Revisions & Issues			
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ELEMENT Consulting Engineers

ELEMENT CONSULTING ENGINEERS (Pty) Ltd

A FIFTH DIMENSION IN ENGINEERING

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Project:

ACSA - CTIA

Client:

VALET OPERATORS' RELOCATION PROJECT

GENERAL NOTES & SPECIFICATIONS

	Name:	ECSA Reg Nº :	
Compiled:	M Duvenhage	980143	Oct 2018
Approved:	G Bezuidenhout	20110306	Oct 2018

DRAWING NUMBER

Status:	ELEMENT CE Project Number:	Drw. Nº:	Revision:
T	1702741	1702741-S-000	**A**

Drawing Status:	
D = Draft	C = Construction
P = Preliminary	A = As Built
T = Tender Purposes	

A. GENERAL ENGINEERING NOTES

1. These notes to be read in conjunction with the drawings and project specifications.
2. Engineering drawings and Structural construction notes are to be read in conjunction and reference to the relevant Architectural, Civil & Structural Engineers', Mechanical & Electrical Engineers' drawings as well as any specifications in the Bill of Quantities. Errors, omissions & discrepancies to be brought to the Engineer attention prior to commencement of work.
3. Information and specification contained on drawings takes preference over information in the Bill of Quantities.
4. All setting-out dimensions, levels and dimensions to be confirmed by the Contractor on site. Any discrepancies to be brought to the Engineer's attention. Under no conditions are dimensions to be scaled off the drawings.
5. Alternative products to those specified may only be used with Engineer's approval.
6. The Contractor is to provide a triplicate carbonated site instruction book and is responsible that Engineer's and Architect's instructions are clearly and unambiguously recorded.
7. In instances where any new work is in contact with or ties into existing services or structures, the Contractor is to gather all relevant dimensions and levels and convey to the Engineer and Project Team this information prior to making decisions and proceeding with the work.
8. Provide an isolation joint between all new and existing structures, unless indicated otherwise on drawings.
9. Refer to Architect's drawings for waterproofing details and specifications.
10. Damage to waterproofing materials, drains, pipes and services during backfilling, steel fixing and concreting are to the Contractor's account.
11. The health and safety procedures and regulations are to be implemented on the site and the Contractor is to ensure that these are maintained throughout the contract duration.
12. Dewatering of the site and prevention of damages to existing site environs, elements and equipment is to be strictly enforced at all times throughout the duration of the contract.
13. All work shall be executed in strict accordance with the latest SANS 10400, 2001, 1921, 10137, 10160 to 10164 or any other latest SANS (SABS) or (BS Codes for water retaining structures) or specifications which might be applicable for the construction of this project
14. Design, materials used and method of construction to be in accordance with SANS 10100, 10137 and 10160 to 10164. The Contractor is to ensure that copies of all the relevant SANS Specifications referred to on the drawings and in the project documentation shall be available for reference on site.

15. Latest SANS 2001 (previously SANS 1200) clauses, project specifications and relevant contract documentation to be applied throughout the project duration and any deviation from these to be conveyed to Engineer and Project Team prior to implementation.
16. It is the contractor's responsibility to ensure that he understands and complies with all relevant engineering drawings and specifications and is adequately experienced to undertake all aspects of the work safely.
17. All details and dimensions pertaining to any existing structures are to be confirmed on site by the contractor and the engineer is to be immediately informed of any unexpected aspects pertaining to them.
18. The contractor is at all times to be fully responsible for quality control on site ensuring strict compliance with all drawings, details and specifications issued for construction by the professional team.
19. Sealing compounds for the building & construction industry to be in accordance with the requirements of:
    a. SANS 11077 (2009) sealing compounds for the building and construction industry, two component, polyurethane-base
20. Sika-flex 11FC universal one component polyurethane joint sealant or equal and approved may be used on all wall joints and must be applied strictly to the manufacturer's specifications and the correct backing cord should be used where necessary.
21. All proprietary products to be used in strict accordance with manufacturer's guidelines and instructions. Contractor to seek approval from the engineer for any deviation from the prescribed proprietary products

B. FOUNDATIONS AND EARTHWORKS

1. Refer to SANS 2001-BE1 for earthworks specification.
2. Strip foundations and bases are designed for ground bearing capacity of 150 kPa.
3. Final excavation levels and exposed slopes to be inspected and approved by the Geotechnical Engineer or Engineer prior to the placing of blinding, waterproofing, concrete or geofabric membranes.
4. DCP test results to be done in excavated foundations and submitted to the Engineer for approval prior to placing the blinding layer.
5. All levels relating to foundations are preliminary and are subject to the Geotechnical Engineer's or the Engineer's recommendations to achieve the required bearing capacity referred to in item 2. If founding levels require lowering, the top of the foundations is to be maintained and the blinding (or mass concrete) layer thickened.
6. Due to prevailing ground conditions foundation sizes and reinforcing may require adjusting.

