

**MOKOLO AND CROCODILE
WATER AUGMENTATION PROJECT
PHASE 2 (MCWAP-2)**

TENDER NO 054/2024/PMID/MCWAP2/RFB

**PART C3.1
SPECIFICATION**

SECTION 24

STRUCTURAL STEEL

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TABLE OF CONTENTS

	PAGE
SECTION 24	1
24.1 SCOPE	1
24.2 NORMATIVE REFERENCES	1
24.3 DEFINITIONS, ABBREVIATIONS AND REFERENCES	1
24.3.1 Definitions	1
24.3.2 Abbreviations	1
24.3.3 References	2
24.4 REQUIREMENTS	2
24.4.1 Materials	2
24.4.2 Drawings	3
24.4.3 Workmanship – General	4
24.4.4 Workmanship – Welding	4
24.4.5 Workmanship – Bolting	4
24.4.6 Workmanship – Erection	4
24.5 COMPLIANCE WITH THE REQUIREMENTS	4
24.5.1 Non-destructive Testing of Welds	4
24.6 SUNDRY STEELWORK ITEMS	5
24.6.1 Access Ladders, Handrails, Open Grid Covers and Cover Plates	5
24.7 MEASUREMENT AND PAYMENT	5
24.7.1 Basic Principles	5
24.7.2 Computation of Quantities	5
24.7.3 Scheduled Structural Steel Items	6

SECTION 24

STRUCTURAL STEEL

24.1 SCOPE

This Section deals with the structural steelwork for buildings and other structures in the Works as specified.

This Section deals with the use of structural steel to be used in the Works and gives amendments and additions to the South African National Standard SANS 2001, Part CS1: Structural Steelwork which shall form part of the Contract. Clause headings are followed by numeric characters which refer to the sub-clause of the Standard. Sub-clauses are numbered sequentially. The clause reference, to which a Sub-clause refers, either amends or adds to the Sub-clause in the Standard. Where the Sub-clause is an addition and there is no appropriate clause in the Standard to which it can be linked, no clause reference is given in the heading.

Should any requirement of this Section conflict with any requirement of the Standard, the requirement of this Section shall prevail.

24.2 NORMATIVE REFERENCES

The applicable national and international standards as listed under Clause 2, Normative References of SANS 2001-CS1 shall apply, with due cognisance of the provisions of Clause 1.14.1.

24.3 DEFINITIONS, ABBREVIATIONS AND REFERENCES

24.3.1 Definitions

24.3.1.1 Specification Data (Clause 3.1.11)

Reference to Project Specification, Specification Data and Works Specification mean references to this Section 24 - Structural Steel.

24.3.2 Abbreviations

ANSI	:	American National Standards Institute
ASTM	:	American Standard for Testing Material
AWS	:	American Welding Society
BS	:	British Standard
CQC	:	Construction Quality Control
EN	:	European Norm
MPa	:	Megapascal
MQC	:	Manufacturing Quality Control
PDF	:	Portable Document Format

SANS	:	South African National Standard
SANAS	:	South African National Accreditation System
UNS	:	Unified Numbering System

24.3.3 References

When reference is made to a Code of Practice, Specification or Standard, the reference shall be taken to mean the latest edition or replacement at time of tender of the Code, Specification or Standard; including addenda, supplements, modifications and revisions thereto. Where a previous version is intentionally used, it will be indicated as such. Where reference is made to a Code, Specification or Standard that has subsequently been withdrawn and not replaced, the intended content will remain relevant unless confirmed otherwise in writing by the Engineer.

24.4 REQUIREMENTS

24.4.1 Materials

24.4.1.1 Structural Steel (Clause 4.1.1)

(a) Hot-rolled Sections

The grade of steel used for the fabrication of structural steel work consisting of hot-rolled sections, shall be Grade 350WA and shall comply with EN 10025-2 as the governing standard. Grade 350WA shall be considered equivalent to Grade S355JR.

(b) Hollow Sections

Structural hollow sections shall comply with the requirements of SANS 657: Part 1 and have a minimum yield strength of 300 MPa.

(c) Cold-formed Sections

Open cold-formed sections shall be rolled from commercial grade steel and comply with the requirements of SANS 10162: Part 2. The minimum design yield strength shall be 225 MPa.

(d) 3CR12

Where specified, 3CR12 shall comply with the requirements of ASTM A240 (UNS S41003), EN 10088-2 (1.4003) and EN 10028-7 (1.4003).

(e) 304 and 316 Stainless Steel

Where specified, stainless steel 304 and 316 shall comply with the requirements of ASTM A240 (UNS S30400) and (UNS S31600) respectively.

24.4.1.2 Painting and Corrosion Protection

All steelwork surfaces that are to be painted or otherwise treated shall be prepared and treated in accordance with Section 37 – Painting and Corrosion Protection.

24.4.1.3 Structural Fasteners (Clause 4.1.5)

The classes and grades of the fasteners to be used shall be as shown in the Design Drawings.

24.4.1.4 Substitution of Steel Quality and Shape (Clause 4.1.6)

The steel quality or shape of components of the original design shall not be substituted.

