DISABILITY ECONOMIC EMPOWERMENT TRUST

REQUEST FOR BID
FOR
THE APPOINTMENT OF A CONTRACTOR FOR THE PROVISION PREFABRICATED STRUCTURES AT GREENVILLE PRIMARY SCHOOL ON BEHALF OF THE EASTERN CAPE DEPARTMENT OF EDUCATION

6GB OR HIGHER

EMIS NO: 200100275

DISTRICT: Nelson Mandela Bay Metropolitan Municipality

RFQ NO: DEET-ECDOE/EMR/04/2024-25
VOLUME 2 OF 2

Consisting of : 2 (Two) Volumes

BIDDER: ……

CRS NO: ……...

Compiled for:

SUPPLY CHAIN MANAGEMENT
Eastern Cape Department of Education
Steve Tshwete Complex, Zone 6
ZWELITSHA
5608

Website: www.edu.ecprov.gov.za

Compiled by:

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20 Suffolk Street
Berea
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5200
Website: www.deet.co.za

19 MARCH 2026

DRAWINGS

Refer to the Architect's specification attached to the back of these bills of quantities. Tenderers are advised to study the Architect's specification for the full intent and meaning of the relevant item.

The following drawings are contained on the Volume 2 Documentation:

1. **Architectural Drawings**
2. **Civil Drawings**
3. **Electrical Drawings**
4. **Mechanical Drawings**

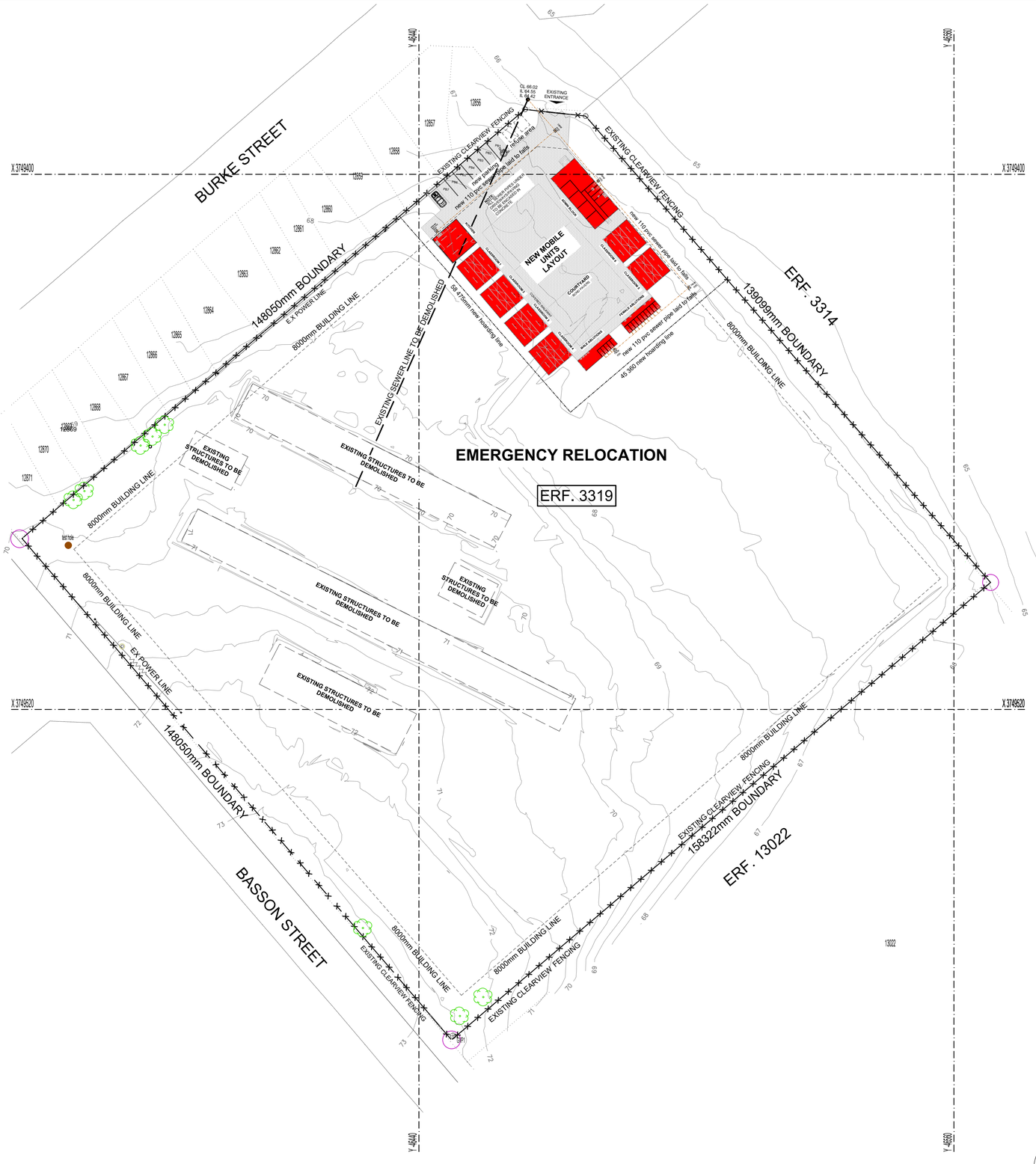
PART 3 - LIST OF DRAWINGS

The following drawings/annexure shall be issued during the bid period to form part of the bid documentation. Where applicable, . drawings/annexure could be re-issued to the Contractor at commencement of the construction phase.

NO	DRAWING DESCRIPTION
ARCHITECTURAL DETAIL	
NN15-PO1	Emergency relocation Architectural layouts
NN15-PO1	Emergency Relocation Layout (REV A)_25-11-2025
NN15-PO2	Emergency Relocation Layout 02 (REV A)_25-11-2025
NN15-PO3	Emergency Relocation Roof Layout (REV A)_25-11-2025
	Phase 01 Decanting - Prefab Catalogue
CIVIL ENGINEERING DETAIL	
FO447-01-01000 (D03)	Masterplan (ER)
F0447-02-01001 Rev D03	SDP (ER)
F0447-02-01002 Rev D03	Cross Sections (ER)
F0447-02-01003 Rev D02	Typical Details (ER)
20260211	Greenville P1 Water Quants 20260211
	Greenville Sewer Quants 20260211_Tender
ELECTRICAL ENGINEERING DETAIL	
	Elec Spec
2511-GR-T-E-100D	100D-Site Plan-Electrical Services& Sleeves Layout
2511-GR-T-E-300D	300-Schematic Block Diagram
MECHANICAL ENGINEERING DETAIL	
SLS-0124-01-MEC-0100-00	Sanitary Drainage Phase 1
SLS-0124-01-MEC-0200-00	Domestic Water Supply Phase 1
SLS-0124-01-MEC-0300-00	Fire Protection Services Phase 1

1.ARCHITECTURAL DRAWINGS

ARCHITECTURAL LAYOUTS



SITE DEVELOPMENT PLAN (EMERGENCY RELOCATION)

scale: 1/500

NOTE : Setting out to be as per engineers drawings
: Sewer management to be as per engineers drawings

GREENVILLE P.S.S

TABLE 1: SUMMARY FOR HUMAN CAPITAL.

TABLE 1A: SCHOOLS ENROLMENT FIGURES FOR THE YEARS 2023-2025.

YEAR	BOYS	GIRLS	TOTAL
2022			342
2023			284
2024			262
2025			196

TABLE 1B: ENROLMENT PER GRADE 2025

YEAR	BOYS	GIRLS	TOTAL
GRADE R	4	2	6
GRADE 01	9	9	18
GRADE 02	8	13	13
GRADE 03	10	6	16
GRADE 04	19	9	28
GRADE 05	16	13	29
GRADE 06	18	12	30
GRADE 07	25	23	48

TABLE 2: SUMMARY OF SCOPE OF WORKS.

TABLE 2A: DEMOLITION WORKS.

NO.	BUILDING USAGE	AREA.	SIZE
BLOCK 1	Administration Block	34.8 m2	
BLOCK 2	Classroom Block	62.6 m2	
BLOCK 3	Ablution Block	10.9 m2	
BLOCK 4	Classroom Block	43.31 m2	

TABLE 2B: RENOVATION / REFURBISHMENT WORKS.

NO.	BUILDING USAGE	AREA.	SIZE

TABLE 2 C: NEW WORKS.

MINIMUM EDUCATION AREAS

NO.	BUILDING USAGE		AREA.	SIZE
01.	Classrooms	14	Classroom Block	840 sq.m
02.	Media Centre	01	Classroom Block	120 sq.m
03.	Science Lab	01	Classroom Block	80 sq.m
04.	Multi-Purpose Classrooms x2	01	Classroom Block	80 sq.m
05.	Computer Lab	01	Classroom Block	80 sq.m
06.	Grade R	02	Classroom Block	120 sq.m
	Total			**1320 sq.m**

ADMINISTRATION AREAS

10.	Entrance Lobby	1	Admin Block	12 sq.m
12.	Waiting Area	1	Admin Block	12 sq.m
13.	Reception	1	Admin Block	15 sq.m
14.	Admin Office	1	Admin Block	20 sq.m
15.	Printing Room	1	Admin Block	15 sq.m
15.	Store Room	1	Admin Block	15 sq.m
16.	Strong Room	1	Admin Block	10 sq.m
16.	Sick Bay	2	Admin Block	30 sq.m
16.	Counseling Room	1	Admin Block	15 sq.m
16.	Principal's Office	1	Admin Block	20 sq.m
16.	Deputy Principal	1	Admin Block	15 sq.m
16.	HOD Office	4	Classroom Block	60 sq.m
16.	Staff Room	1	Admin Block	60 sq.m
16.	Staff Kitchenette	1	Admin Block	20 sq.m
	Total			**319 sq.m**

EDUCATION SUPPORT AREAS

	Nutrition Centre	Nutrition Block	40 sq.m
	Dining Hall	Nutrition Block	120 sq.m
	General Purpose Hall	Hall Block	600 sq.m
	Guard House	Guard House	15 sq.m
	Female/Male Changeroom	Changerooms Block	35 sq.m
	Refuse Area	Nutrition Block	15 sq.m
	Storage Areas	Nutrition Block	20 sq.m
	Total		**845 sq.m**

ABLUTIONS: LEARNERS'

GIRLS'	Girl's WC	Girl's WHB	BOYS'	Boys' WC	Boys' WHB	Boys' Urinals
LEARNERS' ABLUTION BLOCK	06	04		02	02	04
Total	**08**	**06**		**04**	**02**	**04**

ABLUTIONS: STAFF

FEMALE	Female's WC	Female WHB	Paraplegic Toilet	MALE	Male WC	Male WHB	Male Urinals
STAFF ABLUTION BLOCK	02	02			01	01	01
Total	**02**	**02**	**01**		**01**	**01**	**01**

LOCALITY

NOTES

ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR TO COMMENCING, SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION

FIGURED DIMENSIONS ONLY TO BE USED, DRAWINGS ARE NOT TO SCALED

DISCREPANCIES, ERRORS AND OMISSIONS ARE TO BROUGHT TO THE ARCHITECTS ATTENTION IMMEDIATELY THEY BECOME EVIDENT.

SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE OR INSTALLATION

NEW PREFAB STRUCTURES

DEMOLISHED STRUCTURES

REV.	DESCRIPTION	DATE
A	Decrease in number of classroom	25-11-2025

CLIENT

ARCHITECT

TOTAL AREA

PROJECT
PROPOSED NEW
GREENVILLE P.S
BETHELSDORP
Eastern Cape Department of Education

TITLE
SITE DEVELOPMENT PLAN
(EMERGENCY RELOCATION)

DISABILITY ECONOMIC EMPOWERMENT TRUST

Province of the EASTERN CAPE EDUCATION

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> PO Box 8194, Nahoon, 5210 > Tel: 043 735 2027
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> Email: nnarchutt@nnarch.co.za
KOKSTAD: No 10 Hagan Place, Kokstad, 4700
> Tel : 039 727 1101 > Fax: 039 727 5217
> Email : nnarchks@nnarch.co.za

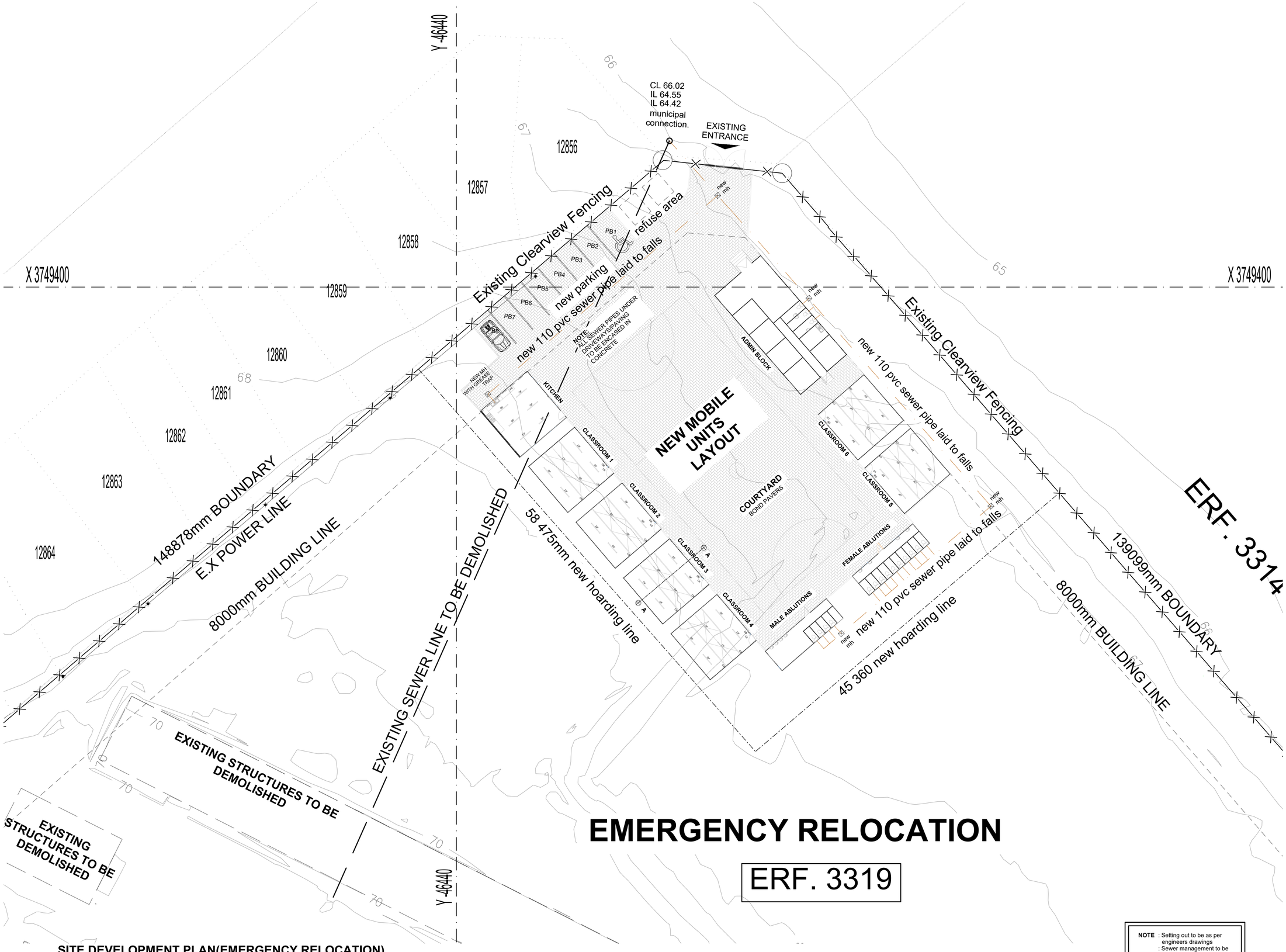
DRAWN
KAMVA

DATE :
NOVEMBER 2025

SCALE
AS INDICATED

SKETCH PLAN

DRAWING NO.
NN15-PO1



EMERGENCY RELOCATION

ERF. 3319

SITE DEVELOPMENT PLAN(EMERGENCY RELOCATION)

scale: 1/200

NOTE : Setting out to be as per engineers drawings
: Sewer management to be as per engineers drawings

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SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE OR INSTALLATION

DEMOLISHED STRUCTURES

REV.	DESCRIPTION	DATE
A	Decrease in number of classroom	25-11-2025

CLIENT

ARCHITECT

TOTAL AREA

PROJECT
PROPOSED NEW
GREENVILLE P.S
BETHELSDORP
Eastern Cape Department of Education

TITLE
SITE DEVELOPMENT PLAN
(EMERGENCY RELOCATION)

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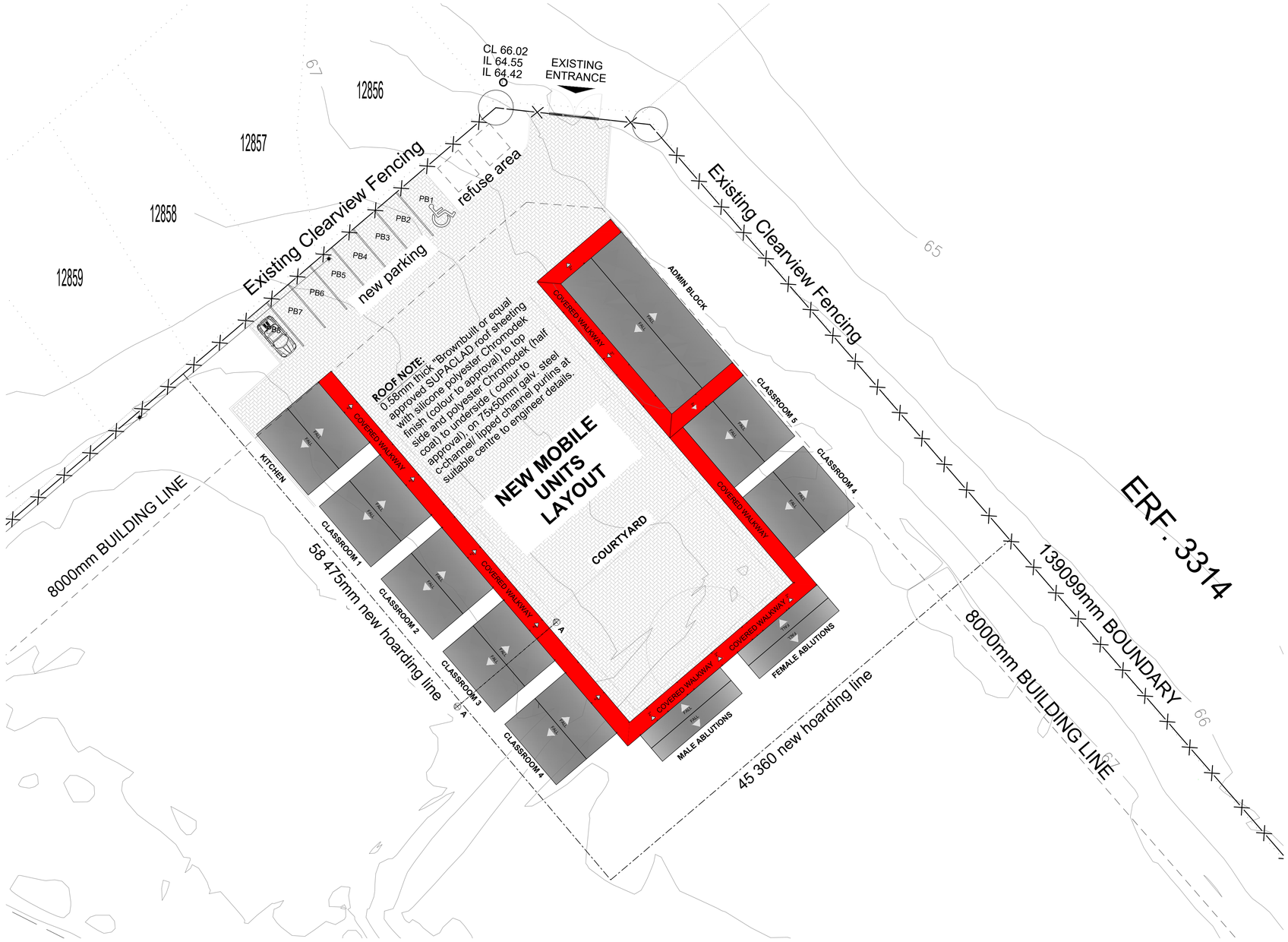
> Email : mnarchks@mnarch.co.za

DRAWN	DATE	SCALE
KAMVA	NOVEMBER 2025	AS INDICATED

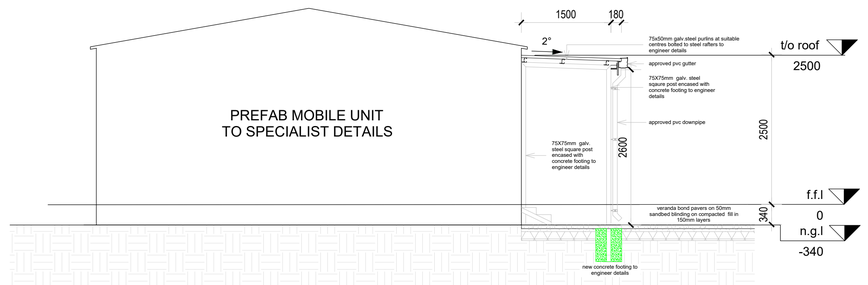
SKETCH PLAN

DRAWING NO.
NN15-PO2



ROOF PLAN (EMERGENCY RELOCATION)

scale: 1/200



TYPICAL SECTION- COVERED WALKWAY

scale: 1/50

NOTES

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SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE OR INSTALLATION

NEW PREFAB STRUCTURE

NEW WALKWAY

REV.	DESCRIPTION	DATE
A	Decrease in number of classroom	25-11-2025

CLIENT

ARCHITECT

TOTAL AREA

PROJECT

PROPOSED NEW
GREENVILLE P.S
BETHELSDORP
Eastern Cape Department of Education

TITLE

ROOF PLAN & WALKWAY DETAILS (EMERGENCY RELOCATION)

DEET
DISABILITY ECONOMIC EMPOWERMENT TRUST

Province of the EASTERN CAPE EDUCATION

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KOKSTAD: No 10 Hagan Place, Kokstad, 4700 > Tel : 039 727 1101 > Fax: 039 727 5217 > Email : nnarchks@nnarch.co.za

DRAWN	DATE	SCALE
KAMVA	NOVEMBER 2025	AS INDICATED

SKETCH PLAN

DRAWING NO. NN15-PO3

DISABILITY ECONOMIC EMPOWERMENT TRUST

GREENVILLE PRIMARY SCHOOL

PROPOSED SCOPE OF WORKS

PROVISION OF PREFAB STRUCTURES FOR EMERGENCY RELOCATION

	ADMIN PREFAB STRUCTURES	QTY
	Admin Block	1
	SUB-TOTAL	**1**

	EDUCATIONAL PREFAB STRUCTURES	
	Classroom Blocks	6
	SUB-TOTAL	**6**

	EDUCATION SUPPORTING PREFABS	
	Ablutions Block (Male/Female)	2
	Kitchen Block	1
	SUB-TOTAL	**3**

	ADDITIONAL SUPPORTING AREAS	
	Electrical & Mechanical Installations	n/a
	Civil & Structural External Works & Paving (incl. S/W)	n/a
	Parking	8 bays
	Temporary Hoarding/Fencing	110m
	Demolition, Testing & removal of asbestos elements	n/a

	TOTAL PREFAB STRUCTURES	**10**

Classroom Catalogue (8m x 7m)

Building Modular Excellence

Our Double Wide Prefabricated, relocatable classrooms inspire children to Learn and Grow. Whether required in rural or urban areas, they provide a spacious classroom setting, making students feel good to be at school.

Optional Extras

- Air-conditioners
- Blinds
- Chalk Boards
- Exterior Skirting
- Overhead Projectors
- Pin Boards
- Rain Water Goods
- Security Doors
- Serving Hatch
- Verandah
- White Boards

Our Size Options

- 7m x 7m
- 8m x 7m
- 9m x 7m
- 12m x 7m
- 15m x 7m
- 18m x 7m

We provide a range of high-quality educational facilities that fulfil departmental requirements and create an ideal work environment for educators and students.

Our Certifications

ISO 9001 · ISO 45001 · NHBRC Registration Council · MPBA The Modular & Portable Building Association · SASFA Southern African Light Steel Frame Building Association · B-BBEE Contributor Level 1 · cidb Construction Industry Development Board

Admin Catalogue

Electrical Fixture	
Description	Count
Distribution Board 12 Way	1
Isolator Airconditioner	5
Isolator Electric Geyser	1
Light Flour. Double 1.200m Open Channel	11
Light Internal Round Flat Bowl JD90	3
Plug Single 16Amp	14
Switch light 1 x 1 lever Complete With Cover	7

Door	
Description	Count
Door (Chromadek) Double Complete excluding Panel	1
Door (Chromadek) Single Complete excluding Panel	1
Door (Hollow Core) Single Complete excluding Panel	10

Windows	
Description	Count
Window A - 900mm x 900mm Top Hung - Clear Glass-4mm	8
Window E - 600mm x 600mm Top Hung - Obscure Glass-4mm	3

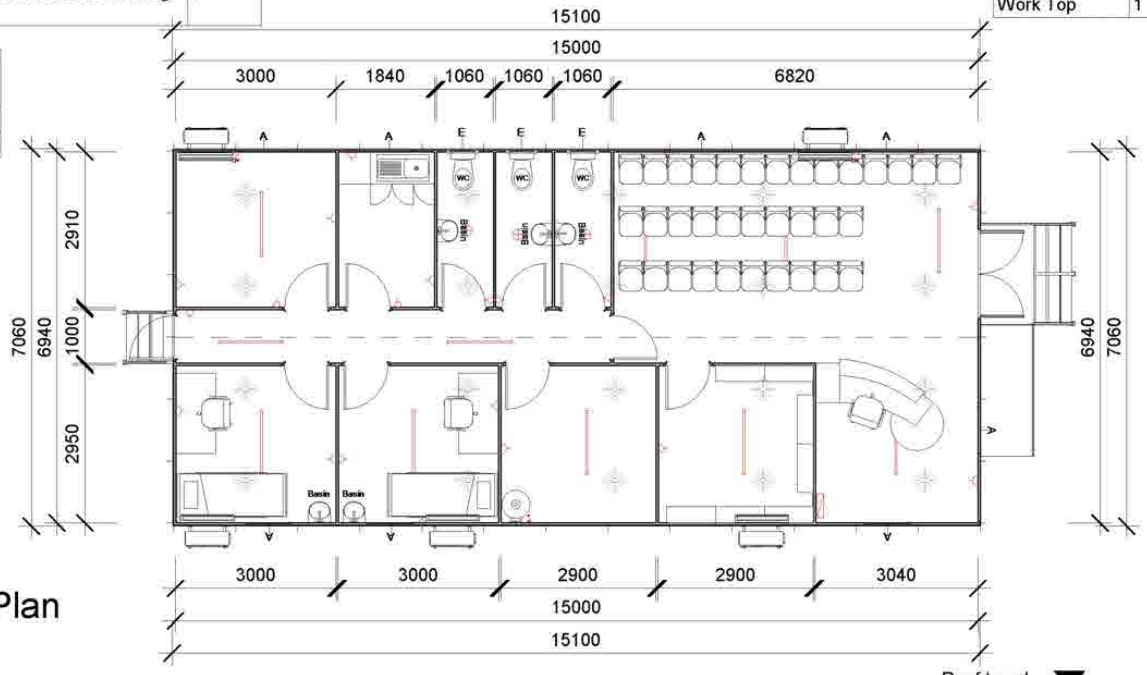
Mechanical Equipment Schedule	
Description	Count
AC 12000 Samsung Non Inverter mid wall	4
AC 18000 Samsung Non Inverter mid wall	1

Generic Model Schedule	
Description	Count
3 Tier Complete With Hand Rails & Landing & Ramp Double Door	1
3 Tier Complete With Hand Rails Single Door	1
Large Tripod Jack with Concrete Pads	20
Shell 7.060m x 15.100m Truss Roof & Ceiling System	1

Plumbing Fixture Schedule	
Description	Count
Geyser Electric 100L Complete With Plumbing	1
Sink 1.200m Single Bowl Complete With Cupboards & Plumbing	1
Wash Hand Basin Porcelain Pedestal Complete With Plumbing -H& C water	5
WC Porcelain Close Couple Complete with Plumbing No Cubicle	3

Furniture Schedule		
Description	Count	Worktop Length
Steel Shelving 1905 mm high x 914mm wide x 305	7	
Work Top	1	600

Floor Schedule	
Description	Area
Vinyl Sheeting	106 m²



Floor Plan
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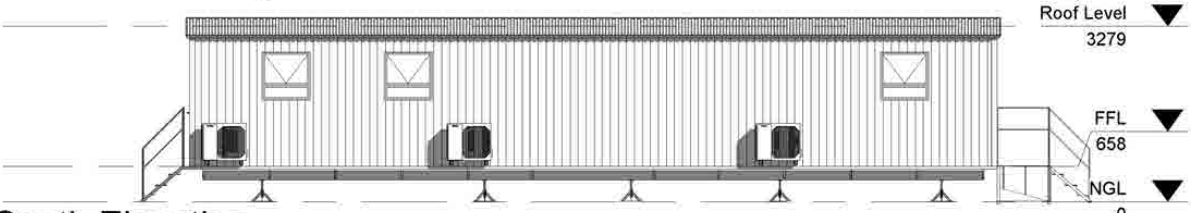

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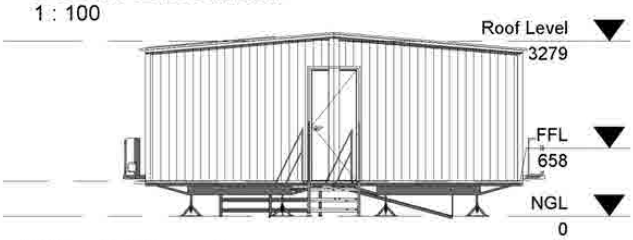

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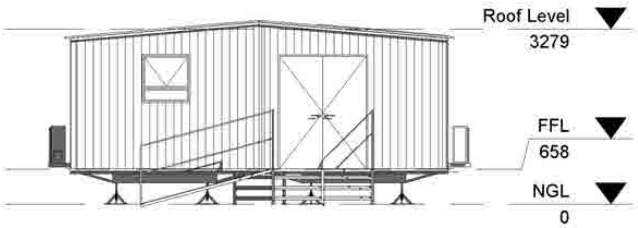

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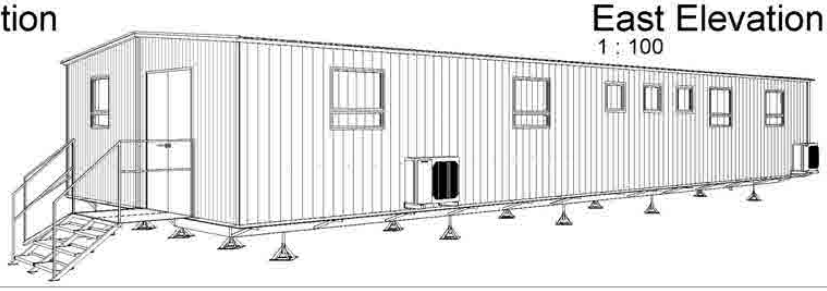

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Project Information	
Client Name:	
Project Address:	

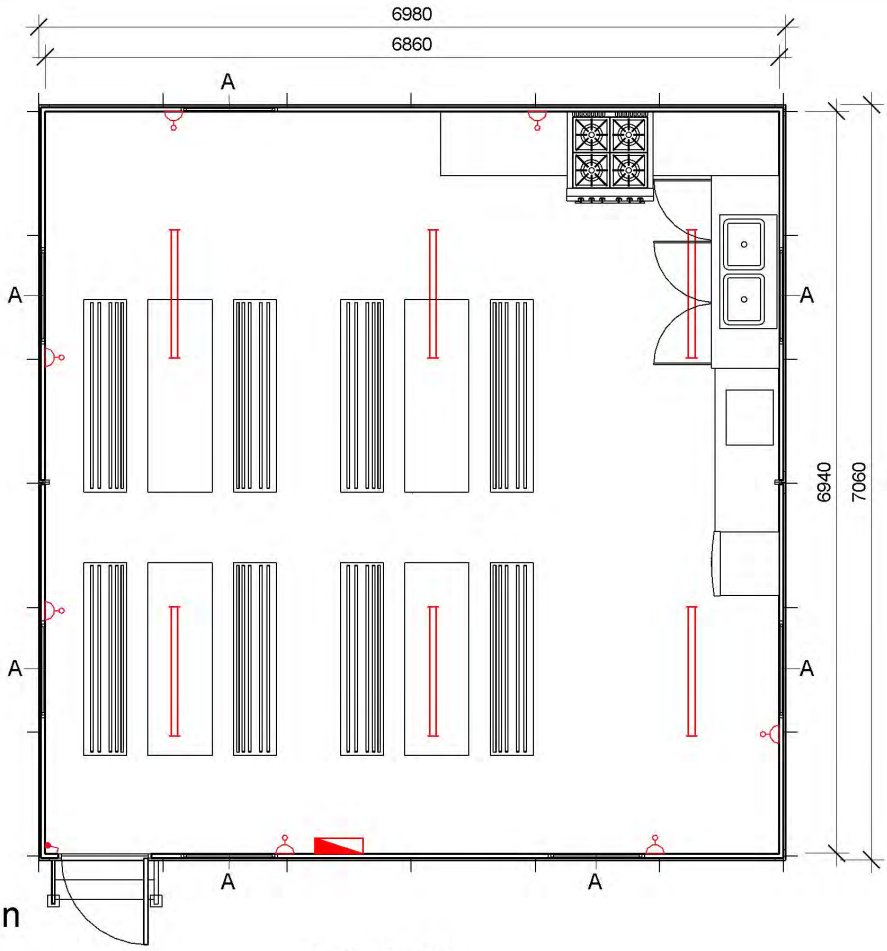
Drawing Information	
Drawing Description:	OFFICE
Scale:	
Drawing Number:	OD0970
	30/03/2016 16:09:04

Revision Number	Description	Date

FOR INFORMATION ONLY

Revision Number:

Kitchen Catalogue



Floor Plan
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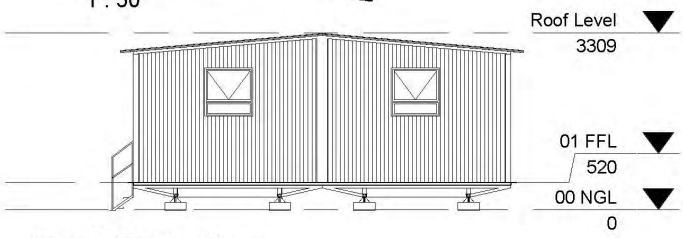

