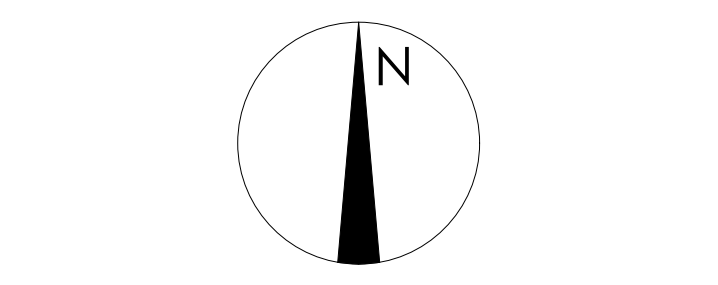




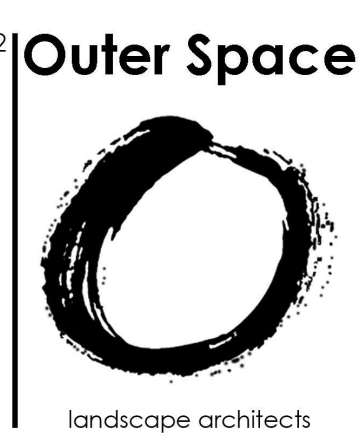
PLAN
SCALE 1:200



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CIRCULATION	
MANAGEMENT / PLANNING	Date: / /
JOHANNESBURG / MANAGER	Date: / /
CITY ENGINEER / PLANNING	Date: / /
WATER / ENGINEER	Date: / /
SEWER / ENGINEER	Date: / /
TRANSPORTATION / ENGINEER	Date: / /
ENVIRONMENTAL / ENGINEER	Date: / /
LANDSCAPE / ARCHITECT	Date: / /
CLIENT / APPROVAL	Date: / /

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 TEL: 011 802 2417/2
 IKEMELENG
 landscape architects

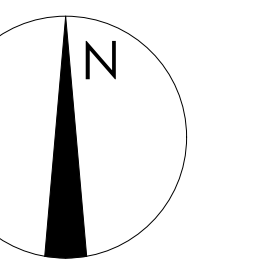
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 ISAO CONSULTING

Koor Dindar Mothei Gauteng (Pty) Ltd
 Reg. No. 2007/018231/07
 kdm KOOR DINDAR MOTHEI

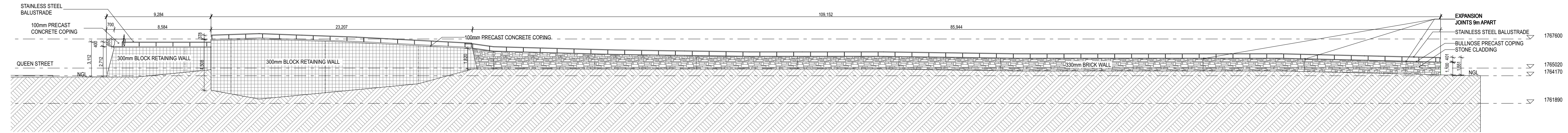
PROJECT:
 Constitution Hill People's Park Phase 2
 Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
 FOR: Constitution Hill Development Company
CONSTITUTION HILL
 DRAWING TITLE:
 FINAL Plan - Detail Coordination

For Information	
OCCUPANCY CLASSIFICATION	CLIMATIC ZONE
A0	1
DRAWN	ISSUED
AB	06/01/2021
CHECKED	DATE
JM	06/01/2021
DRAWING PATH	SHEET SIZE
\\spacelab\Drawings\1374 Con Hill People's Park Phase 2.jm	A0
SCALE	REVISION
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PROJECT No. DRAWING NUMBER	
J1374 A.04.1	F

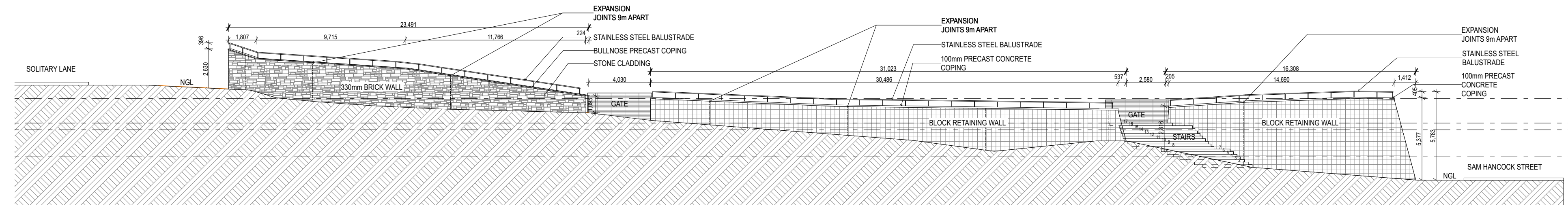
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STRUCTURAL ENGINEER:	
SIGNATURE:	
DATE:	



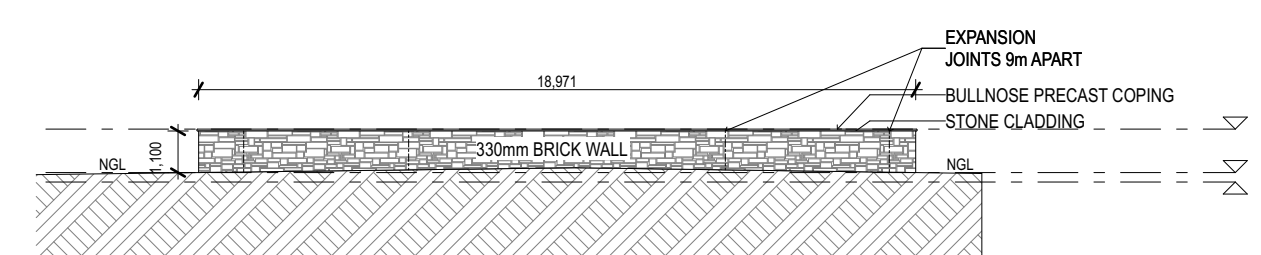
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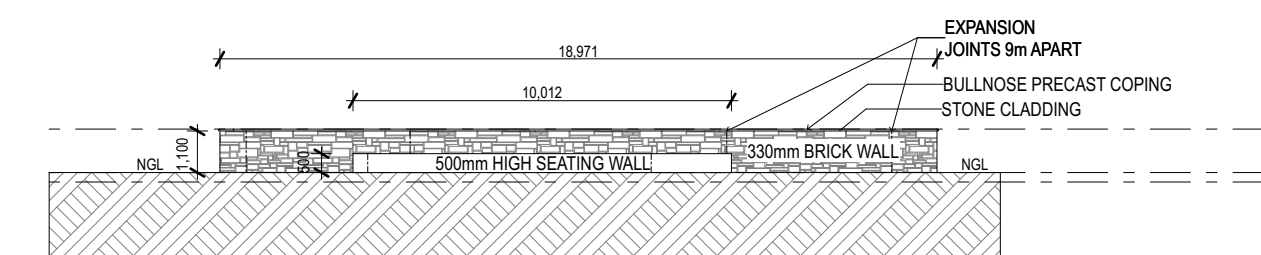
NORTH ELEVATION
SCALE 1:200



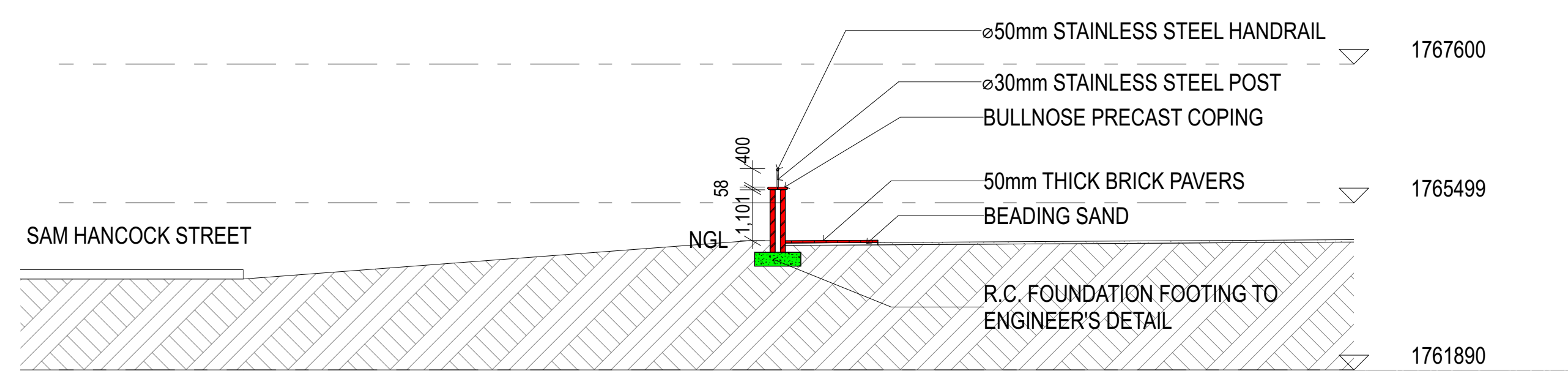
EAST ELEVATION
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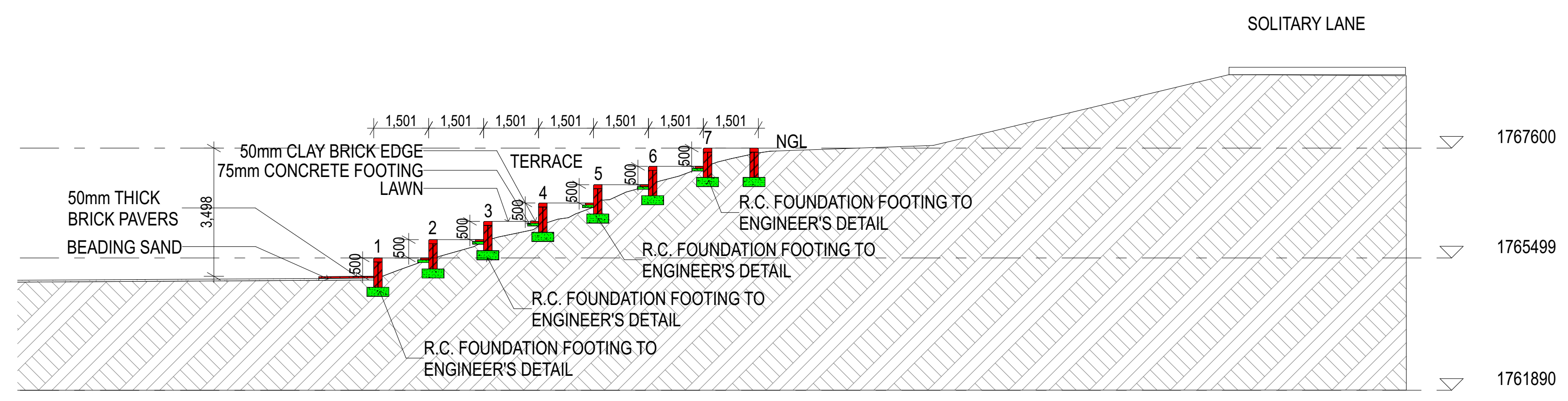
NORTH ELEVATION - WALL 4
SCALE 1:200



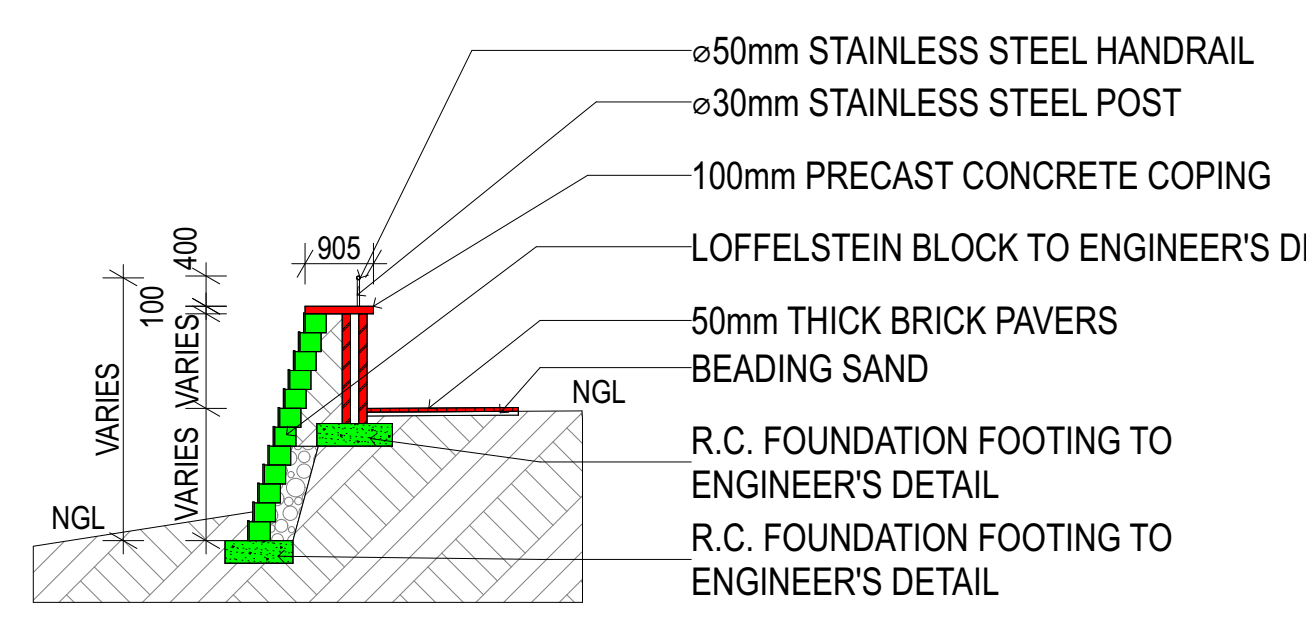
SOUTH ELEVATION - WALL 4
SCALE 1:200



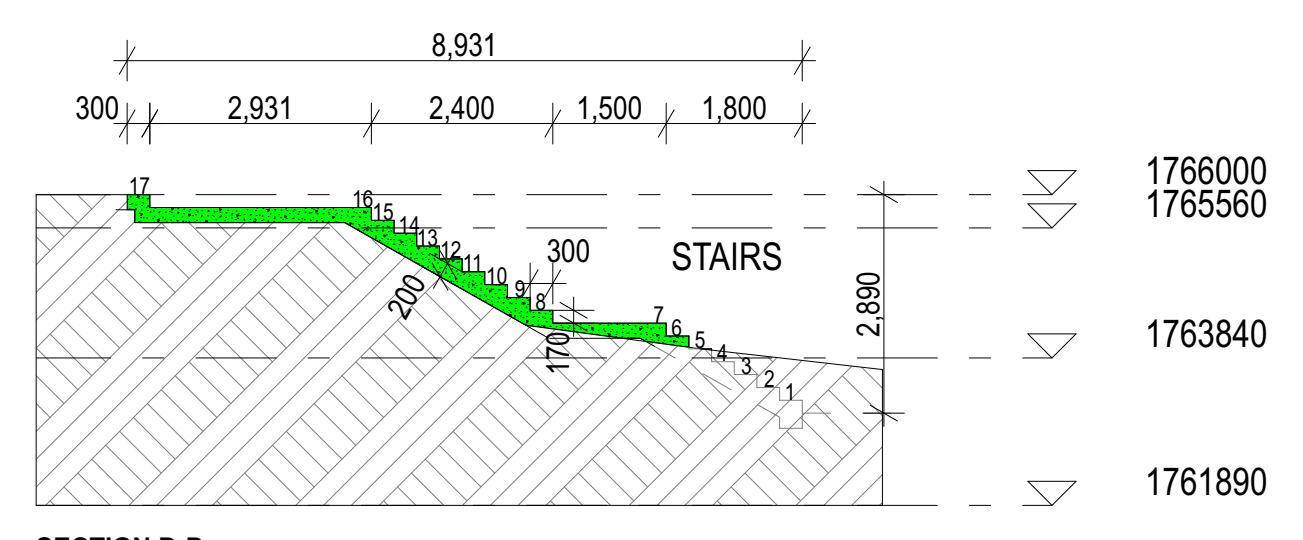
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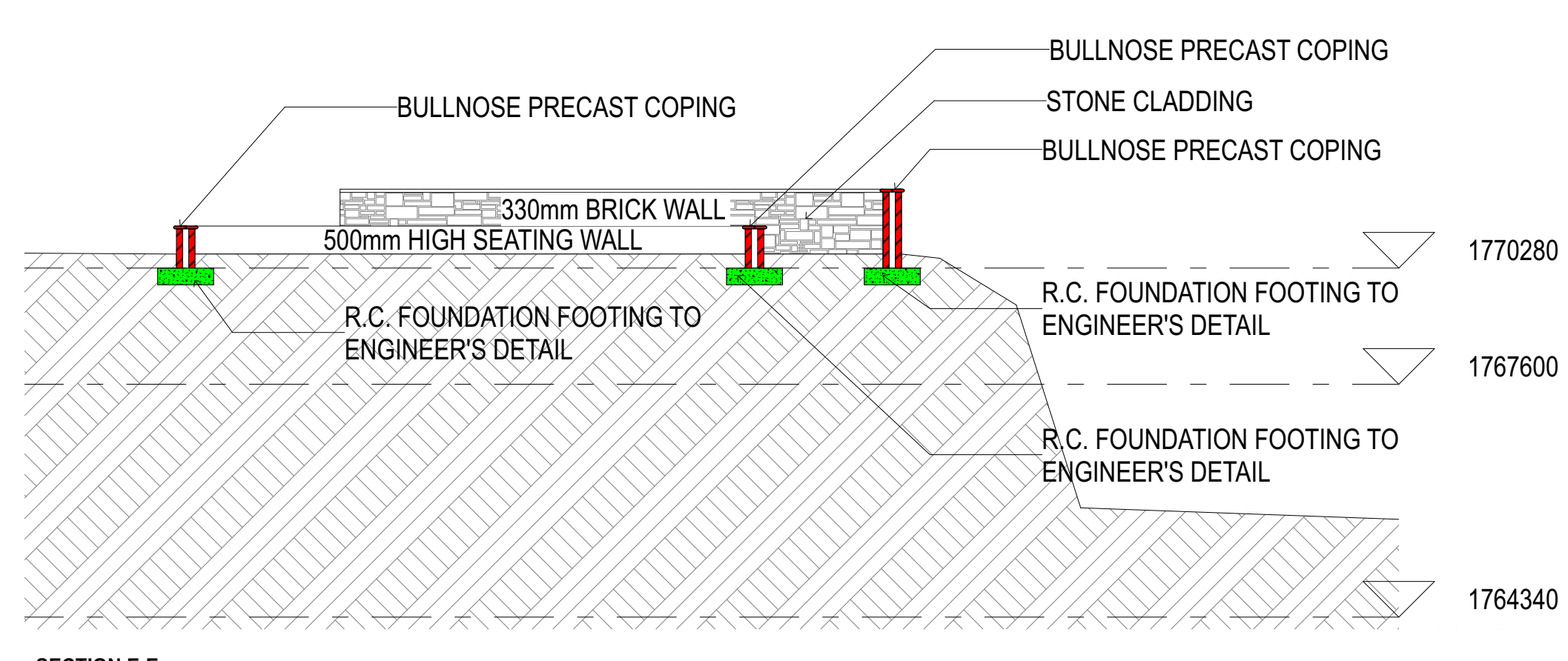
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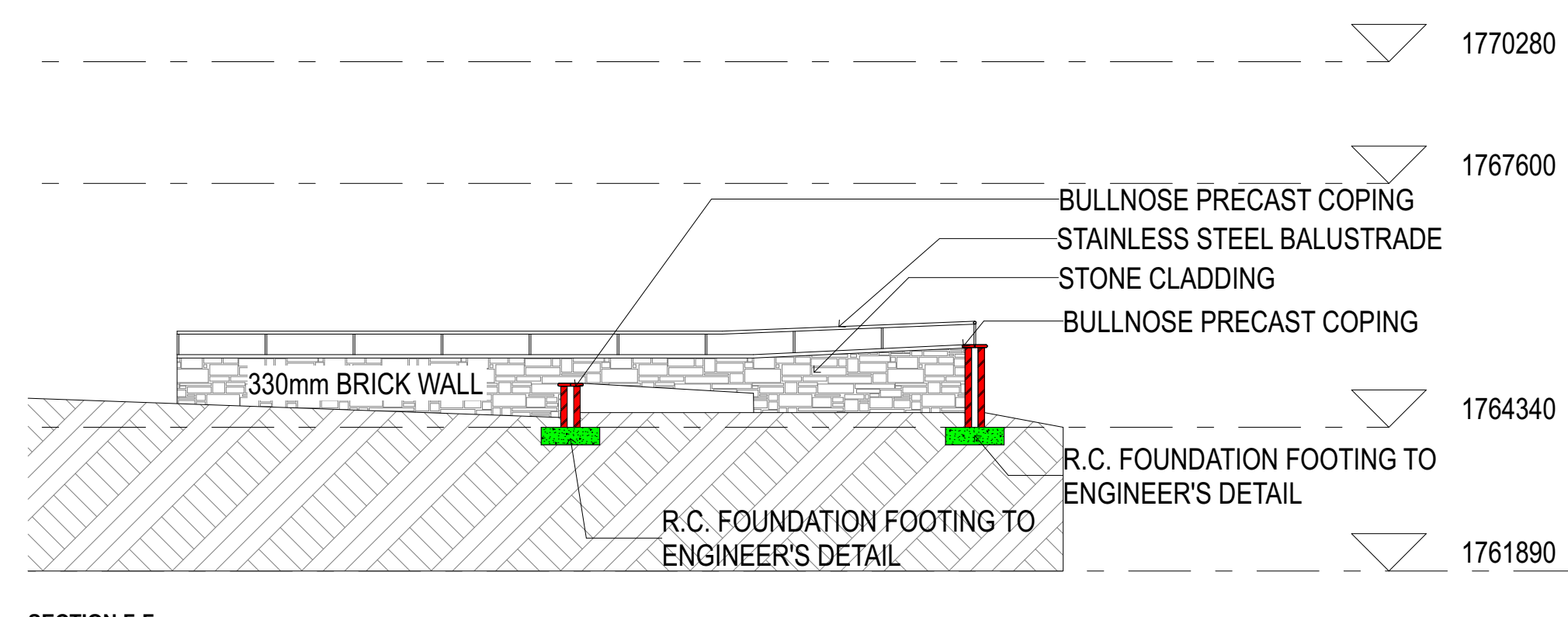
SECTION C-C
SCALE 1:100



SECTION D-D
SCALE 1:100



SECTION E-E
SCALE 1:100



SECTION F-F
SCALE 1:100

CIRCULATION	
JOHANNESBURG MUNICIPALITY	Date: / /
CITY OF JOHANNESBURG	Date: / /
WATER AND SANITATION DEPARTMENT	Date: / /
PHILIP	Date: / /
MANAGEMENT	Date: / /
TRANSPORTATION	Date: / /
ENVIRONMENTAL	Date: / /
MANAGEMENT	Date: / /
DATE	Date: / /

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IKEMELENG

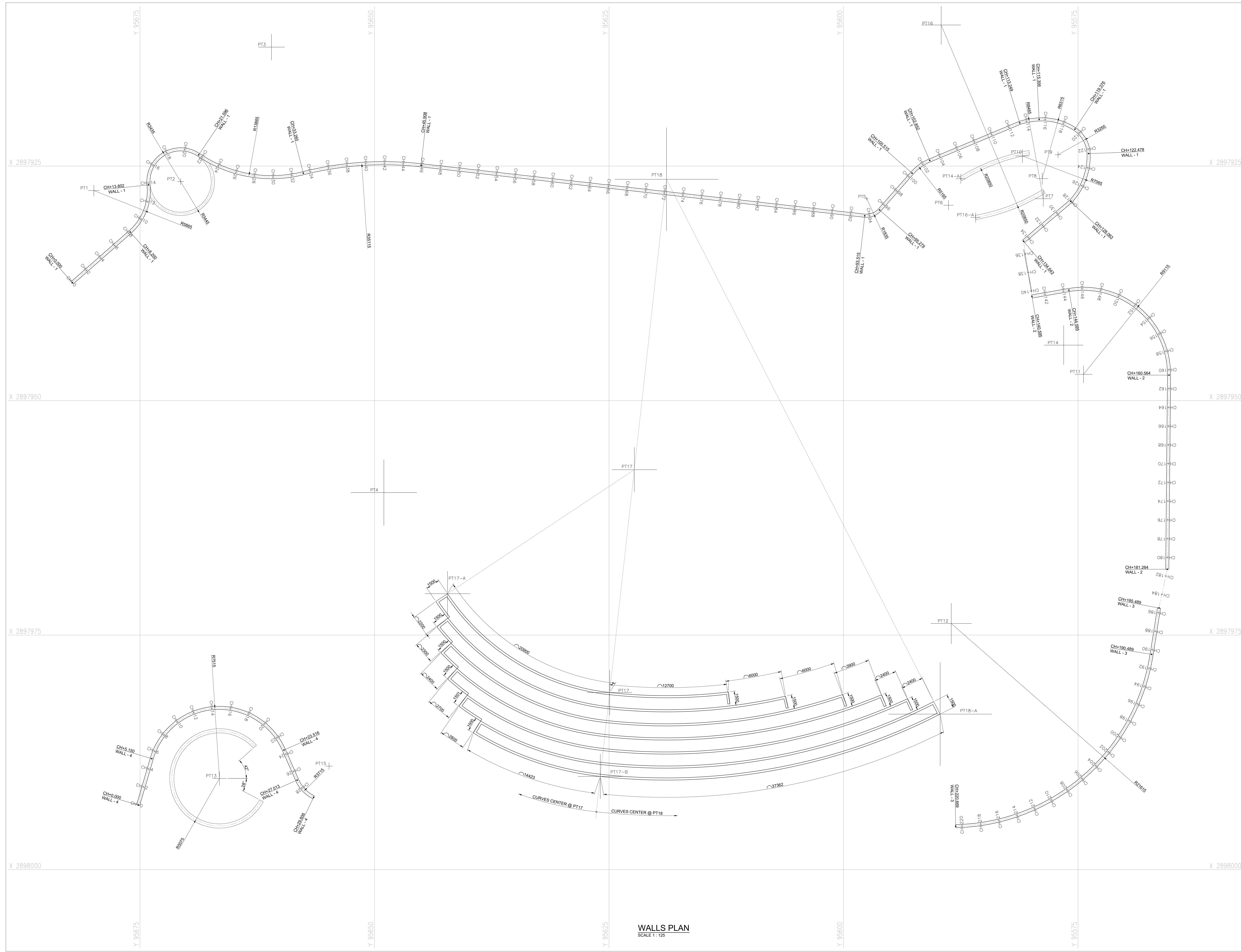
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 Reg. No. 2013/184458/07
ISAO CONSULTING

Koor Dindar Mothei Gauteng (Pty) Ltd
 Reg. No. 2007/018231/07
kdm KOOR DINDAR MOTHEI

PROJECT: Constitution Hill People's Park Phase 2
 Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
 FOR: Constitution Hill Development Company
CONSTITUTION HILL
 Elevations & Sections

CLIENT:	
SIGNATURE:	
DATE:	
ARCHITECT:	
SIGNATURE:	
DATE:	
STRUCTURAL ENGINEER:	
SIGNATURE:	
DATE:	

For Information	
OCCUPANCY CLASSIFICATION	CLIMATIC ZONE
A0	1
RESPONSIBLE PERSON	DATE
DRAWN: AB	ISSUED: 06/01/2021
CHECKED: JM	DATE: 06/01/2021
DRAWING PATH	
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SCALE	SHEET SIZE
1:200, 1:100	A0
PROJECT No. DRAWING NUMBER	REVISION
J1374 A.06.1	



SETTING OUT CO-ORDINATES - WGS84		
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PT2	2 897 926.648	95 670.670
PT3	2 897 912.313	95 660.985
PT4	2 897 959.806	95 649.006
PT5	2 897 928.466	95 597.532
PT6	2 897 929.167	95 588.819
PT7	2 897 928.477	95 578.705
PT8	2 897 926.330	95 578.817
PT9	2 897 923.786	95 577.135
PT10	2 897 923.925	95 580.933
PT11	2 897 947.195	95 574.414
PT12	2 897 973.761	95 588.516
PT13	2 897 990.273	95 666.536
PT14	2 897 944.083	95 576.533
PT14A	2 897 926.345	95 587.491
PT14B	2 897 923.559	95 580.207
PT15	2 897 988.960	95 654.847
PT16	2 897 909.955	95 589.911
PT16A	2 897 930.477	95 585.911
PT16B	2 897 927.689	95 578.627
PT17	2 897 957.366	95 622.306
PT17-A	2 897 970.583	95 642.219
PT17-B	2 897 990.066	95 625.928
PT18	2 897 926.405	95 618.877
PT18-A	2 897 983.423	95 589.688

WALL-1		
CH+0.000	2 897 937.428	95 682.222
CH+8.200	2 897 932.024	95 676.055
CH+13.802	2 897 927.004	95 674.086
CH+21.596	2 897 923.802	95 668.747
CH+33.260	2 897 925.758	95 657.594
CH+45.908	2 897 924.915	95 645.043
CH+93.515	2 897 930.289	95 597.739
CH+95.279	2 897 929.679	95 596.156
CH+100.515	2 897 925.752	95 592.693
CH+102.852	2 897 924.402	95 590.810
CH+113.249	2 897 920.393	95 581.217
CH+115.356	2 897 920.024	95 579.148
CH+119.376	2 897 921.062	95 575.334
CH+122.478	2 897 923.667	95 573.872
CH+128.063	2 897 928.761	95 575.782
CH+134.643	2 897 933.014	95 580.802

WALL-2		
CH+140.595	2 897 938.900	95 579.915
CH+144.595	2 897 938.215	95 575.974
CH+160.564	2 897 947.279	95 565.299
CH+181.264	2 897 967.977	95 565.488

WALL-3		
CH+185.489	2 897 972.109	95 566.370
CH+190.489	2 897 977.048	95 567.153
CH+220.669	2 897 995.371	95 588.043

WALL-4		
CH+0.000	2 897 993.109	95 675.193
CH+5.150	2 897 988.166	95 673.750
CH+23.516	2 897 987.250	95 659.656
CH+27.013	2 897 990.454	95 658.248
CH+29.606	2 897 992.291	95 656.492

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Outer Space
landscape architects

Kemeleng Architects CC
Reg. No. 2000019680/23

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Koor Dindar Mothei Gauteng (Pty) Ltd
Reg. No. 2007018231/07

CONSTITUTION HILL

PROJECT: Constitution Hill People's Park Phase 2
 Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
 FOR: Constitution Hill Development Company

