

C3.2: Particular Specifications



CONTRACT NO: EB/NW1/10/24/Z1A

CONSTRUCTION OF A MANUFACTURING FACILITY IN ZONE 1A OF THE ELIDZ

INDEX:

SECTION	PAGE
A. GENERAL	2
B. FOUNDATIONS AND EARTHWORKS	3
C. BRICKWORK & BLOCKWORK:	4
D. CONCRETE:	6
E. SURFACE BEDS:	14
F. REINFORCEMENT:	14
G. STRUCTURAL STEELWORK:	15
H. CORROSION PROTECTION: HOT DIP GALVANIZING:	18

A. GENERAL

The following SANS 1200 Standardised Specifications apply to this contract:

SABS 1200 C	:	Site Clearance
SABS 1200 D	:	Earthworks
SABS 1200 DB	:	Earthworks (Pipe Trenches)
SABS 1200 DM	:	Earthworks (Roads, subgrade)
SABS 1200 GA	:	Concrete (Small Works)
SABS 1200 L	:	Medium-Pressure Pipelines
SABS 1200 LB	:	Bedding (Pipes)
SABS 1200 LC	:	Cable Ducts
SABS 1200 LD	:	Sewers
SABS 1200 LE	:	Stormwater Drainage
SABS 1200 M	:	Roads (General)
SABS 1200 ME	:	Subbase
SABS 1200 MF	:	Base
SABS 1200 MK	:	Kerbing and Channeling
SABS 1200 MM	:	Ancillary Roadworks
SABS 1200 MJ	:	Segmented Paving

1. These notes to be read in conjunction with the drawings and project specifications.
2. All structural drawings to be read in conjunction with the relevant architectural, civil, mechanical & electrical engineers' drawings, the specifications and the tender documentation. Any errors, omissions & discrepancies to be brought to the attention of the engineer immediately.
3. Where conflicting specifications between the drawings & bill of quantities occur, the drawing specifications will take preference over the specifications in the bill of quantities. The specifications on the drawings will also take preference over specifications in this document.
4. It is the contractor's responsibility to ensure that all material shall comply and all workmanship shall be executed in strict accordance with the details and specifications shown in the drawings, the latest revisions of SANS 10400, SANS 1200, the National Building Regulations (NBR) and the latest editions of the relevant SANS codes of practice and standard methods, irrespective whether the Engineer has inspected the works on site or not. Where a SABS code has been replaced by a SANS code it is deemed that the latest version of the relevant code is applicable.
5. The contractor shall check all project dimensions on site beforehand. All dimensions are also to be checked against the architect's drawings. Any discrepancies shall immediately be reported to the engineer immediately. No work shall commence nor any material ordered until the Engineer is notified accordingly.
6. All existing dimensions and levels are to be checked on site and correlated with the Engineer's and the Architect's drawings by the contractor. All bench mark levels to be correlated with each other for correctness. Any discrepancies or variations from the drawings shall be reported to the engineer immediately. No work shall commence nor any material ordered until the Engineer is notified accordingly.
7. No scaling of dimensions is permitted on these drawings. Only written dimensions which, unless noted otherwise (u.n.o.), are given in millimeters, may be deemed to be correct. If any dimension seems doubtful, the Engineer shall be consulted.
8. Where new construction tie into existing structures, the Contractor shall cross check and confirm all critical dimensions and levels related to existing structures, before any construction or manufacturing commences.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

9. An isolation joint must be provided between all new and existing structures, unless noted otherwise (u.n.o.) on drawings. Stability requirements of elements over joints must be met.
10. All waterproofing to be according to architect's details and specifications unless noted otherwise (u.n.o.) on drawings.
11. The most recent version of the SABS/SANS specifications mentioned in the notes, on the drawings and in the project specifications shall be available on site at all times.
12. All instructions from the engineer shall be written in the triplicate site instruction book provided by the Contractor.
13. Products different to those specified may be used but only with the engineer's prior written approval.
14. The contractor shall ensure that waterproofing materials are not damaged during backfilling operations and fixing of steel. Any repair work for the contractor's account.
15. The contractor is responsible to control storm water and dewatering on the site to prevent damage to the structure, banks, excavations, or any other works for the duration of the contract period.
16. These designs and/or drawings are subject to recall. Reproduction or copying rights are reserved solely by the ELIDZ. These drawings have been delivered and received on the following express conditions:
 - a) they are not to be used in any way which may be construed as being against the interests and/or benefits of the ELIDZ;
 - b) and all copies shall be returned to the ELIDZ upon request;
 - c) all information disclosed by these drawings shall be deemed to be confidential and treated as such.
17. The "Engineer" means the duly authorized personnel appointed by the ELIDZ to supervise and take charge of the contract.
18. This document is not a legal document and must therefore be construed in the language of the construction industry.

B. FOUNDATIONS AND EARTHWORKS

1. All earthworks shall be in accordance with the latest SANS 1200 D specifications.
2. All excavations must be inspected and approved by the Geotechnical Engineer or Engineer before placing of any concrete foundation, blinding, waterproofing or geofabric membrane.
3. All excavations sides to be either sloped or shored unless otherwise instructed by the Geotechnical Engineer or the Engineer.
4. Levels of bases as shown are preliminary and have to be confirmed by the Geotechnical Engineer or Engineer on site to obtain the specified bearing pressure. Where excavation levels have to be lowered, the top level of the base should be kept as shown and the blinding layer thickened. Size and reinforcing may be altered by the engineer if required.
5. No foundation shall be cast on either non-engineered fill or backfill material. Portions that are over-excavated beyond the depth required by the geotechnical engineer, to be filled with mass concrete (10MPa / 38mm) at contractor's expense.
6. A 50mm thick blinding layer of 15 MPa/19mm shall be cast under all reinforced foundations. No blinding layer needs to be cast for unreinforced brickwork and mass concrete foundations.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

7. All foundations are placed symmetrically below columns and brickwork unless otherwise shown.
8. Retaining wall and column foundations shall be cast directly against the vertical faces of the excavation, unless noted otherwise (u.n.o.) on drawings.
9. No backfilling behind retaining walls is to be done before concrete has reached its 28-day strength. Where applicable, backfilling shall be done simultaneously on both sides of walls to minimize the relative height difference in soil levels.
10. Manual compaction of soil is to take place within 500mm of walls.

