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SPECIFICATIONS

FOR

WASTE DISPOSAL TANKS

BUILDINGS 241F AND 241H

FOR

E. I. du PONT de NEMOURS & COMPANY

6) This Specification
was formerly Spec.
3555-S4.

SAVANNAH RIVER PLANT

PROJECT 3980

CHEMICAL PLANTS DIVISION

BLAW-KNOX COMPANY

PITTSBURGH, PA.

SEPTEMBER, 1951

DATE:

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12/20/51

Atomic Energy Commission

RECORDS ADMINISTRATION



R0869181

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REFERENCES

Du Pont Specification 3019
 Du Pont Procedure 1001

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REFERENCE DRAWINGS

6) Design of Concrete Tank	(241) 800-5	W145225-Rev.	#2
6) Steel Pan Plate Details ✓	(241) 800-7	W145367	
6) Tank Bottom Lowering Frame	(241) 800-12	W145388	#3
6) 75'-0" Dia. Steel Tank Details	(241) 800-13	W145379	#3
7)6) General Arrangement & Construction Details	(241) 800-15	W145573	#20
6) Bottom Slab - Plan & Sections	(241) 800-16	W145293	#16
6) Concrete Wall & Column Details	(241) 800-18	W145495	
6) Top Plate Construction Support	(241) 800-19	W145523	
6) Top Slab Permanent Form Plate	(241) 800-21	W145569	#1
6) Riser & Plug Details ✕	(241) 800-24	W145868	(Void) #5
6) (superseded by -	(241) 800-6	W149522	
7)6) Plan of Top - 75'-0" Dia. Steel Tank ✓	(241) 800-32	W146625	#19
6) Top Slab Details	(241) 800-33	W146654	
7)6) Riser & Plug Details ✓	(241) 800-6	W149522	#49
7)6) Excavation - Plan & Sections	(241F) 800-17	W145491	#6
7)6) Riser, Plug & Opn'g Details #2	(241) 800-23	W146758	#44
6) Plan & Profile of Waste Line Encasement	(241F) 800-26	W145995	#14
7)6) Waste Line Encasement - Plan & Sections	(241F) 800-27	W146951	#17
7)6) Waste Line Encasement - Sections & Details	(241F) 800-28	W146809	#23
6) Excavation - Plan & Sections	(241H) 800-50	W146377	#6
7)6) Waste Line Encasement - Plan & Sections	(241H) 800-56	W148228	#31
7)6) Waste Line Encasement - Details	(241H) 800-57	W148413	#22
6) Bottom Cooling Coils for Waste Storage Tanks ✓	(241) 341.62-1	D116001	#6
7)6) Vertical Cooling Coils for Waste Storage Tanks ✓	(241) 341.62-2	D116048	#17
6) Dehumidifying System - Plan, Sections & Details ✕	(241) 400-2	W146593	#25

Specification No. 3206 (3)

1. GENERAL:

- 1.1 Intent: This specification covers the requirements for all primary materials and the construction, inspection and testing of the Waste Disposal Tanks designated as the 24LF Building and the 24H Building in the 200 Area of the Savannah River Project.
- 1.2 Scope: The work shall consist of excavation and subsequent back-fill and the construction, inspection and testing of liquid tight steel tanks set in a steel pan, surrounded by a liquid tight concrete tank and including the manholes, pipe connections and other attachments, all of which require the same degree of liquid and/or gas tightness as the tank itself. The installation of equipment necessary for the process operation of these tanks and mounted thereon and internal and external piping will be by others.
- 1.3 Definitions: The following shall supplement the definitions contained in Article I of the General Conditions:
- a. The term "Steel Subcontractor" shall mean the subcontractor who shall furnish, fabricate and erect the steel pan and tank complete with all attachments affecting the liquid tightness of the structure and other work as specified.
 - b. The term "Radiographic Subcontractor" shall mean the subcontractor who shall perform radiographic inspection of all welds as detailed herein under the direction and supervision of du Pont.
 - c. The terms "approved", "approval" or "as required" shall mean by du Pont or their authorized representatives.
- 1.4 Standards: Du Pont Specifications 3019 and the requirements of all Codes or other technical standards listed herein shall be a part of this specification and shall be fully applicable unless specifically modified by this specification.

2. EARTHWORK:

- 2.1 General: The following sections of Specification 3019 shall be applicable to this work:
- a. SC-3-E Excavation
 - b. SC-4-E Fill (Standard Compaction)
 - c. SC-6-E Borrow
- 2.2 Leveling: Notwithstanding any exceptions stated or implied in sections SC-3-E earth fill under the base slabs of the tanks will not be permitted in order to bring the excavated surface to the working level indicated on the drawings. In lieu thereof, the excavation shall be made to a level $\frac{1}{2}$ " 3" below elevations given on the drawings.
- 2.3 Backfill: Backfill shall not be placed against the tank sides until the concrete has set for at least 28 days. Backfill of the top may proceed after 7 days with the falsework supporting the top in place or after 28 days if the falsework is removed before this time.

3. CONCRETE:

3.1 Materials and Standards: The sections of Specification 3019 as listed herein and the referenced codes therein shall be followed except as noted:

- a. SB-1-A Portland Cement
- b. SB-2-A Aggregates. The aggregate used shall be that specified for building structures.
- c. SB-4-A Reinforcement
- d. SB-5-A Laboratory and Testing
- e. SB-6-A Proportioning. The concrete shall be Type D with a consistency specified for sub-structure walls.
- f. SB-7-A Forms. Undressed lumber shall not be used for forms. Internal wall ties shall not be used.
- g. SB-8-A Placing Reinforcement. Except where shown on drawings, reinforcement shall be placed and spliced in accordance with this section.
- h. SB-9-A Placing Concrete
- i. SB-11-A Joints
- j. SB-12-A Curing
- k. SB-13-A Bonding and Grouting.

This specification is applicable except for the grouting under the steel pan and the steel tank bottom which shall be as specified in Section 6.6.

- l. SB-14-A Repairing and Patching

3.2 Construction

- a. A base slab consisting of lean concrete shall be placed on the solid earth to the working level indicated after excavating as specified in Section 2.2. This shall provide a working surface at the elevations and slopes shown on the drawings.
- b. When the working surface has been approved, the 4" bottom pad shall then be placed in accordance with the drawings and the waterproofing applied in accordance with Section 4 of these specifications.
- c. The bottom of the concrete tank shall then be constructed, care being taken to provide a surface that is without noticeable variations in level.

3. CONCRETE: (continued)

3.2 Construction: (continued)

- d. When approval is given, construction of the concrete walls may proceed.

If the steel sides of the pan, or the tank are to be used to support or act as forms, radiographing and leak testing must be completed with final approval having been given for the steel structure, and the pan or tank must contain water to the level to which construction is to be carried.

- e. The concrete roof slab may not proceed until the tank top with the steel attachments to the same has received final inspection and has been approved. Auxiliary equipment structures and earth covering may proceed in accordance with good practice providing the forms supporting the tank top are in place or the concrete roof has obtained a 28-day set.

4. MEMBRANE WATERPROOFING AND PROTECTION:

4.1 Membrane: The membrane waterproofing is to be bituminous-impregnated glass-fibre fabric as called for on the drawings, and du Pont Standard Specification SB11.

4.2 Application: du Pont Standard Specification SB11 with the following exceptions:

6) a. No preabricated steel mesh membrane is to be used except where shown on drawings.

b. The surface protection is to be as called for on the drawings.

3) 4.3 Covering: Cement plaster 1:3 mix shall be applied over the
4) membrane on the top and bottom slabs. The cement plaster over the membrane waterproofing, on side walls shall be applied in one coat thickness as shown on drawing. Shotcrete of an approved consistency shall be applied over the cement plaster on the tank sides. The thickness and wire mesh insert shall be as shown on drawings. Care must be taken to prevent damage to the membrane by the pressure used in the application.