7. A minimum 50mm thick blinding layer, 15 MPa/19mm, to be cast under all reinforced bases and foundations. No blinding layer is required for un-reinforced brickwork footings or mass concrete foundations. Over-excavated foundations to be mass concrete filled (10MPa / 19mm) to the Contractor's cost.
8. All bases and foundations are placed centrally below columns and brickwork unless otherwise shown.
9. Retaining walls, footings and column foundations to be cast directly against the vertical excavated faces unless otherwise shown.
10. Backfilling behind retaining walls to Engineer's approval. Where applicable, backfilling shall be done simultaneously on both sides of walls.
11. All backfilling to surface beds and behind retaining walls to comply with SANS 2001-BE1. Imported approved cohensionless backfill, in layers not exceeding 150mm, to be compacted to between 93% and 98% MOD AASHTO density depending on the material used (Approved sand to 100% MOD AASHTO)
12. Foundation not to be cast on any either non-engineered fill or backfill material.
13. All foundations to have a minimum soil surcharge of 300mm.
14. The top level of all foundations to be at least 300mm below final outside ground level or finished floor level, whichever is the lower.
15. All rising foundation brickwork to have continuous brickforce every course and cavity to be filled to underside of stepped DPC with 13mm aggregate, 15MPa concrete taking care not to allow any honeycombing.
16. The contractor is responsible for ensuring the safety of all deep excavations and for erecting ready fence and or hoarding around the site to prevent entry after working hours and the general safety of the site at all times.
17. All Piles according to SABS 1200 F: Piling.

C. CONCRETE:

1. Refer to SANS 2001-CC1 for all concrete specifications and read in conjunction with project specifications where applicable.
2. Ordinary Portland Cement will be the main binder material used. If other binder material is used i.e. CEM II (A – S); CEM III (A) etc., the type of binder with full disclosure of all its constituents shall be submitted to the engineer prior to the commencement of the work.
3. Cement replacing materials such as GGBS (Ground Granulated Blast Furnace Slag); Corex Slag; Fly Ash; and Condensed Silica Fume; or other approved constituents may be used in maximum proportions of: GGBS (50%); Corex Slag; Fly Ash (30%) & CSF (15%). Please take

note that certain types of cement already contain portions of cement replacing materials and the totals must adhere to the percentages mentioned above.

4. The use of Corex Slag and GGBS is not preferred for any water retaining structures. 15% to 30% Fly ASH is recommended for all water retaining structures.
5. Sandstone aggregates will not be approved.
6. Engineer to approve all concrete mix designs prior to commencement of construction.
7. The water: binder (w:b) ratios to be within the limits below for a POLLUTED environment

Recommendations for concrete exposed to the atmosphere:

Specification for Concrete to be used	**Type of environment**			
	Non-Polluted	**Polluted**	**Corrosive**	**Highly Corrosive**
Minimum cement content kg/m³	As dictated by Strength requirements	340	380	420
Cement Type	Any cement complying with SANS 50197-1 70% CEM 1 + 30% FA 50% CEM1 + 50% GGBS			
Maximum w:b	As dictated by Strength requirements	0,55	0,50	0,45
Minimum cover to steel	25mm	30mm	40mm	50mm
Minimum strength	As per structural requirements			

Atmospheric exposure conditions:

Non-Polluted: This zone is characteristic of most non-industrialized rural and sparsely populated urban areas situated more than 20 kilometres from the coast.

Polluted: Polluted zones are those occurring in most urban areas where heavy vehicular traffic conditions and moderate industrial activity are responsible for the release of corrosive gases into the atmosphere. Rural areas within 20 Kilometres of the coastline are also included in this category as sea spray can be carried onto structures within this zone resulting in the deposition of potentially corrosive sea water salts on concrete surfaces.

Corrosive: Corrosive areas are those in the immediate proximity of heavily air-polluting activities such as fossil fuel burning electric power generating stations, refineries, electroplating works and other chemical plants where the concrete structures are exposed to the released gases.

Highly Corrosive: Such zones are those where acid rain occurs as result of the corrosive gases described above condensing onto structures or being washed onto them by the scrubbing action of naturally occurring rain. When these conditions are combined with the

presence of marine aerosols generated by wind and wave action, the corrosivity is even further enhanced.

8. The Contractor is to take six test cubes from each day's casting and from at least every 50m3 of concrete of each grade placed. Cubes are to be carefully marked and cured. An independent accredited lab is to crush three cubes at 7 days and three cubes at 28 days.