C. BRICKWORK & BLOCKWORK:

1. All brickwork / blockwork shown on engineer's drawings are load bearing u.n.o.
2. All loadbearing, hollow block work to be filled with grade 15 MPa/19mm mass concrete.
3. All setting out of brickwork / blockwork to be done from architect's drawings.
4. Refer to the architect's drawings for general layout of brickwork or blockwork and control joints in brickwork or blockwork.
5. Masonry units shall comply with the following specifications:
 - SANS 227: burnt clay masonry units
 - SANS 285: calcium silicate masonry units
 - SANS 1215: concrete masonry blocks
6. Brickwork and blockwork shall be built according to SANS 10164 and SANS 10400.
7. All brickwork, blockwork, anchors, wall ties and straps shall be in accordance with the latest SANS 10400 and SANS 10164 specifications.
8. The minimum crushing strength of all loadbearing brickwork/blockwork shall be 14MPa u.n.o.
9. The minimum crushing strength of all non-loadbearing brickwork/blockwork shall be 7MPa u.n.o.
10. The minimum crushing strength of mortar shall be as for Class II mortar in accordance with SANS 10164 Table 1 unless noted (u.n.o.) otherwise on drawings.
11. The contractor shall confirm the type of load-bearing bricks planned to use and get approval from the Engineer in writing prior to ordering.
12. The use thereof and type of maxi type brickwork; including data sheets specifying the crushing strength, shall be submitted to the engineer for approval prior to any building work being carried out.
13. Brickforce:
 - 13.1. All brickforce shall be galvanized.
 - 13.2. Load bearing brickwork shall be reinforced with an approved brickforce every second layer and all non-loadbearing brickwork every fourth layer, u.n.o. on drawings.
 - 13.3. Load bearing blockwork shall be reinforced with an approved brickforce every layer and all non-loadbearing blockwork every second layer, u.n.o. on drawings.
 - 13.4. In addition, continuous brickforce is required in every layer for the first four layers above and below the top of foundations & slabs, as well as windows and over door openings, extending at least 1m beyond both sides of the opening. Minimum laps to be 300mm. Outside wire of brickforce to be continuous at corners.
14. All brick anchors, wall ties and straps shall be galvanized.

15. Where brickwork / blockwork and concrete join, V-joints are to be made through the total thickness of the plasterwork.
16. Non-load bearing brickwork / blockwork may not be built closer than 10mm from the soffits and sides of beams and slabs (unless otherwise shown) and only after all props have been removed. The joint shall be filled with "Jointex", or similar approved, and sealed on both sides with 2-part polysulphide. Any specific waterproofing requirements to architect's details.
17. Loadbearing brickwork over slabs is to be completed before the non-loadbearing brickwork under slabs.
18. Place 2 layers of 3-ply Malthoid between slab soffits and load bearing brickwork.
19. Refer to architect's drawings for positions of expansion joints in brickwork / blockwork.
20. Where joints are indicated in slabs and beams, corresponding joints shall also be constructed in brick/block walls.
21. All brick/blockwork shall be fixed to concrete & steel columns by means of hoop iron to line up with brickforce layer.
22. Provide 10mm Isolation joint around all concrete columns, steel columns and against brick and concrete walls. After concrete has set, Jointex to be raked out 10mm deep and sealed with an approved sealant (refer standard details).
23. In cavity walls, wall ties shall join the leaves uniformly spaced and shall be embedded in masonry joints at right angles to the leaves as the work progresses.
24. The number of wall ties per m² of walling shall be:
 - 75mm > Cavity: 3.7 ties/m²
 - 75mm < Cavity < 100mm: 4.5 ties/m²
 - 100mm < Cavity < 150mm: 5,0 ties/m²
25. Additional ties shall be provided at openings, discontinuities (e.g. control joints) spaced at intervals not exceeding 300mm vertically, or, where deemed necessary or as shown on the drawings such as at external angles.
26. Butterfly galvanized ties of 3,15mm diameter shall be used u.n.o.
27. For high-lift grouted walls, ties complying with the requirements of SANS 10164 Part 2 Annex A (14) shall be spaced at intervals not exceeding 900mm horizontally and not exceeding 300mm vertically, with each layer staggered by 450mm.
28. Ensure that each tie is embedded to a depth of at least 50mm in the mortar joint of each leaf.
29. For cavity widths not exceeding 75mm. Ensure that the wall ties used comply with the relevant requirements of SANS 28 subject to the provision that ties of the single wire type shall not be used.
30. For cavity widths exceeding 75mm but not exceeding 150mm. Ensure that wall ties used are of the vertical twist type (butterfly), or any similar type having at least the equivalent strength and stiffness.
31. Cavity openings shall be left open by omitting brick on the external side until all masonry work was completed. Cavities to be cleaned out properly prior to replacing the omitted brick and the slots to be kept un-grouted.
32. Clay bricks to be wetted before being used.
33. Concrete bricks and blocks to be kept dry before being used.

34. All chases shall be vertical and shall not be greater than 25mm deep by 40mm wide. A maximum of 750mm long horizontal chase will be accepted. No diagonal chases will be accepted.
35. For curved brick/block work construction, refer to the drawings for reinforcing details.
36. All clay brick for general building work below damp-proof course or under damp conditions or below ground level; plastered or un-plastered, shall be 14MPa NFX (Non-Facing Extra) bricks.