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5. LEAD FLASHING:

- 5.1 Material and Application: Eight pound lead flashing shall be installed at the top of the circumferential angle as shown and detailed on the drawings. The flashing shall be secured in a reglet and carried down over the steel angle and returned under the outstanding leg of the angle at least one inch. The ends of the flashing sheets shall be lapped four inches, but shall not be soldered to each other, in order to form a sliding joint.

6. General.

- 1) 6.1 General: Tanks will hold a liquid, the nature of which requires that the tanks and attachments be absolutely liquid tight. Pans and tanks are to be of all welded construction. Welds in pans and tanks will be rigidly inspected visually and by radiographic techniques. All work in connection with the fabrication, erection, welding and testing of tanks shall conform to the "Rules for Construction of Unfired Pressure Vessels", Section VIII of the A.S.M.E. Boiler Construction Code, 1949, (hereinafter referred to as the "Code"). Materials and standards when specifically mentioned herein, are to be used in place of those given in the Code. A complete radiographical inspection will be made in accordance with the procedures and standards of the Code.

6.2 Outline of Work:

- a. The Steel Subcontractor shall furnish all materials, labor, equipment and other services necessary for the steel tank and pan and certain other work in connection with the construction of the complete tank in accordance with the terms of the contract.
- b. Incidental items of work to be performed by the Steel Subcontractor are:
1. The fabrication and installation of a steel raising and lowering frame on foundations provided by others to be used for both the pan and the tank bottom.
 2. Cribbing to support the pan and tank bottom.
 3. Adjusting cribbing, as directed, for inspection of welds.
 4. Provide for the transport and movement of any and all radiographic equipment at the construction site together with the necessary stagework or other means of access required to obtain the best possible analysis of the welding.
 5. Installation of the tank column dowels, furnished by others, in accordance with the drawings.
 - 6) 7. Erection and maintenance of false-work for supporting the tank tops and columns during construction.
 8. Materials for the permanent form plate and removable brackets for support of the concrete top. (Bracket removal subject to du Pont's option.)
 9. Painting of steel structure.

6. STEEL: (continued)

6.2 Outline of Work: (continued)

c. Exceptions: furnished by du Pont:

1. All concrete work including raising-lowering frame foundations.
2. Electric power supply for welding, lighting and radiographing but not lighting fixtures or other connections from the source of power at the building site.
3. Water for the Steel Subcontractors use and for tank testing including facilities for filling and emptying.
4. Excavation and backfill.
5. Internal and external piping connecting to the nozzles or pipe inserts in the tank, pan or form plates.
6. Installation of any equipment in, on or adjacent to the tank.
7. Membrane waterproofing and surface protection.
8. Lead Flashing.
9. Grouting and setting pan and tank bottom.

6)

6.3 Materials:

- a. Steel Plates for Pans and Tanks: Plate material shall be basic open hearth carbon steel, ASTM designation, A285-50T, Grade B, firebox quality, suitable for submerged arc welding. The steel shall not be made by the rimmed process. The analyses of steels, submission of reports, testing and marking shall be as prescribed in ASTM Designation: A285-50T. Copies of all mill tests and ladle analyses shall be submitted to du Pont design division for approval before fabrication.
- b. Structural Shapes: Structural shapes and column base plates shall be open hearth steel suitable for fusion welding. The carbon content of the steel shall not exceed 0.30 per cent nor the manganese content 1.00 per cent by ladle analysis. Except for the above restrictions, limiting the carbon and manganese content, the steel shall conform to the specification ASTM Designation: A7-50T.
- c. Column Covering: The steel encasement for the reinforced concrete interior columns is to be black seamless pipe and is to conform to standard specifications for welded and seamless steel pipe ASTM, A53-47, Grade A or B. The plates for the conical capitals are to be as specified for the steel tank plates. Copies of reports of ladle analyses as prescribed in the applicable specifications shall be submitted for approval.

6. STEEL: (continued)

6.3 Materials (continued)

- d. Electrodes: Electrodes shall comply with AWS-ASTM-"Specifications for Iron and Steel Arc Welding Electrodes". The classification number selected must be suitable for the electric current characteristic and also for the position of welding. In addition to the foregoing requirements, the electrodes shall be an approved type for welding ASME Code pressure vessels under insurance specifications and their containers shall be so marked. Electrodes used must have approval before starting work.

6.4 Welding:

- a. General: The plates forming the steel tank and the steel covering for the concrete columns, capitals and bases shall be assembled by welding in accordance with the Code where applicable and not at variance with any portion of these specifications. All welds in the tank plates and the column covering will be subjected to radiographic inspection in accordance with the Code requirements except the welds joining the bottom of the column to the base plate, and the base plate to the bottom plates and the stiffener angles to the steel pan. These welds will be visually inspected and all defects shall be corrected as required.
- b. Welding Requirements: The welding procedure and welding operator qualifications for strength welding shall comply with Section IX of the Code. The steel Subcontractor shall submit operator's qualification test reports and welding procedure for all types of welded joints, positions, sub-assemblies, and assembly of each tank and pan. Operator qualifications or re-qualifications and procedure specifications or subsequent modifications thereof shall have approval before any welding is undertaken.
- c. Welder's Limitations: Test conducted by one manufacturer or Subcontractor shall not qualify a welding operator to do work for any other manufacturer or subcontractor. Only an operator who has been qualified for welding on welds to be radiographed will be permitted to perform the incidental pipe and structural shape welding required in the fabrication and attachment of tank appurtenances.
- d. Preparation of Welding Surfaces: Surfaces to be welded shall be free from loose scale, slag, heavy rust, grease, paint, any other foreign material. Joint surfaces shall be smooth surfaces, uniform, and free from fins, tears, and other defects which might adversely affect proper welding.

6. STEEL (continued)

6.4 Welding: (continued)

- e. Cleaning and Peening: Immediately prior to any welding operation, the surfaces to be welded shall be dry and clean and free of any coating which would lower the quality of the deposited weld metal. Each layer of metal on multi-layer welding shall be cleaned of slag and other deposits before applying the next layer. Cleaning between passes of welds may be performed by chipping or machining. Cleaning surfaces by means of gas gouging will not be permitted. Peening of welds subject to radiographing will be at the Steel Subcontractors option but any weld not subject to radiographic inspection shall be peened between passes and approved after detailed visual inspection.
- f. Intermittent Welding: Intermittent welding shall not be used for any plate connections, except for the pan angle stiffeners, backing bars and cooling coil support clips.
- 2) g. Defects in Welds: Defects in welds revealed by visual or
2) radiographic inspection shall be chipped flame gouged or otherwise machined out until sound metal is reached on all sides. The resulting cavity shall be filled with new weld metal.
- h. Weather Conditions: Welding shall not be done when the temperature of the base metal is less than 0 deg. F.; when surfaces are wet from rain, snow or ice; when rain or snow is falling on the surfaces to be welded; nor during periods of high winds, unless the operator and the work are properly protected. At temperatures between 32 deg. and 0 deg. F., the surface within 3 inches of the weld shall be heated to a temperature warm to the hand before welding.

