

TRANSNET NATIONAL PORTS AUTHORITY

SPECIFICATION FOR REINFORCED CONCRETE AND STRUCTURAL STEEL STRUCTURES

TNPA-INFRA-ENG-SPEC-EEAM-Q-010

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1. SCOPE

- 1.1 This specification covers Transnet National Ports Authority's requirements for the design, fabrication and erection of reinforced concrete and structural steel static structures like conveyor structures and galleries.

2. GOVERNING CODES AND STANDARDS WITH ASSOCIATED INTERPRETATIONS

- 2.1 The following Specifications and Codes of Practices shall be read in conjunction with this Specification.

Standard or Code	Description
ANSI/AWS D1.1	Structural Welding Code - Steel
SANS1200	Standardised Specifications for Civil engineering Construction
SANS1200F	Piling
SANS 10160	General Procedures and Loadings (Design of Buildings)
SANS 10162	Structural Use of Steel
SANS 1200H	Structural Steelwork
SANS 1200HC	Corrosion Protection of Steelwork
SANS 1200HB	Cladding and Sheeting
SANS 10100	Structural Use of Concrete
SANS 1200G	Concrete (Structural)
SANS 1200D	Earthworks

- 2.2 The applicable wind loading pressure coefficients and free stream velocity pressure for the specific terrain category shall be used for the structural design. (Minimum design requirements will be Category 2). The nominal-imposed loading on roofs in accordance with clause 5.4.3.3 of SANS 10160 shall apply.
- 2.3 All possible combinations of wind, dead, superimposed loadings as well as temperature effects, are to be considered in order to arrive at the most unfavourable conditions of stress, deformation and stability for each component of the structure and its foundations. All designs shall be in accordance with SABS 0162 Part 1 or Part 3 and SANS 10100 Part 1 and 2.
- 2.4 Exposure conditions for the site are severe (Clause 2.4.1.3 of SANS1200G).



3. TOLERANCES AND QUALITY CONTROL

- 3.1 Clause 6.2.2 of SANS1200H shall apply to steelwork. The degree of accuracy required should be degree of accuracy II. The contractor shall check and comment on tolerances and coating finishes of the fabricated steelwork components when they arrive on site. Discrepancies shall be pointed out to the Engineer who will give a directive on repair or replacement procedures.
- 3.2 Shop quality control:
- The contractor shall advise the engineer as soon as the fabrication of steelwork is in hand so that he may inspect and examine the materials and workmanship during fabrication and before painting. In shop protective coatings shall be applied only to those parts of steelwork that have been approved by the Engineer.
- 3.3 Site quality control:
- Cladding of structures may only commence once the final alignment, levelling and grouting of bases have been completed. The limit of deflection for sheeting rails and purlins is span/300 in the plane of the sheeting. Fixing of sheeting shall not commence before this tolerance has been achieved. Care shall be taken so as not to over stress roofseal washers.
- 3.4 H.D bolts for steel structures shall be constructed in accordance with the tolerances specified in clause 6.2.3 of SANS1200G. The contractor shall be required to check and obtain the required alignment and levels of holding down bolts prior to commencing steelwork erection.
- 3.5 Clause 6 of SANS 1200G shall apply to all reinforced concrete works. Permissible deviations in terms of clause 6.2.3 of SANS shall be to degree of Accuracy II.
- 3.6 Permissible deviations for piling in terms of clause 6.2 of SANS 1200F shall be to degree of Accuracy II.

4. MATERIALS

- 4.1 Structural steel:
- All steel shall be new and of SANS 1431 Grade 300W quality (or equivalent). No special steels will be required.
- 4.2 Fasteners:
- All bolts, U-bolts, nuts, washers used for fastening of handrails, gratings, panels, staircases etc. shall be stainless steel.
- Grade 8.8 and 10.9 bolts and nuts used in high stress and friction grip joints shall be manufactured according to BS EN ISO 898 and galvanised to BS EN 12502
- 4.3 Holding down bolts:
- All holding down bolts shall be fabricated from grade 300W or 43A structural steel with ISO metric thread and nuts of course thread free fit series to BS ISO 68 and galvanised to BS EN 12502
- 4.4 Grouting:
- The contractor shall use commercial non-shrink pourable grout material where required. Samples shall be submitted to the Engineer for approval prior to application.
- 4.5 Sheeting and cladding:
- 4.5.1 Sheeting for roof, side cladding and accessories shall conform to specification SANS1200HB.
- Aluminium sheeting shall be prepainted aluminium, colour coated on the outside and on the inside and profiled from prepainted sheets. Colour to be advised by the Engineer.



Alternatively, Chromadek Hyplas galvanized and pre-painted sheeting may be used in areas where chemical corrosion is unlikely.

Use minimum thickness 0.8mm for side and 0.9 mm for roof cladding Profiles shall be subject to the Engineer's approval.

The profile, and fastenings must be suitable for the spans indicated on the Tenderer's drawings and for wind uplift forces corresponding to category 2 Class A of SANS 10160. The costs of testing must be included in the tender price. In areas with uplift forces higher than 1,6 kPa extra fasteners and/or an increase in sheet thickness may be resorted to.

The Tenderer must state the envisaged lap length, sealings and other items not covered above.

4.5.2 Translucent polycarbonate sheeting shall be provided in the areas indicated on the Tenderer's drawings. Polycarbonate sheeting shall have a light translucency of 85%. The profile shall match the sheeting profile. Sheeting and fixings must withstand the same wind uplift forces as the surrounding aluminium sheeting. If necessary, tests may be called for. Additional purlins are to be provided in order to reduce the span for polycarbonate sheeting. Samples of sheeting and fixings have to be provided for approval.