24.4.2 Drawings**24.4.2.1 General (Clause 4.2.1)****(a) Fabrication Drawings (Sub-clause 4.2.1.1)**

The Contractor shall be responsible for the preparation of fabrication drawings (shop drawings). Immediately on receipt of the Design (Construction) Drawings the Contractor shall satisfy himself these Drawings contain all the information required for the preparation of the fabrication drawings and supporting calculations, together with any other necessary details.

The fabrication drawings and supporting calculations, if relevant, shall be submitted to the Engineer for his approval at least 28 days before commencement of fabrication.

(b) Format of Drawings (Sub-clause 4.2.1.3)

The format of the drawings shall be Adobe PDF.

24.4.2.2 Fabrication Drawings (Clause 4.2.4)**(a) Attachments to Facilitate Erection (Sub-clause 4.2.4.2 and 4.4.4.5)**

Attachments to facilitate erections may not remain part of the permanent structure.

(b) Hole Sizes (Sub-clause 4.2.4.4)

Hole sizes for holding-down bolts in excess of 36 mm diameter shall be as indicated on the Design Drawings.

(c) Connections to allow Movement (Sub-clause 4.2.4.7)

Connections that are designed to allow movement shall be fabricated as detailed on the Design Drawings.

(d) Machining (Sub-clause 4.2.4.8)

Requirements for machining will be indicated on the Design Drawings and shall also be clearly indicated on the Fabrication Drawings.

24.4.3 Workmanship – General**24.4.3.1 Identification (Clause 4.3.1)****(a) Material Grade Identification (Sub-clause 4.3.1.1)**

All steel elements shall be marked in such a way as to be traceable to a specific cast or heat of steel.

24.4.3.2 Cutting and Shaping (Clause 4.3.3)**(a) Cutting Operations (Sub-clause 4.3.3.1)**

Cut edges that will remain exposed shall be ground to achieve a smooth and straight surface.

24.4.4 Workmanship – Welding**24.4.4.1 Site Welding (Additional Clause)**

Site welding will not be permitted unless it is dictated by the design and indicated on the Design Drawings or approved by the Engineer.

24.4.5 Workmanship – Bolting**24.4.5.1 Ordinary Bolted Assemblies (Cause 4.5.1)****(a) Washers (Sub-clause 4.5.1.4)**

Washers under nuts and bolt heads on flat surfaces are required.

24.4.6 Workmanship – Erection**24.4.6.1 Alignment and levelling (clause 4.6.3)****(a) Temperature effects (sub-clause 4.6.3.2)**

The reference temperature shall be 27°C.

24.5 COMPLIANCE WITH THE REQUIREMENTS**24.5.1 Non-destructive Testing of Welds**

24.5.1.1 Ultrasonic and Radiographic Examination (Clause 5.3.4)

Should ultrasonic or radiographic examination be required it shall be specified / indicated on the Design Drawings.

24.5.1.2 Scope of Inspection (Clause 5.3.5)

Where non-destructive testing, other than visual inspection in accordance with the criteria of ANSI/AWS D1.1/D1.1m is required, it shall be indicated on the Design Drawings.

24.6 SUNDRY STEELWORK ITEMS**24.6.1 Access Ladders, Handrails, Open Grid Covers and Cover Plates**

Details of access ladders, handrails, open grid covers and cover plates are shown on the Drawings. The type of steel and corrosion protection shall be as indicated on the Drawings and in Section 37 – Painting and Corrosion Protection.

The Contractor shall confirm all dimensions on site before the commencement of fabrication of these items. The items shall be supplied complete with all necessary fixing bolts, nuts, etc.

24.7 MEASUREMENT AND PAYMENT**24.7.1 Basic Principles**

The rates tendered under this Section shall not include for the general obligations, Contractor's Equipment and work deemed to be covered by the items provided in Section 1 – General.

Work involving steel members and plate work will be measured by mass of steel. Sundry items will be measured by number, mass or area, depending on the nature of the item (see following paragraph).

Where there is considerable repetition of articles of the same description and mass (e.g. ladders, foundation bolts, frames, loose cleats, etc.) that are measured by mass, the number of such articles and the mass or length, as applicable, of each are stated in the Bill of Quantities.

24.7.2 Computation of Quantities

The mass of steelwork will be calculated on the basis of the nominal mass per unit length as stated in the South African Institute of Steel Construction's structural steel tables or, where not so stated, the mass will be calculated using a steel density of 7 850 kg/m³. The mass of fittings such as cleats, gussets, battens and stiffeners will be added to the mass of the members.

Tolerance for rolling margins and other permissible deviations will be ignored. No deductions will be made for holes for fasteners or for milling or planeing, and no additions will be made for rolling margin, waste, weld metal or shop fasteners.

Unless otherwise stated, gussets will be measured on the basis of the minimum enclosing rectangle. Each large, shaped element such as a roof, a bottom to a circular tank or a hopper bottom to a bunker or a silo, will be measured on the basis of the net size of the element.