D. CONCRETE:

1. All concrete work shall be carried out strictly in accordance with SANS 1200 G (Structural).
2. All drawings to be read in conjunction with the relevant architectural, concrete drawings as well as the Bill of Quantities and any discrepancy to be brought to the attention of the engineer immediately.
3. No concrete shall be poured until the excavation, blinding formwork and/or reinforcement etc. has been inspected and approved in writing by the Engineer. Engineer to be given a minimum of 48-hours' notice of such an inspection.
4. All casting procedures, construction methods and positions of construction joints shall be submitted to the engineer prior to the commencement of the project.
5. Minimum concrete strength at 28 days shall be as listed below or as indicated on drawings or schedules.

Blinding	-	15 MPa / 19mm
Mass	-	10 MPa / 38 mm
Foundations	-	25 MPa / 26mm
Ground beams	-	30 MPa / 19mm
Columns	-	40 MPa / 19mm
Walls	-	30 MPa / 19mm
Cavity wall infill	-	20 MPa / 19mm
Beams	-	30 MPa / 19mm
Slabs (suspended)	-	30 MPa / 19mm
Surface beds	-	35 MPa / 19mm
External Hard stand	-	30 MPa / 38mm
Stairs	-	30 MPa / 19mm
6. Aggregate used for concrete shall comply with SANS 1083. Slag aggregate shall not be used unless approved in writing by the Engineer.
7. Curing of concrete shall be carried out strictly in accordance with SANS 1200 G clause 5.5.8. The Contractor to provide a method statement, to be approved by engineer, for the curing procedures of the various elements concerned but all surfaces to be kept continuously damp for at least 7 days after casting. Concrete slabs to be covered with moist sand or covered with plastic membrane during this period. Concrete columns to be wrapped in a plastic membrane during this period.
8. Stripping times of shuttering and propping shall be in accordance with SANS 1200 G clauses 5.2.5 and table 2 as reproduced in the table below. No loading shall commence or props removed before the concrete has reached 28-day strength.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

Type of structural member or formwork	Type of cement used								
	Portland cement (PC) and PC 15		Rapid-hardening PC* and rapid hardening PC 15				Portland blast-furnace cement		
	Weather								
	Hot or normal	Cool	Cold	Hot or normal	Cool	Cold	Hot or normal	Cool	Cold
a) Beam sides, walls, and unloaded columns	0.75	+	1.5	0.5	+	1	2	+	4
b) Slabs with props left underneath	4	+	7	2	+	4	6	+	10
c) Beam soffits with props left underneath, and ribs of a fibbed-floor construction	7	+	12	3	+	5	10	+	17
d) Slab props incl. cantilevers	10	+	17	5	+	9	10	+	17
e) Beam props incl. cantilevers	14	+	21	7	+	12	14	+	21
* Shorter periods may be used for sections of thickness 300mm or more + In cool weather stripping times shall be determined by interpolation between the periods specified for normal and cold weather									
Cold weather: Weather conditions in which the ambient temperature is 5°C or less. Cool weather: Weather conditions in which the ambient temperature is higher than 5°C but less than 15°C. Normal weather: Weather conditions in which the ambient temperature is higher than 15°C but not higher than 32°C. Hot weather: Weather conditions in which the ambient temperature is higher than 32°C.									

9. All suspended slabs and beams to be back-propped for two (2) completed levels below the propped level of the relevant beam or slab.
10. Propping underneath slabs and beams shall be completely removed before brickwork is built. All bricks required for brick walls on a specific slab panel should be stacked evenly onto that specific slab panel before walls are being built.
11. The contractor must co-ordinate all services drawings for details and positions of openings and sleeves required for stormwater, sewerage, drainage, electrical, mechanical and other services. Discrepancies to be brought to the attention of engineer and other relevant parties.
12. The contractor must co-ordinate concrete drawings with the architect's drawings, for details and positions of rain water pipes in concrete and other architectural cast-in items. Any discrepancy to be reported to the Engineer immediately.
13. The contractor must obtain permission from the engineer before any openings or services, which are not indicated on the drawings, may be introduced through any structural element or close to any column.
14. All pipes (conduiting, water piping, etc.) passing through expansion joints must be provided with an approved flexible joint.
15. All cast-in items to be hot-dipped galvanized, clean and free of oil, dirt or any other material which may impair the bond with concrete. Tolerance for placing according to SANS 1200 GB clause 6.2.

16. All stormwater down pipes cast into concrete to be minimum class 6 high pressure uPVC pipes.
17. The live loads for which the structures have been designed for are as follows:
- | | | | |
|-------------|------------------------|------|---------------------------------|
| Office area | live | 300 | kg/m ² |
| | brickwork | 2300 | kg/m ³ |
| | screed | 2.3 | kg/m ² /mm thickness |
| | special floor finishes | 3.0 | kg/m ² /mm thickness |
| Roof | live | 30 | kg/m ² |
| | services | 45 | kg/m ² |
| Balconies | live | 300 | kg/m ² |
| | screed | 2.3 | kg/m ² /mm thickness |
| | special floor finishes | 3.0 | kg/m ² /mm thickness |
18. Slagment is to be used in concrete mix only if approved in writing by the Engineer.
19. Concrete cube crushing tests per 50m³ (minimum of one set per day's casting) shall made as below and to SANS 5861 and tested by an approved, accredited laboratory:
- No off cubes shall be crushed at 7-day strength
 - No off cubes shall be crushed at 28-day strength
20. The type, size and fixing method of spacers used shall be discussed in advance with and approved in writing by the Engineer. Spacer blocks made of concrete shall have the strength of at least equal to the strength of the element cast.
21. Downstand and upstand beam dimensions are given as a x b where:
- a = total depth of beam including slab thickness
- b = width of beam
- 100mm kickers for columns and walls have been allowed for in the reinforcing lengths. They shall be cast with the same strength as the concrete elements below them and thoroughly compacted and cured.
22. All exposed concrete work to be off shutter finish u.n.o.
23. Concrete finishes are to be as per Engineer's drawings with 20x20mm chamfers to all visible edges u.n.o.
24. Concrete poured in excess of three meters high will not be accepted without prior written approval of the Engineer.
25. All grouts and epoxies to be used strictly in accordance with the manufacturer's specification.
26. Concrete tolerance to be degree of accuracy No. II as specified in SANS 1200G as reproduced in table below.

