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

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<td>Typical Stormwater Network Layout: Catchment Area</td>
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<td>JRA-SD-SW-012</td>
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<td>JRA-SD-SW-040</td>
<td>Field Inlet Details</td>
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<td>JRA-SD-SW-051</td>
<td>Grid Inlet</td>
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<td>JRA-SD-SW-052</td>
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<tr>
<td>JRA-SD-SW-101</td>
<td>Subsurface Drainage Manhole Detail</td>
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</table>
1. For details of all elements of a stormwater network refer to JRA-SD-SW-011.
2. Detail 010-1 shows a typical stormwater network on two approaches to an intersection.
3. Note the increase in pipe size from d_2 to d_1 in the bottom left corner of the detail.
4. The stormwater network comprises nodes (many types) and links (pipes of differing types and diameters).
5. Combinations of different node types may be required throughout a large network e.g. GI/FO - Grid Inlet/Fielde Outlet.

Acknowledgment: This drawing is based on principles given on City of Tshwane Drawing STD002.
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.
### NOTES

1. **THE LONGITUDINAL STORMWATER 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 155.**

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 STORMWATER 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.**

### TYPICAL STORMWATER DETAILS FOR CONSTRUCTION: LONGITUDINAL SECTION

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### CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

Drawing Sub-set: STORMWATER / DESIGN

TYPICAL STORMWATER DETAILS FOR CONSTRUCTION: LONGITUDINAL SECTION

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**AMENDMENTS**

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**DESIGNED BY:**

**DRAWN BY:**

**DRAWING NUMBER:** JRA-SD SW-012

**AMENDMENT NUMBER:**
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.
TYPICAL SQUARE MANHOLE COVER AND FRAME FOR KERB INLETS

CONCRETE INFILL - 4 QUADRANTS

SECTION A-A

LOW POINT OUTFALL MAY BE DESIGNED FOR 25 YEAR FLOOD CONDITIONS & REQUIRE LARGE OUTFALL PIPE Ø

SECTION B-B

REINFORCED WITH Y12mm BARS AT 150 c/c BOTH WAYS - 25 COVER

SECTION L-L

(SEE JRA-SD-SW-020)

RELATIVE POSITION OF MANHOLE AND PIPELINE IN ROAD WAY (WHERE APPLICABLE)

AMENDMENTS

CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

DRAWING NUMBER

EXTN.

JRA-SD SW-021

AMENDMENT NUMBER

STORMWATER DESIGN

SECTION OF KERB INLET

LEGEND

1. SEE DRG. JRA-SD-SW-020 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 INTERNAL WIDTHS AND DEPTHS:
   a. WIDTH: 750 mm PIPES AND LESS - 900mm
      825 mm PIPES AND MORE - 1200mm.
      SOME 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 345mm.
      d. BELOW 3m SPECIAL ENGINEERING DESIGN REQUIRED FOR BRICKWORK.
5. NO BACKFILL TO BE DONE UNTIL MORTAR IS SEVEN DAYS OLD.
6. PROVIDE STEP IRONS WHEN DEPTH > 1.200m.
7. PIPES AT INLET AND OUTLET TO BE LAID SOFFIT TO SOFFIT.
8. SHOULD THERE BE A CHANGE IN PIPE DIAMETER, THE GREATER OF THE TWO SHOULD BE USED TO DETERMINE THE POSITIONING OF THE PIPES.
9. ALL ROADWORKS TO COMPLY WITH THE SANS 1200 SPECIFICATIONS.
10. ALL BRICKS TO BE OF QUALITY Fibre30 TO SANS 227-2007 WITH WATER ABSORTION <14% AND EFFLORESCENCE <10.
11. ALL BRICKWORK TO BE IN ENGLISH BOND.
12. SECTION L-L ILLUSTRATES VARIATIONS TO SECTION B-B REQUIRED AT A LOW POINT KERB INLET.
400

