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NASA-13215 (May 2005)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA

Superseding NASA-13215 (March 2005)

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13215

FIBERGLASS-REINFORCED POLYESTER STORAGE TANK

05/05

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SECTION 13215

FIBERGLASS-REINFORCED POLYESTER STORAGE TANK
05/05

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers fiberglass-reinforced polyester storage tanks and accessories for use in aggressive chemical service at atmospheric pressures and is limited to flat-bottomed, aboveground, vertical, cylindrical tanks.

This section includes NASA Reliabilty Centered Building and Equipment Acceptance (RCBEA) Guide criteria. The Project Manager and Design staff should evaluate and select products and related Predictive Testing and Inspection (PT&I) criteria which will optimize the life-cycle costs of the project.

Acceptance criteria testing should include:

Tank Integrity testing
Verification of Liquid Level
Verification of Relief Devices.

This section does not cover vertical tanks with dished or conical bottoms, vertical tanks for buried service, pressure vessels, and horizontal tanks for both above ground and buried services.

Related work specified elsewhere includes:

Cast-in-place concrete

Anchor bolts (provide calculations that determine bolt types, sizes and quantities required.)

Plastic pipe

Acid-resistant pipe

Chemical valves

Liquid level gages

Drawings should show:

The physical location of each tank

The location of all accessories to be furnished with each tank

Concrete-foundation details for each tank

Anchoring details for each tank to the foundation

A schedule with connections, size, quantity, and location of tanks.

Specify connection usage such as drain, vent, or overflow and location by top or side. This schedule should be coordinated with all accessories and their locations shown on drawings.

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PART 1 GENERAL

1.1 REFERENCES

****

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

****

The publications listed below form a part of this section to the extent referenced:

ASME INTERNATIONAL (ASME)

ASME B16.5	(2003) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24

ASTM INTERNATIONAL (ASTM)

ASTM C 581-03	(2003) Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures, Intended for Liquid Service

BRITISH STANDARDS INSTITUTE (BSI)

BSI 4994	(2003) Design and Construction of Vessels and Tanks in Reinforced Plastics

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7005-2	(1988) Metallic Flanges Part 2: Cast Iron Flanges

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

RCBEA 2.63 (2004) Tank and Storage Tank Unpressurized

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 15 (1975) Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Air Force, NASA, and Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Air Force, NASA, and Navy projects.

****

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Submit Record Drawing of Existing Conditions to the Contracting Officer.

Submit Material, Equipment, and Fixture Lists and Construction Equipment Lists in accordance with paragraph entitled, "General Requirements" of this section.

SD-02 Shop Drawings

Submit Coordination Drawings in accordance with paragraph entitled, "General Requirements" of this section.

Cleaning
Inspection
Tests

Submit Equipment Room Layout drawings in accordance with paragraph entitled, "Inspection" of this section.

Submit the following in accordance with paragraph entitled, "General Requirements" of this section.

Fabrication Drawings
Installation Drawings
Listing of Product Installation

SD-03 Product Data

Submit Equipment and Performance Data to the Contracting Officer prior to start.

Submit Equipment Foundation Data for fiberglass-reinforced polyester storage tanks including equipment weight and operating loads, horizontal and vertical loads, seismic data, [wind loads][hurricane force windloads],location and projection of anchor bolts, horizontal and vertical clearances for installation, plan dimensions of foundations and relative elevations, and other installation requirements such as utility services.

Submit Manufacturer's catalog data for the following items including spare parts.

Storage Tanks
Accessories

SD-04 Samples

Submit Manufacturer's Standard Color Charts for Laminates.

SD-05 Design Data

Submit certified copies of Design Analysis and Calculations for fiberglass-reinforced polyester storage tanks including live and dead loads, [wind loads],[hurricane force wind loads], [seismic data], and equipment and accessory loads affecting tank shells and tops.

SD-06 Test Reports

Submit Test Reports for Chemical Resistance Tests in accordance with paragraph entitled, "Chemical Storage Requirements" of this section.

Submit Test Reports for Tank Integrity
Submit Test Reports for Verification of Liquid Level Indication Results
Submit Test reports for Verification of Relief Device Results

SD-07 Certificates

Submit Listing of Product Installation in accordance with paragraph entitled, "General Requirements" of this section.