6.5 Fabrication:

- a. Joint Type: All joints of the tank shell plates are to be made in accordance with the drawings.
- b. Finish of Plate Edges: The welding edges of plates may be prepared by machining, shearing, grinding or mechanically guided gas cutting except that irregular edges may be prepared by manually guided gas cutting. When edges of plates are gas cut, the resulting surface must be uniform and smooth and must be free of slag accumulations. All edges shall follow closely the lines prescribed.
- 1) c. Column Bases: The column base plates shall be straightened
1) to a flush bottom surface.
1)
1)

6. STEEL: (continued)

6.5 Fabrication: (continued)

- d. Tank Top, Bottom and Pan Bottom: All plates shall be laid out and joined by welding using a sequence that will provide minimum buckling of the plates and for the bottom assemblies insure minimum variation in slope and/or elevation especially under the column base plates. After the bottom assemblies are completed, the circumference is to be trimmed to size and the edges prepared for welding. No buckle shall be greater than 1" nor shall the slope of a buckle be greater than 0.33" per foot. This flatness tolerance shall be non-accumulative. It shall apply for any area, in its as-fabricated condition and before grouting, for the tank top, bottom and pan bottom. The offset on adjoining plates shall not exceed 10% of the plate thickness.
- e. Knuckle Plates: The knuckle plates shall be carefully curved in two directions by hot forming to the radii shown on the drawings. Welded assemblies of the knuckle plates may be made in the fabricating plant at the option of the Steel Subcontractor. Whether or not shop welding of the knuckle plates is employed, the knuckle plates shall be sub-assembled or fitted in assemblies of not less than four pieces and checked for alignment with the curvature of the top and bottom and the radius of the side plates. Deformation in curvature shall be controlled to the extent that the buckle on the horizontal circumference in a two foot long arc shall not exceed 5/16 inches as formed and before welding to other sections. The matching edges of adjoining plates shall not be offset from each other at any point in excess of 10% of the plate thickness.
- f. Side Plates: The side plates shall be assembled with a welding procedure designed to result in the least distortion due to shrinkage and which will eliminate kinks at seams and vertical joints. Permissible deformation and offsets of plates shall be the same as those specified for knuckle plates.
- g. Columns: The column capital plates shall be formed of rolled plate in not more than two pieces and may be shop assembled with the columns. The pipe columns shall be rigidly braced during the welding to the base plate and a welding procedure employed to insure perpendicularity for proper location of reinforcing steel.
- h. Stiffener Angles: Stiffener angles in the pan shall be butt welded together and fastened to the sides with intermittent welds, as shown on drawings.
- i. Shop Fabrication: Fabrication of plates for the tanks and the welding of tank plates to form assemblies or sub-assemblies, if any, shall be in accordance with these specifications, du Pont Procedure #1001 "Fabrication & Inspection for Unfired Carbon Steel Pressure Vessels Fabricated in the ASME Code", and the referenced codes where applicable.

6. STEEL: (continued)

6.6 Construction Procedure:

- 6)
- a. Place bottom slab as specified in Sections 3.2 a, b and c.
 - b. After the concrete bottom has set (not less than seven (7) days), the Steel Subcontractor shall build the steel pan complete on the concrete slab, taking such precautions as are necessary not to damage the concrete bottom slab during construction. If concrete pad as poured is found to contain depressions trapping water, vendor is to provide means of raising steel tank bottom to assure that welding can be done from a level datum free of water.
 - c. The steel raising and lowering frame and mechanisms will then be installed by the steel Subcontractor on the foundations provided by du Pent. It shall be the Steel Subcontractor's responsibility to maintain the frame for re-use by protective coatings as required and as approved.
 - d. The steel pan will be raised and cribbing installed so that a minimum clearance of 42" is obtained when the pan is resting on the cribbing. The cribbing shall be capable of supporting any loads anticipated during construction, inspection, or water testing of the bottom.
 - e. When the cribbing is complete and approved, the pan will be lowered onto the cribbing and then radiographically examined.
 - f. The leak test will then be conducted as specified in Section 8.4.
 - g. After passing all tests, the pan will be raised clear of the cribbing and painted.

NOTE: Cribbing may not be removed until the painting is completed and approved in order to provide protection for personnel.
 - h. When the bottom slab is cleared of cribbing and thoroughly cleaned, the slab shall be wetted down for at least 8 hours. After this period all surplus water is to be removed and grout placed to form a foundation for the pan. The grout shall be 1:3 mix of cement and sand with an admixture of PLASTIMENT as manufactured by Sika Chemical Corporation or other approved admixture having the same properties and guaranteed to serve as a retardant and a lubricant for the grout.

6. STEEL: (continued)

6.6 Construction Procedure: (continued)

h. (continued)

6)

The proportions of admixture for each sack of cement shall be in accordance with the manufacturer's directions for the purpose intended. A pad of approved grout about 5 feet square and not less than 5 inches in thickness shall first be placed at the location of each tank column. The pan shall then be lowered so that its lowest point is 3 inches above the bottom slab. The high points of the pan bottom at the column locations shall be mechanically vibrated to obtain a uniform level of the steel at each column pad. The height shall be reduced uniformly in increments not exceeding 1/2 inch until the proper elevation is obtained. When this grout has taken its initial set, the remaining voids shall be grouted by pumping thru hose or pipe with sufficient pressure to insure a maximum filling of such voids without buckling of the bottom plate. This grout may be thinner than that approved for use at the column locations. Care shall be taken not to break any bond between concrete and steel at the column base locations, during this operation.

- i. When approval has been given and after grout has set, the raising-lowering frame shall be removed and all lugs or brackets attached by the Steel Subcontractor by welding to the pan plates, and needed only for purposes of erection, are to be removed except those shown on the drawings as not interfering with the completion of the tank construction or operation. Pan plates must not be burned, gouged or torn in the process of removal of these attachments.
- j. After the lugs have been removed, the pan sides will be water tested.
- k. A similar procedure shall be followed for constructing, inspecting, testing, painting, lowering and grouting the bottom portion of the steel tank which shall be assembled to include the bottom knuckle plates.
- l. After lowering the tank bottom onto the grouted surface, the steel raising-lowering frame shall be removed and lugs or brackets be treated as specified for the pan. The water test will be as specified in Section 8.4.
- m. The Steel Subcontractor shall then weld in position and in proper vertical alignment the 16 - #10 column dowels for each column. The dowels will be furnished by du Pont and the position and alignment approved before the columns are installed.

6. STEEL: (continued)

6.6 Construction Procedure: (continued)

- n. Falsework will then be erected together with bracing for supporting the pipe columns during the period of their final attachment to the base plates. It shall be capable of supporting the combined steel and concrete tank tops; if made of wood, shall have its members firmly fastened together to form an integral structure.
- o. The tank sides and column installation may proceed concurrently with the erection of the falsework according to a schedule proposed by the Steel Subcontractor and approved.
- p. In each tank one access opening may be cut in a side plate provided that the edges of the opening are straightly cut and sufficiently clear of welded joints and that the corners of the opening are rounded to a radius of not less than 1/6 of the largest dimension of the opening. The closing plate shall be well formed to fit the edges of the opening, butt welded, inspected, and radiographed as other plate welds. Access manholes and other fittings shall be provided in the tank plates located as shown on the drawings. All piping through the tank plating shall be reinforced as shown on the drawings.
- q. The top knuckle plates and the top plates together with the column capitals, if not assembled with the columns, may then be installed together with hatchways, manholes, risers, piping connections and other appurtenances.
- r. After passing radiographic inspection, the tank will be water tested in accordance with Section 8.4.
- s. The exterior of the tank may then be painted in accordance with Section 7.
- t. The water may be removed after the concrete sidewalls have been placed but the falsework shall remain for at least 7 days after the last concrete roof placement has been made.
- u. At the end of the 7 day period, the Steel Subcontractor may remove the falsework and the interior of the tank may be painted at this time.

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7. PAINTING:

7.1 Materials

- a. Oil-Base Pigmented Type Paint: This shall be a rust preventative coating containing an active corrosion inhibitor of the chromate type and iron oxide pigments of micaceous hematite uniformly dispersed in a processed oil-base vehicle, entirely suitable for use on steel surfaces subject to a maximum temperature of 220°F. The material shall be similar and equal to SRP #75 (primer) color: red, and SRP #87 (finish) color: red and black, distributed by I. Sonneborn Sons, Inc., New York, N. Y.
- b. Bituminous Type Paint: This shall be a bituminous paint containing gilsonite asphalt and adhesive synthetic resins in a processed oil vehicle having an affinity for the oil-base pigmented paint primers and a softening point, after drying, in excess of 220°F. The material shall be similar and equal to Sonolastic Asphalt Paint, colors: Black and green, distributed by I. Sonneborn Sons, Inc., New York, N. Y.
- 5) c. Corrosion Inhibitor: This shall be Shell "VPI"-220 Rust Inhibitor which can be obtained from Lubricants Dept., Shell Oil Co., RCA Building, 50 West 50th Street, New York 20, New York.