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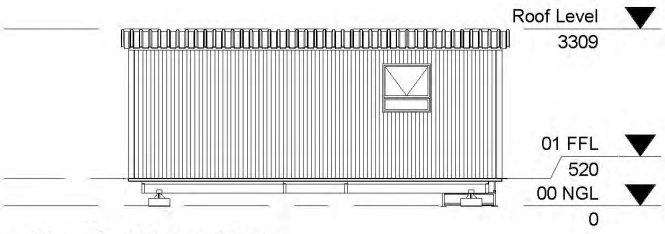

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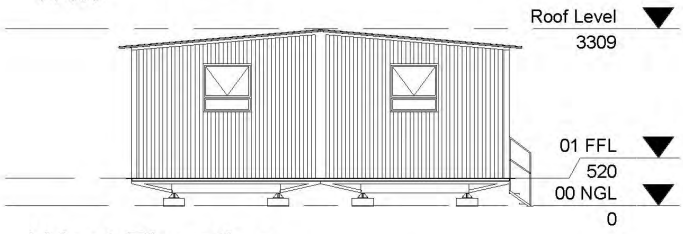

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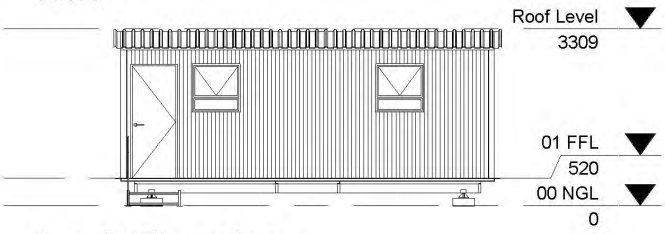

South Elevation
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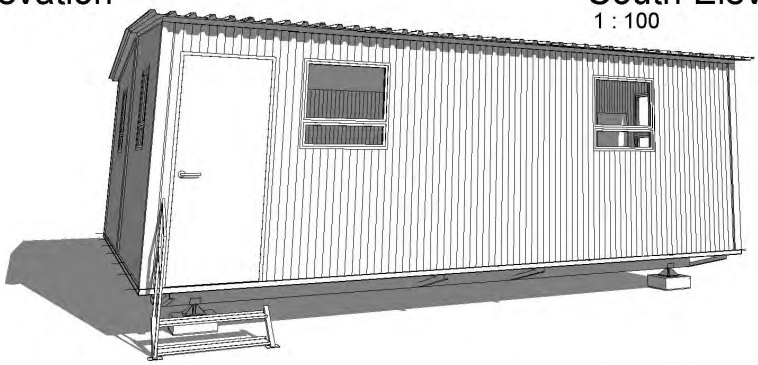

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Email: sales@speedspace.co.za
Website: www.speedspace.co.za

Drawing Information	Project Information
Drawing Description: Kitchen Unit	Client Name:
Scale:	Project Address:
Drawing Number: K0032	
Revision Number:	Drawn By:

FOR INFORMATION ONLY
Date: 07/09/2016 05:05:41 PM

Learner Ablation Catalogue

Electrical Fixture	
Description	Count
Distribution Board 6 Way Exterior	1
Light Internal Round Flat Bowl JD90	4
Switch light 1 x 1 lever Complete With Cover	2

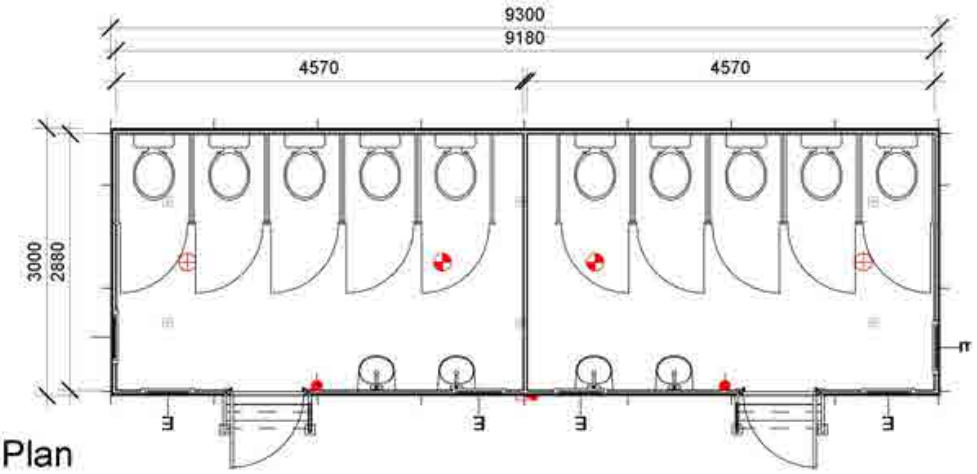
Windows	
Description	Count
Window E - 600mm x 600mm Top Hung - Obscure Glass-4mm	6

Door	
Description	Count
Door (Chromadek) Single Complete excluding Panel	2

Floor Schedule	
Description	Area
Vinyl Sheeting	28 m²

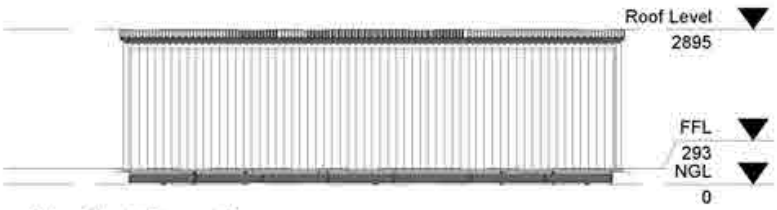
Generic Model Schedule	
Description	Count
1 Tier Complete With Hand Rails Single Door	2
Screw-in Jack	6
Shell 2.99m x 9.3m	1

Plumbing Fixture Schedule	
Description	Count
Toddler Toilet Complete with Plumbing & Cubicle	10
Toddler Wash Hand Basin Porcelain Pedestal Complete With Plumbing -H& C water	4



Floor Plan
1 : 60

East Elevation
1 : 100



North Elevation
1 : 100

West Elevation
1 : 100

South Elevation
1 : 100

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Project Information	
Client Name:	
Project Address:	

Drawing Information	
Drawing Description:	Ablution Unit
Scale:	
Drawing Number:	A1921
	03/03/2016 14:04:53

Revision Number	Description	Date

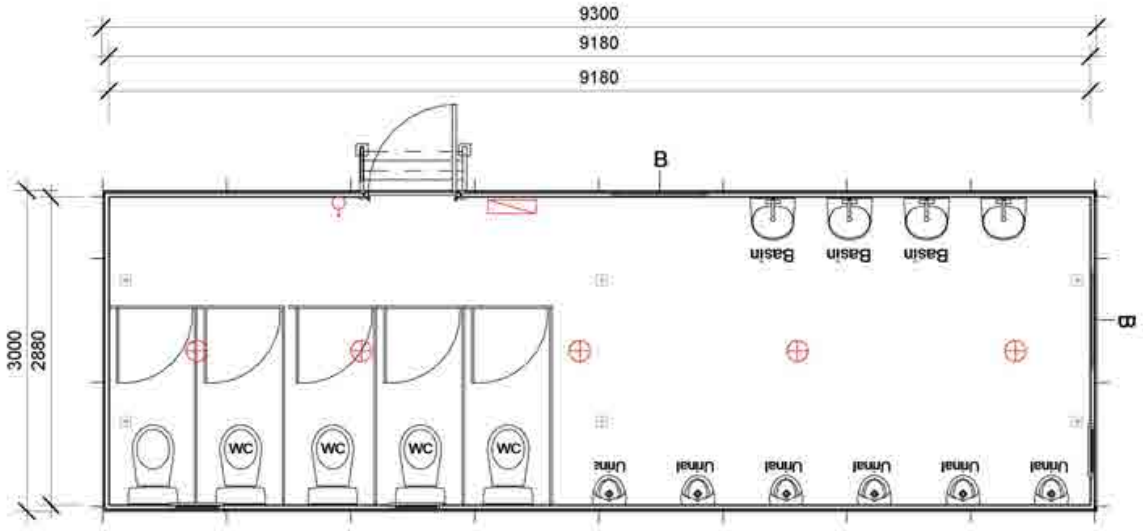
FOR INFORMATION ONLY

Revision Number:

Door		Plumbing Fixture Schedule		Windows		Electrical Fixture	
Description	Count	Description	Count	Description	Count	Description	Count
Door (Chromadek) Single Complete excluding Panel	1		4	L 500 x 300	3		1
		Urinal Wall Hung Porcelain complete with plumbing	6	Window B - 900mm x 900mm Fixed Pane - Obscure Glass-4mm	2	Light Internal Round Flat Bowl JD90	5
		WC Plastic Low Level Complete with Plumbing & Cubicle	5			Switch light 1 x 1 lever Complete With Cover	1

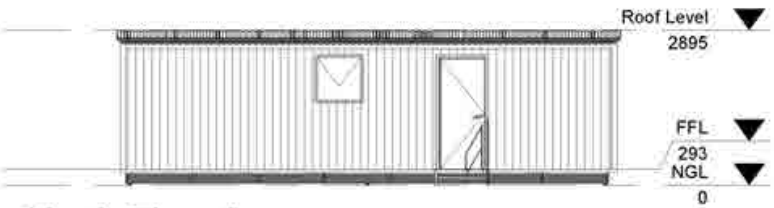
Floor Area	
Description	Area
Vinyl Sheeting - MS022 Grey 2mm (Embossed) - MIF40	27 m²

Generic Model Schedule	
Description	Count
2 Tier Complete With Hand Rails Single Door	1
Shell 2.99m x 9.3m	1
Small Tripod Jack	6



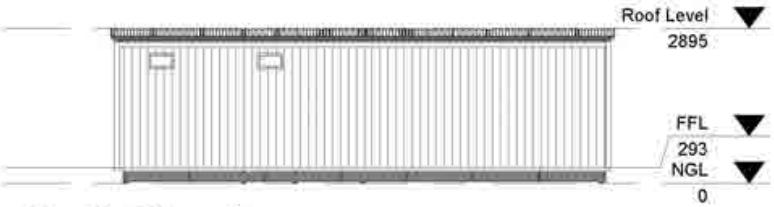
Floor Plan
1 : 50

East Elevation
1 : 100

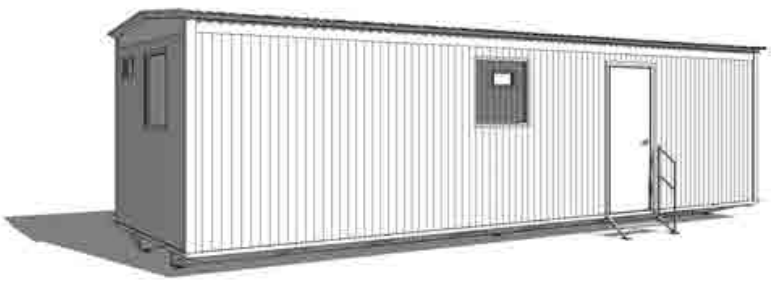


North Elevation
1 : 100

West Elevation
1 : 100



South Elevation
1 : 100



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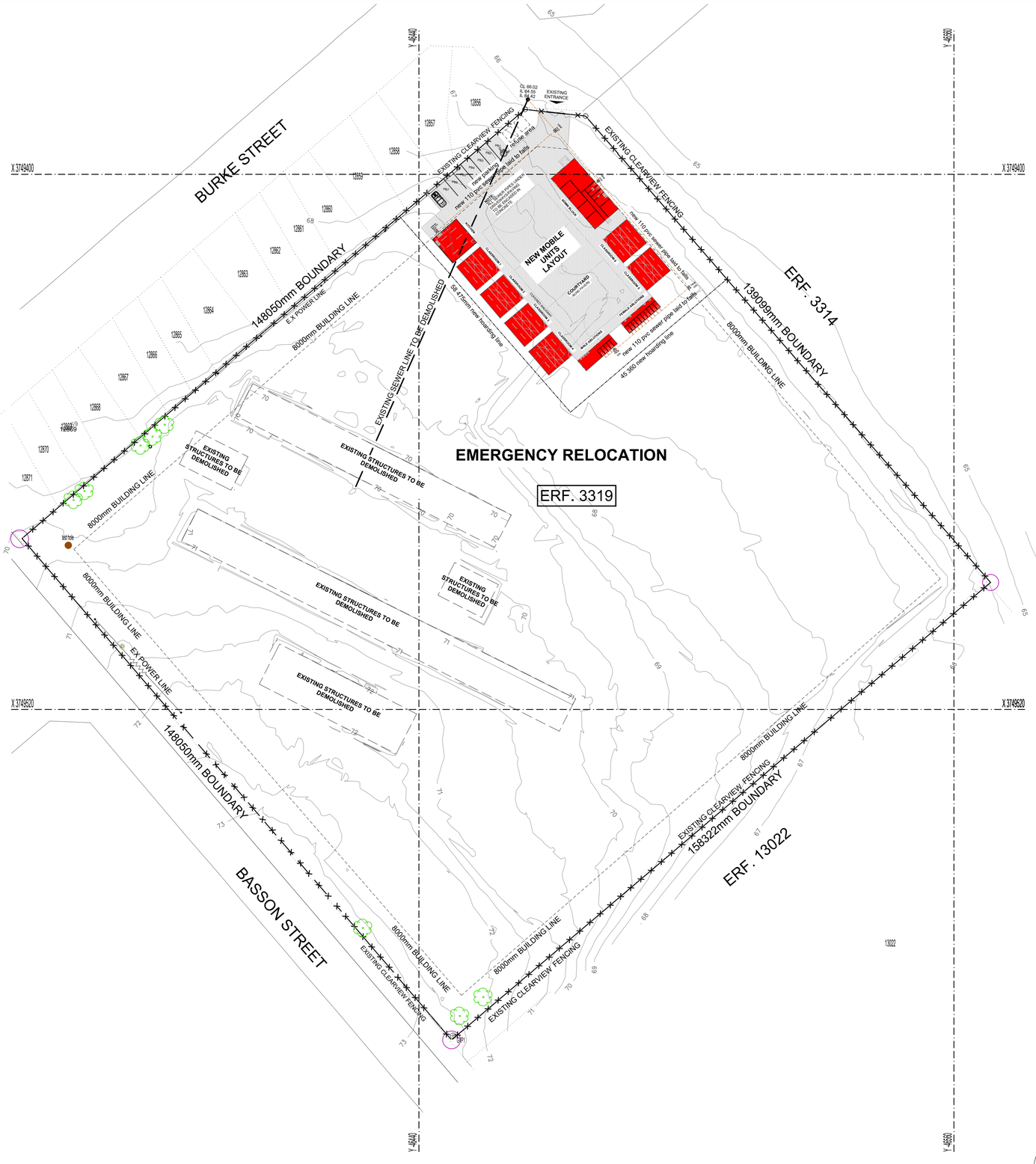
Project Information	Drawing Information
Client Name:	Drawing Description: Male Ablution
	Scale:
Project Address:	Drawing Number: A1955
	Manufactures Code:

Revision Number	Description	Date

FOR INFORMATION ONLY

Revision Number:



SITE DEVELOPMENT PLAN (EMERGENCY RELOCATION)

scale: 1/500

NOTE : Setting out to be as per engineers drawings
: Sewer management to be as per engineers drawings

GREENVILLE P.S.S

TABLE 1: SUMMARY FOR HUMAN CAPITAL.

TABLE 1A: SCHOOLS ENROLMENT FIGURES FOR THE YEARS 2023-2025.

YEAR	BOYS	GIRLS	TOTAL
2022			342
2023			284
2024			262
2025			196

TABLE 1B: ENROLMENT PER GRADE 2025

YEAR	BOYS	GIRLS	TOTAL
GRADE R	4	2	6
GRADE 01	9	9	18
GRADE 02	8	13	13
GRADE 03	10	6	16
GRADE 04	19	9	28
GRADE 05	16	13	29
GRADE 06	18	12	30
GRADE 07	25	23	48

TABLE 2: SUMMARY OF SCOPE OF WORKS.

TABLE 2A: DEMOLITION WORKS.

NO.	BUILDING USAGE	AREA.	SIZE
BLOCK 1	Administration Block	34.8 m2	
BLOCK 2	Classroom Block	62.6 m2	
BLOCK 3	Ablution Block	10.9 m2	
BLOCK 4	Classroom Block	43.31 m2	

TABLE 2B: RENOVATION / REFURBISHMENT WORKS.

NO.	BUILDING USAGE	AREA.	SIZE

TABLE 2 C: NEW WORKS.

MINIMUM EDUCATION AREAS

NO.	BUILDING USAGE		AREA.	SIZE
01.	Classrooms	14	Classroom Block	840 sq.m
02.	Media Centre	01	Classroom Block	120 sq.m
03.	Science Lab	01	Classroom Block	80 sq.m
04.	Multi-Purpose Classrooms x2	01	Classroom Block	80 sq.m
05.	Computer Lab	01	Classroom Block	80 sq.m
06.	Grade R	02	Classroom Block	120 sq.m
	Total			**1320 sq.m**

ADMINISTRATION AREAS

10.	Entrance Lobby	1	Admin Block	12 sq.m
12.	Waiting Area	1	Admin Block	12 sq.m
13.	Reception	1	Admin Block	15 sq.m
14.	Admin Office	1	Admin Block	20 sq.m
15.	Printing Room	1	Admin Block	15 sq.m
15.	Store Room	1	Admin Block	15 sq.m
16.	Strong Room	1	Admin Block	10 sq.m
16.	Sick Bay	2	Admin Block	30 sq.m
16.	Counseling Room	1	Admin Block	15 sq.m
16.	Principal's Office	1	Admin Block	20 sq.m
16.	Deputy Principal	1	Admin Block	15 sq.m
16.	HOD Office	4	Classroom Block	60 sq.m
16.	Staff Room	1	Admin Block	60 sq.m
16.	Staff Kitchenette	1	Admin Block	20 sq.m
	Total			**319 sq.m**

EDUCATION SUPPORT AREAS

	Nutrition Centre	Nutrition Block	40 sq.m
	Dining Hall	Nutrition Block	120 sq.m
	General Purpose Hall	Hall Block	600 sq.m
	Guard House	Guard House	15 sq.m
	Female/Male Changeroom	Changerooms Block	35 sq.m
	Refuse Area	Nutrition Block	15 sq.m
	Storage Areas	Nutrition Block	20 sq.m
	Total		**845 sq.m**

ABLUTIONS: LEARNERS'

GIRLS'	Girl's WC	Girl's WHB	BOYS'	Boys' WC	Boys' WHB	Boys' Urinals
LEARNERS' ABLUTION BLOCK	06	04		02	02	04
Total	**08**	**06**		**04**	**02**	**04**

ABLUTIONS: STAFF

FEMALE	Female's WC	Female WHB	Paraplegic Toilet	MALE	Male WC	Male WHB	Male Urinals
STAFF ABLUTION BLOCK	02	02			01	01	01
Total	**02**	**02**	**01**		**01**	**01**	**01**

LOCALITY

NOTES

ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR TO COMMENCING, SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION

FIGURED DIMENSIONS ONLY TO BE USED, DRAWINGS ARE NOT TO SCALED

DISCREPANCIES, ERRORS AND OMISSIONS ARE TO BROUGHT TO THE ARCHITECTS ATTENTION IMMEDIATELY THEY BECOME EVIDENT.

SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE OR INSTALLATION

NEW PREFAB STRUCTURES

DEMOLISHED STRUCTURES

REV.	DESCRIPTION	DATE
A	Decrease in number of classroom	25-11-2025

CLIENT

ARCHITECT

TOTAL AREA

PROJECT
PROPOSED NEW
GREENVILLE P.S
BETHELSDORP
Eastern Cape Department of Education

TITLE
SITE DEVELOPMENT PLAN
(EMERGENCY RELOCATION)

DISABILITY ECONOMIC EMPOWERMENT TRUST

Province of the EASTERN CAPE EDUCATION

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> Fax: 043 735 1984 > Email: nnarchie@nnarch.co.za
MTHATHA: No 6 Knorf Str, Fortgale, Mthatha, 5100
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>Tel: 047 531 3986 > Fax: 047 532 6570
> Email: nnarchutt@nnarch.co.za
KOKSTAD: No 10 Hagan Place, Kokstad, 4700
> Tel : 039 727 1101 > Fax: 039 727 5217
> Email : nnarchks@nnarch.co.za

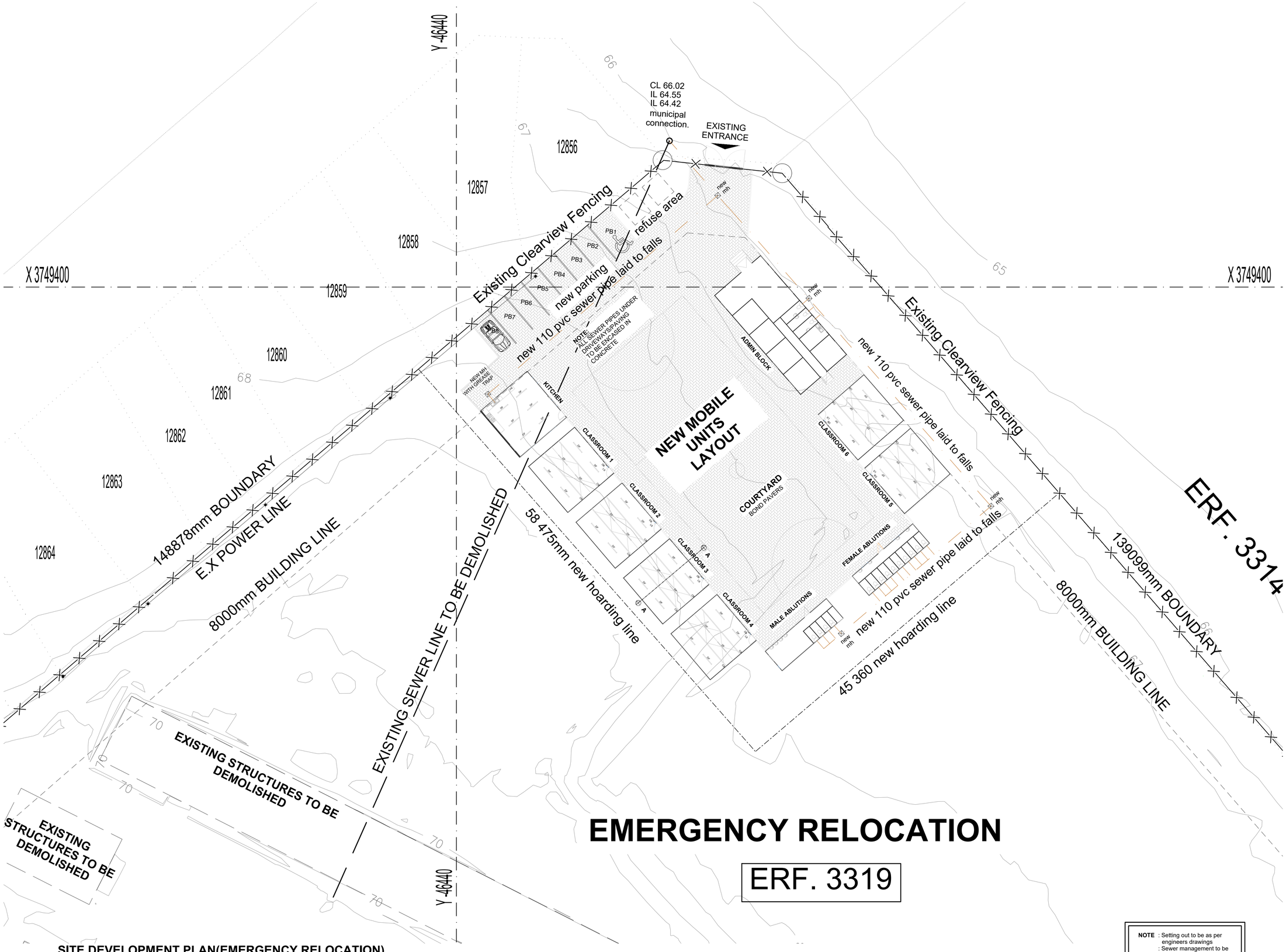
DRAWN
KAMVA

DATE :
NOVEMBER 2025

SCALE
AS INDICATED

SKETCH PLAN

DRAWING NO.
NN15-PO1



EMERGENCY RELOCATION

ERF. 3319

SITE DEVELOPMENT PLAN(EMERGENCY RELOCATION)

scale: 1/200

NOTE : Setting out to be as per engineers drawings
: Sewer management to be as per engineers drawings

NOTES

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SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE OR INSTALLATION

DEMOLISHED STRUCTURES

REV.	DESCRIPTION	DATE
A	Decrease in number of classroom	25-11-2025

CLIENT

ARCHITECT

TOTAL AREA

PROJECT
PROPOSED NEW
GREENVILLE P.S
BETHELSDORP
Eastern Cape Department of Education

TITLE
SITE DEVELOPMENT PLAN
(EMERGENCY RELOCATION)

DISABILITY ECONOMIC EMPOWERMENT TRUST

Province of the EASTERN CAPE EDUCATION

EAST LONDON: No 72 Beach Road, Nahoon, 5241
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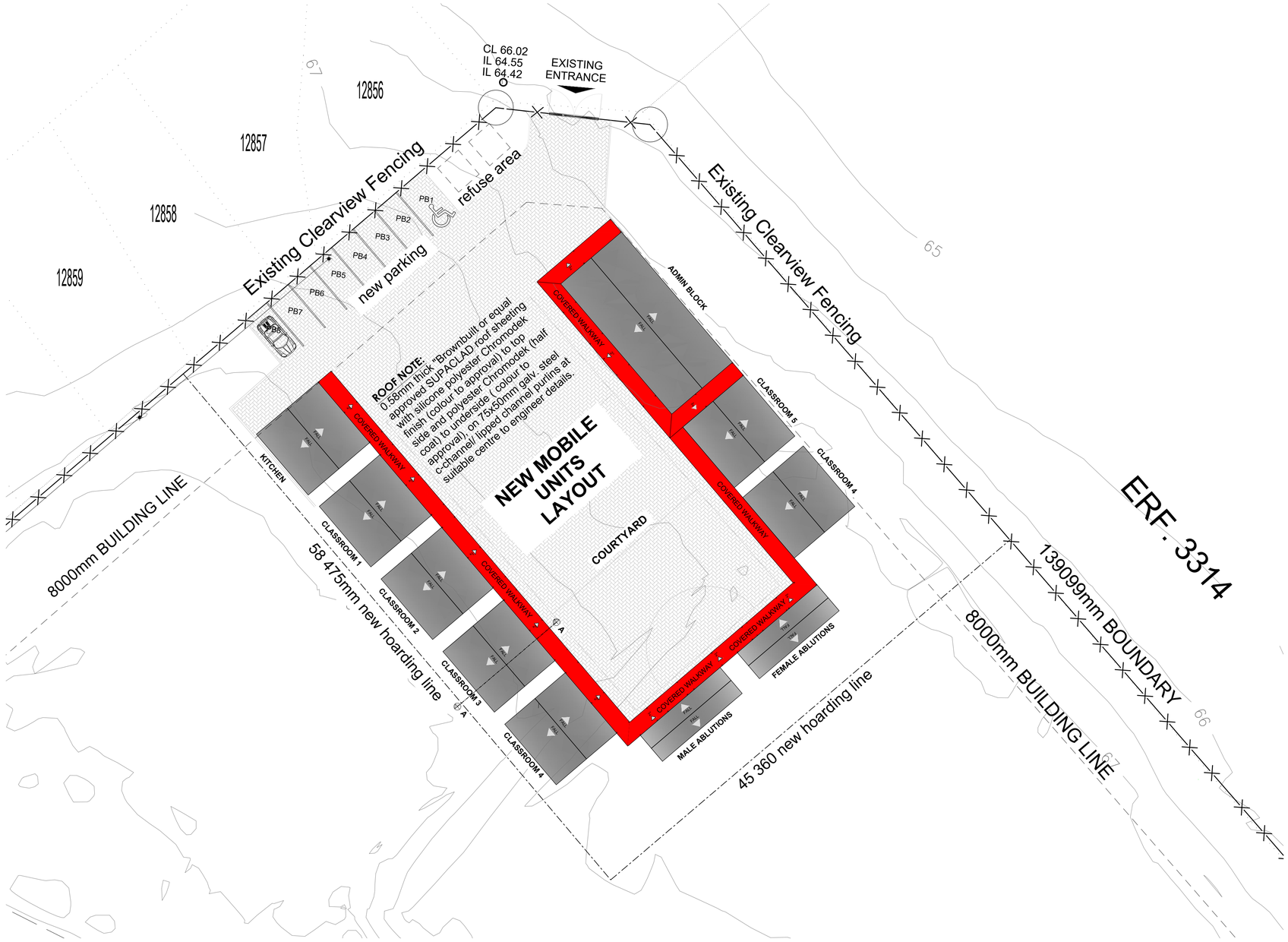
KOKSTAD: No 10 Hagan Place, Kokstad, 4700
> Tel: 039 727 1101 > Fax: 039 727 5217
> Email : mnarchks@mnarch.co.za

DRAWN	DATE	SCALE
KAMVA	NOVEMBER 2025	AS INDICATED

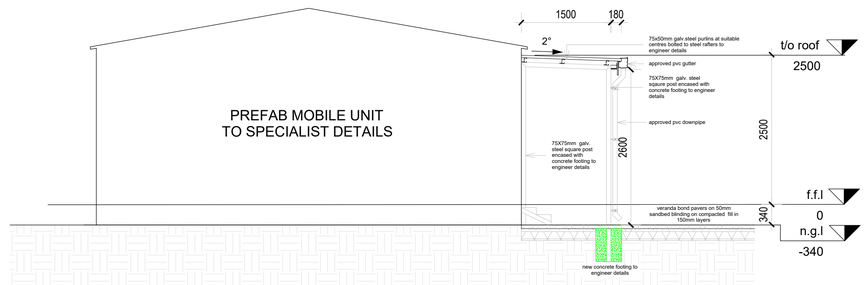
SKETCH PLAN

DRAWING NO.
NN15-PO2



ROOF PLAN (EMERGENCY RELOCATION)

scale: 1/200



TYPICAL SECTION- COVERED WALKWAY

scale: 1/50

NOTES

ALL DIMENSIONS AND LEVELS ARE TO BE VERIFIED ON SITE PRIOR TO COMMENCING, SETTING OUT, WORKSHOP DRAWINGS OR CONSTRUCTION

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DISCREPANCIES, ERRORS AND OMISSIONS ARE TO BROUGHT TO THE ARCHITECTS ATTENTION IMMEDIATELY THEY BECOME EVIDENT

SHOP DRAWINGS TO SUBMITTED FOR APPROVAL PRIOR TO MANUFACTURE OR INSTALLATION

NEW PREFAB STRUCTURE

NEW WALKWAY

REV.	DESCRIPTION	DATE
A	Decrease in number of classroom	25-11-2025

CLIENT

ARCHITECT

TOTAL AREA

PROJECT

PROPOSED NEW
GREENVILLE P.S
BETHELSDORP
Eastern Cape Department of Education

TITLE

ROOF PLAN & WALKWAY DETAILS (EMERGENCY RELOCATION)

DEET
DISABILITY ECONOMIC EMPOWERMENT TRUST

Province of the EASTERN CAPE EDUCATION

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KOKSTAD: No 10 Hagan Place, Kokstad, 4700 > Tel : 039 727 1101 > Fax: 039 727 5217 > Email : nnarchks@nnarch.co.za

DRAWN	DATE	SCALE
KAMVA	NOVEMBER 2025	AS INDICATED

SKETCH PLAN

DRAWING NO. NN15-PO3

2.CIVIL ENGINEERING DRAWINGS

Quantities - Bedding Volumes

Bedding Class	Concrete	Bedding Material	Selected Backfill	Main Fill
Class A	0.0		0.0	0.0
Class B		0.0	0.0	0.0
Class C		0.0	0.0	0.0
Class D		0.0	0.0	0.0
Flexible		45.1	35.1	69.5
Total	0.0	45.1	35.1	69.5

Quantities - Excavation Lengths

Diameter	Surface	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	Over 4.0
25	0.0	1.3	70.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	18.2	99.7	66.3	8.9	0.0	0.0	0.0	0.0	0.0
Total	0.0	19.5	170.4	66.3	8.9	0.0	0.0	0.0	0.0	0.0

Quantities - Excavation Volumes

Diameter	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	Over 4.0	EO Inter	EO Hard
25	0.4	29.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	5.1	52.4	53.5	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	5.5	82.1	53.5	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Quantities - Pipe Lengths

Material	Diameter	Class	Length
uPVC - SABS 966	25	9	72.0
uPVC - SABS 966	75	9	193.3
Total			265.3

Excavation Lengths

Link Type and Size	0.000 to 0.500	0.500 to 1.000	1.000 to 1.500	1.500 to 2.000	2.000 to 2.500	2.500 to 3.000	3.000 to 3.500	3.500 to 4.000	4.000 to 4.500	4.500 to 5.000
PVC-U : 160	0.000	43.277	95.799	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	43.277	95.799	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Link Type and Size	5.000 to 5.500	5.500 to 6.000	6.000 to 6.500	6.500 to 7.000	7.000 to 7.500	7.500 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000
PVC-U : 160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Excavation Lengths

Link Name	0.000 to 0.500	0.500 to 1.000	1.000 to 1.500	1.500 to 2.000	2.000 to 2.500	2.500 to 3.000	3.000 to 3.500	3.500 to 4.000	4.000 to 4.500	4.500 to 5.000
L7	0.000	0.000	31.905	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L8	0.000	0.634	5.827	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17	0.000	17.969	20.293	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17a	0.000	24.673	16.113	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17b	0.000	0.000	14.915	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17c	0.000	0.000	6.746	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	43.277	95.799	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Link Name	5.000 to 5.500	5.500 to 6.000	6.000 to 6.500	6.500 to 7.000	7.000 to 7.500	7.500 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000
L7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17a	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17b	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17c	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Excavation Volumes

Link Type and Size	0.000 to 0.500	0.500 to 1.000	1.000 to 1.500	1.500 to 2.000	2.000 to 2.500	2.500 to 3.000	3.000 to 3.500	3.500 to 4.000	4.000 to 4.500	4.500 to 5.000
PVC-U : 160	0.000	31.370	83.119	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	31.370	83.119	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Link Type and Size	5.000 to 5.500	5.500 to 6.000	6.000 to 6.500	6.500 to 7.000	7.000 to 7.500	7.500 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000	Extra-over Intermediate Material	Extra-over Hard Material
PVC-U : 160	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Excavation Volumes

Link Name	0.000 to 0.500	0.500 to 1.000	1.000 to 1.500	1.500 to 2.000	2.000 to 2.500	2.500 to 3.000	3.000 to 3.500	3.500 to 4.000	4.000 to 4.500	4.500 to 5.000
L7	0.000	0.000	29.811	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L8	0.000	0.461	5.445	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17	0.000	13.028	16.224	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17a	0.000	17.880	12.617	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17b	0.000	0.000	13.358	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17c	0.000	0.000	5.662	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	31.370	83.119	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Link Name	5.000 to 5.500	5.500 to 6.000	6.000 to 6.500	6.500 to 7.000	7.000 to 7.500	7.500 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000	Extra-over Intermediate Material	Extra-over Hard Material
L7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17a	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17b	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
L17c	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Bedding and Backfill Volumes