4.5.3 Flashings, corner trims, closure pieces, ridge cappings etc. shall consist of the same sheeting as above of minimum thickness 1.2mm and coloured to match the sheeting. These items have to withstand the highest negative wind pressures and must be suitably fixed. The type of fasteners and their spacing is subject to approval by the Engineer.

4.5.4 All sheeting fasteners shall be diameter 6.3mm grade 304 stainless steel self tapping screws with hexagonal washer heads. Saddle washer with sealer, capped by 19mm diameter flat bonded washers, shall be used at all purlin/sheeting rail fixings. Saddle washers need not be used under stitching bolts since flat bonded washers only will suffice.

4.5.5 Isolation strips shall be used between the sheeting and steel frames to prevent galvanic action.

4.6 Reinforced concrete structures:

Design for 30 MPa cube strength concrete in supporting structures. The strength of concrete in piles and foundations shall be at least 25 MPa. A minimum cover of 50mm over outer reinforcing is required for shuttered concrete and 60mm cover to all un-shuttered concrete. All materials to comply with SANS 10100 Part II.

5. STAIRS, LADDERS, PLATFORMS AND WALKWAYS

5.1 Platforms, stairways, walkways, hatches and ladders, shall be provided where necessary to give easy access to all parts of the equipment for inspection, maintenance and lubrication purposes. These shall comply with the requirements of B EN ISO 14122

5.2 The hand rails and ladders shall be complete with stanchions, knee rails back hoops, mounting brackets etc. and shall be manufactured in sections which are hot-dipped galvanized and painted and bolted onto the structure.

5.2.1 The handrail shall have a minimum diameter of 25mm and shall not be less than 1100mm above the platform level. Toe boards shall not be less than 150mm high.

5.3 Stairs shall be inclined no more than 45° to the horizontal and shall be broken at suitable intervals, not more than 3metres high, by platforms.

5.4 Stairs and walkways shall not be less than 700 mm wide and working areas around drives etc. shall be of sufficient size to allow for ease of maintenance.



- 5.5 Vertical ladders must be provided with back hoops.
- 5.6 Trap doors and hatches must be of light, but robust, construction, suitably hinged with stainless steel hinges and provided with a catch to keep them in the open position, if necessary. Trap door openings are to be protected by means of toe boards and removable handrails.
- 5.7 All external platforms, stair treads and walkways shall be hot dipped galvanised open grating construction, similar to Andrew Mentis "Rectagrid" type RS40 to allow for free drainage and avoid the accumulation of water and dust. Bearer bar thickness shall not be less than 4,5 mm. The top surface shall provide for adequate grip to avoid underfoot slipping.
- 5.8 Portnet's prior approval is required for all external platforms and walkways where open grating cannot be used. This will only be permitted where the primary purpose of the walkway/platform is for maintenance purposes. All such surfaces are to be provided with a non slip surface coating.
- 5.9 No obstructions or sudden changes in levels will be permitted on walkways.

6. CONSTRUCTION

6.1 Shop connections:

All shop connections shall be welded and as a precaution against corrosion, welds shall be continuous around the periphery of the contact surfaces.

6.2 Welding:

All welding, including qualification of welders and inspection and testing of welds shall be done in accordance with ANSI/AWS D1.1, Structural Welding Code - Steel. The equivalent BS or DIN specifications can also be used where applicable.

6.3 Erection:

6.3.1 Order of erection:

The Contractor shall provide the Engineer with his detailed erection procedure and sequence. The fabricated steelwork shall preferably be delivered in the sequence indicated on the erection diagram.

Where necessary during erection, specialist lifting devices, temporary support and bracing equipment shall be used in order to maintain stability without overstraining any component. Qualified riggers shall be in attendance to control the work at all times.

7. CORROSION PROTECTION

- 7.1 All steelwork shall be shop painted with the first and second coats after fabrication and prior to delivery to site.
- 7.2 The third coat shall be applied after erection on site. All exposed surfaces of galvanised fasteners shall be etch primed before application of the full paint specification.
- 7.3 All painting shall be in accordance with the requirements as set out in SANS1200HC, and the manufacturer's data sheets.
- 7.4 Corrosion protection systems as specified in Transnet specification EEAM-Q-008 shall be used.
- 7.5 To prevent damage during handling the following measures shall be taken: Use sack cloth or old tyres between material and slings when off-loading. Make use of slings, not chains. Do not drag material off the trucks and off-load lighter components by hand. Take care that components do not bump against each other while being handled.
- 7.6 The prepainted components call for ventilation space between surfaces when stacked. Use timber spacer blocks to achieve spaces and do not stack more than 2m high. Try to stack similar components together.



8. TESTING

- 8.1 Relevant clauses in SANS 1200H and 1200G shall apply.

The entire structure, including its cladding and RC foundation remains the responsibility of the Contractor until it is finally handed over to the Engineer at the end of the contract period. Any defects that may occur prior to or in the period between tacit approval during construction and the final day of handing over to the Engineer, shall be repaired, replaced or made good by the Contractor.

- 8.2 The Contractor and/or his designer of the steelwork shall ensure that no sub-contractor or any other persons shall cause damage to or impair the strength of the steelwork by drilling, welding, cutting or loading the steelwork in any manner not allowed for in the design.