9. Minimum concrete strength at 28 days to be;

ELEMENT	CONCRETE STRENGTH / AGGREGATE SIZE	COVER (mm)
Blinding & Mass concrete	15 MPa/19mm	
Foundations & Bases	25MPa/19mm	50
Columns	25MPa/19mm	30 to links
Walls	25 MPa/19mm	30
Surface Bed Slabs	25MPa/19mm	30
Beams	25MPa/19mm	30 to stirrups
Slabs (suspended)	25MPa/19mm	25
Stairs	25MPa/19mm	25

Modulus of Elasticity for concrete to be 25 GPa

10. All formwork/falsework (props) must be in accordance with SANS 2001-CC1.

11. Recommended minimum stripping times are as follows:

Type of structural member or formwork	Type of cement used		
	Portland cement & Portland cement 15	Rapid-hardening Portland cement	Portland Blast-furnace cement
a) Beam sides, walls and unloaded columns	1	0.5	2
b) Slabs with props left underneath	4	2	6
c) De-propping	14	7	7
d) Post tensioned flat slabs	18MPa min. Strength	15MPa min. Strength	15MPa min. Strength
e) Beam soffits with props left underneath, and ribs of a ribbed floor construction	7	3	10
f) Slab props including beam props	10	5	10
g) Cantilevers	14	7	14

12. The contractor shall make provision for the continued support of beams and slabs while the formwork is being removed and / or for back propping of beams, slabs, etc. The propping may be required simultaneously on more than one level directly underneath one another. The requirements for continuous propping and / or back propping shall be calculated to a theoretical model that is acceptable to the engineer, and details shall be submitted for the engineer's approval. Data required for such calculations, e.g. Design loads and structural dimensions, will be supplied by the engineer on request.

13. The removal of formwork/falsework (props): Forms and shoring in the formwork shall remain in place until the concrete has reached at least the strength necessary to prevent plucking of the surface during removal of the formwork and to support its own mass and any loads that might be imposed on it. The Engineer must be consulted before removing any formwork. In the absence of any quantitating data, the periods before striking formwork shall be not less than those given in Table 2 of SANS 2001-CC1.
14. Propping and back propping shall be done/ remain in place until the concrete has reached adequate strength (28 Day strength) to sustain all dead and imposed loads; or until all work related to such elements is completed, or unless otherwise approved by the engineer.
15. On continuously reinforced concrete structures, the falsework and supporting formwork shall not be removed before the concrete of the last pour has reached the appropriate minimum age given in table 2 of SANS 2001-CC1 and the appropriate minimum strength (28 Day strength) all to the approval of the engineer. Where the structure is constructed in stages, the falsework and supporting formwork shall be removed as specified in the specification data.
16. On prestressed-concrete structure's, the falsework and supporting formwork shall be removed after the full prestressing force relating to the particular stage of construction has been applied, unless otherwise stated in the specification data.
17. All structural engineering drawings to be read in conjunction with the relevant Architectural and Specialist's drawings and discrepancy to be brought to the Engineer's attention.
18. Refer to Architect's drawings for positions of v-joints and drip joints in concrete.
19. Refer to Architect's drawings for positions of rain-water down-pipes and associated equipment, including waterproofing details.
20. All services drawings are to be carefully co-coordinated by the Contractor for details and positions of openings and sleeves required within the structural elements for sewerage, storm-water, drainage, electrical, mechanical and other services. Any clashes and discrepancies to be brought to the Engineer and other relevant parties' attention.
21. No openings, sleeves or recesses, which are not shown on the drawings, may be constructed through any structural member or close to any column, without the explicit approval of the Engineer.
22. Cast-in items to be hot-dipped galvanized, clean, free of oil, dirt or any other foreign material that may impair the bond with concrete. Placing tolerances to SANS 2001-CC1.
23. Beam dimensions shown on plans are:
    i. Down-stand beams; width of beam (a) x depth of beam (b) including slab depth.
    ii. Up-stand beams; width of beam (a) x depth of beam (b) including slab depth.
24. Refer to Architect's drawings for the extent of exposed concrete work to be off-shutter.
25. Trafficable ramps in parking areas to have a broom finish unless otherwise shown. All other areas to be mechanically power floated or screeds with steel trowel finish.
26. All specialist's grouts and epoxies to be in strict accordance to manufacturer's specification.