Bedding Class	Bedding Material m^3	Selected Backfill m^3	General Backfill m^3
Class B	17.634	38.781	55.277
Totals	17.634	38.781	55.277

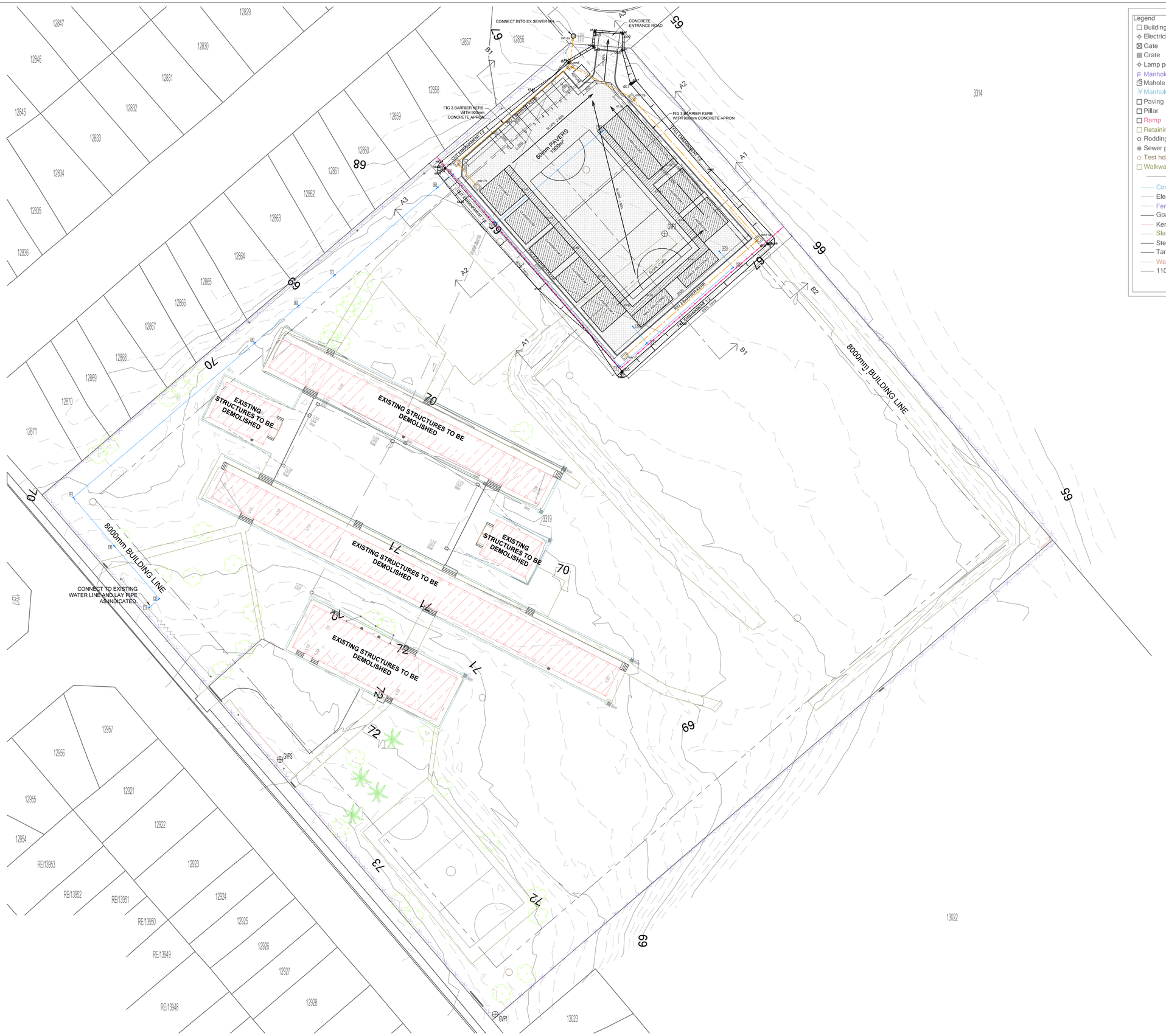
Culvert Lengths

Link Type	Size	Length m
PVC-U	160	139.076
Totals		139.076

Manhole Depths

Manhole Type	0.000 to 0.500	0.500 to 1.000	1.000 to 1.500	1.500 to 2.000	2.000 to 2.500	2.500 to 3.000	3.000 to 3.500	3.500 to 4.000	4.000 to 4.500	4.500 to 5.000
Default	0	5	2	0	0	0	0	0	0	0

Manhole Type	5.000 to 5.500	5.500 to 6.000	6.000 to 6.500	6.500 to 7.000	7.000 to 7.500	7.500 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000	0.000 to 0.000
Default	0	0	0	0	0	0	0	0	0	0



Legend
- Building
- Electricity pole
- Gate
- Grate
- Lamp post
- Manhole fibre
- Mahole sewer
- Manhole valve
- Paving
- Pillar
- Ramp
- Retaining slab
- Rodding eye
- Sewer pipe
- Test holes
- Walkway

- Concrete channel
- Electricity line
- Fence line
- Goal posts
- Kerb
- Slab
- Steps
- Tar
- Wall
- 110mm sewer line

GENERAL NOTES

1. WRITTEN DIMENSIONS TO BE USED IN PREFERENCE TO SCALED DIMENSIONS.
2. DRAWINGS MAY NOT BE SCALED FROM PRINTS DUE TO DISTORTION OF PRINTS.
3. REFER TO CONSTRUCTION NOTES AND STANDARD CONSTRUCTION NOTES.

NORTH

DRAWING LEGEND

- PREFAB STRUCTURES
- NEW CONCRETE
- NEW 60mm PAVING
- 1120.80 NATURAL GROUND LEVEL
- DEMOLITIONS
- uPVC CL. 34 SEWER (ø110-160)
- UPVC CL. 9 WATER (ø75-25)
- PHASE 1 FENCING

BENCHMARKS

10mm peg in Concrete/ Kerb:
GVP1 -46447.66 3749593.16 72.57
GVP2 -46484.05 3749425.67 67.39
GVP3 -46401.50 3749538.51 72.66

DATE		REVISION	BY
2026.02.11	3	ISSUED FOR TENDER.	HJV
2025.11.26	2	REVISED TO ARCH. DWG.	HJV
2025.11.14	1	OMITTED BLOCKS 8 & 9.	HJV
2025.10.29	0	ISSUED FOR INFORMATION.	HJV

CLIENT
EASTERN CAPE DEPARTMENT OF EDUCATION

PROJECT
PROPOSED NEW GREENVILLE PRIMARY SCHOOL,
ERF 3319, BETHELSDORP.

EMIS No: 200100275

TITLE
MASTER PLAN
(EMERGENCY RELOCATION)

CIVIL & STRUCTURAL ENGINEER
SKCMasakhizwe Eastern Cape (Pty) Ltd
CONSULTING ENGINEERS
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DRAWN	CHECKED	DESIGNED
HJV	MLX	AMP

APPROVED	DESIGNED
M.J. LE ROUX Pr Eng, 20000187	A.M. PRINSLOO Pr Eng, 20190579
DATE: MAR 2025	SCALE: Scale 1:400 (A1)
DISCIPLINE: CIVIL & STRUCTURAL	

DRAWING STATUS
TENDER DRAWING

DRAWING NUMBER	REVISION
F0447-02-01000	D03

Sewer Schedule

Name	Y-Coord	X-Coord	Cover	Inlet	Depth	Length	Slope	Type	Size	Level In	Level Out
mh17c	-46443.83	3749415.55	67.73	66.77	0.96						
mh7	-46439.48	3749410.39	67.66	66.61	1.06	6.75	2.45 %	PVC-U	160 mm	66.77	66.61
mh8	-46463.73	3749389.65	67.02	65.82	1.20	31.90	2.47 %	PVC-U	160 mm	66.61	65.82
mhex	-46464.44	3749383.23	66.02	65.20	0.82	6.46	9.57 %	PVC-U	160 mm	65.82	65.20
mh17	-46475.44	3749452.00	68.17	67.17	1.00						
mh17a	-46504.24	3749426.80	67.39	66.59	0.81	38.26	1.54 %	PVC-U	160 mm	67.17	66.59
mh17b	-46477.03	3749396.42	66.94	65.98	0.96	40.79	1.49 %	PVC-U	160 mm	66.59	65.98
mh9	-46463.73	3749389.65	67.02	65.82	1.20	14.91	1.07 %	PVC-U	160 mm	65.98	65.82

Water Schedule

Node	Pipe	Y-Coord	X-Coord	CL	IL	Depth	Length	Slope	Type	Size
[1]		-46373.424	3749505.838	71.630	70.558	1.072				
	[1]						3.001	26.235 %	uPVC - Class 9	75
[2]		-46375.622	3749503.953	71.367	69.771	1.596				
	[2]	-46375.622	3749503.953	71.367	69.771	1.596	14.994	0.753 %	uPVC - Class 9	75
[3]		-46365.861	3749492.572	70.804	69.658	1.146				
	[3]	-46365.861	3749492.572	70.804	69.658	1.146	13.503	0.753 %	uPVC - Class 9	75
[4]		-46357.147	3749482.258	70.241	69.556	0.684				
	[4]	-46357.147	3749482.258	70.241	69.556	0.684	51.280	1.068 %	uPVC - Class 9	75
[5]		-46396.193	3749449.020	69.967	69.009	0.958				
	[5]	-46396.193	3749449.020	69.967	69.009	0.958	12.275	1.068 %	uPVC - Class 9	75
[6]		-46405.538	3749441.063	69.700	68.877	0.822				
	[6]	-46405.538	3749441.063	69.700	68.877	0.822	10.207	1.068 %	uPVC - Class 9	75
[7]		-46413.309	3749434.445	69.370	68.768	0.602				
	[7]	-46413.309	3749434.445	69.370	68.768	0.602	29.032	3.807 %	uPVC - Class 9	75
[8]		-46435.396	3749415.636	68.873	67.663	1.210				
	[8]	-46435.396	3749415.636	68.873	67.663	1.210	4.345	13.013 %	uPVC - Class 9	75
[9]		-46438.676	3749412.843	67.719	67.098	0.622				
	[9]	-46438.676	3749412.843	67.719	67.098	0.622	14.037	1.051 %	uPVC - Class 9	75
[10]		-46447.885	3749423.436	67.850	67.245	0.605				
	[10]	-46447.885	3749423.436	67.850	67.245	0.605	40.620	0.468 %	uPVC - Class 9	75
[11]		-46474.467	3749454.151	68.230	67.435	0.795				
[10]		-46447.885	3749423.436	67.850	67.292	0.559				
	[38]						30.400	2.140 %	uPVC - Class 9	25
[36]		-46470.823	3749403.497	67.190	66.641	0.549				
[11]		-46474.467	3749454.151	68.230	67.482	0.749				
	[39]						7.686	0.108 %	uPVC - Class 9	25
[37]		-46480.251	3749449.088	68.072	67.473	0.599				
[37]		-46480.251	3749449.088	68.072	67.473	0.599				
	[40]						4.689	4.711 %	uPVC - Class 9	25
[38]		-46477.178	3749445.553	68.018	67.694	0.324				
[37]		-46480.251	3749449.088	68.072	67.473	0.599				
	[41]						24.605	1.835 %	uPVC - Class 9	25
[39]		-46498.763	3749432.886	67.570	67.022	0.549				
[39]		-46498.763	3749432.886	67.570	67.022	0.549				
	[42]						4.600	1.153 %	uPVC - Class 9	25
[40]		-46495.745	3749429.414	67.517	66.969	0.549				

PLATFORM COORDS

Name	Y Coord	X Coord	Z Coord
dc1	-46469.155	3749382.407	66.052
dc2	-46468.904	3749385.632	66.375
dc3	-46463.484	3749388.887	67.007
dc4	-46436.932	3749411.593	67.710
dc5	-46474.888	3749455.172	68.248
dc6	-46506.134	3749427.803	67.401
dc7	-46476.704	3749393.511	66.874
dc8	-46474.865	3749386.300	66.130
dc9	-46475.038	3749382.767	65.776

GENERAL NOTES

1. WRITTEN DIMENSIONS TO BE USED IN PREFERENCE TO SCALED DIMENSIONS.
2. DRAWINGS MAY NOT BE SCALED FROM PRINTS DUE TO DISTORTION OF PRINTS.
3. REFER TO CONSTRUCTION NOTES AND STANDARD CONSTRUCTION NOTES.

TERRACE VOLUME (CONCEPT DESIGN)

VOLUME FOR TERRACE : DECANTING
PLATFORM VOLUMES
GROUND SURFACE : HANSEN SURVEY
TERRACE SURFACE : DECANT DESIGN
GRID INTERVAL : 1.000

THE UNADJUSTED VOLUMES ARE :-
570.51 CU.M. TOTAL CUT.
524.54 CU.M. TOTAL FILL.
1174.17 SQ.M. TOTAL AREA IN CUT.
1538.83 SQ.M. TOTAL AREA IN FILL.

DEPTH (M)	CUT (Cu.m.)	FILL (Cu.m.)
0.000 TO 0.500	162.245	339.693
0.500 TO 1.000	399.164	184.849
1.000 TO 1.500	9.103	0.000
1.500 TO 2.000	0.000	0.000
	570.511	524.543

VOLUMES ADJUSTED FOR 100.00% COMPACTION AND 0.40m TOPSOIL STRIPPING.
100.84 Cu.m. CUT AVAILABLE FOR FILL
1170.08 Cu.m. OF FILL IS REQUIRED GIVING:-
1039.23 Cu.m. OF FILL SHORTFALL AND:-
1085.20 Cu.m. OF TOPSOIL TO BE STRIPPED

DRAWING LEGEND

NORTH

- PREFAB STRUCTURES
- NEW CONCRETE
- NEW 60mm PAVING
- 1120.80 NATURAL GROUND LEVEL
- DEMOLITIONS
- uPVC CL. 34 SEWER (ø110-160)
- UPVC CL. 9 WATER (ø75-25)
- PHASE 1 FENCING

BENCHMARKS

10mm peg in Concrete/ Kerb:
GVP1 -46447.66 3749593.16 72.57
GVP2 -46484.05 3749425.67 67.39
GVPS -46401.50 3749538.51 72.66

DATE		REVISION	BY
2026.02.11	3	ISSUED FOR TENDER.	HJV
2025.11.26	2	REVISED TO ARCH. DWG. UPDATES TO CIVIL SETTING OUT TABLES.	HJV
2025.11.14	1	OMITTED BLOCKS 8 & 9.	HJV
2025.10.29	0	ISSUED FOR INFORMATION.	HJV

CLIENT
EASTERN CAPE DEPARTMENT OF EDUCATION

PROJECT
PROPOSED NEW GREENVILLE PRIMARY SCHOOL,
ERF 3319, BETHELSDORP.

EMIS No: 200100275

TITLE
SITE LAYOUT
(EMERGENCY RELOCATION)

CIVIL & STRUCTURAL ENGINEER
SKCM
SKCMasakhizwe Eastern Cape (Pty) Ltd
CONSULTING ENGINEERS
14 QUEENS TERRACE
ALIWAL NORTH
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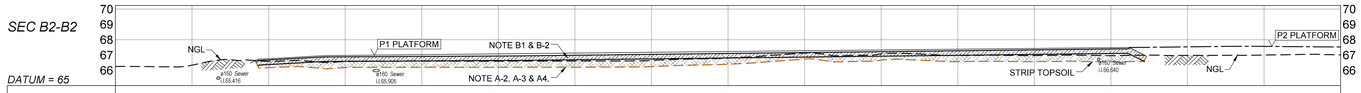
P.O. BOX 578
ALIWAL NORTH
9750
FAX: (086) 650 7254
Web: www.skcm.co.za
eMail: easterncape@skcm.co.za

DRAWN	CHECKED	DESIGNED
HJV	MLX	AMP

APPROVED: M.J.L LE ROUX Pr Eng. 20000187
DESIGNED: A.M. PRINSLOO Pr Eng. 20190579
DATE: MAR 2025
SCALE: Scale 1:200 (A1)
DISCIPLINE: CIVIL & STRUCTURAL
DRAWING STATUS: TENDER DRAWING
DRAWING NUMBER: F0447-02-01001
REVISION: D03

SEC B2-B2



DATUM = 65

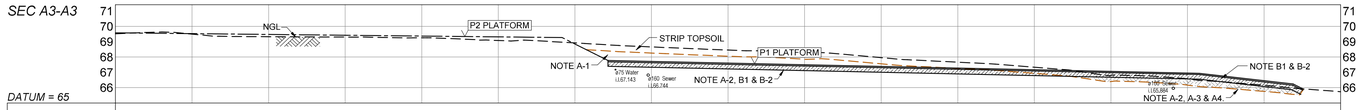
OFFSET		-70.000	-65.000	-60.000	-55.000	-50.000	-45.000	-40.000	-35.000	-30.000	-25.000	-20.000	-15.000	-10.000	-5.000	
DESIGN		66.759	66.962	66.989	67.015	67.064	67.123	67.181	67.239	67.298	67.356	67.414	67.473	67.531	66.857	
NGL	66.252	66.337	66.577	66.578	66.601	66.596	66.607	66.644	66.800	67.133	67.073	66.967	66.967	66.959	66.973	66.998	67.012

SEC B1-B1

DATUM = 66

OFFSET		-70.000	-65.000	-60.000	-55.000	-50.000	-45.000	-40.000	-35.000	-30.000	-25.000	-20.000	-15.000	-10.000	-5.000	
DESIGN		67.364	67.406	67.448	67.491	67.533	67.575	67.617	67.659	67.702	67.754	67.812	67.870	67.929	67.364	
NGL	67.359	67.726	67.906	67.968	67.872	67.794	67.772	67.766	67.758	67.830	67.790	67.394	67.310	67.301	67.329	67.450	67.415

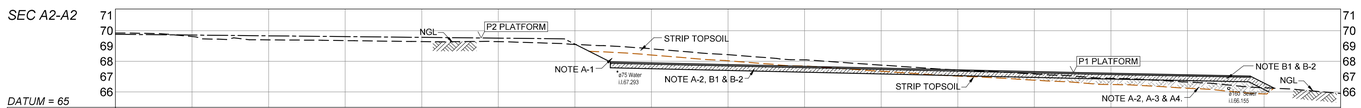
SEC A3-A3



DATUM = 65

OFFSET									35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	
DESIGN									67.709	67.601	67.493	67.385	67.277	67.169	67.061	66.953	66.454	
NGL	69.519	69.498	69.326	69.301	69.257	69.078	68.922	68.659	68.453	68.254	67.959	67.663	67.334	66.801	66.570	66.158	65.737

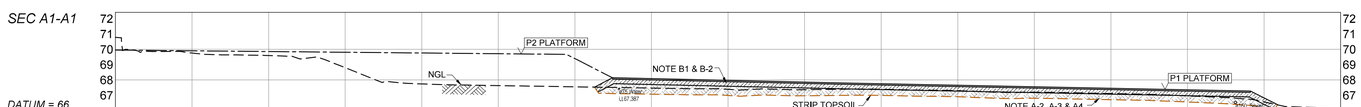
SEC A2-A2



DATUM = 65

OFFSET									35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	
DESIGN									67.895	67.782	67.669	67.555	67.442	67.329	67.221	67.122	66.586	
NGL	69.850	69.618	69.402	69.354	69.289	69.286	69.103	68.816	68.436	68.095	67.752	67.433	67.170	66.885	66.645	66.272	65.904

SEC A1-A1



DATUM = 66

OFFSET									35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	
DESIGN									68.085	67.972	67.859	67.753	67.653	67.554	67.455	67.355	66.829	
NGL	70.780	69.761	69.596	68.801	67.742	67.633	67.552	67.472	67.388	67.368	67.392	67.303	67.206	67.112	66.962	66.570	66.106

GENERAL NOTES

1. WRITTEN DIMENSIONS TO BE USED IN PREFERENCE TO SCALED DIMENSIONS.
2. DRAWINGS MAY NOT BE SCALED FROM PRINTS DUE TO DISTORTION OF PRINTS.
3. REFER TO CONSTRUCTION NOTES AND STANDARD CONSTRUCTION NOTES.

EARTHWORKS NOTES:

STRIP TOPSOIL:
DIGGING UP AND REMOVING SLIGHTLY MOIST; BROWN; FIRM; INTACT; SANDY SILT + QUARTZITE GRAVEL + COBBLE. TRANSPORTED TO A DEPTH OF 0-400mm AND STOCKPILE ON SITE FOR REUSE. EXCESS TO BE CARTED OFF SITE ONLY ON INSTRUCTION BY ENGINEER TO A LOCATION TO BE IDENTIFIED BY THE CONTRACTOR.

NOTE A-1:
CUT MOIST; LIGHT YELLOW BROWN; STIFF; SLICKEN SIDED; SILTY CLAY + CALCRETE AND STOCKPILED ON SITE FOR REUSE.

NOTE A-2:
COMPACTION OF IN-SITU SURFACES, ETC. INCLUDING SCARIFYING FOR A DEPTH OF 100mm, BREAKING DOWN OVERSIZED MATERIAL AND COMPACTING TO A MINIMUM OF 93% MOD AASHTO DRY DENSITY.

NOTE A-3:
FILL MOIST; LIGHT YELLOW BROWN; STIFF; SLICKEN SIDED; SILTY CLAY + CALCRETE FROM STOCKPILE COMPACTING TO A MINIMUM OF 93% MOD AASHTO DRY DENSITY TO 380mm BELOW FINAL LEVEL OF PLATFORM.

NOTE A-4:
IMPORT G6 MATERIAL WHERE REQUIRED COMPACTING in 150mm LAYERS TO A MINIMUM OF 93% MOD AASHTO DRY DENSITY TO 380mm BELOW FINAL LEVEL OF PLATFORM.

NOTE B-1:
IMPORT 1x G6 MATERIAL 150mm SUBBASE LAYER COMPACTED TO A MINIMUM OF 95% MOD AASHTO DRY DENSITY TO 230mm BELOW FINAL LEVEL OF PLATFORM.

NOTE B-2:
IMPORT 1x G5 MATERIAL 150mm BASE LAYER COMPACTED TO A MINIMUM OF 98% MOD AASHTO DRY DENSITY TO 80mm BELOW FINAL LEVEL OF PLATFORM.

PAVING
60mm INTERLOCKING GREY BLOCK PAVING ON 20mm BEDDING SAND (HERRINGBONE PATTERN).

DRAWING LEGEND

- NATURAL GROUND LEVEL
- STRIP TOPSOIL
- PHASE 1 PLATFORM
- PHASE 2 PLATFORM

DATE		REVISION	BY
2026.02.11	3	ISSUED FOR TENDER.	HJV
2025.11.26	2	UPDATED SECTIONS.	HJV
2025.11.14	1	UPDATED EARTHWORKS NOTES.	HJV
2025.10.29	0	ISSUED FOR INFORMATION.	HJV

CLIENT
EASTERN CAPE DEPARTMENT OF EDUCATION

PROJECT
PROPOSED NEW GREENVILLE PRIMARY SCHOOL,
ERF 3319, BETHELSDORP.

EMIS No: 200100275

TITLE
SITE CROSS SECTIONS (EMERGENCY RELOCATION)

CIVIL & STRUCTURAL ENGINEER
SKCMasakhizwe Eastern Cape (Pty) Ltd
CONSULTING ENGINEERS
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ALIWAL NORTH
9750
FAX: (086) 650 7254
Web: www.skcm.co.za
eMail: easterncape@skcm.co.za

DRAWN	CHECKED	DESIGNED
HJV	MLX	AMP

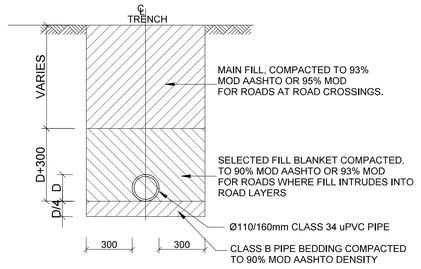
APPROVED	DESIGNED
M.J. LE ROUX Pr Eng, 20000187	A.M. PRINSLOO Pr Eng, 20190579
DATE: MAR 2025	SCALE: Scale 1:200 (A1)
DISCIPLINE: CIVIL & STRUCTURAL	

DRAWING STATUS
TENDER DRAWING

DRAWING NUMBER	REVISION
F0447-02-01002	D03

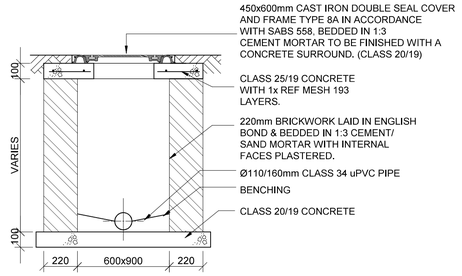
NOTES ON BACKFILL

1. USE EXCAVATED MATERIAL IN ZONES NOT SUBJECTED TO VEHICULAR TRAFFIC
2. USE IMPORTED FILL AS SPECIFIED IN AREAS SUBJECTED TO VEHICULAR TRAFFIC



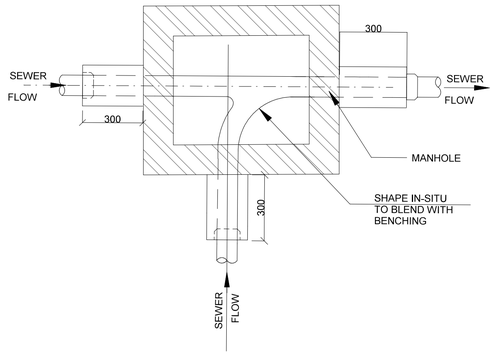
SEWER TRENCH

Scale 1.20 (A1)



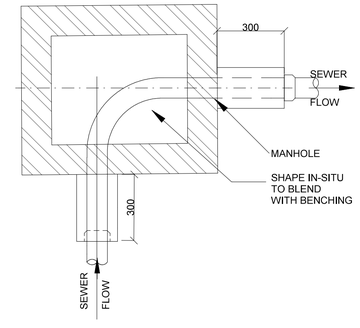
SEWER MANHOLE

Scale 1.20 (A1)



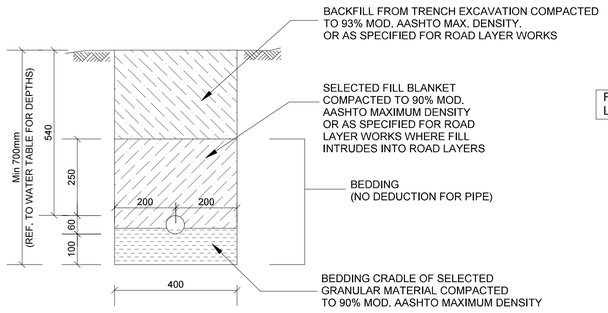
TYPICAL SEWER MANHOLE LAYOUT 1

NOT TO SCALE



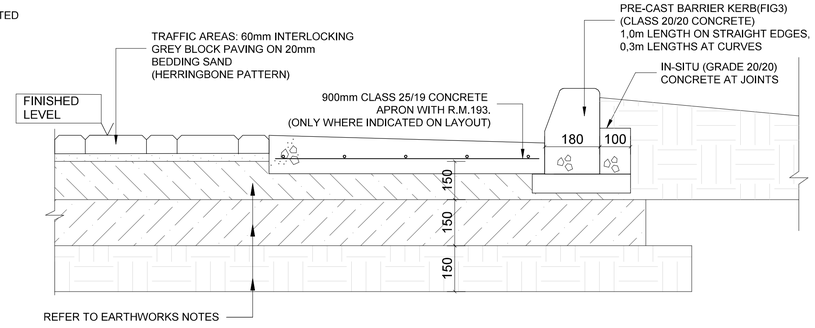
TYPICAL SEWER MANHOLE LAYOUT 2

NOT TO SCALE



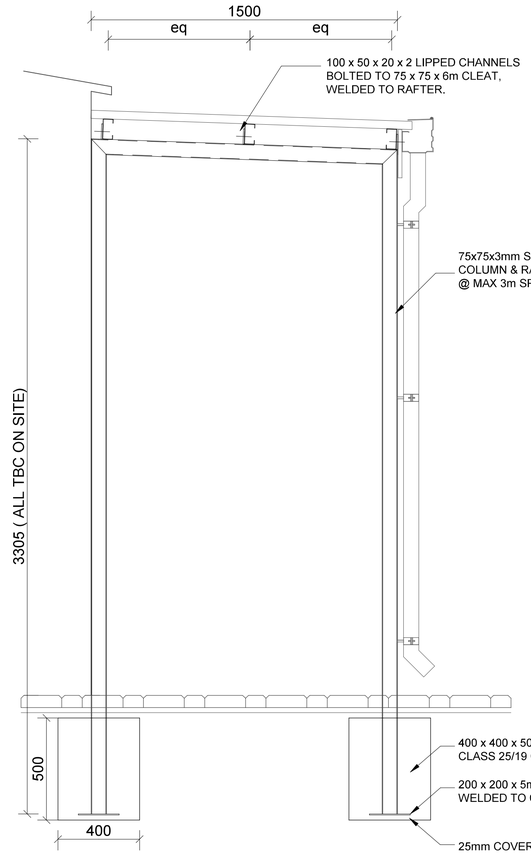
TYPICAL SECTION - PIPE TRENCH UP TO Ø75mm PIPE - DOMESTIC SUPPLY

SCALE 1:10 (A1)



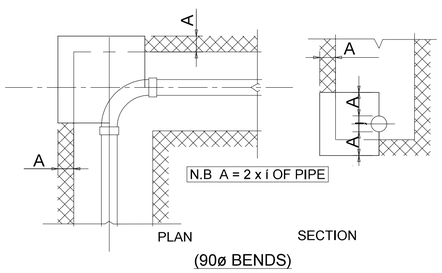
BARRIER KERB & CHANNEL COMBINATION DETAIL

SCALE 1.10 (A1)

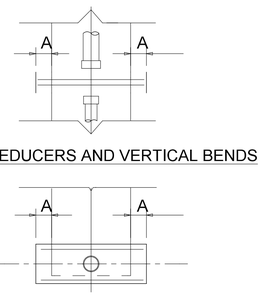


VERANDA WALKWAY SECTION

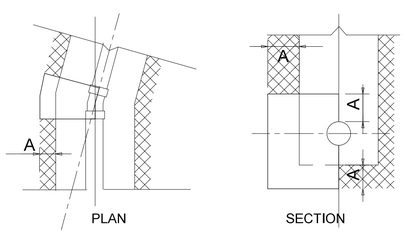
N.T.S. (A1)



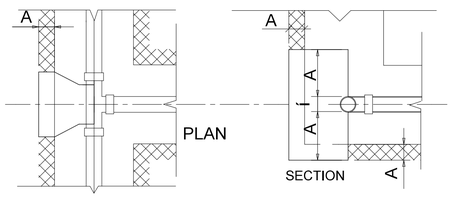
(90ø BENDS)



PLAN-REDUCERS AND VERTICAL BENDS



PLAN-REDUCERS AND VERTICAL BENDS



TEE PIECES

N.B. CONCRETE FOR THRUST AND ANCHOR BLOCKS TO BE TO BE CLASS 20/20 , COUPLINGS NOT TO BE CAST IN CONCRETE UNLESS UNAVOIDABLE AND APPROVED BY ENGINEER.

THRUST BLOCK DETAILS

SCALE 1.20 (A1)

STANDARD BRICKWORK NOTES

1. ALL BRICKWORK SHALL BE IN ACCORDANCE WITH SANS 2001-CM1-1.
2. BRICKWORK TO HAVE NOMINAL COMPRESSIVE STRENGTH OF 14 MPa.
3. INSTALL FABRIC BRICK REINFORCEMENT IN EVERY COURSE BELOW DPC, EVERY 2 COURSES ABOVE DPC AND IN EVERY COURSE FOR FIVE COURSES ABOVE LINTOL HEIGHT.
4. MORTAR FOR BRICKWORK TO BE CLASS II MORTAR AND IN ACCORDANCE WITH SANS 10164 PART I - Table 1.

STANDARD CONCRETE NOTES:

1. ALL CONCRETE TO BE IN ACCORDANCE WITH SANS 2001-CC1.
2. ALL CONCRETE TO BE STRENGTH CONCRETE.
3. GRADES OF CONCRETE:
   MASS CONCRETE 15/19
   CHANNELS/ BASES 25/19

STANDARD REINFORCING NOTES:

1. STRENGTH OF REINFORCEMENT:

REFERENCE	TYPE	STRENGTH (MPa)
R	A	250
Y	C	450

2. CONCRETE COVER (mm)

	EXTERNAL	INTERNAL
CHANNELS	40	30

3. ALL BENDING OF REINFORCEMENT TO BE IN ACCORDANCE WITH SABS 82.
4. ALL PLACING OF REINFORCEMENT TO BE IN ACCORDANCE WITH SABS 0144.
5. MINIMUM SPLICE LENGTHS:
   < 8 mm Ø = 400 mm
6. ALL REINFORCING TO BE INSPECTED AND APPROVED BY ENGINEER BEFORE PLACING CONCRETE.

STANDARD STRUCTURAL STEEL NOTES:

1. ALL DIMENSIONS MUST BE CAREFULLY CHECKED ON SITE BEFORE COMMENCING WITH THE MANUFACTURE OF ANY STRUCTURAL STEELWORK.
2. ALL STRUCTURAL STEELWORK SHALL BE IN ACCORDANCE WITH SABS 1200 H.
3. ALL STRUCTURAL STEEL AND HOLLOW SECTIONS SHALL BE IN GRADE S355-JR IN ACCORDANCE WITH SANS 1431. COLD-FORMED SECTIONS SHALL BE IN GRADE S235-JR.
4. ALL WELDS SHALL BE AT LEAST 6mm CONTINUOUS FILLET WELDS UNLESS OTHERWISE SPECIFIED AND THE STRENGTH OF ALL WELDS SHALL BE EQUAL TO THE STRENGTH OF THE ELEMENTS WHICH THE WELDS INTERCONNECT IN ACCORDANCE WITH SANS 10044.
5. ALL BOLTS, UNLESS OTHERWISE SPECIFIED SHALL BE ISOMETRIC BLACK BOLTS OF GRADE 4.8 IN ACCORDANCE WITH SANS 135.
6. ALL PURLINS AND CLADDING RAILS ARE TO BE FABRICATED IN SECTIONS CONTINUOUS OVER AT LEAST 2 SPANS. JOINTS MUST BE STAGGERED WITH MAXIMUM LENGTHS ON BOTH SIDES.
7. ALL OPEN ENDS OF HOLLOW SECTION SHALL BE SEALED WITH 3mm PLATE.
8. ALL STEELWORK SURFACES TO BE PAINTED SHALL BE PREPARED IN ACCORDANCE WITH SABS 1200 HC AND SECTION PSHC OF THE SPECIFICATION.