DRAWING TITLE: Layout Plan - Walls

For Coordination

OCCUPANCY CLASSIFICATION	CLIMATIC ZONE
	1

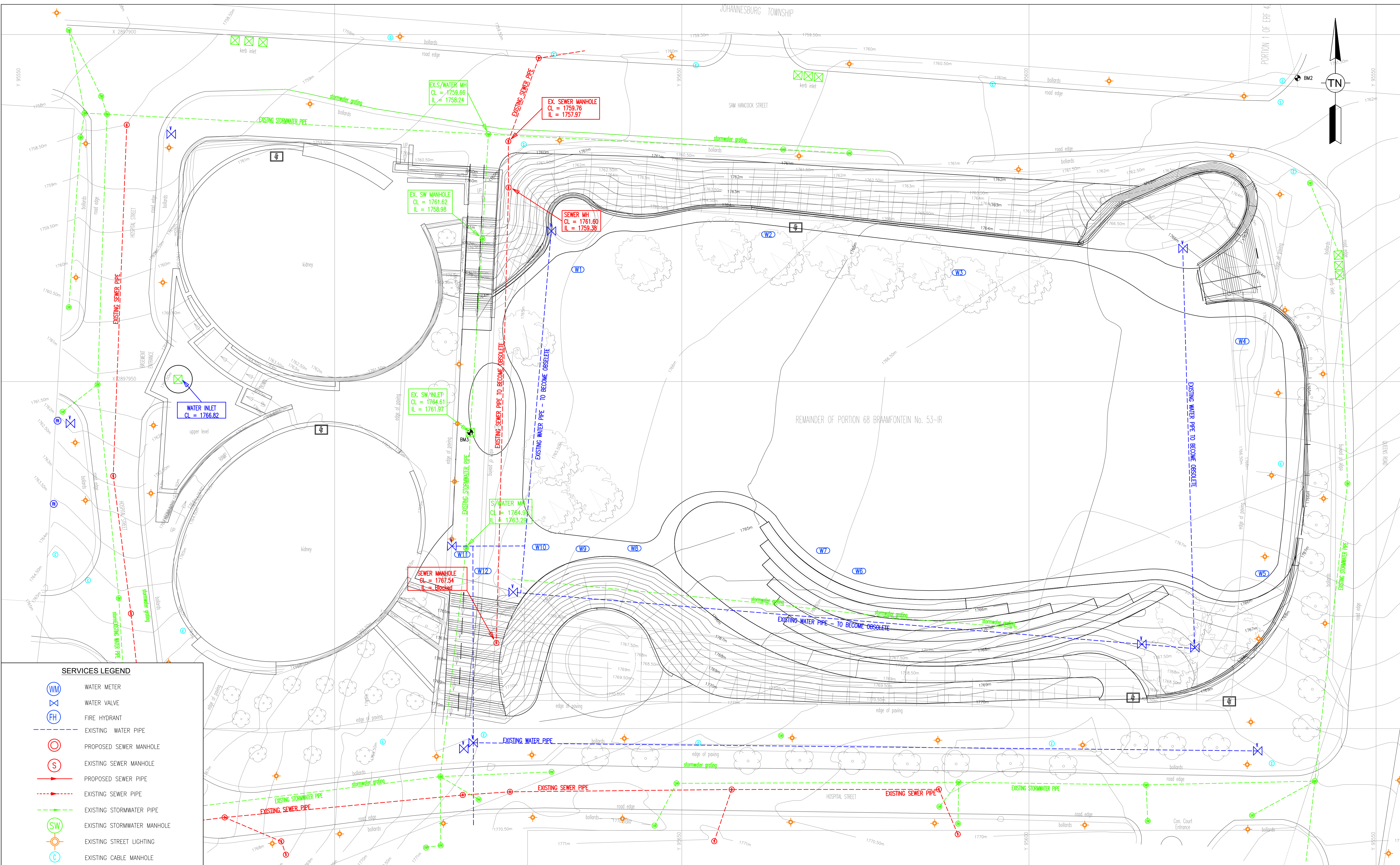
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CHK		2020/11/27

DRAWING PATH	DATE
ISAO/CON-HILL/STRUCTURES/DRAWINGS/CURRENT	2020/11/27

SCALE: 1:125 SHEET SIZE: A0

PROJECT No. DRAWING NUMBER: P1900 | P1900-STR-102 REVISION: B

WALLS PLAN
SCALE 1:125



SERVICES LEGEND	
	WATER METER
	WATER VALVE
	FIRE HYDRANT
	EXISTING WATER PIPE
	PROPOSED SEWER MANHOLE
	EXISTING SEWER MANHOLE
	PROPOSED SEWER PIPE
	EXISTING SEWER PIPE
	EXISTING STORMWATER PIPE
	EXISTING STORMWATER MANHOLE
	EXISTING STREET LIGHTING
	EXISTING CABLE MANHOLE

CONSULTING ENGINEERS		SURVEYED		DESIGNED		DRAWN		CHECKED		SERVICES CHECKED		GEO/TECHNICAL INVESTIGATION		SERVICES		APPROVED	
ISAO CONSULTING		C.GYOSE		C.GYOSE		S.KOU		S.KOU						S.KOU - PrEng_20140316		DATE	
17 HARRISON STREET JOHANNESBURG 2000 TEL : (011) 688-1400 FAX : (011) 688-1521																	

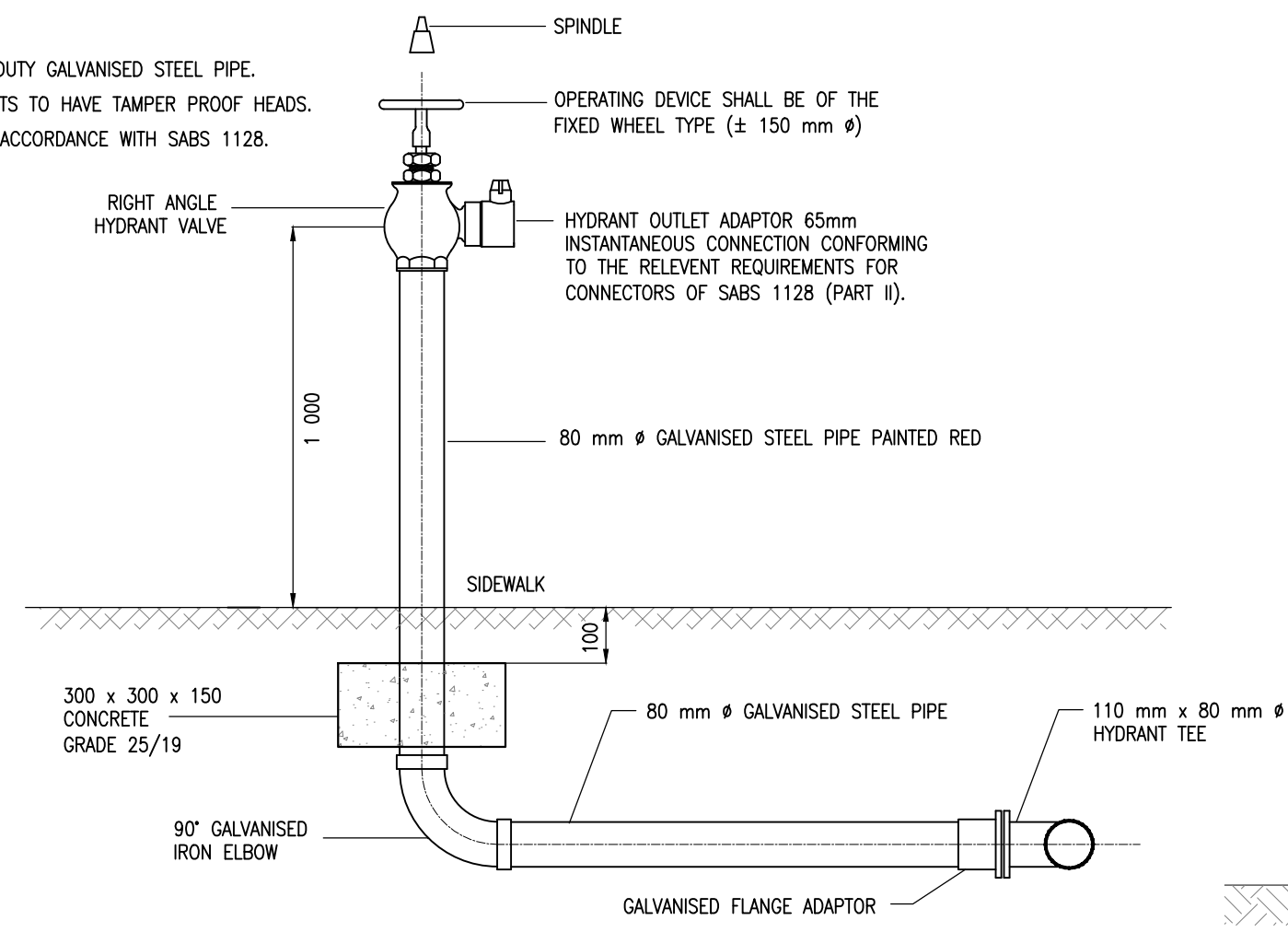
CITY OF JOHANNESBURG

CONSTITUTION HILL PEOPLE'S PARK PHASE 2

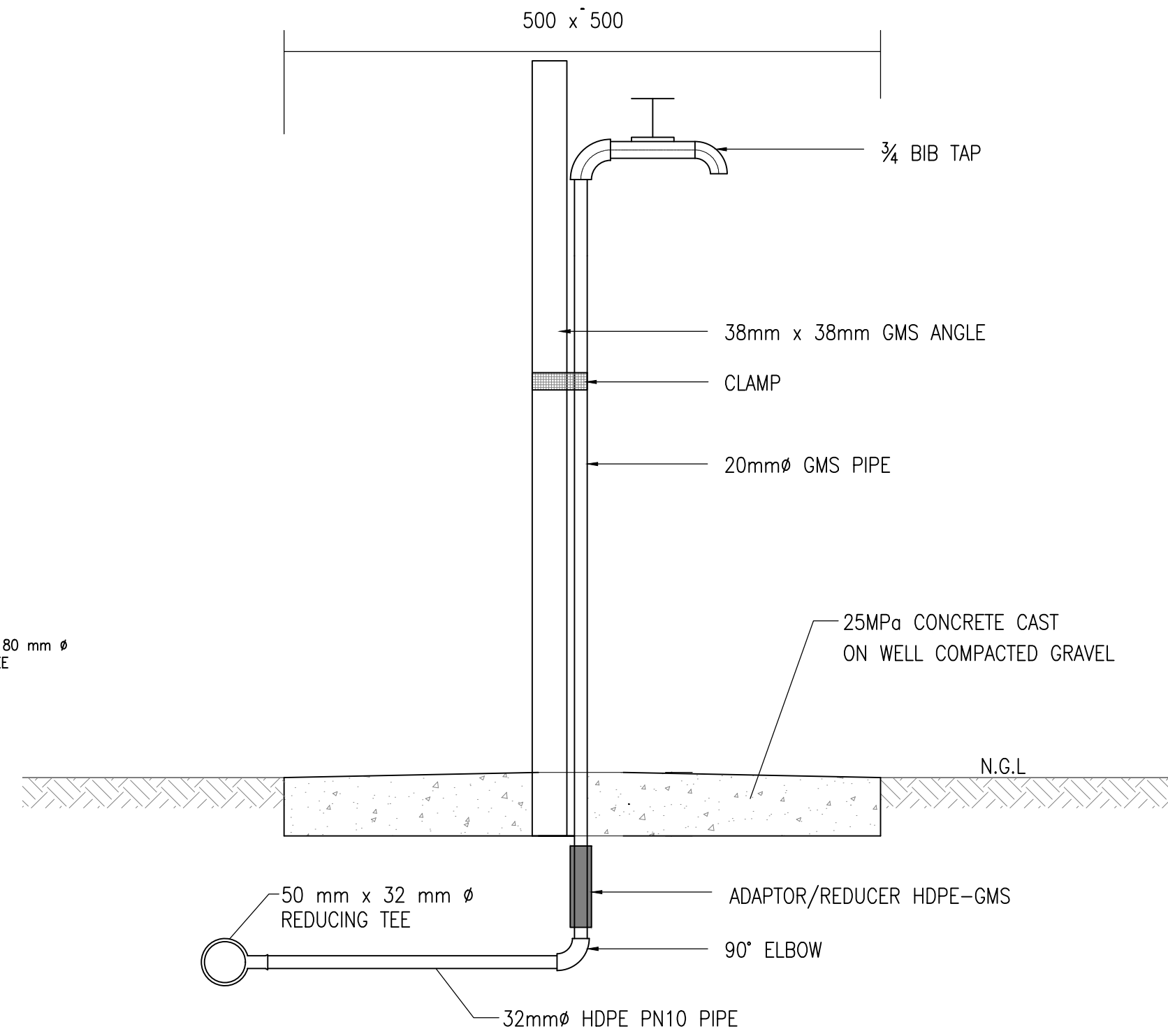
EXISTING SERVICES LAYOUT PLAN

DESIGN MANAGER	SCALE	AMENDMENTS	APPR. DATE	DRAWING NO.
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DATE				FOR APPROVAL

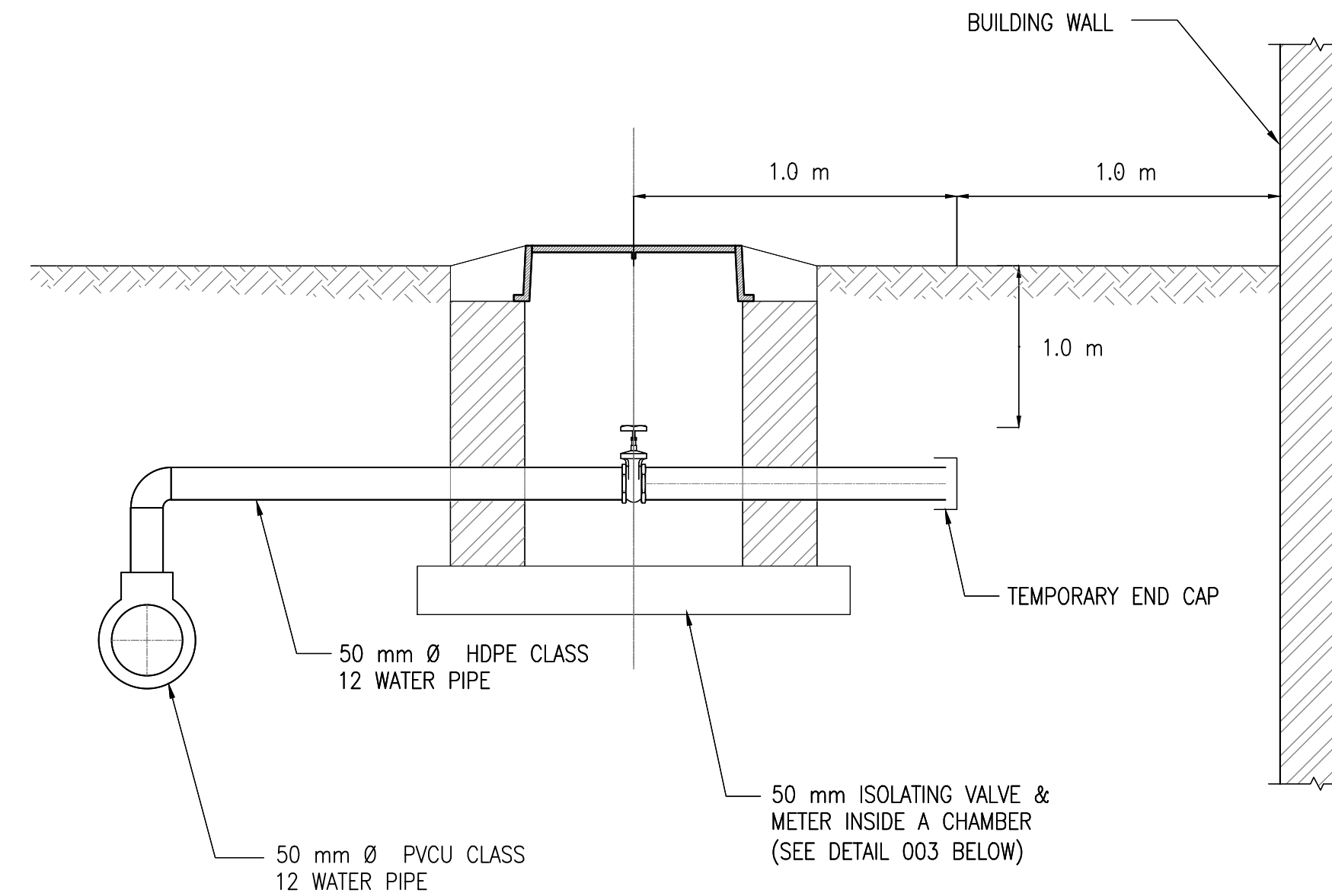
- NOTES:**
1. HEAVY DUTY GALVANISED STEEL PIPE.
 2. HYDRANTS TO HAVE TAMPER PROOF HEADS.
 3. ALL IN ACCORDANCE WITH SABS 1128.



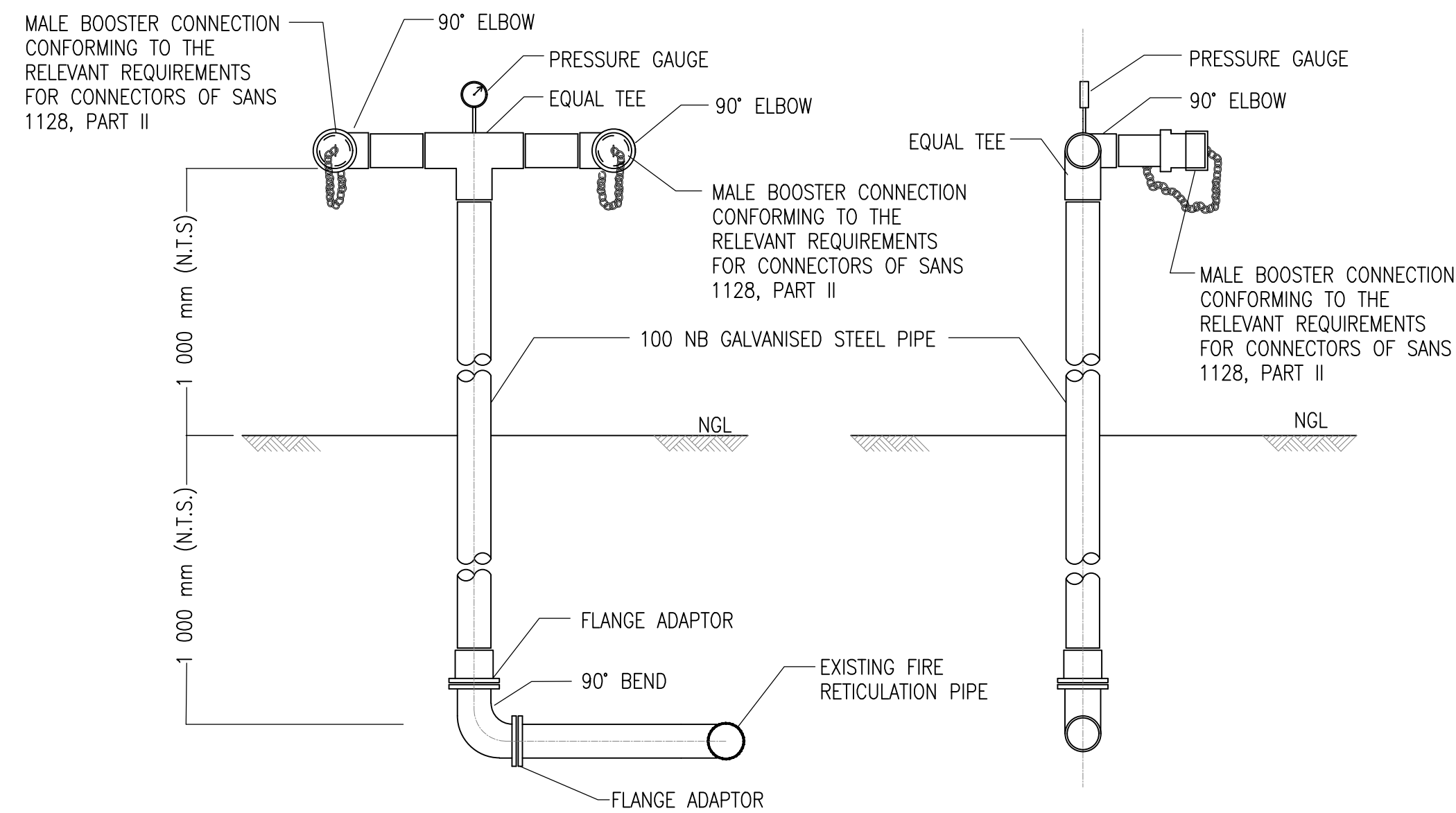
FIRE HYDRANT DETAIL
NTS



STANDPIPE DETAIL
NTS

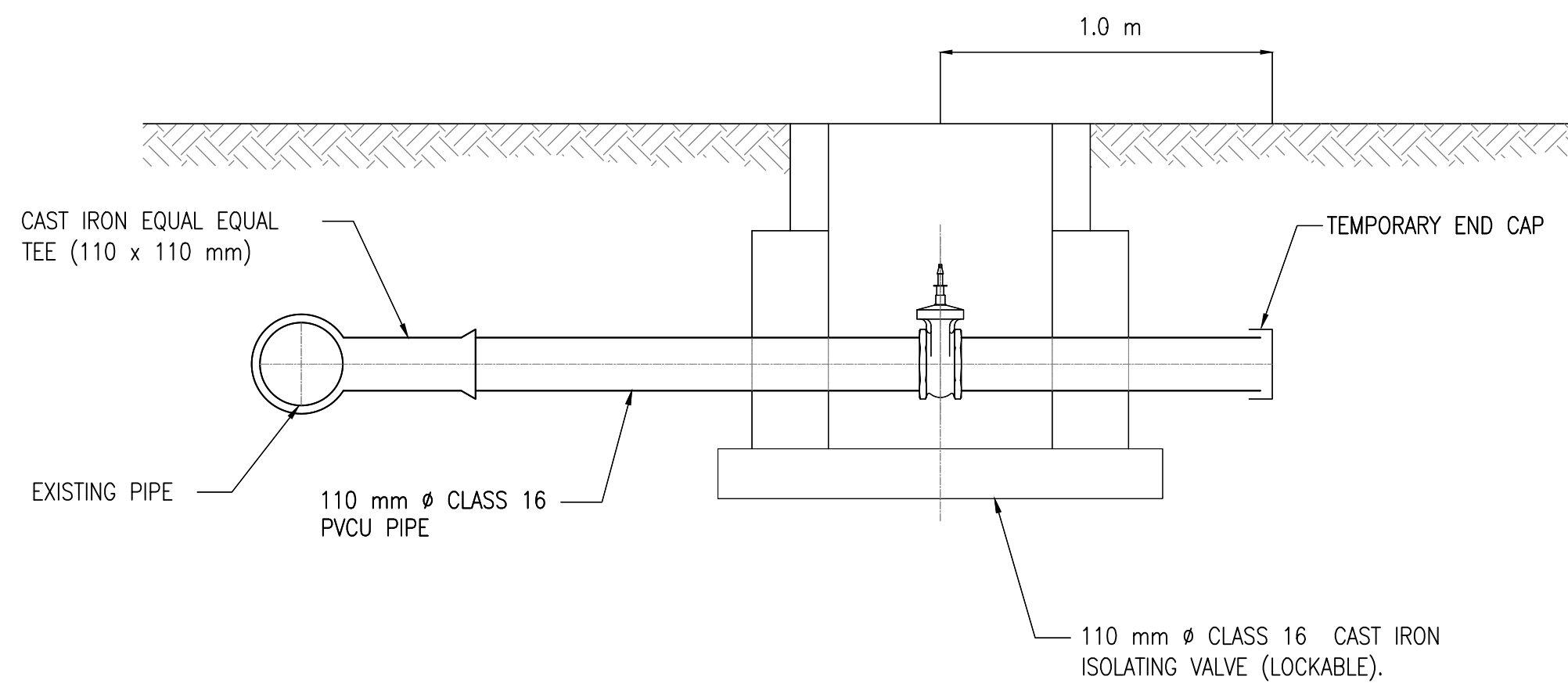


TYPICAL WATER RETICULATION CONNECTION TO BUILDING
NTS



DOUBLE FIRE BOOSTER CONNECTION
NTS

1. HEAVY DUTY GALVANISED STEEL PIPE.
2. HYDRANTS TO BE IN ACCORDANCE WITH SANS 1128.
3. PRESSURE GAUGE MEASURING 1600 KPA MINIMUM.
4. FLANGE DRILLING TO BE IN ACCORDANCE WITH BS 4504 TABLE 16.
5. A WOODLANDS PREFABRICATED DUAL BOOSTER SET MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.



TYPICAL FIRE RETICULATION CONNECTION TO BUILDING
NTS

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Outer Space
landscape architects

Ikemeng Architects CC
Reg. No. 2000/019680/23

IKEMENG

Isao Consulting (Pty) Ltd
Reg. No. 2013/184458/07

ISAO CONSULTING

Koor Dindar Mothei Gauteng (Pty) Ltd
Reg. No. 2007/018231/07

kdm
KOOR DINDAR MOTHEI

PROJECT:
Constitution Hill People's Park Phase 2
 Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
 FOR Constitution Hill Development Company

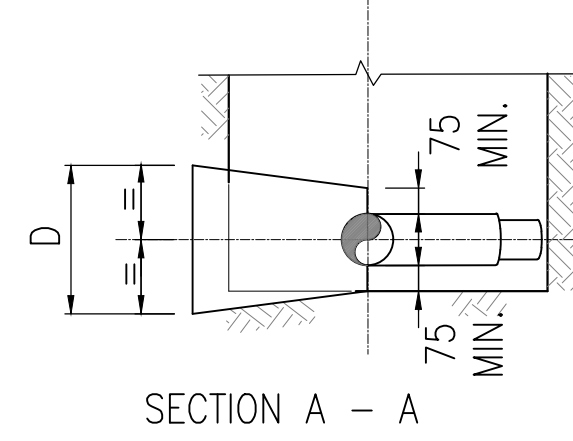
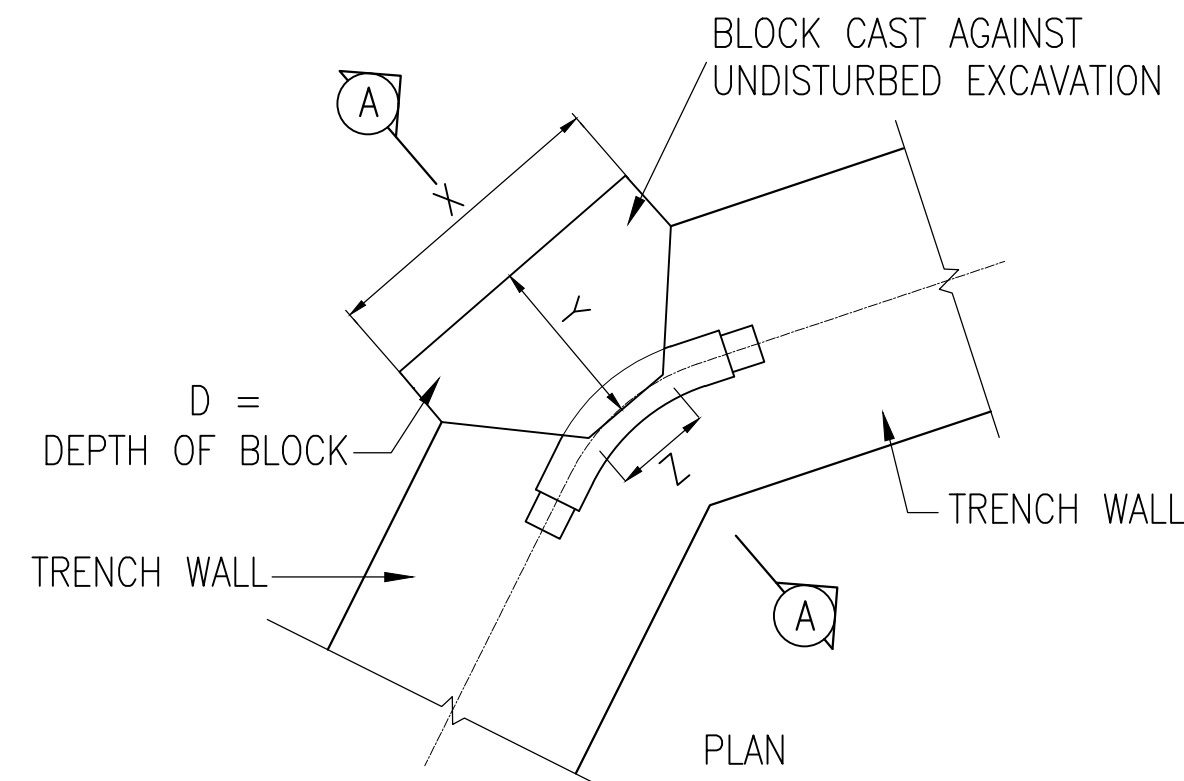
CONSTITUTIONHILL

