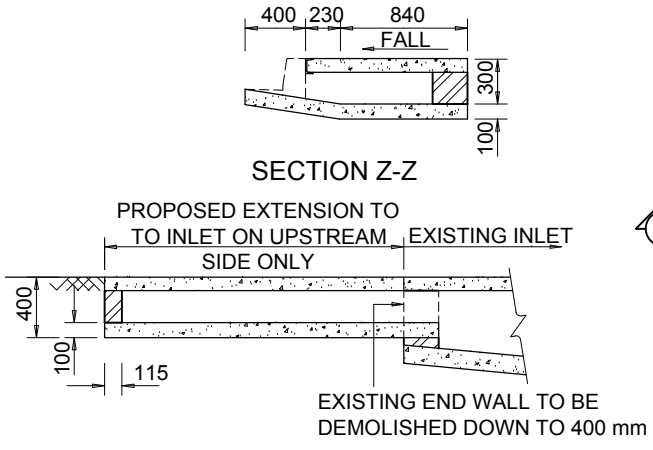
SCALE AS SHOWN: NTS	
DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
<b>JRA-SD SWM-007</b>	
AMENDMENT NUMBER:	



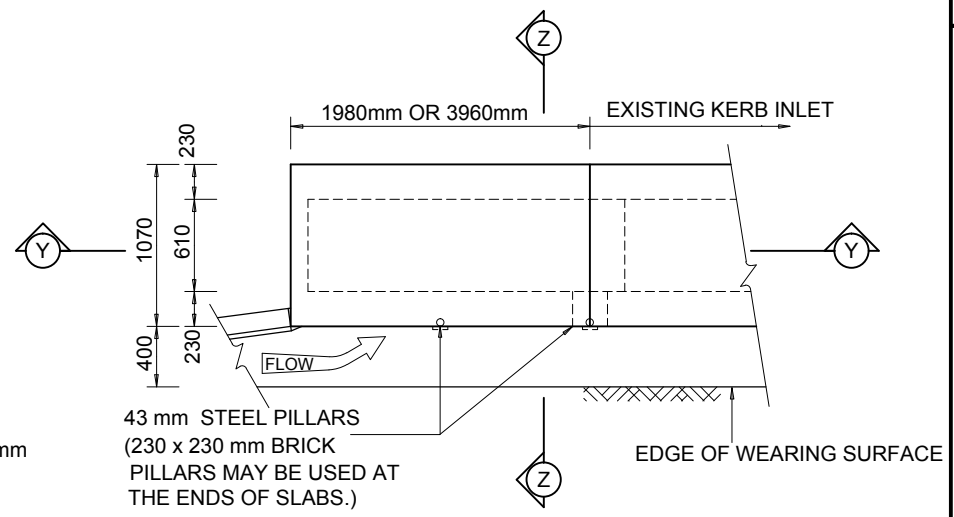
SECTION C-C



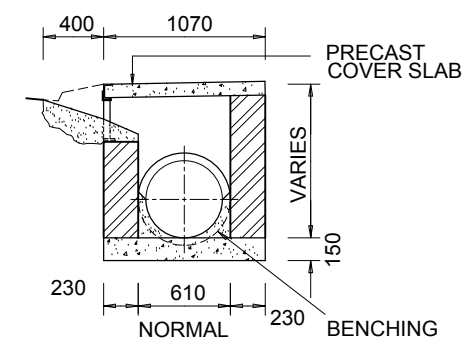
SECTION D1-D1



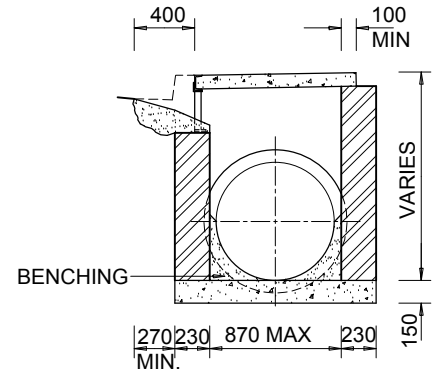
SECTION Y-Y



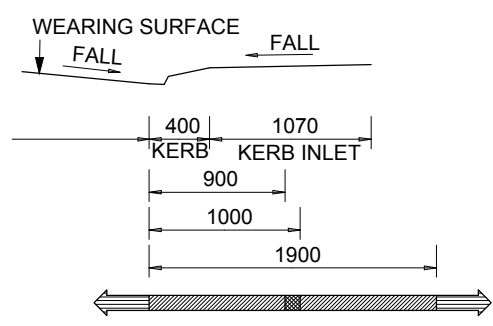
PLAN - EXTENSION TO EXISTING KERB INLET



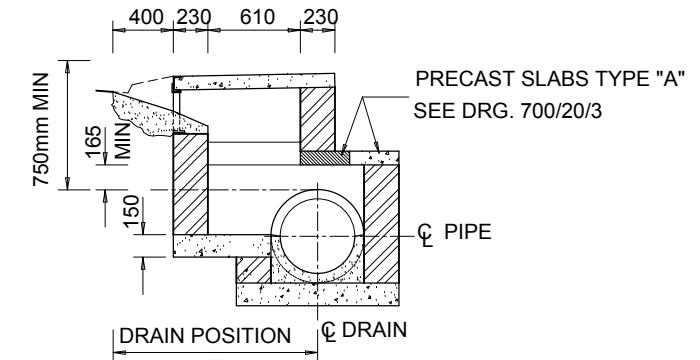
SECTION D2-D2 FOR PIPES UP TO 600 mm



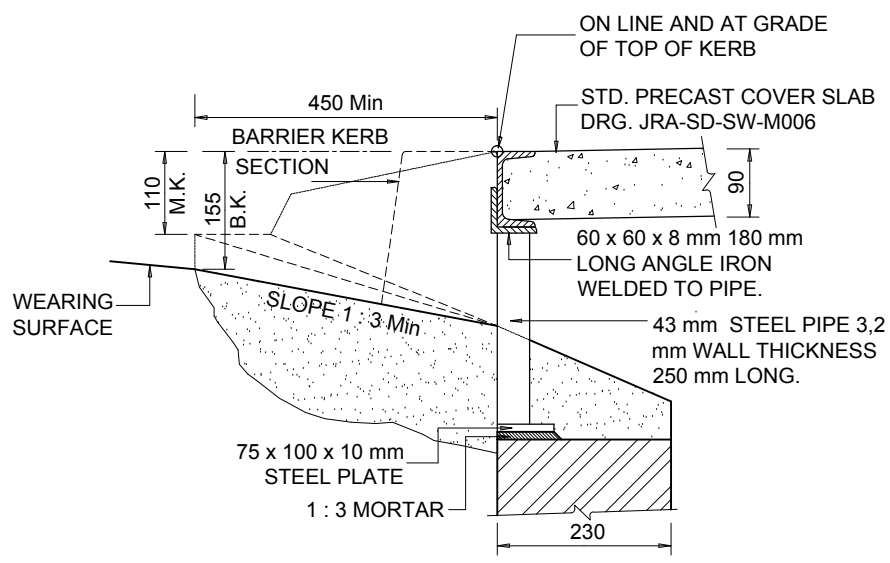
SECTION D2-D2 FOR PIPES 675 mm TO 825 mm



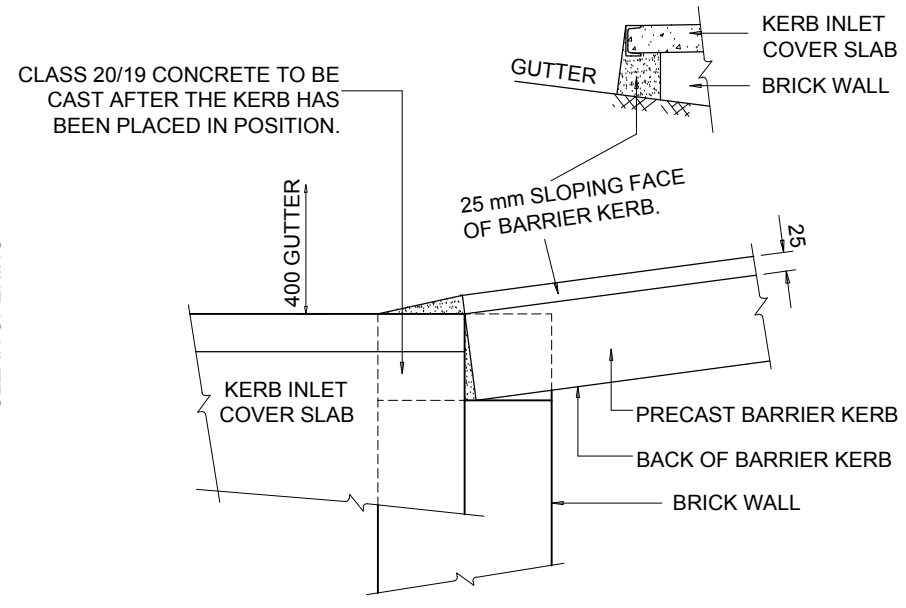
POSITION OF DRAIN C



TYPICAL SECTION AT SUMP OFF CENTRE DRAIN



TYPICAL SECTION STEEL PILLAR, COVER SLAB, KERB POSITION



DETAIL X JUNCTION OF PRECAST KERB & KERB INLET

(SEE PLAN - JRA-SD-SW-M007)

