



NATIONAL PETROCHEMICAL COMPANY
STANDARDS

CONSTRUCTION STANDARD
FOR
SHOP INSPECTION OF MECHANICAL EQUIPMENT

NPCS-CS-TP-02

REVISION : 0

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1 SCOPE

- 1.1 This standard covers the minimum requirements for shop inspection of mechanical equipment to be supplied to NPC.
- 1.2 The procedures outlined in this standard are complementary to any requirements, that may also be laid down in individual NPC standards referred to here in.
- 1.3 Waiver of any requirements specified here in requires, the written approval of NPC.
- 1.4 NPC Construction Standard for shop inspection (NPCS-CS-TP-01), shall be used for general procedure and mode of inspection.

2 STANDARDS AND CODES

Reference is made by all relevant standard, which is indicated in purchase order requisition and NPC Standard and the following standards:

- TEMA CODE

- ASME SEC V Non-Destructive Testing.
- ASME SEC VIII Pressure Vessel Design.
- ASME SEC IX Welding and Brazing Qualifications.
- API 660 Shell and Tube Heat Exchanger for General Refinery Service.
- API 661 Air-Cooled Heat Exchanger for General Refinery Service.
- API 510 Pressure Vessel Inspection Code.
- API 620 Design and Construction of Large, Welded Low Pressure Storage Tank.
- API 650 Welded Steel Tanks for Oil Storage.
- API 598 Valve Inspection and Test.
- API 2001 Fire Protection in Refineries.



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- 3 VESSELS, DRUMS, TOWERS AND REACTORS
- 3.1 GENERAL
- 3.1.1 The following requirements are additional to
NPCS-ES-PV-01, NPCS-ES-PV-02 and NPCS-ES-PV-03.
- 3.1.2 Pre - inspection meeting in accordance with
NPCS-CS-TP-01, shall be arranged unless otherwise
specified.
- 3.1.3 Mill inspection shall be carried out on alloy, clad
and clad service carbon steel materials.
- 3.2 SHELL
- 3.2.1 Carbon steel plates and heads, addition to section
4.2.2 of NPCS-CS-TP-01 check, material thickness (head
thickness, at knuckle radius and at center).
- 3.2.2 Clad Steel Plate
- a) Check chemical properties of clad material.
 - b) Cladding thickness; special attention at thickness
transitions, connection of cones, rounded-off edges
(is sufficient clad left?).
 - c) Clad bonding; weld preparation (check for removal
of stainless steel prior to carbon steel welding),
places where internals are attached to clad.
 - d) Check for cracks at severely formed locations, e.g.
knuckle radius of heads.
 - e) Clad surface finish requirements.
- 3.2.3 Dimensions
- Check:
- a) Straightness of vessel
 - b) Out of roundness: very important, when internals
are to be installed.



3.3 NOZZLES

Check:

- a) Elevation, orientation, tilt, outstand and straddleness of bolt holes.
- b) Type and size of nozzles.
- c) Flange rating and facing.
- d) Inside diameter of nozzle(s) in case internals are to be installed through nozzles.

3.4 REINFORCING PADS

Tell-Tale holes: check size, threading, greasing or plugging and location (each reinforcing pad shall be provided with minimal one tell-tale hole located at the lowest point).

3.5 STRUCTURAL, PIPE AND INSULATION CLIPS

- a) Check type of clips, elevation, orientation.
- b) Check bolt hole size and location.

3.6 INTERNAL SUPPORTS (FOR TRAYS, ETC.)

- a) Check orientation, elevation, tilt/level, type and size.
- b) Check welding will not interfere with proper seating of internals.
- c) Check out of roundness of vessel.

3.7 EQUIPMENT/SUPPORTS (SKIRT OR SADDLE)

- a) Check dimensions including, location of anchor bolt holes and hole size base alignment, straightness of skirt and vessel.
- b) Check correct location of fixed, sliding support and earthing lugs.

3.8 LIFTING LUGS

- a) Check type and dimensions, elevation and orientation.
- b) Check NDE required on welds.

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3.9

FABRICATION

- a) Check forming operation (especially alloy or nonferrous materials).
- b) Check welding; adherence to WPC, welder's qualifications, etc.
- c) Check heat treatment; adherence to procedures, extra attention for local heat treatment and alloy or nonferrous metals.

3.10

INSPECTION AND TESTING

- a) Check material certificates and verify heat numbers NDE and certification.
- b) Check production test plate test results and hardness measurements, if applicable.
- c) Check reinforcing pad air-soap test (soap to be applied both inside and outside).
- d) Check hydrotest.

3.11

MIXER VESSELS

Check for alignment of connecting flange to mixer element and bearing points to guarantee proper installation of mixer element.

3.12

PAINTING/COATING

- a) Check painting/coating as per purchase order.
- b) Check surface preparation.

3.13

ANCILLARY ITEMS

3.13.1

Bolts and Nuts

Check material and sizes. Bolts should not extend more than 1.5 thread beyond the nuts, proper greasing of threading.

3.13.2

Bushes, Nipples and Plugs

Check threading using gauges.

3.13.3

Gaskets

Type, quality and thickness.



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3.13.4 All required blind flanges and other attachments like pipe ends, etc.

3.13.5 Spare parts

Check number of bolts and nuts, gaskets, etc.

3.14 NAMEPLATES

a) Check nameplate stamping and arrange for nameplate rubbing or photograph.

b) Stamp nameplate with inspection engineer's stamp, when equipment is released for shipment (preferably partially on rivets or tap bolts).

c) Equipment shall be stamped with tag number close above the nameplate.

3.15 PREPARATION FOR SHIPMENT

For final inspection, the "Final Vessels Report" will be prepared.



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TRAYS AND INTERNALS

The following requirements are additional to NPC-MS-PV-03.

4.1

INSPECTION OF TRAYS AT MANUFACTURER'S PLANT'

When one or more types of trays are required, vendor will make a complete fit up of tray of each type.

Check the following:

- Type of material, thickness and dimensions as per drawing.
- Diameter of tray and riser, height of riser.
- Type of bubble caps or valves and clearance to tray deck.
- Weir height, dimension of downcomer, distance of bottom downcomer to tray deck.
- Type of bolts and nuts, bolt holes for alignment.
- Packing (listing).
- Weep holes (site and location).
- Fit up tray sections.
- Tray manways; assure that dimensions of individual pieces can pass through the prescribed opening.
- Quality of workmanship.
- Where severe forming of parts is involved, check for cracks at point of forming particularly on materials that are susceptible to work hardening.
- Rust preventatives (only to be applied to carbon steel for field installation or export).
- Cleanliness; trays for both field and shop are to be free of all oil and foreign matter.

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- Method of crating to guard against damage during transport and storage.

Note:

In the event a large number of trays of a single type is involved, then a fitup should be made about every 7-10 days of production run. The reason for this is to guard against dye and tool wear which could affect critical dimensions.

4.2

INSTALLATION OF TRAYS

Inspection engineer is to check the following:

- Before tray floors are set in position the supporting trusses and support rings should be free of all dirt and foreign matter.
- The major support beam must be placed correctly in location, the top of the beam should be flush with the tray support ring and check that the packing (if required) has been properly placed between the tray sections.
- All tray segments must be free of grease, oil or foreign matter before and after installation.
- After tray has been installed the manways are to be left open and following checks shall be made:
 - All bolts, nuts, clamps and wedges must be tight.
 - Packing must be properly installed.
 - Tray should have correct orientation.
 - Weirs and downcomers must be set to height and in relation to tray shown on drawing.
- Each tray and area between trays must be properly cleaned after each tray has been installed and inspected before accepting tray installation.