27. Casting procedures, positions of construction joints and methodology to be submitted to the engineer prior to the commencement of work.
28. Unless otherwise shown all columns are placed symmetrically on grid lines.
29. Propping below slabs and beams to be removed as per SANS 2001-CC1 prior to construction of the brickwork. Bricks to be stacked evenly onto slab panel prior to construction of the walls. Construction of walls may commence after concrete has reached its minimum designed 28 day strength and in consultation with the Engineer.
30. Exposed concrete finish walls, upstands and soffits:
    Concrete degree of accuracy 1 as per SANS 2001-CC1
    Finish Smooth: as per SANS 2001-CC1. Shutters to be smooth and clean and treated with an appropriate release agent. Vibration and compaction of the concrete during placement to be done in all areas to ensure a smooth even finish on all surfaces including up stands. All concrete is to be in cured accordance with SANS 2001-CC1 by method agreed with the engineer. Exposed upstands are to be cast in the same pour as the adjoining slab. Tops of concrete slabs are to be smoothed and levelled, or on roofs sloped to falls, and wood floated, to receive waterproofing or screed. After striking the formwork rub down seams and small irregularities with carborundum block avoid scratching the concrete surface during rubbing. Fill any minor honeycombing (<5mm) with SIKA MONO TOP 620 or MCC MULTIFEATHEREDGE 1050 or equal and approved. For honeycombing >5mm but <30mm with SIKA MONO TOP-612 or equal and approved, applied as per the manufacture's specification. Care is it to be taken when applying the repair mortar to not over coat the face of the concrete, the repair mortar is only to be applied to the area being repaired.
31. On vertical concrete element consisting of more than one lift, care is to be taken to seal the underside of the shutter to avoid grout leaking onto previously poured elements.
32. All timber used for shuttering (formwork) is to be either reused, post-consumer recycled, or Forest Stewardship Council (FSC) certified and supplied by merchants who hold valid FSC Chain of Custody (CoC) certificates at time of purchase. Status of FCS CoC certificate should be verified at info.fsc.org.
33. All structural use of concrete to be in accordance with the requirements of:
    i. SANS 10100-01 (2000): The structural use of Concrete part 1: design
    ii. SANS 10100-02 (2014): The structural use of Concrete part 2: materials and execution of work.
34. Curing and protection: After formwork has been removed (SANS 1200 G) and as soon as it is practicable in the opinion of the engineer, all concrete shall, subject to the provisions of 5.5.9.2 (SABS 1200 G) be protected from contamination and loss of moisture by one or more of the following methods:
35. <u>COLUMNS</u>: Wrap up in plastic sheeting immediately upon removal of formwork, alternatively spray with curing compound.

36. BEAMS: Spray with approved curing compound immediately upon removal of side shuttering, alternatively leave shuttering in place for 7 days

37. SLABS: After formwork has been removed (SANS 1200 G) all concrete shall, subject to the provisions of 5.5.9.2 of SANS 1200 G – (hot weather), be protected from loss of moisture by one or more of the following methods:
    (a) Ponding the exposed surface by means of water, (within mortar or concrete kerbs)
    (b) Continuously spraying the exposed surfaces with water; (impractical in windy conditions)
    (c) The use of an approved curing compound and in accordance with the manufacturer's instructions

38. Walls: Spray with approved curing compound; alternatively, leave the shutters in place for 7 days.

39. Holes, chases and fixing blocks: no holes or chases, other than those shown on the drawings or approved by the engineer, shall be cut or otherwise formed in the concrete. The manner of attaching fixtures to be embedded in the concrete shall be subject to approval by the engineer.

40. Permissible deviations appropriate to the degree of accuracy II (Commonly called "good work") is required for linear dimensions, position, verticality, level, squareness and bow (refer to SANS 1200)

41. All exposed corners for columns and walls to receive 25x25mm chamfers and all columns and walls in brickwork walls to have no chamfers.

42. Excess concrete such as, burrs, spillage, overcast, etc. Is to be rubbed down smooth and have a similar colour variation between the different concrete elements.

43. The live loads for which the structures have been designed for are as below:

TYPE OF ACTIVITY	EXAMPLE OF USE OR TYPE OF LOADING	UNIFORMLY DISTRIBUTED LOAD	
		Kg/m^2	kPa
Commercial and offices	Parking areas for light vehicles of ≤ 25kN gross vehicle weight	200	2.0
	Stairs	500	5.0
	Office area for general use	250	2.5
	Kitchen, communal bathrooms and toilets in office buildings	300	3.0

D. SURFACE BEDS:

1. The Contractor is to provide a detailed Method Statement outlining the construction of surface beds, size of pours, sequence of pours, position of construction joints, proposed saw-cut joints, curing, proposed achieving of finishes, etc. for approval by the Engineer.

2. All surface beds to have a minimum thickness 250micron DPC below them with adequate laps and turned up to the full depth of surface bed as bond breaker against all brickwork on all

sides. Top of surface bed level to be a minimum of 150mm above the final outside levels as per SANS 10400.