- REFERENCE DRAWINGS: -
- JRA-SD-SW-M007:- LAYOUT PLAN
  - JRA-SD-SW-M005 & SW-M006:- DETAILS OF PRECAST COVER SLABS FOR WIDE TYPE KERB INLETS.
  - JRA-SD-SW-M007:- DETAILS OF PRECAST SLABS FOR USE AT SUMPS, MANHOLES AND JUNCTION BOXES.
  - JRA-SD-SW-M009 & SW-M010: - DETAILS OF NARROW TYPE KERB INLETS. DETAILS OF KERBING AND TRANSITIONS TO INLETS.
  - JRA-SD-R005:- TYPICAL DETAILS OF KERB TRANSITIONS.

LEGEND	
	IDEAL POSITION: SEE SECTIONS C-C & D-D
	OFF CENTRE DRAIN: SEE SECTION E-E
	SEPERATE KERB INLET / MANHOLE OR JUNCTION BOX TO BE CONSTRUCTED
M.K.	MOUNTABLE KERB
B.K.	BARRIER KERB
K.I.	KERB INLET

- NOTES
- THE KERB INLETS ARE DETAILED WITH THE COVER SLABS HORIZONTAL. LONGITUDINALLY ALL K.I.'s MUST HOWEVER BE CONSTRUCTED SO THAT THE FRONT TOP EDGE OF THE COVER SLAB IS ON THE LINE AND GRADE OF THE TOP REAR EDGE OF THE ADJACENT KERBING.
  - COVER SLABS ARE TO SLOPE TOWARDS THE ROAD AS SIDEWALKS. (MIN FALL 2%)
  - SIZES OF KERB INLETS ARE SPECIFIED BY THE OVERALL LENGTH ON TOP IN MULTIPLES OF 2,0 m (UNIT COVER SLAB) - DESIGNERS ARE TO USE THE RELATIVE OPENING LENGTHS AS TABULATED TO DETERMINE THE CAPACITY OF THE INLET.
  - POSITION OF THE DRAIN IS TO BE DETERMINED BY SITE CONDITIONS - IF THERE ARE NO OBSTRUCTIONS THE DRAIN SHOULD BE PLACED AT 0,9 m TO 1,0 m FROM THE EDGE OF THE WEARING SURFACE - SEE THE DIAGRAM ON THIS DRAWING.
  - PIPES BUILT INTO CHAMBERS AND SUMPS ARE TO BE CHIPPED BACK UNTIL FLUSH WITH THE FACE OF THE WALL.
  - WALLS COULD BE CONSTRUCTED OF CLASS 20/19 CONCRETE OF 130 mm THICKNESS.
  - ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORTION <14% AND EFFLORESCENCE <10.
  - ALL BRICKWORK TO BE IN ENGLISH BOND.
  - SPECIAL CONSIDERATIONS ARE TO BE GIVEN TO PIPES OVER 825mm.

AMENDMENTS			
No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

**JOHANNESBURG ROADS AGENCY (PTY) LTD**

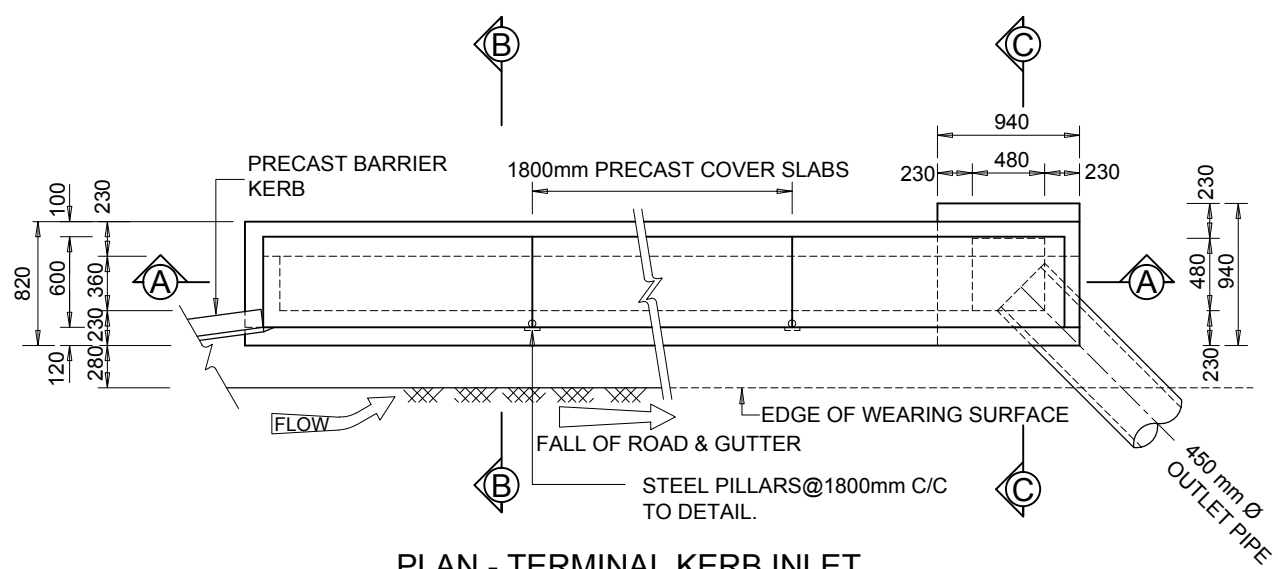
Drawing Sub-set      **STORMWATER MAINTENANCE**

JOHANNESBURG SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 4 OF 6)

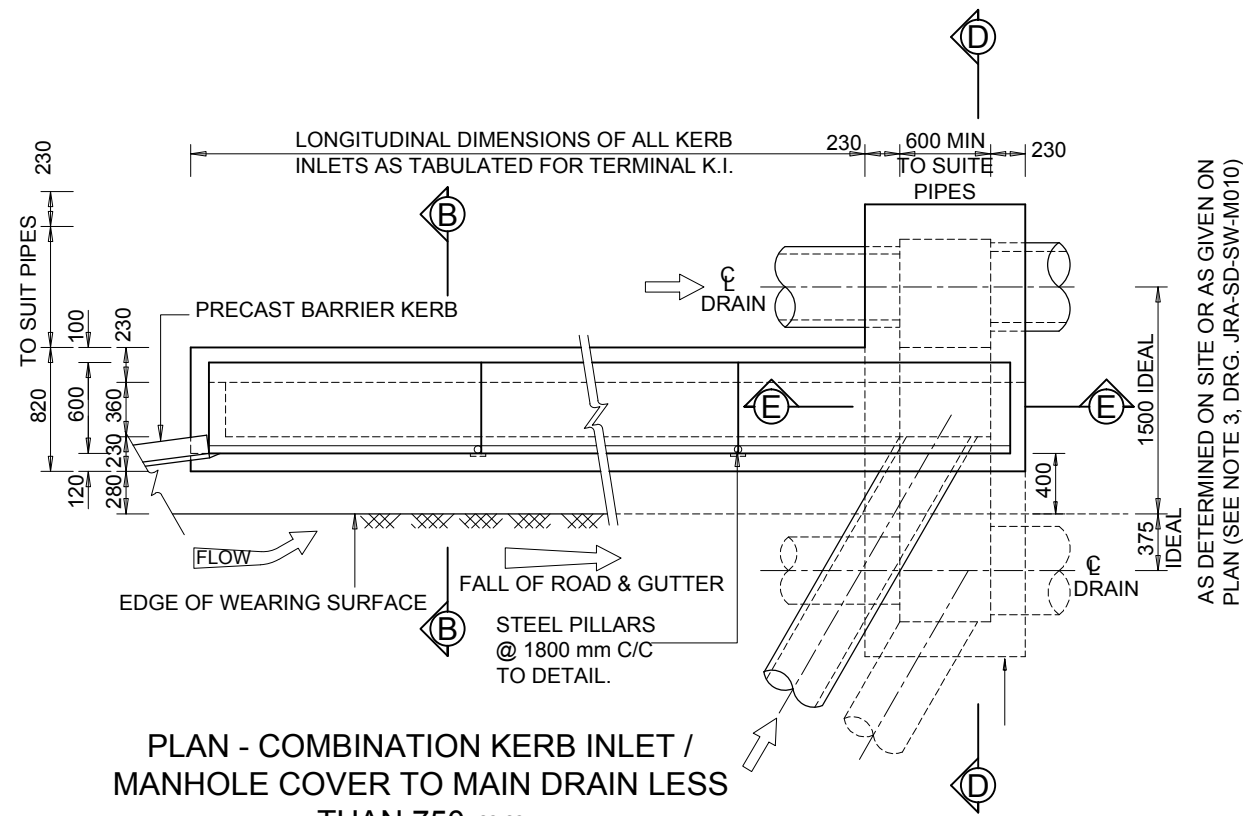
**LAYOUT PLAN & SECTIONS - 2**

SCALE AS SHOWN: NTS	
DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
<b>JRA-SD SWM-008</b>	
AMENDMENT NUMBER:	