DATE		REVISION	BY
2026.02.11	2	ISSUED FOR TENDER.	HJV
2025.11.26	1	UPDATED DETAILS.	HJV
2025.11.14	0	ISSUED FOR INFORMATION.	HJV

CLIENT

EASTERN CAPE DEPARTMENT OF EDUCATION

PROJECT

PROPOSED NEW GREENVILLE PRIMARY SCHOOL,
ERF 3319, BETHELSDORP.

EMIS No: 200100275

TITLE

TYPICAL DETAILS (EMERGENCY RELOCATION)

CIVIL & STRUCTURAL ENGINEER

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APPROVED	DESIGNED
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DATE: MAR 2025	SCALE: AS SHOWN (A1)
DISCIPLINE: CIVIL & STRUCTURAL	
DRAWING STATUS: TENDER DRAWING	

DRAWING NUMBER	REVISION
F0447-02-01003	D02

3.ELECTRICAL ENGINEERING DRAWINGS

DISABILITY ECONOMIC EMPOWERMENT TRUST

GREENVILLE PRIMARY SCHOOL

EMERGENCY RELOCATION (PHASE 1)

ELECTRICAL SPECIFICATION

ELECTRICAL / MECHANICAL ENGINEERS:
MXN ELECTROCON PROJECTS
24 Botha Road
Selborne
EAST LONDON

Tel: 087 702 4198

FEBRUARY 2026

NAME OF BIDDER : ……..……..

CRS NO. : ……..……..

1. GREENVILLE PRIMARY SCHOOL: EMERGENCY RELOCATION

ELECTRICAL INSTALLATION

INDEX

PART 1: WORKS SPECIFICATION

PART 1: WORKS SPECIFICATION

CONTENTS

1.0 Purpose

1.1 This Specification is intended to set out the general technical and procedural requirements for the installation of electrical lighting, power and ancillary services within and around premises largely as contemplated in The Code of Practice for the Wiring of Premises, South African Bureau of Standards SANS 10142-1:2003 (hereinafter called the Wiring Code, or SANS 10142-1:2003). Where the installation falls outside the scope of the Wiring Code, those portions of the installation (e.g.: MV switchgear and cabling, power transformers, and so forth) shall be covered in one or more supplementary specifications appended hereto).

1.2 This Specification shall be read in conjunction with the Contractual Conditions, Schedules, Bills of Quantities and Drawings.

1.3 Clause separations and headings are given for guidance only and the Work may not necessarily be limited to any particular section(s) of this Specification and the project Documentation must be read as a whole.

2.0 Scope

2.1 This Specification covers the supply, delivery, off-loading, storage, installation, testing, commissioning, and handing over in full working order, complete in all respects of lighting, power, and ancillary services as outlined in this Specification and/or shown on the drawing(s). Unless specifically stated otherwise, any reference in the Documentation (see clause 3.1.2) to any material or service being provided, fixed, rendered etc, shall mean that such provision falls under the Contractor's contractual obligations.

2.2 The service/s installation/s shall comprise, but shall not be limited to: all notifications and applications to Authorities, including payment of fees, distribution boards, cables, bus-bars, wireways, wiring, controls, accessories, luminaires and lamps, earthing, static and lightning protection/bonding, facilities for other services, fixings and building-in, earthworks, painting, special power supplies, data services, fire alarms, access and intruder control, communication, TV and radio services, working and record drawings, maintenance manuals etc and all other things to form a complete and proper installation to the extent as contemplated in the Documentation.

2.3 The Tenderer shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the Works and of his rates and prices contained in the various schedules and that his offer shall cover all his obligations under the Contract for the full and proper completion of the Works.

3.0 Definitions

3.1 In addition to the definitions contained in Part 3 of the Wiring Code, the following shall apply: -

3.1.1 'Document' and 'Documentation' shall mean the complete set of contract Documents including any relevant government department's specifications and conditions (where applicable), this Specification, schedules, bills, drawings and any variation orders or site instructions issued in terms of the Contract.

3.1.2 'Contractor' or 'Electrical Contractor' shall mean the person, partnership, company or firm appointed to undertake the electrical and or ancillary installation hereinafter called the electrical installation or Works in terms of this Contract. In this Document, 'Contractor' shall have the same meaning as nominated, selected or domestic sub-contractor where the electrical installation is in any form a subcontract to the Main Contract. For clarity, the builder or principal contractor shall be referred to as the 'Main Contractor'. The Contractor shall also be fully responsible under the contract for any of his sub-contractors, agents, assigns, suppliers etc.

3.1.3 'Tenderer' shall mean the person, partnership, company, or firm who makes a bid to carry out the Works. The successful Tenderer will normally become the Contractor upon official award of the contract and the completion of contractual Documentation when all obligations under this Contract shall become the Contractor's liability.

4.0 Site Visit

In instances where there may be no mandatory formal Tenderers' site visit, Tenderers nevertheless are advised to visit the Site of the Works, prior to the submission of any tender, to ascertain site conditions, accessibility, available facilities etc. No claim on the grounds of want of knowledge in these respects, or any others, will be entertained.

5.0 Compliance with Regulations

5.1 The installation shall comply with the latest versions of the following standards and regulations except where more stringent requirements are laid down in the contract Documentation in which event the latter shall take precedence: -

- The Code of Practice for the Wiring of Premises, SANS 10142-1:2003.
- The latest issues of all SANS Standards and Codes of Practice (hereinafter called SANS standard/s) or, if such standards do not exist, then the latest versions of the appropriate international standard as issued by the British Standards Institute (BS) and/or the International Electrotechnical Commission (IEC).
- The Occupational Health and Safety Act 1993 (Act 85 of 1993), (OHSA) and the Construction Regulations R1010 dated 18 July 2003.
- The bylaws and regulations of the Local Municipality and Authorities who are responsible for the area in which the Works are situated.
- Telkom regulations and specifications.

5.2 The Contractor shall issue all notices and pay all the required fees in respect of the installation to the authorities, and shall indemnify the Employer, Main Contractor and Engineer from all losses, claims, costs, or expenditure which may arise as a result of the Contractor's failure to comply with these requirements and the regulations of any relevant Authority.

5.3 It shall be assumed that the Contractor is conversant with the requirements outlined in 5.2. Should any requirements, bylaws, or regulation, which contradicts the requirements of this Document, apply or become applicable during the course of the Works, such requirements, by-law or regulation shall overrule this Document, and the Contractor shall immediately inform the Engineer of such a contradiction. Under no circumstances shall the Contractor carry out any variations to the installation in terms of such contradictions without obtaining the written permission to do so from the Engineer.

6.0 Standards and Quality of Work

6.1 As the Wiring Code lays down strict requirements for complying with SANS standards, a compulsory specification published in a government gazette, or otherwise approved in terms of the Wiring Code, no detailed list of Standards will be scheduled herein. However, portions of the Works falling outside the scope of the Wiring Code shall comply fully with the latest versions of the applicable standards and codes issued by the SANS or, in the absence of such standard, with an acceptable international standard. Any reference to a particular standard may be given for guidance/clarification only; this shall not relieve the Contractor from complying with all relevant standards in their entirety.

6.2 All components shall be new and of the best available quality and of the class most suitable for the purpose and environment for which they are intended. The whole installation shall be extremely reliable, and all parts shall be of such material as will ensure that they are capable of withstanding variations in temperature and humidity arising under working conditions without distortion or deterioration or setting up of undue strain on any part.

Any particular make or model of equipment referred to in the Documentation is for guidance purposes only in setting standards/types/performances required; equipment that is equal or superior in all respects, and to the approval of the Engineer, may be offered by Tenderers. No reference to any particular make of any equipment shall be construed as that equipment having been selected by the Engineer or Client and the Contractor shall be fully responsible for the guarantee and performance of such equipment.

Only equipment and materials with a proven track record in similar applications will be considered.

6.3 Equipment and components of a similar class, such as wiring accessories, switch disconnector units etc, shall be of the same make, pattern, and where applicable, colour, throughout.

6.4 The Work shall comply with the requirements of the Documentation, but where it may become necessary to carry out the Work in a different manner; the Contractor shall first obtain the approval of the Engineer in writing.

In cases where items offered by Tenderers are not in accordance with the contract Documentation, the deviation/s must be fully detailed, irrespective of whether a special form is included for this purpose or not, and such details shall accompany the tender submission in the form of a covering letter, or on the form provided. Merely stating 'as (manufacturer's name / item)', or submission of manufacturer's pamphlets etc. is not acceptable, will not be considered part of any offer and will be ignored. Where no details are submitted, in a covering letter, or on a form provided, the offer shall be deemed to comply fully with the Works Documentation, and the successful Tenderer/Contractor shall be liable for performance strictly in accordance with all specifications and conditions.

6.5 The complete Work shall be carried out by qualified, highly trained, skilled and competent operatives to the highest standard of workmanship. The minimum requirement is that a permanent on-site electrician whether working alone or leading the Contractor's workforce, and who must be an 'A' Grade artisan as determined by the Department of Labour, is to be the appointed artisan who shall be responsible for the day-to-day installation work.

An adequate number of workmen shall be employed at all times to ensure satisfactory progress of the Works in accordance with the overall pace of the project and/or in harmony with any Works programme set by the Architect, Main Contractor or Engineer, etc.

The Contractor shall liaise and cooperate with any other contractor(s) whose work is related to, close to or build into with the Works as detailed herein and shall coordinate the Work to avoid fouling, unsatisfactory setting out etc. Any failure by other contractors to collaborate with the Contractor herein shall be immediately reported in writing to the Engineer and Main Contractor.

The Work shall at all times and for the full duration of the Contract, be carried out under the management and supervision of a skilled and competent representative of the Contractor who will be authorised to receive and carry out instructions on behalf of the Contractor and to attend site meetings.

7.0 Rejection of Inferior Work and Materials

All inferior work or work containing inferior material shall be rejected by the Engineer whereupon the Contractor shall immediately remove and rectify the faulty work as necessary and bear all costs in connection therewith.

8.0 Drawings and Samples

8.1 Tenderers may be required to submit for approval, comment or records samples of materials, apparatus or components, and also drawings, schematic diagrams or technical details, including calculations, upon which their design and/or offer is based before any contract is awarded. Such details may also be called for during the course of the Contract prior to installation. Any approvals given or comments made shall be on the generality of the scheme and shall not relieve the Contractor of his responsibility to ensure full compliance with all performance and regulatory criteria.

NOTE: A request for submission of samples or drawings does not imply that the Tenderer's quotation will necessarily be accepted.

8.2 Drawings shall be clearly marked "WORKING DRAWINGS FOR APPROVAL", or as otherwise applicable. Samples shall remain on site until completion and taking over of the Works or, with the Engineer's approval, the samples may be embodied within the installation.

8.3 All expenses in connection with the supply and return of the drawings and samples shall be borne by the Tenderer/Contractor.

9.0 Guarantee

9.1 All equipment supplied, and all work performed shall be guaranteed against defective operation, poor design (where designed by the Contractor, or in components / assemblies with inherently poor design), and unacceptable / faulty workmanship, all as determined by the Engineer, for a period of 12 months after commissioning, handover and Client acceptance.

Any faults found during the guarantee period shall be timeously repaired or replaced by the Contractor, including peripheral damage/disturbance (e.g.: wall finishes etc damaged during the course of repairs), at his own expense, excluding misuse and abuse by others and fair wear and tear. Discharge type lamps shall be included in the 12-month guarantee period; however, incandescent lamps shall carry a 3-month guarantee.

The Contractor is required to carry out any remedial work under the guarantee at times and in a manner which will cause the least disruption to the Client's, or other occupant's, operations.

9.2 The Contractor shall ensure that he has access to sufficient spare components for all equipment readily available to forestall any delays in repairing the installation.

10.0 Operating and Maintenance Details

Two complete sets of technical manuals complete with spares schedules, as-fitted layout drawings, schematic wiring diagrams and operating and general maintenance information, bound in hard-cover ring binders shall be prepared by the Contractor and delivered to the Client at or before final handover. A full 'As-Built' set of drawings shall also be submitted to the Engineer for record purposes.

The main and individual distribution board (DB) single line diagrams shall be brought up to 'As-Built' status and copies placed in the technical manual. A further copy of the main single line diagram shall be mounted in a glass-fronted frame and hung in a suitable position in the main LV room. Copies of the distribution board diagrams shall be folded (or reduced) to A4 size and placed in an A4 sized perspex fronted frame or document pocket in the applicable DB. Such frames or pockets shall be fabricated from 1,2mm pre-galvanised steel and spot welded to the DB (usually to the inside of the DB door).

This documentation shall be submitted to the Engineer for comment and approval prior to handing over to the Client. It is therefore advisable to submit the details in draft format so that any amendments/corrections can be easily incorporated.

11.0 Inspection and Testing of Works

11.1 The Contractor shall attend upon the Engineer as reasonably required for Work inspection. Normally, inspection of Work in progress will take place on the same day as the general site meeting, or such other times as the Engineer may reasonably require. Handing-over inspections will be done at the completion of the Contractor's testing, issuing of the Certificate of Compliance by the Contractor's accredited person, livening the installation by the Supply Authority, commissioning of the installation and upon making a written request for the Engineer to carry out an initial handover inspection.

Where the installation is to be switched on and taken over in portions, the Certificate of Compliance shall be limited to that particular part of the Work. New Certificates of Compliance shall be completed for remaining phases of the project as applicable, and the Supply Authority's permission formally obtained to switch electricity to those areas.

The Contractor shall, prior to requesting the Engineer to undertake an initial handover inspection, do a full, complete and proper inspection of his Work to ensure that everything is absolutely complete and in accordance with the Documentation. Following this inspection, and rectification of any faults in parts of the installation that may be required, the Contractor shall make a written request to the Engineer for a handover inspection. Any faults still found in the installation shall be listed by the Engineer and handed to the Contractor who shall attend to all faults within a reasonable period as decided by the Engineer except that this period will in no circumstance exceed 14 days. Once all listed faults have been rectified, the Contractor shall again request the Engineer in writing to carry out a final handover inspection.

Upon the successful completion of a handover inspection and the issuing of a handover certificate by the Engineer, the responsibility for the security of the installation, or part thereof, shall be deemed to be with the Client.

Under no circumstances will any inspection by the Engineer and/or, if appointed, the Electrical Clerk of Works of Resident Engineer, relieve the Contractor of his obligations in terms of the Documentation.

11.2 On completion of the installation, or such part thereof as may be determined by the Engineer, the Contractor shall carry out installation testing and inspection in accordance with Part 8 of SANS 10142-1:2003 and/or any other relevant Standard.

The result of these tests, duly certified by the Contractor, shall be submitted to the Engineer in the form of a typed test-result certificate. No testing for acceptance purposes will be carried out by the Engineer until this is received.

Upon receipt of the test certificate, the Engineer will arrange to carry out acceptance tests and to witness commissioning procedures, including load-balance, phase rotation, bonding and labelling checks. If any faults are found in the installation, a list of those immediately noticed will be handed to the Contractor by the Engineer. The Contractor shall forthwith rectify such faults and issue a further test certificate endorsed "RE-TEST" with all reasonable despatch whereupon the Engineer will carry out further check-tests.

Any list of faults issued by the Engineer shall not be regarded as final but given only for the assistance of the Contractor who will be bound to exercise all necessary diligence in their rectification and to check for any other faults and to rectify same.

The Contractor shall supply all necessary testing instruments for carrying out tests, including, but not limited to: insulation tester, earth loop-impedance tester, clip-on ammeter (e.g.: for load-balance testing), earth-leakage tester, etc. Where there is reason to doubt the accuracy of the instruments, the Contractor shall arrange for tests to check their accuracy.

11.3 Where cast-in conduit is installed, the Contractor shall thoroughly check his layout, fastness etc, well before any concrete is poured. The Engineer shall be informed by the Contractor in writing that he is ready for a check-inspection, giving the Engineer not less than 48-hour notice (usually by telefax and or email). A qualified operative of the Contractor shall stand by at all times when concrete is being poured so that any conduits or boxes that may become loose, displaced etc can be refixed.

11.4 If it is necessary for the Engineer, his agents or assigns, to spend extraordinary time in respect of checking, testing, inspection or any other matter due to the Contractor's default or unsatisfactory attendance all costs of the Engineer in obtaining remedy shall be for the Contractor's account. For example, if the Contractor failed to carry out his own prior testing in a reasonable and diligent manner, or to check cast-in conduits properly before calling the Engineer to undertake a check-inspection, thus necessitating further visits and/or extra time incurred, costs of the Engineer will be

charged to the Contractor. These costs will be deducted from the Contractor's claims or shall be claimed by submission of an account. Engineer's claims for wasted time, including disbursements, shall be based on the applicable Department of Public Works Rates for Reimbursable Expenses.

12.0 Technical and Installation Requirements

12.1 Main Electrical Supply

In instances where the incoming main supply from the Supply Authority is at low voltage (LV), requirements of the Supply Authority with regard to method of incomer connection, earthing, testing/approval of main circuit breaker etc, must be strictly adhered to.

The Supply Authority's requirements for their metering must be complied with and all facilities, space, bus-bar links for current transformers (CTs), etc, as the case may be, shall be in accordance with their requirements. The Contractor shall be deemed to have made all allowances for the Supply Authority's requirements in their tender submission.

12.2 MV Equipment and Cabling

Medium voltage (MV) equipment falls outside the scope of this building services specification. Where required, MV cables, MV switchgear and power transformers etc. shall be specified in a supplementary specification and/or drawings.

12.3 Miscellaneous Equipment and Installations

Miscellaneous items such as diesel generators, uninterruptable power supplies (UPSs), overhead lines etc. which fall outside the scope of this building services specification shall be specified in a supplementary specification and/or drawings.

12.4 Distribution Boards

12.4.1 General

a) Distribution Boards (DBs) shall be of the type as detailed in the single line diagrams, the Detailed Specification and, where applicable, the equipment schedules. Unless otherwise indicated, distribution boards shall be provided with prefitted space/s for a minimum 20% extra switchgear, subject to a minimum of one space for each class of circuit breaker, combination fuse switch (CFS), contactor etc, viz.: 3-pole, single pole etc, as the case may be.

b) DBs shall comply fully with SANS 1765.

c) Enclosures

i) Distribution boards for internal applications shall be constructed from folded pre-galvanised 2mm mild steel sheet suitably welded, bolted and braced to form a rigid construction and finished with an epoxy coating after fabrication. DBs for external applications shall be similar to internal DBs, but shall be fabricated from 2mm 3CR12, plus a suitable epoxy finish. Boards for special applications may be made from polished 2mm 316 stainless steel, fibreglass etc; these will be more fully described in the Detailed Specification where applicable.

ii) All equipment, except door mounted instruments, indicators and so forth, shall be mounted behind removable fascia plates with only the switchgear operating handles protruding.

iii) Normally, free standing boards shall not exceed 2,3m in height with operating handles, pushbuttons etc not exceeding 1,8m from the floor nor

lower than 600mm above floor level (subject to any equipment part not being lower than 300mm from the floor).

iv) Cabinet type boards used mostly for LV distribution shall be 'Form 1' degree of separation to IEC 439 while cubicle boards used mostly for Motor Control Centres (MCCs) shall be 'Form 4'.

v) The Contractor is to check all access routes for distribution boards. Where necessary, DBs are to be made in sections to allow access into their final position.

d) Protection

All boards shall be rendered moisture and vermin proof and shall be adequately ventilated. Unless otherwise specified, free standing and wall mounted DBs in a normal internal environment shall be protected to IP43. DBs in certain factories may have to have a higher degree of protection which will be stated in the supplementary Specification or single line diagrams. The complete DB and its components shall be suitable for coastal conditions.

e) Busbars

i) The busbars shall be of high conductivity 99,9% pure copper of adequate cross section for the current and short circuit rating, mounted on edge (not flat). Multiple/laminated bars shall be appropriately derated as necessary and shall be spaced by a distance equal to the bar thickness. Bars shall be supported on resin type insulators suitable for mechanical stresses due to prospective fault currents and otherwise so arranged and braced as to obviate distortion under short circuit conditions. The material used for bracing, shielding etc must be tested and approved by SANS and shall be completely non-hygroscopic and non-tracking.

ii) Bus-bar current ratings for both phase and neutral shall be based on an internal temperature of 40°C with a maximum bar temperature rise of 60°C.

iii) As a guide, the following current densities should not be exceeded for single bars:

- 100 Amps and below : 3,50A/mm²
- 101 - 300 Amps : 2,65A/mm²
- 301 - 1000 Amps : 1,85A/mm²
- 1001 Amps and above : 1,20A/mm²

iv) In addition to the current rating, the bars shall be sized to accommodate the prospective fault rating and the cross-sectional area of the bars shall be the greater of the calculated sizes. Sizing for fault levels shall be based on the following:

$a = 8,2 \times Isc \times \sqrt{t}$, where:
a = minimum cross section in mm²
Isc = prospective short circuit current in kA
t = maximum time in seconds to clear fault, subject to a minimum of 0,2s

v) An earth busbar shall be installed at a convenient position, usually near the bottom, along the entire length of DBs with an incomer size of 200 Amps or more, or they may be of shorter but adequate length for smaller DBs. Earthbars need not be supported on insulators. The cross-sectional area of the earthbars shall be equal or greater than half the cross-sectional

area of the incomer feeder cable. Earth terminal strips with screw connections may be used for boards with a maximum incomer size of 100 Amps.

vi) Teed-off neutral bars are to have the same cross-sectional area as the sub-feeder phase bars and shall be mounted in a suitable position adjacent to the switchgear, which they serve. The outgoing connections must match the sequence of the switchgear to which they relate. Neutral terminal strips with screw connections may be used for boards with a maximum incomer/sub-feeder size of 100 Amps. These requirements shall also apply to smaller DBs where such neutral bars are also the main neutral bars.

vii) A separate neutral bar shall be installed for circuits protected by adjacent single phase earth leakage breakers connected to the same phase.

f) Gland Plates

i) Bottom entry boards shall be provided with minimum 2mm galvanised steel gland plates installed across the full width of each DB section at a minimum height of 300mm above the level of the bottom of the DB. Sufficient clearance for the bending of cable cores shall be provided between the lowest terminals of any equipment.

ii) Where single core cables are to be terminated, 10mm non-hygroscopic Delaron or similar material shall be used for the gland plate. Alternatively, gland plates for single core cables shall be made from 4mm thick aluminium.

g) Doors

Where called for, doors shall be fabricated from the same material as the main enclosure and shall be provided with closed-cell silicon gasketing to obtain the level of protection required (Refer also to 12.17.6). The doors shall be provided with catches, square-key turnbuckles, lockable catches or cylinder locks and handles, as specified in the Detailed Specification and/or drawings. All DB keys, where provided, shall be the same for all DBs on the particular project.

h) Paintwork

i) Pre-galvanised sheet metal shall be cold galvanised at all exposed edges and welded surfaces, degreased, bonderised, etch-primed and then finished with baked epoxy enamel or powder coatings per SANS 51274, as applicable and to paint manufacturer's recommendations to achieve a dry film thickness (DFT) of 70 microns.

ii) 3CR12 panels shall be pickled, passivated, and etch-primed before being finished, similarly to pre-galvanised sheet steel boards, with baked epoxy enamel or powder coatings to achieve a DFT of 70 microns.

iii) Colour finishes shall be as follows:

- Normal Supply LV Distribution Boards: Light Orange, colour B26 of SANS 1091
- The standby power sections of DBs shall be Signal Red, colour A11 of SANS 1091
- Uninterruptable Power Supply (UPS) DBs, or such sections within composite boards shall be Dark Violet, colour F06 of SANS 1091

- Small domestic and shop type DBs, and boards in open kitchen areas shall be finished white, colour G80 to SANS 1091 (unless the latter is of bright stainless steel)

iv) A minimum of 1 litre of touch-up paint for each colour shall be provided.

i) Switchgear

i) MCCBs, MCBs and switch-disconnectors shall be of the same make throughout. Similarly, CFS units shall be metalclad type and are to be of the same make throughout. Current ratings must be clearly indicated on the front of the units.

ii) A suitably braced chassis for the mounting of moulded case type switchgear, including DIN type rails etc, shall be firmly secured to the frame of the switchboard. Large switchgear, such as ACBs, shall be secured directly to the framework using suitable structural/bracing members.

iii) MCCBs switch disconnectors and CFS units with a rating of 150 Amps and above shall be connected to the main busbars with bus-bar links. PVC insulated cable, neatly installed, shall generally be used for switchgear below 150 A. This latter requirement shall not preclude the use of small-section feeder bus-bar arrangements where available. Where long runs of PVC insulated cable are run within the DB, they shall be neatly laced together or shall be installed in purpose made slotted PVC trunking. The smallest cable size for DB wiring shall be 2,5mm².

iv) Where necessary, stub busbars shall be fitted to the outgoing side of MCCBs and CFS units and the supply side of switch disconnector incomers to allow for lug connections to the cable cores.

v) Incoming circuit breakers and bus-coupler breakers rated 800 Amps and above shall be of the withdrawable type of air circuit breakers (ACBs) or large frame MCCBs, as specified.

vi) Castell, or similar interlocks shall be provided for all main DBs which have bus-couplers. Alternatively, where detailed in the single line diagrams and/or Detailed Specification, the bus-coupler shall comprise a shuttered cradle only (no circuit breaker fitted) to match the incomer circuit breaker cradles. In the latter instance, bus-coupling will be affected by racking out the appropriate incomer ACB/MCCB, fitting it into the bus-coupler cradle and engaging the ‘ON’ position.

vii) Where MCCBs and ACBs have been set to a lower rating (e.g., 400A MCCB set to 350A etc.), the setting arrangements shall be sealed off and rendered tamper-proof after adjustment.

viii) Where instrument fuses or fused switchgear is used, spare fuses shall be housed in a small compartment built into the applicable board. 20% of each size of fuse, subject to a minimum of three, shall be provided and shall be mounted in stainless steel 'Terry' type clips inside the compartment. A label inside the spare fuse compartment shall indicate all part numbers for reordering. The outside of the compartment shall be labelled as follows:

SPARE FUSES THE FUSES ARE USED TO CONTROL DANGEROUS PROSPECTIVE FAULT CURRENTS – DO NOT BRIDGE OUT UNDER ANY CIRCUMSTANCES Reorder and replace any used-up fuses immediately

ix) Where fault limiting is employed, fuses or fault-limiter MCCBs shall be selected to limit down-stream faults to levels no higher than indicated in the single line diagrams or implied in the design.

j) Surge Arrestors

Surge arrestors, which comply with SANS 61643-1, may be installed in each distribution board. These shall be fitted at the load side of main incomers to each phase and the neutral.

k) Timeswitches

i) Timeswitches shall be suitable for single-phase operation at a minimum rating of 15 Amps. They shall be of the programmable electronic type complete with a minimum 24-hour back-up rechargeable battery. The battery shall be a locally available type and shall be arranged for easy removal and replacement. The characteristics of the timeswitch shall suit the requirements of the circuit as dictated by details in the single line diagrams (e.g.: day omitting etc). Solar type timeswitches shall be used for all outside lighting circuits unless photocells are employed for control purposes.

ii) A manual by-pass switch, mounted in the DB fascia, or as otherwise indicated, shall be provided to permit the circuit to be switched 'on' or 'off' manually for one switching cycle without affecting any other settings.

l) Contactors

i) Contactors shall be DP or TP electromagnetically operated air break, low noise type suitable for the rated supply voltage, circuit current and prospective fault level current.

ii) Contactors for general lighting and power shall be AC1 category while AC3 category shall be used for motor starting.

iii) Where auxiliary contacts are not specified to be fitted initially, the contactor shall have provision for adding these contacts. Auxiliary contacts shall be rated at 6 Amps, 250V AC. Auxiliary contacts characteristics such as 'make-before-break', 'late break' etc must be inherent in the design and shall not be adapted from standard contacts.

iv) All contactors shall have the following features:

- Easily replaceable coil
- Permanent airgap in the magnetic circuit
- Clearly marked main and auxiliary terminals
- Provision for easy inspection and changing of contacts

v) Contactors shall be electrically and mechanically interlocked for changeover arrangements and electrically interlocked only for star-delta starters.

m) Instruments and Controls

i) Instruments, indicators, and controls shall be provided as indicated in the single line diagrams. Where the components are to be actuated from the front of the DB door, they shall be rated to the appropriate IP level (e.g.: IP43). In instances where meters and the like are required, and where these cannot be protected to the level specified by themselves, suitably protection-rated impact resistant glass windows shall be provided in the door through which to view the dials and the instrument/s mounted in the inner fascia.

i) Doors in which instruments are installed shall be provided with a flexible woven copper earth link across the hinge side. Insulating shrouds or other suitable barriers shall be installed to prevent accidental contact with door mounted instrument terminals.

ii) Fuses for the protection of instruments shall be of the HRC cartridge type mounted behind the DB fascia. All control fuses shall be clearly labelled.

iv) Pushbuttons for protection ratings of IP65/66 shall be provided with rubber 'boots' for enhanced protection. Any exposed rubber shall be further protected (e.g.: with silicon covers) where used in food factories containing sugars and other carbohydrates which may give rise to attack from bacteriological action when fine particles collect on or near the rubber.

v) Only LED type indicator lamps shall be used. A set of spare LEDs (20% of each type, subject to a minimum of three) shall be supplied. These may be housed in the spare fuse compartment where provided, and the labelling suitably modified. Alternatively, the LEDs shall be housed in a small, labelled compartment similarly to HRC fuses as aforementioned.

vi) Unless otherwise specified, ammeters, voltmeters, frequency meters and running-hour meters shall have a minimum dial size of 96mm x 96mm with anti-static impact resistant clear faces. Instruments shall be screened against magnetic interference.

vii) Voltmeters shall be of the moving iron type with class 1.5 accuracy as per IEC 51. A zero-adjustment screw shall be provided. Voltmeters shall be scaled 0 - 250V or 0 - 500V as appropriate. Selector switches used in conjunction with a single voltmeter shall be of the cam-actuated or wiping air-break type. The switch shall be labelled with the 'OFF' position and other positions as specified (e.g.: 'N - R' for neutral to red phase, 'R - Y' for red to yellow phase etc.)

viii) Ammeters shall have a moving iron element to indicate instantaneous values. Direct reading ammeters may be used up to 60 Amps. Current Transformer (CT) operated ammeters of 60 Amps and above shall be 5

Amps full scale, calibrated to read actual primary currents. The CT ratio shall be indicated on the faceplate.

ix) Unless otherwise stated, ammeters shall be of the Maximum Demand (MD) reading type. The mean value over a fifteen-minute period shall be indicated by a red pointer driven by a bimetal spiral element. Full load current shall be indicated with a distinctive line on the dial. The scale should indicate at least 25% over full-load rating.

x) Instrumentation and control (I&C) wiring shall be segregated into LV and ELV wiring and installed in separate slotted plastic trunking within the main casing of the board. I&C wiring shall also be kept separate from power wiring. The smallest ELV conductor shall be 1mm². Conductors connecting to components on hinged panels shall be shrouded in spiral plastic 'loom-former' and fixed on both sides of the hinge. A loop shall be formed in the wiring so that the loom produces a twisting motion away from the door jamb when it is closed.

n) Consumption Meters

i) KWh meters shall be Direct on Line (DOL) type up to 80 Amp rating and CT operated above this amperage. Meters shall be calibrated for the specific application to obviate the use of multiplication factors.

ii) Consumption meters shall have cyclometer dials with six-digit readout, the last digit indicating one-tenth of a unit.

iii) Facilities for a security seal shall be provided on the fixing screws of the terminal cover.

o) Current Transformers

i) Current transformers shall be epoxying resin encapsulated and comply with the requirements of SANS 60044-1 and IEC 185. Unless otherwise stated, the secondary current of CTs shall be 5 Amps and all instruments, meters etc shall be selected accordingly. The rated burden shall not be less than 10VA.

ii) The following accuracy classes shall be adhered to:

Application	Primary Current	Class
Indication	A11	5
Protection	A11	3
Metering	Up to 250A	1
Metering	250 - 600A	0,5
Metering	600 - 800A	0,2
Metering	800A +	0,1

p) Power Factor Correction

i) Where called for, power factor correction (PFC) capacitors shall be housed in a separate section of the DB, segregated from other sections by a metal barrier, and designed for extra ventilation. The PFC section shall have low-level vermin proofed inlet louvres and the top shall have a 12mm diamond mesh 'roof' with a solid flat section spaced at least 50mm above the mesh. Whilst the construction, paintwork etc, shall be similar to the DB casing, the level of protection shall be IP21.

ii) PFC capacitors shall be protected and controlled by HRC fuses and contactors specially designed for PFC applications. Switchgear shall be rated 70% higher than the normal current rating of the capacitor, e.g.: for a 60kVAr capacitor, the rating of the protective fuses would be 150 Amps in a 400V system.

iii) Where metalised plastic film capacitors are used, the board construction shall be such as to limit the temperature rise, with all capacitors switched-in, to 35°C above ambient. If necessary, a fan, complete with switchgear, controls- and failure alarm, shall be employed. This equipment will not normally be indicated in the single-line diagram/s and the Contractor shall make do allowance as necessary.

iv) PFC controllers shall be electronic type giving 6 or 12 steps of control as specified. Digital indication of the power factor shall be built in, as well as 'auto, manual, off' controls and LED pilot lights indicating PFC steps.

v) The separate capacitor section of the DB shall have a 'double skin' metal separating barrier with a 12mm air gap for all PFC loads of 250kVAr and above.

vi) A discharge resistance system shall be provided for each capacitor to ensure effective discharge within 60 seconds after switch-off. A suitable barrier, complete with warning notice, shall be installed for all capacitor banks.

q) Anti-Condense Heaters

Where specified, 'black heat' anti-condense heaters shall be fitted in the bottom sections of DBs in areas of high humidity or dampness. The heaters shall be fitted behind suitable screening to obviate accidental contact with persons or wiring. Anti-condense heaters shall be protected by dedicated MCBs or fuses and shall be sized to prevent condensation without giving rise to excessive temperature levels inside the DB housing.

r) Labels

i) Before installation, the Contractor shall submit a fully detailed proposed labelling schedule to the Engineer for comment and approval.

ii) Engraved plastic 'Ivorine' or 'Traffolyte' type sandwiched labels shall be used for all labelling on DBs, control panels etc. Main labels on the outside of panels, and labels for individual components, switchgear etc shall be fixed to the panel or fascia face with brass bolts, nuts, and washers. Labels for small, grouped items such as a row of single pole MCBs may be securely fixed into slotted label holders. In the latter cases, the labels would normally identify the circuit number only and a typewritten legend card installed to the fascia front, or inside the DB door in a card holder, used to identify the circuit function.

iii) Normal informative labels shall have black lettering on a white background while warning labels shall have white lettering on a red background.

iv) Lettering sizes for labels shall generally be as follows:

- Outdoor Panels, Minisubs etc: 50mm
- Indoor Panels (main labels): 15mm
- Bus-bar sections and sub-compartments: 10mm
- Individual switchgear, indicators etc: 5mm

v) Substations, minisubs, kiosks, transformer room & switchgear rooms, shall be provided with notices as required by the Occupational Health and Safety Act.

s) Testing

i) Unless otherwise specified, the Contractor shall make all arrangements and provide all instruments for inspection and testing by the Engineer of distribution boards at the manufacturer's premises. The Contractor shall give the Engineer at least 5 working days notice of any impending test/s.

ii) The tests shall comprise, but shall not be limited to:

- Visual inspection, label checks etc
- Polarity checks
- 500V Megohm meter insulation resistance test
- Injection tests for CTs etc
- Function tests for all equipment, control and interlocking circuits, indicators, earth leakage relays etc

iii) In addition, these tests will be spot-checked at Site when phase rotation checks, and installation commissioning will be carried out.

iv) After successful completion of tests, the Contractor shall provide the Engineer with duplicate test certificates for all DBs.

v) Extra time, travelling etc expended by the Engineer in repeating tests due to any failure shall be claimed from the Contractor in accordance with clause 11.4 herein.