3. Unless otherwise stated, ensure that reinforced mesh is placed 30mm from top of surface bed.
4. Isolate all columns and walls from the surface bed using 10mm “Jointex” or equal and approved filled isolation or (expansion) joints (I.J.). Once the concrete is set rake out the top 10mm of “Jointex” or equal and approved and seal with approved polysulphide (e.g. SIKAFLEX-FC or equal and approved) joint sealant.
5. Once the concrete is firmly set, 4 to 48 hours after pouring, commence the saw-cut joints. Joints in finishes to be placed directly over all joints in the surface beds.
6. See standard details for specifications for saw-cut, isolation & construction joints.
7. All backfill to comply with SANS 2001-BE1 and to be compacted in layers not exceeding 150mm to between 93% and 98% MOD. AASHTO, depending on the material used (sand to be compacted to 100% MOD. AASHTO). The Contractor is responsible to provide the Engineer with compaction tests continuous basis as the work progresses, done with a Troxler, done by a SANAS accredited laboratory. The number of tests must be done at +- 1 per 20m² in large areas and +- 1 per 10m² in smaller areas.
8. All screeds are to be minimum 30mm thick and jointed into panels of maximum size of 4m x 4m. Joints should also be provided over joints in the slab/surface bed below. Joints in screed are to extend at least halfway through the thickness of the topping. The aspect ratio of the panel sizes should be no more than 1:1:2. Tile joints should coincide with the screed joints and sealed with an approved polyurethane sealant.
9. Finishes of surface beds according to the type of covering (tiles, vinyl, concrete, etc.) - see architect’s or engineer’s drawings.
10. Slabs to be cast in sections not exceeding 450m²/day to ensure the highest quality finish.

E. REINFORCEMENT:

1. Reinforcement shall be manufactured and fixed to comply with the tolerances as specified in SANS 2001-CC1 and/or the project specification.
2. Reinforcement to be cut and bent in accordance with SANS 10082.
3. Welded mesh fabric to comply with SANS 10240.
4. Refer to SANS 2001-CC1 as well as SANS 920 for all reinforcement manufacture and fixing.
5. Reinforcement is not to be cut or heat treated without the Engineers approval.
6. The Contractor is to ensure that “Pull Out Bars” have no kinks once straightened.
7. The contractor shall inspect and approve the fixed reinforcement before the engineer is notified for inspection. (The Engineer shall be given a minimum 24 hours – 1-day notification prior to his inspection) All reinforcement shall be inspected and approved by the engineer before

casting of concrete may commence. The concrete pours are to be scheduled to suit this requirement.

8. All reinforcing/stressing steel is to have a post-consumer recycled content of 90% or greater or be reused. Any additional structural steel is to have a post-consumer recycled content of 60% or greater or is to be reused.
9. It is the contractor's responsibility to ensure that all reinforcement and cover blocks are correctly and accurately fixed, the correct strength, and remain in place during pouring
10. The engineer will not be responsible for any concrete cast where he was not notified in time to carry out a rebar inspection visit.
11. The following grouts and epoxies are pre-approved. These must be used to all the manufacturer's specifications. Alternative products to be equal and approved.
12. i. For bars grouted vertically into concrete use;
    a. Hilti HIT-HY 200/RE500
    b. Sikadur 31
    c. ABE Epidermix 395
    d. Pro-struct 618/632

    ii. For bars grouted horizontally into concrete use;
    a. Hilti HIT-HY 200/RE500
    b. Sikadur 31
    c. ABE Epidermix 395
    d. Pro-struct 617

    iii. For bars grouted vertically up-side-down into concrete use;
    e. Sikadur 31
    f. Pro-struct 617
    g. Hilti HIT-RE500

F. <u>BRICKWORK & BLOCKWORK</u>:

1. All brickwork, blockwork, masonry units, mortars and workmanship shall comply with the following specifications:
    i. SANS 227: burnt clay masonry units
    ii. SANS 285: calcium silicate masonry units
    iii. SANS 1215: concrete masonry blocks
    iv. SANS 10164 and SANS 10400K and SANS2001-CM1: construction of brickwork & blockwork
    v. SANS 10400 and SANS 10164: specification for brickwork, blockwork, anchors, wall ties & straps
    vi. SANS 10164 Part I - 1980 Table 1: Class II mortar

vii. SANS 28: cavity less then 75mm, (no single wire ties to be used)

2. Loadbearing Brickwork: minimum crushing strength = 14 MPa
3. Loadbearing Blockwork: minimum crushing strength = 14 MPa unless otherwise shown.
4. All other brickwork & blockwork: minimum crushing strength = 7 MPa
5. All brickwork, blockwork and masonry walls shall comply with the following specifications:
   i. In all load bearing brickwork supply approved NHBRC continuous brickforce in every fourth layer
   ii. In all load bearing blockwork supply NHBRC approved continuous brickforce every second layer
   iii. In addition, supply continuous NHBRC approved brickforce in every layer for the first four layers above and below the top of foundations & slabs, as well as over and below all window and door openings
   iv. Minimum laps to be 300mm.
   v. In all foundation walls, supply continuous NHBRC approved brickforce in very layer up to the DPC layer.
6. All brickwork and blockwork wall ties, anchors and straps to be hot-dipped galvanized.
7. All brickwork shall be fixed to concrete & steel columns by means of galvanized 1,6 x 32mm x 600mm long hoop iron shot fixed at every fourth course of brickwork and blockwork every second course.
8. In cavity walls, wall ties to be embedded in masonry joints at right angles to the brick skins.
9. The number of wall ties per m^2 of walling shall be:
   i. 50mm > Cavity: 2,5 ties/m^2
   ii. 50mm < Cavity < 100mm: 3,0 ties/ m^2
   iii. 100mm < Cavity < 150mm: 5,0 ties/ m^2
10. At door / window openings and discontinued edges, provide additional wall ties that are spaced at 300mm vertically, or as instructed, or as shown on the drawings.
11. Use galvanized butterfly wall ties of 3,15mm diameter unless otherwise stated.
12. For high-lift grouted walls, ties complying with the requirements of SANS 10164 Part 2 Annex A (14) shall be spaced at horizontal intervals not exceeding 900mm and vertically at centres not exceeding 300mm, with each layer staggered by 450mm.
13. All ties to be embedded to a depth of at least 50mm into the mortar joint of each brick skin.
14. Use 25 x 2.5 vertical twist hoop iron wall ties in all cavities exceeding 55mm but less than 150mm.
15. At the interfaces of brickwork / blockwork and concrete elements the Contractor is to make deep V-joints right through the plaster thickness.
16. Refer to Engineer's drawings for load bearing brickwork and blockwork.
17. For general arrangement (G.A.) and setting out of all brickwork and blockwork refer to Architect's drawings.