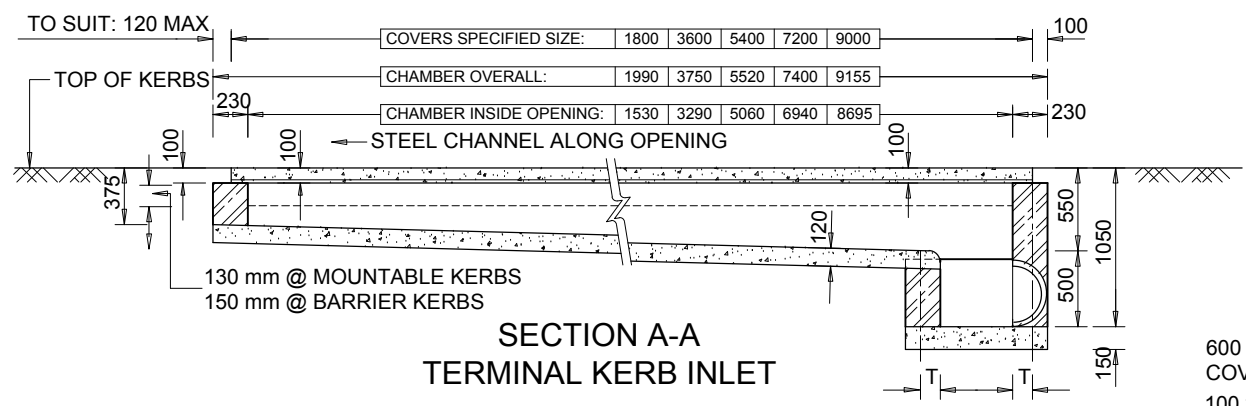




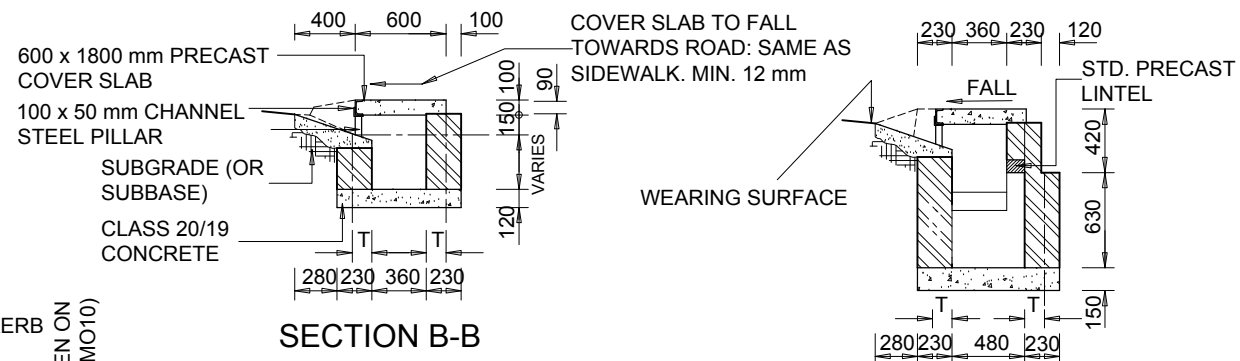
PLAN - TERMINAL KERB INLET



PLAN - COMBINATION KERB INLET /  
MANHOLE COVER TO MAIN DRAIN LESS  
THAN 750 mm

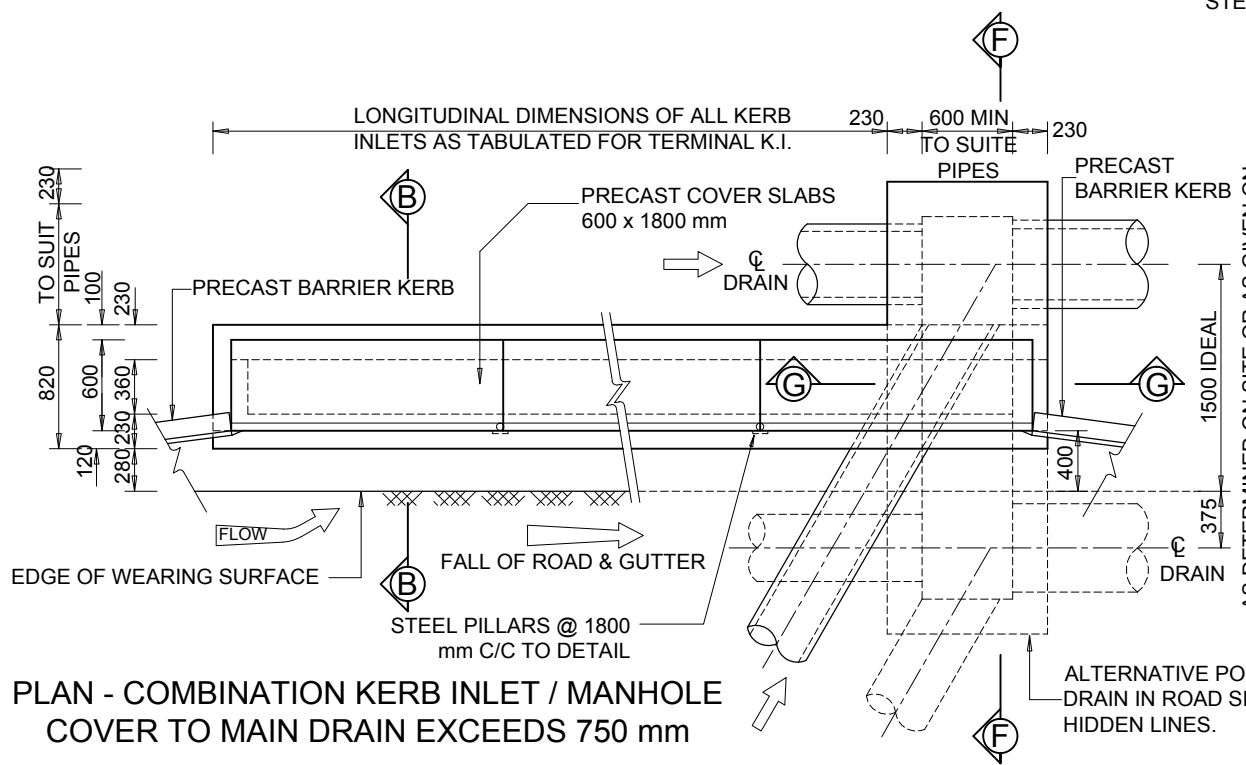


SECTION A-A  
TERMINAL KERB INLET

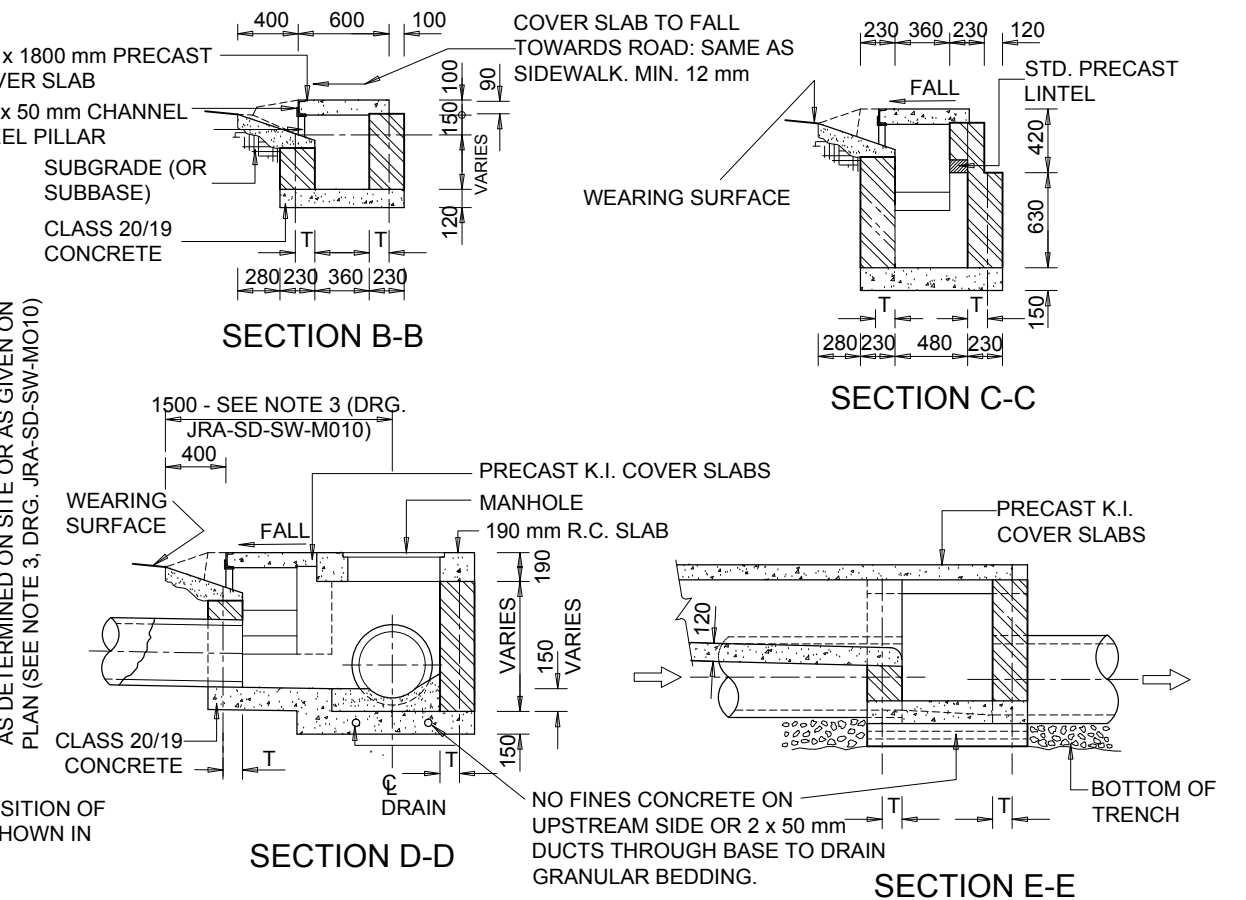


SECTION B-B

SECTION C-C



PLAN - COMBINATION KERB INLET / MANHOLE  
COVER TO MAIN DRAIN EXCEEDS 750 mm



SECTION D-D

SECTION E-E

LEGEND

K.1. KERB INLET

NOTES

1. REFER ALSO TO DRG. JRA-SD-SW-M010
2. ALL BRICKWORK TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
3. ALL BRICKWORK TO BE IN ENGLISH BOND.
4. FOR SECTIONS F-F & G-G REFER TO DRG. JRA-SD-SW-M010.