DRAWING TITLE:
PROPOSED WATER RETICULATION DETAILS
SHEET 1 OF 3

For Tender

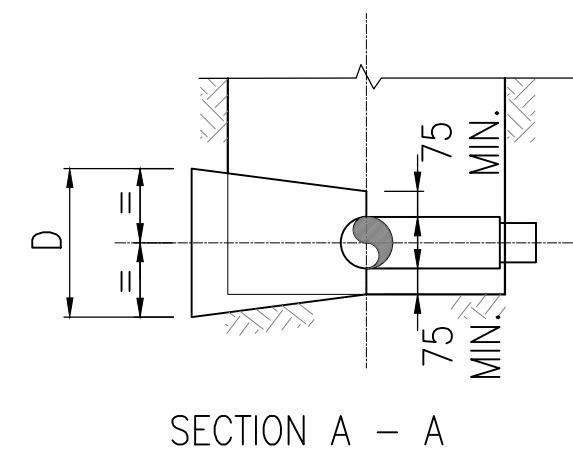
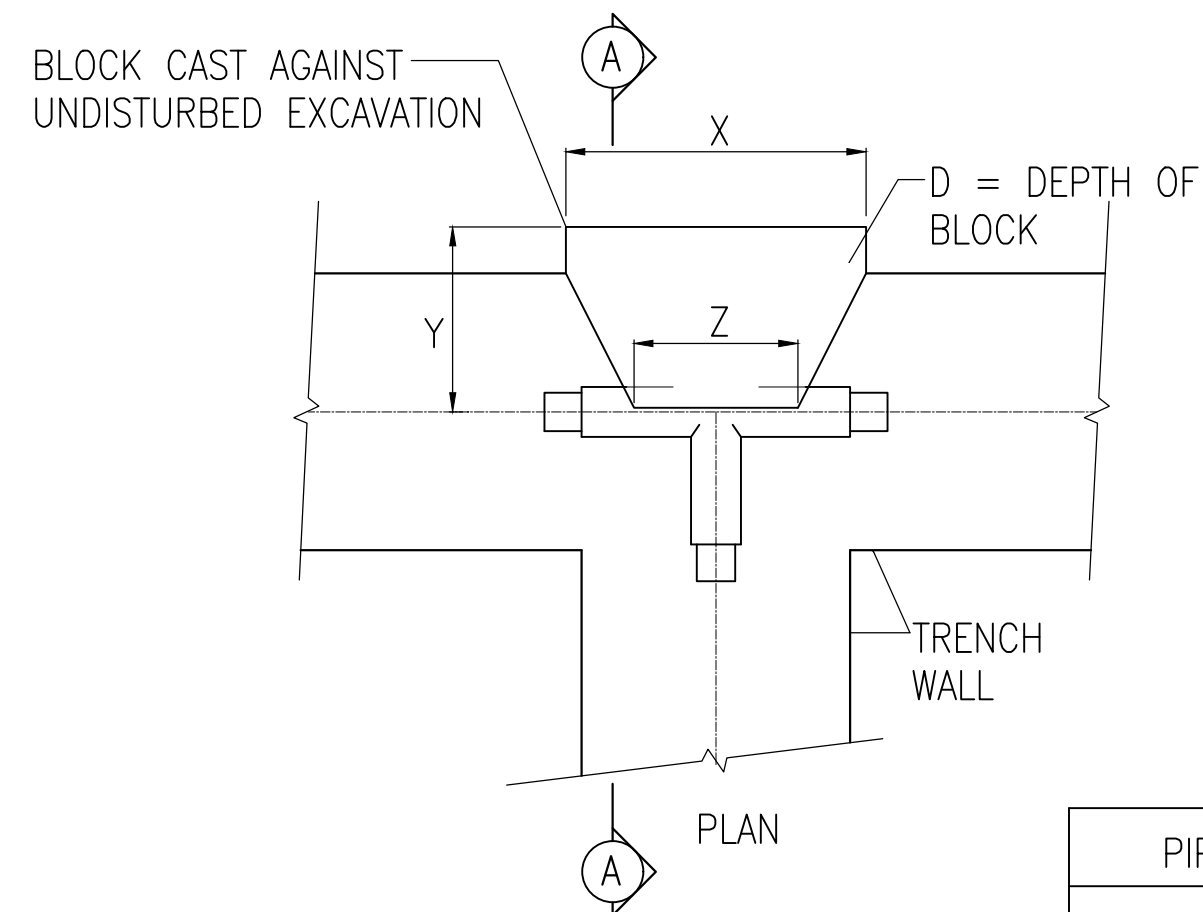
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DRAWN RK	ISSUED 13/03/2020
CHECKED CG	DATE 13/03/2020
DRAWING PATH #Drawing Location	
SCALE As Shown	SHEET SIZE A1
PROJECT No. P1900	DRAWING NUMBER CIV-301
REVISION	A

- NOTES:**
- COUPLINGS AND/OR FLANGES SHALL BE CLEAR OF CONCRETE
 - ALL THRUST BLOCKS TO BE 19/25 MPa CONCRETE



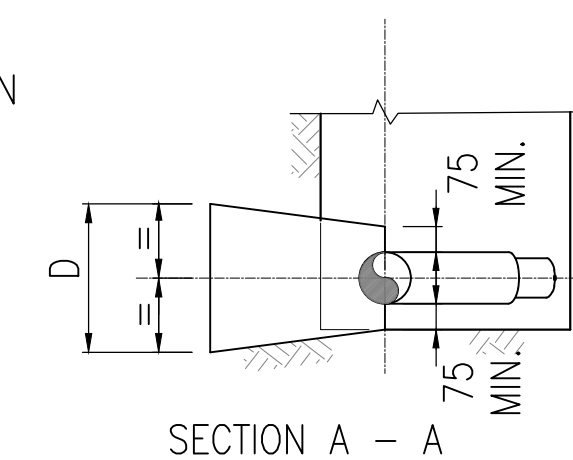
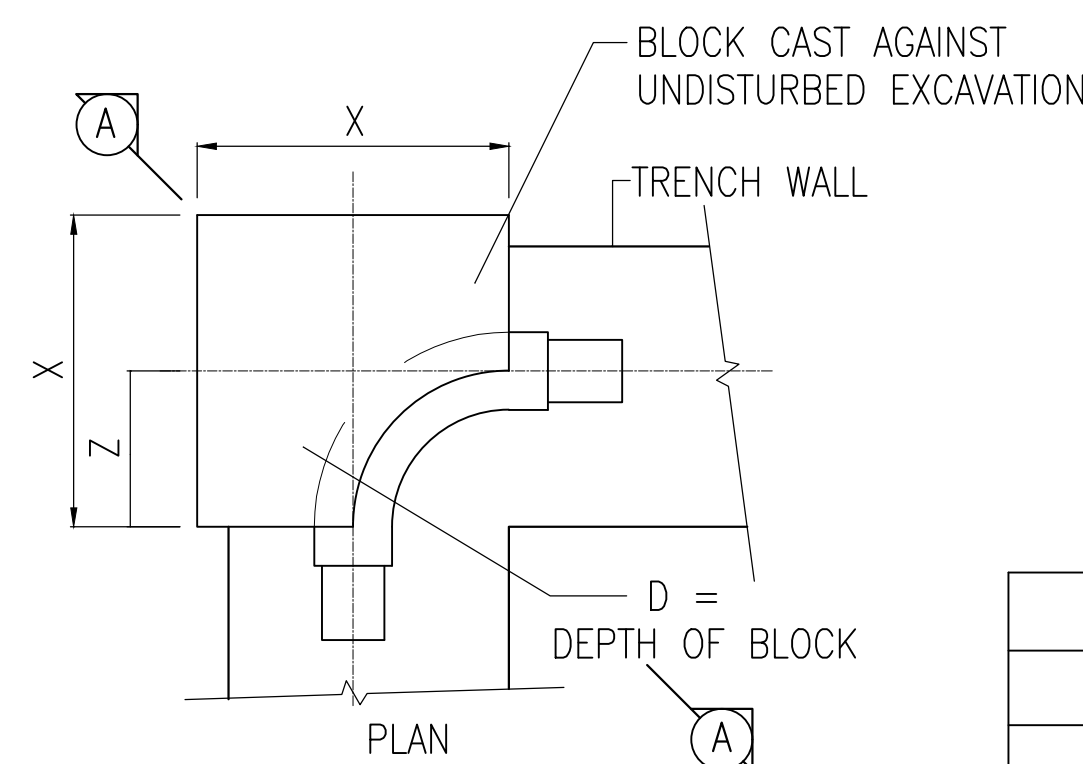
PIPE ϕ	X mm	D mm	Z mm	Y mm
75	375	300	125	500
100	500	400	175	500
160	750	600	275	550
200	1000	800	325	550

FOR 45° AND SMALLER BENDS



PIPE ϕ	X mm	D mm	Z mm	Y mm
75	500	300	150	450
100	650	400	200	450
160	1000	600	275	500
200	1300	800	350	500

FOR TEE OR END CAP

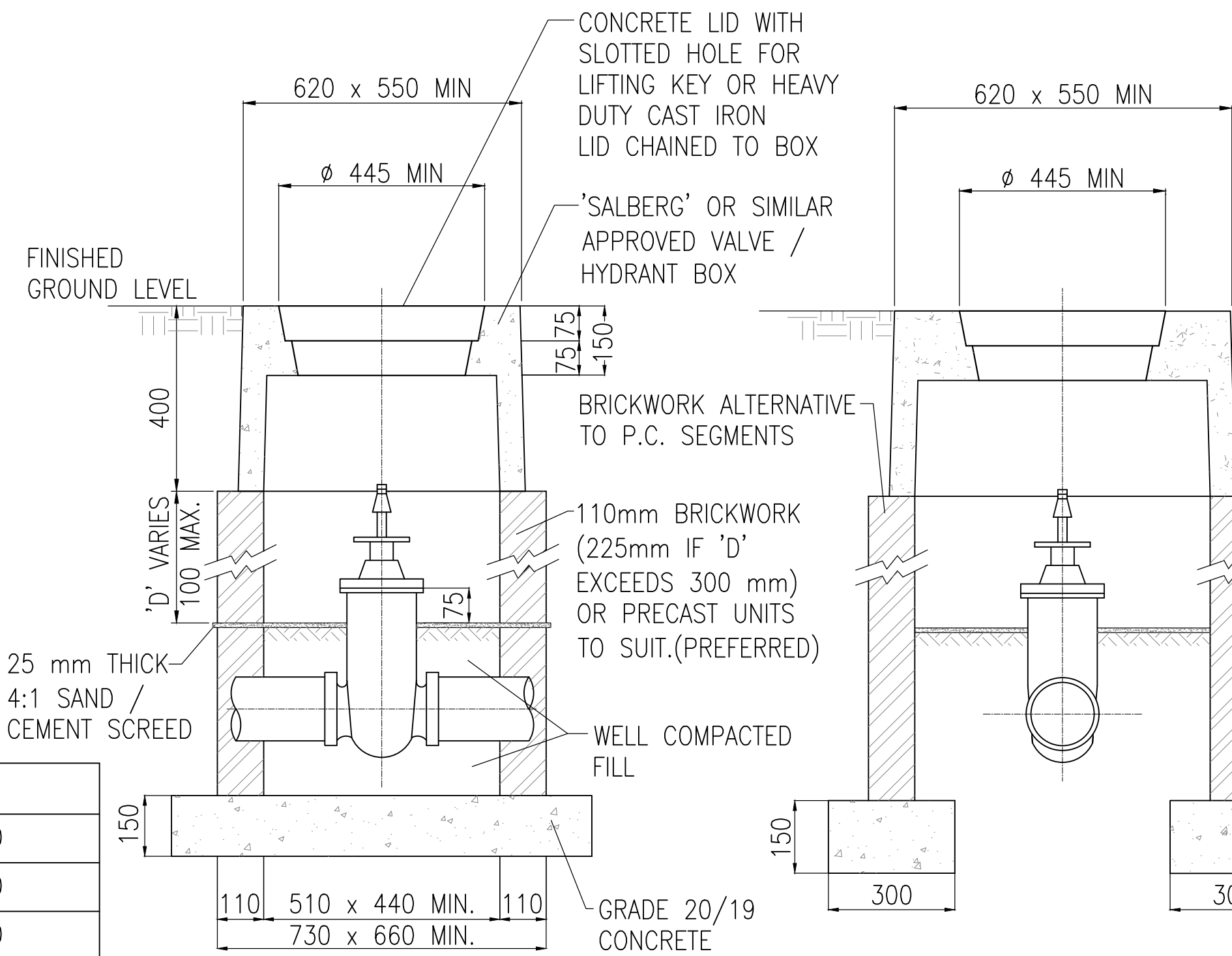


PIPE ϕ	X mm	D mm	Z mm
75	650	300	250
100	800	400	350
160	1000	600	550
200	1200	800	700

FOR 90° BENDS

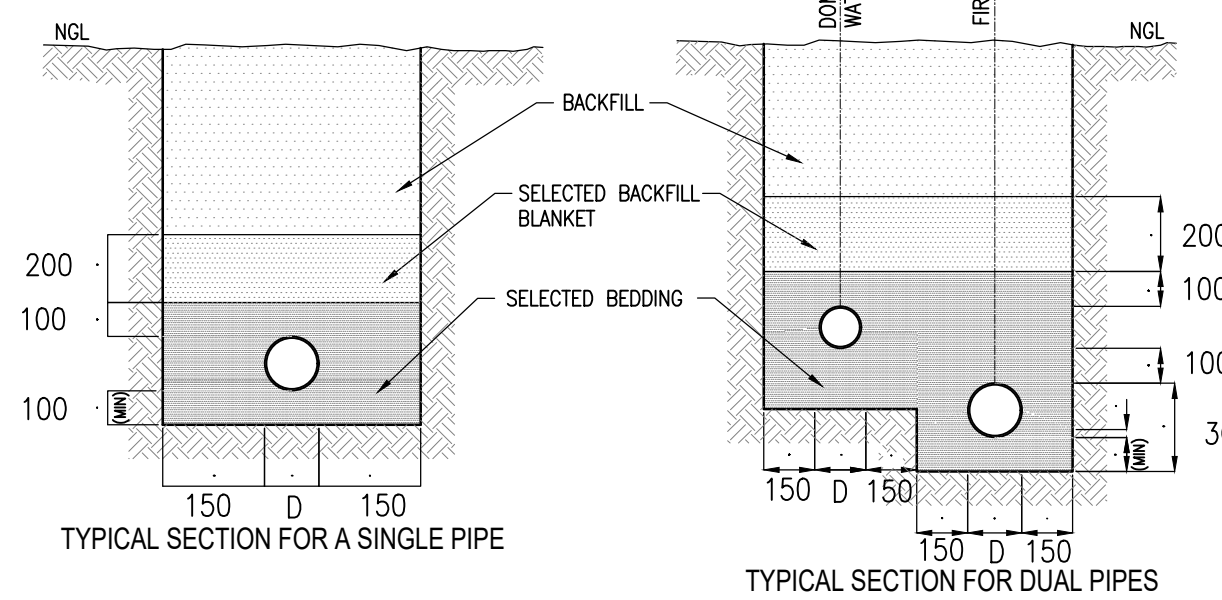
THRUST BLOCK ON PRESSURE PIPELINE

NTS



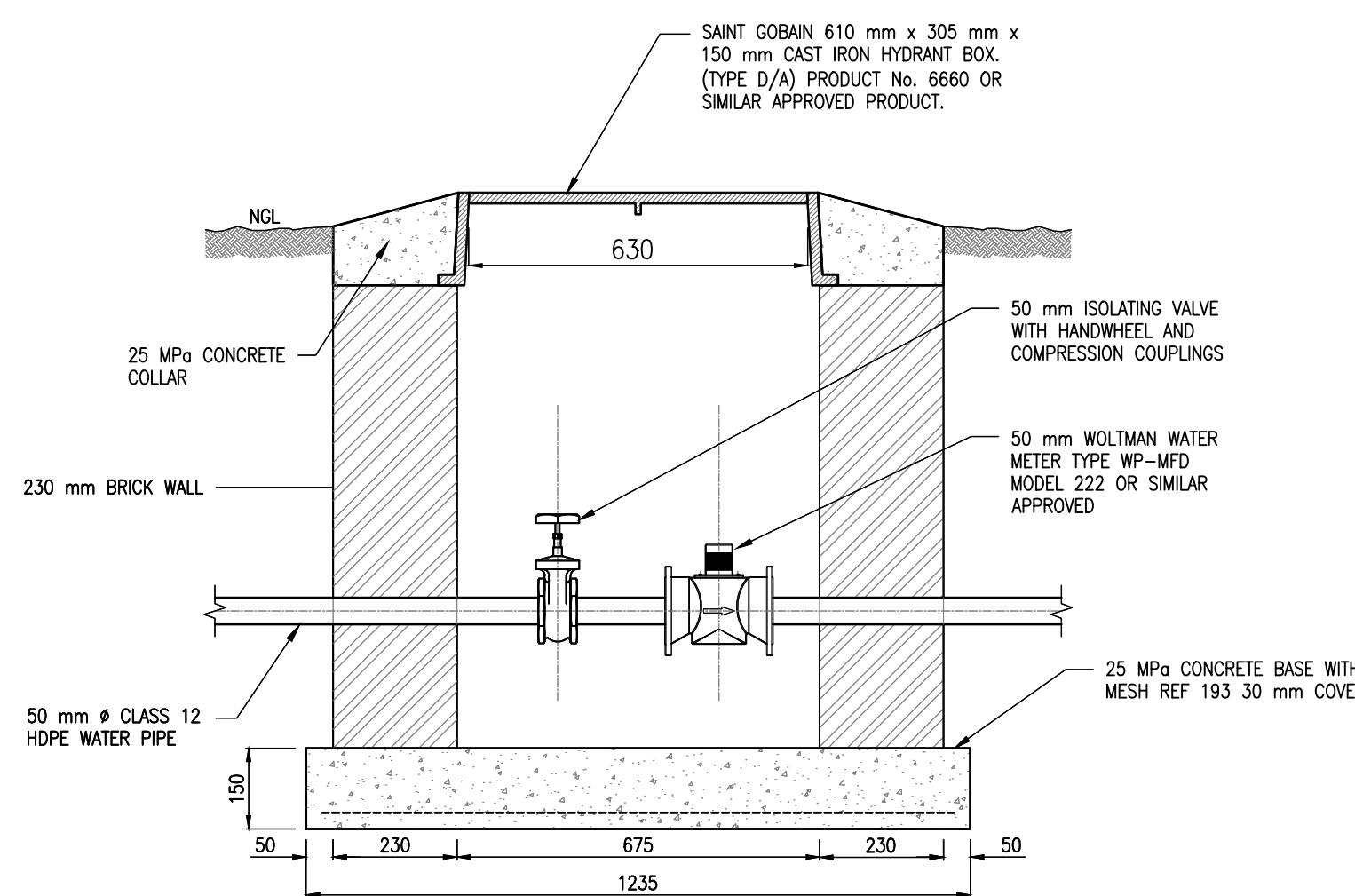
NOTES

- VALVES UP TO 300 mm
 - RESILIENT SEAL GATE VALVE
 - NON RISING SPINDLE
 - ANTI CLOCKWISE CLOSING FOR FIRE RETICULATION
 - CLOCKWISE CLOSING FOR DOMESTIC WATER
 - A REMOVABLE COUPLING MUST BE PROVIDED ON ONE SIDE OF THE VALVE AT LEAST 500 mm FROM THE SHAFT. SPECIFICATIONS TO SABS 664
- VALVES OVER 300mm
 - WEDGE GATE VALVE
 - A REMOVABLE COUPLING MUST BE PROVIDED ON ONE SIDE OF THE VALVE AT LEAST 500 mm FROM THE SHAFT. SPECIFICATIONS TO SABS 664
- PRECAST SEGMENT SPECIFICATIONS
 - ALL MANHOLE SEGMENTS ACCORDING TO SABS 1294-1981
 - TOP SURFACE OF MANHOLE COVER TO BE 50 mm ABOVE THE FINISHED GROUND LEVEL EXCEPT IN PAVED AREAS
 - SEGMENTS TO BE BONDED WITH 1:3 CEMENT MORTAR TO PROVIDE A WATERTIGHT JOINT
 - DIMENSIONS OF SEGMENTS FOR VALVES BIGGER THAN 300mm ϕ MUST BE ADAPTED TO FIT VALVE SIZE.
- ISOLATION VALVE
 - VALVES UP TO 200 mm ϕ MAY BE PLAIN ENDED.
 - VALVES OVER 200 mm ϕ SHALL BE FLANGED.



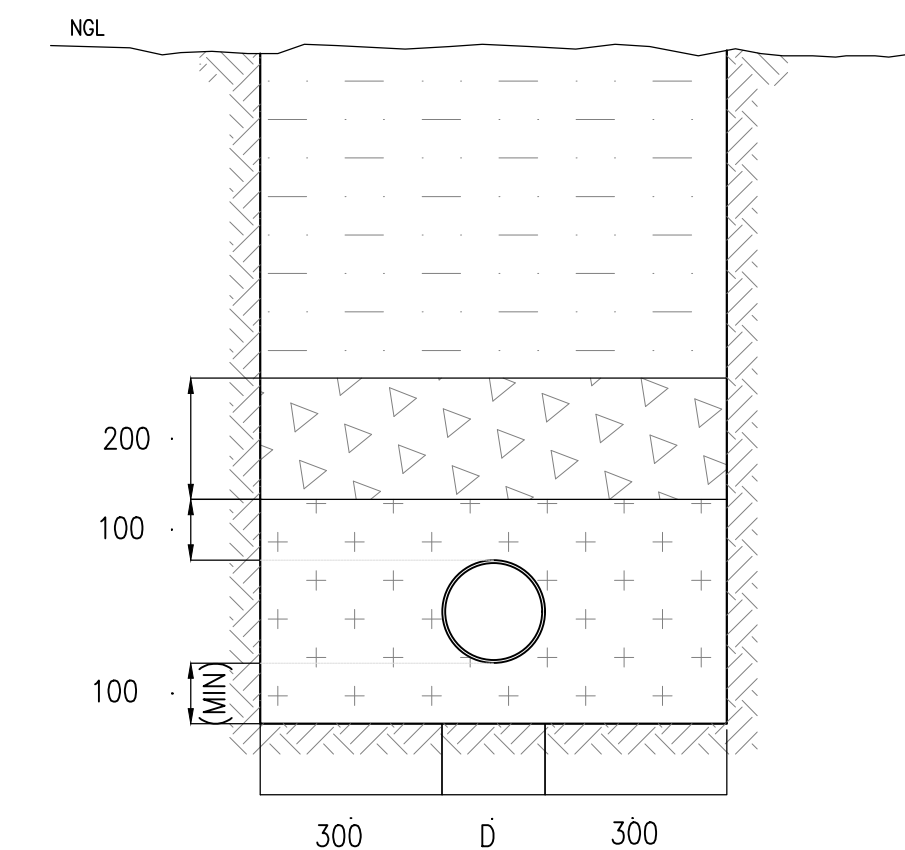
MATERIAL	DESCRIPTION	COMPACTION
BACKFILL	SABS 1200 DB CL 3.5	IN 150mm LAYERS TO MOD AASHTO: 90% FOR ROAD RESERVE 93% FOR ROAD TRAFFIC LOADS
SELECTED FILL BLANKET	SABS 1200 LB CL 5.3 b)	IN 150mm LAYERS 90% MOD AASHTO
SELECTED BEDDING	SABS 1200 LB CL 5.3 a)	90% MOD AASHTO DENSITY

- NOTES:**
- SOCKETS OF PIPES SHALL BE ACCOMMODATED WITHIN THE SELECTED GRANULAR BEDDING MATERIAL
 - WHERE PIPE IS UNDER A ROAD BACKFILL BELOW ROAD FOUNDATION LAYERS SHALL COMPLY WITH SABS 1200 DB CL 3.5 (b)



50 mm WATER METER AND VALVE CHAMBER

NTS



TYPICAL DETAIL OF PIPE BEDDING FOR FLEXIBLE PIPES

NTS

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 landscape architects

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IKEMENG

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kdm
 KOOR DINDAR MOTHEI

PROJECT:
 Constitution Hill People's Park Phase 2
 Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
 FOR Constitution Hill Development Company

CONSTITUTIONHILL
 DRAWING TITLE:
 PROPOSED WATER RETICULATION DETAILS
 SHEET 2 OF 3

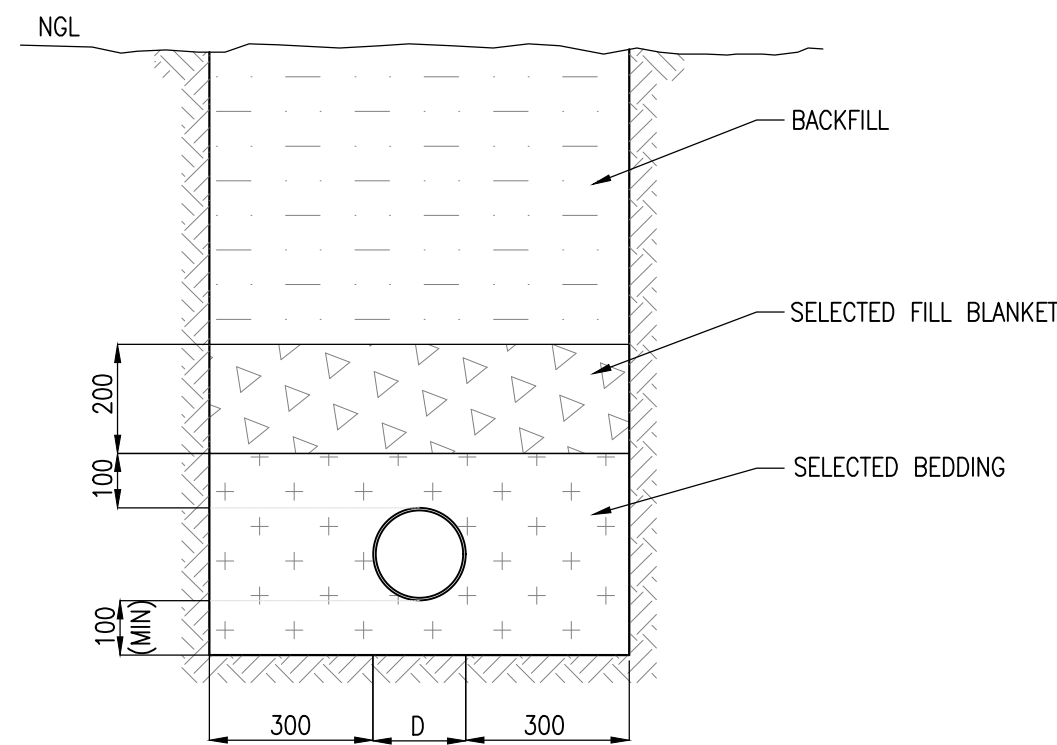
For Tender

RESPONSIBLE PERSON	DATE
DRAWN RK	ISSUED 13/03/2020
CHECKED CG	DATE 13/03/2020
DRAWING PATH #Drawing Location	
SCALE As Shown	SHEET SIZE A1
PROJECT No. P1900	DRAWING NUMBER CIV-302
REVISION A	

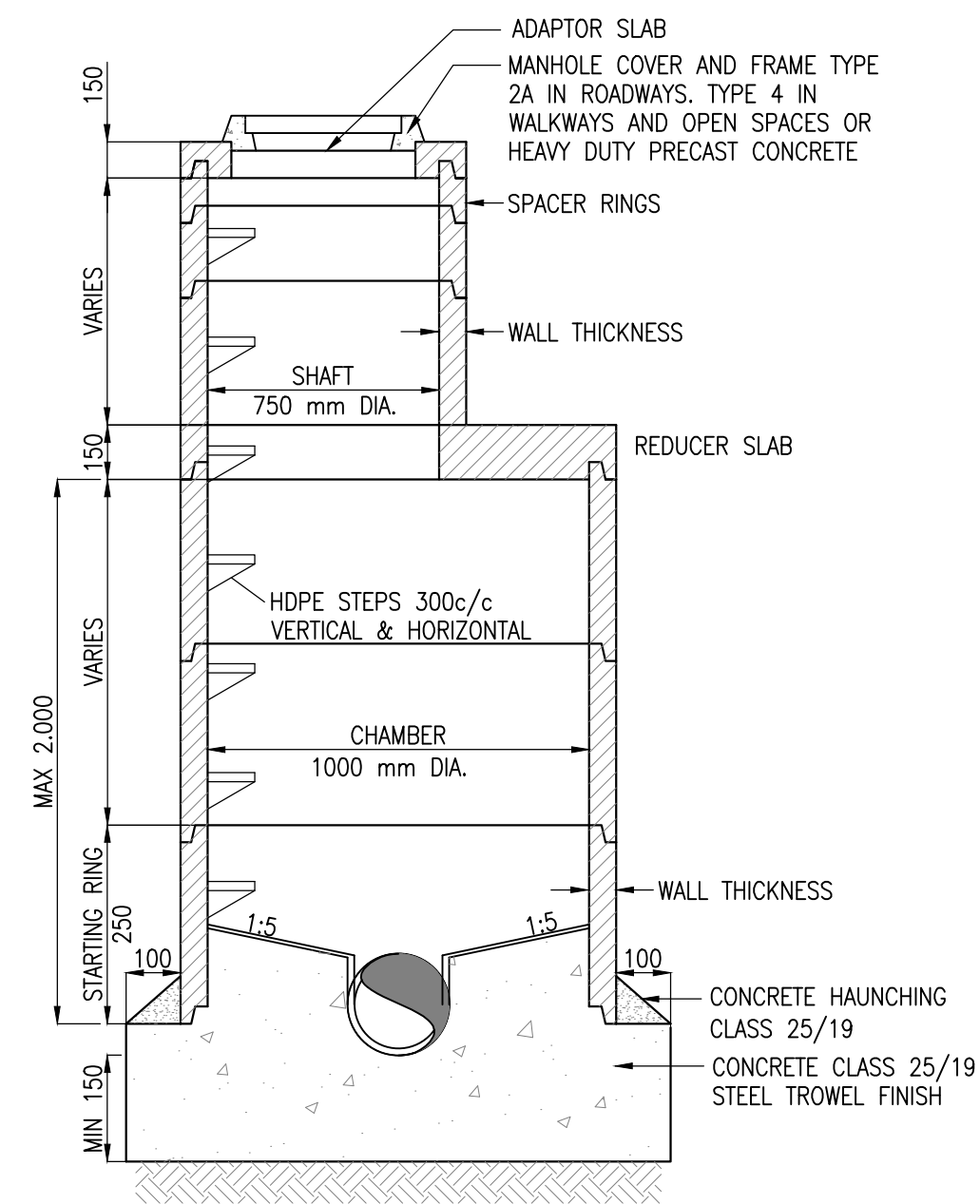
BEDDING AND BACKFILL		
MATERIAL	DESCRIPTION	COMPACTION
BACKFILL	SABS 1200 DB CL 3.5	IN 150mm LAYERS TO MOD AASHTO: 90% FOR ROAD RESERVE 93% FOR ROAD TRAFFIC LOADS
SELECTED FILL BLANKET	SABS 1200 LB CL 5.3 b)	IN 150mm LAYERS 90% MOD AASHTO
SELECTED BEDDING	SABS 1200 LB CL 5.3 a)	90% MOD AASHTO DENSITY

NOTES:

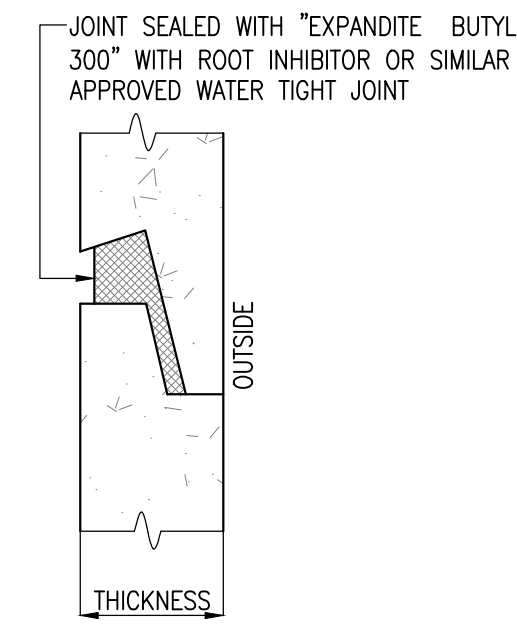
- SOCKETS OF PIPES SHALL BE ACCOMMODATED WITHIN THE SELECTED GRANULAR BEDDING MATERIAL.
- WHERE PIPE IS UNDER A ROAD BACKFILL BELOW ROAD FOUNDATION LAYERS SHALL COMPLY WITH SABS 1200 DB CL 3.5 (b)