12.4.2 Free Standing Distribution Boards

In addition to the general requirements contained in clause 12.4.1, free standing DBs shall be as follows:

a) Distribution boards shall have a 'U' channel baseframe designed to support all equipment and to span cable trenches etc.

b) General power supply boards shall be of the cabinet type with sections no wider than 1,5m.

c) Cubicle boards for the control of motors shall be of a modular cubicle design. The disconnector for each cubicle shall be operated from the front, and it shall not be possible to open the particular cubicle without switching off the disconnector.

d) Unless otherwise stated, free standing boards shall be of the front access, bottom and/or top entry type as dictated by installation requirements and/or stated in the single line diagrams. Where called for, rear panels shall be removable and shall be secured to the frame by means of square key turnbuckles.

e) Where specified, boards shall be extensible to the left or right, as called for. This shall be accomplished by the installation of removable bus-bar cover plates in the side panels.

f) Upon completion of cabling into the distribution board, the Contractor shall ensure that the board is rendered totally vermin proof, especially at the bottom of the board around the incoming cables.

g) Distribution boards for external applications shall be fabricated from 2mm 3CR12 corrosion resistant steel sheets. External DBs shall be fitted with gasketed doors and shall be protected to IP55. These boards shall have sloped overhanging roofs for rain protection.

h) Where boards exceed 2m in width, they shall be provided with suitable lifting bales to facilitate off-loading, emplacement etc using a crane or similar. Where no facilities are available at Site for off-loading heavy DBs, the Contractor is to ensure that the boards are delivered using a crane-lorry or shall make such other arrangements as required.

12.4.3 Surface Mounted Distribution boards

In addition to the general requirements contained in clause 12.4.1, surface mounted boards shall be as follows:

a) Unless otherwise indicated, all DBs shall be provided with flush mounting doors secured with catch/es, lock/s etc, as specified.

Except where otherwise specified, DBs shall be installed so that the top of the board lines up with the top of door frames. Where no such reference line exists the tops of boards shall be at a height of 2m above finished floor level. The maximum permissible height of any switchgear handle, push-button, meter or instrument face shall be 1,8m.

b) Suitable heavy-duty lugs for securing the board to a vertical surface shall be provided.

c) Boards for external applications shall be fabricated from 2mm 3CR12 corrosion resistant sheet steel and shall be protected to IP55. A sloped roof shall be provided for rain protection. All cables entering or leaving externally mounted DBs shall do so at the bottom only.

12.4.4 Flush Mounted Distribution Boards

In addition to the general requirements contained in clause 12.4.1, flush mounted boards shall be as follows:

a) Unless otherwise indicated, all DBs shall be provided with adjustable overlapping architraves, and flush mounted doors complete with catch/es or lock/s as specified.

Except where otherwise specified, DBs shall be installed so that the top of the board lines up with the top of door frames. Where no such reference line exists the tops of boards shall be at a height of 2m above finished floor level. The maximum permissible height of any switchgear handle, push-button, meter or instrument face shall be 1,8m.

b) The built-in tray may be fabricated from 1,6mm pre-galvanised steel without any further paint finish except for cold galvanising at exposed edges, weld joins etc.

c) Small domestic type DBs may have the front panel and door made from 1,6mm pre-galvanised sheet steel. Such boards shall not exceed 500mm x 500mm and the framework shall be finished as per clause 12.4.1 h).

d) Where called for, 'semi-recessed' boards shall be provided with a 35 to 50mm deep overlapping architrave surround into which the door/s and inner fascia are recessed. The portion of the architrave perpendicular to the wall shall be suitable for the future termination of surface conduits into the DB.

e) DBs for fitting into 115mm single brick walls shall be provided with suitable 'keying' strips of expanded metal spot welded to the sides of the tray for building into the brick courses. In addition, expanded metal shall be spot-welded to the rear of the bonding trays to act as 'keying' for plaster etc. This mesh shall overlap the tray by 75mm on all sides to obviate cracks in plaster.

f) At least two 20mm diameter spare conduits shall be installed from each DB into the ceiling void where applicable.

12.4.5 Layout Drawings for Approval

The Contractor shall timeously obtain detailed/dimensioned proposed layout drawings of distribution boards, including schematic wiring diagrams, bus-bar sizes, component details etc, from the board manufacturer prior to fabrication. The Contractor shall check all details, correct them where necessary and submit two sets to the Engineer for approval. No distribution board is to be fabricated until the Engineer's formal approval has been given.

12.5 Cable Work

12.5.1 General

The Contractor shall be responsible for all main, sub-main and final circuit cablework.

12.5.2 Cable Types

Only the following types of cables shall be used for LV work: -

a) PVC Insulated, Armoured Copper Cables (PVC/SWA/PVC)

Polyvinylchloride insulated, armoured, copper cable shall be 600/1000V grade in accordance with SANS 1507, comprising PVC insulated stranded copper conductors with PVC bedding, galvanised steel wire armouring and PVC sheathing overall.

Mains voltage cables shall be at least 2,5mm² and no larger than 185mm² for ease of handling. Parallel cables of equal size shall be utilized where the current demand is greater than that rated for 185mm² cables.

Control cables shall be at least 1,5mm² unless otherwise specified.

b) PVC Insulated, Armoured Aluminium Cables (PVC/SWA/PVC) and PVCATAPVC Cable)

Polyvinylchloride insulated, armoured, aluminium cable shall be 600/1000V grade in accordance with SANS 1507 comprising PVC insulated solid aluminium conductors with PVC bedding, galvanised steel wire or aluminium tape armouring and PVC sheathing overall.

The cables shall be at least 16mm² and no larger than 120mm². Parallel cables shall be utilized where necessary.

Aluminium cables shall be used only when specifically specified.

c) PVC Insulated, Non-Armoured Cables (PVC/PVC)

Polyvinylchloride insulated non-armoured cable shall be 600/1000V grade in accordance with SANS 1507, comprising PVC insulated stranded copper conductors with PVC sheathing overall.

PVC/PVC mains cables shall only be used for trefoil configured applications.

For ease of handling the core size shall be limited to 240mm² except in special circumstances where space, routing etc. may allow for larger sizes.

Trefoil cables shall comprise 3 sets of three single core cables (R, Y & B), and one set of two cables for the neutral.

d) XLPE Insulated Cables

Where called for Cross-Linked Polyethylene (XLPE) insulated cables shall be used. These are similar to the specifications for the foregoing PVC insulated cables a), b) and c) except that the initial insulation shall be XLPE, thereafter PVC bedding and sheathing shall be used.

The Contractor must ensure early ordering of these cables as they are usually only made upon request and to a minimum quantity. For ease of identification, the Contractor shall insure that the manufacturer embosses the outer sheath: “XLPE insulated”.

e) Flame Retardant and Halogen Reduced/Free Cables

Where called for in the Detailed Specification, low halogen (LH), halogen free (non-halogenated, low smoke and fume, flame retardant - or “NHLSFR”) or flame retardant (FR) PVC cables to SANS 1507 and BS6724 (latest issues) shall be used.

12.5.3 Cable Terminations

a) Cable Glands

Cable glands shall be used for armoured multi-core cables and are to be of the electroplated brass or bronze compression type and shall be matched to the type of cable used and shall be suitable for waterproof, flameproof or general installations, as required. PVC or neoprene shrouds and plated earthing washers shall be used in all instances.

b) Single Core Terminations

Termination of single core PVC/PVC cables in distribution boards, transformer cable boxes, etc. shall be undertaken by securely clamping the cables onto a fixed section of galvanised “Unistrut” type channel, or galvanised angle-iron, using nylon cable straps and then taking the individual cores through bushed holes in the non-ferrous gland plate, thence to the termination point. Alternatively, with the Engineer’s approval, a treated hardwood cleat arrangement may be employed.

c) Cable Joints

i) Because of the relatively short runs of cable utilized in industrial general lighting and power services, through-joints shall only be used in exceptional circumstances and only with written permission from the Engineer.

ii) Where a tee-off is required in indoor circuit cabling, this shall be affected using a suitable cable junction box, as Pratley, or equal and approved.

Such junction boxes shall be of the weatherproof type, complete with integral compression glands and DIN rail-mounted terminals of appropriate rating.

iii) Joints in power cables shall only be allowed a) where the cable runs exceed a standard drum length, or, b) with the express permission of the Engineer in writing

d) Conductor Lugs

i) Lugs for the termination of conductors onto busbars and equipment are to be of the compression type and of the correct size and type for the application.

ii) For cables of size up to 16mm², the locking type of handplier crimpers may be used. Above this size, the hydraulic type must be employed.

iii) Where aluminium lugs, used for aluminium conductors, are bolted to a dissimilar metal (e.g., copper, tinned copper, etc.), suitable bonding compound shall be used to obviate the possibility of electrolytic action.

iv) Shaped lugs shall be used in conjunction with shaped cable cores.

12.5.4 Handling of Cable Drums

a) Drums of cable shall be delivered to Site with seals intact and shall be off-loaded and stored in an approved manner. Any drums, which show signs of damage or mishandling, shall at the Engineer's option, be replaced with fresh undamaged stocks. The Contractor shall bear all costs of replacing such unacceptable cables.

b) Cable drums shall be supported on an axle and support jacks when the cable is unreeled. The arrow on the drum flanges showing the direction of rotation shall be observed. Rolling of drums along the ground will not be permitted.

c) Empty cable drums shall be stored in a tidy and safe manner prior to their removal from the Work Site. The Contractor shall be responsible for the removal and disposal of all empty drums at intervals dictated by Work progress, or upon instruction by the Engineer or the Main Contractor.

12.5.5 Installation of Cables

a) Surface (Direct)

Where cables are run along horizontal or vertical building surfaces, structural steel members, in vertical ducts, etc., they shall be secured with approved means of fixing such as saddles, cleats, etc.

All cable runs shall be vertical or horizontal, or run parallel to building or structural members and shall at all times present a neat appearance.

b) Cable Trays

i) Where a sheet steel cable tray is required, this shall consist of approved galvanised sheet-metal perforated medium duty tray supported with approved substantial brackets or hangers at suitable intervals to reduce sag to a maximum of 10mm. Where necessary to achieve this, the run of cable tray shall be reinforced along its length with angle iron or similar stiffening members or shall be of the heavy-duty type.

ii) When wire mesh trays are required, these shall be of heavy duty hot-dipped galvanised type, or stainless steel, left bright as required. Mesh trays shall be installed in a similar manner to perforated tray.

iii) All cable tray accessories such as bends, tees, etc., shall be as supplied by the tray manufacturer and made-up components will not normally be allowed.

iv) Trays shall be installed vertically or opening up horizontally as specified. Brackets and hangers shall be constructed to permit the easy removal of any cable from the tray. Flat horizontal runs of tray suspended from slabs shall be installed at least 200mm clear of the soffit. Trays crossing under beams shall be spaced off the beam soffit to allow the removal of the largest cable(s) in the group.

v) Earth continuity shall be maintained throughout the complete run of cable tray.

c) Cable Ladder-Rack

i) Where ladder-rack is called for, this shall consist of 2,0mm thick galvanised steel with side sections of 75mm and cross-rungs every 350 – 400mm.

ii) Only manufacturer's accessories shall be used for ladder-rack.

iii) Ladder-rack shall be installed in the same manner as cable trays (Refer to 12.5.5 (b)).

iv) Where specified, cable trays and racks shall be finished in a light orange epoxy coating, colour B26, or other colour appropriate to the service, to SANS 1091, all as clause 12.4.1 h).

Epoxy coating damaged or removed during installation shall be made good.

d) Cable Installation on Racks and Trays

i) Racks and trays shall be sized to afford at least 20% spare space. Control cables may be installed touching, but not bunched. Power cables shall be laid-up spaced apart not less than the diameter of the largest adjacent cable, unless otherwise specified.

ii) Cables shall be fixed to racks and trays using stainless steel cable strap and buckles fixed every 500mm or fixing-rung intervals for edge-on rack / tray installations and at 1000mm or every second fixing-rung interval for cables laid flat and also where installed vertically.

iii) Different classes of services (e.g., power and instrumentation) shall not be installed on the same rack or tray.

e) Common Earthing for Racks and Trays

i) Cables for final circuits installed on racks and trays shall, unless otherwise specified, be provided with an integral earth core, or shall have a separate bare earth conductor per cable, or as indicated in the circuit diagram.

ii) Multiple runs of heavy power feeder cables may share a common earth conductor comprising bare copper tape of at least 70mm² run along mesh

type trays or ladder rack. (Perforated cable tray would normally carry light circuitry only and common earthing would not apply).

iii) Earth tapes are to be fixed and bonded at regular intervals and the final earth connection shall comprise an appropriately sized bare copper earth-wire tail bonded to the common tape earth using a compression lug and high tensile bolt and nut arrangement.

f) Underground Cable

i) Unless otherwise specified, cables installed earth trenches shall be buried at a depth of 750mm; multiple runs of cables shall be laid 150mm apart throughout the run.

ii) Cables shall be drawn along the trench using rollers corner rollers, snatch blocks and skid plates as necessary.

iii) Unless stated to the contrary, the Contractor shall carry out all excavations of cable trenching, including bedding, topping, backfilling and compaction, generally in accordance with SANS 1200 LC and SANS 1200 DA. Differing soil-type classifications shall be as specified in the bills of quantities.

iv) The Contractor shall allow for all necessary removal of vegetation, roots and tree branches, hazard protection, drainage, including pumping, watching, lighting, barriers, disposal of spoil and vegetation, supply of fill, levelling of subsidence and 10mm thick temporary steel plates to allow vehicles of 3 tonnes maximum axle load and pedestrians to pass over excavations where these crossroads, driveways etc.

v) Where applicable, the Contractor shall comply fully with Traffic Ordinances, the Mines and Works Act 1956 (Act 27 of 1956) and all other requirements at or near public roads, bridges, buildings, and other structures.

vi) No excavations shall be backfilled until the Engineer has the opportunity to inspect cables and has given permission to backfill.

vii) The floor of the trench shall be free of stones and sharp projections. A 75mm layer of –6 fines sifted soil or no-sharps sand shall be applied (bedding), onto which the cables shall be laid. A further layer of the same material shall be laid to a depth of at least 75mm above the top of the cable(s).

viii) Dampened soil free from fibrous matter, rocks and large stones shall be backfilled on top of the cable(s) (or cable sleeve(s)), as follows: -

- Two 150mm hand-rammed layers to 93 % AASHO compaction
- Thereafter, well compacted power-rammed layers of not more than 150mm, to 93 % AASHO compaction.

The backfill shall be raised by approximately 50mm above the normal surface level to allow for settlement. Such raised surfaces shall be periodically levelled, as necessary, and finally levelled not less than 90 days after backfilling. Grassed surfaces shall be made good. Others will make good paved or concrete surfaces etc.

ix) Cable trenches may be hand or machine excavated and shall be of such a width as to afford a minimum of 150mm clearance between the cable(s)

and the trench walls. Excavation within 600mm of other services shall only be done by hand.

x) Unsuitable soil and filthy material encountered during the execution of the Works shall not be deposited on the surface of any road or footpath but shall immediately be carted away to a dumping site.

xi) The Contractor shall take all necessary steps to avoid the pollution of streams, drainage systems etc. by excavated soil and its dust.

xii) Where required, concrete protective cable tiles shall be installed 300mm over the tops of cables. These shall cover the full width of the layer of cables within the trench. Concrete cable protective tiles shall be of the interlocking type approximately 900mm long by 150mm wide with a suitable inscription on the supper side such such as “Danger Electric Cables” or similar.

xiii) Where unsleeved cables cross other services, they shall be taken at least 500mm under such service. Interlocking concrete cable tiles shall be laid 300mm above the cables and shall extend 900mm each side of the crossing point.

g) Cable Markers and Tape

i) Cable markers shall be provided for all underground cable routes. Such markers shall be provided at each point of entry to any building, at either side of any road to rail crossing, at any change of direction of the cable, at intervals not exceeding 30m along any straight runs and over cable joints. Cable markers shall be made of concrete and cast in the form of a truncated pyramid, approximately 250mm high, 100mm square at the top and 150mm square at the base. The markers shall be provided with brass plates complete with direction arrows and suitably inscribed.

ii) Yellow 0,1mm thick cable marker tape with the words “Danger Electric Cable” printed continuously and depicting skull and crossbones, shall be laid at a depth of 300mm below the finished surface level and immediately above all cables and sleeve pipes. Should a roadway or paved area base layer exceed 300mm, the tape shall be laid immediately below the base.

h) Cable Sleeves

i) Cables sleeves shall be provided wherever required or indicated on drawings and also for all cables entering or leaving any building, crossing a road or other services. Such sleeves shall be supplied and installed by the Contractor unless otherwise required. In all cases the Contractor shall ensure that all sleeves are installed in good time, in correct positions, and in the proper manner.

ii) Where no details are given, the sleeves shall be of generous size and made of substantial material, which may be galvanised steel, ceramic, pitch fibre, high impact uPVC, corrugated high-density polyethylene (HDPE), etc., capable of withstanding any stresses to which they may be submitted, e.g., road compacting. Care shall be taken to ensure the easy passage of cable through the sleeves by providing large radius bends where necessary.

iii) NB: For health reasons, the use of pipes containing asbestos is strictly forbidden.

iv) The ends of all sleeves shall be sealed with non-hardening watertight compound after the installation of cables. All sleeves intended for future use shall likewise be sealed.

i) Earthworks by Others

Where trenches, sleeves etc. are provided by another contractor e.g., civils, the Contractor shall liaise and co-ordinate with such other party regarding general advices, sleeve positions, radii etc. Moreover, the Contractor shall stand by and ensure correct backfilling and the positioning of marker tape.

j) Cable Identification

A non-corrosive strap with the cable number, or circuit number, stamped or embossed upon it shall be provided at each end of the cable (and at joints, in cases where these are permitted).

12.6 Bus-Bar Feeders

12.6.1 General

a) Bus-bar feeder systems shall comply with SANS 1195 or shall be authorised by SANS and shall consist of metalclad copper busbars for voltages not greater than 1000V.

b) Bus-bar feeder systems shall be used for the following:

- Indoor and outdoor connections from transformer LV terminals to main LV switchboards
- Horizontal indoor power distribution to workshop and factory machinery etc
- Indoor lateral and vertical-riser feeders for distribution boards and MCCs

c) All bends, accessories, take-off units, bus-bar sections/modules and so forth shall be a standard or pre-engineered component by the bus-bar trunking manufacturer; no site fabricated items will be allowed without the express permission of the Engineer in writing.

12.6.2 Construction Details

a) Enclosures

i) Bus-bar systems for indoor use shall be enclosed in hot-dipped or pre-galvanised sheet metal casings finished in epoxy coating similarly to distribution boards. (See clause 12.4.1 (h)). Alternatively, the casing shall be of extruded aluminium. The bus-bar trunking shall be vermin proof, adequately ventilated and protected to IP30.

ii) Outdoor, non-ventilated casings shall be constructed from 3CR12 corrosion resistant steel, finished as for indoor trunking, or alternatively, shall be of extruded aluminium, and protected to IP54 or better.

iii) In all instances, metal enclosures shall be of adequate gauge and strength to withstand rough usage and the mechanical stresses of prospective fault conditions.

iv) The casings shall be provided with heavy duty fixing lugs or similar suitable for M10 bolts or studding supports.

v) Sections of bus-bar trunking shall be joined in an approved manner maintaining mechanical strength and protection levels.

b) Busbars:

i) Busbars shall be of high conductivity 99,9% pure copper of adequate section for the maximum current and short-circuit rating. Unless otherwise specified, the bars shall be mounted edgewise (long side vertical).

ii) The bars shall be supported in the casing by substantial high dielectric, non-tracking, and non-hygroscopic members at sufficient intervals to allow for mechanical stresses due to prospective fault conditions.

iii) Joints in busbars shall overlap by a minimum length equal to twice the bar width. Contact surfaces shall be tinned using non-acid based flux and bolted together with high-tensile cadmium plated bolts, nuts, and spring washers.

iv) As well as sizing for current rating, the bars shall be sized to accommodate the prospective fault level rating in accordance with clause 12.4.1 e), whichever size is the higher.

v) Where installed, neutral bars shall be the same cross section as phase bars.

vi) An earthbar shall be installed along the entire length of the bus-bar trunking and shall be sized in accordance with IEC 439.

c) Bends

Horizontal (flat) bends in the trunking system shall house busbars bent at the correct angle with the supports and casings made to suit, while vertical internal or external bends shall have the bars bolted together at the correct angle. Alternatively, bus-bar bends may be of the flexible laminated type.

d) Take-Off and Feeder Points

i) Take-off points shall be pre-engineered and located to specific requirements by the bus-bar trunking manufacturer in the case of power feeders for distribution boards in risers etc, or shall comprise shrouded plug-in arrangements at regular intervals for machine shops etc.

ii) The take-off unit shall consist of a suitably rated MCCB with contacts to satisfy the requirements for a switch-disconnector, housed in a sheet steel or polycarbonate enclosure arranged for bolting directly to the bus-bar trunking in the case of tap-off type units, or permanently fixed in the case of pre-engineered take-offs.

iii) Feeder end boxes shall be suitable for terminating feeder cables or feeder busbars, as applicable.

e) Expansion Joints

Expansion joints to allow for thermal expansion and contraction for a temperature range of between 0°C and 90°C in the busbars and 0°C and 45°C in the enclosure shall be provided at intervals per manufacturer's recommendation, but in any event, not exceeding every 10 metres. The full rating of all current carrying parts shall be maintained through the joint as well as casing integrity and level of protection.

f) Fire Barriers

Fire compartmentation shall be maintained at wall and floor penetrations of bus-bar trunking by the use of 4-hour rated fire barriers installed centre with the applicable partition wall or floor slab. The Contractor shall ensure that the main contractor is timeously informed of the need to make good around such penetrations; this information shall be put in writing with a copy to the Engineer.

12.6.3 Installation and Testing

a) Installation

Bus-bar trunking shall be fixed directly to walls or other structural members or shall be suspended on galvanised studding, supported on channels, angle iron etc as dictated by installation conditions and requirements, and as may be specified in the Detailed Specification or drawings.

b) Testing

Completed bus-bar systems shall be subjected to a test voltage of 2,5kV rms for one minute in accordance with SANS 1195.

12.6.4 Fabrication Drawings

a) Where it is necessary to have bus-bar trunking prefabricated prior to delivery to Site, the Contractor shall liaise with all relevant parties to have fabrication drawings prepared (usually by the bus-bar trunking manufacturer), viz.: transformer supplier, main and sub-main LV board supplier, etc as the case may be.

b) The Contractor shall check all drawing details, including on-site dimensions, coordination with other services etc, rectify where necessary and submit to the Engineer for approval. The Engineer will approve the general layout of the system only. The Contractor shall be fully responsible for the correctness of all dimensions etc.

12.7 Tubular Conduit Wireways

12.7.1 Types and Applications

a) Screwed Conduit

Heavy gauge screwed welded (HGSW) steel conduit and associated fittings shall be to SANS 1065-1 and shall be black enamelled or hot-dipped galvanised as specified. No conduit of less than 20mm diameter shall be used.

HGSW conduit shall be used for all general applications run either surface on walls, ceilings, on machinery etc, or else installed flush in walls, cast into concrete slabs etc.

b) Plain End Conduit

Plain end (non-screwed) steel conduit shall be to SANS 1065-1 with a minimum wall thickness of 0,9mm. Only hot-dipped galvanised conduit of 20mm diameter minimum size will be permitted.

Plain end conduit shall be used for all general applications, except heavy industrial environments or flameproof installations, run surface on walls and ceilings, or else installed flush in walls, cast into concrete slabs etc.

c) Non-Metallic Conduit

Plastic conduit shall be to SANS 950. No conduit smaller than 20mm diameter shall be used.

Plastic conduit shall be used for general applications, except any industrial or flameproof installation or any surface installation on walls, machinery etc. Non-metallic conduit shall be run surface only on ceilings or in ceiling voids, chased into walls, cast into concrete slabs etc.

d) Flexible Conduit

Flexible conduit shall be of the orange PVC covered spiral metal type, as Kopex, Adaptaflex or equal, with an internal diameter of at least 15mm. Flexible conduit connectors shall be of the gland or screw-in type manufactured from either brass or mild steel plated with zinc or cadmium.

Flexible conduit shall be used to form the final connection to equipment that has to be moved frequently to enable adjustments to be made, for the connection of motors or any other vibrating equipment, for the connection of thermostats and sensors on equipment, for stove and similar appliance connections etc.

12.7.2 General Installation Details

Insofar as relevant conduit types apply as per clause 12.7.1, the following general installation details shall apply:

a) No manufactured bends less than 32mm diameter or any inspection elbows or tees are to be used.

b) Open ends of conduits for future extensions and conduit and accessory boxes shall, during the building process, be temporarily plugged to prevent the ingress of moisture, rubble etc.

c) Where conduit crosses an expansion joint in a building or structure, the following method shall be used:

- An adaptable box shall be installed at a suitable position within 2m or the expansion joint and a draw box and a conduit sleeve one size larger than the circuit conduit shall be installed from the draw box to the edge of the expansion joint on the draw box side.
- The circuit conduit shall pass across the joint and through the sleeve and project 30-35mm inside the box where the end shall be bushed.
- For metallic conduits, an earth clip shall be secured to the circuit conduit end in the draw box, and this shall be bonded to the box with a minimum 2,5mm² jumper.
- In addition, for metallic conduits, an earth wire shall be installed between the fitting outlet boxes either side of the expansion joint.
- Adjacent multiple runs of conduits which are to cross expansion joints should preferably be taken via one large adaptable box, across the expansion joint, into a second large adaptable/draw box.

d) All accessory boxes for switches and socket outlets etc shall be made of pressed galvanised steel and are to be provided with earth studs.

e) No portion of the conduit installation may be installed closer than 150mm to any other service, including gas, water etc. No wireway carrying mains voltage cables shall be installed closer than 150mm to any communications/data wireway or cable etc, except in the case of multi-service power skirting or similar.

f) 'Unwired' conduits for other services shall be provided with rustless steel draw wires.

g) Where necessary, draw boxes shall be installed to facilitate the easy drawing-in of wiring and/or to avoid pulling wires through more than two right angled bends or the aggregate thereof. Adjacent multiple runs of conduit, which requires draw boxes should preferably be taken via one large draw-box. Where possible, draw boxes are to be installed at inconspicuous positions away from general view.

h) 25% spare conduits, subject to a minimum of two, shall be installed from wall mounting distribution boards into the ceiling void for possible future additions. A coupling with a temporary plug shall be fitted to the ends of spare conduits.

12.7.3 Flush Conduit Installations

Insofar as the relevant conduit types apply as per clause 12.7.1, the following installation details shall apply to flush conduit installations:

a) Where conduits are chased into brick walls or similar, they shall be adequately secured with crampets, or other approved devices driven into the wall fabric and shall further be secured at strategic points by mortar. The clearance between the finished wall surface and the conduit shall be not less than 12mm. Only power tool chasing machines shall be used for making chases. (E.g.: angle grinders).

b) Accessory boxes shall be fixed square and mortared in. Concrete surfaces, columns and face brick surfaces shall not be chased without the written permission of the Engineer in each case.

c) The building contractor will make good all normal chasing and cutting away except that the Contractor shall be held responsible for the cost of work done by the building contractor due to faulty setting out, redundant chases or late installation of conduits and accessories.

d) Conduits installed within concrete slabs, beams, columns, or walls shall be firmly fixed in position before the concrete is cast. Adequate fixings and/or spacer blocks shall be employed to prevent conduits 'creeping' to the surface. Conduit must not be fixed longitudinally together with reinforcement rods.

e) The general disposition of conduits within the slabs shall be agreed upon before installation between the Engineer, structural engineer, and the Contractor. Furthermore, where such conduits occur in large concentrations, or where large diameter conduits (32mm dia. or larger) are installed, the Contractor shall obtain the approval of the Engineer for the positioning of such conduits. Generally, however, conduits shall be installed in the middle or neutral axis of the slab thickness and extension boxes, or extension rings shall be provided for as necessary.

f) Where conduit runs occur in groups or in large concentrations (e.g., near distribution boards, draw-boxes or in similar situations), they shall be fixed with a clearance between adjacent conduits of not less than one conduit diameter to permit adequate penetration of concrete.

g) Conduit may be installed in surface beds provided that the conduits are clear of contact with ground and are completely encased in mass concrete.

h) Conduits may only be installed directly into floor screeds where a cover of at least 40mm can be affected. For clearances of 20-40mm, “chicken wire” shall be used as a cover over the conduit to act as a screed binder. For clearance less than 20mm, the conduit may be chased into the slab, provided the written permission of the Engineer is obtained in each case.

i) Conduit crossings in screed shall be avoided as far as possible. Where this is unavoidable, one conduit may be set under the other one and chased into the slab, provided the written permission of the Engineer is obtained in each case.

j) Conduits shall be firmly fixed to slabs intended to receive screed by means of half saddles or similar.

k) Conduit boxes, draw-boxes etc. installed on shuttering decks or wall shutters shall be suitably sealed against the ingress of moisture and vibrated concrete with dampened paper rammed in them, and shall be securely fixed to the shuttering by means of lashing with galvanized steel wire (except in the case of off-shutter ceilings) or else by temporarily fixing the box to the shuttering by screws through the shuttering into the fixing lugs of the box. It is of the utmost importance that fixing screws or lashings be released immediately the concrete has been allowed to set and before the shuttering is struck.

   Where fibreglass or other pre-formed plastic shuttering is used by the builder, equipment shall be fixed to the reinforcement steel only and the equipment/box shall be arranged to press firmly against the shuttering. No holes shall be made in the shuttering.

   The Contractor shall stand by when concrete is being poured in order to rectify any defects that may occur such as loose boxes or displaced upright conduits (See also item 11.3).

l) All conduit boxes and accessory boxes shall be finished flush with the finished plaster work and the Contractor shall co-operate with the building contractor to this end. Where necessary, extension plates or rings shall be fitted to meet this requirement.

12.7.4 Surface Conduit Installations

Insofar as the relevant conduit types apply as per clause 12.7.1, the following details shall apply to surface conduit installations:

a) Conduit run surface on walls, floors, ceilings, or in accessible ceiling voids, etc. shall be installed in a neat manner running generally with the building lines. The conduits shall be vertically plumb and horizontally level as applicable.

b) Bends in multiple runs of conduit shall have following bends. Other right-angle bends shall be standard machine made. In all instances the installation shall present a neat and workmanlike appearance.

c) Evenly spaced spacer bar saddles shall affect fixing of tubing. Light gauge saddles may be used for general internal installation while heavy base saddles are to be used for external installations and industrial applications.

d) Galvanized conduit shall be used for all surface installations, as follows: -

   - In damp or external areas
   - Within 50 km of the coast

- In kitchens, laundries, and boiler rooms
- Where exposed to humidity, such as plenum chambers
- In buildings where animals are housed, e.g.: kennels, cattle/sheep pens etc.

e) Unless otherwise specified, all surface mounted metallic conduits and accessories shall be painted after installation. Conduits shall be cleaned, degreased and de-rusted and finished with 2-coats of brush-applied enamel paint. Galvanised steel shall be bristle-scrubbed with solvent detergent complying with SANS 1344 and rinsed with clean water to achieve a water-break free surface prior to painting.

For industrial installations, the following colours shall be used:

SERVICE	COLOUR	SANS 1091 REF.
Electrical	Light Orange	B26
Instrumentation	Light Blue	
Fire Alarms	Red	A11
Communications and Data	White	G80

For non-industrial installations, the colours shall be specified in the Detailed Specification.

12.7.5 Steel Conduit

Insofar as the relevant conduit types apply as per clause 12.7.1, the following installation details shall apply to steel conduit installations.

a) HGSW conduit shall be cut square and clean before threading. Threads shall be made using suitable conduit thread dies and the liberal application of cutting grease or similar. The length of thread shall be such as to permit conduits to be firmly butted together in couplings and hard against the shoulders of threaded conduit box spouts. The ends of all cut lengths of conduit shall be reamered free from burrs and any loose swarf shall be removed from inside the conduit. Running joints in conduit shall be securely locked with a conduit lock nut.

b) Terminations into non-threaded equipment and accessories shall be mechanically secure and electrically continuous. Terminations may be threaded and locknutted on both sides of the termination point together with a brass female bush. Alternatively, terminations shall be made with couplings and brass male bushes. All mating faces are to be thoroughly cleaned of paint, couplings being filed flat and free from unevenness at the mating face. All conduits shall be earth bonded at distribution boards using copper tape and wire.

c) Exposed threads of screwed conduit and damaged paint or galvanised surfaces shall be painted with red-lead or zinc rich paint to prevent rust.

d) Couplings and box entries of plain-ended conduit in cast-in situations shall be taped up with adhesive PVC tape to prevent the ingress of moisture or vibrated concrete.

e) All bends and sets shall be undertaken using bending apparatus suited for the purpose. Plain-end conduit bends shall be made with benders recommended by the conduit manufacturer.

Any damaged conduit resulting from incorrect bending methods shall be completely removed and replaced, including any wiring installed, all at the Contractor's expense.

f) Mechanical and electrical continuity shall be maintained throughout all steel conduit installations.

g) Only HGSW conduit shall be used for;-

- Flameproof installations
- Load-bearing situations
- Suspension pendants
- Damp or exterior surface areas

12.7.6 Non-metallic Conduit

The following installation details shall apply to non-metallic conduit as outlined in 12.7.1 c):-

a) Unless otherwise specified, only steel accessory boxes shall be used in conjunction with plastic conduit installations.

b) Hand bending, using a bending spring, may be used for conduits up to and including 25mm diameter. Above this size, the appropriate manufactured bend/accessory must be used.

c) Tubing is to be out square and clean using a fire-toothed hacksaw, and all burrs and loose material removed. The correct adhesive is to be used on clean and dry surfaces with all excess adhesives being wiped off after fitting together.

d) Plastic conduit and accessories are not to be used for mechanical load bearing, luminaires support etc, nor are they to be used where they could be subject to temperatures below -10°C or above 70°C.