A. Reinforcement				
		Permissible deviation		
1	Spacing between two adjacent bars	± 25	± 20	± 15
2	Longitudinal location of bends and ends of bars	± 40	± 30	± 20
3	Cover to reinforcement (see (e) below)	-0+20	-0+20	-0+10
B.	Formwork: Formwork shall be so constructed as to ensure that the position of the finished work will be as specified, subject to the relevant: permissible deviation given in (c) or (d) below, as applicable.			

C.	Foundations: Mass and reinforced concrete			
1	Position on plan of any edge of surface measured from the nearest grid line or agreed centre line	± 50	± 35	± 20
2	Linear dimension on plan cast against excavation sides	± 60	± 40	± 20
3	Linear dimension on plan cast against formwork	± 30	± 20	± 10
4	Level of underside of concrete	-40+20	-30+15	-20+10
5	Surface level (i.e. top of foundation) (excluding floor slabs)	-30+15	-20+10	-10+5
D.	Elements or components above foundations (Administrative and Service Buildings)			
1	Position on plan of any edge or surface measured from the nearest grid line or agreed centre line	± 25	± 15	± 5
2	Linear (other than cross section) dimensions	± 30	± 20	± 10
3	Cross section dimensions	-10+20	-5+15	±5
4	Level (deviation from designed level with reference to the nearest transferred datum (TD) of the upper or lower surface, as may be specified, of any slab or other element or component)	-20+10	-15+5	-10+0
5	Verticality, per meter of height Subject to a maximum of	5 70	5 50	2 30
6	Out of squareness of a corner or an opening or an element such as a column (see 6.1.2 c) for short side of length i) Up to and including 0.5m ii) Over 0.5m, up to and including 2m iii) Over 2m up to and including 4m	±10 ±20 ±25	±5 ±15 ±20	±3 ±10 ±15
7	Exposed concrete surface: i) Flatness of plane surface ii) Abrupt changes in a continuous surface	10 10	5 5	3 2
8	Exposed concrete surface to be plastered: i) Flatness of plane surface ii) Abrupt changes in a continuous surface	15 10	10 5	* *
D1.	Elements and Components above foundations (factory floors)			
	FM3 Floor Finish			
E.	Cover to reinforcement			
	No deviation from the minimum cover of concrete over reinforcement specified in 5.1.3 (a) will be permitted.			
F.	Location of holding down bolts			
1	The centre line of a holding down bolt from its designated location in plan	*	+3	*
2	The top of the bolt from its designated elevation	*	-3+5	*
G.	Constituents in concrete mix (including water)			
	PD of quantities from approved or designated or prescribed mix, as applicable.	±5	±5	±5

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

Tolerances not stated and those for bow, camber, and twist, and for slipform concrete and precast concrete will be staged in the project specification where applicable.

27. FAIR FACED CONCRETE:

27.1 Designation

Fair-faced concrete will be indicated as such with the code FF-Sxx-Fx, where:

27.1.1 FF - Fair-faced finish

27.1.2 Sxx - Structure class, see below for further details

27.1.3 Fx - Color Class, see below for further details

27.2 Formwork requirements:

27.2.1 All formwork to have non-porous linings. Non-porous linings are deemed to be any of the following.

27.2.1.1 Film coated or sealed plywood

27.2.1.2 Coated boards

27.2.1.3 Steel linings

27.2.1.4 Plastic linings

27.2.2 Joints in the formwork are to be sealed and rendered smooth.

27.2.3 All formwork to be water tight to prevent grout loss.

27.2.4 The formation and arrangement of the formwork on all visible areas (e.g. direction of the formwork boards, joints joint sealing, tie positions, formwork openings and blockouts) are to be shown systematically. The drawings are to be submitted to the engineer and architect for comment and/or approval in good time.

27.2.5 All fair-faced formwork is to be provided to 300mm below ground level.

27.2.6 Ties on concrete surfaces remaining visible are to be arranged to a regular grid pattern. Their number is to be restricted by suitable design of the formwork where possible.

27.2.7 Tie holes are to be carefully plugged with fine concrete of a fitting color, cleanly inserted, or with deeply bonded plugs. The proposed type is to be agreed with the architect.

27.2.8 Ties in cornices and mouldings are not permitted, unless specified otherwise.

27.2.9 A form without longitudinal joints is to be used for cornices and mouldings.

27.2.10 Board formwork:

27.10.1 Prepared boards are to be at least 22mm thick.

27.10.2 Board joints are to be staggered.

27.10.3 Joints to be either (1) tongued and grooved, or (2) wedge-shaped rebated.

27.3 Panel formwork:

27.3.1 The joints of panel formwork must be adjusted in their grid pattern to the shape of the building and also cut to the slope where necessary.

27.3.2 Supplements through board strips or wedges are not permitted on visible surfaces.

27.3.3 Only stiff panels of the same type may be used as formwork panels.

27.3.4 Only thin panels of the same type may be used on stiff base formwork.

27.4 Release agents:

27.4.1 Only proven release agents that leave no spots on the concrete may be used.

27.4.2 All agents to be used strictly as specified by the relevant manufacturer.

27.4.3 Timber formwork is to be treated with release agent in such good time that it has penetrated into the timber when the reinforcement is fixed. Reinforcement and/or pre-stressing steel may not be soiled by the release agents.

27.4.4 New formwork not coated with plastic is to be treated with cement slurry before the first use and to be cleaned and sprayed / painted with release agent at least twice.

27.4.5 Concrete requirements:

27.4.5.1 Only self compacting concrete (SCC) is to be used.

27.4.5.2 Refer to the relevant drawings for the required minimum concrete strengths.

27.4.5.3 All concrete mixes are to be designed by a specialist ready-mix supplier.

27.4.5.4 Visible surface pores:

27.4.5.6.1 The total area of open pores on the concrete surface measured within a test area of at least 500mm x 500mm, may amount to a maximum of 0.3 % of this area; pores below 1mm in diameter are not to be taken into account.