TYPICAL DETAIL OF PIPE BEDDING FOR FLEXIBLE PIPES
NTS

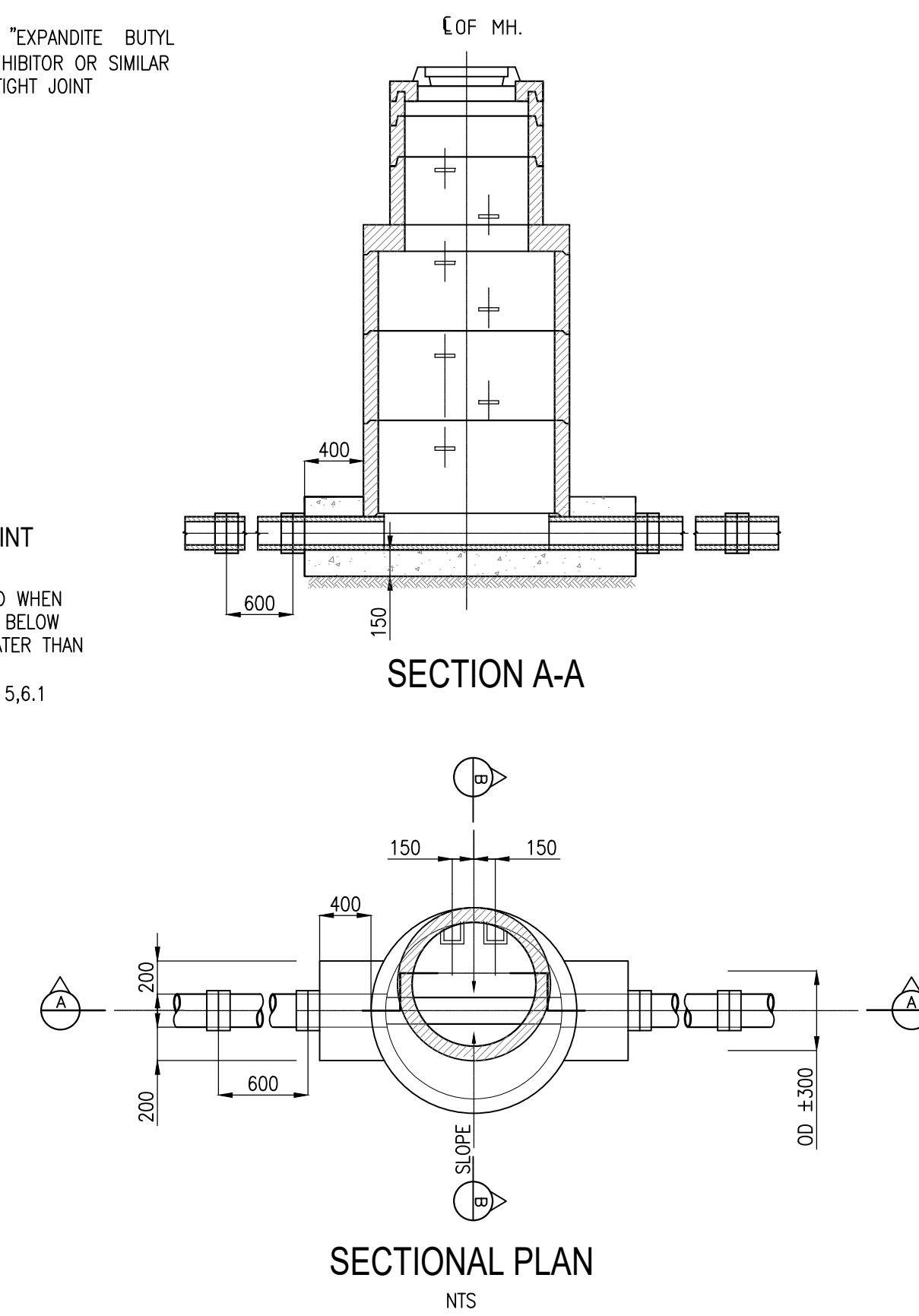


SECTION B-B
NTS
TYPICAL MANHOLE DETAIL
NTS

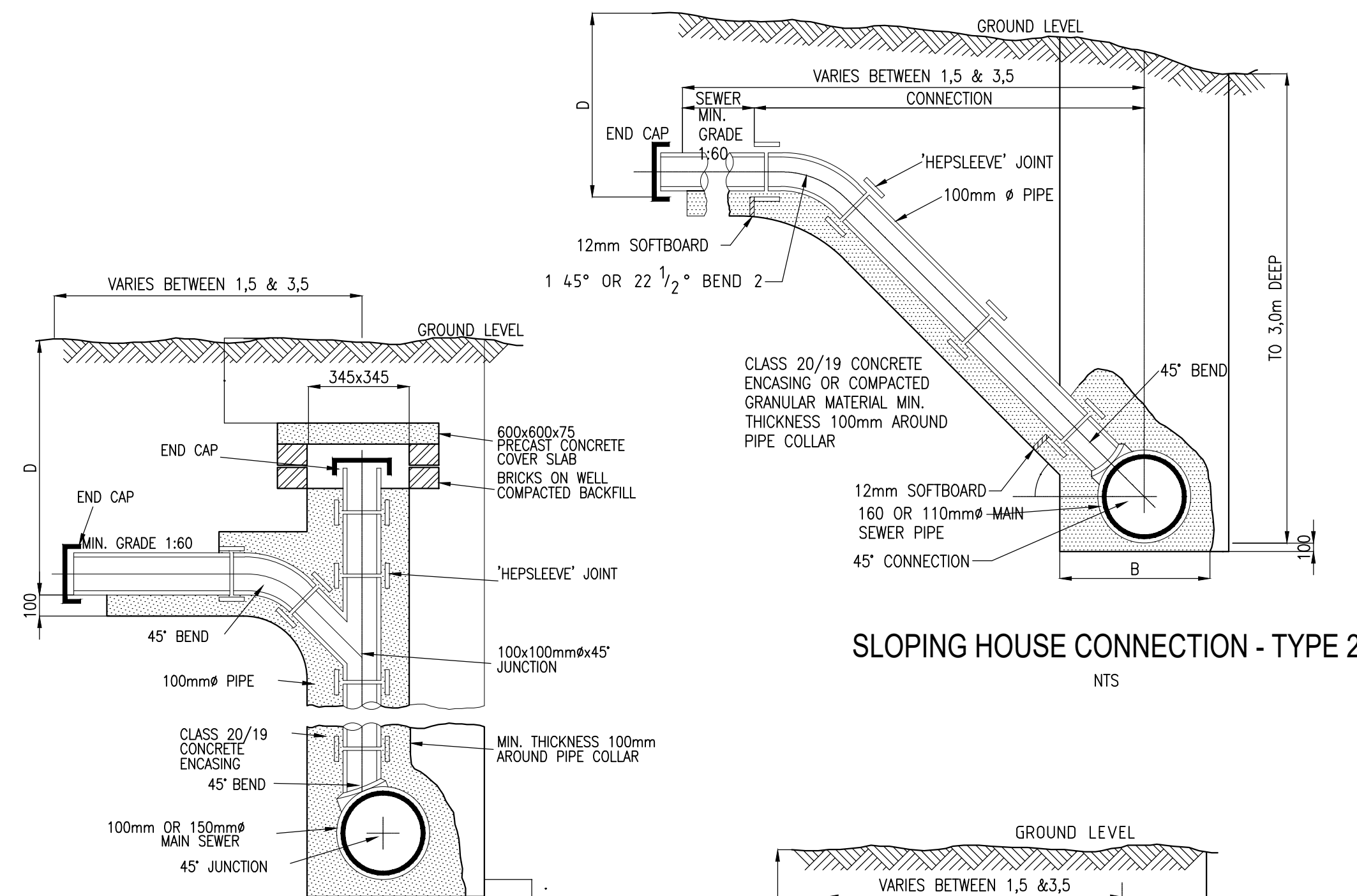


INTERLOCKING JOINT

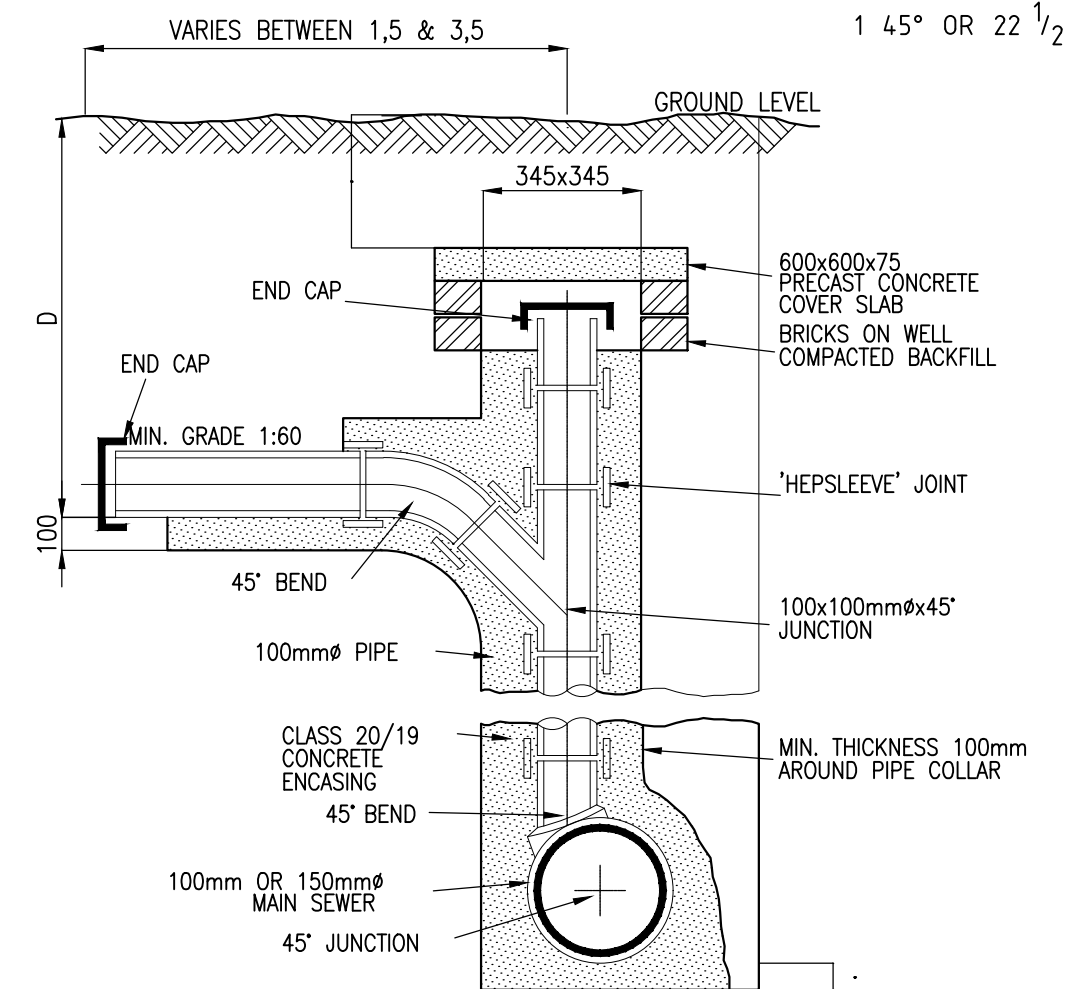
- REDUCER SLAB USED WHEN DEPTH OF PIPE INVERT BELOW GROUND LEVEL IS GREATER THAN 2.5m
- SEE SABS 1200 LD 5.6.1



SECTION A-A
NTS
SECTIONAL PLAN
NTS

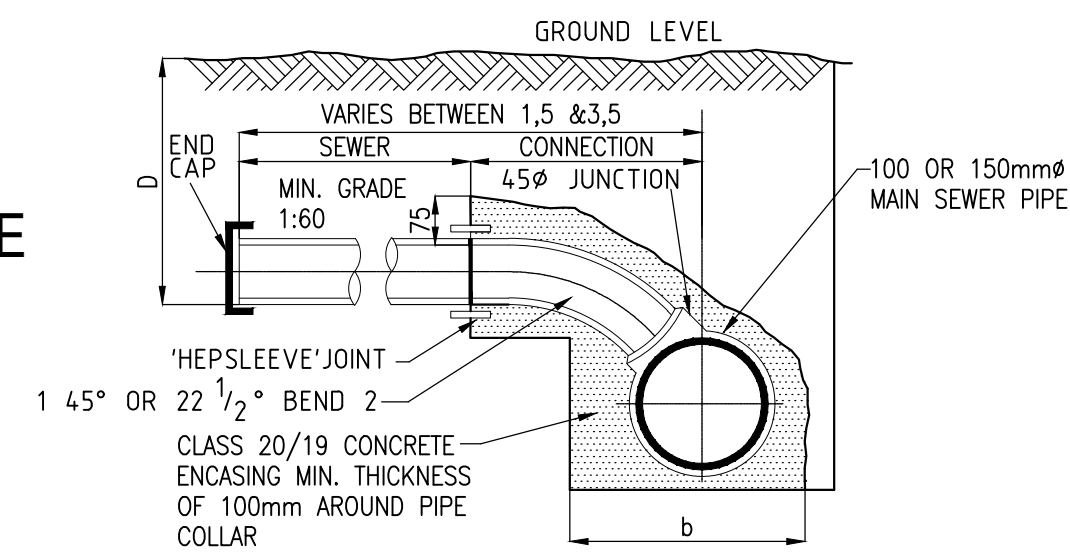


SLOPING HOUSE CONNECTION - TYPE 2
NTS



VERTICAL HOUSE CONNECTION - TYPE

NOTE
FOR HOUSE CONNECTION
DIMENSION 'b' = (1.5xOD)
WITH A MINIMUM VALUE OF
(OD+250mm)



DIRECT HOUSE CONNECTION - TYPE 1
NTS

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kdm
KOOR DINDAR MOTHEI

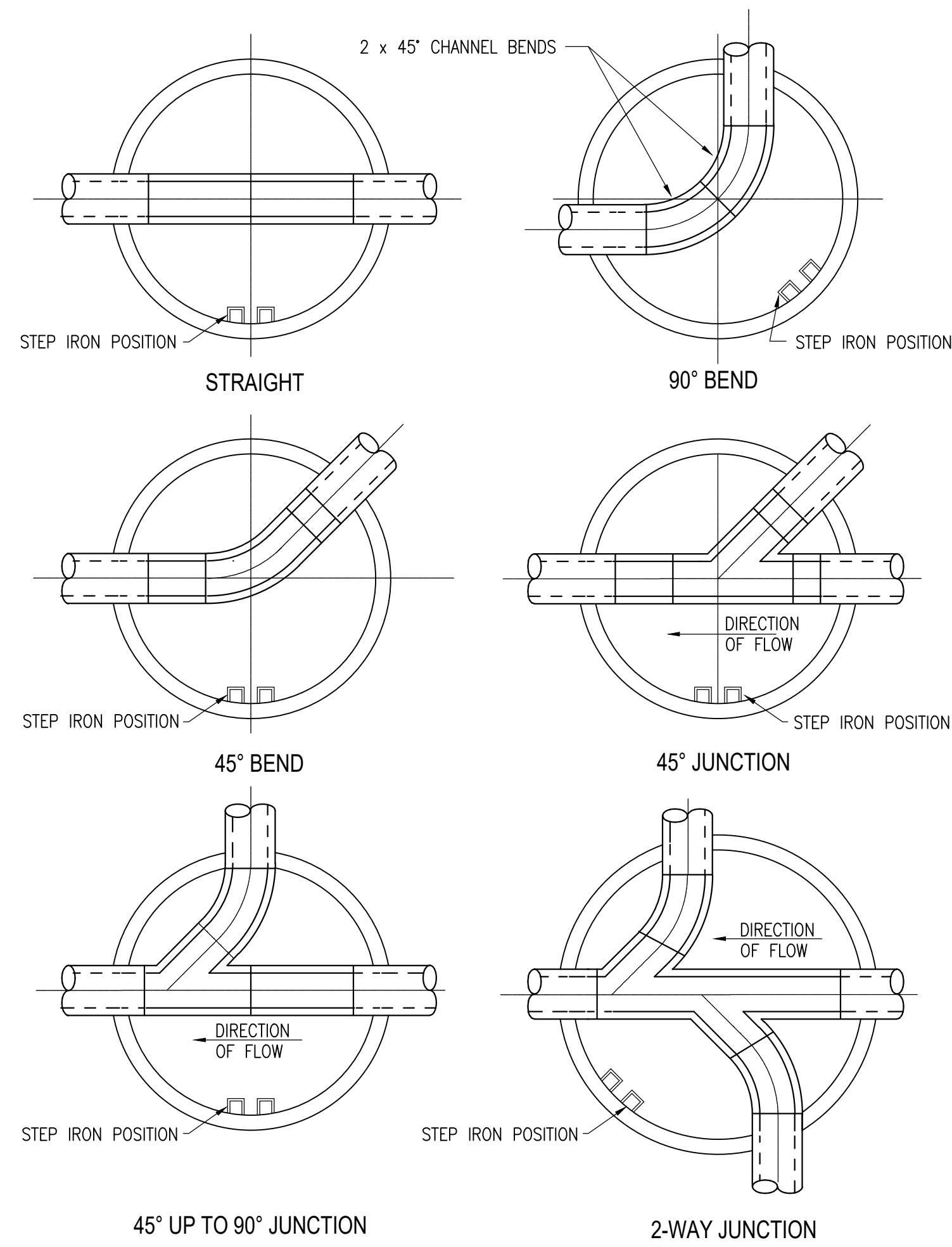
PROJECT:
Constitution Hill People's Park Phase 2
Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
FOR Constitution Hill Development Company

CONSTITUTIONHILL

DRAWING TITLE:
PROPOSED SEWER RETICULATION DETAILS SHEET 1 OF 2

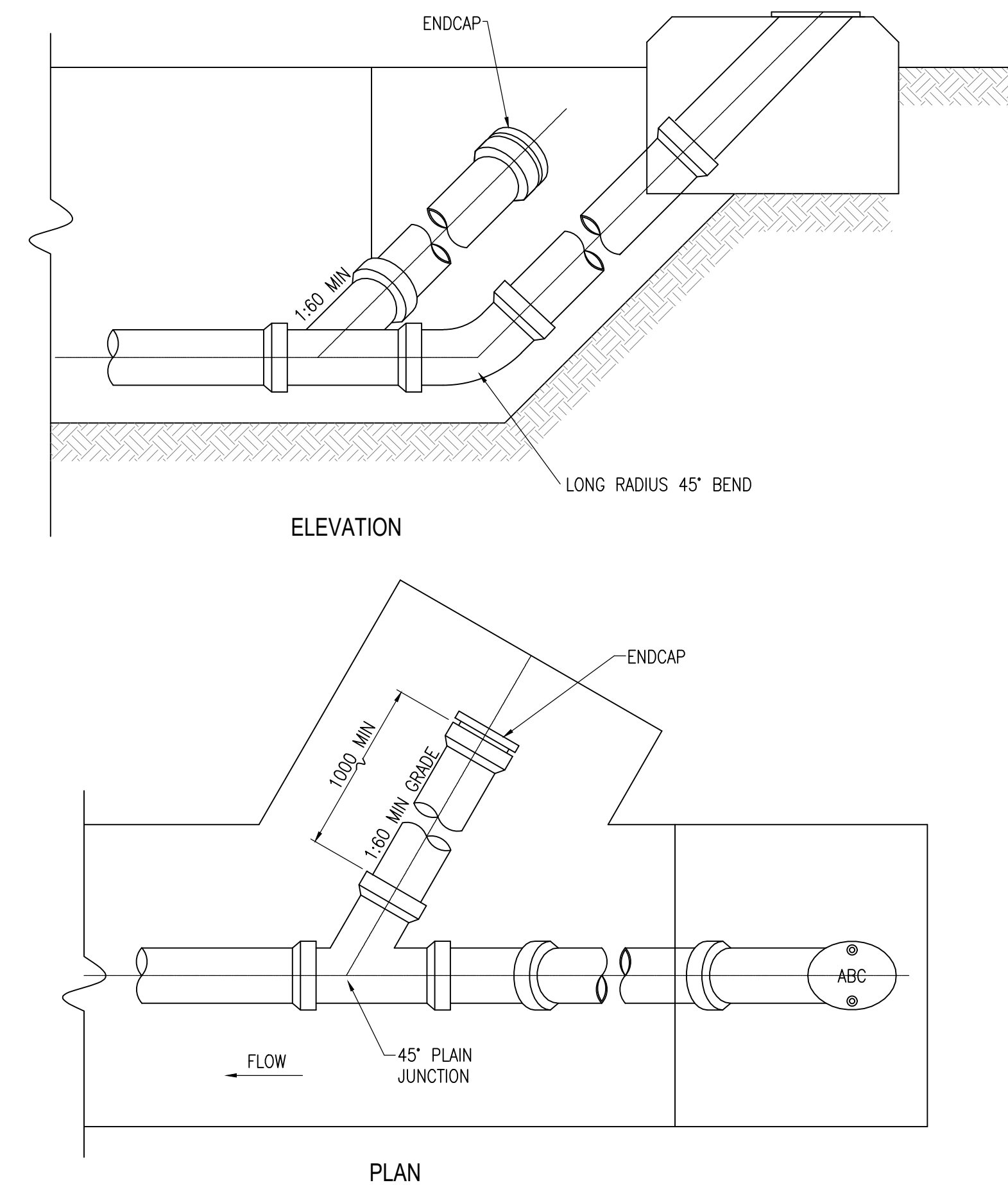
For Tender	
RESPONSIBLE PERSON	DATE
DRAWN RK	ISSUED 13/03/2020
CHECKED CG	DATE 13/03/2020
DRAWING PATH #Drawing Location	
SCALE As Shown	SHEET SIZE A1
PROJECT No. P1900	DRAWING NUMBER CIV-303
REVISION A	

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TYPICAL MANHOLE CHANNEL DETAIL

NTS

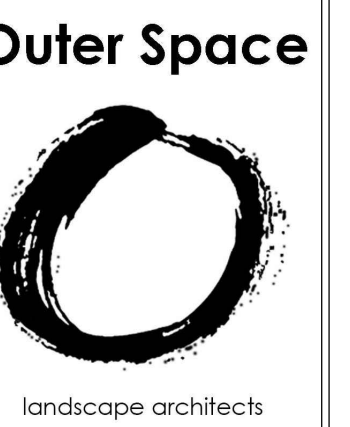


TYPICAL RODDING EYE DETAIL

NTS

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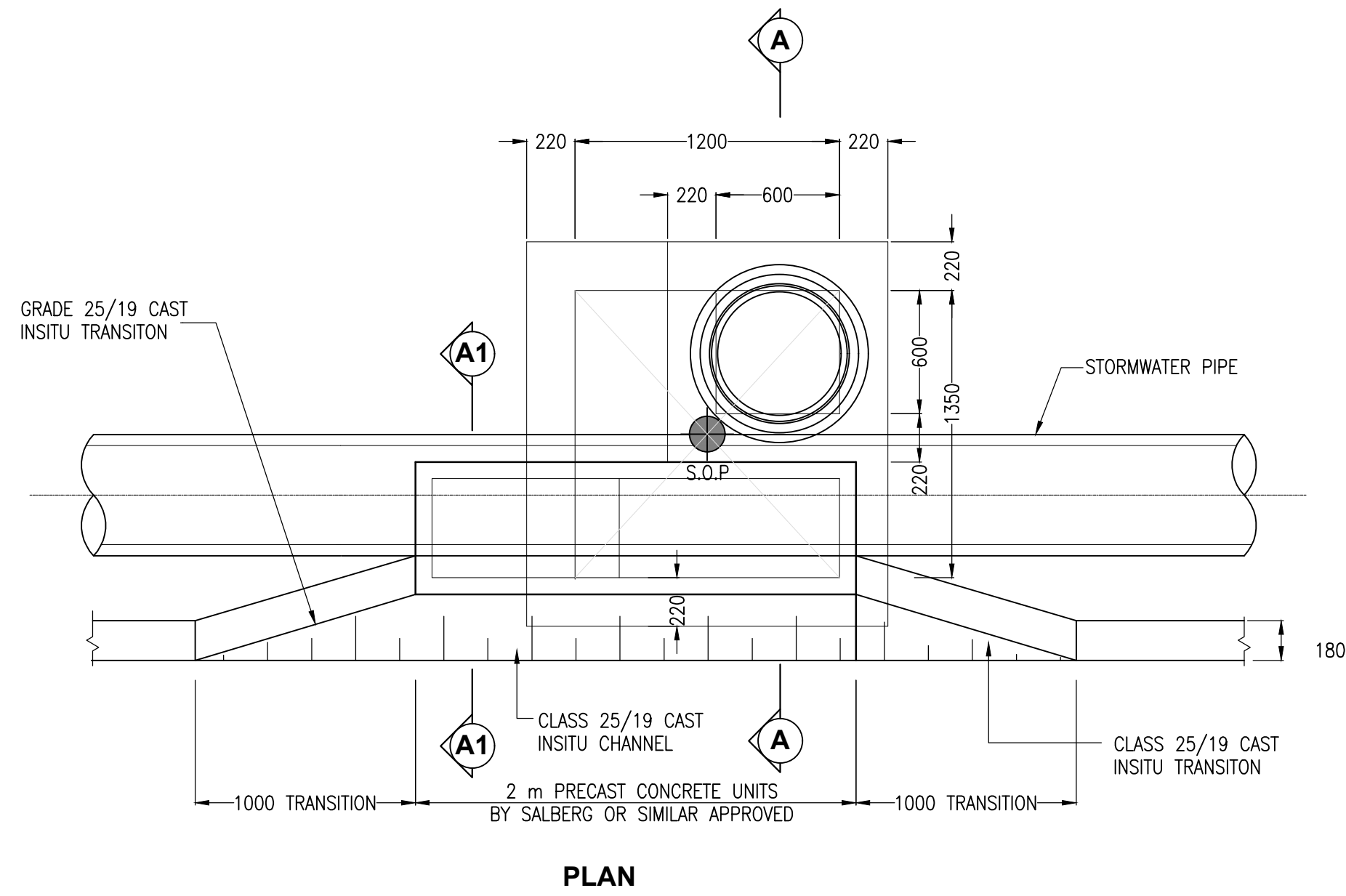


PROJECT:
Constitution Hill People's Park Phase 2
 Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
 FOR Constitution Hill Development Company

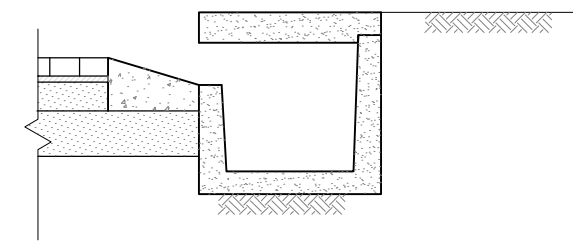
DRAWING TITLE:
PROPOSED SEWER RETICULATION DETAILS SHEET 2 OF 2

For Tender

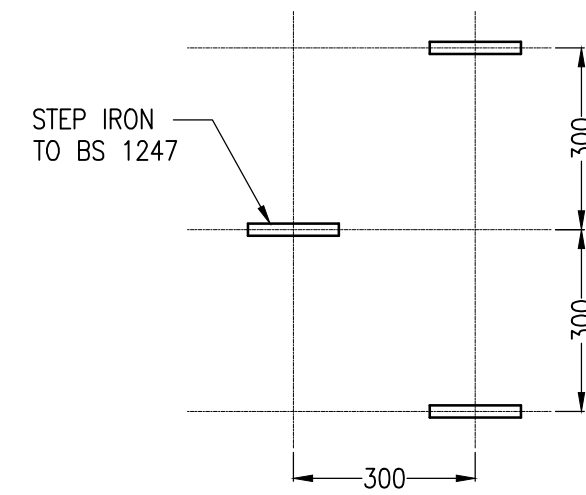
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DRAWN RK	ISSUED 13/03/2020
CHECKED CG	DATE 13/03/2020
DRAWING PATH #Drawing Location	
SCALE As Shown	SHEET SIZE A1
PROJECT No. P1900	DRAWING NUMBER CIV-304
	REVISION A