12.7.7 Flexible Conduit

The following installation details shall apply to flexible conduit as outlined in 12.7.1 d):-

a) In installations where the equipment must be moved frequently to enable adjustment during normal operation, for the connection of motors or any other vibrating equipment, for the connection of thermostats and sensors on equipment, for stove connections and where otherwise required by the Engineer, flexible conduit shall be used for the final connection to the equipment.

b) Flexible conduit shall preferably be connected to the final connection point from a local draw-box. The flexible conduit may be connected directly to the end of a conduit if an existing draw-box is available within 2m of the junction and if the flexible conduit can easily be rewired.

c) Flexible conduit shall be metal-reinforced plastic conduit (Kopex, Adaptaflex or equal) orange PVC-covered spiral metal conduit with an internal diameter of at least 15mm, unless approved to the contrary.

d) Connectors for coupling to the flexible conduit shall be of the gland or screw-in type, manufactured of either brass or mild steel plated with either zinc or cadmium.

12.8 Trunking Wireways

12.8.1 Scope

This section describes the following types of wiring trunking: -

- Standard wiring trunking
- Lighting channel
- Power skirting, dado and bench-top trunking
- Underfloor trunking

12.8.2 Standard Wiring Trunking

a) Wiring trunking and accessories shall be fabricated from folded or cold-rolled sheet steel. The trunking manufacturer shall supply all bends, tees, stop-ends etc. No accessory shall be made up where a manufactured accessory is available.

b) Any made up accessories shall be neatly fabricated and shall be brazed or strongly pop-rivetted at joining edges.

c) Accessories and sections of trunking shall be coupled with coupling pieces and earth bonded together with copper bonding links. In addition, the links shall be bonded to the trunking main earth or largest circuit earth wire with a jumper of at least 2,5mm².

d) The maximum number of circuit and earth wires that may be installed into any trunking shall be such that the total overall cross-sectional area of the wiring including the insulation does not exceed 45% of the free area of the trunking.

e) With the exception of underfloor trunking and loosely filled “opening up” trunking, wiring retainers shall be installed every metre of run and at other positions as required.

f) The trunking shall be installed in a neat and workmanlike manner on ceilings, walls, plant machinery etc., as indicated in the drawings.

g) All standard trunking used in industrial applications shall be finished in the colour code appropriate to the service (refer to 12.7.4 (e)).

h) Where channel passes through a “firewall” the channel lid shall be cut 100mm either side of the penetration and the wall entry around the channel shall be sealed by the building contractor. The Contractor shall supply and install suitable fire-barriers inside the channel. These shall consist of intumescent or other approved fire-resistant material, as supplied by PH Protection Plaster Systems (Pty) Ltd of Johannesburg, Pyro-Cote cc of Durban, or equal and approved and installed in accordance with the supplier’s recommendations.

12.8.3 Lighting Channel

a) General

i) Lighting channel and accessories shall be “Cabstrut” or equal and approved and shall be manufactured from cold-rolled steel sheet and galvanized. For industrial installations and elsewhere as specified the channel shall be epoxy coated light orange (colour ref. B26 according to SANS 1091).

ii) Unless otherwise required the dimensions of the channel shall be 41,3mm x 41,3mm.

iii) Lighting fittings or pendant drop conduits shall be fixed directly to “opening down” channel using special connecting nipples as supplied by the channel manufacturer. Alternatively, fittings may be fixed to the solid underside of channel installed “opening up” using bushed entries and screws, nuts and washers. Self-tapping screws shall not be used.

iv) Conduit connections to wiring channels shall be terminated directly into the channel using a screwed and bushed entry. Alternatively, where channels are fixed surface directly to a soffit, entry may be affected from a flush conduit box through a bushed hole in the back of the channel.

b) Surface Installations

i) Self supporting lighting channel shall be manufactured from cold-rolled steel of thickness at least 2,5mm, and shall be fixed in such a manner that the maximum deflection recommended by the channel manufacturer is not exceeded with all wiring and fittings installed.

ii) Fixings shall be by stirrups supported from structural members via threaded steel rod of at least 10mm diameter, or 20mm diameter conduit. Alternative or additional supports shall be affected by girder clamps etc. Cartridge pin fixings shall not be permitted without the prior written approval of the Engineer.

iii) Where required, channel installed directly to a soffit shall be fixed at intervals not exceeding 1m subject to a minimum of two substantial fixings to every accessory or section of channel. Channel fixed in this fashion may be not less than 1,6mm thick.

iv) Clip-in lidding of plastic or of zinc-coated metal, as specified, shall be installed over all faces of the channel left open after the installation of fittings etc.

c) Flush Installation

i) Lighting channel installed flush, either in or forming an integral part of a suspended ceiling shall be manufactured from minimum cold-rolled or folded sheet steel of thickness not less than 1,6mm.

ii) Where the channel is cast into concrete, fastening straps shall be provided every 600mm as supplied by the manufacturer of the channel. The channel shall be firmly fixed to the shuttering by galvanized steel wire lashing or by screws fixed through the concrete insert lugs. The channel shall be suitably sealed against the ingress of vibrated concrete by the use of dampened paper or expanded polystyrene inserts.

iii) Where the ceiling finish is “off-shutter”, narrow clip-in plastic or metal lid shall be used. This shall be grey for non-painted ceilings and white for painted ceilings. Wire lashings may not be used for fixing channels to be shuttering in “off-shutter” areas.

iv) Where plaster finish is to be applied, the plaster shall be taken up to the edges of the channel. Overlapping metal lidding finished white shall be used, fixed over the opening by means of special extension screws into fixing nuts installed in the channel.

v) For suspended-ceiling lighting channels, the channels will be supplied and installed by the ceiling erector, unless otherwise specified.

White plastic clip-in lidding shall be used for all suspended-ceiling lighting channels. The Contractor shall supply and fit the lidding unless otherwise specified.

vi) In the case of mullion partitioning the mullion may be utilized as a wiring channel where specified. For other types of partitioning, conduit switch-drops shall be used. Any entry into the lighting channel shall be suitably bushed to obviate abrasion of wiring.

12.8.4 Power Skirting and Dado Height Trunking

a) General

i) Power skirting and dado height trunking shall, unless otherwise specified, be formed from folded and welded pre-galvanized sheet steel of thickness not less than 1,2mm, to form two or three equal compartments designed for power services, socket outlets etc., (upper compartment) and communications/data services (lower compartment(s)). The power skirting shall be finished in baked enamel of colour(s) as stated in the Detailed Specification. The paintwork shall be in accordance with 12.4.1 (h) with due account being taken of the pre-galvanizing. The trunking shall be 150-225mm high x 50-55mm deep with fixed partitions to divide it into two or three compartments. The compartments shall each be provided with separate removable covers.

ii) Where a building module is applicable, the power compartment shall have provision for 16 A switched socket outlets at the module interval, or where the module interval exceeds 2m, twice every module interval. Socket outlet positions shall be centred between the window mullion or column modules. At the mullion or column position, a permanently fixed 250mm wide cover shall be provided across all compartments to permit the erection of partitions etc., without interfering with accessibility into the power skirting.

iii) Socket outlets shall be 16 A 3-pin and shall be attached to a fixing grid or mounting bracket in the trunking body. The cover shall be pre-punched to accept the socket outlet and shall be fixed both to the trunking body and socket outlet fixing grid. Wiring terminals shall be of the recessed type, or alternatively fitted with an insulated cover, to prevent accidental contact with bare earth wiring that may be installed or disturbed while adjacent circuits are alive.

iv) Where the trunking is a non-modular type, the punched socket outlet cover shall normally be 250mm long. Where it is of the modular type, the power section cover between the over-lapping covers shall be in one piece. Irrespective of whether socket outlets are indicated or not, full facilities including blanked off pre-punched covers shall be provided at the spacings specified herein.

Unless otherwise required, provisions for telephone and data outlets shall comprise a blank plate, or plates, mounted in line with socket outlets.

b) Installation

i) Power skirting shall, unless otherwise required, be installed surface against the wall at finished floor level. Where vinyl tiles or other fixed finish is to be laid, the power skirting shall be laid on top of the tiles. Where carpeting is specified, the power skirting shall be installed onto the screed before the installation of carpets.

ii) Dado trunking shall be installed surface on the wall at 900mm above finished floor level (to underside), or as otherwise specified.

iii) Fixings, suitable for the particular application, shall be provided at intervals not exceeding 1m. Subject to a minimum of two substantial fixings to each accessory or section of trunking.

iv) Conduit entry into power skirting installed along brick or concrete walling shall be affected via a bushed entry from a conduit box or standard 100mm x 50mm switch box mounted in the wall behind the respective compartment.

v) Conduit entry into power skirting installed along sheet metal curtain walling or similar shall be affected via a bushed entry from a conduit box, or similar, mounted in the floor under the power skirting. Wiring to the upper compartment(s) shall pass through a short conduit link within the lower communication(s) compartment(s). The conduit links shall be installed towards the back of the lower compartment(s) to afford adequate space for wiring to pass.

vi) The trunking main earth wire immediately adjacent to the socket outlet positions including the socket outlet earth jumper shall be suitably sleeved at the tee-off to prevent accidental contact with live terminals.

vii) All covers shall be adequately bonded to earth either through the fixing screws or a separate earth wire jumper fixed to an earthing stud brazed, at the manufacturer's works, to the lid. Where necessary, power skirting covers shall be specially ordered to include earthing studs.

c) Bench-Top Trunking

Where called for, bench-top socket outlet trunking shall be installed along bench tops etc, in workshops and laboratories. The general construction, socket outlet mounting, and installation procedure shall be similar to power skirting or dado trunking. A detail of compartments, sizes etc, and shall be as detailed in the drawings or specified in the Detailed Specification.

12.8.5 Underfloor Trunking

a) General

i) Several types of underfloor trunking are available and in the main, the choice depends upon certain structural restraints as floor type, screed thickness etc. Therefore, the exact type to be used will be specified in the Detailed Specification or drawings.

ii) Unless otherwise specified, the trunking shall be manufactured from pre-galvanized folded sheet steel and shall be single, double, or triple compartment as specified.

iii) Pre-formed outlets, suitably blanked off, shall be provided at intervals to suit the particular application.

iv) Flush floor level junction boxes shall have a removable trafficable cover and shall be designed to accept a portion of the floor tile, carpet or similar. The Contractor must liaise with the Main Contractor to determine the thickness of the floor finish.

v) Multi-channel junction boxes shall be so designed that the compartmentalisation is continued through these accessories.

vi) Socket outlets, telephone outlets and data outlets shall be provided where required in surface floor level pedestals or recessed floor boxes as specified. Suitable barriers shall be included to segregate different classes of services.

b) Installation

i) Trunking designed to be fully built into the screed shall be fixed to the slab surface by suitable straps or clips. A topping of at least 50mm of screed cover the trunking shall be applied. Where a cover of less than 50mm, but exceeding 25mm occurs, expanded metal shall be applied over the trunking to act as a screed binder. Where less than 25mm of screed topping occurs, the trunking shall be installed into the concrete slab to achieve at least the minimum cover. The written permission of the Engineer shall be obtained in each case.

ii) Trunking designed to be set flush with the screed surface shall be installed straight and level on mortar bedding on the slab. The trunking shall be slightly dove-tailed in section or shall have other suitable means to ensure that the trunking will remain firmly fixed into the screed.

iii) The Contractor shall obtain the screed finish datum line from the building contractor for levelling trunking and junction boxes.

12.9 General Wiring

12.9.1 General Applications

a) For general applications, 600/1000 V PVC insulated single core stranded copper conductors shall be used. In situations where high ambient temperatures are likely to be encountered, such as the enclosures of certain types on incandescent lighting fittings, ceiling voids of metal roofed buildings, etc., silicon or butyl insulated single core stranded conductor cables shall be used. All wiring cables shall bear the appropriate SABS or SANS mark and shall be delivered to Site with seals intact.

b) No cable of size smaller than 2,5mm² shall be used. The current carrying capacity of wiring shall comply with the requirements of SANS 10142-1:2003, particular regard being given to volt drop limitation and to derating due to bunching of cables and ambient temperatures.

12.9.2 Installation

a) Wiring within conduit shall be by means of the looping-in system. Joints will only be permitted in special circumstances and where accessible, subject to the approval of the Engineer in writing. Wires shall not be allowed to become twisted or tangled within the conduit when drawing in, and lubricating agents shall not be used.

b) Where earth conductors are looped between terminals of equipment, the conductor shall either remain unbroken in the terminal, or shall be twisted together and ferruled or soldered to ensure that earth continuity is maintained when the conductors are removed from the terminal(s).

c) Unless otherwise indicated in the drawings, no more than one circuit shall be run in one conduit.

d) Vertical runs of wiring shall be provided with a suitable stress relieving arrangement at intervals not exceeding 15m.

e) Within wiring trunkings, each separate circuit of wiring shall be neatly strapped or laced together and shall be so disposed as to afford easy removal. Adhesive insulating tape or similar shall not be used for binding of circuit wires.

12.9.3 Wire Markers

All wires in industrial installations, and where otherwise specified, are to be provided with closed-sleeve markers at each feeder termination point, including each leg of looped wires. The markers shall indicate the relevant distribution board and circuit number, e.g.: “DB-AP/P9” etc.

12.10 General Earthing

12.10.1 General

The installation shall be effectively earthed in accordance with the requirements of SANS 10142-1:2003 and the local supply authority. All metallic hot and cold-water pipes and waste pipes shall be bonded with copper tape clamped by means of a brass bolt and nut and earthed. Metal roofs, gutters, and downpipes shall be bonded together and earthed.

12.10.2 Earth Continuity Conductors

a) Separate bare copper earth continuity conductors shall be run with all multi-core cables (where no earth core is incorporated), and green/yellow PVC insulated earth conductors, or bare earthwires, as specified, shall be installed with all mains circuits, sub-circuits and final circuits wired with PVC insulated conductors in conduit or trunking wireways.

b) Only one earth conductor is required per group of conductors run in one wireway provided that such earth conductor is not less than half the cross-sectional area of the largest conductor in the group (subject to a minimum are of 2,5mm²), and provided the earthing complies with the requirements of SANS 10142-1:2003. Teed off connections shall be undertaken using crimped tee-ferrules or shall be soldered. Under no circumstances shall the common earth be broken.

c) Where practicable, common earth continuity conductors shall be run as a “ring main”.

12.11 Luminaires

12.11.1 General

a) Luminaires shall, unless otherwise specified, be supplied by the Contractor in accordance with the Luminaire Schedule. All luminaires shall bear the SABS “S” safety mark and, where applicable, the SABS “A” approved performance mark.

b) Class A2 electronic ballasts supplied with luminaires must bear a SABS, IEC or VDE mark. Any other alternative ballasts may be submitted for approval. Preferred ballasts are:

- Tridonic
- Vossloh Schwabe
- Philips

NOTE: No-name brands and brands of dubious quality and origin are not acceptable.

c) All luminaires shall be fitted with the appropriate lamps.

i) Unless otherwise specified, fluorescent lamps shall be “cool white”, colour temperature 4300°K with a minimum colour rendering index (Ra) of 64.

ii) Dichroic lamps shall be of the sealed type. Open reflectors will not be permitted.

iii) Unless otherwise agreed in writing by the Engineer, only the following makes of lamps will be permitted: -

- Osram
- Sylvania
- Philips
- GEC

c) Linear tubular fluorescent lamps shall have bi-pin end cap arrangements. The lamp holders shall be of the telescopic spring-loaded type.

d) Lenses

i) Prismatic, opal and clear lenses shall be manufactured from UV stabilised high-impact acrylic material for general luminaires.

ii) Where specified, luminaires, floodlights and lanterns shall be fitted with clear glass or clear tempered glass lenses as required.

iii) All tungsten halogen fittings shall be complete with glass lenses.

e) Streetlight and area lighting post-top lanterns shall be in accordance with the Detailed Specification and/or drawings.

Lantern ballasts shall have tappings for 95% and 100% of the nominal voltage, unless otherwise specified.

f) For ease of maintenance, luminaires and lamps in the following classes shall be from one single manufacturer / supplier per class;

i) Fluorescent luminaires and general incandescent fittings.

ii) Indoor decorative / display luminaires (downlighters, decorative spotlights etc.)

iii) Outdoor lanterns, bollards, and floodlights

iv) Industrial high-bay luminaires

v) Operating theatre fittings

vi) Medical examination lamps

vii) Dark Room lights

viii) Other specialised luminaires as specified (E.g.: stage lighting etc.).

12.11.2 Installation of Luminaires

a) General

Where possible, all luminaire outlets shall terminate in standard round boxes to which the fitting shall be fixed in addition to other fixings that may be required. Where conduit is run in roof spaces, or where conduits are cast into screeds and not directly into the slab, back-entry conduit boxes are to be used which shall be so installed as to be flush with the finished ceiling.

b) Mounting

i) Fluorescent fittings shall be fixed to one conduit box in the centre with two further independent fixings either side, one sixth of the fitting length from each end of the fitting. Fittings of 300mm or wider shall be fixed with two pairs of fixings.

ii) Where fluorescent fittings are fixed in continuous rows, wiring may be carried out from one outlet and then wired through the channels of the fittings. The entry from one channel to another shall be suitable bushed and the internal wiring shall be clipped to the insides of the channels.

iii) Corrosion proof and explosion proof type fluorescent luminaires shall be fixed using external stirrups or brackets. The wiring entry must be made via the gland entry arrangement using suitable multicore wiring (e.g., “Cabtyre”, PVC/PVC etc.) routed from an adjacent conduit box or Pratley type box, as appropriate. Under no circumstances shall the body of the fitting be pierced for any reason whatsoever.

iv) In surface installations to incandescent bulkhead type fittings, the conduit shall not enter the fitting directly but shall terminate in an adjacent conduit box; one outgoing way of the conduit box being terminated in the fitting. A fixed porcelain or plastic terminal block within the conduit box and heat resisting wire, (e.g., silicon insulated), shall form the final connection to the fitting. Alternatively, the whole circuit wiring shall be heat resistant (See clause 12.9 1(a)).

v) Where luminaires are mounted onto conduit boxes in external or potentially damp situations, a suitable neoprene gasket seal or other approved means shall be used at the junction of the fitting and the conduit box.

vi) The mounting positions of the luminaires shall be verified on Site with the Engineer before installation commences. Fittings will normally be mounted in an even or symmetrical pattern in relation to the particular area having due consideration for architectural features, beams, ceiling tiles, etc.

vii) Where fluorescent fittings are specified to be suspended on pendants the Contractor shall provide at least two pendants for each fitting, such pendants consisting of 20mm diameter conduit finished in white enamel for commercial and domestic installations and electrical standard light orange for industrial installations.

The wiring to the fitting shall be taken through one of these pendants. The pendants shall be secured to the outlet box or fixing surface by means of domelids. Where the length of the pendants exceeds 0,6m. Domelids shall be of the swivel type. The domelids shall be painted to match the pendants.

viii) Luminaires shall not be mounted directly to ceiling boards and suitable wooden inserts are to be supplied and installed by the Contractor for this purpose. Alternatively, fixings may be made into brandering where convenient.

ix) Heavy industrial high-bay luminaires, floodlights etc, shall be fixed to substantial steel brackets or "Cabstrut" type channel or as indicated in the drawings or Detailed Specification.

x) Where specified, luminaires shall be fed via a 5 Amp socket outlet mounted close to the fitting. The Contractor is advised to procure luminaires with suitable 3-core flexible cords with rubber clad plug-tops attached, as necessary.

c) Mounting Facilities

Where no facilities exist for supporting fittings, the Contractor shall supply and install brackets, hangers, angle irons, wooden battens inside ceiling space or other means as approved by the Engineer.

d) Fixings

Fixings direct to conduit boxes shall consist of cadmium plated or sheradised steel screws screwed into the conduit box fixing lugs. Extra independent fixings into concrete or brick shall consist of suitable fibre or plastic fixing plugs and steel or brass wood screws. Wooden fixing plugs shall not be used. Fixings for fittings over 10kg in mass shall be of the self-drill anchor or expanding bolt-type. Fixings into hollow blocks etc, shall consist of steel screws secured into the hollow cavity with a spring-loaded toggle-nut or other approved cavity fixing device.

Cartridge pin fixings shall not be used unless the prior approval of the Engineer is obtained in writing.

Refer also to clause 12.17 (Fixings and supports).

12.11.3 Poles and Masts

a) Street lighting and area-lighting poles and masts shall be supplied in accordance with the Detailed Specification and/or drawings.

b) All poles, masts, outreach arms etc. shall comply fully with all relevant SANS Specifications and Codes of Practice and shall be manufactured from:

- Galvanised Steel
- Self-Coloured fibreglass
- Aluminium,

As detailed.

c) Poles and masts shall be suitable for fixing to a concrete surface (this method being restricted to post-top lanterns of no more than 4m height) or burying the "root" in soil.

Where buried, each pole must be provided with a suitable baseplate complete with drain hole. Baseplates shall be secured with a minimum of 2 off 20mm dia. hook bolts.

d) Spigots shall be provided to suit the specified lantern. Particular care shall be taken to establish the exact diameter and length of the spigot or spigots required such that the luminaire fits neatly up against the shoulder formed between the pole and the spigots. Care shall be taken to avoid damage to the spigots during transport, storage and erection.

e) Galvanised poles shall be provided with a "corrosion collar" which must extend at least 150mm below and above finished ground level.

Unless otherwise stated, galvanised poles will not require painting.

f) After galvanising, poles shall be stacked and transported in such a way as to minimise mechanical damage to the zinc coating. In particular, poles shall not be stored in direct contact with the ground and if stacked on top of each other, wood spacers shall be used to prevent the formation of white rust. Poles shall be carefully handled at all times and shall not be dragged along the ground in such a way that the coating may be damaged.

Notwithstanding the foregoing, any small areas of the galvanised coating which have become damaged shall be repaired by shot blasting and zinc spraying to a nominal thickness of not less than 0,1mm. Care shall be taken to ensure that all loose flakes of coating around the area to be repaired are removed prior to zinc spraying. Any signs of substantial damage to the galvanised coating, as determined by the Engineer, will result in the pole being rejected.

h) Poles and masts shall be provided with suitable cable entries and access openings with fixing chassis suitable for the connection of cables and the installation of MCBs. Access openings shall be provided with a cover plate of the same material as the pole. Covers shall be provided with suitable gaskets and means of fixing to the approval of the Engineer.

i) Unless otherwise specified no cable glands or gland plates are required for the termination of PVC/SWA/PVC cables. The cable shall be brought up to a convenient position adjacent to the lower section of the access opening. The outer PVC sheath shall be stripped back, and the steel wire armouring pulled away from around the cables, twisted into compact tails and bonded together by means of an adequately sized line tap.

A separate earth conductor shall be taken from this line tap to the earth stud in the pole base compartment. Phase and neutral conductors shall be jointed using shrouded line taps and the cables neatly secured to the bottom of the fixing chassis by means of saddles.

j) Poles shall be planted in the positions indicated on the drawings. They shall be planted absolutely plumb with the outreach, where applicable, at right angles to the roadway edge. The root depth shall be as recommended by the manufacturer.

Should any pole position coincide with trees, building canopies, driveway entrances, overhead conductors or other obstacles, an alternative position is to be confirmed with the Engineer before excavation of the pole hole.

Poles shall be carefully aligned with each other to form straight lines or smooth curves generally following the alignment of the associated roads. The planting depth shall be carefully controlled to ensure that all luminaires will be at the same height above the level of the roadway, parking area etc.

k) Care shall be taken when backfilling around the pole to ensure that compaction is even all around the pole and is to the requirements specified in sub-clause 12.5.5 f) viii). Where poles are to be planted in fill material, on ramps, etc., one

pocket of dry cement shall be mixed with the backfill material before commencing backfilling and compaction. Subject to the prior approval of the Engineer, this technique shall also be applied wherever it is considered necessary to stabilise the pole due to unsuitable soils, etc. Where the Contractor feels that this situation exists, he must advise the Engineer immediately and obtain a decision.

l) Where poles are to be anchored into rock, the base of the pole shall have a reinforced concrete block cast around it. The dimensions of this block shall be approximately 1,25m x 1,25m x 0,5m and the bottom face shall be reinforced by R10 bars at 250mm centres in both horizontal axes. A Y20 bar shall be grouted into the rock for a distance of 300mm. The grouted end shall be straight while the end located in the concrete shall be provided with a hook around the reinforcing bars. Alternatively, 20mm “Rawplug” or similar duplex studs may be used in place of grouted bars.

12.12 Lighting Switches

12.12.1 General

Switches shall be of 15-20 A rating and shall comply with the requirements of SANS 60669-2-1. No switch shall be used to control more than 2000 W of incandescent, or 1500 W of discharge and fluorescent lighting.

All switch boxes shall be fitted with an earth stud.

12.12.2 Switch Types and Installation

a) Flush Switches

Flush switches with pressed steel or plastic overlapping coverplates shall be mounted into pressed steel rust-proofed boxes installed flush in the building fabric. The switch boxes shall be installed square and shall be flush with the wall finish. Boxes chased into walls shall be fixed square and mortared in position prior to plaster or other finish being applied.

b) Surface Switches

Surface switches shall be of the metal-clad type. Protected dollies shall be used for all industrial applications. The switch plate and box shall have a suitable rust resistant enamel finish.

c) Architrave Switches

i) Architrave switches shall be used in partitioning mullions as required.

ii) Unless otherwise specified, tapped holes for screws and outlet openings will be provided by others. The Contractor shall co-ordinate fully with the contractor providing the holes with regard to positions and switch screw templates. Fixing screws shall be provided by the Contractor.

iii) Wiring to architrave switches may be run within the hollow mullion or other hollow metal structural members of the partitioning but shall be run in conduit from the lighting outlet, terminating with a bush at the point when wiring enters the hollow mullion.

v) Where the wiring for lighting circuits is run in a ceiling channel which is situated directly over the hollow mullion or other wire carrying member, then the wiring to switches may be taken directly into the latter without the use of conduit or lead-in tubes.

Under no circumstances shall the wire pass over sharp edges and suitable provisions shall be made to shield the wiring accordingly.

d) Watertight Switches

i) Watertight switches shall be used for all external applications and in potentially damp areas.

ii) Watertight switches shall have cast alloy or UV stabilised high-impact plastic enclosures.

iii) The minimum protection rating shall be IP55.

12.12.3 Mounting Heights

a) Unless otherwise specified, switches shall generally be mounted at 1,4m above finished floor level to the underside of the switch.

b) Where switches are located on walls near a change of wall finish, e.g., on tilted, face brick, or wood panelled dadoes, they shall be positioned so that the coverplates fall completely within one or other of the surfaces, but not on the junction line of the different finishes. The Contractor shall liaise with the relevant other trades to ensure that switches on surfaces present a neat appearance.

c) Switches in locations meant for persons in wheelchairs (paraplegic toilets etc.) shall be mounted at 1,1m above finished floor level to underside.

12.12.4 Dimmers

a) Standard Dimmers

i) Dimmer units suitable for controlling 220/230 V incandescent and fluorescent luminaires shall be of the integral controller/dimmer unit type suitable for mounting in a standard switchbox, or else in a suitable box supplied with the unit. The units shall be rated at 250 V and sized according to the load.

ii) Dimmer units used in conjunction with 12 V dichroic luminaire transformers shall be of the induction type.

iii) All dimmers shall be provided with a mains on-off switch and a dimmer control knob. Multi-lever switches may be utilized where there is a combination of dimmed and non-dimmed circuits fed from the same position.

iii) The correct pre-heat transformers and lamps shall be used for all dimmable fluorescent luminaires, in accordance with the supplier’s details. Alternatively, units suitable for use with electronic fluorescent ballasts shall be used where electronic ballasts are employed.

iv) Dimmers shall be noise-free and fully suppressed for radio and fluorescent ballast interference.

b) Remote Dimmers

Dimmers for loads larger than 1200 W are to be of the two-part type, i.e., with a local controller and a remote dimmer.

12.12.5 Photo-electric Controls

Where specified photocells shall be used to switch external lighting installations. Photo-electric switches shall be of the type comprising a photo-sensitive resistor, thermal actuator with an inherent operating delay to make it insensitive to short duration changes in light levels and a change-over switch mechanism, all housed within a tough, translucent, weatherproof ultraviolet stabilised cover. The operating level shall be factory preset to switch on at approximately 50 lux and off an approximately 100 lux. The response time after sudden changes in light level shall be not less than 15 seconds.

Integral protection against voltage surges shall be provided.

Photocells shall be positioned in such a way that they will not be affected by spill-light from the external lighting installation or by vehicle headlamps.

12.12.6 Occupancy Sensors

a) General Description
Single load 360° Dual Technology using PIR and Ultrasonic (US) sensing technology with a maximum load of 2000W and rated at AC voltage of 230V, +-10% at 50Hz within an optional Infrared (IR) Remote Controller interface.

b) Detection Range
i) PIR: 8m (Diameter) at 2.5m height
ii) US: Adjustable up to 10m x 16m (Oval Shape)

c) Type of Installation
i) Ceiling (Flush/Surface)

d) Infrared (IR) Remote Controller for Dual Technology Occupancy Sensor
i) Rated Voltage: 3V DC

12.12.7 Labelling

All switches in industrial applications, and elsewhere as specified shall be provided with a Traffolyte label screwed to the wall, or other fixed member, immediately adjacent to the switch. The label designation shall indicate the distribution board and circuit and outlet number, e.g.: “DB-AB/L4.3”.

12.13 Bell Pushes

Bell pushes shall be 250 V rating, even where used for low voltage bell installations. In all other respects the requirements for lighting switches given in 12.12 shall apply to bell pushes. Bell pushes shall be mounted in separate boxes to switches or other components.

12.14 Socket Outlets and Plug Tops

12.14.1 16 A Switched Socket Outlets (SSOs)

a) 16 Amp SSOs shall be 250 V rating; shuttered 2 pin and earth type complying with the requirements of SANS 164-1 and SANS 164-2.

b) Outlets on circuits rated up to 20 A shall be of the normally switched type whilst outlets on 25-32 A circuits shall be provided with a class F0 SP MCB, or where especially detailed, a DP MCB. The ratings shall be 16A unless otherwise specified.

c) Single flush wall mounted SSOs shall be housed in 100 x 100 x 50mm accessory boxes. Double flush wall mounted SSOs shall be housed in 100 x 150 x 50mm accessory boxes. Surface single-outlet sockets shall be housed in 83 x 119 x 50mm galvanised steel boxes. SSOs for mounting in power skirting, bench-top trunking, hospital bed-head channels etc. shall be mounted on cradles suitable for such applications. Unless otherwise required, flush wall mounting outlets shall have pressed steel coverplates finished white or ivory. Surface outlets shall be of the industrial protected-dolly type with grey pressed steel coverplates.

d) Where SSOs complying with SANS 164-1 are to be used in exposed areas, they shall be housed in a York S15 weatherproof enclosure or equal and approved.

12.14.2 Non-Standard Socket Outlets

a) Data/Electronic Equipment Outlets

i) Dedicated 16 Amp SSOs shall be similar in construction to normal SSOs but shall have flattened earth pins in the 10 o'clock or 12 o'clock position as specified. The earth socket shall be isolated from the chassis of the unit to allow for the connection of 'clean' earths.

Unless otherwise specified, the socket outlet plate shall be of a distinctive colouring (usually red, or as specified in the Detailed Specification). Alternatively, the socket pin shrouds, and switch dolly shall be of the selected colour; the latter instances usually being applied to outlets in power skirting or hospital bed-head channel etc.

ii) Where specially called for, dedicated SSOs are to be of the British Standard square pin, 13 Amp type. Similarly, to 12.4.2 (a) (i), the earth socket shall be isolated from the chassis of the unit.

Wall mounting 13 Amp SSOs shall be suitable for mounting in a standard 100 x 100 x 50mm accessory box. Surface and power skirting mounted units shall generally be as detailed for 16A SSOs (12.14.1(c)).

iii) 16 A dedicated plug tops, colour-matched to the respective plate or shrouds, and 13 A plug tops in ivory or white plastic, complete with 5 A cartridge fuses, at the rate of 60 % of all relevant outlets shall be provided and handed to the Client at Works handover.

b) Luminaire Outlets

Where required luminaires shall be fed via a locally mounted 5A SP, N + E non-switched socket-outlet. In these instances, the luminaires shall be fitted with 3m of 3-core flex and a rubber-clad 5A plug-top.

12.14.3 220/240 V Plug-Tops

a) When required to be supplied by the Contractor, 13 A plug-tops shall be white or ivory plastic. 16 A plug tops shall be white or ivory plastic for general office areas and rubber clad type for workshops, production areas, etc. or colour coded plastic for dedicated types.

b) When wired, a small loop shall be made in the earth core of the flex within the plug top so that in the event of undue stress upon the equipment flex, the earth connection will tend to remain intact even if the feed wires are pulled loose.

12.14.4 3-Phase Socket Outlets

a) Existing Installations

420 V 3-Phase socket outlets for use in existing factories etc. shall generally match the units already installed, unless otherwise specified.

b) New Installations

i) Generally multi-phase sockets shall be BICC Marachel type DS 16/30A or 32/50A TP + N + E wall mounting decontactors, or equal and approved, or as otherwise specified.

ii) Each decontactor or similar shall be supplied with a plug unit which shall be handed to the Client upon Works completion and handover. 16 A units shall be fed with cable not exceeding 6mm² and 32 A units with cable not exceeding 10mm².

12.14.5 Mounting Heights

Unless otherwise required SSOs shall be mounted at the following heights from finished floor/surface level to the bottom of the outlet.

Flush outlets, generally	:	0,45 m
Garages, factories, and workshops	:	1,4m (SP & TP units)
Kitchens and tea rooms	:	1,0m
Above work surfaces (Kitchens and Offices)	:	0,2m (SP only)

12.14.6 Labelling

Socket outlet labelling shall be as for switches, refer 12.12.5.

12.15 Miscellaneous Power Connections

12.15.1 Geysers

a) Domestic-type geysers will be supplied, installed, and connected to water services by others. The Contractor shall undertake all electrical connections.

b) For wall mounted geysers, flush supply conduit shall terminate in a flush round box conveniently close to the electrical entry to the water heater. A surface type metal clad or polycarbonate encased 30 A DP switch disconnector shall be superimposed over the conduit box and the final connection shall be made using surface galvanised conduit, painted after installation.

c) Where geysers are installed in concealed positions such as roof voids, the final connection from the local switch disconnector may comprise PVC covered flexible steel conduit.

d) Unless otherwise indicated in the single line diagrams, wiring for geyser circuits not exceeding 4 kW single-phase shall be carried out with conductors and earthwire at least 2,5mm² each.

e) Connections to calorifiers and large type geysers shall be as specified.