27.4.5.6.2 The pores are to be determined on two test areas for each test.

27.4.5.6.3 The test areas are to be decided by the architect and/or the engineer.

27.4.5.6.4 At least one test is to be done for each representative pour.

27.4.5.5 Concrete structure to be Class S2 (u.n.o. on drawings), where

27.4.5.6.1 Concrete structure classes are:

Class S1

Smooth, plugged concrete surface

The joints between neighbouring formwork units must be tightly sealed, so that a maximum of 10mm wide nibs can occur on the surface of the otherwise smooth concrete, by means of the exit cement slurry and/or fine mortar.

Nibs caused by this are permitted.

Class S2

As Class S1, but joints are to be so tight between neighbouring units that practically no cement slurry and/or fine mortar can escape.

Nibs are not permitted.

Class S1A

As S1, but using a specific type of formwork according to the information in the specification.

Class S2A

As Class S2, but using a specific type of formwork according to the information in the specification.

Class S3

Structured or plastically designed concrete surface according to the type demanded.

The joints are to be so tight between neighbouring units that practically no cement slurry and/or fine mortar can escape.

Any other special concrete surface finishes to architect's details & specification. Special finishes will be referred to as **Class S4**.

- 27.4.5.6 Concrete colour uniformity to be Class F1 (u.n.o on drawings), where

27.4.5.6.1 The concrete colour classes are:

Class F1

Discolouration over an area caused by: rust; different types and previous improper treatment of the form lining; improper subsequent treatment of the concrete; aggregates from different sources; as well as lines of discolouration (reinforcement marks) are not permitted.

Further demands on the uniformity are not made.

Class F2

In addition to the requirements of F1, discolourations that are to be attributed to cement of different types or origin, or to different aggregates are not permitted.

Unavoidable differences in the colour when maintaining these conditions and with careful concrete placement are permitted.

Special colouring / pigment requirements to be specified by the architect.

Special requirements will be referred to as **Class F3**.

27.5 Samples:

- 27.5.1 Representative sample panels of each required finish is to be identified on existing buildings in the region, or
- 27.5.2 If no suitable sample exists a sample panel is to be constructed on site. The panel should preferably form part of a normal concrete panel, i.e. not originally deemed fair-faced.
- 27.5.3 The distance of observation is to be agreed by all parties concerned, and documented.
- 27.5.4 Suitable digital photographic evidence of the sample panel is to be kept on record by the contractor.

27.6 Defective concrete & remedial works:

- 27.6.1 Defective concrete to the engineer's immediate attention in writing.
- 27.6.2 No remedial work may be done without written consent from the engineer.

- 27.6.3 Visible honey combing will not be permitted.
- 27.6.4 All concrete forming part of the pour containing visible honeycombing will be demolished and rebuilt at the contractor's expense.
- 27.6.5 No protruding reinforcement will be permitted.
- 27.6.6 All blows are to be filled using durarep FC (by abe Construction chemicals or similar approved), if deemed necessary by the architect and/or engineer.
- 28. Construction joints:
 - 28.1. All horizontal and vertical construction joints shall be cleaned of all dirt and loose particles. All intersections of construction joints with concrete surfaces, which will be exposed to view, shall be made straight and level or plumb.
 - 28.2. The surface of concrete to be prepared shall be between 6h and 12h old after completion of placing and shall be "blown off" using a high-pressure water jet until all dirt and laitance is removed, and particles of clean coarse aggregate are exposed sufficiently to produce a rough keyed surface. (The success of this method of preparation is dependent on selection of the correct time and equipment to suit the cement type and atmospheric conditions).
 - 28.3. The prepared surfaces shall be saturated with fresh clean water for a period of 4 hours prior to the adjoining pour.
 - 28.4. Prior to the placement of concrete, the surface condition shall be saturated, yet surface dry – no ponding or standing of water.
- 29. Concrete surfaces
 - 29.1 When a wood-floated / Mechanical Pan float finish is specified, the surface shall first be treated as follows:
 - 29.1.1 Immediately after placing and compaction, the concrete shall be levelled with true straight edged equipment working between forms or other guides set accurately to line and level.
 - 29.1.2 No mortar shall be added to depressions and proud aggregate shall be tamped level.
 - 29.1.3 After the concrete has hardened sufficiently, it shall be floated to a uniform surface, free from trowel marks with a wooden float.
 - 29.1.4 Within 2hrs of final set, curing of the concrete shall commence.
 - 29.2 When a steel-floated finish is specified, the surface shall be treated as specified for a wood-floated finish above. In addition, the following is to be done:
 - 29.2.1 When the bleed water has disappeared and the concrete has hardened sufficiently to prevent the migration of laitance foam to the surface, the leveled surface shall be floated with a steel trowel.
 - 29.2.2 Firm uniform pressure shall be applied to provide a dense, smooth, uniform surface free from any irregularities.
 - 29.3 When a power-floated finish is specified, the surface shall be treated as specified for a wood-floated finish above, in addition the following is to be done:
 - 29.3.1 The leveled concrete surface shall be power-floated to provide a dense surface.
 - 29.3.2 After the bleed water has disappeared and the concrete has hardened sufficiently the float-blades shall be replaced with trowel-blades.
 - 29.3.3 The Surface will be power-trowelled with a single pass to provide a dense, smooth, uniform surface free from irregularities.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

29.4 When a power-trowelled finish is specified, the surface shall be treated as specified for power-floated finish above. In addition, the following is to be done:

29.4.1 After fitting the trowelled-blades the surface shall be continually burnished to provide a dense, smooth, high quality polished surface free from all irregularities.