PLAN

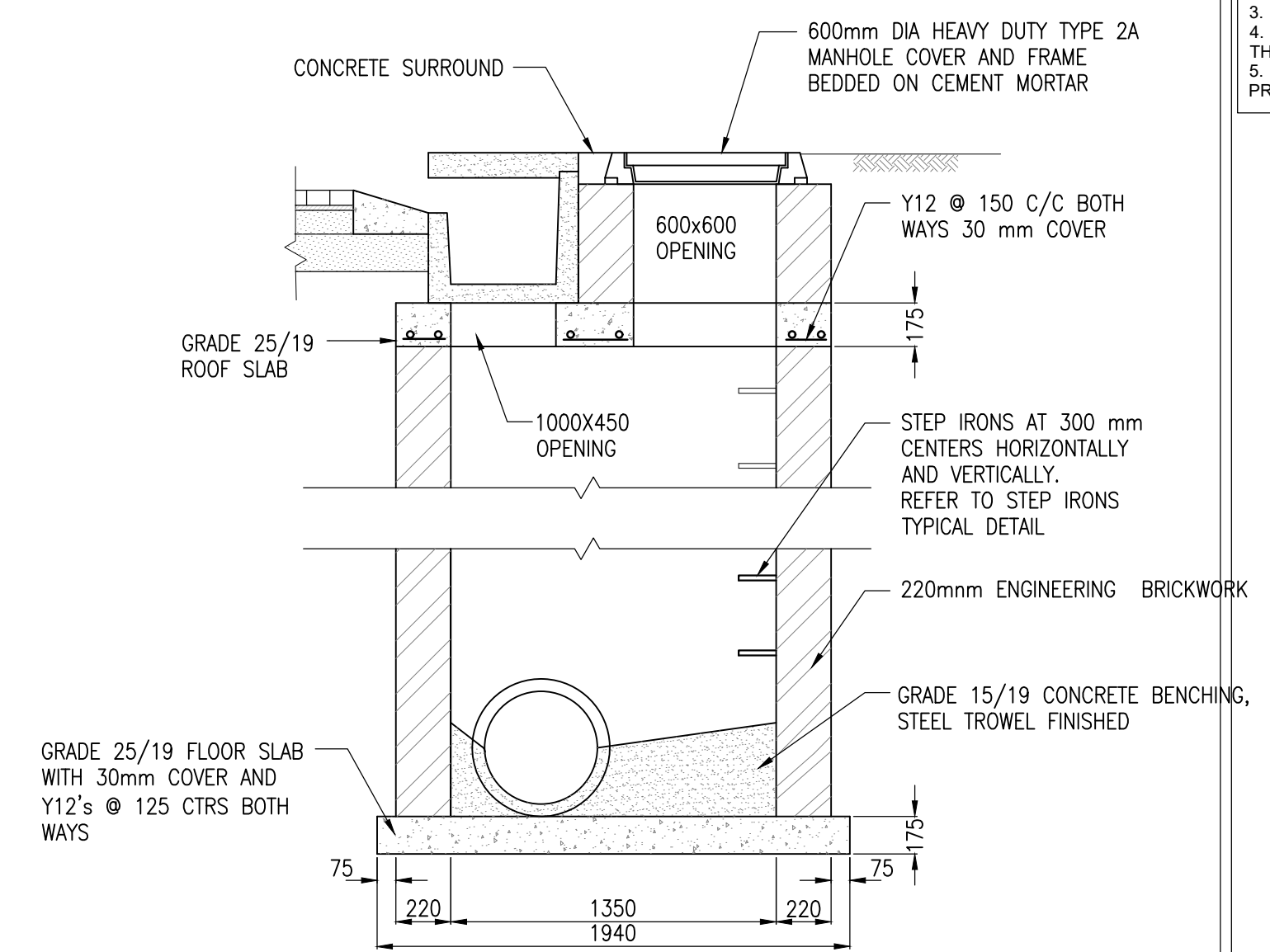


SECTION A1-A1

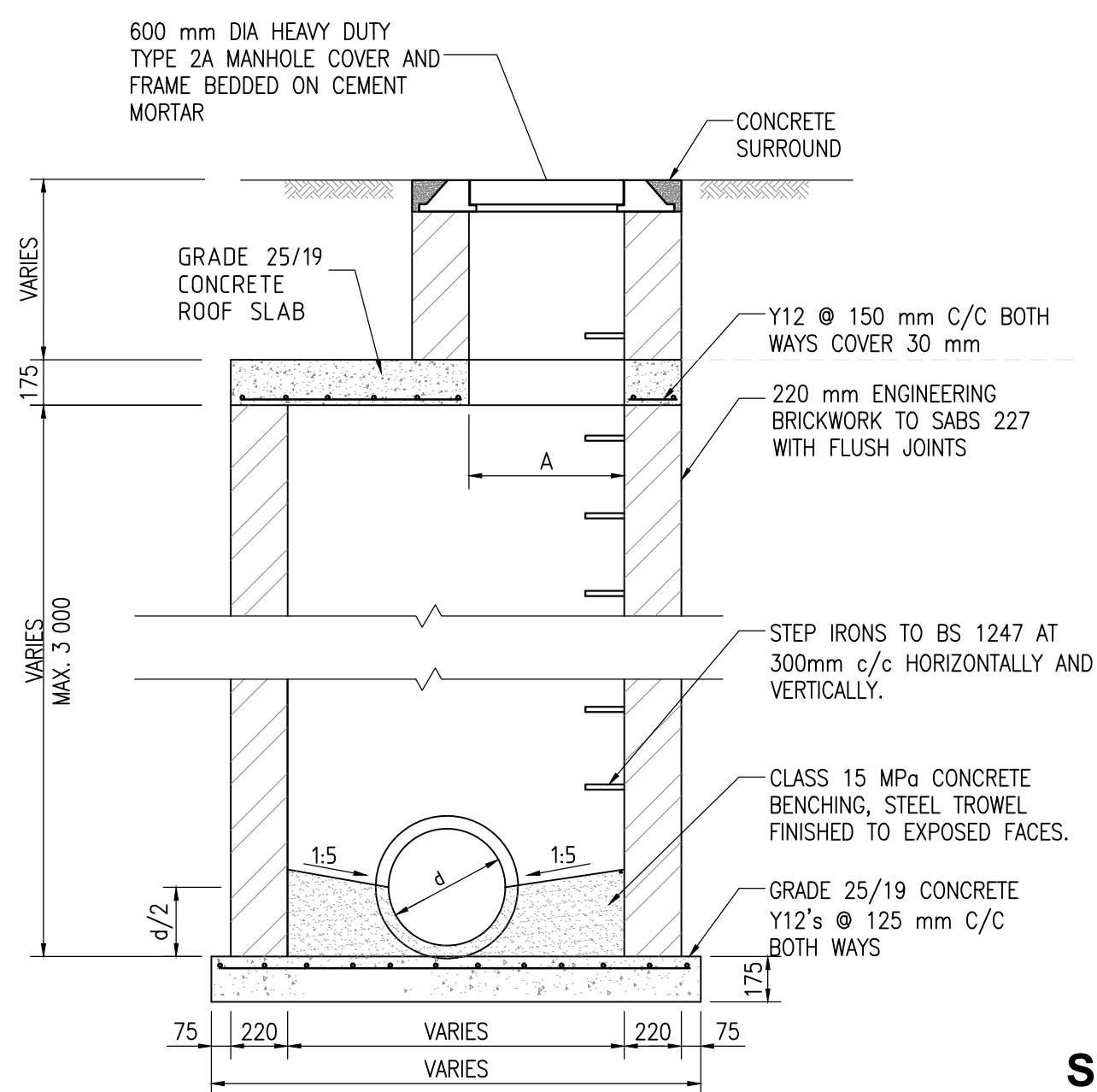


STEP IRONS TYPICAL DETAIL

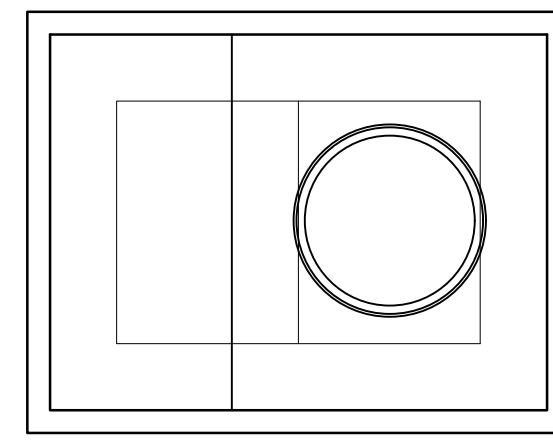
STORMWATER KERB INLET FOR ROADWAYS AND PARKING AREAS
NTS



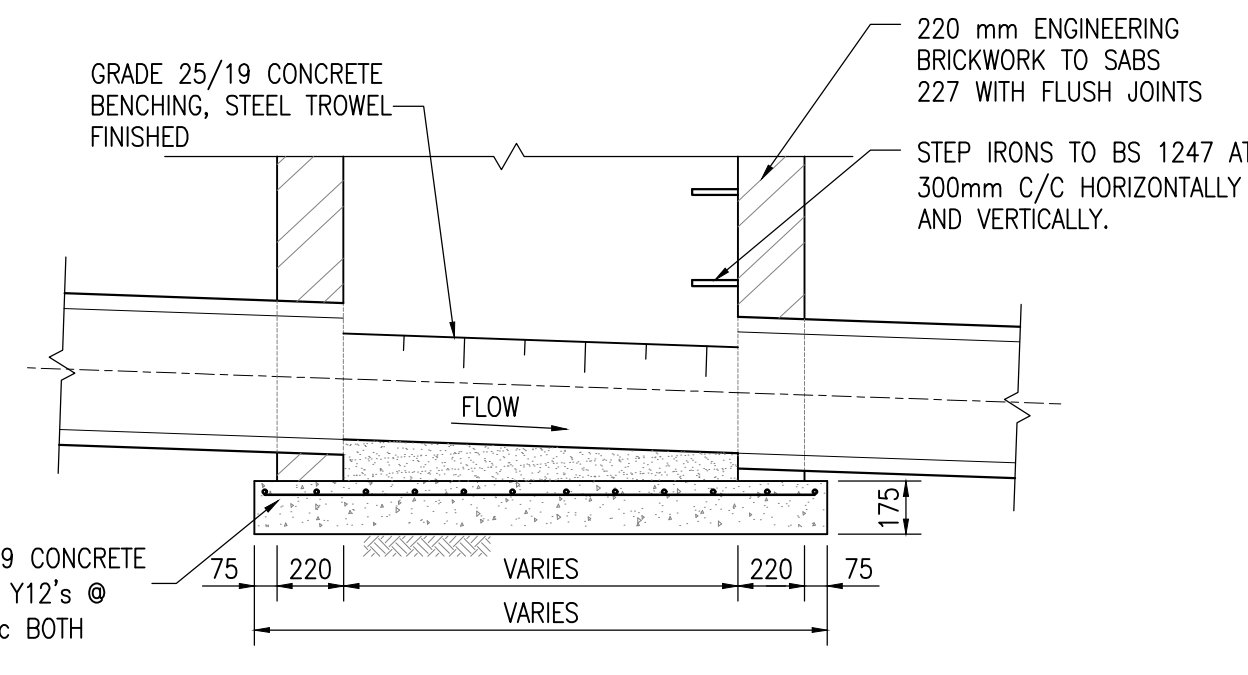
SECTION A-A



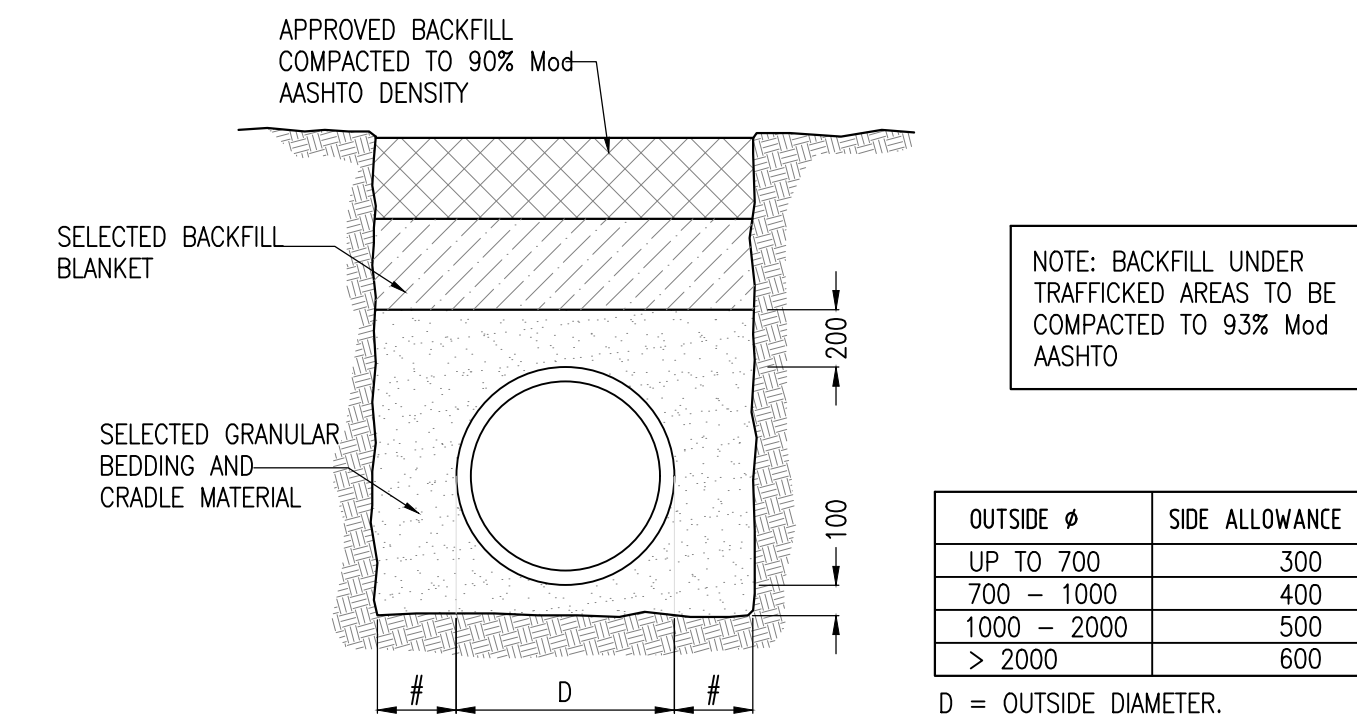
TYPICAL SECTION



DETAIL 001 STORMWATER MANHOLE (TYPE I)
NTS



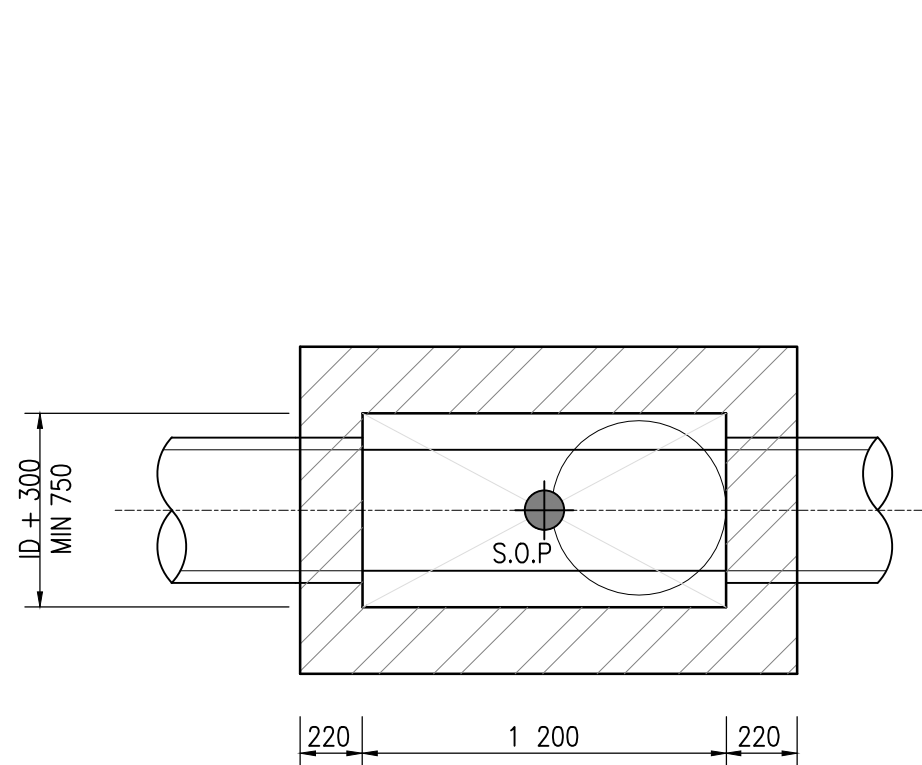
TYPICAL SECTION



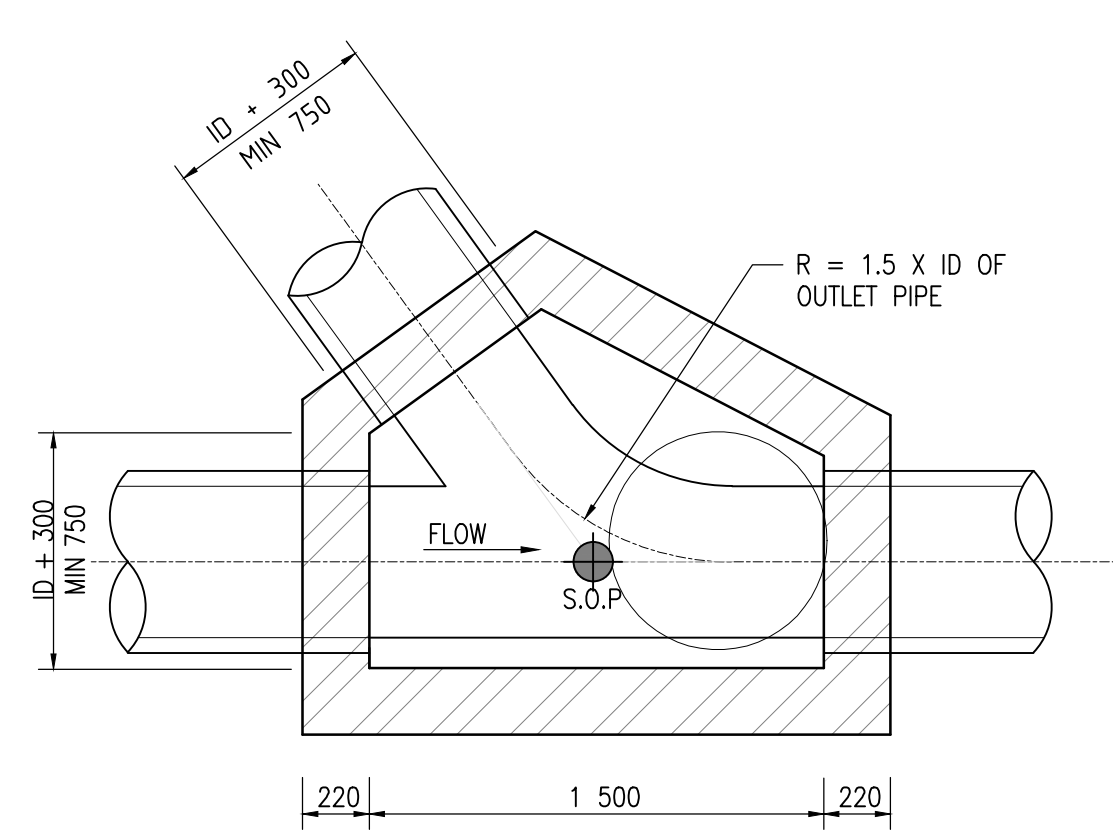
STORMWATER PIPE BEDDING SECTIONS
NTS

OUTSIDE Ø	SIDE ALLOWANCE #
UP TO 700	300
700 - 1000	400
1000 - 2000	500
> 2000	600

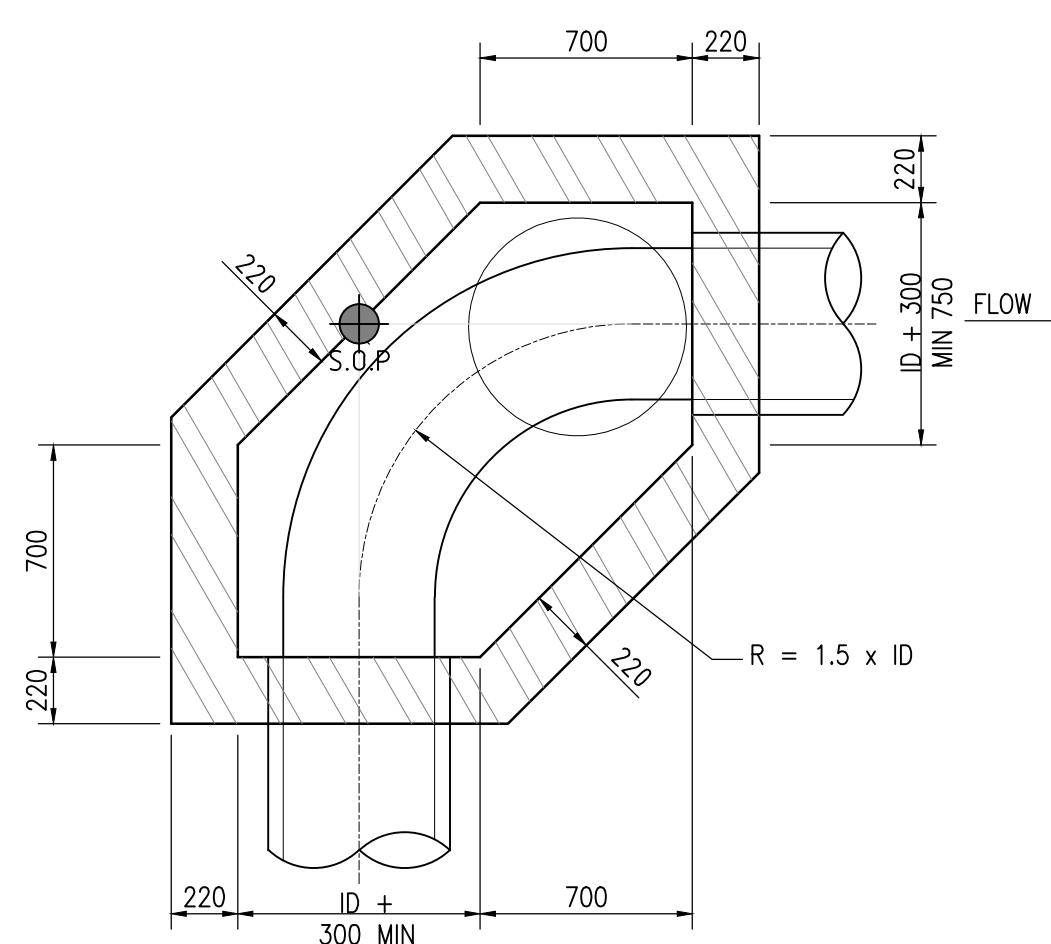
D = OUTSIDE DIAMETER.



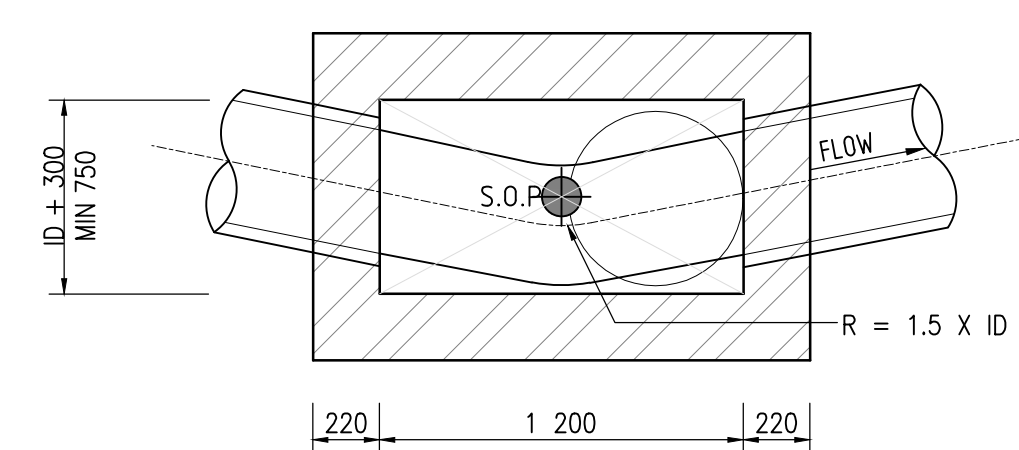
SECTIONAL PLAN - STRAIGHT



SECTIONAL PLAN - JUNCTION



SECTIONAL PLAN - ANGLE > 22.5°



SECTIONAL PLAN - ANGLE < 22.5°

TYPICAL MANHOLES SECTIONAL PLAN
NTS

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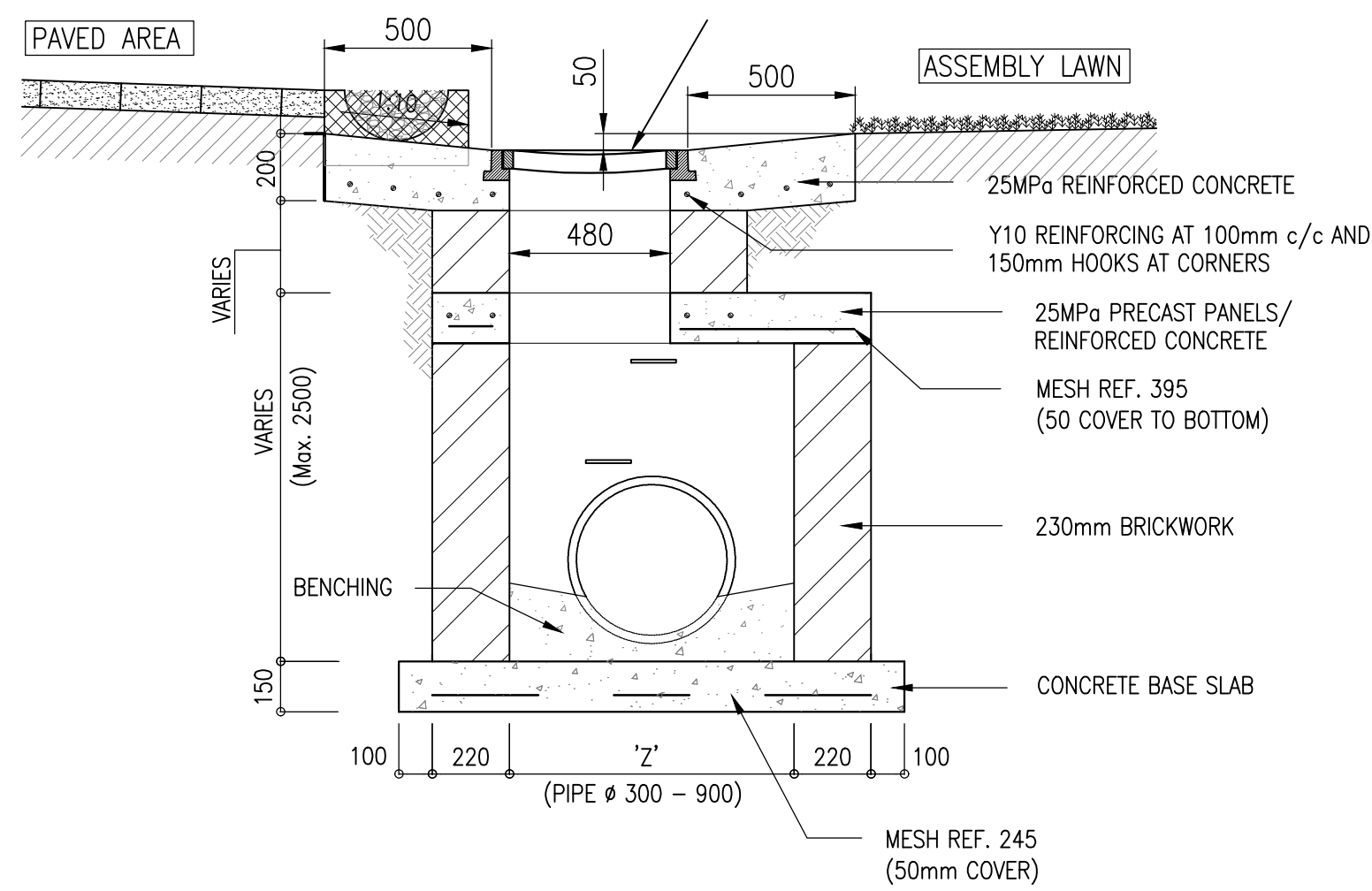
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KOOR DINDAR MOTHEI

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Constitution Hill People's Park Phase 2
Design & supervision of the construction of the People's Park Phase 2 project at Constitution Hill
FOR Constitution Hill Development Company

DRAWING TITLE:
PROPOSED STORMWATER RETICULATION DETAILS - SHEET 1 OF 2

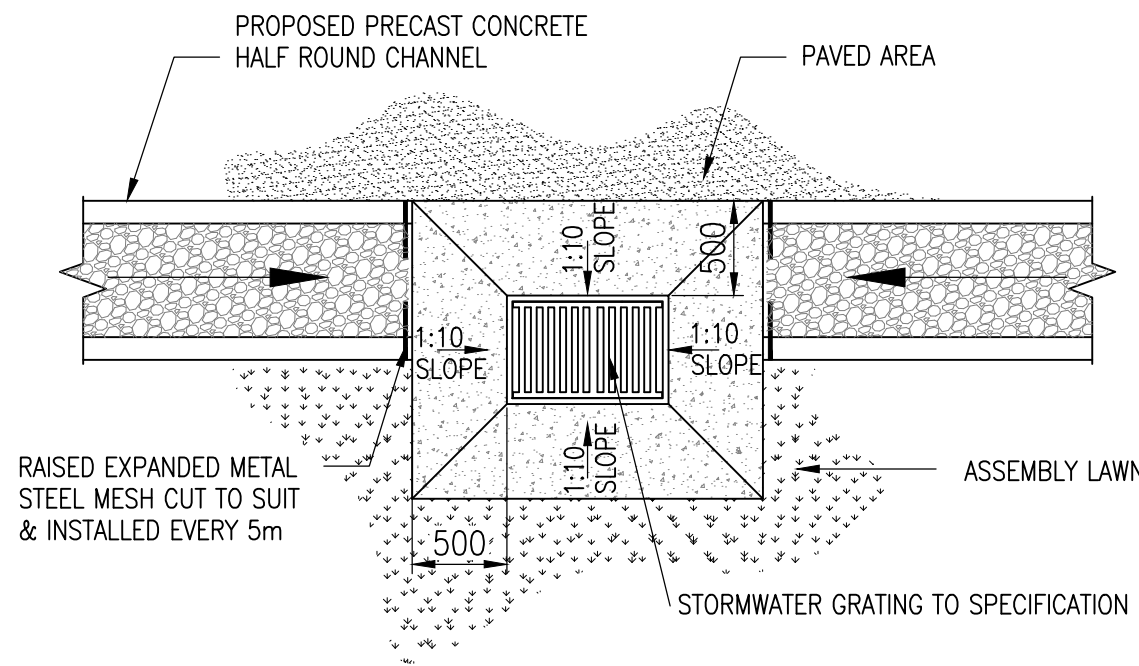
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SCALE As Shown	SHEET SIZE A1
PROJECT No. P1900	DRAWING NUMBER CIV-305
	REVISION A

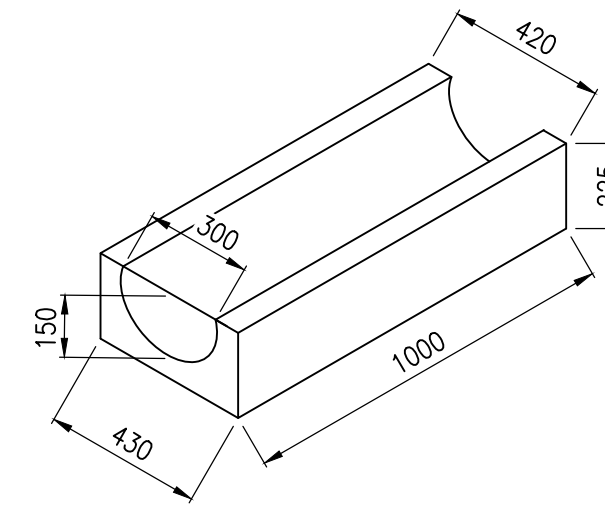


SECTION THROUGH GRID INLET AND MANHOLE

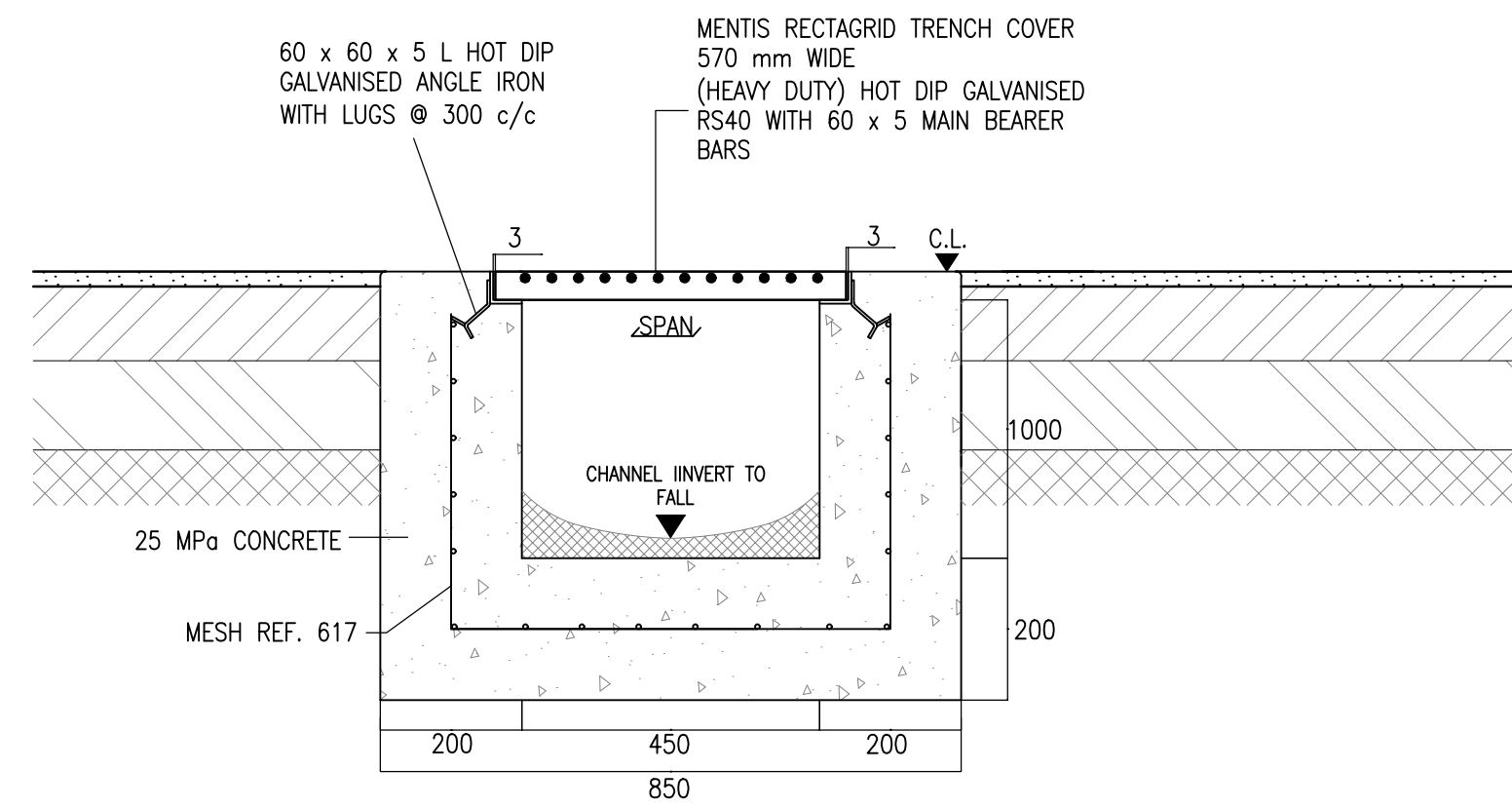
PROPOSED LAWN/ PAVING CROSS SECTION DETAIL
NTS



PLAN VIEW



PROPOSED HALF ROUND CHANNEL
NTS



LINEAR DRAIN CHANNEL DETAIL
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DRAWING TITLE:
PROPOSED STORMWATER RETICULATION DETAILS - SHEET 2 OF 2

For Tender

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SCALE As Shown	SHEET SIZE A1
PROJECT No. P1900	DRAWING NUMBER CIV-306
REVISION A	

PART 1 - GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS

1. DESCRIPTIONS AND PREAMBLES

Reference shall be made to other trades and preambles for preambles and full descriptions of items not fully described in this trade, which shall apply equally to the work in this trade, unless otherwise described.

