HEAVY TANK FABRICATION: A COMPLETE GUIDE

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Large industrial tank projects fail when fabrication capabilities don't match engineering requirements. A 10,000-gallon pressure vessel operating at 150 psi demands expertise beyond standard fabrication, including material selection, welding procedures, testing protocols, and compliance documentation, all of which separate qualified heavy metal fabrication services from shops that lack specialized equipment.

This custom tank guide addresses critical specifications for heavy tank design and large industrial tank fabrication, focusing on engineering factors, material requirements, and ASME Code compliance that determine project success. We've fabricated custom tanks for aerospace, agriculture, food processing, and industrial manufacturing since 1976, delivering solutions where precision and regulatory compliance cannot be compromised.

DESIGN CONSIDERATIONS AND ENGINEERING FACTORS

Heavy tank design begins with operating parameters that dictate every subsequent decision:

- **Pressure and Temperature Requirements:**

1. **Internal Pressure.** Ratings determine shell thickness and head configurations (elliptical, torispherical, or hemispherical).
2. **Temperature Extremes.** Influence material selection and thermal expansion allowances.
3. **Vacuum Conditions.** Require structural reinforcement (stiffening rings) beyond standard pressure ratings.
4. **Pressure Cycling.** Frequency affects fatigue considerations in weld joints.

- **Capacity and Dimensional Constraints:**

1. Vessel capacity drives material quantities and fabrication complexity.
2. Site access limitations restrict maximum fabricated dimensions.
3. Transportation clearances determine whether field assembly becomes necessary.
4. Foundation load capacities influence design weight and support structures.

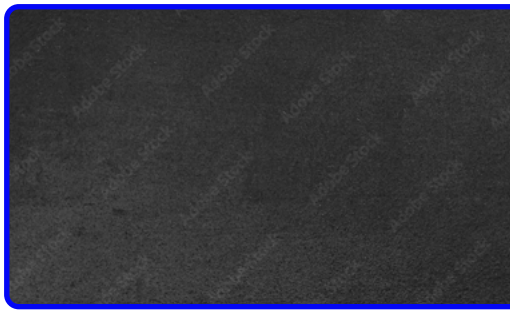
- **Process Media Characteristics:** Chemical compatibility governs material selection. Corrosive substances, abrasive slurries, and high-purity applications each demand specific alloy grades and surface finishes. Engineers must account for chemical concentration, operating pH, and contamination sensitivity when specifying tank internals.

- **Regulatory and Site Requirements:** Local jurisdictions enforce varying tank regulations. Some require third-party inspection, specific code compliance, or earthquake resistance calculations. Early identification of applicable requirements prevents costly redesigns during fabrication.

COMMON TANK MATERIALS AND THEIR USES

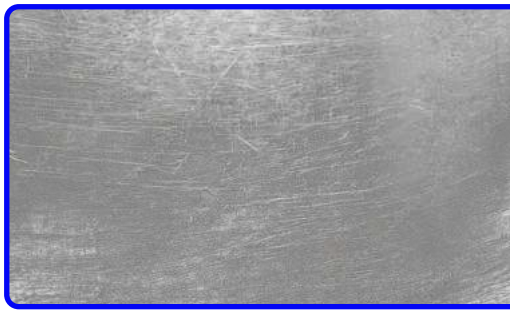
Material selection directly impacts tank performance, service life, and total project cost:

- **Carbon Steel.** Standard grades (A36, A516-70) are suitable for non-corrosive liquids and moderate temperatures. Carbon steel delivers cost-effectiveness for water storage, petroleum products, and neutral pH chemicals. Applications include process feed tanks, bulk storage, and thermal expansion vessels.



- **Stainless Steel.** Grades 304/304L and 316/316L provide corrosion resistance for food processing, pharmaceutical production, and chemical storage. Stainless steel maintains surface cleanliness, resists oxidation, and tolerates sanitization procedures. Higher initial costs are offset by extended service life and reduced maintenance.

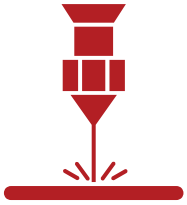
- **Aluminum.** Lightweight aluminum suits applications where weight reduction matters, such as mobile tanks, rooftop installations, and structures with limited load capacity. Aluminum resists atmospheric corrosion and works well for potable water and specific chemical storage.



FABRICATION TECHNIQUES AND EQUIPMENT

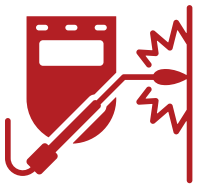
Heavy metal fabrication services demand specialized capabilities beyond standard metalworking, including

- **Cutting and Forming.** Precision cutting establishes dimensional accuracy from the project start. CNC plasma systems cut plate stock to exact specifications, minimizing material waste. Our facility operates press brakes capable of forming thick plates that smaller shops cannot handle.