Certificates shall be submitted for the following items:

Storage Tanks
Installers

SD-08 Manufacturer's Instructions

Submit Manufacturer's Instructions describing the installation of specified system, including special notices and material safety data sheets, special signage and data relating to impedances, hazards, and safety precautions.

SD-09 Manufacturer's Field Reports

Submit written Manufacturer's Field Reports of all test data made at the job site for review and final approval no later than 30 calendar days prior to contract completion.

SD-10 Operation and Maintenance Data

Submit [_____] copies of the Operation and Maintenance Manual 30 calendar days prior to testing the system involved. Update and resubmit all data for final approval no later than 30 calendar days prior to contract completion.

Storage Tanks
Flanged Nozzles
Inlet Nozzles
Outlet Nozzles

SD-11 Closeout Submittals

Submit Record Drawings no later than 30 days prior to final completion.

1.3 GENERAL REQUIREMENTS

****
NOTE: If Section 15003 GENERAL MECHANICAL PROVISIONS is not included in the project specification, applicable requirements thereof should be inserted and the following paragraph deleted.
****

Section 15003 GENERAL MECHANICAL PROVISIONS applies to work specified in this section.

Submit Existing Conditions drawings, including any underground utilities, prior to start.

Submit Fabrication Drawings for fiberglass-reinforced polyester storage tanks.

Include construction and anchorage details within Installation Drawings for fiberglass-reinforced polyester storage tanks. Submit Listing of Product Installation for fiberglass-reinforced polyester storage tanks identifying at least five units, similar to those proposed for use, that have been in successful service for a minimum of five years. Identify purchaser, address of installation, service organization, and date of installation.

Provide Coordination Drawings showing the processes, structural, and architectural elements of the work. Indicate where conflicts or clearance problems exist between the various functions. Drawings must clearly show and include:

Manufacturer's certification that Storage Tanks are suitable for storage of specified chemicals.

Certificates providing confirmation that Installers have knowledge of the requirements of the applicable standard, including NASA RCBEA 2.63, and that installation practices are enforced to ensure installation in a sound, undamaged condition.

Material, Equipment, and Fixture Lists including manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

Construction Equipment Lists consisting of proposed construction equipment to be used in the project, including descriptive data.

1.4 PRODUCT DELIVERY AND STORAGE

Handle and store tanks per manufacturer's guidelines to prevent damage. Deliver each tank in compliance with specifications and provide verification of no damage, surface defects, or poor quality laminates.

Concurrent with delivery of tanks submit three copies of manufacturer's Operation and Maintenance Manual.

All damaged or defective tanks or removable covers will be rejected. Remove immediately from the project site.

PART 2 PRODUCTS

2.1 LOADING CONDITIONS

****

NOTE: Show equipment and accessory loads affecting tank shells and tops, if required. Show windload for exterior tanks and tank top design load when top manways are specified.

****

Conform tanks to meet loading conditions specified in project requirements.

2.2 CHEMICAL STORAGE REQUIREMENTS

Provide Design Analysis and Calculations for fiberglass-reinforced polyester storage tanks complying with BSI 4994, and loading conditions specified in project requirements.

****
NOTE: Project Manager should review NASA RCBEA criteria under section 2.63 (2.63.1, 2.63.2, and 2.63.3 to determine the extent of required acceptance documentation.
****

Submit Test Reports for Chemical Resistance Tests in accordance with ASTM C 581-03.

Submit Test Reports for the following:

Tank Integrity
Verification of Liquid Level Indication Results
Verification of Relief Device Results

Results of previous successful tests are acceptable provided laminates are representative of the tanks specified for this project.

2.3 CAPACITY AND DIMENSIONAL REQUIREMENTS

****
NOTE: Capacities vary from approximately 10 to 75,000 gallons 40 liter to 300 kiloliter.
****

Minimum capacity (gallons) (liter) measured to the top of the straight shell or wall height must be as indicated.

****
NOTE: Diameters vary from approximately 2 to 16 feet 0.6 to 5 meter. Wall heights vary from approximately 1 to 47 feet 0.3 to 14 meter.
****

Approximate diameter and approximate straight shell or wall height must be as specified.