2. MATERIALS, ETC.

Electrical work, materials, etc. shall comply with the following specifications and requirements:

Material	SABS Specification
Impregnated paper-insulated electric cables	97
Pressure sensitive adhesive tapes for electrical purposes	122
Manually operated air-break switches	124
Flexible cords for power and lighting appliances	127
Plugs, socket-outlets and socket-outlet adapters	129
Lamp holders and lamp holder adapters	132
Polyvinyl-chloride (PVC)-insulated electric cables and flexible cords	150
Fixed electric storage water heaters	151
Low-voltage air-break switches, air-break disconnectors, air-break switch disconnectors and fuse-combination units	152
Moulded-case circuit-breakers	156
Low voltage porcelain insulators	161
Wall and appliances switch	163
Two-pole and earthing-pin plugs and socket-outlets	164
Lamp holders	165
Rubber-insulated cables and flexible cords	168
Surge arresters for low voltage distribution systems	171
Cartridge type fuse-links for low voltage electric fuses	172
Fuse-link holders for cartridge type fuse-links	173
Flexible polyvinyl chloride (PVC) compounds for electrical purposes	175
Porcelain cleats, bobbins and leading-in tubes	176
Flameproof enclosures for electrical apparatus	314
Immersion heaters for electrical storage water heaters	514
Heat-resisting wiring cable	529

Earth leakage protection units	767
Ballast for fluorescent lamps and fluorescent lamp reference ballasts	890/891
Plasticized polyvinyl chloride rigid conduit and fittings for use in electrical installation	950
Enclosure for electrical apparatus (dust-ignition-proof or hose-proof or both)	969
Standard voltage and currents and insulation levels for electricity supply	1019
Standard transformer bushings	1037
Tubular fluorescent lamps for general service	1041
Earth rods, couplers and clamps	1063
Metal conduits and fittings (screwed-end and plain-end) for electrical wiring	1065
Intercommunication systems	1066
Cover plates for wall outlet boxes	1084
Wall outlet boxes for the enclosure of electrical accessories	1085
Luminaire entries and spigots	1088
Contractors	1092
Interior luminaires for fluorescent lamps	1119
Electric distribution boards	1180
Enamelled copper conductors	1181
Busbars	1195
Wireways for electrical cables	1197
Plugs, socket-outlets and couplers intended for non-domestic use	1239
Capacitors for use with fluorescent and other discharge lamp ballasts	1250
Ballasts for low pressure sodium vapour and high intensity discharge lamps and reference ballasts for low-pressure sodium vapour and high intensity discharge lamps	1266/1267
Polymeric or rubber insulated combined neutral/earth (ONE) cables with solid aluminium phase conductors and a concentric copper waveform combined neutral/earth conductor	1268
Streetlighting luminaires, interior luminaires for low pressure sodium vapour and high intensity discharge lamps, and floodlighting luminaires	1277/1279
Fixed electric instantaneous water heaters	1356
Materials of insulated electric cables and flexible cords	1411

The protection of structures against lightning

SANS 61312-1

Installation and maintenance of electrical equipment used in explosive atmosphere 086

Bulkhead lighting fittings (surface mounted) 199

3. DISTRIBUTION BOARDS

Main and sub-distribution boards shall be robustly constructed of galvanised sheet steel of not less than 1,6 mm. The boards shall be fully equipped with the requisite number of circuit breakers, earth leakage device/s, insulated neutral bar/s and earthing bar mounted behind a removable cover plate through which switch toggles are to protrude.

Rating of busbars shall not exceed 1,5 A/mm² for copper and busbars shall be designed to withstand the mechanical and thermal stresses under short circuit conditions. Busbars shall be mounted on porcelain or other approved stand-off insulators with the phase correctly colour coded.

Spacing the busbars shall be not less than 50 mm and neutral busbars must be of the same cross-section as the phase bars.

A suitable solid copper earth bar with enough ways including 30% spare ways shall be provided near the cable entry gland tray and shall be easily accessible.

All internal wiring shall be carried out with PVC insulated stranded copper conductors of adequate size and of a colour corresponding to the relevant phase. Conductors shall be neatly led in vertical or horizontal rows and bound with "Helvin" strapping. No joints will be allowed in internal wiring.

All boards shall be completely vermin proof.

The Contractor will be required to balance the loads as evenly as possible across the phases to the entire satisfaction of the Architect before final acceptance.

Where distribution boards are to be built into walls, they shall be equipped with an adjustable mild steel shroud to compensate for any irregularities in mounting, plaster thickness or tray position.

The internal surfaces of all distribution boards shall be painted with two coats of best quality "arc free" paint and the external surfaces shall be properly treated and coated with an approved epoxy/polyester baked powder coating process of a colour to be approved by the Architect.

Distribution boards shall always be properly protected until final hand over to obviate damage during construction.

Any damage shall be made good to the entire satisfaction of the Architect.

All safety warning notices shall be in both official languages.

Labels as separately provided for shall be in the sequence shown on the drawings; all circuits and functions shall be properly and clearly identified.

All labels used shall be engraved trifoliate with black letters on a white background for all normal labels and red letters on white background for all danger notices.

The main isolating switches shall be clearly labelled in accordance with the regulations and the size and origin of all supply cables and busbars shall be clearly labelled, as must all equipment have situated inside the board, indicating function, circuit controlled, fuse rating, etc.

A legend card, covered by removable 2 mm thick transparent acrylic plastic panel, shall be installed on the inside of the door of the distribution boards or cubicles and circuits shall be designated on this card. All other equipment shall be individually labelled, indicating function. All plates shall be fixed to panels by means of screws or channelling.

Doors to distribution boards shall be suitably braced, on heavy duty "lift-off" hinges and shall be fitted with approved spring catches without locks.

Removable front panels shall be secured by means of quick release fasteners and front panels carrying instruments shall be hinged in addition. Where nuts are visible, chromium-plated dome head nuts are to be used.

All terminations onto busbars shall be by means of turned copper cable lugs soldered or crimped to the conductors and these shall be bolted onto the busbar with cadmium plated high tensile bolts with nuts, washers and lock washers.

4. EQUIPMENT

Lightning arrestors shall be provided for each phase in all main boards.

All mounted case circuit breakers shall be of flush panel mounting and with inverse current time delay overload and instantaneous short circuit characteristics. Mechanically coupled single-pole circuit breakers used as double or triple-pole circuit breakers are not acceptable unless overload releases are internally coupled. The fault current rating shall be as specified but not less than 5 kA.

Space is to be provided in each board for at least 30% but not less than three additional single-phase breakers. When spare capacity for future circuit breakers is called for, escutcheon blanks shall be used and not blank-off covers.

Triple, double and single-pole switches shall be capable of breaking the full load and closing on to a full system fault. The fault current rating shall be specified, but not less than 5 kA.

All contactors and relays shall comply with BS 5424 and shall be able to withstand the maximum prospective fault current than can occur at the point where the contactor or relay is installed. All contactors unless otherwise specified shall have two normally opened and two normally closed auxiliary contacts spare of 10A rating.

Earth leakage protection units shall be suitable for operation at the system voltage, shall have test push buttons and unless otherwise specified shall have a sensitivity of 30 mA maximum. Earth leakage protection units shall not incorporate overcurrent protection.

Time switches shall be suitable for operation at the system voltage with silver to silver or other approved contacts rated at not less than 10 A with a 72-hour battery reserve and are to have the following features:

- daily programmable with minimum 5 minute "on" and "off" control segments.
- weekly programmable with day omission segments of minimum 1 hours,

Ammeters shall be 96 mm flush mounted 5 A instruments complying with BS 89 and shall be combined maximum demand registering and instantaneous indicating type with direct reading scales with a full-scale deflection corresponding to 120% of the rated circuit current. Full load ratings are to be indicated with an indelible red line.

Current transformers shall be mounted in such a way that they are visible when the front panel is removed with the name plate indicating class, rating ratio and functioning.

Voltmeters shall match ammeters and shall be of 400 V moving iron suppressed zero type scaled up to 500V.

Voltmeter selector switches shall be suitable for a three phase 50 Hertz system and must be so arranged that voltages between phases, and phases to neutral, can be read. Voltmeter selector switches shall be suitable for the system voltage. Voltmeter selector switches shall be of the break-before-make type.

The voltmeter selector switch shall have one "off" and six "metering" positions and shall be suitable for panel mounting in such a way that the operation knob and indicator plate can be mounted on the front of panel and the switch itself at the back of the panel.

The operating knob and indicator plate shall be manufactured of insulating material and the switch positions shall be clearly and indelibly marked thereon.

The switches shall be provided with substantial contacts and the terminals shall be clearly marked and arranged for easy wiring.

The voltmeters of ammeter selector switch shall be mounted directly below the associated volt or ammeter.

5. CABLES

All cables shall be unrolled, handled, laid, supported, etc. in accordance with the manufacturer's recommendations.

All polyvinyl chloride insulated cables (PVC/PVC/SWA/PVC and other) shall be single steel wire armoured and shall be served overall with a final layer of polyvinyl chloride or shall be aluminium strip armoured served overall with a final layer of polyvinyl chloride.

Cables laid in ground shall be laid in trenches to a depth as specified and shall be bedded in and enclosed in clean river sand 75 mm all round before backfilling commences. Ends of all PVC/PVC/SWA/PVC cables shall be made off (terminated) with a suitable gland complete with neoprene shroud, effectively earthed with armouring clamped between substantial tapered bushes and bolted to equipment or switchboards. All mechanical cable glands shall be of the captive cone type. No joints in cable runs will be allowed except under exceptional circumstances and then only as specifically approved by the Engineer.

When more than one cable is laid in the same trench, they shall be laid parallel to one another not less than 40 mm apart.

All trenching and excavation shall be reinstated to the original condition by mechanical compaction in 150 mm layers and the Contractor shall be responsible for the making good of any settlement.

Yellow or orange PVC marking tape, 150 mm wide, with the wording "Buried Electric Cable Below - Caution" and "Elektriese Kabel Hieronder - Gevaar" shall be laid at a depth as specified below ground level above each cable.

In the case of HT cables, PVC or concrete cable tiles shall be laid at a depth as specified below ground level above the cable/cables.

Approved concrete cable route markers shall be installed at each point where the installed cable changes direction and at intervals along the cable route as specified.

6. TRUNKING

Trunking wiring channels shall be plastic, aluminium or galvanised mild steel rolled lipped channels fixed as specified. All cut ends of metal trunking shall be filed smooth and touched up with an approved zinc-rich cold galvanising paint.

Power skirting shall be two or three compartment trunking fixed as specified.

7. CONDUIT AND ACCESSORIES

Conduit shall either be seamless hot dipped galvanised conduit, heavy gauge black enamelled conduit or plastic conduit (SABS approved). Where conduit is surface mounted, it shall be fixed with galvanised space bar saddles as specified.

All metal conduit accessories shall be malleable iron or pressed steel and except in the case of brass bushes shall be hot dipped galvanised.

Draw boxes shall be positioned where approved by the Architect and to have covers.

Where conduits are surface mounted, they shall be run parallel to the structure. In roof spaces conduits shall run in parallel paths with a minimum of crossovers and shall be adequately secured by means of saddles as specified.

Where conduit is run across building expansion joints, special precautions shall be taken to ensure that the conduit is free to follow any movement of the building.

Care shall be taken in the bending of conduit to avoid "kinking" and all burred ends of conduit shall be treated to avoid damage to cable insulation.

Conduits cast into concrete shall be securely fixed in position before pouring commences.

Conductors may not be drawn into conduits before the conduiting has been inspected and approved by the Architect.

All conduit for communications services shall have drawn-wires as specified drawn in and left in.

All conduits shall be bushed and secured by locknuts to distribution boards, wall boxes, etc.

Spare conduits (10% with a minimum of two 20 mm and one 25 mm conduits) shall be run from the distribution boards into the roof space to cater for future circuits.

8. CONDUCTORS

Conductors shall be either PVC insulated stranded copper conductors or solid copper conductors of the sizes specified.

All earth continuity conductors laid with cables shall be bare stranded copper conductors and all other earth continuity conductors shall be PVC insulated stranded copper conductors.

Extreme care shall be taken not to apply excessive mechanical tension to PVC insulated conductors when drawing in and care shall also be taken not to draw PVC insulated conductors around sharp corners or protruding surfaces in conduits.

PVC insulated conductors shall be lubricated with high quality French chalk before they are drawn into conduit. The use of lubricating oil for drawing in PVC insulated conductors is not permitted.

Conductors between an isolator and appliance shall be of the same cross-sectional area as the conductors fed to the isolator and shall, where necessary, be in flexible metal conduit. Wiring between isolators and fixed heating appliance terminals shall be in silicone rubber insulated conductors.

Wiring installed in wiring channels shall be installed in the correct compartment to prevent any crossovers and shall be bound together in groups not exceeding ten conductors by means of approved straps at spacings not exceeding 1m.

No joints will be permitted in wiring.

Circuit wiring shall be of the loop-in system, and not more than four conductor ends will be allowed at any one termination point. Cutting away of wire strands of any cable will not be allowed and no jointing of conductors in draw boxes or the cutting away of insulation is permissible. Where joints are used, they shall be in heavy brass terminals with porcelain insulators.

Circuits for different services, e.g. lighting circuits, power circuits, intercommunication circuits and telephone circuits, shall each be routed in separate conduit runs.

A neutral conductor, equal in size to the phase conductors, shall be run to each three-phase outlet unless otherwise specified.

9. SWITCHES AND SOCKET OUTLETS

All switches and switches socket outlets shall be of approved manufacture.

Watertight switches shall be of quick make and break type with porcelain boxes in robust brass or galvanised cast iron cases with machined joints or in plastic or aluminium cases.

All switches and switches socket outlets of the domestic or industrial type shall be rated for 250 Volt 16 Ampere.

Three phase socket outlets shall be of the CEE-17, 380V, 6h pattern with five contact tubes incorporating an interlocked switch and shall be rated at 32 A.

10. LUMINAIRES

All luminaires shall be complete with lamps, ballasts, chokes, control gear and all other accessories required. All luminaires with a metal content shall be equipped with an earth terminal and shall be properly earthed.

Internal wiring of luminaires shall consist of heat-resisting PVC insulated stranded copper conductors of not less than 0,5 mm².

Luminaires shall be designed to prevent excessive temperatures and components and materials shall be selected so that they are not adversely affected by the operating temperature.

The voltage rating and lamp wattage shall be clearly and indelibly marked on control gear.

Ballasts shall be silent in operation. Noise level reports, prepared by an accredited laboratory, shall be submitted for approval to the Architect on request.

The wattage and type of the lamp suitable for use in the luminaire shall be clearly marked on the base of the luminaire close to the lamp holder. For incandescent luminaires, the maximum wattage of the lamp shall apply.

11. FIXING OF LUMINAIRES

Ceiling mounted luminaires shall be secured by at least two screws into the outlet box, using sherardized steel screws.

The Contractor shall supply framing formed of brandering in the roof spaces around and shall cut the ceiling boards at outlet boxes.

Fluorescent luminaires other than single or double tube luminaires of 1,2 m long or less shall be supported in at least two positions, each of which shall be not exceeding 450 mm from the ends of the luminaires.

Fixing in concrete slabs shall be to outlet boxes; metal inserts or bolts cast or shot into the concrete.

12. CONNECTIONS

The Contractor shall allow for making connections to equipment supplied by others as specified and for providing lugs soldered or crimped to conductors as may be necessary.

13. INSTALLATION

The entire electrical installation shall be executed in accordance with SANS 10142-1:2003 "The wiring of premises".

PART 2: DETAILED PROJECT ELECTRICAL SPECIFICATIONS

1 GENERAL INFORMATION FOR THE CONTRACTOR

1.1 FORM OF CONTRACT

The successful tenderer shall enter into a Sub-Contractor's Agreement with the Principal Contractor.

1.2 TENDER PRICE

The unit price in the bill of quantities shall be net and VAT exclusive.

1.3 CONTRACT WORK

The installation shall be carried out entirely by the Electrical Contractor's own staff and shall not in any way be sub-let.

1.4 SITE VISIT

Tenderers must visit the site to ascertain the local conditions, and to allow in their tenders for all equipment, material, labour, and other costs to complete the work as specified.

No claims for extras will be allowed if the Tenderer overlooks site conditions and does not allow for these circumstances in their tender.

The tenderer must thoroughly familiarise themselves with the extent of the work being done and clear up all uncertainties beforehand.

1.5 SUPPLY AUTHORITY

This must be signed by an Electrician who is a permit holder in accordance with the requirements of the Occupational Health and Safety Act, Act 85 of 1993 as revised to the owner of the building.

A copy of the certificate of compliance will be handed to the supply authority and a copy to the Engineer.

1.6 INFORMATION TO BE SUBMITTED WITH THE TENDER

THE TENDERER'S ATTENTION IS DRAWN TO THE FACT THAT IF THE SCHEDULES OF THIS SPECIFICATION ARE NOT COMPLETED, HIS TENDER CANNOT BE ADJUDICATED AND MAY BE DISQUALIFIED.

1.7 SEQUENCY OF WORK

The sequence in which the work is to be carried-out must be determined in collaboration with the authorised representative of the Principal Contractor.

1.8 SUPERVISION

The works must under all circumstances be supervised by a qualified and experienced representative of the Contractor who must be registered as an accredited person. The representative must be authorised by the Contractor and must be able to receive instructions on behalf of the Contractor.

1.9 MAKING GOOD

The Electrical Contractor shall carry-out, in all instances, any work to be made good such as damage to, or disturbance of the buildings or installations, caused by himself or his employees during the execution of this contract, at his own cost.

1.10 ELECTRICAL EQUIPMENT

All the equipment and material must comply with the attached General Specification and must have the approval of the Engineer.

1.11 SCOPE OF THE SUB-CONTRACT

This contract covers the supply, delivery, installation, testing and commissioning of the entire electrical installation associated with the alterations, refurbishments, and additions to the Constitutional Hill Park in Johannesburg.

The scope of electrical works shall consist of the following and as indicated on the drawings:

- Supply, installation, and commissioning of LED strip lights on handrails and balustrades as per the drawings
- Supply and installation of power supply cables from the electrical distribution kiosks to the LED strips on the handrails and balustrades
- Locate the existing underground cable from Distribution Kiosk 1 to Distribution Kiosk 2 laid across the field and deepen the level as per the new levels of the field
- Remove and reposition the streetlights on the eastern side of the facility away from the new boundary as indicated on the drawings
- The excavation and back-filling of all cable trenches
- Commissioning and testing of the new installation, issuing a Certificate of Compliance and submission of the "As-Built Drawings".

1.12 ELECTRICAL CONNECTION

There is an existing power supply to the facility and the contractor shall obtain power for the LED lights from the existing distribution kiosks as per the drawings

Cables shall be in accordance with the cable's specifications in the General Specifications.

1.13 ELECTRICITY SUPPLY SYSTEM

The supply system is as follows:

High Voltage 11,000V 3-phase 3-wire 50Hz AC Supply

Low Voltage (No Load) 400 / 231V, 3-phase, 4-wire 50Hz AC Supply

1.14 TECHNICAL REQUIREMENTS OF THE INSTALLATION

Over and above the equipment specified in this Specification the Contractor shall supply and install equipment and auxiliary equipment which he may consider necessary for the proper operation of the complete Electrical Installation to fully comply with the requirements of this Specification.

1.15 QUALITY CONTROL

The Contractor shall maintain adequate and effective quality control standards while installing the specified equipment. The Engineer shall have the prerogative of inspecting the equipment in the Contractor's factory at any reasonable time to ensure accuracy of dimensions, completeness, configuration, quality of workmanship, correct identification, proper use of and type of materials, equipment used and finishes to equipment.

If required, the Contractor shall provide the Engineer with equipment and facilities to examine the equipment and if necessary, test this equipment to preclude malfunctions of the equipment.

1.16 RELIABILITY AND MAINTAINABILITY OF EQUIPMENT

The equipment used in the installation shall be new and of good commercial quality, having good reliability and shall be selected for ease of maintenance.

The requirements must be considered in the Contractor's approach to the interpretation of the Engineers design and may be subject to approval by the Engineer, following demonstration of the equipment's capability by the Contractor.

1.17 TERMINOLOGY

The function of and positions to which equipment is connected shall be indicated on the boards.

All equipment shall be fitted with identification labels like the type specified in General Technical Specification.

Terminology shall be in "ENGLISH".

1.18 AS BUILT DRAWINGS

On completion the Electrical Contractor must provide the Engineer with one complete set of "As Built" drawings. These drawings must show the exact installation as finally completed.

The Contractor must use the same List of Symbols, etc., used by the Engineer. Only drawing work conforming to the latest drawing office practice will be accepted.

2 CABLES

2.1 GENERAL

The Contractor must supply and install all the necessary medium and low voltage cables as required by this document and shown on the drawings.

NB. All cables shall have the SABS mark of approval.

2.2 LOW VOLTAGE (LV) CABLES

Specifications

The low voltage cables must be of the 600/1,000V PVC insulated armoured (PVC/PVC/SWA/PVC) type.

The cables shall conform to the General Technical Specification and the following:

Condition of Services	Normal
Armouring	SWA
Conductor Material	Stranded Copper

Cable Trenches

Cable trenches shall be excavated to the following dimensions:

HT Cables	1,000mm (depth) x 450mm (width)
LT Cables	800mm (depth) x 300mm (width)

LV Cable Terminations

LV cable terminations shall be done with cable glands, shrouds, and suitably sized cable lugs.

LV Cable Joints

Joints in LV cables will only be allowed when specifically approved by the Engineer. If joints are made, it must be done in accordance with the General Technical Specification.

Cable Routes

The low voltage cables shall be installed as specified in the schedules of this document and in the positions shown on the drawings.

2.3 CABLE SLEEVE PIPES

Supply and install all the cable sleeves in positions indicated on the drawings.

3 DISTRIBUTION BOARDS

3.1 GENERAL

There are existing weatherproof distribution kiosks to which the power to the LED strip lights shall be supplied from.

The construction and wiring of the boards must be in accordance with the General Technical Specification.

There is additional space for future extensions that has been allowed for in the existing distribution kiosks.

The contractor shall update the legends to include all the additional circuits added

3.2 CIRCUIT BREAKERS

All MCB's shall have minimum fault capacities as specified on the schematic diagrams. The frame sizes of the MCB's shall be adequate for the size of conductors used in the installation.

3.3 SERVICES DISTRIBUTION BOARDS/DRAWBOXES

All the services distribution boards and draw-boxes must be manufactured to the same standards and finish, complete with architrave frame and doors and shall be flush mounted.

3.4 EARTHING OF BUILDING & INSTALLATIONS

Installations shall be effectively earthed in accordance with the "Standard Regulations" and to the requirements of the supply authority, who may require additional earthing to meet test standards. Earthing must comply with S.A.B.S 0142 – 1993.

4 WIRING OF CIRCUITS

4.1 GENERAL

A neutral equal in size to the phase conductors and earth wire one size smaller than the phase conductors must be installed to each three-phase outlet.

Cable lugs must be used at all terminations of conductors. The lugs must be soldered or crimped to the end of the conductor with the correct amount of insulation removed to fit the lug. Strands may not be cut from the conductor.

4.2 CONDUCTOR SIZES

Refer to schematic diagrams for conductor sizes and earth wire sizes for each individual circuit.

4.3 WIRING THROUGH LIGHT FITTINGS

Where surface mounted fluorescent light fittings are installed end to end through wiring will be allowed. An interconnecting male bush lock nut and female bush shall be provided between fittings.

5 LIGHTING

5.1 GENERAL

Supply and install the LED strip luminaires schematically indicated on the drawings and the luminaires must comply with the requirements listed hereunder.

The required LED strip luminaires types are specified on the drawings and tie up with the types indicated on the layouts.

Samples of all luminaires must be approved by the engineer before any order is placed.

All light fittings shall be supplied complete with SABS approved control gear and lamps.

The installation of luminaires must be done in accordance with the relevant clauses in the general project specification.

All luminaires must be complete with lamps and where necessary, control gear.

6 CONDUITS AND WIRING OUTLETS

6.1 GENERAL

Supply and install all the outlet points in the positions shown on the drawings.

The conduit installation shall be done in accordance with the General Technical Specification.

6.2 LIGHT SWITCHES

Where required, outlets for light switches shall consist of a 100 x 50 x 50 mm deep draw-box installed recessed in wall or partitioning.

7 PHOTOCCELL

All the LED strip lights to the handrails and balustrades shall be switched directly by a photocell and the photocell shall be mounted on the side of the distribution kiosk.

The photocell must be wired to the distribution board by 3x 2.5mm² PVC conductors drawn in conduit.

The photocell must comply with the following:

- Area lights must be switched ON when the illumination drops to 50lux

- Area lights must be switched OFF when the illumination is raised above 90lux.
- It must be weatherproof and must have a built-in time delay of approximately 40 seconds
- Built in protection against voltage surges must be provided
- A sample of the proposed photocell must be submitted to the Engineer for approval
- The photocell shall be 16A rated

8 EXCAVATION

Material to be excavated shall be classified as follows:

"Rock" will be held to be composed of boulders each exceeding a nominal diameter of 1 m and solid rock in bulk or banks or ledges, the practicable excavation of which would necessitate the use of explosives and or drilling and wedging.

"Soft rock will be held to be material other than rock, the excavation of which would be economically impracticable if executed by pick and shovel or by means of an ordinary "back actor" without attaching a special mechanical ripper to it.

Soft rock material can only be excavated by either pneumatic tools or by a "back actor" with a special mechanical ripper attached to it. Soft rock shall include soil with loose boulders with nominal diameters between 300 mm and 1 m.

"Pick-able soil" will be held to be material more easily excavated and not falling into the categories of "rock" or "soft rock" such as gravel, earth, turf, scale, sand, silt and clay.

9 BACKFILLING OF EXCAVATIONS

9.1 GENERAL

The Contractor shall be responsible to dig all cable and sleeve pipe trenches indicated on the drawings. All cable trenches shall be backfilled in 150mm layers to a density of 90% MASSHTO.

9.2 ROAD AND PAVED AREA CROSSINGS AND SLEEVE PIPE TRENCHES UNDER BUILDINGS

After installation of cable sleeve pipes under roads, paved areas or buildings, the Contractor shall be responsible for backfilling and compaction of these trenches in 150mm layers. This must be done to the satisfaction of the Engineer to a density of MASSHTO of 90% on bottom layers, 93% for the third layer from the top, 95% for the second layer of the top and 97% of the top layer.

The third layer from the top shall be of selected sub grade quality, the second from the top layer shall be subbase quality and the top layer base course quality or alternatively the three top layers can be stabilised with 7% cement and compacted to the required densities. All tests to prove the density of layers shall be for the account of the Contractor.

All cable trenches must be excavated in the positions shown on the drawings. All cables must be installed at a depth of 1,0m for HV cables and 800mm for LV cables. There are existing services in the areas where the cable trenches must be excavated. The contractor must take care not to damage these services.

It is the responsibility of the Contractor to obtain the drawings showing other services. Any damage to these services will be for the Contractor's account.

The bottom of the trenches must be even and shall follow the contour of the natural ground level.

10 CABLE TRENCHES

Due to the locality of the cable trenches in relation to the building site, the contractor is to ensure that the cable trench does not stay open for more than 4 (four) days.

During excavation activities the contractor is to ensure that the trench is properly demarcated and protected.