5. "T" INDICATES THICKNESS (130mm) OF WALLS CONSTRUCTED OF CLASS 20/19 CONCRETE.
6. ALTERNATIVE POSITION OF DRAINS IN ROAD SHOWN IN HIDDEN LINES.

AS DETERMINED ON SITE OR AS GIVEN ON PLAN (SEE NOTE 3, DRG. JRA-SD-SW-M010)

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

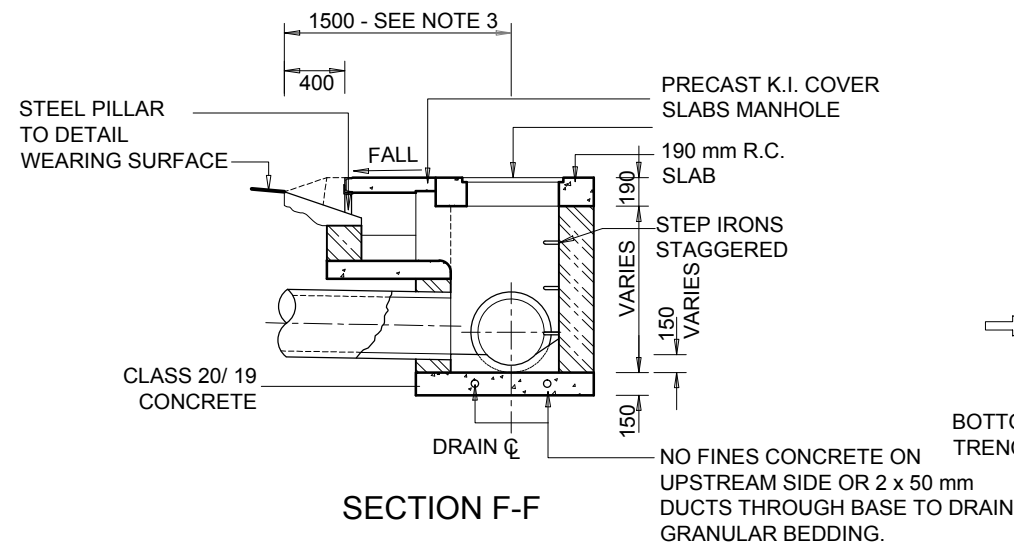
**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set      **STORMWATER MAINTENANCE**

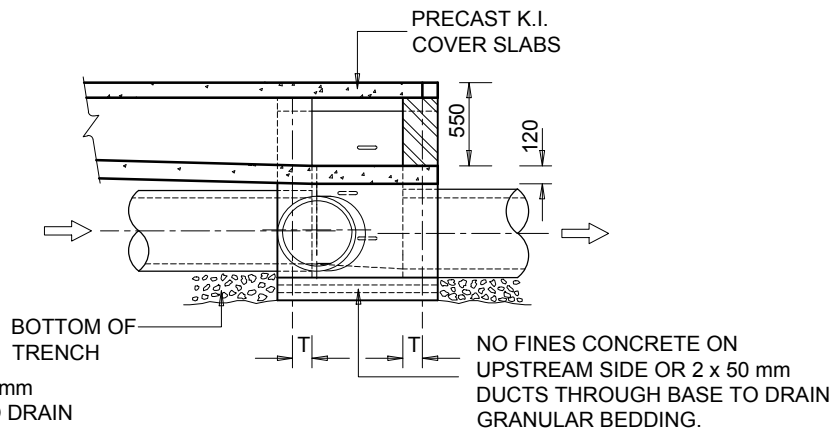
JOHANNESBURG SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 5 OF 6)

**LAYOUT PLANS & SECTIONS - 3**

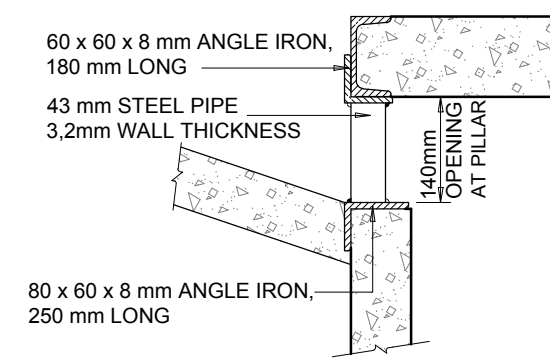
SCALE AS SHOWN: NTS	
DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
<b>JRA-SD SWM-009</b>	
AMENDMENT NUMBER:	