E. SURFACE BEDS:

1. Provide 10mm isolation joints (IJ) around all concrete columns, steel columns and against brick and concrete walls. After concrete has set, Jointex to be raked out 10mm deep and sealed with approved joint sealant – refer to Standard Details.
2. Concrete class: Refer section D: Concrete to be 35/19 MPa to receive Micro Fibre at a rate of 600g – 900g/m³.
3. Finishes: FM3 Finish with a Mechanical power pan floated finish.
4. Damp proofing membrane to be installed under surface beds 250 Micron, u.n.o.
5. Saw-cut joints shall be done as soon as concrete is firm enough not to damage the edges, usually between 6 to 16 hours but not later than 24 hours. Joints to be repeated in finished surfaces in panels of 4m c/c.
6. Preparing and sealing of joint to be carried out by specialist.
7. Sealants: All sealants as per the drawings. The preparation, quantities used and application procedure to be in strict compliance with the manufacturers' recommendations and specifications.
8. Dowels: To be hot dip galvanized. Utmost care to be taken when dowels are placed, straight and true in position. Dowel ends at sliding end to be free of burrs.
9. Method statement for pouring of surface bed panels to be approved by the engineer.

F. REINFORCEMENT:

1. Reinforcement shall be manufactured and fixed to comply with the tolerances as specified in SANS 1200 G and/or the project specification.
2. Reinforcement tolerance to be degree of accuracy No. II as specified in SANS 1200 G (as reproduced in table in Section D: Concrete).
3. Bending of reinforcement shall be in accordance with SANS 282.
4. The contractor shall inspect and approve the fixed reinforcement with spacers and cover blocks, services and confirm that the shuttering is clean before the engineer is notified. All reinforcement shall be inspected and approved by the engineer before casting of concrete may commence. Engineer to be given a minimum of 48-hours' notice of such an inspection.
5. The Contractor is to maintain the reinforcing steel in position after placing and during concreting. If additional spacers and chairs are required, (other than those detailed) they are to be provided by the contractor at his expense.
6. Reinforcing must be thoroughly cleaned of all dirt, grease, bituminous material, scale and loose rust.
7. The lap lengths of reinforcing bars are to be as specified or a minimum of 40 bar diameters for mild steel and 50 bar diameters for high tensile deformed bars.
8. No heat treatment or cutting of steel without the written approval of the engineer shall be allowed.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

9. Bend-out bars at construction joints shall be bent out with a suitable pipe so that no kink is formed in the bar.
10. Minimum concrete cover to reinforcing to be allowed for to be as follows (u.n.o.):
- | | | |
|---------------------------------|---|------------------|
| Foundations | - | 75mm |
| Columns (internal office) | - | 30mm to stirrups |
| Columns (external warehouse) | - | 40mm to stirrups |
| Beams | - | 30mm to stirrups |
| Slabs (internal) | - | 30mm |
| Slabs and roof slabs (external) | - | 30mm |
| Retaining walls (against soil) | - | 40mm |
| Retaining walls (other faces) | - | 40mm |
| Raft foundations | - | 75mm |
11. The following grouts may be used for dowel bars (or similar products prior approved by the Engineer) u.n.o. Grouts to be used strictly in accordance with the manufacturers' specifications:
- | | | |
|-----------------------------|---|--------------------|
| Vertical dowels | - | |
| | - | |
| | - | |
| | - | |
| Horizontal dowels | - | Hilti HIT-HY 200 |
| | - | Fischer FIS V Plus |
| | - | |
| | - | |
| Vertical dowels upside down | - | |
| | - | |

G. STRUCTURAL STEELWORK:

- All structural steelwork shall be fabricated and erected in accordance with SANS 1200 H (Structural steelwork) and SANS 10162 (Structural use of Steel).
- Steel surfaces of all steel shall be prepared to a preparation grade P3 (very thorough preparation) according to SANS 8501-3:2008 irrelevant of the type of corrosion protection specified.
- All dimensions and levels shall be checked on site in order to confirm shop drawings. Any discrepancies shall be brought to the attention of the engineer.
- All structural steel drawings to be read in conjunction with the relevant architectural, concrete drawings as well as the Tender Documents and any discrepancy to be brought to the attention of the engineer.
- A complete set of shop drawings shall be submitted to the engineer for approval before fabrication commences. Shop drawings will only be checked for compliance with design intent. No dimensional checks, checks on cleats, bolts, welds and gussets will be done. Only sizes of structural members, connections and splices will be checked also with regard to design intent. Final dimensions and the correct fitting of members shall remain the responsibility of the contractor.
- Structural steelwork shall be completed by the manufacturer (i.e. cleaned and coated with the specified primer in the workshop or hot dip galvanized with/without a duplex) before transportation to site.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

7. All hot rolled, plates, sections and CHS (Circular Hollow Sections) structural steelwork shall be grade S355JR or grade 350WA. Cold-formed steel sections used for girts and purlins, shall have a minimum yield stress of 240 MPa. Tensile strength testing results must be provided for each batch of steel.
8. No steel of grade Q345 shall be accepted.
9. All pre-hot dip galvanized sheeting shall be minimum grade Z275 to SANS 4998:2007 Continuous hot dip zinc coated carbon steel sheet or structural quality.
10. A certificate from the steel manufacturer in which the grade of the structural steel is verified shall be handed to the engineer for approval prior to any manufacturing commences.
11. The contractor is responsible for stabilizing the structure and maintaining it in the correct position during erection. Where temporary bracing or propping is required, the contractor shall be responsible for the design, erection, maintenance and removal (where necessary) of such supports. If splices in trusses are required for transport restrictions, proposals of this shall be submitted to the engineer at an early stage for written approval.
12. The contractor shall, at the commencement of the project, acquaint himself with the availability and delivery time of the products and steel profiles specified on the drawings so that such material can be ordered ahead of time.
13. Welds:
 - 13.1 Welding shall be done in accordance and comply with regulations set out in AWS D1.1 American Welding Society: Structural Welding Code – Steel.
 - 13.2 The welding symbols used are in accordance with AWS D1.1 as reproduced in Table 6.32 & 6.33 of the Structural Steel Tables published by the SAISC (SA Institute of Steel Construction).
 - 13.3 Welds shall conform to SANS 10167 and AWS D1.1 specification.
 - 13.4 Where no weld sizes are shown, the minimum weld size (throat thickness) shall be that of the thickest plate of the connecting plates/elements or 6mm minimum. Unless otherwise shown the intention of connections are to transfer the full force that can be developed in connecting members through the connection.
 - 13.5 When using SMAW (Shielded metal arc welding), all electrodes shall be E7018. For any other welding process to be used, the contractor shall apply, in writing, for the approval from the engineer for the electrodes to be used.
 - 13.6 All butt welds shall develop the full strength of the elements joined.
 - 13.7 All splices shall develop the full strength of the elements joined.
 - 13.8 Welding shall only be performed by coded welders and certificates shall be supplied to the engineer.
 - 13.9 Suitably qualified and experienced welders using proper equipment in a good condition shall do all site welding.
 - 13.10 The contractor shall design all welds and, where necessary, gussets of sufficient strength shall be provided to obtain the required weld length to ensure the full strength of the connection.
 - 13.11 In joints with groove welds, the edges of the elements to be connected shall be cut (“prepared”) to allow for the weld to penetrate into the groove and the elements.