11 CONDUIT

All conduit and accessories shall be galvanized conduit type except where specifically indicated to the contrary

12 INNOVATIVE WIRING SYSTEMS

Only innovative wiring systems with an extruded aluminium sheath commonly known as "SURFIX" will be accepted. Twin and earth wiring systems without the extruded aluminium sheath will not be accepted.

End of Specification

Crossman, Pape & Associates

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REPORT NO 20/30/WK (Rev. A)

JULY 2020

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTITUTION HILL PEOPLES PARK: PHASE 2, HILLBROW, GAUTENG

1. INTRODUCTION AND TERMS OF REFERENCE

At the request of Tembisa George of Constitution Hill Development Company Soc. Ltd., we have carried out a geotechnical investigation for the proposed Constitution Hill Peoples Park in Hillbrow, Gauteng. Confirmation of our appointment to proceed with the investigation was received via a purchase order dated on 20 March 2020. A copy of a site locality plan was received to facilitate the investigation.

The nature of the development is believed to be a precinct with a double-storey building in the southwestern corner, a number of terraced stairways, a central lawn area and a mini Amphitheatre area in the northwest. Exact earthworks details are unknown at this stage.

The terms of reference for the investigation are as follows:

- i) to establish the nature and relevant engineering properties of the upper soil and rock strata underlying the site.
- ii) to comment on suitable excavation procedures for the installation of services and stability of cut excavations.
- iii) to present comments on the use of the on-site soils in the construction of bulk fill terraces, access roads and parking areas.
- iv) to present foundation recommendations for the proposed development.
- v) to comment on any other geotechnical aspects as these may affect the development.

2. SITE DESCRIPTION

The area of investigation comprises a vacant portion of land situated to the east of Queens Way and to the south of Sam Hancock Street. The site covers an area of approximately 0.88 Ha and been built up on a fill platform. The site is covered by grassed lawn. Sub-surface services in the form of stormwater and electrical services are known to be present around the perimeter of the site. The topography is relatively flat at present. A site locality plan is presented in **Figure 1**, below.



Figure 1: Site Locality Plan, Constitutional Hill Peoples Park, Hillbrow.

3. **NATURE OF INVESTIGATION**

3.1 **Fieldwork**

Seven test pits (TP1 to TP7) were excavated across the site on 25 March 2020. The test pits were excavated using a CAT 426F₂ tractor-loader-backhoe (backacter). The test pits were excavated to the excavation limit of the machine. All test pits were profiled in-situ by an engineering geologist and where necessary disturbed soil samples were obtained for laboratory testing. The positions of the test pits are shown on the site plan enclosed in **Appendix A**. Copies of the recorded test pit soil profiles are presented in **Appendix B**.

Dynamic Cone Penetrometer (DCP) tests were conducted at the base of test pits TP1, TP2 and TP3 in order to better understand soil strengths / consistencies beneath the reach of the backacter. The DCP test results are presented in **Appendix C**.

3.2 **Laboratory Testing**

The following laboratory tests have been carried out on the soil samples recovered from the test pits during the field investigation.

- (i) Hydrometer, Atterberg limits and particle size distribution analyses to determine basic engineering properties and to effect classification.
- (ii) Moisture / density and California Bearing Ratio (CBR) tests to evaluate compaction and related strength characteristics.

The laboratory test results are presented in **Appendix D**.

4. SITE GEOLOGY/SOIL PROFILE

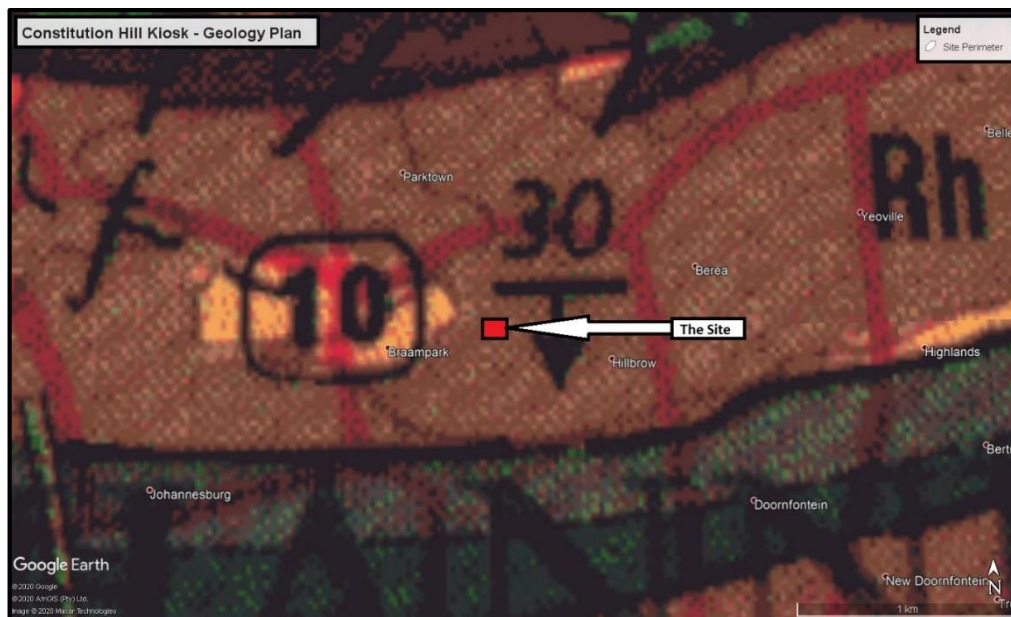


Figure 2: Regional Geology Plan, Constitutional Hill Peoples Park, Hillbrow.

Available geological maps: **2628 (East Rand – 1986)** (see **Figure 2**, above) indicate that the area of investigation is underlain by **shale, quartzite and banded ironstone** of the Hospital Hill Subgroup of the West Rand Group (Witwatersrand Supergroup). This was confirmed during the current investigation. Residual quartzite soils have developed from the weathering of the quartzite bedrock. The general soil profile is as follows.

The upper soil layer in all test pits, namely TP1 to TP7 comprises a predominantly medium dense to dense (with zones of loose and very dense in places) uncontrolled and voided silty sand with scattered to abundant gravels, cobbles and boulders in places. This horizon constitutes an **uncontrolled fill** and ranges in thickness from 1.6m to 3.3m.

In test pits TP1 and TP2, the fill is underlain by a medium dense to dense intact slightly clayey silty sand with abundant quartz gravels. This soil horizon is of **transported pebble marker** origin, and extends to depths ranging between 2.45m and 2.6m below ground surface (average extent of 2.55m).

The pebble marker horizon in test pits TP1 and TP2, and the uncontrolled fill in test pits TP3 and TP7 is underlain by a loose to medium dense slightly voided silty sand with scattered to abundant quartz gravel. This horizon is of **reworked residual quartzite** origin. This horizon extends to depths in excess of 3.3m below ground surface, that is the depth limit of the backacter.

Minor groundwater seepage was encountered in test pit TP6 at a depth of approximately 1.8m to 2.0m below ground surface.

The area along the northern perimeter of the site, where a retaining wall is to be constructed was considered inaccessible to the backacter. For foundation design purposes, Crossman, Pape and Associates feel that it would be prudent to re-investigate this portion of the site during the construction and earthworks phase, when accessibility is made available.

Table 1: Summary of near-surface ground conditions, Constitutional Hill Peoples Park, Hillbrow.

Test Pit No. ↓ / Soil Layer→	Fill (m-m)	Pebble Marker (m-m)	Reworked Residual Quartzite (m-m)
1	0-2	2-2.45	2.45-3.3
2	0-2.3	2.3-2.6	2.6-3.3
3	0-1.7	-	1.7-3.3
4	0-3	-	-
5	0-3.3	-	-
6	0-3.2	-	-
7	0-1.6	-	1.6-3.3
Average Layer thickness / extent (m)	2.45	2.55	3.3+

5. EXCAVATION PROCEDURES

Excavation procedures for earthworks and for the installation of services have been evaluated according to the South African National Standards standardized classifications for excavations (SANS 1200D, DA & DB). According to this classification, the site generally classifies as **soft excavation** material to a depth in excess of 3.3m below present ground level. Along the southern portion of the site we believe that **intermediate excavation** material, in the form of very dense residual quartzite, may be anticipated. The intermediate excavation material could be removed using medium to heavy earthmoving equipment and / or power tools.

Dynamic Cone Penetrometer (DCP) tests have been undertaken within the base of a number of the test pits in order to determine soil strengths / consistencies beneath the excavation depth of the test pits. The purpose of the DCP tests is to better understand the allowable bearing pressures at depth beneath the site. **Table 2**, below, summarises the test pit final depths as well as the DCP depths.

*Table 2: Test Pit & DCP refusal depths below natural ground level (m),
Constitutional Hill Kiosk, Hillbrow*

Test No.	Test Pit Final Depths (m)	Final DCP Depths (m)
1	3.3	4.3
2	3.3	4.3
3	3.3	4.3
4	3.0	Not done to due instability
5	3.3	Not done to due instability
6	3.2	Not done to due instability
7	3.3	Not done to due instability
Ave (m):	3.3+	4.3+

6. MATERIAL USAGE

Laboratory testing has been carried out on the upper and intermediate soil layers to assess their suitability for use in the construction of bulk fill, access roads and parking areas. Based on a visual and tactile assessment from the fieldwork, however, the following comments are considered pertinent the on-site soil for use in these operations:

- The fill, pebble marker and reworked residual quartzite materials are considered suitable for use as **bulk fill** material as well as **lower selected layer** material.

7. EVALUATION OF FOUNDING CONDITIONS AND GENERAL FOUNDATION RECOMMENDATIONS

The fill horizon as well as the pebble marker and reworked residual quartzite horizons (if exposed at final terrace level) are considered to be potentially highly compressible / collapsible. These soil layers are thus considered unsuitable for use as founding layers, even for lightly loaded structures.

We believe that collapse settlements in excess of 15 mm may take place within the reworked residual quartzite, specifically in the area in close proximity to the proposed double-storey structure.

In light of the above, we would recommend that the following founding solutions be considered for the proposed structure:

- Suitably-designed **reinforced-concrete raft foundations**. This may be constructed within the soils exposed at final terrace level. A modulus of subgrade reaction (kv) of **30 kPa / mm** is recommended for the raft foundation design. It is noted that the "*collapsible nature*" of the upper soil horizon needs to be taken into consideration in the design of the raft. In this instance "wetting up" of the soils could occur, leading to collapse settlement. Thus it is recommended that in the analysis for the design of the raft it should be assumed that a reduction in the support of the raft could occur at any

position below the raft footprint. In such an event, the afore-mentioned modulus of subgrade reaction (K_v) of 30 kPa / mm must be reduced by 50% of this value assuming a 2.0m radius in the worst case scenario. Large loose particles within the fill need to be taken into account during the excavation for the ribs of the raft. Overbreak of the larger particles within the fill should be taken note of during the excavation of the ribs for the raft. Quantities of concrete required for the raft would have to be adjusted accordingly.

- b) The upper in-situ soils may be removed to stockpile and then be re-used to reinstate levels, thus forming an engineered fill mattress within which **conventional spread and strip foundations** could be utilized for the structure. Removal for re-compaction must extend from the soffit of foundations to 1.5 times the breadth of the foundation. The removal process must extend to 1.0m beyond the footprint of the structure. The reinstatement should be carried out in 150 mm layers compacted to 95% of Mod AASHTO at -1% to +2% of optimum moisture content. The foundations (conventional) can then be founded at nominal depth within the soil mattress. The foundations must be sized to limit imposed bearing pressures to **150 kPa**, under which load conditions total settlements would be less than 15mm. Differential settlements can be assumed to be 50% of total settlements.
- c) Along the lower northern boundary of the site (Sam Hancock Street), due to limited access and abundant municipal services, no investigations were able to be conducted in this area. However, with regards the foundations for the retaining wall in this area, we would propose that the in-situ material be removed and recompacted to a depth of 1.5 times the breadth of the foundations for the wall. The reinstatement should be carried out in 150 mm layers compacted to 95% of Mod AASHTO at -1% to +2% of optimum moisture content. **Conventional strip foundations** could be utilized for the retaining wall structure, founded at nominal depth within the recompacted fill material. An allowable bearing pressure of **100 kPa** may be utilized for the design of this wall, under which load conditions total settlements would be between 5mm and 10mm. Differential settlements can be assumed to be 50% of total settlements.

Based on the soil profile as described in **Section 4**, and considering the founding recommendations given above, the site would generally classify as **Zone P (Fill) / C2** in terms of the classification system as given by the NHBRC and SAICE Code of Practice (2010).

8. **SURFACE BEDS**

Surface beds could be placed directly on top of the final terrace platform level within the engineered fill for the strip / spread foundation solution option. The soil conditions within the engineered fill will have been recompacted in layers and will therefore provide sufficient support for the placement of the surface beds.

In the case of suitably-designed reinforced concrete raft foundations, the notion and functionality of surface beds will be incorporated into the raft itself.

9. **BULK EARTHWORKS**

9.1 **Lateral Support**

There is always the risk that exposed cut slopes may prove unstable if left unprotected for a prolonged period of time. For this reason, the timeframe between cut and implemented support needs to be kept to a minimum and that suitable lateral support techniques would need to be utilised.

Since the cut faces are proposed to be semi-vertical cuts of 2.5m heights, a concrete block retaining system is considered to be the most optimally economical solution.

Inferred shear strength parameters for the in situ soils are provided in **Table 3** below and are considered appropriate for the design of the lateral support system on this site.

Table 3: Summary of Inferred Shear Strength Parameters.

Material	Recommended Peak Strength	
	Φ' (°)	C' (kPa)
Fill / Pebble Marker / Reworked Residual Quartzite	30	2

10. **VEHICULAR ACCESS & BYSTANDER AREAS**


The following comments are considered pertinent to the design and construction of access areas onto the site for vehicular movement, as well as areas catering for the mass congregation of persons.

- For pavement design purposes and for the integrity and longevity of the assembly lawn, equality plaza and dignity garden (areas where people may congregate and vehicles may drive), it is estimated that the upper in-situ subgrade material would have a CBR of the order of 5.0 to 7.5 percent if compacted to 90% of Mod AASHTO density at optimum moisture content and of the order of 7.5 to 10.0 percent if compacted to 93% of Mod AASHTO density at optimum moisture content.
- In specific areas that will comprise brick paving, it is recommended that the layer immediately below the brick paving and bedding sand be stabilised. The purpose of the stabilized layer immediately below the bedding sand would be to seal the layerworks from water ingress from ground surface.

12. SUB-SURFACE DRAINAGE

A zone of water seepage was encountered in test pit TP6 during the present investigation. Thus, based on the nature of the in-situ soil profile, the following points are considered pertinent to the development in terms of subsurface drainage.

- Conventional drainage should be allowed for behind all retaining walls within areas of cut for long term conditions.
- Particular attention must be paid to ensure that the damp-proof membrane (DPM) and damp-proof course (DPC) is suitably installed in order to avoid problems in the future with rising damp for the double-storey structure.



M CROSSMAN Pr Eng
CROSSMAN, PAPE & ASSOCIATES



W KRETZINGER Pr Sci. Nat

APPENDIX: A

Site Plan

Constitution Hill Peoples Park Site Plan



Legend

- Site Boundary
- Test Pit positions



Sam Hancock St

Queens Weg

Google Earth

Image © 2020 Maxar Technologies
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70 m

**REPORT 20/30/WK
GEOTECHNICAL INVESTIGATION FOR THE
PROPOSED CONSTITUTION HILL PEOPLES
PARK, HILLBROW, GAUTENG**

**SITE LOCALITY PLAN, PROPOSED CONSTITUTION HILL
PEOPLES PARK, HILLBROW, GAUTENG**

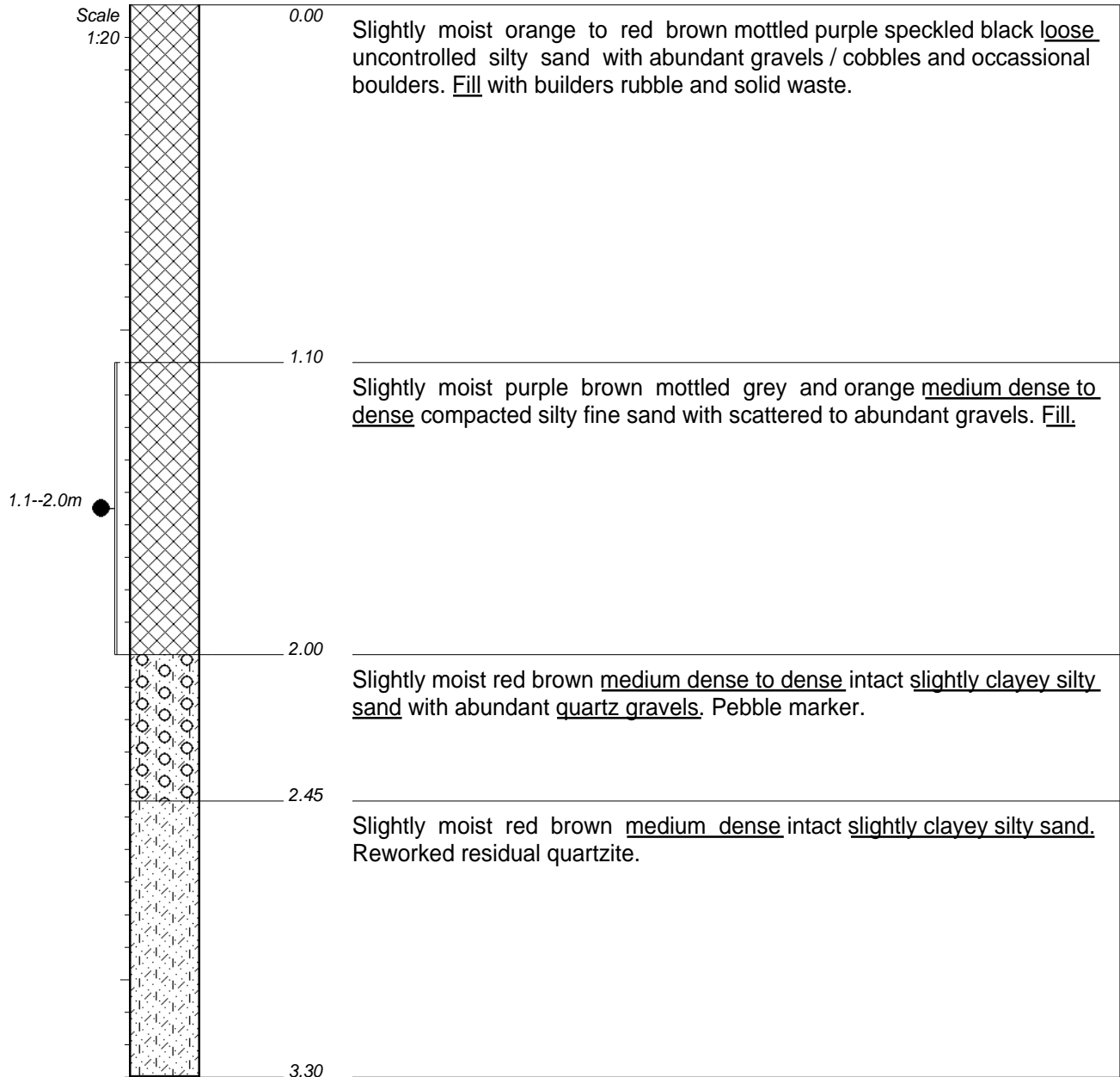
Crossman, Pape & Associates
Geotechnical Engineers and Engineering Geologists
Tel. (+27)11 465 1699
Cell. (+27)82 556 7302

**SCALE:
NOT TO SCALE**

**DATE:
MARCH 2020**

APPENDIX: B

Test Pit Profiles



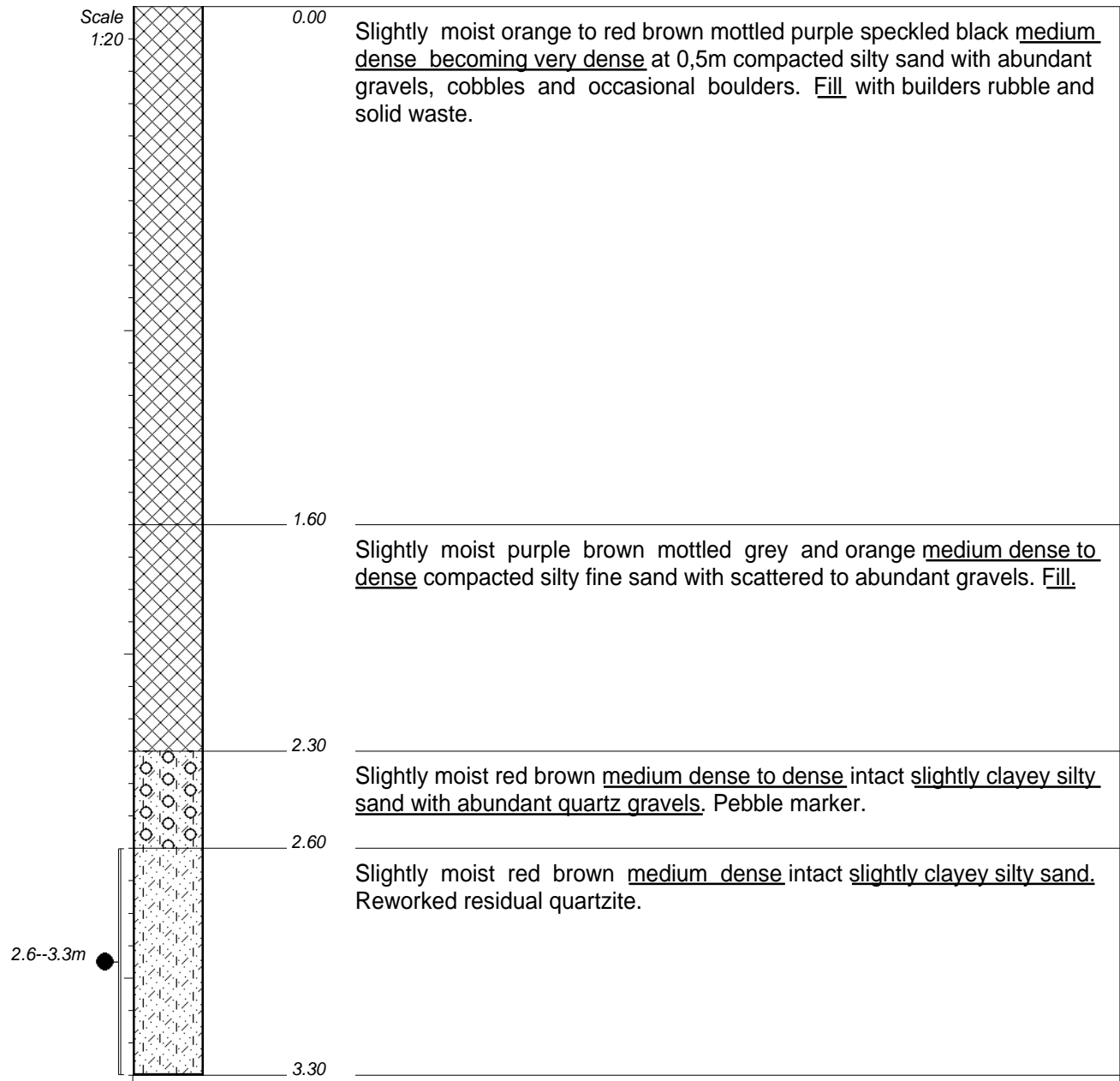
NOTES

- 1) No refusal.
- 2) No evidence of water.
- 3) Disturbed sample taken at 1,1--2,0m.

CONTRACTOR :
 MACHINE : Cat 426F2
 DRILLED BY :
 PROFILED BY : Riaan / Warren
 TYPE SET BY : Renee
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE :
 DATE : 25/03/2020
 DATE : 25/03/2020 15:32
 TEXT : ..IDevelopmentCompany.txt

ELEVATION :
 X-COORD :
 Y-COORD :



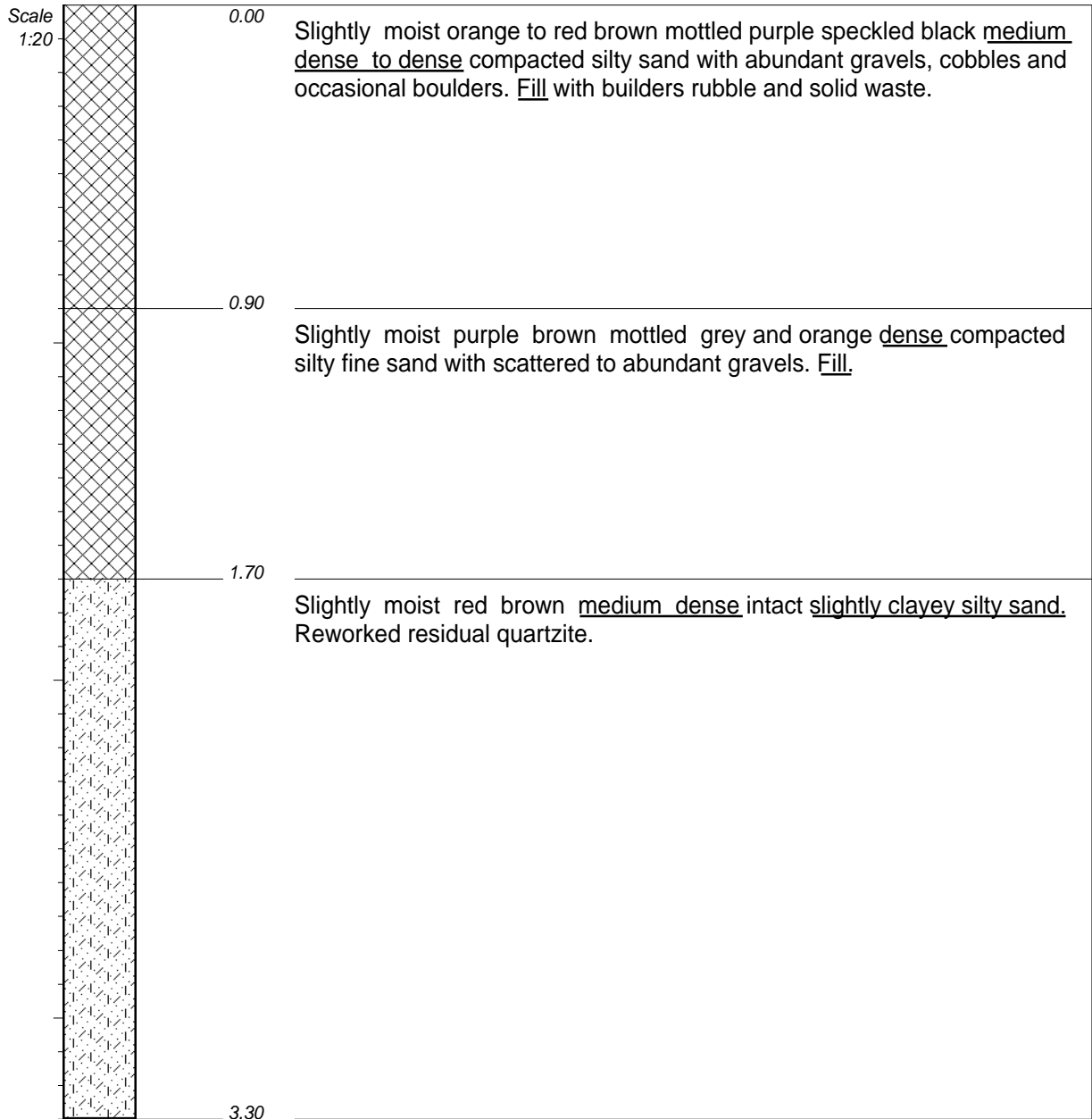
NOTES

- 1) No refusal.
- 2) No evidence of water.
- 3) Disturbed sample taken at 2,6--3,3m.

CONTRACTOR :
 MACHINE : Cat 426F2
 DRILLED BY :
 PROFILED BY : Riaan / Warren
 TYPE SET BY : Renee
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE :
 DATE : 25/03/2020
 DATE : 25/03/2020 15:32
 TEXT : ..IDevelopmentCompany.txt

ELEVATION :
 X-COORD :
 Y-COORD :



NOTES

- 1) No refusal.
- 2) No evidence of water.

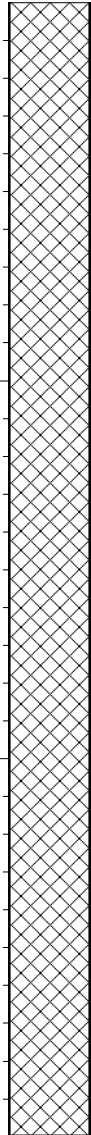
CONTRACTOR :
MACHINE : Cat 426F2
DRILLED BY :
PROFILED BY : Riaan / Warren
TYPE SET BY : Renee
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 25/03/2020
DATE : 25/03/2020 15:32
TEXT : ..IDevelopmentCompany.txt

ELEVATION :
X-COORD :
Y-COORD :



Scale
1:20



0.00

Slightly moist orange to red brown mottled purple speckled black loose to medium dense compacted silty sand with abundant gravels, cobbles and occasional boulders. Fill with builders rubble and solid waste.

3.00

NOTES

- 1) No refusal.
- 2) No evidence of water.

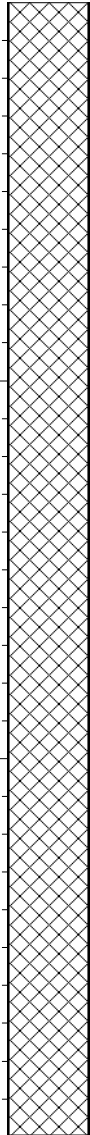
CONTRACTOR :
 MACHINE : Cat 426F2
 DRILLED BY :
 PROFILED BY : Riaan / Warren
 TYPE SET BY : Renee
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE :
 DATE : 25/03/2020
 DATE : 25/03/2020 15:32
 TEXT : ..IDevelopmentCompany.txt

ELEVATION :
 X-COORD :
 Y-COORD :



Scale
1:20



0.00

Slightly moist orange to red brown mottled purple speckled black dense becoming loose to 1,9m compacted silty sand with abundant gravels, cobbles and occasional boulders. Fill with builders rubble and solid waste.

3.00

NOTES

- 1) No refusal.
- 2) No evidence of water.

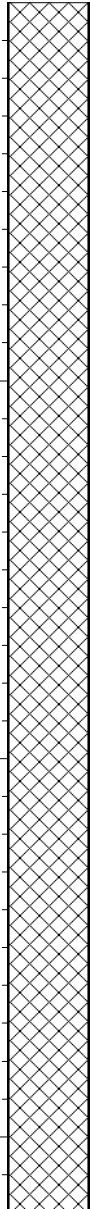
CONTRACTOR :
 MACHINE : Cat 426F2
 DRILLED BY :
 PROFILED BY : Riaan / Warren
 TYPE SET BY : Renee
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE :
 DATE : 25/03/2020
 DATE : 25/03/2020 15:32
 TEXT : ..IDevelopmentCompany.txt

ELEVATION :
 X-COORD :
 Y-COORD :



Scale
1:20



0.00

Slightly moist orange to red brown mottled purple speckled black loose to medium dense compacted silty sand with abundant gravels, cobbles and occasional boulders. Fill with builders rubble and solid waste.