2.4 CONSTRUCTION REQUIREMENTS

****
NOTE: Select either filament-wound or contact-molded construction.

Filament winding is a process for tank fabrication in which continuous strands of fiberglass impregnated with resin are wound over the inner corrosion barrier in a predetermined geometric pattern.

Contact molding is a process for tank fabrication in which the structural reinforcement comprises

sprayed, chopped-fiberglass supplemented with woven-glass roving fabric. This process is also known as hand layup, spray layup, pressure molding, or contact pressure molding. The pressure is seldom greater than that required to hold the materials together during fabrication.

Tanks up to 5 feet 1.5 meter are less expensive when fabricated by contact-molding methods. Strength requirements in larger tanks make filament-wound structures more economical. Filament winding offers equivalent strength with less shell thickness, and laminate quality is also improved.

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****

NOTE: NIST PS 15 is English system units, for designer information, if needed.

****

[Tank must be contact-molded, conforming to NIST PS 15 BSI 4994 (NIST PS 15).]

[Tank must be filament-wound, conforming to NIST PS 15. BSI 4994 (NIST PS 15).]

****

NOTE: Select one of the following for tank top.

****

[Tank must have an open top, with reinforcing flangein compliance with ISO 7005-2 or rib [and removable cover].]

[Tank must have a closed top.]

****

NOTE: Select one of the following types if tank is to have closed top.

The end of a filament-wound cylindrical container normally appearing convex is called a domed top.

The end of a filament-wound or contact-molded tank normally appearing concave is called a dished top.

****

[Tank must have a closed top and be type [dome] [dished] [flat].]

****

NOTE: Select one of the following for top fabrication.

Separate fabrication of top and shell is most common.

****

[Closed top must be [integrally fabricated with shell] [separately fabricated and laminated to the shell].]

****

NOTE: Select one of the following two paragraphs

for flat bottom fabrication.

Integral fabrication offers greater strength and does not rely on laminating procedures to join separate sections.

****

The flat bottom must be fabricated [integrally with the shell] [separately and laminated to the shell].

****

NOTE: Specify any additional special surfaces based on accessories and equipment required.

****

Tank must have bracketed flat surfaces for [identification plate] [certification plate] [liquid-level gage] [mounting lugs].

Submit Manufacturer's catalog data for Storage Tanks including spare parts.

Submit Manufacturer's Standard Color Charts for visual inspection of surface finish and color of Laminates.

2.5 ACCESSORIES

****

NOTE: Accessories specified are common items for general usage. Consult manufacturer's literature for other standard and special accessories.

****

2.5.1 Flanged Nozzles

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NOTE: Standard nozzles are suitable for most applications, but conically gusseted nozzles should be specified when vibratory or thermal stresses are anticipated.

****

Nozzles must be [standard] [conically gusseted].

Conform Flange diameter and drilling to ASME B16.5, ISO 7005-2, 150 pounds per square inch 1050 kilopascal (150 psi).

2.5.2 Inlet Nozzles

****

NOTE: Double-flanged inlet nozzles should be specified when interior pipe connections are desired.

****

Inlet connections must be [single] [double] flanged.

2.5.3 Outlet Nozzles

****

NOTE: Double-flanged outlet nozzles should be specified when interior pipe connections are desired.

****

Outlet connections for side shell and top must be [single] [double] flanged.

Drain must be [side-bottom] [full] [siphon] [bottom] type.

[Bottom elbow must be provided.]

2.5.4 Vent

****
NOTE: Select one of the following types of vents for closed-top and removable-top tanks. Show vent size on drawings.
****

Vent for tank top must be [v-vent] [gooseneck] [mushroom].

2.5.5 Flanged Manways

[Manway not required.]

Tank must have [top-flanged] [side-flanged] manway.

[Conform Flange diameter and drilling to ASME B16.5, ISO 7005-2, 150 pounds per square inch 1050 kilopascal.]

2.5.6 Removable Cover

[Cover not required.]

Cover style must be [domed] [dished] [flat].

[Provide lifting ring at center of cover.]

[Provide three lifting lugs on cover.]

