

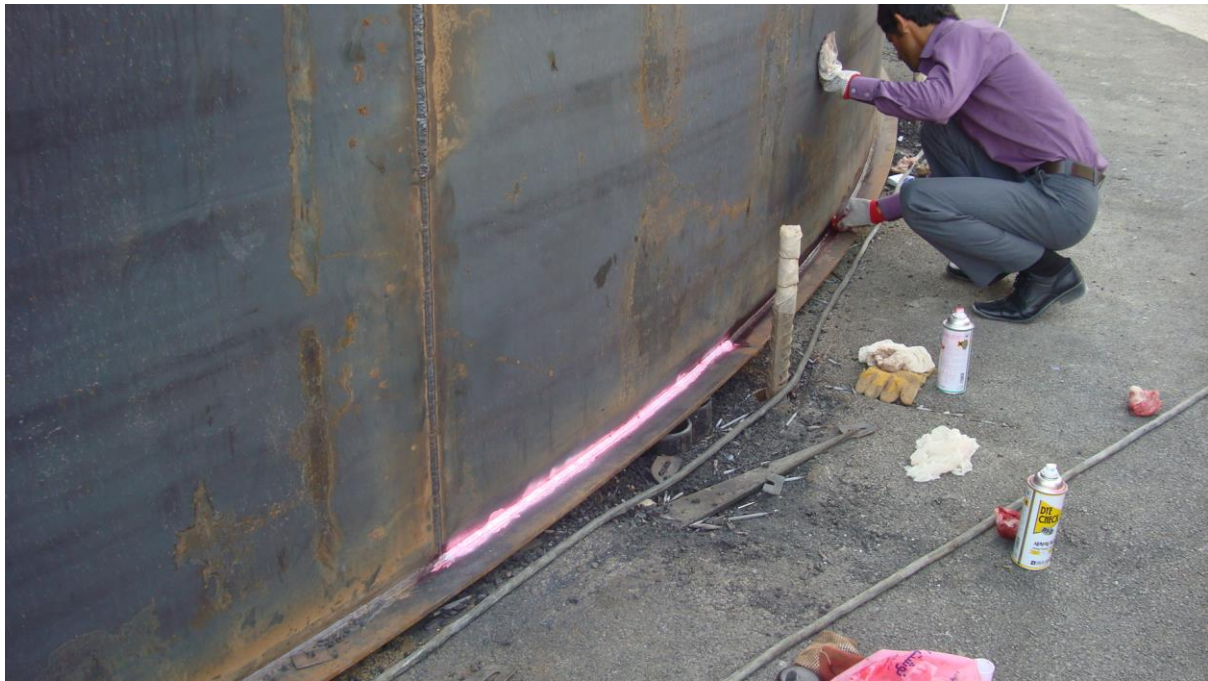
Nondestructive Testing (NDT)

NDT techniques can be complimentary, and in some cases, they may need to be combined to give the best result. The actual condition of the tank being inspected will also influence measurement accuracy, and this should be considered.

The API 650 for atmospheric above ground storage tank and API 620 for low pressure storage tank requirements normally are applied for inspection and test plan in manufacturing shop as well as site erection. The witness of some inspection and test by third party inspector is mandatory and cannot be waived.



Some others must only monitored and fully witnessing is not necessary, for these items, the inspection man-days etc. depends to the purchaser decision, some prefer stringent monitoring and even assign resident inspector in manufacturing shop and some others relay to quality control system of the manufacture and assign only few days for monitoring points.



These are some of inspection points which need to be witnessed, checked monitored and reviewed by third party inspector in pressure vessel manufacture shop.

Inspection and Test Plan for Storage Tank - Important Points

- Shell plates to be dimensionally checked (including diagonals for squareness) before rolling to curvature.
- All shell plates to be inspected and dimensionally checked after rolling to curvature.
- Checking material test certificates and ensuring that all shell plates are clearly stamped with the cast and plate number, so that they can be identified against the relevant test certificates.
- Checking material test certificates for roof and bottom plates.
- Selection of the spot radiographs, DP & MP test as per codes.
- Reviewing of radiographs.
- On completion of inspection of shell plates ensuring that vendor provide a chart giving all plate numbers, tier by tier.
- Inspection of fabrication of all fabricated fittings. This is to include checking of material test certificates also.
- Inspection of tank gauging equipment.
- For shop fabricated tanks, witnessing hydrostatic tests to applicable standards.
- Checking welding material electrodes.

-The Third Party Inspection for Storage Tank article provides a sample procedure for storage tank inspection and testing in shop and site. You may review storage tank inspection and test plan with this procedure.



This content guides about all necessary stages in the production of the storage Tanks from the examination of material, welding, fabrication, NDE, dimensional inspection to the final inspection, preservation and packing to despatch to site. This content is primarily for mill and prefabrication stages with site erection being covered in outline only.