7.2 Surface Preparation and Application

5)

- a. Steel Tank - Interior: All exposed interior surfaces including columns, column capitals, base plates, stiffeners and pipe nozzles extending within steel tank and coils are to be sprayed with Corrosion Inhibitor as called for in Section 7.1c. These surfaces will be wiped clean of foreign loose material before application is made. The spray solution that is to be used will consist of 3.5 pounds of "VPI"-220 per gallon of water. The Inhibitor should readily dissolve in water at room temperature. This mixture should provide about 1/2 gram of Inhibitor per square foot of surface. This mixture is to be sprayed in standard equipment used for paint. A spray size similar to that used for paint should be used. Air masks should be worn while spraying and outer garments should be waterproof. Although no skin irritation is expected, rubber or neoprene gloves are advisable. Following the application of the mixture, the floor of the tank should be dried and resprayed with the Inhibitor solution. The tank should then be sealed off. If a vent is necessary, suspend a bag of dry "VPI"-220 in the line. It is recommended that the welding fume ventilation system be used while the spraying is being done.
- b. Steel Tank - Exterior: The exterior surfaces of the steel tank shall be cleaned of dirt, loosely adherent mill scale and excessive rust by wire brushing. All oil, grease or other detrimental coating shall be removed. All of the cleaned metal surfaces on the exterior of the tank exclusive of the top surface shall be given one brush coat of the specified primer, Section 7.1a.

7. PAINTING: (continued)

7.2 Surface Preparation and Application: (continued)

b. (continued)

Following the applications of the primer, the exterior bottom surface of the tank shall be given two brush coats of the specified asphalt paint, Section 7.1b, one coat green and the final coat black. The balance of the exterior surface of the steel tank exclusive of the top surface shall be given two finish coats of the specified paint, Section 7.1a, one coat black and the final coat red. The primer, asphalt coatings, and finish coats shall not be applied to damp surfaces or to surfaces at temperatures below 50° F. Mixing, coverage, and drying time shall be in strict accordance with the paint manufacturer's application instructions.

c. Steel Pan - Interior: The interior surfaces of the steel pan shall receive the same preparation and painting application as specified for the steel tank exterior, Section 7.2b.

d. Steel Pan - Exterior: All exterior surfaces of the steel pan shall be cleaned of dirt, loosely adherent mill scale and excessive rust by wire brushing. All oil, grease or other detrimental coating shall be removed. All of the cleaned metal surfaces on the exterior of the pan shall be given one brush coat of the specified primer, Section 7.1a, and two finish coats of the specified asphalt paint, Section 7.1b, one coat green and the final coat black. The primer, and asphalt coatings, shall not be applied to damp surfaces or to surfaces at temperatures below 50°F. Mixing, coverage and drying time shall be in strict accordance with the paint manufacturer's application instructions.

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8. INSPECTION:

8.1 General: All inspection and final acceptance of all work shall be by du Pont or conducted under their supervision.

8.2 Visual Inspection of all welds will be made upon completion of the weld and/or after each pass if requested. The Steel Subcontractor shall correct any defects indicated by visual inspection and all must have approval before radiographic inspection.

8.3 Radiographic Inspection:

a. Methods: The radiographic technique employed must meet the accuracy required by the Code, and the Radiographic Subcontractor shall prove to the satisfaction of du Pont his ability to meet these standards before being awarded the contract.

b. Scope:

1. Included: All welds affecting the ability of the tank to retain liquids or gases shall be radiographed. These shall include welds to and in manholes, nozzles, sleeves or couplings attached to, or penetrating the steel shell and other welds which might become a source of leakage from liquids or gases and shall also include all welds having through penetration whether or not the same are so shown on the drawings. It should be noted, however, that it is possible to radiograph only butt welds, and then only if the reinforcement of the joint is not excessive or is ground to a smooth contour.

2. Excepted: The welds specifically exempt from radiographic examination are:

a. Those joining the angle stiffeners to the pen and to each other.

b. The column base plates to the tank bottom

c. The columns to their base plates.

d. Attachment clips or hangers to the tank plates providing the weld does not fully penetrate any such plate.

c. Division of Work:

1. Electric Service: Power to outlets will be maintained by du Pont during all periods of radiographic inspection. The Steel Subcontractor shall provide adequate illumination as required.

8. INSPECTION (continued)

8.3 Radiographic Inspection (continued)

c. Division of Work: (continued)

2. Movement of Equipment: The Steel Subcontractor shall provide for the transport and movement of all equipment at the site together with stagework or other means of access required to obtain the best possible analysis of the welding.

3. Correlation: du Pont will inform the Radiographic Subcontractor when initial inspection will be required. Inspection of replaced welds shall be done as promptly as possible after the work has been corrected.

d. Procedure:

1. Pan: The pan assembly will be made available to the Radiographic Subcontractor resting on cribbing about 42 inches above a concrete slab. All welds are to be inspected and the Steel Subcontractor will be directed to move the cribbing as necessary to obtain complete radiographs of all welds. Defective welds will then be corrected and a recheck made to determine the acceptability of the repair. This will be repeated as often as necessary until all welds are approved. The water test on the pan bottom will then be made and any defects found will be re-welded and the procedure for defective welds repeated including radiographing and water testing. When the pan bottom has been accepted, the pan will be lowered and set in place, the lifting frame removed and a water test made on the sides of the pan. Defective welds shall be treated as previously described.

2. Tank Bottom: The procedure for inspecting the tank bottom shall be the same as for the pan bottom.

3. Tank sides, top and attachments: Radiographing of the welds in the remaining portions of the tank shall be done when directed. Defective welds shall be treated as previously described for the pan. The tank will then be water tested. The procedure after the water test will be the same as specified for the pan.

e. Reports:

The Steel Subcontractor will be informed by du Pont immediately of any weld found defective, and he shall have the weld identified and marked as prescribed by the Code. A report of the findings of this examination of the radiographs will be made and distributed as soon as possible. A similar procedure will be followed for rewelds and for each step in construction. A report for each step shall show, upon completion and acceptance of the construction, the results of the analysis of all negatives including those of rewelds and the locations of welds acceptable within the tolerances of the Code but showing detectable defects. When each tank is complete and accepted, du Pont will have a final report compiled and distributed. This report, including negatives of all radiographs, will be in reproducible form.

8. INSPECTION: (continued)

8.3 Radiographic Inspection (continued)

e. (continued)

This report shall include:

Identification of the welds shown on each film.
The thickness of the base metal.
Distance of the film to the surface of the weld.
Distance of the film to the source of radiation.
Technique employed for each exposure.

8.4 Leak Testing:

- a. The pan, the tank bottom, and the completed tank will be subjected to a water test to determine leakage in the sequence given in Section 6.6. The water and pumping facilities for filling and emptying will be furnished by du Pont. Du Pont shall be notified in writing seven (7) days in advance of the desired date for the initial test on each pan and tank and two (2) days in advance for each subsequent test, if required.
- b. The pan bottom will be vacuum leak tested using 2 1/2 psig differential pressure before being lowered to its final position.
- c. The pan sides will be tested by filling with water to the top of the pan after completion of construction of the pan and when the grout foundation is thoroughly set.
- d. The tank bottom will be tested similar to the pan bottom.
- e. The completed tank will be tested by water to a head not less than 9" nor more than 1'-0" above the top of the tank. All pipes or openings below this point shall be blanked off for this test except that one pipe shall be fitted with an adapter to act as an overflow. The water will be retained in the tank, defined in Section 6.6, a minimum of 24 hours before inspection for leaks can be made, provided the time limit is applied after the possibility of tank sweating has passed or the steel is dry following any rain.
- f. The Steel Subcontractor shall correct any defects detected by this testing and retest will follow the previous procedures of this Section until final acceptance.

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9. OPTION:

- 9.1 Procedure Method: Subcontractors may submit proposals based on alternate methods of procedure but such methods of procedure must be guaranteed to meet the requirements specified herein, and will be subject to approval.