24.7.3 Scheduled Structural Steel Items**24.001 Supply and fabrication of steel work****Unit: t or Sum****a) Supply and fabrication****Unit: t**

Separate items are scheduled for each structural position, regardless of member size and regardless of methods of jointing (welding or bolting).

The rate shall include preparation of fabrication drawings for approval by the Engineer, including calculations where applicable.

The rate shall cover the cost of supply, trial assembly (if required) and fabrication of the steelwork complete with all the necessary cleats, brackets, gussets, shop fasteners, packs, base plates, fasteners and the like, and loading ready for despatch to the site.

Unless separately scheduled under items 24.002 delivery shall also be included in the rates.

b) Extra over for non-destructive testing**Unit: t**

The rate shall cover the cost of carrying out all the testing as per the requirements specified on the drawings, by a suitably qualified welding inspector as per AWS D1.1 requirements, and of supplying the necessary test certificates to the Engineer.

c) Extra over for curvature of structural steel sections**Unit: m**

The extra over rate shall cover additional cost to supply fabricate and erect curved sections as indicated on the drawings.

24.002 Delivery to Site**a) Normal delivery (loads)****Unit: t**

Transportation (delivery) of steelwork to site is scheduled separately.

b) Abnormal loads**Unit: t**

Separate items are scheduled as extra-over normal delivery for transportation of members that are abnormal in shape, size or mass as to warrant special arrangements for their transportation in terms of the Road Traffic Ordinance.

c) Rates

The rates for normal delivery and abnormal loads shall cover the cost of transportation from the shop to the site of the Works, including handling on and off railway trucks, if required as part of the transit operation, and the cost of any demurrage incurred in connection with the movement of the steelwork from shop to site.

PART C3.1 - SPECIFICATION

24.003 Erection on Site**Unit: t or No.**

Erection of steelwork on site is scheduled separately.

Separate items are provided for expansion bolts and other anchorages for handrails and the like. The rate shall cover the cost of offloading the steelwork from vehicles on Site, stacking in a designated area, moving from such area to the point of erection, assembly, erection, aligning, provision of erection equipment, temporary supports, labour and safety measures.

24.004 Erection bolts**Unit: t or No.**

Unless otherwise indicated on the drawings, no separate items are scheduled for bolts and washers. The rate for bolts nuts and washers shall be included in the supply and delivery of the applicable items.

24.005 Site welding**Unit: m.**

The rate shall cover the cost of supplying of access, including scaffolding, preparation of the weld areas, welding, including the supply of consumables and equipment, and the cleaning up of the weld, including grinding, if necessary, and removal of weld spatter.

24.006 Holding-down (HD) bolts**Unit: t or No.**

No separate items will be scheduled for holding-down bolts. The rate for holding down bolts, washers, nuts and levelling nuts shall be included in the supply and delivery of the applicable item.

The rate shall cover the cost of supplying and delivering HD bolts complete with washers and nuts. And all threading, shaping, anchor plates and frames, as shown on Drawings, and stacking them on site ready for installation.

24.007 Handrails**a) Handrail assembly complete (Drawing number stated)****Unit: Sum****b) Handrail assembly complete (details given)****Unit: m**

i) Horizontal

Unit: m

ii) Sloping (measured on slope)

Unit: m

iii) Shaped ends

Unit: No.

c) Handrail (type stated)

i) Rails only

Unit: m

ii) Stanchions only

Unit: No.

iii) Bends, end closures and accessories

Unit: No.

iv) HD Bolts, nuts and washers for each stanchion

Unit: Sets

PART C3.1 - SPECIFICATION

The rates for (a) and (b) above shall cover the cost of supplying all materials and fixing bolts, assembling and fixing or grouting in as relevant.

The rates for (c) above shall cover the cost of supplying the rails, stanchions (with bases), bends, closures, accessories and HD bolts (or expansive bolts) complete with nuts and washers, as necessary, and assembling and installing the rails and stanchions complete with fixing or grouting in as relevant.

24.008

Ladders, complete and installed (Drawing number or type and length stated)

Unit: No. or t

The rate shall cover the cost of supplying and delivery to Site of all materials for each ladder, including lugs or other means of fixing to walls, floors, etc., as shown on the Drawing, and fabricating, installing and grouting in.

24.009

Flooring and frames, complete and installed (Drawing number stated)

Unit: Sum or m² or No.

a)

Open grid floors

Unit: m² or Sum

b)

Floor plate floors

Unit: m² or t

c)

Angle frames, trimmings and edging

Unit: m

The rate shall cover the cost of supplying the specified or scheduled type of flooring, frames, trimmings or edging as shown on the Drawings and the cost all fixings, installing, fixing (including welding, where applicable) and grouting in.

24.010

Manhole covers and lids, complete and installed (drawing number and size stated)

Unit: No.

The rate shall cover the cost of supplying the specified lid complete including frame and locking system as shown on the drawings, including casting or grouting in, welding and fixing where applicable

24.011

Corrosion protection

No separate payment shall be made for painting and corrosion protection. Payment for the requirements of this Section will be included in the payment item for the particular item supplied including painting or corrosion protection.

24.012

Cast in items (description and size stated)

Cast in items will be measured under concrete works.