SECTION D - D
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 Y10-1940 LONG-130 c
2 Y10-500-50 c
80 x 80 x 8mm L WITH LOOP REINFORCEMENT

SECTION E - E
LOOP REINFORCEMENT WELDED TO INSIDE CORNER OF ANGLE IRON (R10)
3 Y12-1940 LONG-65 c/c
4 Y10-500-50 c/c
5 Y10-500-80 c/c
13 Y10-960 LONG-160 c/c
40

SECTION M-M
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 Y10-1940 LONG-130 c
2 Y10-500-50 c
80 x 80 x 8mm L WITH LOOP REINFORCEMENT

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.
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.
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.

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.
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.
      - 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.
230mm BRICK WALL

REINFORCEMENT (a) Y12 AT 150c/c BOTH WAYS, 25 COVER
(b) 110c/c FOR MAIN BARS WHERE SLAB IS UNDER ROADWAY

CONCRETE SURROUNDS TO MANHOLE

M.H. COVER AND FRAME TO SANS 558-1973 (TYPE 6 IN SIDE/WALKS AND STANDS - TYPE 2A IN ROADS)

STEP IRONS TO BS 1247 STAGGERED AT 300 C/C

MANHOLE OFFSET FULLY TO ONE SIDE - TYPE 4A

STANDING / EQUIPMENT HOLDING AREA

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.


DETAIL 051 - 1

DETAILED 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.

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.

FOR SPECIFIC MANHOLE DETAILS REFER TO SANS 558 - 1973.


DETAIL A
HEAVY DUTY MANHOLE (SIMPLIFIED)

DETAIL B
LIGHT DUTY MANHOLE (SIMPLIFIED)
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.

\[ V_1 = \sqrt{2g(H_1 - D_1/2)} \]
\[ L_1 = V_1 \times 2H_1/g \]
\[ L = L_1 - D_1/4 \]

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 \( L \).

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 \( h = (V^2/2g)/2 \) still applies.

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

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

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 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.
1. ALL BRICKS TO BE QUALITY FBESE30 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 300 c/c, STAGGERED.
5. FOR DEEPER OR LARGER FIELD INLETS DESIGN ACCORDING TO DRAWING JRA-SD-SW-050.
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.
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 FBS30 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 1.1m 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.
ENERGY DISSIPATION MEASURES
DOUBLE DISSIPATION MEASURES

CONCRETE FLOOR
230 BRICK WALL 200 x 200 x 250 PRECAST CONCRETE BLOCKS

PLAN

SECTION A-A
ENERGY DISSIPATION OUTLET

SECTION B-B

CONCRETE FLOOR
230 BRICK WALL

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.
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.

**DIMENSIONS**

<table>
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<tr>
<th>FOR SHALLOW STILLING BASIN (SEE NOTE)</th>
<th>DIMENSIONS</th>
<th>FOR DEEP STILLING BASIN (SEE NOTE)</th>
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<tr>
<td>$0.0552 (Q^{1.333})$ (m)</td>
<td>$D_o$</td>
<td>$0.0382 (Q^{1.333})$ (m)</td>
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<tr>
<td>$D_o^{2.333}$ (m)</td>
<td>$A$</td>
<td>$8D_o$ (m)</td>
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<tr>
<td>$5D_o$ (m)</td>
<td>$B$</td>
<td>$D_o$ (m)</td>
</tr>
<tr>
<td>$0.5 D_o$ (m)</td>
<td>$C$</td>
<td>$9D_o$ (m)</td>
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<tr>
<td>$6D_o$ (m)</td>
<td>$D$</td>
<td>$2D_o$ (m)</td>
</tr>
<tr>
<td>$2D_o$ (m)</td>
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</table>

**NOTES**

THIS TYPE OF EROSION PROTECTION IS NOT TO BE USED IN DOLOMITIC AREAS.
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 K.I slabs to match to cast in-situ slab. Manhole and second outlet slabs to be Type A.
STORMWATER PIPES UNDERNEATH ROADS, ACCESS ROADS & PARKING AREAS