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Rev. 2 6/12/52 A.J.Tibery
Rev. 3 8/4/52 J.E.Sayler
Rev. 4 10/16/52 A.J.Tibery
Rev. 5 1/19/53 R.P.Trunick
Rev. 6 2/13/53 L.E.Moncrief
Rev. 7 3/13/53 R.P.Trunick

SPECIFICATIONS

FOR

WASTE DISPOSAL TANKS

BUILDINGS 241F AND 241H

FOR

E. I. du PONT de NEMOURS & COMPANY

6) This Specification
was formerly Spec.
3555-S4.

SAVANNAH RIVER PLANT

PROJECT 2980

CHEMICAL PLANTS DIVISION

BLAW-KNOX COMPANY

PITTSBURGH, PA.

SEPTEMBER, 1951

DATE:

APPROVED BY:

Blaw-Knox Company

W. W. Jones

12/20/51

E. I. du Pont de Nemours & Company

T. J. Conroy (A. P.)

12/20/51

Atomic Energy Commission

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REFERENCES

Du Pont Specification 3019
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REFERENCE DRAWINGS

6) Design of Concrete Tank	(241) 800-5	W145225	Rev. #2
6) Steel Pan Plate Details ✓	(241) 800-7	W145367	
6) Tank Bottom Lowering Frame	(241) 800-12	W145388	#3
6) 75'-0" Dia. Steel Tank Details	(241) 800-13	W145379	#3
7)6) General Arrangement & Construction Details	(241) 800-15	W145573	#20
6) Bottom Slab - Plan & Sections	(241) 800-16	W145293	#16
6) Concrete Wall & Column Details	(241) 800-18	W145495	
6) Top Plate Construction Support	(241) 800-19	W145523	
6) Top Slab Permanent Form Plate	(241) 800-21	W145569	#1
6) Riser & Plug Details ✕	(241) 800-24	W145868	(Void) #5
6) (superseded by -	(241) 800-6	W149522	
7)6) Plan of Top - 75'-0" Dia. Steel Tank ✓	(241) 800-32	W146625	#19
6) Top Slab Details	(241) 800-33	W146654	
7)6) Riser & Plug Details ✓	(241) 800-6	W149522	#49
7)6) Excavation - Plan & Sections	(241F) 800-17	W145491	#6
7)6) Riser, Plug & Opn'g Details #2	(241) 800-23	W146758	#44
6) Plan & Profile of Waste Line Encasement	(241F) 800-26	W145995	#14
7)6) Waste Line Encasement - Plan & Sections	(241F) 800-27	W146951	#17
7)6) Waste Line Encasement - Sections & Details	(241F) 800-28	W146809	#23
6) Excavation - Plan & Sections	(241H) 800-50	W146377	#6
7)6) Waste Line Encasement - Plan & Sections	(241H) 800-56	W148228	#31
7)6) Waste Line Encasement - Details	(241H) 800-57	W148413	#22
6) Bottom Cooling Coils for Waste Storage Tanks ✓	(241) 341.62-1	D116001	#6
7)6) Vertical Cooling Coils for Waste Storage Tanks ✓	(241) 341.62-2	D116048	#17
6) Dehumidifying System - Plan, Sections & Details ✕	(241) 400-2	W146593	#25

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1. GENERAL:

- 1.1 Intent: This specification covers the requirements for all primary materials and the construction, inspection and testing of the Waste Disposal Tanks designated as the 241F Building and the 241H Building in the 200 Area of the Savannah River Project.
- 1.2 Scope: The work shall consist of excavation and subsequent back-fill and the construction, inspection and testing of liquid tight steel tanks set in a steel pan, surrounded by a liquid tight concrete tank and including the manholes, pipe connections and other attachments, all of which require the same degree of liquid and/or gas tightness as the tank itself. The installation of equipment necessary for the process operation of these tanks and mounted thereon and internal and external piping will be by others.
- 1.3 Definitions: The following shall supplement the definitions contained in Article I of the General Conditions:
 - a. The term "Steel Subcontractor" shall mean the subcontractor who shall furnish, fabricate and erect the steel pan and tank complete with all attachments affecting the liquid tightness of the structure and other work as specified.
 - b. The term "Radiographic Subcontractor" shall mean the subcontractor who shall perform radiographic inspection of all welds as detailed herein under the direction and supervision of du Pont.
 - c. The terms "approved", "approval" or "as required" shall mean by du Pont or their authorized representatives.
- 1.4 Standards: Du Pont Specifications 3019 and the requirements of all Codes or other technical standards listed herein shall be a part of this specification and shall be fully applicable unless specifically modified by this specification.

2. EARTHWORK:

2.1 General: The following sections of Specification 3019 shall be applicable to this work:

- a. SC-3-E Excavation
- b. SC-4-E Fill (Standard Compaction)
- c. SC-6-E Borrow

2.2 Leveling: Notwithstanding any exceptions stated or implied in sections SC-3-E earth fill under the base slabs of the tanks will not be permitted in order to bring the excavated surface to the working level indicated on the drawings. In lieu thereof, the excavation shall be made to a level $\frac{1}{2}$ " below elevations given on the drawings.

2.3 Backfill: Backfill shall not be placed against the tank sides until the concrete has set for at least 28 days. Backfill of the top may proceed after 7 days with the falsework supporting the top in place or after 28 days if the falsework is removed before this time.

3. CONCRETE:

3.1 Materials and Standards: The sections of Specification 3019 as listed herein and the referenced codes therein shall be followed except as noted:

- a. SB-1-A Portland Cement.
- b. SB-2-A Aggregates. The aggregate used shall be that specified for building structures.
- c. SB-4-A Reinforcement.
- d. SB-5-A Laboratory and Testing.
- e. SB-6-A Proportioning. The concrete shall be Type D with a consistency specified for sub-structure walls.
- f. SB-7-A Forms. Undressed lumber shall not be used for forms. Internal wall ties shall not be used.
- g. SB-8-A Placing Reinforcement. Except where shown on drawings, reinforcement shall be placed and spliced in accordance with this section.
- h. SB-9-A Placing Concrete
- i. SB-11-A Joints
- j. SB-12-A Curing
- k. SB-13-A Bonding and Grouting.

This specification is applicable except for the grouting under the steel pan and the steel tank bottom which shall be as specified in Section 6.6.

- l. SB-14-A Repairing and Patching

3.2 Construction:

- a. A base slab consisting of lean concrete shall be placed on the solid earth to the working level indicated after excavating as specified in Section 2.2. This shall provide a working surface at the elevations and slopes shown on the drawings.
- b. When the working surface has been approved, the 4" bottom pad shall then be placed in accordance with the drawings and the waterproofing applied in accordance with Section 4 of these specifications.
- c. The bottom of the concrete tank shall then be constructed, care being taken to provide a surface that is without noticeable variations in level.

3. CONCRETE: (continued)

3.2 Construction: (continued)

d. When approval is given, construction of the concrete walls may proceed.

If the steel sides of the pan or the tank are to be used to support or act as forms, radiographing and leak testing must be completed with final approval having been given for the steel structure, and the pan or tank must contain water to the level to which construction is to be carried.

e. The concrete roof slab may not proceed until the tank top with the steel attachments to the same has received final inspection and has been approved. Auxiliary equipment structures and earth covering may proceed in accordance with good practice providing the forms supporting the tank top are in place or the concrete roof has obtained a 28-day set.

4. MEMBRANE WATERPROOFING AND PROTECTION:

- 4.1 Membrane: The membrane waterproofing is to be bituminous-impregnated glass-fibre fabric as called for on the drawings, and du Pont Standard Specification SB11.
- 4.2 Application: du Pont Standard Specification SB11 with the following exceptions:
- a. No pre-fabricated steel-mesh membrane is to be used except where shown on drawings.
 - b. The surface protection is to be as called for on the drawings.
- 3) 4.3 Covering: Cement plaster 1:3 mix shall be applied over the membrane on the top and bottom slabs. The cement plaster over the membrane waterproofing, on side walls shall be applied in one coat thickness as shown on drawing. Shotcrete of an approved consistency shall be applied over the cement plaster on the tank sides. The thickness and wire mesh insert shall be as shown on drawings. Care must be taken to prevent damage to the membrane by the pressure used in the application.
- 4)

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5. LEAD FLASHING:

- 5.1 Material and Application: Eight pound lead flashing shall be installed at the top of the circumferential angle as shown and detailed on the drawings. The flashing shall be secured in a reglet and carried down over the steel angle and returned under the outstanding leg of the angle at least one inch. The ends of the flashing sheets shall be lapped four inches, but shall not be soldered to each other, in order to form a sliding joint.