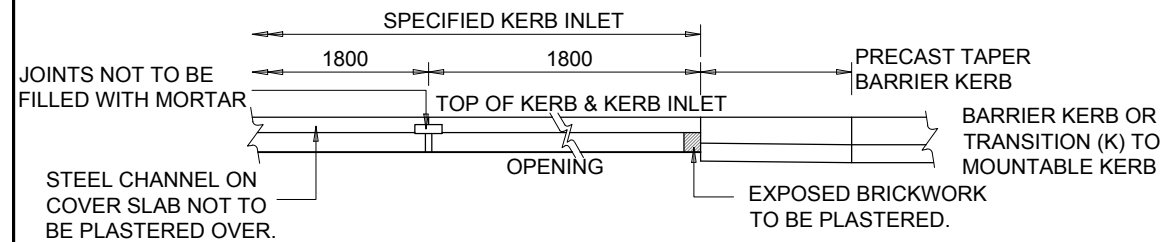
SECTION F-F



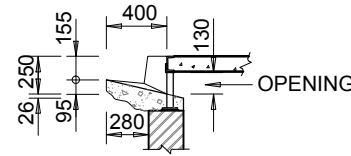
SECTION G-G



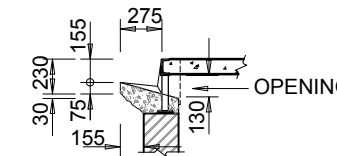
DETAILS OF STEEL PILLAR FOR USE ON PRECAST UNITS



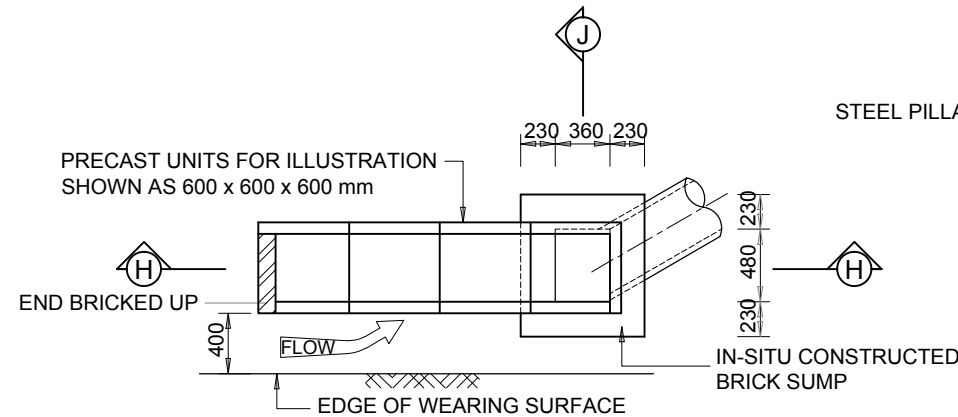
FRONT ELEVATION OF KERB INLET



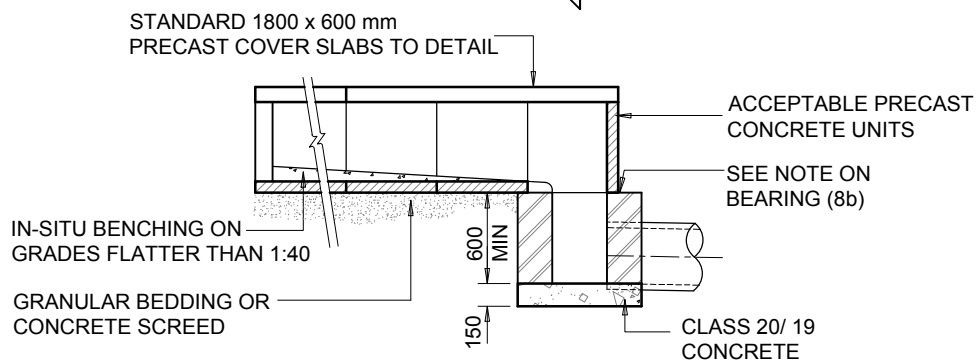
NORMAL ARRANGEMENT AT BARRIER KERBS



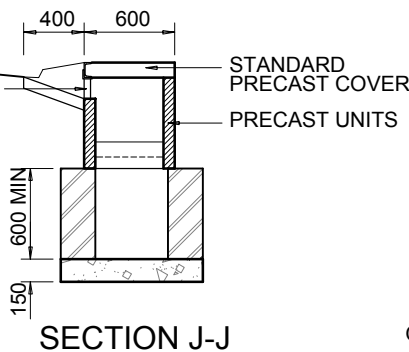
ARRANGEMENT AT BARRIER KERBS WHERE INLET IS NOT SET BACK - SPECIAL CIRCUMSTANCES



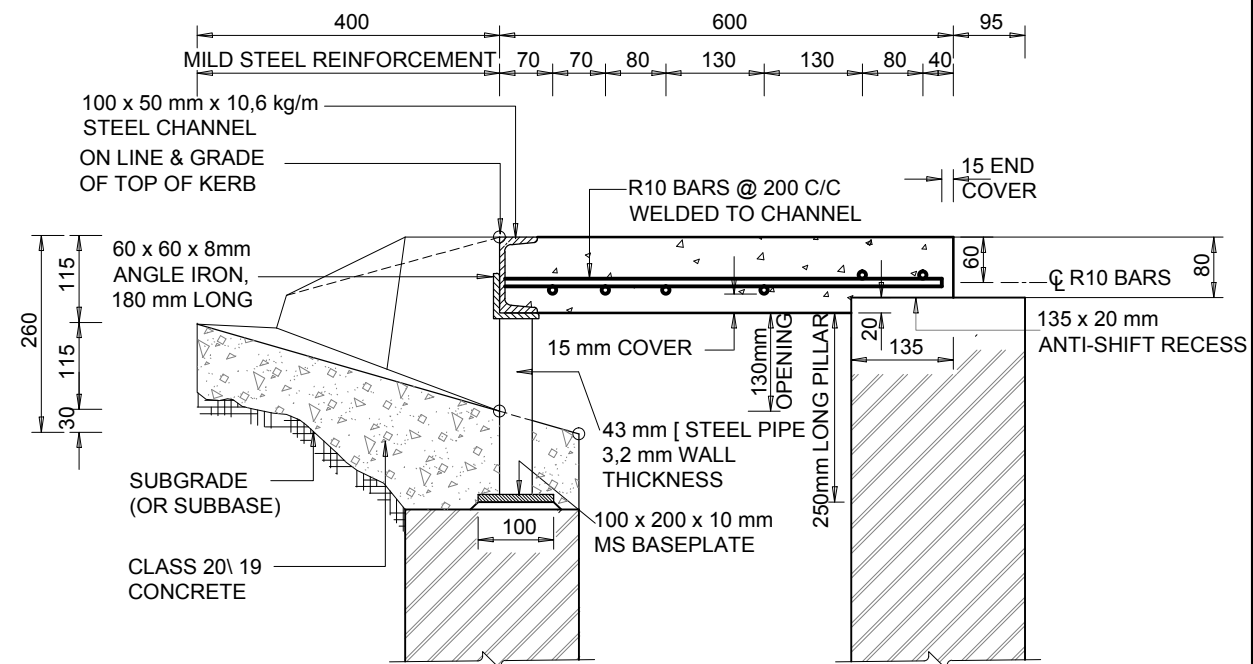
PLAN



SECTION H-H



SECTION J-J



NORMAL ARRANGEMENT AT MOUNTABLE KERBS

LEGEND

NOTES

1. FOR LAYOUT PLANS REFER TO DRG. JRA-SD-SW-M009
2. COVER SLABS TO SLOPE TOWARDS ROAD AS SIDEWALK - MIN FALL 2%
3. SIZES OF INLETS ARE TO BE SPECIFIED BY THE OVERALL LENGTH ON TOP IN MULTIPLES OF 1,8m (UNIT COVER SLAB). DESIGNERS ARE TO USE THE RELATIVE OPENING LENGTHS AS TABULATED TO DETERMINE THE CAPACITY OF THE INLET.
4. POSITION OF DRAIN TO BE DETERMINED BY SITE CONDITIONS. IF NO OBSTRUCTIONS EXIST, DRAIN IS TO BE LOCATED AT 1,5m FROM EDGE OF WEARING SURFACE. WHERE DRAIN IS MORE THAN 2,0m FROM EDGE OF WEARING SURFACE SEPARATE KERB INLETS AND MANHOLES ARE TO BE CONSTRUCTED.
5. CONCRETE QUALITY REFERED TO AS SPECIFIED IN THE "CONSTRUCTION OF TOWNSHIP ROADS - GENERAL SPECIFICATION."
6. PIPES BUILT INTO CHAMBERS AND SUMPS ARE TO BE CHIPPED BACK UNTIL FLUSH 5. WITH THE FACE OF THE WALL.
7. WALLS COULD BE CONSTRUCTED OF CLASS 20/19 CONCRETE OF THICKNESS T=130 mm
8. PRECAST UNITS MANUFACTURED COMMERCIALY MAY BE USED IF APPROVED.
  - a. STANDARD COVER SLABS (600 x 1200 x 90 mm) CAN BE USED.
  - b. SUMPS ARE TO BE CONSTRUCTED & LOCATED IN SUCH A WAY THAT THE PRECAST UNITS ABOVE HAVE ADEQUATE BEARING AT ALL CORNERS.
  - c. PRECAST UNITS ARE TO BE SUITABLY BEDDED.
  - d. A SLOPE OF 1:40 min. IS TO BE PROVIDED IN THE CHANNEL eg. - BY BENCHING.
9. COVER SLABS ARE TO BE REMOVABLE & ARE NOT TO BE JOINED WITH MORTAR.
10. ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.1
11. ALL BRICKWORK TO BE IN ENGLISH BOND.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set      **STORMWATER MAINTENANCE**

JOHANNESBURG SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 6 OF 6)

**ADDITIONAL SECTION DETAILS**

SCALE AS SHOWN: NTS	
DATE: 17/09/2014	
DRAWING NUMBER	EXTN.
<b>JRA-SD SWM-010</b>	
AMENDMENT NUMBER:	