TABLE 1

<table>
<thead>
<tr>
<th>CONCRETE SLAB CLASS</th>
<th>PIPE DIA</th>
<th>MIN. COVER</th>
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<tbody>
<tr>
<td>NORMAL REINFORCED</td>
<td>500mm</td>
<td>100mm</td>
</tr>
<tr>
<td>GRANULAR</td>
<td>500mm</td>
<td>125mm</td>
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TABLE 2

<table>
<thead>
<tr>
<th>PIPE CLASSES FOR PIPES UNDER SECONDARIES, LIGHT ACCESS ROADS, PARKING AREAS, PRIVATE ENTRANCES AND SIDEWALKS FOR 40kN WHEEL LOAD WITH DUE ALLOWANCE FOR IMPACT LOADS.</th>
</tr>
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<tr>
<td>Ø Trench Width</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>mm</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>600</td>
</tr>
<tr>
<td>750</td>
</tr>
<tr>
<td>900</td>
</tr>
<tr>
<td>1200</td>
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AMENDMENTS

DATE APPROVED DESCRIPTION

DETAILED BY

DRAWN BY

CHECKED BY

DRAWN APPROVED

CITY OF JOHANNESBURG

JOHANNESBURG ROADS AGENCY (PTY) LTD

STORMWATER: DESIGN

BEDDING OF STORMWATER PIPES WITH TABLES

NOTES

1. ALL PIPES BELOW SIDEWALKS & OPEN AREAS TO BE CLASS 50 D' & OPEN CIRCUMSTANCES WHERE A CONCRETE SLAB IS REQUIRED

2. FOR STORMWATER PIPES BELOW STREETS & MAIN ROUTES SEE TABLE 2.


4. IF TRENCHES ARE 200mm WIDER THAN THE SPECIFIED WIDTH IN TABLE 2 IT MAY BE NECESSARY TO CHANGE THE PIPE CLASS.

5. BEDDING:
   a. NORMAL BEDDING ACCORDING TO DETAIL 1.
   b. BEDDING ACCORDING TO DETAIL 2.
   c. CONCRETE SLAB OVER PIPE ACCORDING TO DETAIL 3.
   d. CONCRETE BEDDING ACCORDING TO DETAIL 4.

6. BEDDING MATERIAL:
   a. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   b. MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   c. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   d. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   e. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   f. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   g. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   h. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   i. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.
   j. THE MATERIAL USED CONSISTS OF SELECTED GRAVEL WITH PI ≤ 6.

7. BACKFILL TYPE A:
   a. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   b. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   c. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   d. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   e. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   f. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   g. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   h. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   i. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   j. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.

8. BACKFILL TYPE B:
   a. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   b. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   c. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   d. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   e. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   f. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   g. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   h. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   i. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.
   j. THE MATERIAL USED MUST BE FREE OF STONES LARGER THAN 20mm, ORGANIC MATERIAL AND CLAY LUMPS.

9. MINIMUM PIPE SIZING TO BE 450mm DIAMETER.

10. CONNECTIONS FROM ERVEN TO MUNICIPAL SYSTEM TO BE 450mm DIAMETER.

LEGEND

- D = PIPE CLASS
- D₀ = INTERNAL PIPE DIAMETER
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% AND 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.
TYPES OF SUBSURFACE DRAINAGE

**TYPE A: SUBSURFACE DRAIN**
- Kerbing
- 0.15mm Thick Polythene
- Synthetic Filter - Kaymat U14 or Similar
- Perforated Pipe
- Coarse Grade Stone (19mm)
- Pavement Layers
- Backfill compacted to 90% Mod. AASHTO