6. STEEL.

1) 6.1 General: Tanks will hold a liquid, the nature of which requires that the tanks and attachments be absolutely liquid tight. Pans and tanks are to be of all welded construction. Welds in pans and tanks will be rigidly inspected visually and by radiographic techniques. All work in connection with the fabrication, erection, welding and testing of tanks shall conform to the "Rules for Construction of Unfired Pressure Vessels", Section VIII of the A.S.M.E. Boiler Construction Code, 1949, (hereinafter referred to as the "Code"). Materials and standards when specifically mentioned herein, are to be used in place of those given in the Code. A complete radiographical inspection will be made in accordance with the procedures and standards of the Code.

6.2 Outline of Work:

a. The Steel Subcontractor shall furnish all materials, labor, equipment and other services necessary for the steel tank and pan and certain other work in connection with the construction of the complete tank in accordance with the terms of the contract.

b. Incidental items of work to be performed by the Steel Subcontractor are:

1. The fabrication and installation of a steel raising and lowering frame on foundations provided by others to be used for both the pan and the tank bottom.
2. Cribbing to support the pan and tank bottom.
3. Adjusting cribbing, as directed, for inspection of welds.
4. Provide for the transport and movement of any and all radiographic equipment at the construction site together with the necessary stagework or other means of access required to obtain the best possible analysis of the welding.
5. Installation of the tank column dowels, furnished by others, in accordance with the drawings.
- 6) 7. Erection and maintenance of false-work for supporting the tank tops and columns during construction.
8. Materials for the permanent form plate and removable brackets for support of the concrete top. (Bracket removal subject to du Pont's option.)
9. Painting of steel structure.

6. STEEL: (continued)

6.2 Outline of Work: (continued)

c. Exceptions: Furnished by du Pont:

1. All concrete work including raising-lowering frame foundations.
2. Electric power supply for welding, lighting and radiographing but not lighting fixtures or other connections from the source of power at the building site.
3. Water for the Steel Subcontractors use and for tank testing including facilities for filling and emptying.
4. Excavation and backfill.
5. Internal and external piping connecting to the nozzles or pipe inserts in the tank, pan or form plates.
6. Installation of any equipment in, on or adjacent to the tank.
7. Membrane waterproofing and surface protection.
8. Lead Flashing.
9. Grouting and setting pan and tank bottom.

6)

6.3 Materials:

- a. Steel Plates for Pans and Tanks: Plate material shall be basic open hearth carbon steel, ASTM designation, A285-50T, Grade B, firebox quality, suitable for submerged arc welding. The steel shall not be made by the rimmed process. The analyses of steels, submission of reports, testing and marking shall be as prescribed in ASTM Designation: A285-50T. Copies of all mill tests and ladle analyses shall be submitted to du Pont design division for approval before fabrication.
- b. Structural Shapes: Structural shapes and column base plates shall be open hearth steel suitable for fusion welding. The carbon content of the steel shall not exceed 0.30 per cent nor the manganese content 1.00 per cent by ladle analysis. Except for the above restrictions, limiting the carbon and manganese content, the steel shall conform to the specification ASTM Designation: A7-50T.
- c. Column Covering: The steel encasement for the reinforced concrete interior columns is to be black seamless pipe and is to conform to standard specifications for welded and seamless steel pipe ASTM, A53-47, Grade A or B. The plates for the conical capitals are to be as specified for the steel tank plates. Copies of reports of ladle analyses as prescribed in the applicable specifications shall be submitted for approval.

6. STEEL: (continued)

6.3 Materials (continued)

- d. Electrodes: Electrodes shall comply with AWS-ASTM-"Specifications for Iron and Steel Arc Welding Electrodes". The classification number selected must be suitable for the electric current characteristic and also for the position of welding. In addition to the foregoing requirements, the electrodes shall be an approved type for welding ASME Code pressure vessels under insurance specifications and their containers shall be so marked. Electrodes used must have approval before starting work.

6.4 Welding:

- a. General: The plates forming the steel tank and the steel covering for the concrete columns, capitals and bases shall be assembled by welding in accordance with the Code where applicable and not at variance with any portion of these specifications. All welds in the tank plates and the column covering will be subjected to radiographic inspection in accordance with the Code requirements except the welds joining the bottom of the column to the base plate, and the base plate to the bottom plates and the stiffener angles to the steel pan. These welds will be visually inspected and all defects shall be corrected as required.
- b. Welding Requirements: The welding procedure and welding operator qualifications for strength welding shall comply with Section IX of the Code. The steel Subcontractor shall submit operator's qualification test reports and welding procedure for all types of welded joints, positions, sub-assemblies, and assembly of each tank and pan. Operator qualifications or re-qualifications and procedure specifications or subsequent modifications thereof shall have approval before any welding is undertaken.
- c. Welder's Limitations: Test conducted by one manufacturer or Subcontractor shall not qualify a welding operator to do work for any other manufacturer or subcontractor. Only an operator who has been qualified for welding on welds to be radiographed will be permitted to perform the incidental pipe and structural shape welding required in the fabrication and attachment of tank appurtenances.
- d. Preparation of Welding Surfaces: Surfaces to be welded shall be free from loose scale, slag, heavy rust, grease, paint, any other foreign material. Joint surfaces shall be smooth surfaces, uniform, and free from fins, tears, and other defects which might adversely affect proper welding.

6: STEEL (continued)

6.4 Welding: (continued)

- e. Cleaning and Peening: Immediately prior to any welding operation, the surfaces to be welded shall be dry and clean and free of any coating which would lower the quality of the deposited weld metal. Each layer of metal on multi-layer welding shall be cleaned of slag and other deposits before applying the next layer. Cleaning between passes of welds may be performed by chipping or machining. Cleaning surfaces by means of gas gouging will not be permitted. Peening of welds subject to radiographing will be at the Steel Subcontractors option but any weld not subject to radiographic inspection shall be peened between passes and approved after detailed visual inspection.
- f. Intermittent Welding: Intermittent welding shall not be used for any plate connections, except for the pan angle stiffeners, backing bars and cooling coil support clips.
- g. Defects in Welds: Defects in welds revealed by visual or radiographic inspection shall be chipped flame gouged or otherwise machined out until sound metal is reached on all sides. The resulting cavity shall be filled with new weld metal.
- h. Weather Conditions: Welding shall not be done when the temperature of the base metal is less than 0 deg. F.; when surfaces are wet from rain, snow or ice; when rain or snow is falling on the surfaces to be welded; nor during periods of high winds, unless the operator and the work are properly protected. At temperatures between 32 deg. and 0 deg. F., the surface within 3 inches of the weld shall be heated to a temperature warm to the hand before welding.

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2)

6.5 Fabrication:

- a. Joint Type: All joints of the tank shell plates are to be made in accordance with the drawings.
- b. Finish of Plate Edges: The welding edges of plates may be prepared by machining, shearing, grinding or mechanically guided gas cutting except that irregular edges may be prepared by manually guided gas cutting. When edges of plates are gas cut, the resulting surface must be uniform and smooth and must be free of slag accumulations. All edges shall follow closely the lines prescribed.
- c. Column Bases: The column base plates shall be straightened to a flush bottom surface.