Table 3.3 of the AWS D1.1 as reproduced in Table 6.25 of the Structural Steel Tables published by the SAISC, provides prequalified edge preparations for SMAW welding.

14. Quality control on welding shall be ensured as follows:
 - 14.1 Quality control of welding will be done by qualified external consultants; u.n.o.; and the cost associated therewith shall be included in the tendered amount for the project.
 - 14.2 The following methods shall be used during quality control:
 - 12.2.1 Visual Inspection: All welds shall be inspected using visual aid and individual weld passes shall be inspected for signs of arc strikes, spatter, porosity, slag inclusion, undercut, crater cross section and any welding cracks. Bead size, shape and sequences will also be observed, as well as possible signs that may point to lack of base metal fusion and incomplete penetration.
 - 12.2.2 100% of all butt welds shall be tested using ultrasonic non-destructive tests. The requirement; under the approval of the engineer and recommendation from the consultant; may be reduced when confidence in the quality provided by the welder(s) has been developed.
 - 12.2.3 10% of all fillet welds shall be tested using magnetic particle non-destructive tests. The requirement; under the approval of the engineer and recommendation from the consultant; may be reduced to 5% of all fillet welds when confidence in the quality provided by the welder(s) has been developed.
 - 12.2.4 100% of all welds on crane or crawl beams shall be tested using ultrasonic non-destructive tests.
13. All structural bolts shall be hot-dipped-galvanized grade 8.8 u.n.o.
14. Where HSFG bolts are specified, the following shall apply:
 - 14.1 All contact surfaces at HSFG bolt splices shall be free from oil, grease, rust, scale, paint or any other impurities at the time of bolting.
 - 14.2 The tightening of high strength friction-grip bolts shall be done according to the turn-of-the-nut method as specified in clause 5.3.1(a) of SANS 10094

or

where HSFG bolts have been specified, the contractor shall use "coronet"-type load indicating washers in conjunction with such bolts.
15. Fabricator to ensure that centers of gravity of members intersect at node points, except where eccentricities are specified on engineer's drawings. Where slotted holes for bolts occur, the nut shall be hand tightened and a lock-nut be provided (u.n.o.).
16. Paint and hot dip galvanizing specifications to be adhered to as specified by Section H and K of this document.
17. Allow for all bolts to be hot dip galvanized and be painted 3 days in advance of needing them for erection. Refer to hot dip galvanizing and paint specification of bolts in Section H and K of this document.
18. Where applicable, cementitious non-shrink grout shall be provided under base plates before any primary loads are applied to the structure. Hot-dip galvanized, laminated finger shaped packing to be provided under base plates. The following grouts, u.n.o., may be used (or similar products approved by the Engineer). Grouts to be used strictly in accordance with the manufacturers' specifications.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

H. CORROSION PROTECTION: HOT DIP GALVANIZING:**General**

1. The hot dip galvanized coatings shall conform in every respect to the standards contained in the South African National Standards, SANS 121 (ISO 1461) Hot dip galvanizing coatings on fabricated iron and steel articles and SANS 32 (EN 10240) Internal and/or external protective coatings for steel tubes, Hot Dip Galvanizing specification for products other than continuously galvanized sheet and wire as well as the SANS1200HC or latest edition of the relevant specification.
2. All pre-hot dip galvanized sheeting shall be minimum grade Z275 to SANS 4998:2007 Continuous hot dip zinc coated carbon steel sheet or structural quality and all wire to SANS 675:2009: Specification for coated fencing wire.
3. The galvanizer shall be an accredited member of the Hot Dip Galvanizers Association Southern Africa (HDGASA) and shall issue a certificate of conformance to ISO 10474 or if registered as a South African Bureau of Standards (SABS) Mark Scheme Galvanizer, a SABS certificate of conformance. (A list of approved members is available on the Association web site, www.hdgasa.org.za).
4. All structural steel shall be minimum grade of S355JR (350WA) and shall be certified with a Silicon content between 0.15% and 0.23% and Phosphorus content <0.02%. The contractor to supply the certificate as proof of the above requirements prior to the manufacturing of any structures.
5. For this project all steelworks shall not be hot dip galvanized U.N.O. on drawings.
6. It is the contractor's responsibility to ensure that all steel to be hot dip galvanized shall be designed and fabricated in accordance with ISO 14713: 2011 Part 1: General principles of Hot dip Galvanizing and ISO 14713: 2011 Part 2: - Design for hot dip galvanizing.
7. The hot dip galvanizer shall provide a quality management plan detailing inspection procedures, which will include inspection of steel prior to galvanizing, inline inspection during surface preparation and galvanizing and final inspection prior to dispatch. Where fabrication defects are identified prior to galvanizing, e.g. burrs, poor welding or excessive weld spatter, such components shall be placed on hold and a non-conformance report submitted to the fabricator.
8. Double end dipping shall be permitted provided that it will not result in distortion of the product and an acceptable surface finish of the coating is achieved.
9. Bolts and nuts of gr 4.8 and gr 8.8 shall be hot dip galvanized to SANS 121 (ISO 1461) and high tensile fasteners from grade 10.9 and above, shall be hot dip galvanized in conformance to ISO 10684. The hot dip galvanizer shall issue a certificate of compliance with this requirement. All fasteners shall be supplied by a SABS approved manufacturer.
10. Zinc electroplated (electro-galvanizing) bolts and nuts are unacceptable.
11. All welds to be full length seal weld.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