You need to take this point in account this article is written for a typical storage Tank and might not be complete for special cases.

All storage Tank inspections and tests are carried out against the approved drawings, purchase order specifications, purchasers or company standards, and within the practices and rules of the country, state or province and any government decrees, laws, ordinance or regulation as may apply.

The applicable codes and specifications for the Storage Tank which is under construction process are:

- Design code
- Purchase order specification
- Purchaser's standards
- Approved drawings

And the applicable codes and standards are:

- API 650
- API 620

The applicable codes and standard may be based other international standards such as BS 2654 and etc. This content is general and can be useful if even the design code is different from API Code.

Required Documents for Third Party Inspector Review:

The list of documents normally is agreed in the Pre Inspection meeting which is hold several weeks before actual commencement of inspection work. The parties which are participated in this meeting are manufacture, purchaser and third party inspection agency representatives.

These are the list of documents which are normally agreed to be presented to the inspector:

- Storage Tank Purchase Order or Contract
- Storage Tank Manufacture Quality Control Plan
- Storage Tank Inspection and test plan
- Storage Tank Data Sheet
- Storage Tank Approved Drawings
- Storage Tank Material Test Reports
- Storage Tank Welding Specification Procedures (WPS) and Procedure Qualification Records(PQR)
- Storage Tank Welding Map
- Storage Tank Welders Qualifications Reports
- Storage Tank NDE procedures i.e RT, UT, MT, PT and PMI
- Storage Tank NDE Personnel qualifications Reports
- Storage Tank Heat treatment procedure
- Calibration Certificates for Test Equipment
- Storage Tank Hydrostatic Testing Procedure and Water Quality Document
- Storage Tank Preparation and Painting Procedure
- Storage Tank Preservation, Packing and Shipping Procedure
- Storage Tank Packing List

Storage Tank NDE procedures i.e RT, UT, MT, PT

Large chemical and petroleum product storage tanks can be found at chemical processing plants, refineries, and industrial locations. They are huge metal structures 150 feet in diameter and 50-60 feet tall and can easily hold more than two million gallons of gas or other hazardous liquids. Most tanks are made of steel plate that is welded together to form the structure. The material and the welds are inspected for manufacturing defects when constructed but must also be periodically inspected throughout their service life for signs of damage. The carbon steel is prone to attack by corrosion and in some circumstances cracks can form over time. NDT personnel use visual, X-ray, ultrasonic and other inspection methods to search for flaws and service-induced damage.

Inspections and thickness measurements of the tank walls can be made manually with the inspector in a man lift or hanging down from the top. However a much safer way to make an inspection is to use a crawling robot. These robots have magnetic wheels that allow them to cling to the tank walls. Using remote controls, an operator guides them into positions and makes the necessary measurements. They work great on the side walls, however, getting to a tank floor is a different story since it is not accessible from the outside. The floor is particularly prone to thinning due to corrosion attack and tank owners must find the weak spots in the floors before they breach the tank's integrity. This often involves the costly process of draining the contents, removing the layer of sludge from the bottom and cleaning the tanks so inspection personnel may enter it.

Third Party Inspection for Storage Tank Painting and Coating

Surface preparation for painting is checked for the following points, according to specification by third party inspector:

- Cleaning method (commercial blast cleaning, near-white metal blast cleaning, etc.)
- Surface Preparation Level
- Freedom from weld spatter, blow-holes and other defects
- Dry film thickness is checked according to specification

Surface condition need to be free from pin-holes, runs damage and other discontinuity



Third Party Inspection for Storage Tank- Reporting:

Third party inspector provides Inspection Visit Report (IVR) after each visit as well as a final report summarising the activities carried out during the storage tank production in accordance with the contract requirements and circulated within the time limits specified in the contract.

The report is in the format required by the client and clearly indicates final acceptance or rejection of the Storage Tank.

Third Party Inspection for Storage Tank Packing, Marking and Shipping:

The following points are checked by the third party inspector:

- Cleanliness and dryness of storage tank
- Rust prevention for all machined surfaces
- Protection for cover for all opening and protruding parts
- Spacing of plates
- Security from warping/transit damage
- Packing style and suitably for overseas transportation
- Shipping marks and other markings and notification of welding prohibited, etc.

Third Party Inspection for Storage Tank - Fabrication Shop Documents

The following final documents are reviewed and signed off by third party inspector to the contract or purchase order requirement.

These may apply to both shop and site operations.

Component detail drawings, Manufacturer's data reports, Material certificate or certified mill test reports, Material list or map, Welder record for each seam, Heat treatment records (Temperature-time record chart during PWHT), Dimensional record, NDE records, Hardness test record, Packing list, Spare parts and tool list.

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