2.5.7 Tiedown Lugs

****
NOTE: Indicate quantity of lugs and angular spacing based on manufacturer's recommendations. Lugs should be specified on tanks subject to vibratory stresses and those erected outdoors. Three to six lugs evenly spaced are standard practice, depending upon tank size.
****

Provide tiedown lugs as indicated.

2.5.8 Tank Lifting Lugs

Provide three lifting lugs spaced 90 degrees apart at top portion of straight shell; provide one lug below center top lug.

2.5.9 Identification Plate

Provide phenolic-plastic identification plate stating chemical to be stored, with letters at least 2 inches 50 millimeter high.

2.5.10 Certification Plate

Provide stainless-steel certification plate, stating chemical to be stored, concentration, specific gravity, and maximum temperature.

PART 3 EXECUTION

3.1 INSTALLATION

Install Tank on foundation in accordance with recommended Manufacturer's Instructions. Submit Equipment Foundation Data to the Contracting Officer.

3.2 HYDROSTATIC TEST

After tank has been installed, before piping connections are made and equipment attached, block outlets and fill straight-shell portion with chemically compatible fluid. Perform Hydrostatic Tests to determine if leak proof storage is provided, and correct deficiencies . Submit written Manufacturer's Field Reports of all test data made at the job site for review and final approval. Repair or replace unsatisfactory tanks and retest at no additional cost to the Government until leak proof systems are obtained.

3.3 CLEANING

After installation has been completed and piping connections have been made, clean tank and nozzles in accordance with Manufacturer's Instructions.

3.4 INSPECTION

Inspect installed tanks for indications of defective workmanship or improper installation practices. Repair or replace all faulty construction and damaged work at no additional cost to the Government.

Submit Equipment and Performance Data by the storage tank manufacturer indicating use life, safety features, and mechanical automated details.

Show on drawings of Equipment Room Layout structural and fenestration features, and items requiring installation that could reduce the available space. Detail all ductwork and piping .

3.5 Record Drawings

Record drawings must include all civil site developments such as new facility and/or land modifications, external structural changes to aboveground structures, and changes to underground structures and utilities external to facilities located on lands owned by or held in leasehold interest of the federal government.

Acceptance of the completed drawings by the Contractor certifies accuracy and completeness of the documents. Nonconformity with any of the following requirements will result in withholding of vendor payments.

Information in record drawings must include, but not be limited to:

a. Location of all new lines, conduits, valves, fittings, fire hydrants, meters, terminal points using at least two ties to permanent points (manholes, power poles, curbs, or storm water

inlets), or GPS coordinates with accuracy to at least 1 meter, or better if more stringent accuracy requirements are specified in other sections of this subcontract. An acceptable station and offset system may be used for service lines and fittings only.

b. Location of new lines from property easement lines or edges of pavement at intervals of 300 feet 90 meter.

c. All utility routing and interface changes shall be reflected on the drawings to scale and defined with sufficient dimensions.

d. Provide support for obtaining surveyed coordinates for facility footprint corner and underground structures and utilities external to facilities by submitting Form ENG-F-CE06 to the Subcontract Administrator at least five (5) working days prior to foundation construction or open excavation as notification to the JBOSC Survey Services Department.

e. Prepare record drawing prints at a minimum scale of 1 inch equals 100 feet. Enlarge as necessary all areas requiring additional detail.

f. Provide record drawings in digital format. Geospatially referenced files must be in ESRI GIS Geodatabase, ESRI GIS Shapefile, Microstation DGN, AutoCAD DWG or DXF file format.Information should be provided in separate layers/levels as specified by GIS in at least the same degree of separation as the design drawings provided. Contain in the same levels any new like items to permit easy conversion to GIS layers.

g. Use spatial reference as:

   Horizontal accuracy: Reference all surveys/drawings to Florida State Plane Coordinate System, East Zone, North American Datum 1983/1990 adjustment based on Second Order Class II horizontal control monument.

   Vertical accuracy: Reference all surveys to North American Vertical Datum (NAVD) 1988. Include a description of the reference benchmarks from which the NAVD has been determined in the survey.

h. Make all lines, letters, and details sharp, clean, and fully legible.

i. One reproducible print and one digital copy in an electronic storage media are required for submittal.

-- End of Section --