



NATIONAL PETROCHEMICAL COMPANY
STANDARDS

CONSTRUCTION STANDARD FOR STEEL STRUCTURE'S

NPCS-CS-ST-02

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1 GENERAL

1.1 SCOPE

This standard covers the minimum requirements for the fabrication and erection of steel framing for buildings, steel structures supporting equipment, steel yard supports and miscellaneous structural steel, such as steel platforms, stairs, ladders, grating, walkways, stanchions, trolley beams, crane rails, railing, etc., but excluding steel piling and fence posts.

1.2 REGULATIONS

1.2.1 The work shall be done in accordance with the national and local laws and regulations.

1.2.2 For subjects not covered by regulations or specifications, the fabrication and erection shall be based on good engineering and working practice and shall be subject to approval by client.

1.3 CODES AND STANDARDS

The latest edition of the following codes and standards shall constitute minimum requirements of this standard, where applicable.

a) American Institute of Steel Construction (AISC)

- Manual of Steel Construction.
- Specification for Structural Steel Buildings.
- Code of Standard Practice for Steel Buildings and Bridges.
- Specification for Structural Joints Using ASTM A325 or A490 Bolts.

b) American National Standards Institute (ANSI)

A14.3 Safety Requirements for Fixed Ladders.

A64.1 Requirements for Fixed Industrial Stairs.

c) Other Construction Standards

NPCS-CS-TP-06, Construction Standard for Painting.

NPCS-CS-ST-03, Construction Standard for Fireproofing.

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2 CONSTRUCTION REQUIREMENTS

2.1 FLOORS

2.1.1 Utilization and selection of type of grating and/or raised pattern plate shall be in accordance with section 2.3.1.7 of this standard.

2.1.2 Grating

2.1.2.1 Fabrication of grating, safe working loads and allowable deflections shall be according to standard drawing: NPCS-SD-ST-37.

2.1.2.2 Grating shall be hot-dip galvanized in accordance with ASTM A53, unless specified otherwise on design drawing.

- a) The average weight of the zinc layer shall be 550 gr/m^2 of galvanized surface with a minimum of 500 gr/m^2 .
- b) If a galvanized coating is damaged, the area shall be thoroughly cleaned free of grease, oil and other foreign matter and shall be dry. It shall then either be blast cleaned to white metal or prepared to the same standard, using mechanically operated tools and following two coats of zinc-rich [minimum 92 wt%]. Epoxy paint shall be applied to give a total dry film thickness of at least 150 micron, considering that the zinc-rich paint shall be applied in accordance with section c following:
- c) When during construction maintenance, cutouts or repairs by flame have to be made or surface area have to be prepared, grating shall be removed to a remote safe area to avoid that molten zinc attack on stainless steel piping and/or equipment.

2.1.2.3 Grating parts will be provided with end bars.

2.1.2.4 Grating shall be spliced near cutouts, as indicated on design drawings and shall be provided with end bars.

2.1.2.5 Unsupported bearing bars will be trimmed by a steel band.

2.1.2.6 Toeplate will be welded to grating holes and cutouts.

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- 2.1.2.7 Toeplate will not be welded to grating, where handrailing is connected to platform beams.
- 2.1.2.8 Fixation
- Grating panels shall be clamped to structural steel with a minimum of 4 bolted clamps.
At large grating panels, minimum 4 panel clamps per square meter to be provided.
These fixing devices shall be hot-dip galvanized.
- 2.1.2.9 Minimum clearance for a pipe through grating shall be provided using the greatest of the following hole diameters:
- Diameter of hole is pipe diameter + insulation + 50mm
 - or
 - Diameter of hole is flange diameter + 25 mm
- 2.1.3 Plate
- 2.1.3.1 Raised Pattern Plate 6/8 mm Thick
- Following limitations shall be considered:
- Maximum clear span (L) : 1000 mm.
 - Maximum allowable deflection : L/200.
- 2.1.3.2 Raised pattern plates shall be attached by means of intermittent welds to support steel (except where otherwise noted on design drawings).
- One drainage hole ϕ 15 mm for every 2.0 m² of floor plate, shall be drilled after erection at low spots, with a minimum of one hole per panel.
- 2.1.3.3 Removable floor panels shall not be locked in position by piping conduits or other equipment.
Removable sections of flooring shall have a maximum weight of 70 kg.
- 2.1.3.4 Holes in flooring (due to e.g. pipes passing through the flooring) and around plant vessels or other gaps shall be bonded with shop welded toeplate.



Minimum clearance around a pipe through the flooring will be provided using the greatest of the following hole diameters:

- Diameter of hole is pipe diameter + insulation + 50mm
- or
- Diameter of hole is flange diameter + 25 mm.

2.2 STRUCTURES

2.2.1 Structures will be designed such that the surfaces of all parts will be accessible for inspection, cleaning and painting.

2.2.2 Pockets or depressions, which would hold water, shall have drainholes or be otherwise protected.

2.2.3 Sizes of Members

See Clause 3.1.

2.2.4 Minimum Thickness of Members

- For open steel structures, the minimum thickness is 6 mm.
- It does not apply to the webs of various rolled steel joists and channels.

2.2.5 Connections

Connections shall be constructed in accordance with details as per standard drawings:

- Platforms shall be normally bracketed from the vessels.
- Gusset plates shall not be thinner than the members to be connected and shall have a thickness of at least 8 mm.
- End plates for beams shall not be thinner than the flange thickness of that beam.
- Double angle members shall have fillers spaced not more than 600 mm on centers.
- Columns shall have full bearing at splices and at end plates.



- Provision shall be foreseen in the design already, which will make erection at high elevation more safe, e.g. clamps for temporary fastening of scaffolds.

2.2.6 Structural Members

- For trolley beams and crane tracks for underhung cranes, joints with inside tapered flanges are preferred. If only broad flange beams are available, the bottom flange shall be checked separately for distortion and reinforced, if required.
- The flange width of purlins supporting light weight concrete slabs shall not be less than 65 mm. For supporting roof sheeting and wall cladding, flange width shall not be less than 50 mm.
- Width of steel rolled sections, etc., which will be connected to other structural members, shall be at least 45 mm.
- The height of joints for platforms of all structures shall not be less than 120 mm. This does not apply to joints for platforms around columns.
- Purlins shall be fixed to the roof beams or trusses by means of angle steels. Fixing purlins by means of bent flats is not permitted.
- Steel gutters and down pipes shall be made from sheet 1.5 mm thick and hot-dip galvanized.

2.3 WALKWAYS, PLATFORMS, STAIR CASES, LADDERS AND HANDRAILING

2.3.1 Walkways and Platforms

- 2.3.1.1 The minimum width of linking and secondary platforms shall be 750 mm.
- 2.3.1.2 The minimum width of service platforms shall be 900 mm.
- 2.3.1.3 The minimum width of walkways over ground level pipe tracks shall be 600 mm.
- 2.3.1.4 The standard width of circular platform shall be 1050 mm.