12.15.2 Kitchen Equipment

a) Domestic Stoves

Domestic stoves will be supplied and placed in position by others.

The Contractor shall provide a suitable electrical supply and final connection. A feed shall be taken to a flush mounted 60 A DP switch-disconnector positioned 300mm to one side of the stove and at a height determined by work surface, kitchen cupboards etc. From the switch-disconnector, flush conduit shall be taken to a point 450mm above floor level, and centred to the rear of the stove, terminating in a round conduit box. The final connection shall be carried out using a superimposing spout-entry conduit box and PVC covered flexible conduit for permanently connected units and via a 'stove connector' socket for plug-in units.

b) General Kitchen Equipment

i) Canteen kitchen equipment such as stoves, fryers etc. shall be connected up by the Contractor.

ii) Unless otherwise specified, equipment shall be fed via a local polycarbonate encased switch-disconnector mounted at 1400mm on the wall behind the appliance. The switch-disconnector shall be single-phase DP, or 3-phase 4-pole as required. The final connection shall be taken from the switch-disconnector using flush conduit offset out of the wall at 450mm above floor level. Water-tight PVC covered flexible steel conduit shall connect directly to the end of the wall conduit and shall then connect to the particular item of equipment.

iii) Where no wall exists, a stainless-steel pedestal and switch-disconnector arrangement shall be supplied, as detailed in the Work drawings.

12.15.3 Air Conditioning Units

a) Console, ceiling, and wall-mounting air conditioners (ACs) will be supplied and installed by specialist contractors.

b) The Contractor will undertake electrical and control connections to the extent outlined in the drawings.

c) Unless otherwise specified, AC units shall be fed via a locally mounted 30 A DP switch-disconnector unit and the final connection shall comprise the 3-core flex supplied with the AC unit taken via a cord-outlet arrangement mounted on the switch-disconnector faceplate.

12.15.4 Fans

a) General

Where fans are required to be supplied by the Contractor, they shall be supplied complete with all necessary accessories as applicable, such as mounting brackets, diaphragm plates, wire guards where fan blades are liable to be touched by hand, weatherproof louvres where fans are mounted on an outside wall, etc.

Fans and all accessories supplied therewith, shall be bolted, screwed, or secured to walls and other surfaces as required.

Holes in walls or windows will be provided by the building contractor to details to be supplied by the Contractor.

b) Connection to Lift Motor Room Fans

i) Where a lift motor room fan connection is required, the Contractor shall, in addition to the fan, also provide and install a “close-on-rise” 20A rating thermostat, having room temperature range, which shall be mounted near the fan unless otherwise indicated.

ii) The wiring to the fan shall be taken from a SP MCB on the distribution board through a clearly labelled local 15/20A switch disconnect and through the thermostat to the fan motor terminals.

iv) Final connections to the fan shall be carried out in flexible conduit.

c) Connection to Small Extract Fans

Where a small extract fan, such as is used in domestic kitchens toilets, etc., is specified, and when no facilities exist on the fan for conduit entry, connections may be made to the fan terminals by means of 3-core plastic-covered or “cabtyre” flexible cord, taken from a cord-outlet 15/20A switch disconnector unit in close proximity to the fan.

12.15.5 Plant and Motor Connections

a) General

Due to the many types of plant and/or motors that the Contractor may be called upon to connect up, specific details will be as described in the drawings or Detailed Specification.

b) Plant Supplies

i) Generally, the Contractor will be called upon to supply and install an incoming feeder cable to a motor control panel (MCC), or similar, supplied by others.

ii) The Contractor shall liaise and co-operate with the plant vendor/contractor regarding program, correct location, testing – including phase rotation check, and switch-on.

iii) Where the Contractor has any doubt regarding electrical and safety aspects of plant controls and equipment by others, he shall have the right to refuse to liven up the system until the receipt of an indemnity from the Engineer.

c) Motor Connections

i) Unless otherwise specified motors and associated machinery will be supplied and fixed by others. The Contractor will be required to provide an electrical supply and to connect the means of disconnection, starting and to the motor terminals and accessible to the machine operator where applicable.

ii) Unless specified as being supplied by others, the Contractor shall supply and install a padlockable, local switch disconnector for each motor. A suitable starter (which will be provided with the motor) shall be fixed and connected by the Contractor.

iii) Switch-disconnectors shall, unless otherwise specified, be wall mounted adjacent to the motor, or onto a suitable floor mounting pedestal or onto the framework of the machine or equipment. The switch disconnector shall be within 2,0m of the motor terminals.

iv) Unit starters shall, where possible, be mounted adjacent to the switch disconnector provided that this position will afford easy control of the machine by the operator.

v) The final connection to a motor shall comprise a multi-core armoured cable with a neatly strapped loop of slack at least 800mm long to allow adjustments to be made to the motor and/or its mountings. The multi-core cable shall contain an extra core for earthing purposes. The entry into the motor terminal box should preferably be from below/or alternatively from the side, but never from above.

vi) The Contractor shall ensure the correct rotation of the motor and the settings of the starter in co-operation with the representative of the supplier of the motor.

12.15.6 Labelling

All cables, cores, switch-disconnectors, and other items of control equipment shall be labelled. Labels for controls shall be affixed to a non-removable member or wall, adjacent to the item.

Refer to items 12.9.3 and 12.12.5 for general requirements.

12.16 Provisions for Ancillary Services

12.16.1 General

Where provision only for telephones and other systems of communication, fire defence, security, aerial, computer data or other services are specified, the Contractor shall supply and install all necessary conduit, wiring channel, cable tray, boards, outlet boxes, sleeves etc., as detailed.

12.16.2 Junction Boards

Where called for, junction boards for telephone and data services shall be supplied as specified. The boards are to be similar in construction and finish to flush, surface or semi-flush distribution boards, as required (See clause 12.4). Boards shall generally be 100 – 115 mm deep with an internal 15 mm softwood backing. Doors shall be secured with square-key turnbuckles and provision for padlocking. Main distribution frames (MDFs) shall generally be similar to normal junction boards but are to be 150 mm deep.

12.16.3 Cable Sleeves

a) Unless otherwise specified or indicated on the drawings, the Contractor shall supply and install all sleeves for telephone and other service cables of sizes and in positions as detailed.

b) Where sleeves are specified to be supplied and installed by others, the Contractor shall be responsible for ensuring that such sleeves are installed in good time and in their correct positions. Suitable rustless draw wires shall be provided in all sleeves.

12.16.4 Conduit

All conduit for telephones and other services shall be provided and installed to the same requirements as for the electrical installation and shall be fitted with rustless draw wires. Colour coding for industrial project and other installations where specified shall be in accordance with 12.7.4 (e).

Each class of service shall be kept entirely segregated from any other service.

12.16.5 Outlets

a) Unless otherwise specified all outlets for telephones and other services shall consist of standard 100 x 50mm flush type pressed steel boxes generally mounted a height of 0,3m from finished floor level to bottom of box.

b) Where switch sockets or other outlets are mounted in the same room at nominally the same height above floor, care shall be taken to ensure that the undersides of all such outlets are accurately lined up.

12.16.6 Coverplates

The Contractor shall supply and fit metal or plastic coverplates of the same material and finish to match flush switches and switched socket coverplates. A blank cradle shall be fitted in the outlet box to which the coverplate shall be screwed, allowing for proper alignment of the coverplate. Nickel or chromium plated screws shall be used to secure all blank coverplates.

12.16.7 Co-operation

The Contractor shall co-operate with the suppliers and installers of other services in providing all information required, and shall assist such other installers in the event of difficulties which they may experience with drawing in of their cables into conduit or channel provided by the Contractor and where such difficulty arises because of want of knowledge of location, blockages broken draw-wires etc.

12.17 Fixings and Supports

12.17.1 General

a) The Contractor shall be responsible for all fixings in connection with his installation, including brackets, suspensions, clamps, bolts, screws etc, and all accessories and fixing devices to affect a substantial and proper means of fixing equipment, components, wireways, cables etc.

b) All items shall be selected to fully suit the application; due cognisance being taken of:

- Weight of equipment and fixing media (‘pullout strength’)
- Temperature and humidity
- Effect of corrosive and damp environments
- Weathering, UV degradation etc
- Electrolytic effects

c) The following details shall apply to all fixings irrespective of the various categories in which they are described.

12.17.2 Concrete and Brickwork

a) Wall Plugs

i) Fixings into concrete and brick surfaces for equipment with a maximum mass of 10kg may be undertaken with plastic or fibre 'wall-plugs'. Under no circumstances shall wooden inserts be used.

ii) A masonry drill of the correct size shall be used, in conjunction with a suitable hammer drill or similar, to make holes into the brick or concrete fabric; fixings into mortar joints will not be allowed. The fixing plug length must match the threaded portion of the fixing screw; undersized plugs will not be allowed.

iii) Round or cheese headed screws of the correct diameter to match the respective plug shall be used throughout.

b) Anchor Bolts

i) Fixings into concrete and brick surfaces for equipment with a mass exceeding 10kg, or where the fixing holes are 10mm or larger, shall be undertaken using expanding anchor bolts, or by means of bolts cast into concrete.

ii) For expanding anchor fixings, holes shall be made similarly to wall-plug holes (see 12.17.2 a) ii)).

c) Channel Fixings

i) Where brackets, cable-rack support arms etc are to be fixed, the Contractor shall supply and install Cabstrut, or equal and approved, galvanised channel supports and associated clamps, cantilever arms and so forth. Surface channels for the support of various brackets, pendant studding etc shall be fixed into concrete ceilings or brick/concrete walls using anchor bolts.

ii) In instances where cast-in support channels are to be used, the Contractor shall liaise with the building/civil contractor to ensure that inserts are installed timeously on to shuttering and that all openings are protected from the ingress of vibrated concrete.

iii) Unless otherwise detailed in the Detailed Specification and/or drawings, the Contractor shall submit particulars, including sketch drawings, of proposed fixings to the Engineer for approval prior to installation. Such proposals shall be accompanied by design calculations of loadings and fixing spacings.

d) Cartridge Fixings

Shot or cartridge fixings, using fixing guns, percussion charges and fixing pins in accordance with the relevant manufacturer's recommended methods, shall only be used with the express written permission of the Engineer. Where used, the Contractor shall comply fully with the requirements of the Occupational Health and Safety Regulations and shall ensure that warning signs are placed at all entrances where such work is in progress.

12.17.3 Hollow Partitions, Hollow Blocks and Ceiling Boards

a) Fixings shall not be made using gypsum, fibre or similar ceiling boards or ceiling tiles as the supporting medium.

b) For ceiling boards, the component shall be installed to a substantially fixed conduit box. In the case of linear fluorescent luminaires or other large

components, further fixings shall be made into the support brandering. Where there is no brandering conveniently located, the Contractor shall supply and install independently fixed wooden inserts.

c) Surface fixed items mounted to ceiling tiles within support tees shall be fixed similarly to the foregoing except that, with written permission of the Engineer, supplementary fixings may be made into the ceiling tee lips using approved self-tapping screws.

d) Fixings into hollow partitioning material, or hollow building blocks, shall be done by means of spring-loaded 'toggle' fixings, or, where suitable, compression type cavity fixing devices may be used.

12.17.4 Fixings on Steelwork

a) Support brackets, hangers etc shall be fabricated from galvanised angle iron or channel iron or shall be made up using Cabstrut or equal channel and associated accessories to suit the application.

b) Brackets etc shall be fixed to the structural steelwork using purpose made galvanised beam clamps, Caddy clips or similar. Welding to structural steelwork may only be carried out with the written permission of the Engineer.

12.17.5 Painting

a) All exposed steel shall be cold galvanised.

b) Where specified, supports etc shall be primed and painted using an epoxy finish, colour: light orange, SANS 1091, ref. B26. Refer to clause 12.4.1 (h) for details of painting.

12.17.6 Adhesives

a) Under no circumstance will any adhesive material be used for any fixing with the single exception of the fixing of door gaskets.

b) The adhesive for use with gaskets shall be applied as per manufacturer's specifications, or self-adhesive gasketing material shall be used. The adhesive shall be of the silicone-based type suitable for use under extreme weathering and temperature ranges between -40ºC and +70ºC.

12.18 Earthing and Lightning Protection

12.18.1 General

a) In instances where soil resistivity surveys have been carried out to determine the design of the earth electrode system/s, Tenderers shall submit their price in accordance with the Tender Documentation, including the bills of quantities where applicable.

b) All earthing and lightning protection surveys, installations and testing must be carried out by a recognised specialist. Unless the Tenderer is also the earthing specialist other Tenderers (e.g.: electrical contractors) must submit full details of their proposed specialist sub contractor.

c) This section does not include switchyard earthing. Where necessary a supplementary specification: "Standard Specification for Substation Earthing" will be issued.

12.18.2 Earth Resistance Testing

a) Soil resistivity tests shall be carried out at the proposed location of the electrode/s and following ground levelling by the civil/building contractor, where applicable.

b) The Contractor must give at least 48 hours notice of impending tests to the Engineer to allow him to attend and witness them at his option.

c) The tests must be carried out in accordance with SANS 10199 using a recognised method (e.g.: Wenner method) with a four terminal null balance 'megger' tester. A meter calibration certificate proving calibration within the last six months undertaken by a recognised testing authority must be submitted to the Engineer prior to carrying out earth readings. If there is any reason to suspect the accuracy of any instrument, the Engineer may call for confirmation testing at the Contractor's expense.

d) The result of tests, including a specification for the electrode design, shall be submitted to the Engineer within seven days. The test results in tabulated and graphical form shall be accompanied by a copy of the meter test certificate.

e) The following maximum resistances shall apply:

i) Transformers

Up to 500kVA	5 Ohms
500 - 800kVA	3 Ohms
800 - 1000kVA	2 Ohms
Above 1000kVA	1 Ohm

ii) Lightning Protection

- SANS 10313, category A structures: 30 Ohms overall, subject to a maximum of 200 Ohms for any single electrode (or per SANS 10313, whichever is the lower reading).

- SANS 10313, category B & C structures: 50 Ohms overall, subject to a maximum of 200 Ohms for any single electrode (or per SANS 10313, whichever is the lower reading).

iii) Plant Bonding – Hazardous Areas

Where specified to be bonded, the electrode reading for tanks, silos etc must not exceed 7 Ohms with the electrode disconnected from any other electrode system (See also item 12.18.6).

12.18.3 Earth Electrode

a) The earth electrode shall consist of earth rods, bare copper wire, copper tape etc, or a combination of these, as specified in the drawings.

b) Earth rods shall nominally be 1500mm long, 16mm diameter extensible type steel cored, copper jacketed where the copper cladding is at least 250 microns thick molecularly bonded to the steel rod, as 'Cadweld', or equal and approved.

c) Mains earthing conductors ('trench earths') shall consist of 70mm² bare copper cable while conductors for lightning protection and static bonding shall be 50mm².

d) Trench earth conductors, as well as the tops of earth rods shall be not less than 600mm below finished ground level.

e) Earth rods shall be driven into the soil utilising a purpose made driving head in conjunction with a mechanical hammer. In hard ground and in rock, the rods shall be installed into pre-drilled holes made with an earth-drilling rig. Whilst loose soil or a soil slurry may be used to back-fill holes in hard soil, carbonaceous conductive aggregate, such as 'Marconite' or equal and approved, shall be used for holes bored in rock.

f) Rods longer than the nominal 1500mm shall be coupled using an external sleeve arrangement and the liberal application of silicon or hydrocarbon grease. Rods must butt against one another inside the coupling; gaps will not be allowed.

g) Rods, tapes, and cable conductor in highly corrosive soils shall be of stainless steel, or as otherwise specified.

h) Joints in copper cable electrodes shall only be affected using an exothermic welding process as 'Cadweld', or equal and approved.

i) Lightning protection trench earths shall not be run directly in soil under pathways. In these instances, the conductor shall be run in 75mm diameter uPVC sleeving which shall be laid under the path and at least 1000mm clear of its edges.

12.18.4 Mains Earthing

a) The earth electrode resistance for mains earthing of transformers, switchgear etc. shall be in accordance with 12.18.2 (e) (i)

b) A main earthing bar of high conductivity copper, at least 50mm x 6mm in section and 500mm long, (or as otherwise specified in the Detailed Specification and/or drawings) installed in the transformer room facing the LV side of the transformer/s shall be provided. This shall be mounted onto insulators at 500mm above finished floor level. The bar shall be pre-drilled with 12 No. M12 diameter holes for the connecting of earth leads.

c) The earth electrode cable/s and all earth bonding leads shall be connected to the bar by means of brass or stainless-steel bolts, nuts, washers and lock-washers. Earth cable terminations shall comprise hydraulically crimped tinned lugs. The point of origin of each conductor must be clearly indicated by means of an embossed or punched metal tag attached to the conductor near its lug or connection point.

d) The following points shall be bonded to the earth bar with 70mm² conductor, or as otherwise specified:

   i) Transformer star points (*)
   ii) LV switchboard neutral bar (*)
   iii) LV switchboard earth bar (*)
   iv) MV switchgear

   (*): Subject to the earth conductor being not less than half the cross-sectional area of the of the relevant phase conductor between the transformer and the LV switchboard.

e) Minisubs shall be earthed in a similar fashion to main substations except that the earthing bar in the LV compartment shall take the place of the separate main earth bar.

12.18.5 Lightning Protection

a) Besides earth resistance testing, the Contractor shall arrange for the design of the lightning protection system, including air terminals, roof bonding, down conductors etc to be carried out by a reputable specialist. The Engineer will provide suitable drawings to the Contractor for this purpose either as transparencies or as DXF Computer Assisted Draughting (CAD) files.

b) Following submission of the design to the Engineer for comment (modification where necessary) and approval, the Contractor shall submit the final design to the SANS for approval. Transparencies of the SANS approved drawing/s shall be submitted by the Contractor to the Engineer for record purposes prior to, or simultaneously with, the start of the installation.

c) Air terminals may be of various designs. As a general guide, the following basic requirements shall be complied with:

i) All conductor material shall be electrical grade aluminium alloy in accordance with the requirements of BSS 1476/H/E9 or American Standards Specification 6063. Conductors shall be installed in such a way that no part of the system shall come into contact with concrete of plaster.

ii) Circular conductors shall have a minimum cross-sectional area of 50mm². Flat conductors shall be 20mm x 3mm minimum.

iii) Joints in circular conductors shall be done using a hydraulic crimping machine. Flat conductors shall be joined with either two bolts, or else two aluminium rivets of 6mm diameter.

iv) Bonding to extraneous metallic surfaces shall be done by bolting or riveting.

v) Conductors must be mounted into aluminium alloy guides which in turn are seated on a suitable barrier material (plastic or similar) and which allow free longitudinal movement of the conductor.

vi) Straight horizontal runs of conductor shall be provided with expansion loops every 30m or less.

vii) Electrically continuous metal roofs shall be used as the air termination. Where flat metallic roofs may be surrounded by non metallic parapet walls, conductors are to be installed on top of the wall and bonded to the metal roof sheeting at intervals not exceeding 20 metres.

viii) Non metallic roofing supported by steel trusses and purlins which are electrically continuous may be treated as for a complete metal construction.

ix) Where required 12mm diameter x 500mm long finials shall be installed at the outer corners of buildings of 15m to 30m in height and in addition at intervals of no more than 30m along exposed parapet walls. The finials, in turn must be bonded to the peripheral conductors.

x) Tall structures, as defined in SANS 10313, shall, where required, have 12mm diameter x 1000mm long finials. These shall be installed at an angle of 30° out from the structure and bonded to the peripheral air terminal system, all as required by the Code of Practice.

d) Down conductors shall consist of aluminium alloy run surface down the outside of buildings, or, where suitable, shall comprise structural steel columns, or reinforcement steel in reinforced concrete columns all as described in the Detailed Specification and/or installation drawings and in accordance with the Contractor's SANS approved design.

i) Down conductor spacing shall not exceed 30 - 0,4h metres, where h = the maximum height of the structure. However, the minimum separating distance need not be less than 10 metres except for tall slim structures (like chimney stacks) where a minimum of two down conductors must be installed.

ii) Large expanses of external metal wall cladding as well as external metal staircases, ductwork etc shall be bonded to ensure vertical electrical continuity and to the lightning protection system at their upper and lower extremities.

iii) Aluminium based down conductors shall terminate at 500mm above ground level where they shall be bonded to the earth electrode system. Under no circumstances shall aluminium conductor come into contact with the ground.

iv) The Contractor must liaise closely with the building contractor to ensure the timeous placement of cast-in threaded bonding sockets at the tops and bottoms of reinforced concrete columns.

e) Test points shall be provided where specified. These shall be either mounted near the base of the down conductor in the lower part of the wall or else contained in a small cast iron inspection chamber installed in the ground, all as detailed in the installation drawing/s and/or Detailed Specification.

12.18.6 Static Bonding

Static bonding of operating theatres, explosives magazines, petrochem installations, electronic workshops, and the like fall outside the scope of this general specification and, where required, will be specified in supplementary specifications or the Detailed Specification.

12.18.7 Testing and Maintenance Manuals

Upon completion of the earthing installation, testing in accordance with the relevant SANS specification/s shall be carried out by the Contractor and the results submitted to the Engineer. The Contractor shall also supply maintenance manuals, including as fitted and SANS approved record drawings, test certificates etc, all as outlined in clause 10.0.

12.19 Interactive White Board System

12.19.1 Data Projector Specification

Display Technology	Single 0.65" WXGA DC3 DMD chip DLP® Technology by Texas Instruments
Native Resolution	1080p 1920 x 1080
Brightness 1 (Bright Mode)	4000 ANSI Lumens
Contrast	20,000:1
Noise Level (Eco mode)	28dB
Weight (kg)	4.85
I/O Connectors	2 x HDMI (1.4a 3D support), 2 x VGA (YPbPr/RGB), Composite, 2 x Audio In 3.5mm, Audio Out 3.5mm, VGA Out (Shared with VGA2), RJ45, RS232, USB remote mouse/service, 12V trigger, Mic In, USB-A Power, 3D-Sync
Computer Compatibility	UXGA, SXGA, WXGA, HD, XGA, SVGA, VGA, Mac
Video Compatibility	PAL (B, D, G, H, I, M, N, 576i/p), NTSC (M, 4.43/3.58 MHz, 480i/p), SECAM (B, D, G,
Displayable Colours	1.07 Billion
Projection Lens	F/2.4; f=3.72mm, Fixed Zoom
Throw Ratio	0.25:1
Projection Screen Size	2.03 – 2.54m (80" – 100") Diagonal 16:9
Projection Distance	0.45 - 0.59m
Zoom Type	Fixed
Aspect Ratio	16:9 Native, 4:3 Compatible
Offset	118%
Horizontal Scan Rate	15.3 - 91.1kHz
Vertical Scan Rate	24 - 85Hz (120Hz for 3D)
Lamp Type	269W
Lamp Life 2 Bright	3000 (hrs)
Keystone Correction	± 20° Vertical
Dimensions (W x D x H)	385 x 310 x 99
Power Supply	100-240V, 50-60Hz
Power Consumption	310W Bright mode / 260W Eco mode (< 0.5W Standby)
Operating Conditions	5°C - 40°C, Max. Humidity 85%, Max. Altitude 3000m
Uniformity	85%
Security	Security Bar, Kensington Lock, Password Protection
Standard Accessories	AC power cord, VGA cable, USB cable, remote control, batteries, quick start card, CD user manual, TouchBeam interactive module, 2 x interactive passive pens
Optional Accessories	DLP® Link™ 3D glasses, wireless, wall mount
RoHS	Compliant
3D Support	Full 3D - The 3D features of Optoma projectors can only be used with compatible 3D content. Typical applications include use with 3D educational or 3D design and modelling systems. 3D TV broadcast systems, (SKY in the UK), Blu-ray 3D™ and 3D games from the Sony® PS3 or Microsoft® Xbox 360 are now supported as part of the HDMI v1.4a specification.
3D Compatibility	Side-by-side:1080i50 60, 720p50 / 60 Frame-pack: 1080p24, 720p50 / 60 Over-Under:
Speaker (Watts)	16
On Screen Display	25 Languages: English, German, French, Italian, Spanish, Portuguese, Swedish, Dutch, Norwegian/Danish, Polish, Russian, Finnish, Greek, Hungarian, Czech, Arabic, Traditional Chinese, Simplified Chinese, Japanese, Korean, Thai, Turkish, Farsi, Romanian, Slovenian
Optional Wireless	Yes

12.19.2 White Board Size and Material Specification

Dimensions	2.5m (W) x 1.5m (H)
Projector Type	WXGA – Full HD 1080 x 1920
Aspect Ratio	16:9 / 16:10
Active Area	105”
Total Thickness	265±15μm (10.43 ± 0.59mil) Including PSA
PSA Type	Gray acrylic Pressure-Sensitive Adhesive
Release Liner	90g/m2 both side PE Coated Paper Liner
Film Surface	Matte and anti-glare surface
Film Transparency & Haze	White opaque
Initial Adhesion	At SUS 304 24hr after application ≥500gf/25mm (1.1lbf/inch)
A week after application	≥1,500gf/25mm (3.3lbf/inch) ASTM D 3330
Pencil Hardness	≥ 3H
Water Resistance	No changes over 120hr at 25°C (water bath)
Recommended Storage	77°F (25°C), 50% RH
Recommended Application	59°F (15°C) to 95°F (35°C).

12.19.3 Speaker Specification

Bluetooth	Built-in (10m Range)
FM Radio	Yes
Audio Inputs	Aux-in / Line-in / USB & mini SD / Bluetooth 2.1
Power Input	DC 16V
Output (RMS)	18w x 2 + 30w (Total RMS 58W)
Frequency Response	60-20k(Hz)
Speaker Units	3”Bass x 2 + 2.5” Mid-Tweeter x 2 + Passive Bass Radiator x 1
Dimension	L940 x W78 x H100mm

PART 2: SCHEDULE OF INFORMATION

PART 2: SCHEDULE OF INFORMATION

1. SCHEDULE OF PERSONNEL TO BE ASSIGNED TO THIS PROJECT

The Tenderer shall list below the key personnel (including first nominee and the second-choice alternate), whom he proposes to employ on the contract should his offer be accepted, both at his headquarters and on the Site, to direct and for the execution of the work, together with their qualifications, experience, positions held and their nationalities.

DESIGNATION	NAME AND NATIONALITY OF: (i) NOMINEE (ii) ALTERNATE	SUMMARY OF QUALIFICATIONS, EXPERIENCE AND PRESENT OCCUPATION
HEAD OFFICE Partner/director		
Project manager		
Other key staff (give designation)		
SITE OFFICE Site Agent		
Site Engineer		
Construction supervisor (Give designation)		
Other key staff (give designation)		

…….. ……

NAME OF TENDERER **TENDERER'S SIGNATURE**

…….

DATE

2. SCHEDULE OF WORK CARRIED OUT BY TENDERER

The Tenderer shall list below the last five Electrical engineering contracts of a similar nature awarded to him. This information is material to the award of the Contract.

EMPLOYER (Name, Tel No and Fax No)	**CONSULTING ENGINEER** (Name, Tel No and Fax No)	**NATURE OF WORK**	**VALUE OF WORK**	**YEAR OF COMPLETION**

…….. ……

NAME OF TENDERER **TENDERER'S SIGNATURE**

…….

DATE

3. SCHEDULE OF PROPOSED SUBCONTRACTORS

I/We hereby notify you that it is my/our intention to employ the following Sub-Contractors for work in this contract.

NAMES AND ADDRESSES OF PROPOSED SUBCONTRACTORS	NATURE AND EXTENT OF WORK TO BE SUBCONTRACTED	PREVIOUS EXPERIENCE WITH SUBCONTRACTOR OR RECENT WORK EXECUTED BY THE SUB-CONTRACTOR

…….. ……

NAME OF TENDERER **TENDERER'S SIGNATURE**

…….

DATE

4. REGISTRATION AS AN ELECTRICAL CONTRACTOR

The Tenderer must be registered as an Electrical Contractor with the Electrical Contracting Board of South Africa and must also be registered with the Workmen's Compensation Commissioner and the Unemployment Insurance Commissioner to qualify for this tender.

Tenderers must complete the following questionnaire and submit it with this tender.

a) Has the company been registered with the Electrical?

Contracting Board of South Africa YES/NO

Registration No : .....

Date of issue : .....

b) Has the company been registered with the Department of Manpower?

i) The Workmen's Compensation Commissioner YES/NO

Registration No :.....

Date of issue :.....

ii) The Unemployment Insurance Commissioner YES/NO

Registration No :.....

Date of issue :.....

c) Has the company been registered with, and graded by the CIDB? YES/NO

Registration No :.....

Grading :.....

I/We certify that the above information is correct

Signature :.....

Name of Signatory :.....

Name of Firm Represented :.....

Address :.....

.....

.....

Date :.....

NOTE: **IN TERMS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT ELECTRICAL INSTALLATIONS REGULATIONS FAILURE TO COMPLY WITH THIS CLAUSE OF THE SPECIFICATION MAY RESULT IN DISQUALIFICATION AND REJECTION OF THE TENDER.**

5. DETAILS OF INSTALLATION ELECTRICIAN

I/We certify that .....……..... is a registered installation electrician in terms of the Occupational Health and Safety Act (Act 85 1994 and is permanently employed by my/our company trading as:

.....…….....

I/We further certify that the abovementioned person will be appointed as the responsible person in charge of the installation, which person shall personally supervise the whole of the electrical works as tendered for from inception to completion inclusive of signing all commencement/completion/ cost certificates necessary as part of the Works.

I/We further certify that I/We am/are fully aware of the provisions of the Occupational Health and Safety Act (Act 85 1994), and that my/our company is trading as a registered electrical contracting organisation.

SIGNATURE OF TENDERER	……..	**SIGNATURE OF INSTALLATION ELECTRICIAN**	…….
REGISTRATION NUMBER OF INSTALLATION ELECTRICIAN	…….	**DATE**	……..
COMPANY STAMP			

NOTE **It is an offence to employ a registered single-phase installation electrician on a poly-phase installation and it may be necessary to submit a certified copy of the licence of the person to be employed on any poly-phase project**.

6. DETAILS OF THE PROPOSED LIGHTNING PROTECTION SYSTEM (LPS) SUBCONTRACTOR

NAME OF THE LPS SUBCONTRACTOR : ……

ADDRESS : ……

PROOF OF EXPERIENCE ATTACHED? : **YES**: ……. **NO** :……

NAME OF TENDERER : ……

TENDERER'S SIGNATURE : ……..

DATE : ……..

7. SCHEDULE OF MATERIALS OFFERED

The Tenderer must complete the following schedules and submit them with the priced Bill of Quantities.

The schedules will be scrutinised by the Engineer and should any material offered not comply with the requirements contained in the specification, the Electrical Sub-Contractor will be required to supply material in accordance with the contract at no additional cost.

NB: Only one manufacturer's name to be inserted for each item.

Item	Material	Make or trade name	Country of origin
1.	Distribution boards		
2.	Circuit breakers 1P, 2P, 3P		
3.	Contactors 1P, 2P, 3P		
4.	Earth leakage relays		
5.	Daylight sensitive switch		
6.	Surface all weather isolators		
7.	Watertight rotary switch with and without night light switch contact.		
8.	16A power skirting mounted socket outlets		
9.	16A flush switched socket outlets		
10.	16A surface switched socket outlets		
11.	5A unswitched socket outlets		
12.	PVC SWA PVC cable		

NOTE: Tenderers are to note that under no circumstances may materials be installed other than offered in the above materials schedule, which has been approved and accepted by the Contractor.

Should the successful tenderer wish to supply materials other than those originally offered, prior written approval must be obtained from the Contractor before any orders are placed.

…….
NAME OF TENDERER
(or Company stamp)

…….
TENDERER'S SIGNATURE

…….
DATE

PART 3: PREAMBLES TO BILLS OF QUANTITIES

PART 3: PREAMBLES TO BILL OF QUANTITIES

1. BILLS OF QUANTITIES

These Bills of Quantities contain pages numbered in the consecutive order.

The Tenderer is required to check the numbers of pages and should any page be found to be missing, or in duplicate, or if any reproduction is indistinct, or if any ambiguity arises as to the meaning of any item or description, or if these Bills of Quantities contain any obvious errors, then the Tenderer must immediately inform the Engineer and have he same rectified or explained, as the case may be. No claim will afterwards be considered where the Tenderer has failed to comply with these instructions.

No alteration, erasure, amendment or note is to be made in the text of these Bills of Quantities and should any such alteration, erasure, amendment or note be made by the Tenderer it will be recognised, but these Bills of Quantities as prepared by the Engineer will be adhered to.

2. CONTRACT DOCUMENTS

The Bill of Quantities form part of and must be read in conjunction with the Specification which document contains the full descriptions of the work to be done and material and equipment to be used and unless otherwise described in the Bill of Quantities, reference should be made to the Specification for the full meaning of descriptions of work to be done and materials and equipment to be used in this service.

3. ARITHMETICAL ERRORS

The tender price arithmetically corrected where necessary and not the amount stated on the form of tender shall constitute the contract price of the successful Tenderer.

No error in the calculation of schedule rates which may be discovered subsequent to the submission of a tender will constitute grounds for a claim of any description. A tender that is incomplete or insufficient in any respect may result in the disqualification of such tender.

4. ALTERATIONS

No alteration, erasure or addition is to be made in the text of the Bills of Quantities. Should any alteration, erasure or addition be made, it will not be recognised but the original wording of the Bills of Quantities will be adhered to

5. ADJUSTMENTS

The Priced Bills of Quantities of the successful Tenderer will be checked, and the Engineer reserves the right to call for adjustments to any individual price and to rectify any discrepancy whilst the total arithmetically correct tender price, as submitted, remains unaltered.

6. RESPONSIBILITY OF TENDERER

The responsibility for the accuracy of the quantities written into the Bill remains with the person who prepared the Bill. The Tenderer shall be relieved of responsibility of measuring quantities at the tender stage, and the tender sum submitted shall be in respect of the quantities set out in the Bills, although he will be required to make his assessment of items such as brackets, fixing, etc., from details stated in the Bills and shall include in the item prices for such small installation materials as are required for the complete installation in accordance with the Specification.

7. QUANTIFICATION OF ITEMS

The successful Tenderer and the Employer or his Agent may agree that the total of any Bill or Bills, including any variations by way of additions thereto or deductions there from, represents a fair and accurate quantification of the items set out in the Bills and the parties may agree final payment on that basis. In the event of any dispute as to the quantities, then the disputed item or items shall be adjusted where necessary.

8. ORDERING OF MATERIALS

These Bills of Quantities are not to be used for ordering purposes. Any orders placed by the Contractor on the basis of these Bills of Quantities shall be at his own risk.

9. VARIATIONS

Variations in the scope and extent of the work included in the Bills shall be allowed to meet the Employer's requirements and shall be measured and costed at rates entered in the Bills, where appropriate, and shall form an addition to or deduction from the total Bills. Any items or variation for which rates have not been included in the Bills shall be agreed and priced as non-scheduled items in accordance with the provisions of the contract.