18. Refer to Architect's drawings for positions of expansion joints in brickwork / blockwork.
19. All external non-load bearing brickwork / blockwork is to be clear of slab and beam soffits and sides, unless otherwise shown. Minimum 20mm "Jointex", or equal and approved material, to fill the joint. Joint to be sealed on both sides with 2-part polysulphide (inside & outside skin).
20. All waterproofing to Architect's details.
21. All internal non-load bearing brickwork / blockwork is to be clear of slab and beam soffits and sides, unless otherwise shown. Minimum 20mm "Jointex", or equal and approved material, to fill the joint and sealed in accordance with the architectural, fire and acoustic engineering specifications.
22. Tops of cavity walls to be left open to ventilate for as long as possible.
23. Wet all clay bricks prior use.
24. Concrete bricks and blocks to be kept dry prior to being used.
25. Walls on different types of footings and foundations to be separated using movement joints e.g. walls on piled foundations and on strip footings. Stability requirements over joints to be met in all cases.
26. For reinforcement or proprietary steel anchors grouted into brickwork use: Hilti HIT-HY 70 injection mortar (with perforated stainless-steel sleeve) or equal and approved.

G. STRUCTURAL STEELWORK:

1. All setting out dimensions, levels and detail dimensions are to be checked and confirmed by the Contractor and relevant Sub-Contractor prior to commencement of fabrication. This applies to both works undertaken in the workshop and on site.
2. Refer to SANS 2001-CS1 for Structural Steelwork Specification.
3. A full and comprehensive set of shop-drawings is be submitted to the Engineer for approval prior to commencement of the fabrication. These shop-drawings will be checked for compliance with the design intent only and not for layouts and dimensions. No dimensional checks, or checks on cleats, bolts, welds and gussets will be undertaken.
4. All structural steelwork shall be grade S355JR. Cold-formed open steel sections are to have a minimum yield stress of 240 MPa. The Contractor is to acquire tensile strength testing results for each batch of steel from which cold-formed sections are sourced.
5. All cold-formed channels to be hot dipped galvanized or use pre-galvanized sections.
6. The Contractor is to submit a certificate verifying the structural steel grade from the steel manufacturer.
7. All structural steel drawings are to be read in conjunction with ALL the relevant architectural, concrete drawings as well as the Bill of Quantities. Any discrepancy to be brought to the Engineer's attention immediately.