**TYPE B: SUBSURFACE DRAIN**
- Kerbing
- 0.15mm Thick Polythene
- Flownet DN1 or Similar
- Synthetic Filter (Kaymat U14 or Similar)
- Gravel backfill compacted to 90% Mod. AASHTO
- Perforated Pipe
- Coarse Grade Stone
- Synthetic Filter - Kaymat U14 or Similar
- Perforated Pipe
- Backfill as per JRA-SD-SW-090
- Do not plug handling holes
- Synthetic Filter - Kaymat U14 or Similar around stone and wrapped around pipe joints
- Bedding as per JRA-SD-SW-090
- Compacted to 93% Mod. AASHTO

**TYPE C: SUBSURFACE DRAIN**
- Kerbing
- 0.15mm Thick Polythene
- Synthetic Filter - Kaymat U14 or Similar
- Perforated Pipe
- Coarse Grade Stone
- Synthetic Filter - Kaymat U14 or Similar
- Perforated Pipe
- Backfill compacted to 90% Mod. AASHTO

**TYPE D: SUBSURFACE DRAIN COMBINED WITH STORMWATER PIPE**
- Kerbing
- 0.15mm Thick Polythene
- Flownet DN1 or Similar
- Synthetic Filter (Kaymat U14 or Similar)
- Gravel backfill compacted to 90% Mod. AASHTO
- Perforated Pipe
- Coarse Graded Stone 19mm
- Do not plug handling holes

**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.

**LEGEND**
- D = Diameter as specified by the engineer
- H = Depth as specified by the engineer
BACKFILL COMPACTED TO 90% MOD. AASHTO
FILTER SAND COARSE GRADE (TO BE COMPATIBLE WITH NATURAL MATERIAL)
EXCAVATION
NO-FINES CONCRETE BLOCK (1:8 CEMENT/COARSE GRADE STONE)
SYNTHETIC FILTER - KAYMAT U14 OR SIMILAR

EXCAVATION
NO-FINES CONCRETE BLOCK (1:8 CEMENT/COARSE GRADE STONE)
SYNTHETIC GEOTECHTILE FILTER - KAYMAT U14 OR SIMILAR

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

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.
FRONT ELEVATION OF OUTLET

SECTION A-A

BALL OF CHICKEN WIRE TO PREVENT ACCESS OF RODENTS

WELDED MESH REF: 395

PRECAST 25/19MPa CONCRETE BLOCKS IF REQUIRED (CONCRETE BLOCKS MAY BE REPLACED WITH PRECASTKERBS OR NATURAL STONE). (SEE NOTE 5).

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 <15.
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.
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.

**NOTES**

**PLAN (COVER NOT SHOWN)**

**SECTION A-A**

- Concrete Class 20/19
- 2x2Y10 Each Way
- SANS 558-1973 Type 14A CI, Cover and Frame
- Benching
- Concreting Class 20/19
- Blinding if required

**JRA-SD SW-103**

Johannesburg Roads Agency (PTY) Ltd

City of Johannesburg

Drawing Sub-set

Stormwater: Design

Subsurface Drain Manhole Detail

Date: 17/09/2014

Scale as shown: NTS
## 2.3 STORMWATER: MAINTENANCE

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<th>DRAWING DESCRIPTION</th>
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<th>REVISION DATE</th>
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</table>
PLAN OF KERB INLET

SECTION K - K

SECTION J - J

DETAIL OF JOINT IN APRON

END SUPPORT FOR COVER SLAB

INTERMEDIATE SUPPORT FOR COVER SLAB

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

JRA-SD
SWM-001

CITY OF JOHANNESBURG
JOHANNESBURG ROADS AGENCY (PTY) LTD
STORMWATER MAINTENANCE
SANDTON SW STRUCTURES FOR MAINTENANCE PURPOSES (SHEET 1 OF 4)
PLAN OF KERB INLET

DESIGNED BY:
DRAWN BY:
CHECKED BY:
DRAWING CHECKED BY:
DRAWING APPROVED BY:

No. DATE APPROVED DESCRIPTION
17/09/2014 SCALE AS SHOWN: NTS

LEGEND

AMENDMENTS

DRAWING NUMBER: JRA-SD-SW-M001
AMENDMENT NUMBER: 1

DATE: 17/09/2014
EXTN.
PRECAST COVER SLAB "B" SEE DETAIL DWG JRA-SD-SW-M003

SECTION A-A

SECTION B-B

PREMIX (SEE NOTE 5)

REINFORCED WITH Y12mm BARS AT 150 c/c BOTH WAYS - 25 COVER

CEMENT MORTAR BEDDING

MIN. 750 - VARIES

RELATIVE POSITION OF MANHOLE AND PIPELINE IN ROAD WAY (WHERE APPLICABLE)

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 TROWELED 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 MANHOLES 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.
6. NO BACKFILL TO BE DONE UNTIL MORTAR IS SEVEN DAYS OLD.
7. PROVIDE STEP IRONS WHEN DEPTHS > 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 EFFLORESCENCE <10.
12. ALL BRICKWORK TO BE IN ENGLISH BOND.
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.
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 FIRE 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 - 900 mm
      - 825 mm PIPES AND MORE - 1200 mm
   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 > 1.75 m, WIDTH OF BRICKWORK TO BE INCREASED TO 330 mm.
CLEARANCE HOLES TO BE DRILLED FOR 10 BOLT

SECTION B-B

SECTION A-A

SECTION Z-Z

PLAN ON C-C ON CHANNEL TO SHOW DRILLING FOR EXTENSION UNIT

EXTENSIONS TO BE AFFECTED AS SHOWN ABOVE FOR BOTH TYPES

BENDING SCHEDULE

STEEL FOR SLAB TOP

<table>
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<tr>
<th>BAR MARK</th>
<th>No. OFF</th>
<th>DIAMETER</th>
<th>LENGTH</th>
<th>SHAPE</th>
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<td>4</td>
<td>R20</td>
<td>1950</td>
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</tr>
<tr>
<td>02</td>
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<tr>
<td>03</td>
<td>13</td>
<td>R10</td>
<td>1050</td>
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NOTES
1. ALL BRICKS TO BE OF QUALITY FBS 30 TO SANS 227-2007 WITH WATER ABSORPTION <14% AND EFFLORESCENCE <10.
2. ALL BRICKWORK TO BE IN ENGLISH BOND.
3. CONCRETE TO BE CLASS 20/19.
4. MINIMUM END COVER 15mm.
**NOTES**


2. COVER SLABS ARE TO SLOPE TOWARDS THE ROAD AS SIDEWALKS. (MIN FALL 2%).

3. 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.

4. 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 FROM THE EDGE OF THE WEARING SURFACE - SEE THE DIAGRAM ON THIS DRAWING.

5. PIPES BUILT INTO CHAMBERS AND SUMPS ARE TO BE CHIPPED BACK UNTIL FLUSH WITH THE FACE OF THE WALL.

6. WALLS COULD BE CONSTRUCTED OF CLASS 20/19 CONCRETE OF 130 mm THICKNESS.

7. ALL BRICKS TO BE OF QUALITY FIRE30 TO SANS 227-2007 WITH WATER ABSORTION <14% AND EFFLORESCENCE <10.

8. ALL BRICKWORK TO BE IN ENGLISH BOND.

9. SPECIAL CONSIDERATIONS ARE TO BE GIVEN TO PIPES OVER 825mm.

**REFERENCE DRAWINGS:**

- JRA-SD-SW-M005 & SW-M006: DETAILS OF PRECAST COVER SLABS FOR WIDE TYPE KERB INLETS.
- JRA-SD-SW-M007: DETAILS OF PRECAST COVER SLABS FOR USE AT SUMPS, MANHOLES AND JUNCTION BOXES.
- JRA-SD-SW-M009 & SW-M010: DETAILS OF NARROW TYPE KERB INLETS.
- JRA-SD-SW-M011: TYPICAL DETAILS OF KERB TRANSITIONS.