The rules governing the extent and costing of the variation shall be those provided for in the form of Conditions of Contract.
Variations to the planning before the work has been executed shall be priced as above.
Alterations to work already executed cannot necessarily be priced as above and must be reviewed on its merits.

Unless a separate rate for the supply and for the installation of any item is specifically called for, the supply and installation costs of any item shall be fully included in the unit price.

10. DESCRIPTION OF ITEMS

The description of each item shall, unless otherwise stated herein, be held to include making, conveying, and delivering, unloading, storing, unpacking, hoisting, setting, fitting and fixing in position, cutting and waste, patterns, models and templates, plant, temporary works, return of packing, establishment charges, profit and all other obligations arising out of the conditions of contract.

11. WASTE ALLOWANCE

All measurements are net, unless otherwise stated, and Tenderers must allow in the rate for wastage.

12. CABLE QUANTITIES

The quantities given in the Bill for cable, cable markers, and earth wire laid with cable and excavations cannot be regarded as exact and are subject to measurement on site after completion of the service and adjustments will be made according to the unit rates given in the Bill.

Note: Checking of Cable Lengths

Notwithstanding the fact that the lengths of cables as given in the Bills of Quantities have been measured from scaled drawings, the contractor shall check such lengths on site before ordering the cable, as he will not be paid for excess cable after the completion of the service. Any allowance for off-cuts shall be made in the unit rates. The final measurements shall be based on the net route length of the cables concerned.

13. **CLASSIFICATION OF MATERIALS ENCOUNTERED IN THE EXCAVATIONS**

Materials encountered in the excavations for cable trenches, lighting standard and bollard holes generally shall, unless special provision to the contrary is made hereinafter, be classified as follows: -

a) 'Hard rock' shall mean any excavation requiring the use of explosives.

b) 'Soft rock' shall mean any excavation which necessitates the use of pneumatic tools.

c) 'Ordinary material' shall mean all pickable material.

In the event of any dispute regarding the classification of material, the Engineer's decision in this connection shall be final.

Should the Subcontractor consider that any material encountered in the excavations is 'hard rock' or 'hard material', he shall immediately notify the Engineer in writing. Failing such notification, the excavation shall be assumed to be in 'ordinary material' and shall be measured and valued accordingly. Wherever practicable all excavation in ground other than 'hard rock' and/or 'soft rock' shall be carried out first after which levels will be taken of the exposed 'hard rock' and/or 'soft rock' and agreed upon by the Engineer and the Contractor.

Where the Contractor encounters a combination of 'hard rock' and/or 'soft rock' simultaneously in a section of trench and employs explosives or pneumatic tools to remove all the various types of materials in that section of trench, the use of these methods of removal will in no way influence the Engineer's classification of the materials.

14. **VALUE ADDED TAX OR OTHER LEGAL DUTIES PAYABLE**

All items priced in this Bill of Quantities shall exclude any tax applicable to the particular service article equipment or accessory and these net priced items will be used for normal variations on the contract.

The tax value will be added at the ruling % rate to all payments and valuations i.e., net price + VAT.

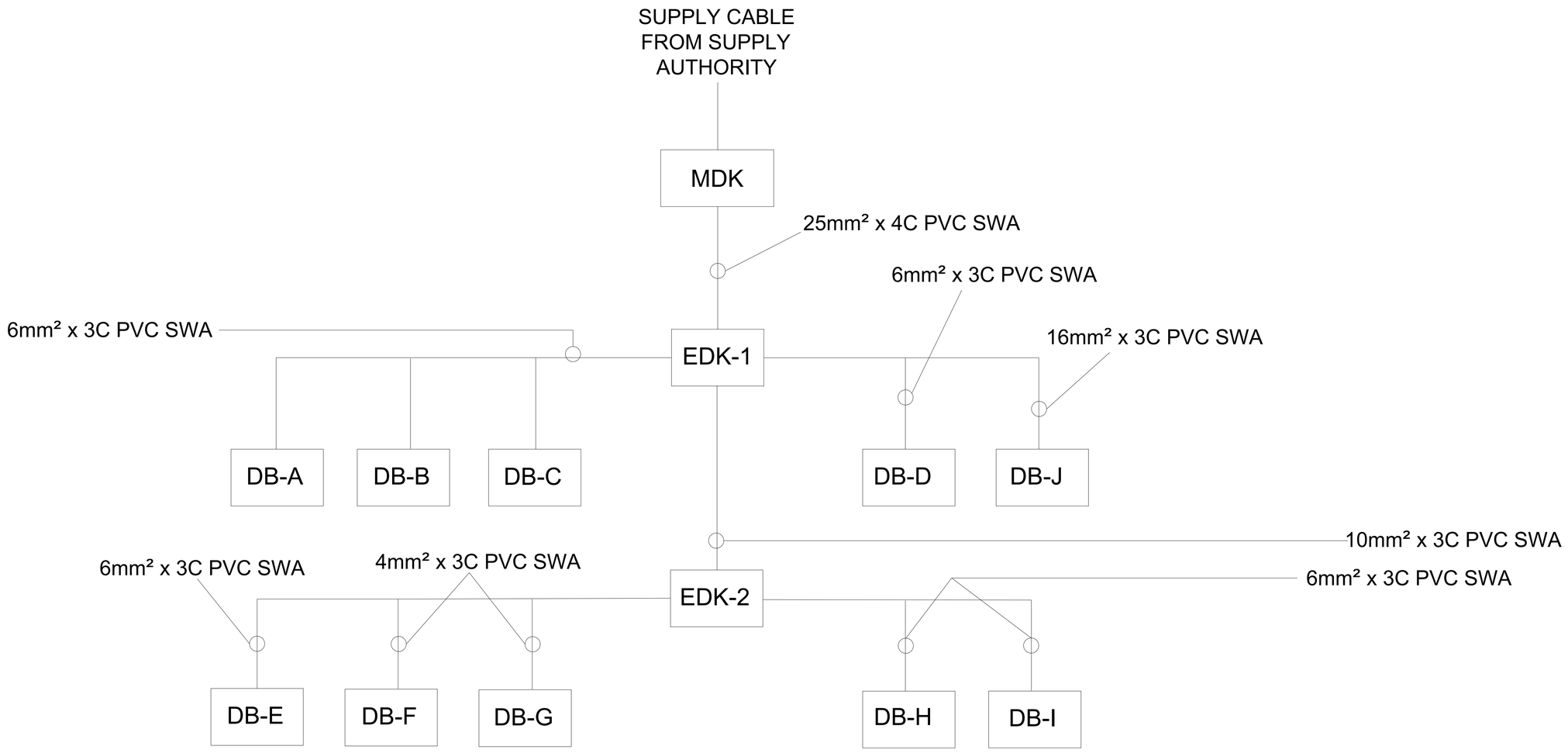
15. **ITEMS THAT ARE NOT RE-MEASURABLE**

Unless there has been a written variation either in the form of a site instruction or an issue of a revised drawing, conduits and conductors are not re-measurable.

PART 4: UNSCHEDULED RATES

PART 4: UNSCHEDULED RATES

Material		**%**
Materials shall be charged at net cost, plus a percentage for profit, procuring, taking delivery and safe keeping. These costs shall be substantiated with invoices.		
(i)	Percentage mark-up on proven net cost (for unit cost of less than R1 000,00)	……
(ii)	Percentage mark-up on proven net cost (for unit cost of less above R1000,00)	……
(ii)	Handling charge for the correctly supplier materials but that have to be replaced with a different material and the material that is being replaced is to be returned to the supplier as instructed by the Engineer in writing.	……



GENERAL NOTES:

1. **ELECTRICAL INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH SANS 10142-1: 2003 (SOUTH AFRICAN NATIONAL STANDARD - THE WIRING OF PREMISES, PART 1: LOW VOLTAGE INSTALLATIONS)**

NO.	DATE	REVISION	DRAWN
A	11-02-26	TENDER	Y.P

THESE DRAWINGS WILL BE ISSUED FOR CONSTRUCTION FOR THE FOLLOWING SCHOOL:

SCHOOL NAME:	GREENVILLE PS
EMIS NUMBER:	200100275

"The electrical and mechanical engineer hereby assures the Eastern Cape Department of Education and the Eastern Cape Department of Roads and Public Works that these drawings concur with the approved Site Development Plans, and will be used without any changes or alterations. Any necessary and unavoidable changes or alterations must be preapproved by the Eastern Cape Department of Education and Eastern Cape Department of Roads and Public Works before any works commences on construction site.

PROJECT ENGINEER:	MXOLISI NYIKANA
ECSA REGISTRATION NUMBER:	200930204
SIGNATURE	

DISABILITY ECONOMIC EMPOWERMENT TRUST

IMPLEMENTING AGENT

Province of the EASTERN CAPE EDUCATION

CLIENT

MXN ELECTROCON PROJECTS
24 Botha Road
Selborne
East London, 5201
Tel: 087 702 4198
Fax: 086 263 8571
Email: mxn@mxnep.com

ELECTRICAL & MECHANICAL ENGINEER

	SIGNATURE	DATE	SHEET SIZE
DESIGNED	M. N.	05-09-25	A1
DRAWN	S.M.	05-09-25	SCALE N.T.S
VERIFIED	M.N.	09-09-25	
VALIDATED	-	-	

STATUS LEGEND
I = INFORMATION
T = TENDER
C = CONSTRUCTION
AB = AS BUILT

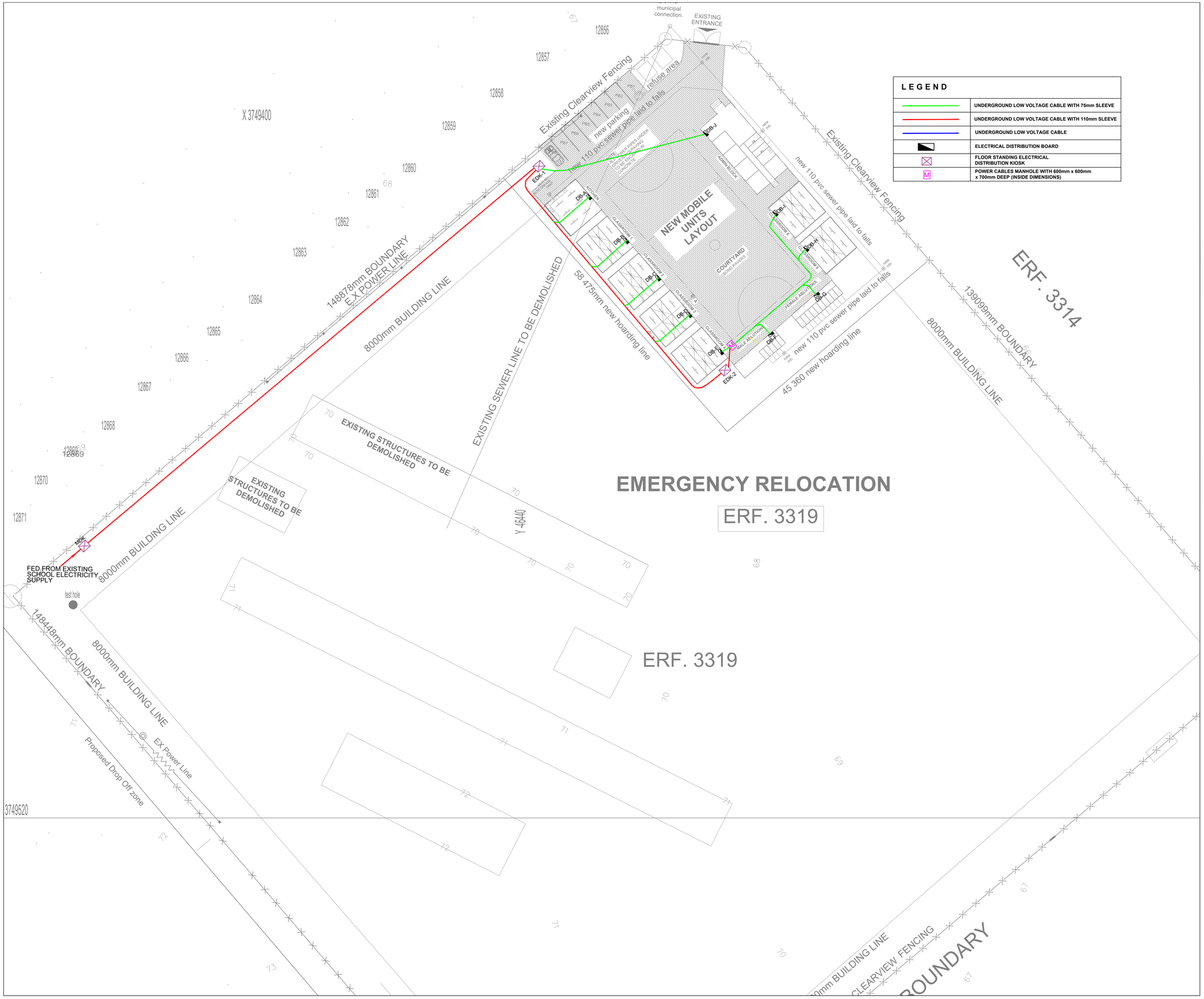
PROJECT

GREENVILLE PS - EMERGENCY RELOCATION

DRAWING TITLE

GREENVILLE PS: SCHEMATIC BLOCK DIAGRAM

PROJECT NUMBER	DISCIPLINE	DRAWING NUMBER	STATUS	REV.
2511	ELECTRICAL	2511-GR-T-E-300D	T	A



EMERGENCY RELOCATION

ERF. 3319

LEGEND

	UNDERGROUND LOW VOLTAGE CABLE WITH 75mm SLEEVE
	UNDERGROUND LOW VOLTAGE CABLE WITH 110mm SLEEVE
	UNDERGROUND LOW VOLTAGE CABLE
	ELECTRICAL DISTRIBUTION BOARD
	FLOOR STANDING ELECTRICAL DISTRIBUTION KIOSK
M	POWER CABLES MANHOLE WITH 600mm x 600mm x 700mm DEEP (INSIDE DIMENSIONS)

GENERAL NOTES:

1. ELECTRICAL INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH SANS 10142-1: 2003 (SOUTH AFRICAN NATIONAL STANDARD - THE WIRING OF PREMISES, PART 1: LOW VOLTAGE INSTALLATIONS)

NO	DATE	REVISION	DRAWN
A	11-02-26	TENDER	Y.P

THESE DRAWINGS WILL BE ISSUED FOR CONSTRUCTION FOR THE FOLLOWING SCHOOL:

SCHOOL NAME:	GREENVILLE PS
EMIS NUMBER:	200100275

"The electrical and mechanical engineer hereby assures the Eastern Cape Department of Education and the Eastern Cape Department of Roads and Public Works that these drawings concur with the approved Site Development Plans, and will be used without any changes or alterations. Any necessary and unavoidable changes or alterations must be preapproved by the Eastern Cape Department of Education and Eastern Cape Department of Roads and Public Works before any works commences on construction site.

PROJECT ENGINEER:	MXOLISI NYIKANA
ECSA REGISTRATION NUMBER:	200930204
SIGNATURE	

DISABILITY ECONOMIC EMPOWERMENT TRUST

IMPLEMENTING AGENT

Province of the EASTERN CAPE EDUCATION

CLIENT

MXN ELECTROCON PROJECTS
24 Botha Road
Selborne
East London, 5201
Tel: 087 702 4198
Fax: 086 263 8571
Email: mxn@mxnep.com

ELECTRICAL & MECHANICAL ENGINEER

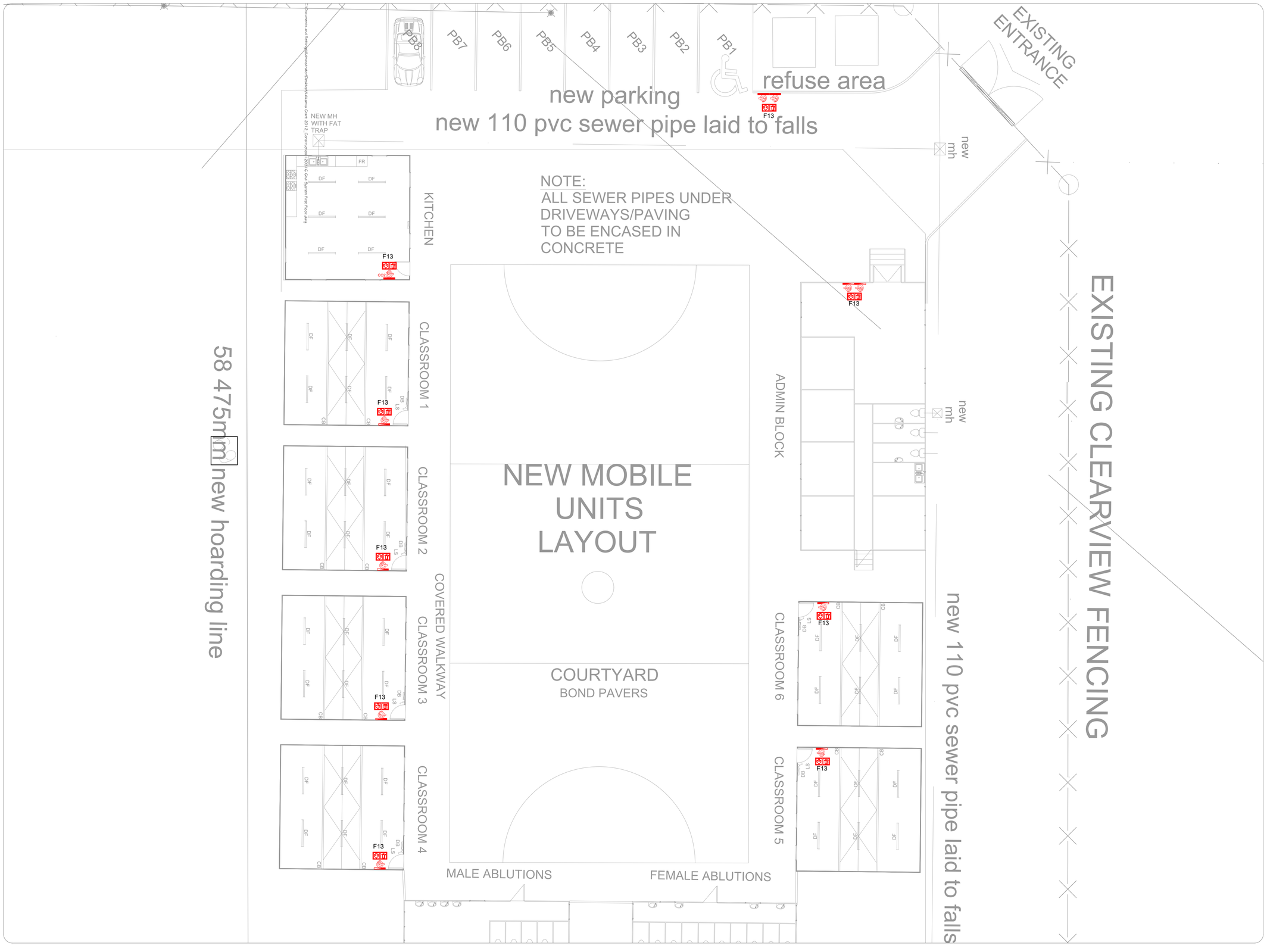
	SIGNATURE	DATE	SHEET SIZE
DESIGNED	M. N.	05-09-25	A1
DRAWN	Y.P.	05-09-25	SCALE 1 : 300
VERIFIED	M.N.	09-09-25	STATUS LEGEND
VALIDATED	-	-	I = INFORMATION T = TENDER C = CONSTRUCTION AB = AS BUILT

PROJECT
GREENVILLE PS - EMERGENCY RELOCATION

DRAWING TITLE
SITE PLAN: ELECTRICAL SERVICES & SLEEVES LAYOUT

PROJECT NUMBER	DISCIPLINE	DRAWING NUMBER	STATUS	REV.
2511	ELECTRICAL	2511-GR-T-E-100D	T	A

4.MECHANICAL ENGINEERING DRAWINGS



GENERAL NOTES:
1. THE DRAWING SHALL BE READ IN ONJUCTION WITH ALL OTHER PROJECT DRAWINGS FROM ALL DISCPLINES.
2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE N.B.R. SANS 10400 AND LOCAL AUTHORITY REGULATIONS.
3. THE DRAWING IS NOT TO BE SCALED.
4. ANY DISCREPANCIES MUST BE IMMEDIATELY REPORTED TO THE ARCHITECT/ENGINEER.
5. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE PRIOR TO CONSTRUCTION.

NOTES

- 9kg DCP Fire Extinguisher c/w wooden backing board
- 4,5kg DCP Fire Extinguisher c/w wooden backing board
- 2kg Carbon Dioxide Fire Extinguisher Extinguisher c/w wooden backing board

REV.	DATE	DESCRIPTION	BY
0	12-02-2026	ISSUED FOR CONSTRUCTION	MH
B	26-11-2025	UPDATED TO LATEST LAYOUT	MH
A	17-10-2025	ISSUED FOR INFORMATION	MH

Revisions

CLIENT: **DEET**

DISABILITY ECONOMIC EMPOWERMENT TRUST

Physical Address:
16 Greenwood Street,
Berea, East London, 5200

E-mail: asanda@ecdeet.co.za Tell: (+27) 43 722 7334
Website: deet.co.za

END USER: **ECDOE**

Province of the EASTERN CAPE EDUCATION

Physical Address:
Steve Vukile Tshwete
Education Complex, Zone 6,
Zwelitsha, 5608

E-mail: customercarecentre@ecdoe.gov.za Tell: (+27) 80 121 2570
Website: eceducation.gov.za

MECHANICAL ENGINEER: **SLS ENGINEERING SOLUTIONS**

SLS ENGINEERING SOLUTIONS

Physical Address:
23 On Eaton, 23 Eaton Avenue
South Block, First Floor, Suite 4
Bryanston, 2191

E-mail: info@slseng.co.za
Website: slseng.co.za Tell: +27 11 568 6075

PROJECT:

PROPOSED NEW GREENVILLE PRIMARY SCHOOL BETHELSDORP

TITLE:

PHASE 01
FIRE PROTECTION SERVICES

ISSUE FOR INFORMATION

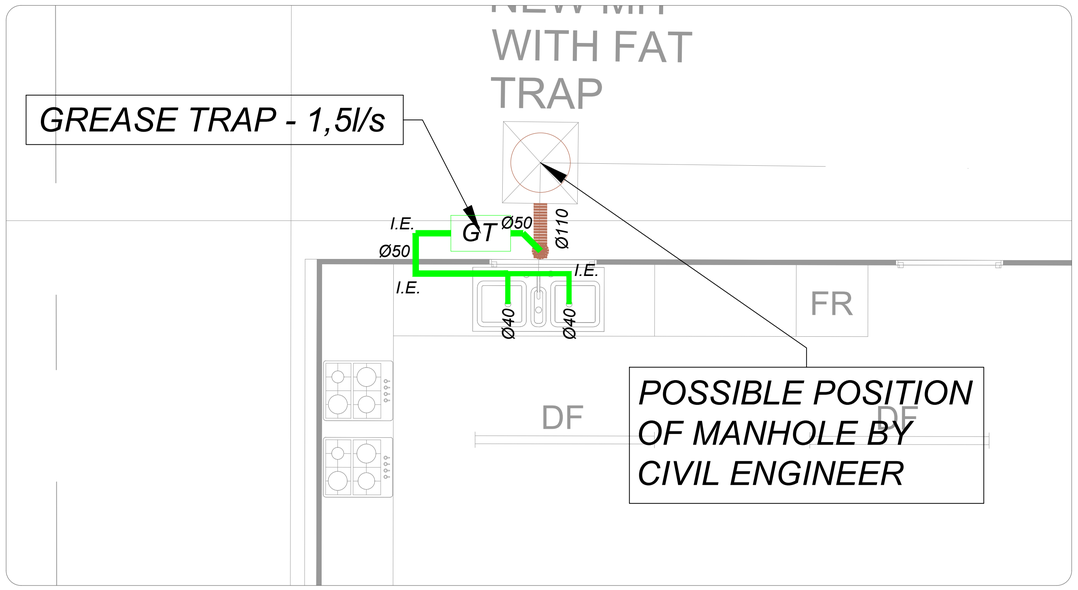
TASK	RESPONSIBLE PERSON	SIGNATURE
DESIGNED	M.H.	
DRAWN	M.H.	
CHECKED	N.J.	

APPROVAL

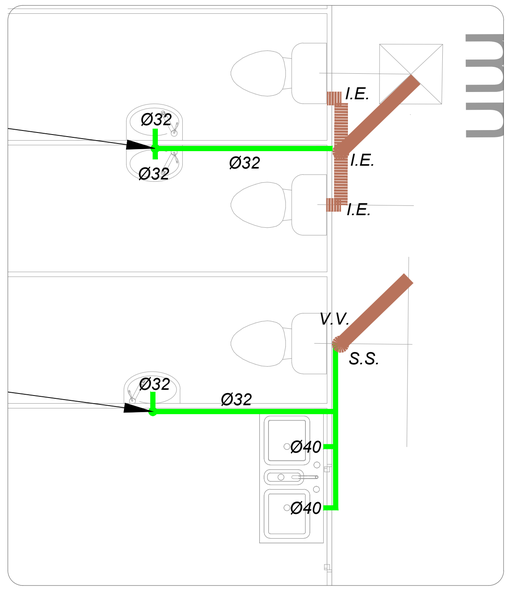
APPROVED	Registration No.:	SIGNATURE	DATE

PROJECT NO.:	DICIPLINE CODE:	DRAWING NO.	SHEET SIZE:	REVISION:
SLS/0124/01	MEC	300	A1	0

SCALE: **N.T.S.**



KITCHEN
1:50



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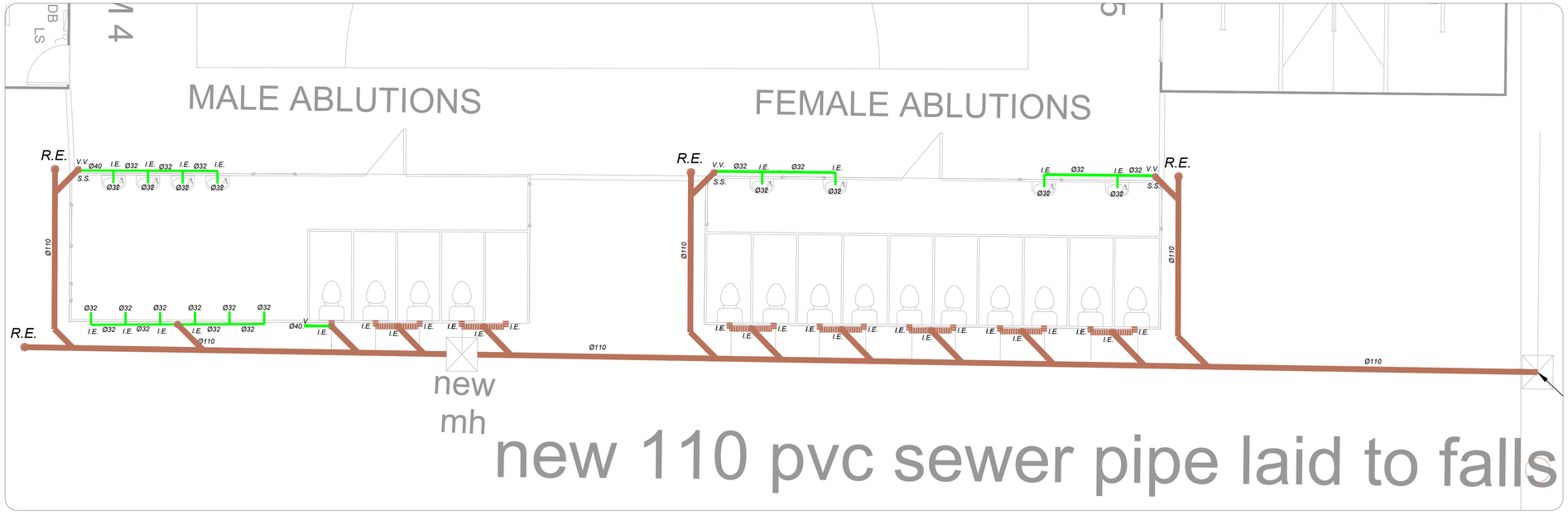

ABLUTIONS
1:100

GENERAL NOTES:
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NOTES

1. POSITION OF MANHOLE IS DEPENDANT ON WHICH SIDE THE SEWER OUTLET IS IN THE CONTAINER.

Sewer line by Civil Engineer

Possible position of manhole

GT — Stainless Steel Grease Trap Rofo type ROGT 500 or similar approved - 1,5l/s

REV.	DATE	DESCRIPTION	BY
0	11- 02-2026	ISSUED FOR CONSTRUCTION	MH
B	27-11-2025	UPDATED TO LATEST LAYOUT	
A	17-10-2025	ISSUED FOR INFORMATION	MH

Revisions

CLIENT: DEET

DISABILITY ECONOMIC EMPOWERMENT TRUST

Physical Address:
16 Greenwood Street,
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Website: deet.co.za

END USER: ECDOE

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Website: ecducation.gov.za

MECHANICAL ENGINEER: SLS ENGINEERING SOLUTIONS

SLS ENGINEERING SOLUTIONS

Physical Address:
23 On Eaton, 23 Eaton Avenue
South Block, First Floor, Suite 4
Bryanston, 2191

E-mail: info@slseng.co.za
Website: slseng.co.za Tell: +27 11 568 6075

PROJECT:

PROPOSED NEW GREENVILLE PRIMARY SCHOOL BETHELSDORP

TITLE:

PHASE 01
SANITARY DRAINAGE

ISSUE FOR INFORMATION

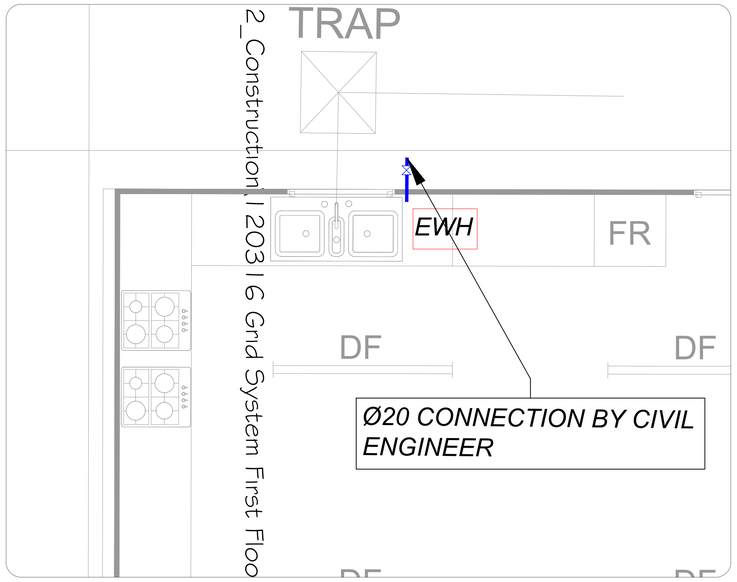
TASK	RESPONSIBLE PERSON	SIGNATURE
DESIGNED	M.H.	
DRAWN	M.H.	
CHECKED	N.J.	

APPROVAL

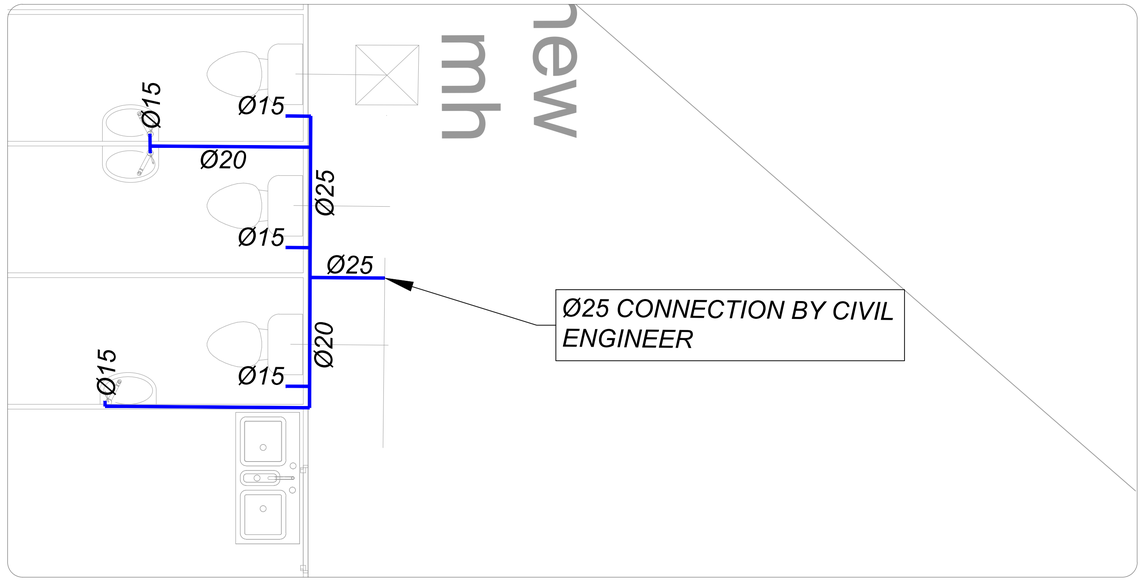
APPROVED	Registration No.:	SIGNATURE	DATE

PROJECT NO.:	DICIPLINE CODE:	DRAWING NO.	SHEET SIZE:	REVISION:
SLS/0124/01	MEC	100	A1	0

SCALE: AS SHOWN



KITCHEN
1:25



ADMIN BLOCK
1:25

ABLUTIONS
1:50

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NOTES

1. POSITION OF WATER CONNECTIONS IS DEPENDANT ON WHICH SIDE THE WATER CONNECTION POINT IS IN THE CONTAINER.

Domestic Water Pipe Class 12 uPVC

EWH — 10L undercounter Electric Water Heater

REV.	DATE	DESCRIPTION	BY
0	11-02-2026	ISSUED FOR CONSTRUCTION	MH
B	26-11-2025	UPDATED TO LATEST LAYOUT	MH
A	17-10-2025	ISSUED FOR INFORMATION	MH

Revisions

CLIENT: DEET

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South Block, First Floor, Suite 4
Bryanston, 2191

E-mail: info@slseng.co.za
Website: slseng.co.za Tell: +27 11 568 6075

PROJECT:

PROPOSED NEW GREENVILLE PRIMARY SCHOOL BETHELSDORP

TITLE:

PHASE 01 DOMESTIC WATER SUPPLY

ISSUE FOR INFORMATION

TASK	RESPONSIBLE PERSON	SIGNATURE
DESIGNED	M.H.	
DRAWN	M.H.	
CHECKED	N.J.	

APPROVAL

APPROVED	Registration No.:	SIGNATURE	DATE

PROJECT NO.:	DICIPLINE CODE:	DRAWING NO.	SHEET SIZE:	REVISION:
SLS/0124/01	MEC	200	A1	0

SCALE: AS SHOWN