8. The contractor is responsible for the design, erection, maintenance and removal, if necessary, of all temporary bracing and/or propping. Where required due to transport constraints, the Contractor is to submit a proposal for the Engineers approval of the splicing of trusses and larger members.
9. The Contractor/Fabricator to ensure at all times that centres of gravity of members intersect at nodal points, unless the eccentricities are specified on engineer's drawings.
10. It is the responsibility of the Contractor/Fabricator/Supplier to ensure the availability and delivery of products and steel profiles specified and shown on the drawings well ahead of the construction programme to avoid delays.
11. Structural bolts shall be grade 8.8 hot-dipped-galvanized unless otherwise noted.
12. Where slotted holes for bolts occur, the nut shall be hand tightened and a lock-nut be provided unless noted otherwise.
13. Provide cementitious approved non-shrink grout under base plates prior to any loads being applied. Hot-dip galvanized laminated finger shaped packing to be provided under base plates.
14. Welding to conform to the SANS 10167 and 1044 specifications:
    a) Unless otherwise shown, the minimum weld size shall be that of the thickest plate of the connecting plates/elements, so that the connection transfers the full force that can be developed in connecting members.
    b) Electrodes shall be E7018 when using electric arc welding. The Contractor is to motivate and apply in writing for the approval of any alternative welding process that may be proposed.
    c) Full element strength must be achieved for all butt-welded elements.
    d) Full element strength must be achieved for all splices and spliced joints.
    e) Only Coded and suitably qualified Welders may undertake welding operations, both under workshop and on-site conditions.
    f) On-site equipment must be in good working condition at all times and strict safety procedures must be implemented and maintained.
    g) To ensure the full strength of the connection the contractor shall design all welds and gussets to achieve the required strength.
15. Quality control on welding shall be as follows:
    a. All welds shall be inspected using visual aids
    b. All butt welds: 100% ultrasonic NDT
    c. All fillet welds: 20% MPI
    d. Crane / crawl beams: 100% ultrasonic NT
16. The following applies where HSFG bolts are specified and used:
    a) All the contact surfaces at HSFG bolt splices shall be clean and free from oil, grease, rust, scale, paint or any other impurities at the time of bolting.
    b) 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. Where slotted holes are provided the nut shall be finger tightened and a lock-nut be provided unless otherwise indicated.
16. Steelwork Paint specification as follows;
    a) Carefully inspect each coat for misses and carry out dry film thickness (DFT) testing. No single DFT reading may be less than the minimum or greater than the maximum. The mean of the readings shall equal or exceed the nominal.
    b) All critical areas, edges, welds, etc. to be given extra stripe coats. All coats to be in contrasting shades.
    c) All work to comply with the project quality requirements and the general preamble.
17. Bolt Paint Specification: 3 days prior to the erection of the structural steelwork, all bolts are to be cleaned and degreased. Within 2 days of erection, all bolts are to be coated with 1 coat of Sigmadur Gloss or equal and approved.
18. Paint Specifications for the bolts: 3days before the erection of the structural steelwork, all bolts are to be cleaned and degreased. Within 2 days of erection, all bolts are to be coated with 1 coat of Interseal 670HS or equal and approved (Only applicable if bolts are not hot dip galvanised)
19. Refer to architectural drawings for final colour and specification of structural steelwork.
20. Specification for intumescent paint for internal structural steel:

    Coatings to be sprayed on in the steel fabricators' workshop. All painting to Chemrite Coatings Specification, colour G13 dark grey or equal and approved. The fire rated intumescent specification shall be 30 minutes as per BS476 Part 20/21.

    - Preparation Sandblast To Asa 2½
    - Prime Carboline Carbogaurd 880 (100µm) or equal and approved
    - Nullifire - S707 waterborne intumescent coating or equal and approved - thickness to achieve 30min fire rating.
    - Top Coat Carboline Carbothane 134 (40µm) or equal and approved

21. The products used shall be supplied and applied by an approved applicator, as well as certificates from a certified provided shall be provided to the fire engineer upon completion stating that the paint was applied to the supplier specification and the fire rating was achieved.

H. CORROSION PROTECTION OF STRUCTURAL STEELWORK

H1 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 to be:

   5.1. Hot dip galvanized only, as well as hot dip galvanized and painted (duplex) – refer to the architect's drawings for extent. For the steel which is Hot dip galvanized only, the steel shall be hot dip galvanized without passivation. Should the steel have been passivated, it must be comprehensively removed prior to painting by means of sweep blasting.
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 procedure, 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 not acceptable.
11. All welds to be full length seal weld.
12. Any coating repairs undertaken on the galvanizer's 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.

15. Site repairs/defects/uncoated areas:

15.1. Any coating repairs undertaken on the galvanizer’s 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.

H2 DUPLEX COATING (HOT DIP GALVANIZING PLUS PAINT)

This specification covers the painting of hot dip galvanized steel other than sheet and wire. The requirements for the painting of hot dip galvanized sheet are contained in ISO 12944 Parts 4 and 5.

1. For paint colour and specification refer to the Architect's specifications.

2. All hot dip galvanized steel to be painted shall be certified as conforming to the required hot dip galvanizing quality standard, prior to painting.

3. Painting shall take place as soon as possible (preferably within hours) after hot dip galvanizing, preferably at the galvanizing contractor's premises. If this is not feasible for practical reasons and only on written approval of the Engineer, painting on site is acceptable. However, all paint work shall be in accordance with no 4 below and section I: Corrosion Protection: Paint.

4. Code of Practice for Preparation and Painting Hot Dip Galvanized Steel:

4.1. Surface preparation shall be done by sweep blasting for this project. Chemical cleaning shall only be done on written approval of the Engineer and be for pre-galvanized sheeting. Preparation shall be conducted in accordance with HDGASA 01-1990 - Code of Practice for Surface Preparation and Application of Organic Coatings.

4.2. ***Warning*****:** Sweep blasting shall be undertaken strictly in accordance with the procedures as specified in the code of practice, with particular reference to the selection of the appropriate abrasive, blasting nozzle pressure and angle of deflection of the blasting media. Failure to do so will result in damage of the hot dip galvanized coating.

4.3. A hold or witness point should be established after sweep blasting has taken place before painting is commenced where the contractor to give the Engineer 48 hours' notice for inspection.