3.20

NOTES

- 1) No refusal.
- 2) Water at 1,8m.
- 3) Collapse at 1,8m.

CONTRACTOR :
 MACHINE : Cat 426F2
 DRILLED BY :
 PROFILED BY : Riaan / Warren
 TYPE SET BY : Renee
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE :
 DATE : 25/03/2020
 DATE : 25/03/2020 15:32
 TEXT : ..IDevelopmentCompany.txt

ELEVATION :
 X-COORD :
 Y-COORD :



Constitutional Hill Development Company
Constitutional Hill Kiosk

LEGEND
Sheet 1 of 1

JOB NUMBER: 20/30/TP

	GRAVELS	{SA02}
	SAND	{SA04}
	SILTY	{SA07}
	CLAYEY	{SA09}
	FILL	{SA32}
	DISTURBED SAMPLE	{SA38}

Name ●

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : Renee
SETUP FILE : STANDARD.SET

DATE : 25/03/2020 15:33
TEXT : ..\DevelopmentCompany.txt

LEGEND
SUMMARY OF SYMBOLS

APPENDIX: C

DCP test results

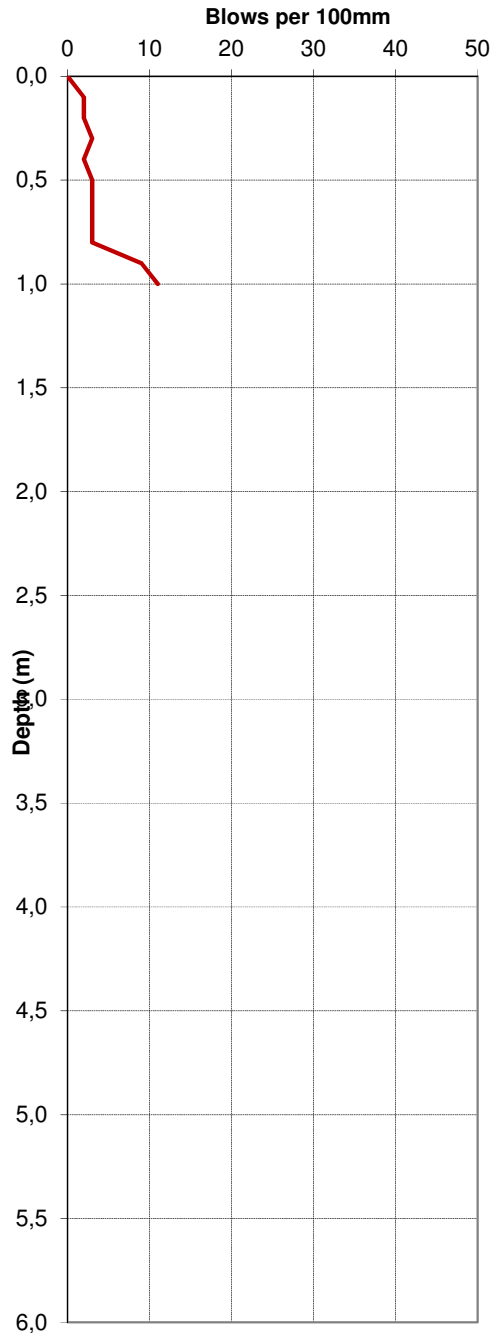


Client:	Constitutinal Hill Dev. Company	Ref. No.:	20.30
Project:	Con Hill Peoples Park Phase 2	Date:	25-Jun-20
Section:		Operator:	WK / RK

CBR DYNAMIC CONE PENETROMETER PROBE TEST No DCP1

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE AND SHOULD BE VERIFIED BY TEST OR OBSERVATION.

Depth (m)	Blows/100mm	Inferred Consistency	Shear Strength	CBR %
0,0	0			
0,1	2	Loose	<30 deg	3
0,2	2	Loose	<30 deg	3
0,3	3	Loose	<30 deg	5
0,4	2	Loose	<30 deg	3
0,5	3	Loose	<30 deg	5
0,6	3	Loose	<30 deg	5
0,7	3	Loose	<30 deg	5
0,8	3	Loose	<30 deg	5
0,9	9	Med.Dense	35 deg	15
1,0	11	Dense	36 deg	19
1,1				
1,2				
1,3				
1,4				
1,5				
1,6				
1,7				
1,8				
1,9				
2,0				



Tel: (011) 465 1699

Email: mark@crossmanpape.co.za

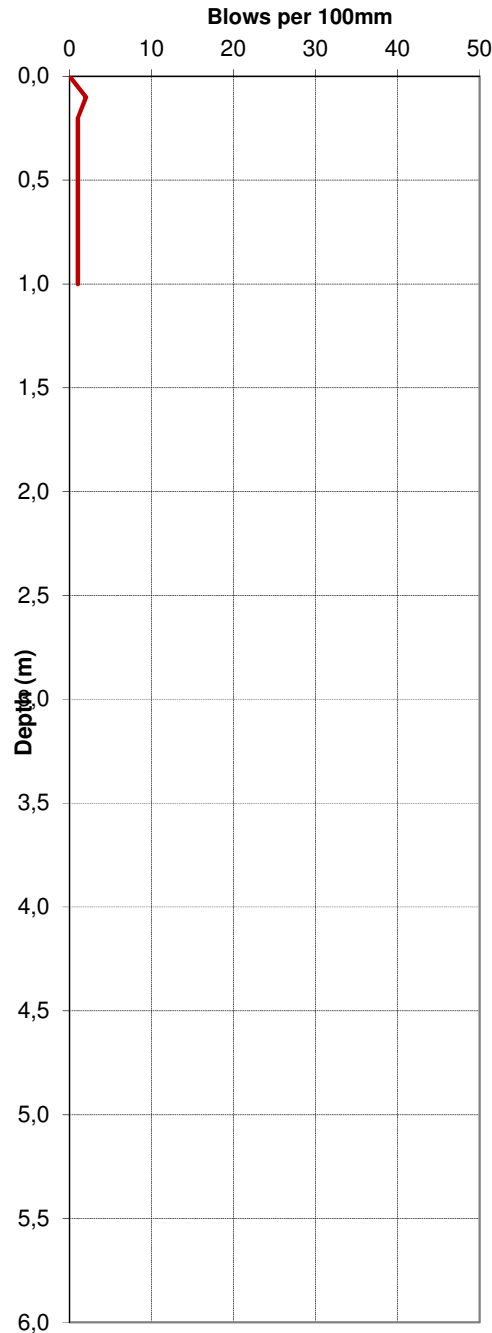
Cell 082 556 7302

Client:	Constitutinal Hill Dev. Company	Ref. No.:	20.30
Project:	Con Hill Peoples Park Phase 2	Date:	25-Jun-20
Section:		Operator:	WK / RK

CBR DYNAMIC CONE PENETROMETER PROBE TEST No DCP2

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE AND SHOULD BE VERIFIED BY TEST OR OBSERVATION.

Depth (m)	Blows/100mm	Inferred Consistency	Shear Strength	CBR %
0,0	0			
0,1	2	Loose	<30 deg	3
0,2	1	V.Loose	<29 deg	2
0,3	1	V.Loose	<29 deg	2
0,4	1	V.Loose	<29 deg	2
0,5	1	V.Loose	<29 deg	2
0,6	1	V.Loose	<29 deg	2
0,7	1	V.Loose	<29 deg	2
0,8	1	V.Loose	<29 deg	2
0,9	1	V.Loose	<29 deg	2
1,0	1	V.Loose	<29 deg	2
1,1				
1,2				
1,3				
1,4				
1,5				
1,6				
1,7				
1,8				
1,9				
2,0				





Tel: (011) 465 1699

Email: mark@crossmanpape.co.za

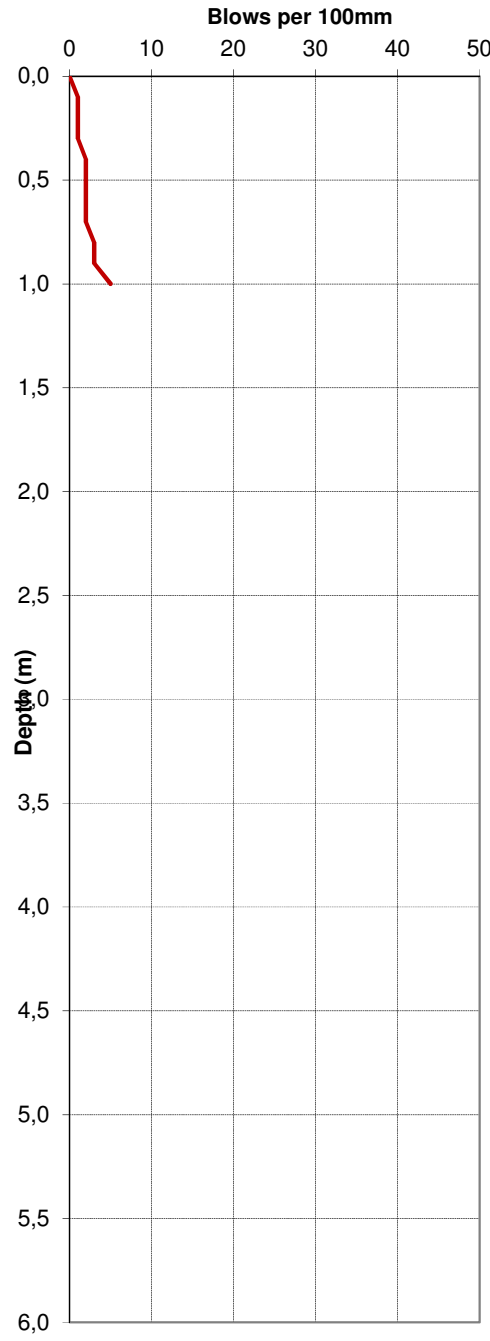
Cell 082 556 7302

Client:	Constitutinal Hill Dev. Company	Ref. No.:	20.30
Project:	Con Hill Peoples Park Phase 2	Date:	25-Jun-20
Section:		Operator:	WK / RK

CBR DYNAMIC CONE PENETROMETER PROBE TEST No DCP3

THE STRENGTH AND CBR VALUES ARE EMPIRICAL AND DEPEND ON FACTORS SUCH AS MOISTURE CONTENT WHICH HAVE NOT BEEN DETERMINED. THEY ARE THEREFORE INDICATIVE AND SHOULD BE VERIFIED BY TEST OR OBSERVATION.

Depth (m)	Blows/100mm	Inferred Consistency	Shear Strength	CBR %
0,0	0			
0,1	1	V.Loose	<29 deg	2
0,2	1	V.Loose	<29 deg	2
0,3	1	V.Loose	<29 deg	2
0,4	2	Loose	<30 deg	3
0,5	2	Loose	<30 deg	3
0,6	2	Loose	<30 deg	3
0,7	2	Loose	<30 deg	3
0,8	3	Loose	<30 deg	5
0,9	3	Loose	<30 deg	5
1,0	5	Med.Dense	32 deg	8
1,1				
1,2				
1,3				
1,4				
1,5				
1,6				
1,7				
1,8				
1,9				
2,0				



APPENDIX: D

Laboratory Test Results

Client : CROSSMAN PAPE ASSOCIATES cc
Address : P O BOX 3557
 : KRAMERVIEW
 : 2060

Client Reference :
Order No. : Riaan

Attention :
Facsimile : 011 465 4586
E-mail : lynne@crossmanpape.co.za

Date Received : 02/06/2020
Date Tested : 02/06/2020 - 24/06/2020
Date Reported : 24/06/2020

Project : Constitutional Hill Kiosk
Project No. : 2020-B-549

Report Status : Final
Page : 1 of 5

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Moisture Density Relationship	2.000	SANS 3001 GR30	J Marques	3-4
Atterberg Limits <0.425mm	2.000	SANS 3001 GR10	J Marques	2, 5
Sieve Analysis 0.075mm	2.000	SANS 3001 GR1	S Pullen	2, 5
California Bearing Ratio (CBR)	2.000	SANS 3001 GR40	B Mvubu	5
Hydrometer Analysis	2.000	SANS 3001 GR3	S Pullen	2

Any test results contained in this report and marked with * in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context.

While every care is taken to ensure that all tests are carried out in accordance with recognised standards, neither Civilab (Proprietary) Limited nor its employess shall be liable in any way whatsoever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.

All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

This report is completely confidential between the parties (Civilab and Civilab`s client) and shall not be disclosed to anybody else, unless agreed upon in writing or made publicly available by the client or required to make available by law.

Deviations in Test Methods:

Technical Signatory:	B Mvubu
Signature:	

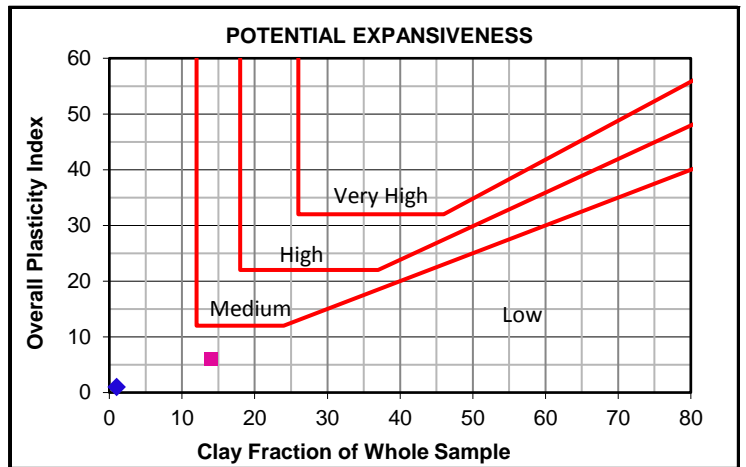
**All results are authorized electronically by approved managers and/or technical signatories.

Client : CROSSMAN PAPE ASSOCIATES cc
 Project : Constitutional Hill Kiosk
 Project No : 2020-B-549

Date Received: 02/06/2020
 Date Reported: 24/06/2020
 Page No. : 2 of 5

FOUNDATION INDICATOR

Laboratory Number	1 ◆	2 ■
Field Number	TP1	TP2
Client Reference		
Depth (m)	1.1-2.0	2.6-3.3
Position		
Coordinates	X Y	
Description		
Additional Information	Silty sand with	Slightly clayey silty sand .
Calcrete / Crushed Stabilizing Agent		



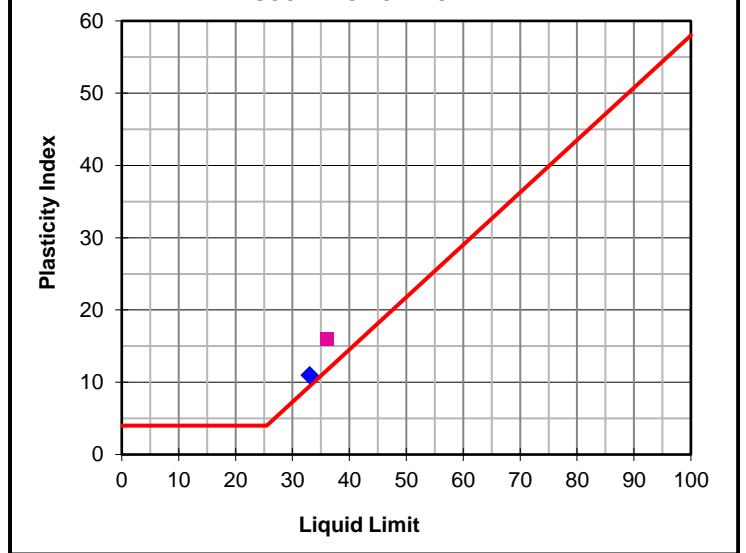
Moisture Content & Relative Density SANS 3001 GR30

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep) SANS 3001 GR1

Sieve Size	Sample 1 (%)	Sample 2 (%)
100 mm	100	100
75 mm	100	100
63 mm	100	100
50 mm	100	100
37.5 mm	100	97
28 mm	93	95
20 mm	86	93
14 mm	62	72
5 mm	34	59
2 mm	25	49
1 mm	19	44
0.425 mm	12	40
0.250 mm	11	39
0.150 mm	11	38
0.075 mm	11	35
Grading Modulus	2.52	1.76

USC PLASTICITY CHART



Hydrometer Analysis SANS 3001 GR3

Percentage Passing	Sample 1 (%)	Sample 2 (%)
0.060 mm	10	35
0.040 mm	9	33
0.020 mm	7	28
0.006 mm	3	20
0.002 mm		14
Gravel	75	51
Sand	15	14
Silt	10	21
Clay		14

Laboratory Number 1 ◆ 2 ■

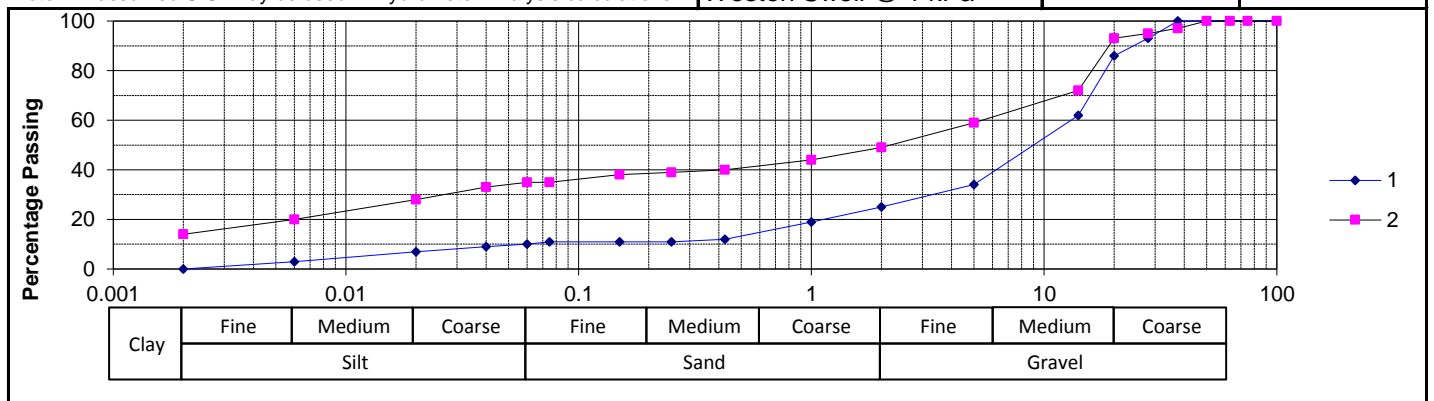
Atterberg Limits -425µ SANS 3001 GR10

Liquid Limit (%)	33	36
Plasticity Index (%)	11	16
Linear Shrinkage (%)	4.0	7.0
Overall PI (%)	1	6

Classifications

HRB (AASHTO)	A-2-6(0)	A-2-6(1)
Unified (ASTM D2487)	GP-GC	GC
Weston Swell @ 1 kPa		

Note: An assumed S.G. may be used in Hydrometer Analysis calculations



Client : CROSSMAN PAPE ASSOCIATES cc
 Project : Constitutional Hill Kiosk
 Project No: 2020-B-549

Date Received: 02/06/2020
 Date Reported: 24/06/2020
 Page No. : 3 of 5

MOISTURE DENSITY RELATIONSHIP

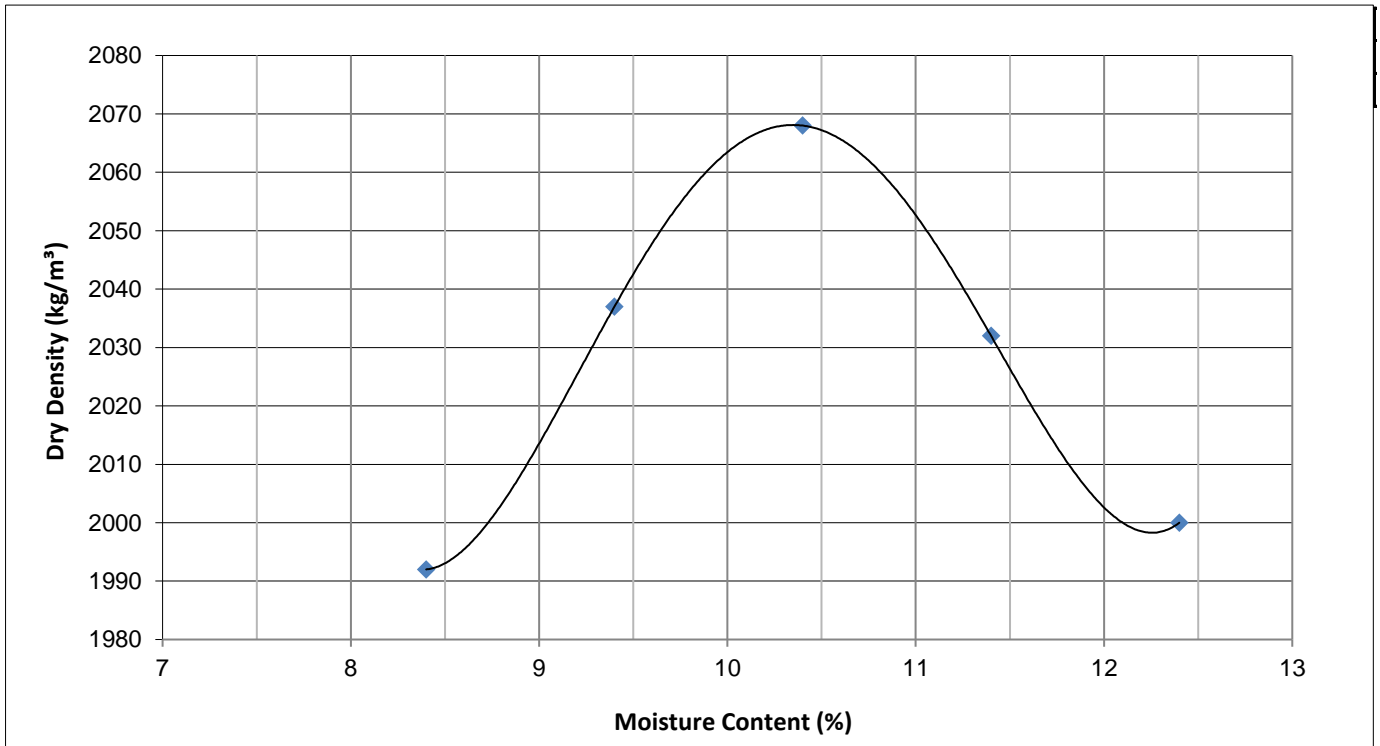
Laboratory Number	1	
Field Number	TP1	
Client Reference		
Depth (m)	1.1-2.0	
Position		
Coordinates	X	
	Y	
Description		
Additional Information	Silty sand with gravels.Fill	
Calcrete / Crushed Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO
--------------------	-----------------

Dry Density	kg/m ³	1992	2037	2068	2032	2000	
Moisture Content	%	8.4	9.4	10.4	11.4	12.4	

Max. Dry Density	kg/m ³	2068
Optimum Moisture	%	10.4



Client : CROSSMAN PAPE ASSOCIATES cc
 Project : Constitutional Hill Kiosk
 Project No: 2020-B-549

Date Received: 02/06/2020
 Date Reported: 24/06/2020
 Page No. : 4 of 5

MOISTURE DENSITY RELATIONSHIP

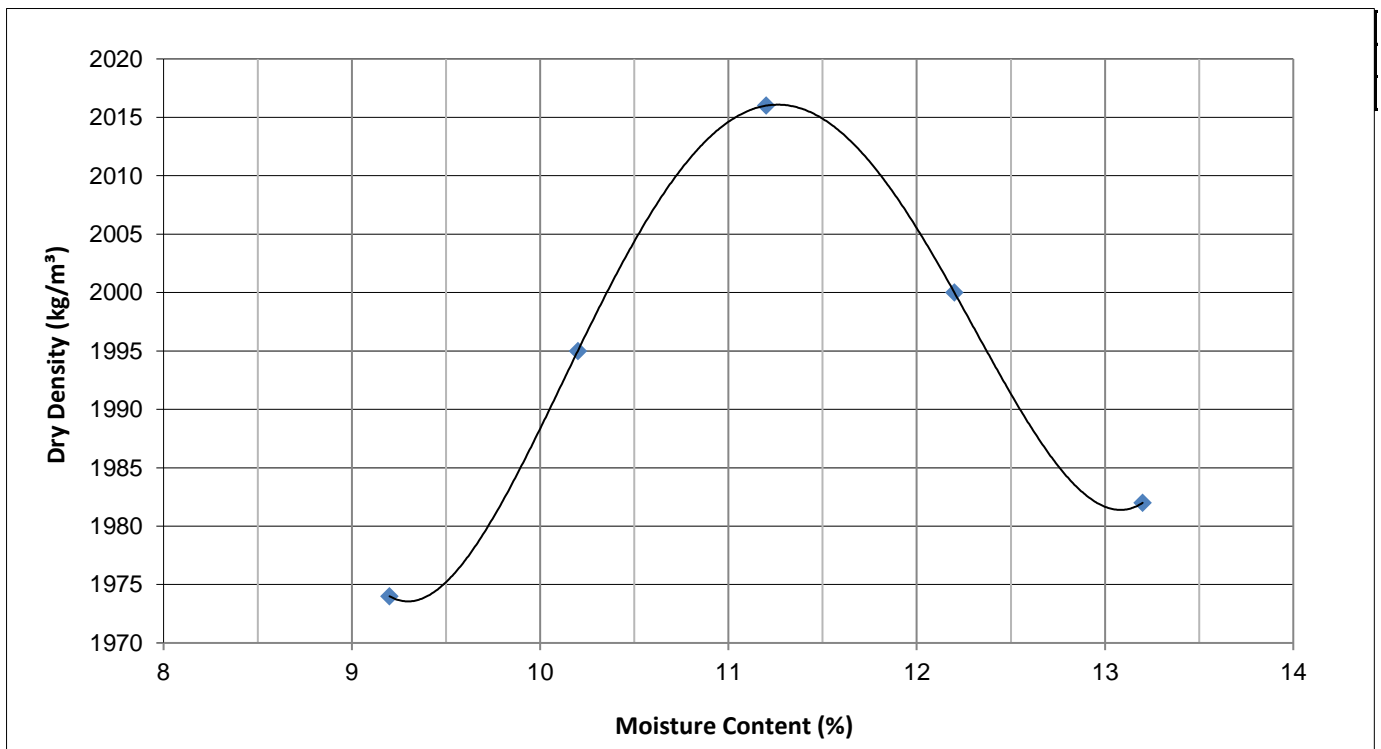
Laboratory Number	2	
Field Number	TP2	
Client Reference		
Depth (m)	2.6-3.3	
Position		
Coordinates	X	
	Y	
Description		
Additional Information	Slightly clayey silty sand .	
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO
--------------------	-----------------

Dry Density	kg/m ³	1974	1995	2016	2000	1982	
Moisture Content	%	9.2	10.2	11.2	12.2	13.2	

Max. Dry Density	kg/m ³	2016
Optimum Moisture	%	11.3



Client : CROSSMAN PAPE ASSOCIATES cc
 Project : Constitutional Hill Kiosk
 Project No. : 2020-B-549

Date Received : 02/06/2020
 Date Reported : 24/06/2020
 Page No. : 5 of 5

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

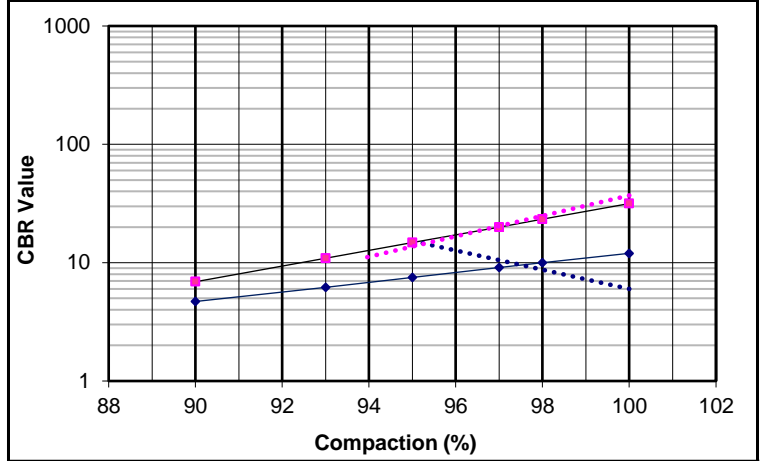
Laboratory No.	1	2
Field Number	TP1	TP2
Client Reference		
Depth (m)	1.1-2.0	2.6-3.3
Position		
Coordinates	X Y	
Description		
Additional information	Silty sand with gravels.Fill	Slightly clayey silty sand .
Calcrete/Crushed		
Stabilizing Agent		

Laboratory No.	1	2
Maximum Dry Density & Optimum Moisture Content		SANS 3001 GR30
MDD	kg/m ³	2068
OMC	%	10.4
		2016
		11.3

California Bearing Ratio		SANS 3001 GR40
Compaction Data		
Moisture	%	10.4
Dry Density	kg/m ³	2091 1988 1872
Compaction	%	100.0 95.1 89.5
		2042 1917 1820
		100.0 93.9 89.1

Penetration Data		
CBR at	2.50 mm	6 15 4
	5.00 mm	12 21 10
	7.50 mm	16 24 15
Swell	%	2.1 2.7 2.4
Final Moisture (%)		2.1 2.8 3.1
		13.8 17.2 23.2
		15.9 17.8 18.6

Sieve Analysis (Wet preparation)		SANS 3001 GR1
Percentage Passing		
	100 mm	100
	75 mm	100
	63 mm	100
	50 mm	100
	37.5 mm	100
	28 mm	93
	20 mm	86
	14 mm	62
	5 mm	34
	2 mm	25
	1 mm	19
	0.425 mm	12
	0.250 mm	11
	0.150 mm	11
	0.075 mm	11
Grading Modulus		2.5
		1.8



Interpolated CBR Data			
CBR	Mod. AASHTO		
@ 100%		12	32
@ 98%		10	23
@ 97%		9	20
@ 95%		8	15
@ 93%		6	11
@ 90%		5	7
@ SANS3001 Midpoint		10	20

Soil Mortar Analysis		
Coarse Sand	52	18
Coarse Fine Sand	2	2
Medium Fine Sand	2	3
Fine Fine Sand	2	6
Silt and Clay	42	71

Atterberg Limits		SANS 3001 GR10
Liquid Limit (%)	33	36
Plasticity Index (%)	11	16
Linear Shrinkage (%)	4.0	7.0
Classifications		
HRB (AASHTO)	A-2-6(0)	A-2-6(1)
COLTO		
TRH14		