1)
1)
1)
1)

6. STEEL: (continued)

6.5 Fabrication: (continued)

- d. Tank Top, Bottom and Pan Bottom: All plates shall be laid out and joined by welding using a sequence that will provide minimum buckling of the plates and for the bottom assemblies insure minimum variation in slope and/or elevation especially under the column base plates. After the bottom assemblies are completed, the circumference is to be trimmed to size and the edges prepared for welding. No buckle shall be greater than 1" nor shall the slope of a buckle be greater than 0.33" per foot. This flatness tolerance shall be non-accumulative. It shall apply for any area, in its as-fabricated condition and before grouting, for the tank top, bottom and pan bottom. The offset on adjoining plates shall not exceed 10% of the plate thickness.
- e. Knuckle Plates: The knuckle plates shall be carefully curved in two directions by hot forming to the radii shown on the drawings. Welded assemblies of the knuckle plates may be made in the fabricating plant at the option of the Steel Subcontractor. Whether or not shop welding of the knuckle plates is employed, the knuckle plates shall be sub-assembled or fitted in assemblies of not less than four pieces and checked for alignment with the curvature of the top and bottom and the radius of the side plates. Deformation in curvature shall be controlled to the extent that the buckle on the horizontal circumference in a two foot long arc shall not exceed 5/16 inches as formed and before welding to other sections. The matching edges of adjoining plates shall not be offset from each other at any point in excess of 10% of the plate thickness.
- f. Side Plates: The side plates shall be assembled with a welding procedure designed to result in the least distortion due to shrinkage and which will eliminate kinks at seams and vertical joints. Permissible deformation and offsets of plates shall be the same as those specified for knuckle plates.
- g. Columns: The column capital plates shall be formed of rolled plate in not more than two pieces and may be shop assembled with the columns. The pipe columns shall be rigidly braced during the welding to the base plate and a welding procedure employed to insure perpendicularity for proper location of reinforcing steel.
- h. Stiffener Angles: Stiffener angles in the pan shall be butt welded together and fastened to the sides with intermittent welds, as shown on drawings.
- i. Shop Fabrication: Fabrication of plates for the tanks and the welding of tank plates to form assemblies or sub-assemblies, if any, shall be in accordance with these specifications, du Pont Procedure #1001 "Fabrication & Inspection for Unfired Carbon Steel Pressure Vessels Fabricated in the ASME Code", and the referenced codes where applicable.

6. STEEL: (continued)

6.6 Construction Procedure:

- 6)
- a. Place bottom slab as specified in Sections 3.2 a, b and c.
 - b. After the concrete bottom has set (not less than seven (7) days), the Steel Subcontractor shall build the steel pan complete on the concrete slab, taking such precautions as are necessary not to damage the concrete bottom slab during construction. If concrete pad as poured is found to contain depressions trapping water, vendor is to provide means of raising steel tank bottom to assure that welding can be done from a level datum free of water.
 - c. The steel raising and lowering frame and mechanisms will then be installed by the steel Subcontractor on the foundations provided by du Pent. It shall be the Steel Subcontractor's responsibility to maintain the frame for re-use by protective coatings as required and as approved.
 - d. The steel pan will be raised and cribbing installed so that a minimum clearance of 42" is obtained when the pan is resting on the cribbing. The cribbing shall be capable of supporting any loads anticipated during construction, inspection, or water testing of the bottom.
 - e. When the cribbing is complete and approved, the pan will be lowered onto the cribbing and then radiographically examined.
 - f. The leak test will then be conducted as specified in Section 8.4.
 - g. After passing all tests, the pan will be raised clear of the cribbing and painted.

NOTE: Cribbing may not be removed until the painting is completed and approved in order to provide protection for personnel.

- h. When the bottom slab is cleared of cribbing and thoroughly cleaned, the slab shall be wetted down for at least 8 hours. After this period all surplus water is to be removed and grout placed to form a foundation for the pan. The grout shall be 1:3 mix of cement and sand with an admixture of PLASTIMENT as manufactured by Sika Chemical Corporation or other approved admixture having the same properties and guaranteed to serve as a retardant and a lubricant for the grout.

6. STEEL: (continued)

6.6 Construction Procedure: (continued)

h. (continued)

6)

The proportions of admixture for each sack of cement shall be in accordance with the manufacturer's directions for the purpose intended. A pad of approved grout about 5 feet square and not less than 5 inches in thickness shall first be placed at the location of each tank column. The pan shall then be lowered so that its lowest point is 3 inches above the bottom slab. The high points of the pan bottom at the column locations shall be mechanically vibrated to obtain a uniform level of the steel at each column pad. The height shall be reduced uniformly in increments not exceeding 1/2 inch until the proper elevation is obtained. When this grout has taken its initial set, the remaining voids shall be grouted by pumping thru hose or pipe with sufficient pressure to insure a maximum filling of such voids without buckling of the bottom plate. This grout may be thinner than that approved for use at the column locations. Care shall be taken not to break any bond between concrete and steel at the column base locations, during this operation.

- i. When approval has been given and after grout has set, the raising-lowering frame shall be removed and all lugs or brackets attached by the Steel Subcontractor by welding to the pan plates, and needed only for purposes of erection, are to be removed except those shown on the drawings as not interfering with the completion of the tank construction or operation. Pan plates must not be burned, gouged or torn in the process of removal of these attachments.
- j. After the lugs have been removed, the pan sides will be water tested.
- k. A similar procedure shall be followed for constructing, inspecting, testing, painting, lowering and grouting the bottom portion of the steel tank which shall be assembled to include the bottom knuckle plates.
- l. After lowering the tank bottom onto the grouted surface, the steel raising-lowering frame shall be removed and lugs or brackets be treated as specified for the pan. The water test will be as specified in Section 8.4.
- m. The Steel Subcontractor shall then weld in position and in proper vertical alignment the 16 - #10 column dowels for each column. The dowels will be furnished by du Pont and the position and alignment approved before the columns are installed.

6. STEEL: (continued)

6.6 Construction Procedure: (continued)

- n. Falsework will then be erected together with bracing for supporting the pipe columns during the period of their final attachment to the base plates. It shall be capable of supporting the combined steel and concrete tank tops; if made of wood, shall have its members firmly fastened together to form an integral structure.
- o. The tank sides and column installation may proceed concurrently with the erection of the falsework according to a schedule proposed by the Steel Subcontractor and approved.
- p. In each tank one access opening may be cut in a side plate provided that the edges of the opening are straightly cut and sufficiently clear of welded joints and that the corners of the opening are rounded to a radius of not less than 1/8 of the largest dimension of the opening. The closing plate shall be well formed to fit the edges of the opening, butt welded, inspected, and radiographed as other plate welds. Access manholes and other fittings shall be provided in the tank plates located as shown on the drawings. All piping through the tank plating shall be reinforced as shown on the drawings.
- q. The top knuckle plates and the top plates together with the column capitals, if not assembled with the columns, may then be installed together with hatchways, manholes, risers, piping connections and other appurtenances.
- r. After passing radiographic inspection, the tank will be water tested in accordance with Section 8.4.
- s. The exterior of the tank may then be painted in accordance with Section 7.
- t. The water may be removed after the concrete sidewalls have been placed but the falsework shall remain for at least 7 days after the last concrete roof placement has been made.
- u. At the end of the 7 day period, the Steel Subcontractor may remove the falsework and the interior of the tank may be painted at this time.

6)

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7. PAINTING:

7.1 Materials

- a. Oil-Base Pigmented Type Paint: This shall be a rust preventative coating containing an active corrosion inhibitor of the chromate type and iron oxide pigments of miscellaneous hematite uniformly dispersed in a processed oil-base vehicle, entirely suitable for use on steel surfaces subject to a maximum temperature of 220°F. The material shall be similar and equal to SRP #75 (primer) color: red, and SRP #87 (finish) color: red and black, distributed by I. Sonneborn Sons, Inc.; New York, N. Y.
- b. Bituminous Type Paint: This shall be a bituminous paint containing gilsonite asphalt and adhesive synthetic resins in a processed oil vehicle having an affinity for the oil-base pigmented paint primers and a softening point, after drying, in excess of 220°F. The material shall be similar and equal to Sonolastic Asphalt Paint, colors: Black and green, distributed by I. Sonneborn Sons, Inc., New York, N. Y.
- 5) c. Corrosion Inhibitor: This shall be Shell "VPI"-220 Rust Inhibitor which can be obtained from Lubricants Dept., Shell Oil Co., RCA Building, 50 West 50th Street, New York 20, New York.