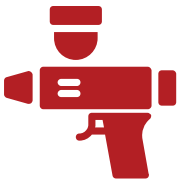
- **Welding Procedures.** Certified welders execute procedures qualified specifically for pressure vessel work. We maintain welder qualifications across multiple processes:

1. **SMAW (Shielded Metal Arc Welding):** For field repairs and installation.
2. **GMAW (Gas Metal Arc Welding):** For production efficiency on long runs.
3. **GTAW (Gas Tungsten Arc Welding):** For critical root passes and high-purity piping.
4. **SAW (Submerged Arc Welding):** For deep penetration on long seam welds in heavy plate



- **Assembly and Fit-Up.** Large diameter tanks require precise fit-up to maintain tolerances. Rolling equipment forms shell sections to specification, while positioning fixtures hold components during tack welding. Dimensional verification occurs at multiple assembly stages.

- **Surface Preparation and Coating.** Sandblasting removes mill scale and contaminants before coating application. Painting systems protect exterior surfaces from atmospheric corrosion. Interior linings address specific chemical compatibility requirements when the base material alone provides insufficient resistance.



COMPLIANCE AND ASME CODE OVERVIEW

ASME Code compliance ensures structural integrity and legal operation. The breakdown of these codes is as follows:

- **Section VIII, Division 1:** This section covers pressure vessels operating above 15 psi. It defines design formulas, material specifications, fabrication requirements, examination procedures, and testing protocols. Our ASME authorization allows us to stamp vessels certifying code compliance.
- **Code Requirements:**
    1. Material certifications verifying chemistry and mechanical properties
    2. Design calculations demonstrating adequate strength under maximum pressure
    3. Welding procedures are qualified through destructive testing
    4. Nondestructive examination for detecting weld defects
    5. Hydrostatic testing proves leak-tight construction
    6. Data reports documenting compliance for regulatory review
- **Authorization and Oversight:** The ASME Certificate of Authorization demonstrates fabricator qualifications. Authorized Inspectors (AI) review designs, monitor fabrication, witness testing, and approve data reports. This third-party oversight protects end users and ensures consistent quality.

INSPECTION, TESTING, AND QUALITY CONTROL

Rigorous inspection prevents failures that compromise safety and production. This process includes:

- **Nondestructive Examination (NDE):**
  1. **Radiographic Testing (RT):** Reveals internal weld defects using X-ray or Gamma-ray.
  2. **Dye Penetrant Inspection (PT):** Detects surface cracks and porosity.
  3. **Magnetic Particle Testing (MT):** Finds subsurface discontinuities in ferromagnetic materials.
  4. **Ultrasonic Examination (UT):** Measures material thickness and flaw depth.

- **Hydrostatic Testing:** Vessels undergo pressure testing at 1.3 to 1.5 times maximum allowable working pressure. Test duration typically runs for 4 hours minimum while inspectors examine all seams and connections for leaks.

- **Quality Documentation:**
  1. Material test reports (MTRs).
  2. Welding procedure specifications (WPS) and welder qualifications (WPQ).
  3. Nondestructive testing reports with radiographic films.
  4. Hydrostatic test charts record pressure and duration.
  5. ASME U-1 manufacturer's data reports.

DELIVERY, INSTALLATION, AND SUPPORT

Fabrication quality means nothing if tanks arrive damaged or are installed incorrectly. Consider the following key steps:

- **Transportation Planning.** Large tanks require specialized hauling equipment. Oversized loads need permits, route surveys, and escort vehicles. We coordinate logistics to minimize delivery complications and prevent site access issues.
- **Installation & Startup.** Foundation preparation must be completed before tank arrival. Field welding of nozzles or supports follows the same quality standards as shop fabrication. We provide technical guidance during commissioning to address operational questions, ensuring initial filling procedures prevent thermal shock or pressure surges.

GET IT BUILT RIGHT THE FIRST TIME

Heavy tank fabrication separates qualified specialists from general metal shops. Material expertise, welding capabilities, ASME authorization, and testing facilities determine whether your tank performs reliably for decades or fails prematurely.

At N.J. McCutchen, Inc., we've delivered custom metal fabrication solutions since 1976, building tanks that meet exact specifications for aerospace, agriculture, food processing, and industrial manufacturing clients. Our facility handles complex ASME Code work and advanced welding procedures, capabilities that mid-sized companies need but that smaller shops cannot provide.

Ready to start your project? Contact us to discuss your heavy tank requirements and review our fabrication capabilities.

ABOUT US

Founded in 1976, N.J. McCutchen, Inc. has been serving customers in a variety of industries for nearly 50 years. Located in Stockton, California, in the heart of the Central Valley, our 50,000-plus sq. ft. facility is within easy reach of I-5, I-205 and state highway 99 as well as the port of Stockton. With our machine shop, fabrication, painting and sandblasting facilities, we offer one-stop solutions for your project.

From our beginning, we have always pursued providing the highest-quality products and services. We started in 1976 as a metal fabrication and machine shop. Since that time we have expanded to our present capacity as a full-service custom fabrication facility. We have completed projects for our clients in a variety of industries, including manufacturing, power generation, industrial machinery, paper manufacturing, aerospace, food processing, and many others. Our in-house capabilities include painting, sandblasting, metal fabrication, and machining. Large or small, we have the capability and know-how to get your project completed.

REQUEST A QUOTE

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