<b>2.4 STORMWATER: RETAINING WALLS/ SUB SOIL DRAINAGE</b>						
DRAWING NUMBER	DRAWING DESCRIPTION	REVISION NUMBER				
		0	1	2	3	4
		REVISION DATE				
JRA-SD-SSD-001	Details of Brick Retaining Wall with Subsoil Drain (JRA-SD-G001)	300615				
JRA-SD-SSD-002	Concrete Details of Concrete Retaining Wall with Subsoil Drain (JRA-SD-G002)	300615				
JRA-SD-SSD-003	Reinforcement for Concrete Retaining Wall (JRA-SD-G003)	300615				

**2.4 STORMWATER:  
RETAINING WALLS/ SUB SOIL DRAINAGE**

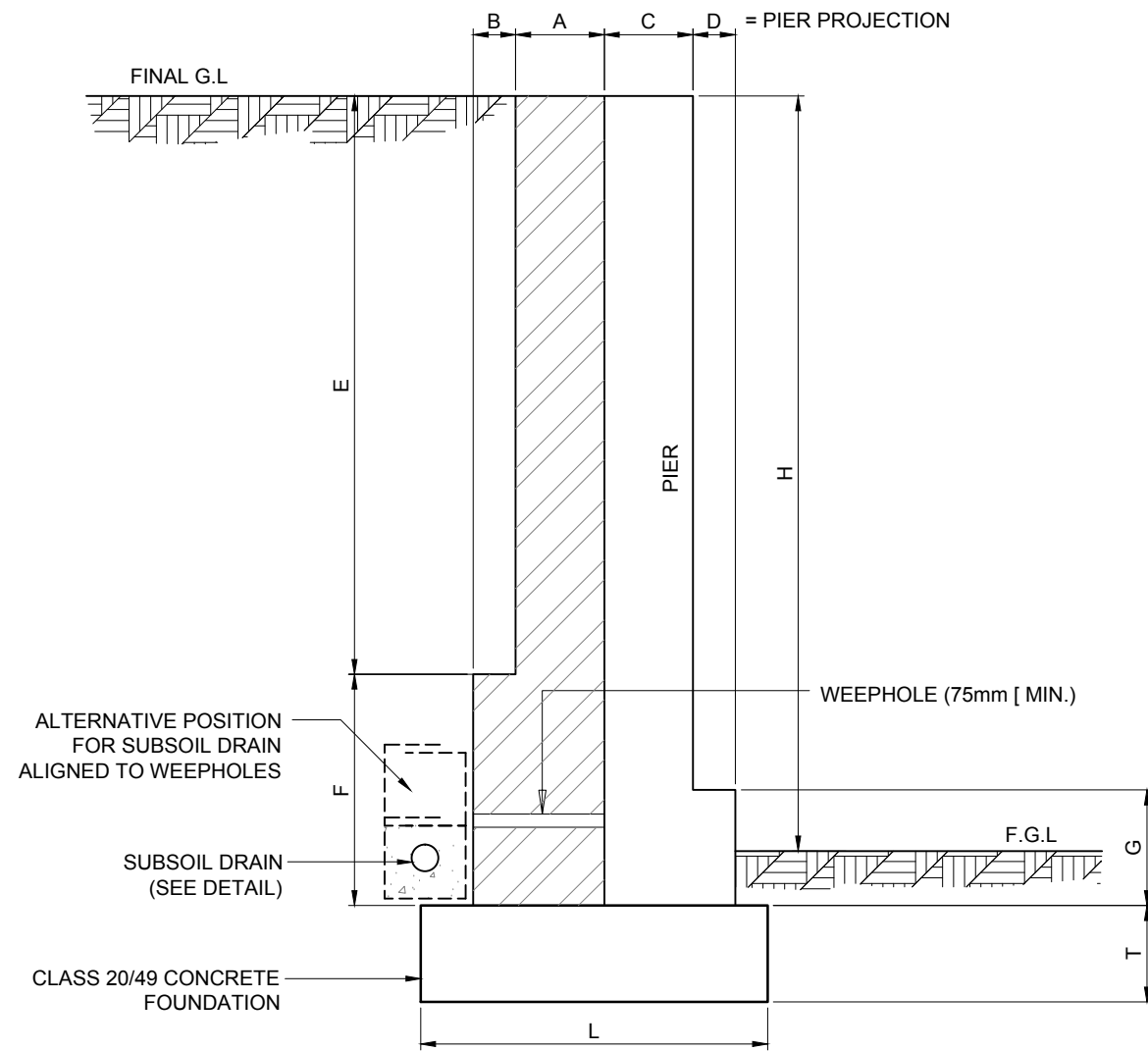
**2.4 STORMWATER:  
RETAINING WALLS/ SUB SOIL DRAINAGE**

LEGEND

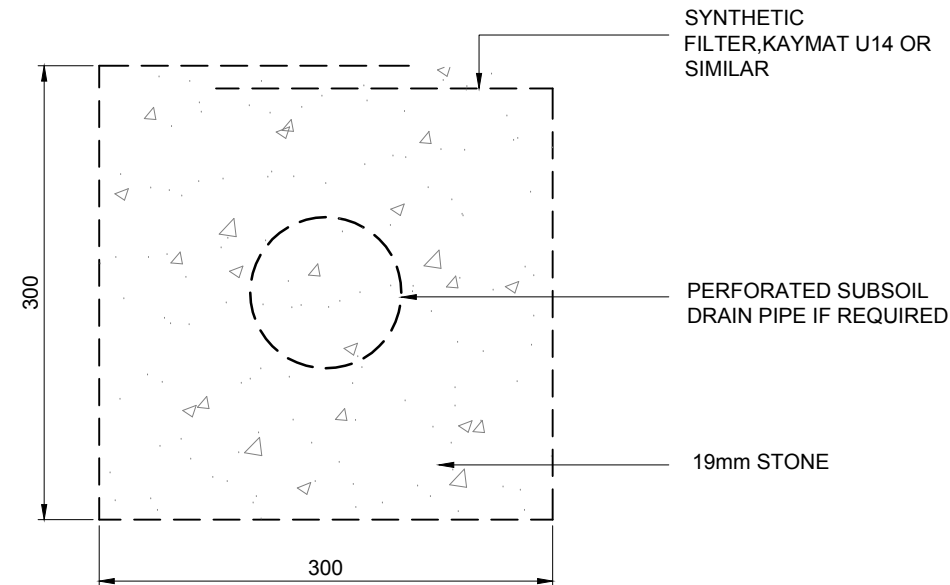
NOTES

- NOTES:
- MORTAR TO BE CLASS II AND MUST CONFORM TO SANS 10164-1980.
  - THE GROUND OR FILL BEHIND THE RETAINING WALL MUST NOT BE SUBJECTED TO SUPERIMPOSED LOADS SUCH AS TRAFFIC OR SURCHARGE OF FILL WITHIN A DISTANCE EQUAL TO THE HEIGHT OF THE WALL.
  - MOVEMENT JOINTS SHALL BE PROVIDED AT DISTANCES NOT EXCEEDING 10m.
  - SUBSOIL DRAINS SHALL BE PROVIDED BEHIND THE RETAINING WALL.
  - WEEP HOLES THROUGH THE WALL SHALL BE PROVIDED AT THE BOTTOM OF THE WALL AT 2m SPACINGS.
  - NO DAMP PROOF COURSE OR OTHER SHEET MATERIAL SHALL BE USED IN ANY RETAINING WALL.
  - BRICKFORCE MUST BE PROVIDED IN WALL EVERY THIRD COURSE.
  - WALL TIES MUST BE PROVIDED BETWEEN WALL AND PIER EVERY THIRD COURSE.
  - ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10%.
  - ALL BRICKWORK TO BE IN ENGLISH BOND.
  - SUBJECT TO SPECIFIC SITE CONDITIONS THE SUBSOIL DRAIN PIPE MAY BE OMITTED. THE 19mm STONE WILL BE THE DRAIN MEDIUM.
  - THE DRAIN MAY BE RAISED TO ALIGN WITH THE WEEPHOLES.
  - ALL DESIGNS TO BE CERTIFIED BY A PROFESSIONAL ENGINEER.