12. Any coating repairs undertaken on the galvanizers premises or later on site, e.g. touch up of small-uncoated surfaces (black spots), shall be strictly limited both in dimension and quantity as stipulated in the relevant SANS 121 (ISO 1461) specification.
 - 12.1. Uncoated areas and defects shall be repaired according to the site repair instructions below of this. The repaired surface shall not be accepted or dispatched until the repaired surface coating has cured.
 - 12.2. Where coating defects exceed the specified permissible limit, which qualifies for touch-up repairs after galvanizing, affected items shall be rejected and re-galvanized or, if applicable, a repair method may be approved in writing by the engineer.
 - 12.3. Final inspection: Following satisfactory completion of the final inspection and provided prior arrangements have been made as per clause 1, the galvanizers' inspectorate shall issue a certificate stating that the applied coating conforms to the requirements of SANS 121 (ISO 1461) or SANS 32 (EN 10240) as applicable.
13. Quality surveillance:
 - 13.1. For the purpose of carrying out quality surveillance, the engineer or its QA / QC Consultant shall be granted access to any part of the galvanizer's premises relevant to the work being carried out, at any reasonable time. The galvanizer shall provide, at his own cost, any equipment or labour necessary to gain access to surfaces which are coated, to be coated or are in the process of being coated.
 - 13.2. The Engineer may remove any reasonable samples of materials to be used in the coating application. Rejection of the sample will place a hold on the use of material of the same batch number and may lead to rejection of all that batch of material and the reworking of any components that have already been coated with rejected material.
 - 13.3. The Engineer may carry out reasonable destructive tests to ascertain compliance with the specification. The contractor, to the satisfaction of The Engineer and at no additional cost, shall repair areas thus damaged.
 - 13.4. The cost of quality surveillance will be borne by the Engineer, except where surveillance results in rejection of the work or when notice by the contractor results in a fruitless trip, in which case the contractor shall carry the cost of surveillance.
14. Handling and storage:
 - 14.1. Handling: All coated components shall be handled using soft slings or specially positioned lifting points provided for such handling.
 - 14.2. Loading and off-loading: All hot dip galvanized and/or duplex coated components to be transported shall be loaded on suitable dunnage and lashed to avoid chafing and steel to steel contact. Plastic "Spaghetti strips" must be used to protect smaller items of steel and angles (5mm spaghetti plastic coil). Coated steel shall be secured on the truck preferably with nylon securing straps. Where chains must be used, suitable rubber insertion pads must be placed between the coated steel and chains at all contact points.
 - 14.3. Cover: Coated items shall be stored under cover where possible. Items not stored under cover shall be stored in such a manner as to avoid retention of water and allow good circulation. Items shall be stored on timber or on trestles fitted with timber to raise the product to at least 100mm off the ground.
 - 14.4. Stacking: Items shall be stacked using timber packaging or other approved means to avoid coating-to-coating contact. Sufficient bearing area of packing shall be used to avoid damage to coatings.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____

15. Site repairs/defects/uncoated areas:

- 15.1. Any coating repairs undertaken on the galvanizers premises or later on site, e.g. touch up of small-uncoated surfaces (black spots), shall be strictly limited both in dimension and quantity as stipulated in the relevant SANS 121 (ISO 1461) specification.
- 15.2. Any uncoated areas, modifications, transportation and erection damage, shall be repaired by abrading with 80 grit sand paper and painting with Zincfix, GalvPatch or equal and approved twin pack zinc rich epoxy paint, achieving an overlap of 5mm onto the surrounding sound zinc coating and to a minimum thickness of 100µm. When a duplex coating system has been specified the DFT of the repair coating shall be equal to that of the surrounding hot dip galvanized coating in terms of SANS 121 (ISO 1461). Steel shall not be accepted until the repaired surface has cured. Furthermore, in priority and as approved by the Engineer:
 - 15.2.1. Black steel utilized in modifications with hot dip galvanized steel shall be dispatched for hot dip galvanizing. Any areas that are to be subsequently welded should either be masked prior to hot dip galvanizing or suitably cleaned of zinc in order to prevent possible weld metal embrittlement or zinc residue inclusions, prior to welding on site.
 - 15.2.2. Alternatively, black steel utilized in modification with galvanized steel shall be abrasive blast cleaned to Standard SA 2½ to obtain a surface profile of 40 to 70 microns. Once the surface profile has been inspected and certified, apply zinc thermal sprayed coating to a minimum thickness of 120µm.
 - 15.2.3. Alternatively, black steel utilized in modifications with hot dip galvanized steel shall be abrasive blast cleaned to Standard SA 2½ per International Standard ISO 8501-1 – 1988 to obtain a surface profile of 40 to 70 microns. Once the surface preparation has been inspected and certified, apply one coat of Zincfix, GalvPatch or equal and approved twin pack zinc rich epoxy paint, achieving a overlap of 5mm onto existing sound hot dip galvanized coating where black steel is welded to hot dip galvanized components. Dry film thickness shall be 100µm. When a duplex coating system has been specified the DFT of the repair coating shall be equal to that of the surrounding hot dip galvanized coating.
- 15.3. Where site modifications by means of welding of a hot dip galvanized surface is required, all traces of the hot dip galvanized coating shall be ground-off prior to welding. Removal of the zinc coating from surfaces to be welded is necessary in order to prevent possible weld metal embrittlement or zinc residue inclusions. Repair to be done to all welds as per above instructions.

Tenderer _____ Witness 1 _____ Witness 2 _____ Employer _____ Witness 1 _____ Witness 2 _____