**LEGEND**

- M.K.: MOUNTABLE KERB
- B.K.: BARRIER KERB
- K.I.: KERB INLET
- B.K.: BARRIER KERB

**SCALE AS SHOWN:** NTS

**DATE:** 17/09/2014

**DRAWING NUMBER:** JRA-SD SWM-008

**AMENDMENT NUMBER:**
ADDITIONAL SECTION DETAILS

SECTION J-J

NORMAL ARRANGEMENT AT MOUNTABLE KERBS

Details of steel pillar for use on precast units

SECTION G-G

Normal arrangement at barrier kerbs

Arrangement at barrier kerbs where inlet is not set back - special circumstances

SECTION H-H

Normal arrangement at mountable kerbs

Notes

1. For layout plans refer to Org. 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).
4. Designers are to use the relative opening lengths as tabulated to determine the capacity of the inlet.
5. Position of drain to be determined by site conditions.
6. Pipe 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 150mm
8. Precast units manufactured commercially may be used if approved.
   a. Standard cover slabs (600 x 1200 x 90mm) can be used.
   b. Sumps are to be constructed and located in such a way that the precast units above have adequate bearing at all corners.
9. Cover slabs are to be suitably bedded.
10. A slope of 1:40 min. is to be provided in the channel eg. by benching.
11. All brickwork to be in English bond.

City of Johannesburg

Johannesburg Roads Agency (Pty) Ltd

Stormwater Maintenance

Johannesburg SW Structures for Maintenance Purposes (Sheet 6 of 6)

Additional section details

JRA-SD

SWM-010

Amendment number

Date: 17/09/2014

Drawing number

Extn.
## 2.4 STORMWATER: RETAINING WALLS/ SUB SOIL DRAINAGE

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<td>Concrete Details of Concrete Retaining Wall with Subsoil Drain (JRA-SD-G002)</td>
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<td>Reinforcement for Concrete Retaining Wall (JRA-SD-G003)</td>
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CLAY BRICK RETAINING WALL

NOTES:
1. MORTAR TO BE CLASS II AND MUST CONFORM TO SANS 10164-1980.
2. THE GROUND OR FILL BEHIND THE RETAINING WALL MUST NOT BE SUBJECT TO SUPERIMPOSED LOADS SUCH AS TRAFFIC OR SURCHARGE OF FILL WITHIN A DISTANCE EQUAL TO THE HEIGHT OF THE WALL.
3. MOVEMENT JOINTS SHALL BE PROVIDED AT DISTANCES NOT EXCEEDING 10m.
4. SUBSOIL DRAINS SHALL BE PROVIDED BEHIND THE RETAINING WALL.
5. WEEP HOLES THROUGH THE WALL SHALL BE PROVIDED AT THE BOTTOM OF THE WALL AT 2m SPACINGS.
6. NO DAMP PROOF COURSE OR OTHER SHEET MATERIAL SHALL BE USED IN ANY RETAINING WALL.
7. BRICKFORCE MUST BE PROVIDED IN WALL EVERY THIRD COURSE.
8. WALL TIES MUST BE PROVIDED BETWEEN WALL AND PIER EVERY THIRD COURSE.
9. ALL BRICKS TO BE OF QUALITY FBSE30 TO SANS 227-2007 WITH WATER ABSORTION <14% AND EFFLORESCENCE <10%.
10. ALL BRICKWORK TO BE IN ENGLISH BOND.
11. SUBJECT TO SPECIFIC SITE CONDITIONS THE SUBSOIL DRAIN PIPE MAY BE OMITTED. THE 19mm STONE WILL BE THE DRAIN MEDIUM.
12. THE DRAIN MAY BE RAISED TO ALIGN WITH THE WEEPHOLES.
13. ALL DESIGNS TO BE CERTIFIED BY A PROFESSIONAL ENGINEER.
1. The ground or fill behind the retaining wall must not be subjected 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.
### Retaining Wall Type A

**H = 2800mm**

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Directors:
Company Secretary: Adv. T P Bokako

Registration No. 2000/028993/07