HEIGHT OF WALL	WALL THICKNESS		PIER PROJECTION		PIER WIDTH	PIER SPACING	WALL HEIGHT			FOUNDATION DIMENSIONS	
	A	B	C	D			E	F	G	L	T
900	230		0	0	0	0	900	0	0	500	200
1500	230	110	0	0	0	0	900	600	0	700	250
1500	230	0	230	0	350	2500	1500	0	0	700	250
1800	230	110	230	0	350	3000	1500	300	0	900	250
2100	340	0	230	110	470	3200	1500	600	300	1000	250



CLAY BRICK RETAINING WALL



DETAIL OF SUBSOIL DRAIN

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

**JOHANNESBURG ROADS AGENCY (PTY) LTD**

Drawing Sub-set      **STORMWATER: RETAINING WALLS/SUB-SOIL DRAINAGE**

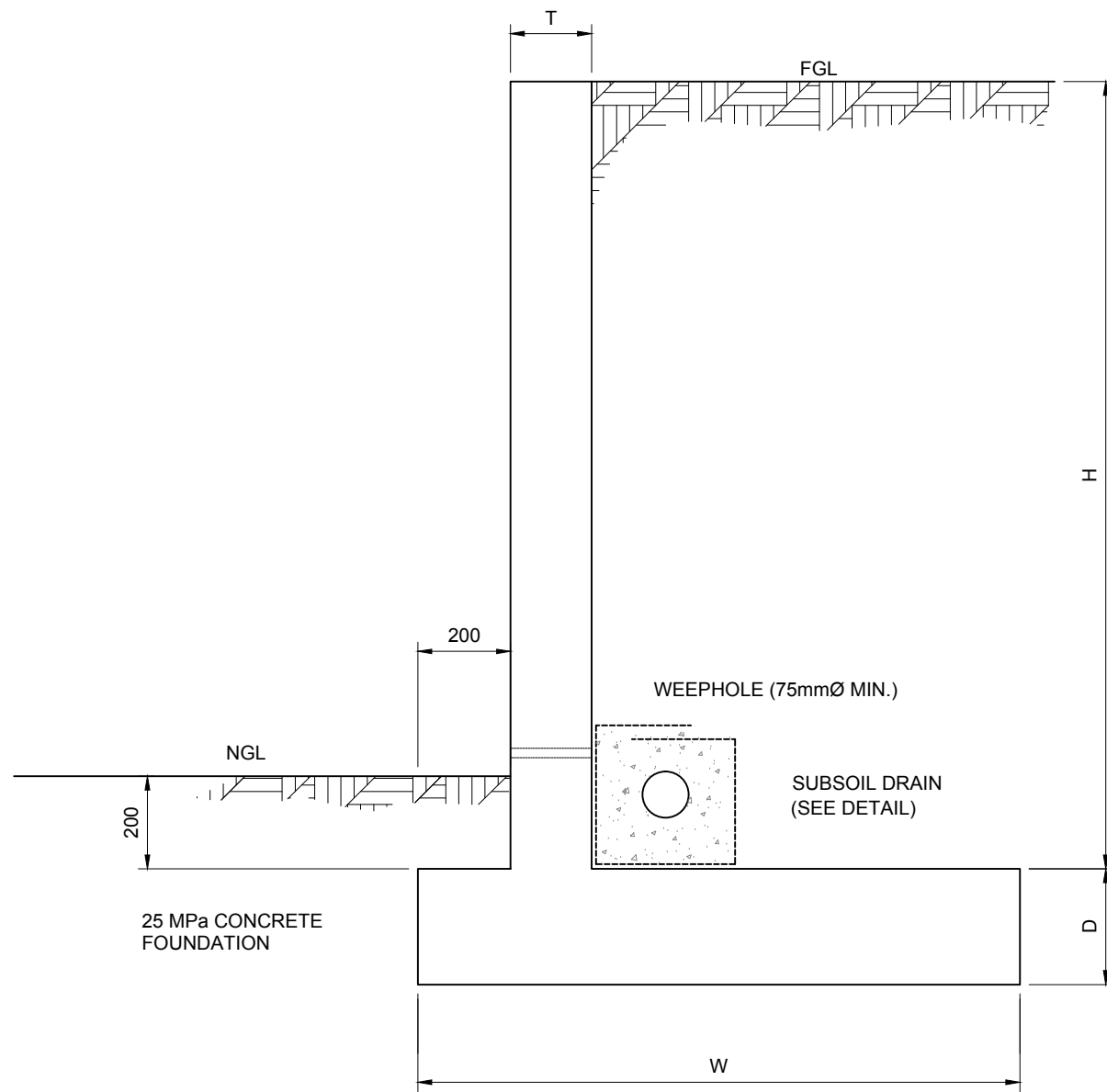
**DETAILS OF BRICK RETAINING WALL**

SCALE AS SHOWN: NTS	
DATE: 29/01/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD SSD-001</b>	
AMENDMENT NUMBER:	

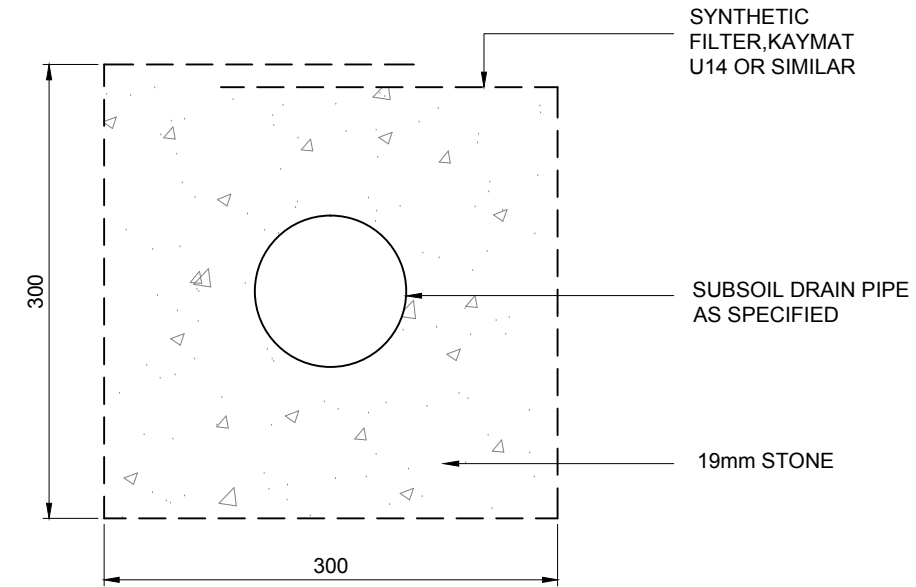
LEGEND

NOTES

- NOTES:
1. THE GROUND OR FILL BEHIND THE RETAINING WALL MUST NOT BE SUBJECT TO SUPERIMPOSED LOAD SUCH AS TRAFFIC OR SURCHARGE OF FILL WITHIN A DISTANCE EQUAL TO THE HEIGHT OF THE WALL.
  2. MOVEMENT JOINTS SHALL BE PROVIDED AT DISTANCES NOT EXCEEDING 10m.
  3. SUBSOIL DRAINS SHALL BE PROVIDED BEHIND THE RETAINING WALL.
  4. WEEPHOLES THROUGH THE WALL SHALL BE PROVIDED AT THE BOTTOM OF THE WALL AT 2m SPACINGS.
  5. ALL CONCRETE TO BE CLASS 25/19.
  6. ALL CONCRETE TO HAVE A SMOOTH FINISH WITH 25 x 25 CHAMFERS ON ALL EXPOSED EDGES.
  7. ALL WORK TO BE ACCORDING TO SANS 1200 SPECIFICATIONS.
  8. FOR REINFORCEMENT SEE DRG.JRA-SD-SSD-003.
  9. ALL DESIGNS TO BE CERTIFIED BY A PROFESSIONAL ENGINEER.



TYPICAL SECTION



DETAIL OF SUBSOIL DRAIN

RETAINING WALL DIMENSIONS IN mm			
HEIGHT OF WALL	WALL THICKNESS	FOUNDATION DIMENSIONS	
		W	D
H	T	W	D
1700	175	1300	250
2200	200	1700	250
2800	250	2200	300

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set

STORMWATER: RETAINING WALLS/SUB-SOIL DRAINAGE

CONCRETE DETAILS OF CONCRETE RETAINING WALL FOR INTERNAL USE ONLY

SCALE AS SHOWN: NTS

DATE: 29/01/2015

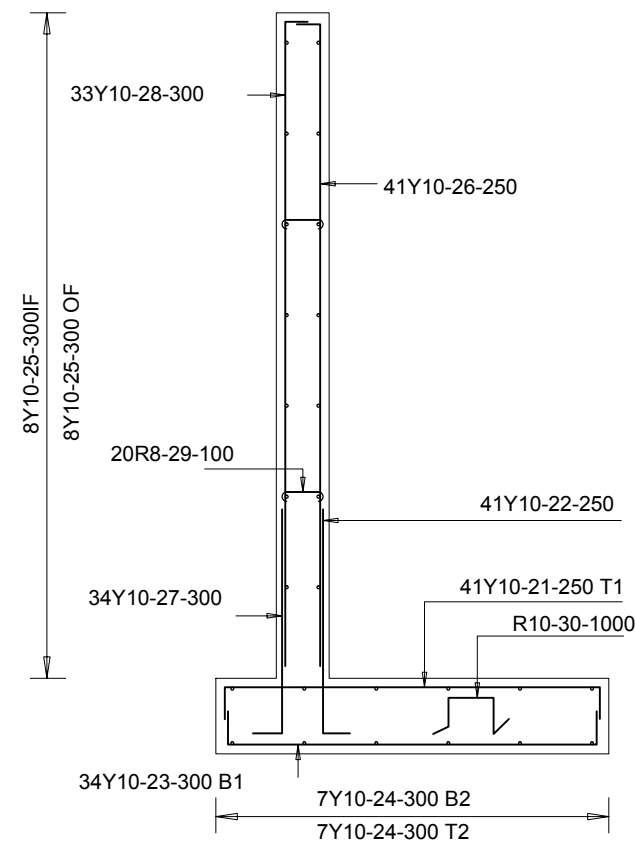
DRAWING NUMBER

EXTN.