4.4. Painting procedures shall comply with the requirements contained in, HDGASA 02-1990 - Specification for the Performance Requirements of Coating Systems.

4.5. Quality control procedures in duplex coating

Quality control in duplex coating should be carried out at the following stages:

4.5.1. Before commencing work, to check removal of sharp edges, weld spatter, slivers and similar mechanical interference with the application of organic coatings.

4.5.2. After cleaning, when the surface must be tested to ensure that it is “water-break” free.

4.5.3. During and after each coat of paint to ensure that the paint is uniformly applied to the correct wet film or dry film thickness as appropriate, in accordance with the manufacturer’s recommendations.

4.5.4. Gloss, uniformity and absence of craters, fish eyes, blisters, runs, sags and other visible defects.

4.5.5. Total coating dry film thickness determined by an electromagnetic gauge calibrated on a similar hot dip galvanized but unpainted surface. Alternatively, the gauge may be calibrated on smooth polished steel plate, then the thickness of the hot dip galvanizing (without paint) can be measured. The mean of at least 10 hot dip galvanized thickness readings is then deducted from total layer thickness over steel to obtain the average thickness of paint.

I. TEMPORARY SUPPORT WORK

1. It is the contractor’s responsibility to ensure the adequacy of temporary support work at all times. This responsibility to include, inter alia, lateral bracing, warning signs and public protection measures.
2. Support work to remain in place until new support beams are in place and caulked and in the case of new cast in-situ concrete support, cured for a minimum of 14 days.

J. STRUCTURAL TIMBER

1. Gang nailed roof trusses to be designed by Mitek or equal and approved. Mitek is to inspect erection of the roof trusses, sign off that they are satisfied with the erection and provide A19 roof certificate.
2. All roof trusses are to be tied down by means of galvanised hoop-iron built in securely at least 6 brick courses below wall plate as per SANS 10400.
3. All South African pine timber specified is to be grade 5 unless specified otherwise.
4. Galvanised steel strap anchors shall be taken up over the top of the rafter or tie beam, bent down on either side and nailed down from both sides, or galvanised roof ties shall be made up of two strands of wire which shall be taken up on either side of the rafter beam, twisted

together so as to have no slack, but not so as to overstrain the wire, and the free ends then nailed down to prevent untwisting.

5. Any roof truss, rafter or beam shall be fixed to any wall by using one of the following types of anchors:
   5.1 Type A: two strands of 4mm galvanised steel wire;
   5.2 Type B: 30mm x 1.2mm galvanised steel strap;
   5.3 Type C: 30mm x 1.6mm galvanised steel strap.

K. POST-TENISONED SLABS

K1. General notes on drilling or core drilling into Post-Tensioned slab

1. Suspended slabs are post-tensioned slabs and consist of conventional top and bottom reinforcing combined with post-tensioned (PT) cables. PT cables are running in plastic/PvC sleeves in perpendicular directions and are positioned on a specific profile e.g. closer to the top surface over columns and closer to the bottom surface in mid-span of the slab.
2. Cable positions are marked on the soffit of the slab are indicative only.
3. Cable positions on drawings are indicative only.
4. Extreme care to be taken when drilling into slabs either from the top or the bottom especially when drilling deeper than 30mm.
5. No Hilti type shot guns to be used, only conventional drilling equipment.

K2. Drilling into Post-Tensioned slab

Any hole to be made in the slab, to be done as follows:

a) It is recommended to transfer the soffit cable markings to the top surface of the slab for any fixing needed on top of the slab.
b) Pre-mark the position of the needed hole from the soffit (or transferred markings on top of the slab) to be able to plan fixtures and try and avoid drilling into or near cables.
c) No drilling to be done within 50mm of a marked cable i.e. marked edge if a painted strip.
d) Pre-drilled with a 10mm dia drill in the position needed.
e) Drilling to stop immediately should any sign of plastic/PvC (i.e. the sleeve surrounding of a cable) be visible.
f) If a bigger hole than 10mmdia is needed, continue so once the 10mm dia hole was drilled to the correct depth and position.

K3. Core drilling into Post-Tensioned slab

Any core hole to be made in the slab, to be done as follows:

a) Pre-mark the position of the needed holes from the soffit to be able to plan fixtures and try and avoid drilling into or near cables.

b) Plan hole in such a way that no drilling to be done within 50mm of a marked cable i.e. marked edge if a painted strip.

c) Scan the slab with a HILTI 1000 scanner or approved similar to ensure no cables are in the position of the planned core drill.

d) If no scanning of the rebar is done or the scanning results are not clear, pre-drilled holes through the slab with a 10mm dia drill on the perimeter of the marked hole.

e) Drilling to stop immediately should any sign of plastic/PvC (i.e. the sleeve surrounding of a cable) be visible and repeat the procedure 100mm away.

f) Chip out or core drill the needed hole in the position as pre-drilled.