7.2 Surface Preparation and Application

- 5) a. Steel Tank - Interior: All exposed interior surfaces including columns, column capitals, base plates, stiffeners and pipe nozzles extending within steel tank and coils are to be sprayed with Corrosion Inhibitor as called for in Section 7.1c. These surfaces will be wiped clean of foreign loose material before application is made. The spray solution that is to be used will consist of 3.5 pounds of "VPI"-220 per gallon of water. The Inhibitor should readily dissolve in water at room temperature. This mixture should provide about 1/2 gram of Inhibitor per square foot of surface. This mixture is to be sprayed in standard equipment used for paint. A spray size similar to that used for paint should be used. Air masks should be worn while spraying and outer garments should be waterproof. Although no skin irritation is expected, rubber or neoprene gloves are advisable. Following the application of the mixture, the floor of the tank should be dried and resprayed with the Inhibitor solution. The tank should then be sealed off. If a vent is necessary, suspend a bag of dry "VPI"-220 in the line. It is recommended that the welding fume ventilation system be used while the spraying is being done.
- b. Steel Tank - Exterior: The exterior surfaces of the steel tank shall be cleaned of dirt, loosely adherent mill scale and excessive rust by wire brushing. All oil, grease or other detrimental coating shall be removed. All of the cleaned metal surfaces on the exterior of the tank exclusive of the top surface shall be given one brush coat of the specified primer, Section 7.1a.

7. PAINTING: (continued)

7.2 Surface Preparation and Application: (continued)

b. (continued)

Following the applications of the primer, the exterior bottom surface of the tank shall be given two brush coats of the specified asphalt paint, Section 7.1b, one coat green and the final coat black. The balance of the exterior surface of the steel tank exclusive of the top surface shall be given two finish coats of the specified paint, Section 7.1a, one coat black and the final coat red. The primer, asphalt coatings, and finish coats shall not be applied to damp surfaces or to surfaces at temperatures below 50° F. Mixing, coverage, and drying time shall be in strict accordance with the paint manufacturer's application instructions.

c. Steel Pan - Interior: The interior surfaces of the steel pan shall receive the same preparation and painting application as specified for the steel tank exterior, Section 7.2b.

d. Steel Pan - Exterior: All exterior surfaces of the steel pan shall be cleaned of dirt, loosely adherent mill scale and excessive rust by wire brushing. All oil, grease or other detrimental coating shall be removed. All of the cleaned metal surfaces on the exterior of the pan shall be given one brush coat of the specified primer, Section 7.1a, and two finish coats of the specified asphalt paint, Section 7.1b, one coat green and the final coat black. The primer, and asphalt coatings, shall not be applied to damp surfaces or to surfaces at temperatures below 50°F. Mixing, coverage and drying time shall be in strict accordance with the paint manufacturer's application instructions.

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8. INSPECTION:

8.1 General: All inspection and final acceptance of all work shall be by du Pont or conducted under their supervision.

8.2 Visual Inspection of all welds will be made upon completion of the weld and/or after each pass if requested. The Steel Subcontractor shall correct any defects indicated by visual inspection and all must have approval before radiographic inspection.

8.3 Radiographic Inspection:

a. Methods: The radiographic technique employed must meet the accuracy required by the Code, and the Radiographic Subcontractor shall prove to the satisfaction of du Pont his ability to meet these standards before being awarded the contract.

b. Scope:

1. Included: All welds affecting the ability of the tank to retain liquids or gases shall be radiographed. These shall include welds to and in manholes, nozzles, sleeves or couplings attached to, or penetrating the steel shell and other welds which might become a source of leakage from liquids or gases and shall also include all welds having through penetration whether or not the same are so shown on the drawings. It should be noted, however, that it is possible to radiograph only butt welds, and then only if the reinforcement of the joint is not excessive or is ground to a smooth contour.

2. Excepted: The welds specifically exempt from radiographic examination are:

- a. Those joining the angle stiffeners to the pan and to each other.
- b. The column base plates to the tank bottom
- c. The columns to their base plates.
- d. Attachment clips or hangers to the tank plates providing the weld does not fully penetrate any such plate.

c. Division of Work:

1. Electric Service: Power to outlets will be maintained by du Pont during all periods of radiographic inspection. The Steel Subcontractor shall provide adequate illumination as required.

8. INSPECTION (continued)

8.3 Radiographic Inspection (continued)

c. Division of Work: (continued)

2. Movement of Equipment: The Steel Subcontractor shall provide for the transport and movement of all equipment at the site together with stagework or other means of access required to obtain the best possible analysis of the welding.

3. Correlation: du Pont will inform the Radiographic Subcontractor when initial inspection will be required. Inspection of replaced welds shall be done as promptly as possible after the work has been corrected.

d. Procedure:

1. Pan: The pan assembly will be made available to the Radiographic Subcontractor resting on cribbing about 42 inches above a concrete slab. All welds are to be inspected and the Steel Subcontractor will be directed to move the cribbing as necessary to obtain complete radiographs of all welds. Defective welds will then be corrected and a recheck made to determine the acceptability of the repair. This will be repeated as often as necessary until all welds are approved. The water test on the pan bottom will then be made and any defects found will be re-welded and the procedure for defective welds repeated including radiographing and water testing. When the pan bottom has been accepted, the pan will be lowered and set in place, the lifting frame removed and a water test made on the sides of the pan. Defective welds shall be treated as previously described.

2. Tank Bottom: The procedure for inspecting the tank bottom shall be the same as for the pan bottom.

3. Tank sides, top and attachments: Radiographing of the welds in the remaining portions of the tank shall be done when directed. Defective welds shall be treated as previously described for the pan. The tank will then be water tested. The procedure after the water test will be the same as specified for the pan.

e. Reports:

The Steel Subcontractor will be informed by du Pont immediately of any weld found defective, and he shall have the weld identified and marked as prescribed by the Code. A report of the findings of this examination of the radiographs will be made and distributed as soon as possible. A similar procedure will be followed for rewelds and for each step in construction. A report for each step shall show, upon completion and acceptance of the construction, the results of the analysis of all negatives including those of rewelds and the locations of welds acceptable within the tolerances of the Code but showing detectable defects. When each tank is complete and accepted, du Pont will have a final report compiled and distributed. This report, including negatives of all radiographs, will be in reproducible form.

8. INSPECTION: (continued)

8.3 Radiographic Inspection (continued)

c. (continued)

This report shall include:

Identification of the welds shown on each film.
The thickness of the base metal.
Distance of the film to the surface of the weld.
Distance of the film to the source of radiation.
Technique employed for each exposure.

8.4 Leak Testing:

- a. The pan, the tank bottom, and the completed tank will be subjected to a water test to determine leakage in the sequence given in Section 6.6. The water and pumping facilities for filling and emptying will be furnished by du Pont. Du Pont shall be notified in writing seven (7) days in advance of the desired date for the initial test on each pan and tank and two (2) days in advance for each subsequent test, if required.
- b. The pan bottom will be vacuum leak tested using 2 1/2 psig differential pressure before being lowered to its final position.
- c. The pan sides will be tested by filling with water to the top of the pan after completion of construction of the pan and when the grout foundation is thoroughly set.
- d. The tank bottom will be tested similar to the pan bottom.
- e. The completed tank will be tested by water to a head not less than 9" nor more than 1'-0" above the top of the tank. All pipes or openings below this point shall be blanked off for this test except that one pipe shall be fitted with an adapter to act as an overflow. The water will be retained in the tank, defined in Section 6.6, a minimum of 24 hours before inspection for leaks can be made, provided the time limit is applied after the possibility of tank sweating has passed or the steel is dry following any rain.
- f. The Steel Subcontractor shall correct any defects detected by this testing and retest will follow the previous procedures of this Section until final acceptance.

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9. OPTION:

9.1 Procedure Method: Subcontractors may submit proposals based on alternate methods of procedure but such methods of procedure must be guaranteed to meet the requirements specified herein, and will be subject to approval.

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