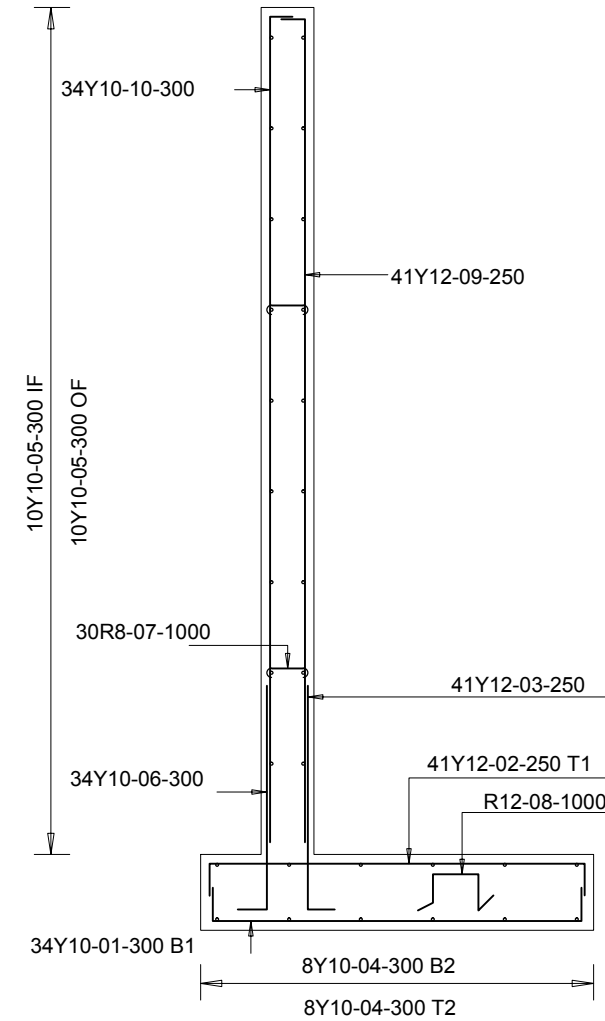
JRA-SD  
SSD-002

AMENDMENT NUMBER:

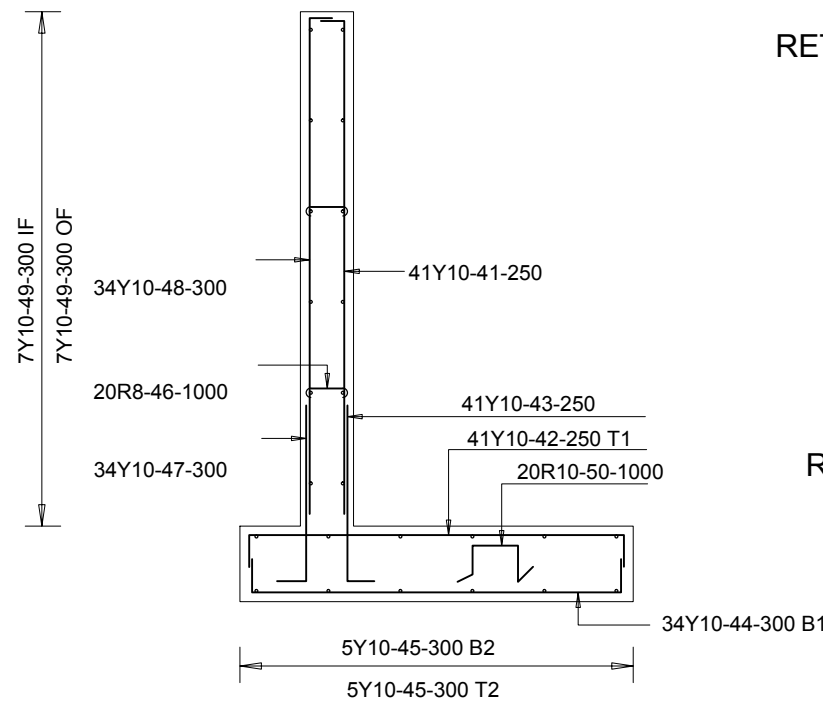
MEMBER	Mk.	R/Y Dia.	No.of Memb.	No.in each	Total Num	Cutting Length	Shape Code	A	B	C	D	E or r
<b>RETAINING WALL TYPE A H = 2800mm</b>												
01	Y10	1	34	34	2450	38	200	2100				
02	Y12	1	41	41	2450	38	200	2100				
03	Y12	1	41	41	1200	37	300	900				
04	Y10	1	16	16	9900	20						
05	Y10	1	20	20	9900	20						
06	Y10	1	34	34	1200	37	300	900				
07	R8	1	30	30	300	85	100	160	60			
08	R12	1	20	20	850	83	350	190	150			
09	Y12	1	41	41	2750	37	150	2650				
10	Y10	1	34	34	2750	37	150	2650				
<b>RETAINING WALL TYPE B H = 2200mm</b>												
21	Y10	1	41	41	1900	38	150	1600				
22	Y10	1	41	41	950	37	250	700				
23	Y10	1	34	34	1900	38	150	1600				
24	Y10	1	14	14	9900	20						
25	Y10	1	16	16	9900	20						
26	Y10	1	41	41	2150	37	100	2050				
27	Y10	1	34	34	950	37	250	700				
28	Y10	1	34	34	2150	37	100	2050				
29	R8	1	20	20	300	85	100	105	60			
30	R10	1	20	20	950	83	350	140	150			
<b>RETAINING WALL TYPE C H = 1700mm</b>												
41	Y10	1	41	41	1600	37	70	1550				
42	Y10	1	41	41	1500	38	150	1200				
43	Y10	1	41	41	950	37	250	700				
44	Y10	1	34	34	1500	38	150	1200				
45	Y10	1	10	10	9900	20						
46	R8	1	20	20	300	85	100	110	60			
47	Y10	1	34	34	950	37	250	700				
48	Y10	1	34	34	1600	37	70	1550				
49	Y10	1	14	14	9900	20						
50	R10	1	20	20	900	83	300	140	150			



RETAINING WALL TYPE B  
H = 2200mm



RETAINING WALL TYPE A  
H = 2800mm



RETAINING WALL TYPE C  
H = 1700mm

LEGEND

NOTES

- NOTES:
- FOR CONCRETE DETAILS REFER TO JRA-SD-SSD-002.
  - THIS BENDING SCHEDULE IS FOR A 10000mm RETAINING WALL ONLY.
  - CONCRETE COVER TO REINFORCEMENT TO BE AS FOLLOWS:  
-WALLS: 25mm  
-FOUNDATION: 40mm.
  - ALL DESIGNS TO BE CERTIFIED BY A PROFESSIONAL ENGINEER.

AMENDMENTS

No.	DATE	APPROVED	DESCRIPTION

DESIGNED BY:	DRAWN BY:
STRUCTURAL DESIGN BY:	DRAWING CHECKED BY:
CHECKED BY:	DRAWING APPROVED BY:



CITY OF JOHANNESBURG  
**JOHANNESBURG ROADS AGENCY (PTY) LTD**  
 Drawing Sub-set      STORMWATER: RETAINING WALLS/SUB-SOIL DRAINAGE  
**REINFORCEMENT FOR CONCRETE RETAINING WALL**

SCALE AS SHOWN: NTS	
DATE: 30/01/2015	
DRAWING NUMBER	EXTN.
<b>JRA-SD SSD-003</b>	
AMENDMENT NUMBER:	



**Directors:**  
Chairman: K Shubane. Managing Director: D S Macozoma. Non-Executive Directors:  
M Miamane. Dr J Maina. E. Ngomane. L Masamaife. J Nxumalo. H Mashele  
Company Secretary: Adv. T P Bokako

Registration No. 2000/028993/07



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