

# Procurement Specification Cover Sheet

1. Title TECHNICAL SPECIFICATION FOR MELTER EXTERNAL PIPING FOR THE DEFENSE WASTE PROCESSING FACILITY (U)-			
PROJECT #MLT4			
2. Specification No. P-501	3. Revision 6	4. Page 1 of 10	
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ENGINEERING DOC. CONTROL - SRS



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**1.0 SCOPE**

1.1 This specification describes the requirements for fabrication and installation of stainless steel and nickel based alloy piping which will be installed within the melter frame in the 221S building of the Defense Waste Processing Facility. Piping includes pipe and fittings as required by the WSRC drawings. The work includes the following:

1.1.1 Preparation of shop detail drawings.

1.1.2 Furnishing procedures and documentation.

1.1.3 Furnishing materials as described herein.

1.1.4 Furnishing material evaluation coupons.

1.2 Deleted.

**2.0 QUALITY STANDARDS**

2.1 The Supplier shall control the quality of items and services to meet the requirements of this specification, referenced codes and standards, and other procurement documents.

**2.2 Codes and Standards**

Unless otherwise specified or shown on the drawings, work under this specification shall be performed in accordance with ASME B31.3 and to additional codes and standards to the extent indicated by Specification M-500, "Technical Specifications for Melter Vessel Assembly for the Defense Waste Processing Facility", Section 3.0. The date of issue (or revision) indicated shall apply.

**3.0 SUBMITTALS**

Prepare and submit engineering and quality verification document requirements in accordance with Attachments 9-1, "Engineering Document Requirements" and 9-2, "Quality Verification Document Requirements".

**3.1 Engineering Documents**

3.1.1 Completed Spool Detail Drawings as described in 4.2 shall be submitted to WSRC for review and acceptance prior to fabrication.

3.1.2 The Supplier shall submit applicable Leak Test Procedures to WSRC for review and approval.

**3.2 Quality Verification Documents**

3.2.1 The Pipe Fabrication Record identifying heat code numbers traceable to material test reports and fabrication history, shall be included in the documentation data package. In addition, the documentation package shall include the quality verification documents, identified to spool number, as listed below:

3.2.2 Radiographic and liquid penetrant, ultrasonic and eddy-current examination records shall show the piping assembly spool number, weld joint or part number, examination procedure, acceptance standards, and other pertinent information. The records shall also show the

acceptance of examination results by the Supplier's examiner. (Radiographic film need not include all the information listed but shall be traceable to the reader sheets. The two documents shall, as a package, include all the information listed above.)

3.2.3 Pressure Test Records shall show the piping assembly spool number, test media, test pressure, acceptance standards and other pertinent information. The records shall also show the acceptance of the test results by the Supplier's examiner.

3.2.4 Delta Ferrite Content Report. (Reference Paragraph 5.4 and Attachment 9.4).

#### 4.0 DESIGN REQUIREMENTS

4.1 Existing Melter piping and conduit routing drawings will be furnished by WSRC for guidance in routing piping.

4.2 The Supplier shall prepare Spool Detail Drawings. These drawings shall include pipe size and spool numbers, materials, dimensions, fabrication details, examinations, cleaning operations, and applicable codes and procedures. The complete spool number shall be shown on the title block.

4.3 Piping for lines PLA245 and PLA250 shall comply with the requirements of ASME B31.3 Category M Fluid Service. This includes design, material, fabrication, installation, testing and inspection. All other piping shall comply with ASME B31.3 Category D Fluid Service.

#### 5.0 MATERIALS

5.1 Materials shall be in accordance with the material P-Codes in Attachment 9.3 and the referenced ASTM standards.

5.2 Austenitic stainless steels shall be provided in the solution annealed and pickled condition. The heat treatment shall consist of heating the material to the manufacturer's recommended solution annealing temperature and holding at this temperature for the required period, followed by water quenching.

5.3 Elbows shall be long radius unless otherwise specified.

5.4 Type 308L welding materials (A-8), including consumable inserts, for welding austenitic stainless steels shall have a delta ferrite content of not less than five percent. The quantity of delta ferrite shall be determined from the WRC Delta Ferrite Diagram, shown in Attachment 9.4, and the certified chemical analysis of the welding material.

5.5 The storage, baking and drying of all filler materials and fluxes shall be as recommended by the manufacturer.

5.6 Materials shall be examined in accordance with the applicable ASTM standards and these specifications.

5.7 The repair of material defects by welding is permitted subsequent to review and approval by WSRC of the Supplier's Weld Repair Procedure. The procedure shall include as a minimum:

5.7.1 Type and extent of repairable defects.

5.7.2 Defect removal and nondestructive examination used to ensure complete defect removal.

- 5.7.3 Weld preparation and treatment including reference to ASME IX Qualified Weld Procedures.
- 5.7.4 Nondestructive examination methods on completed repair welds.

## 6.0 FABRICATION

### 6.1 Weld End Preparation

- 6.1.1 End preparation shall be in accordance with ASME B16.25.
- 6.1.2 Preparation for shop and field welds shall be by mechanical means. Flame cutting of stainless steel and nickel alloy pipe shall not be permitted.

### 6.2 Bending

- 6.2.1 Hot bending shall not be performed.
- 6.2.2 Bends shall be smooth to the touch, visually free from cracks and surface defects, and shall have uniform curvature. Flattening, as determined by the difference between the major and minor diameter, shall not be greater than 5% of the nominal diameter.
- 6.2.3 Thinning of the wall thickness shall not exceed 10%.
- 6.2.4 Cold bending of stainless steel and nickel alloy pipe is performed at a metal temperature below 350F. Postbend solution heat treatment is not required under the following conditions:
- 6.2.4.1 For pipe larger than two inches in diameter that is cold bent to a radius not less than ten pipe diameters.
- 6.2.4.2 For pipe larger than two inches in diameter that is cold bent to a radius less than ten pipe diameters provided the minimum radius is five pipe diameters and the maximum wall thickness is 3/8 inch and the hardness does not exceed 95 Rockwell B in the highest stress area on the outside of the bend.
- 6.2.4.3 For pipe two inches in diameter and less that is cold bent provided the radius of the bend is not less than five pipe diameters.
- 6.2.5 Stainless steel pipe and nickel alloy pipe shall be bent with stainless steel tools which have not been previously used on ferritic steels. Hard chrome or nickel plated tools may be used if copper undercoating was not used in preparation for plating.

### 6.3 Dimensional Tolerances

- 6.3.1 Dimensional tolerances of fabricated piping assemblies shall not exceed PFI ES-3, unless otherwise noted on the design drawings.
- 6.3.2 The minimum wall thickness for fabricated assemblies shall be not less than 87-1/2 percent of the nominal wall thickness.

### 6.4 Welding Processes

The welding processes listed in ASME Boiler and Pressure Vessel Code, Section IX may be used subject to the following limitations.

- 
- 6.4.1 Welding Process Limitations
    - 6.4.1.1 Gas Metal Arc Welding (GMAW)
      - 6.4.1.1.1 GMAW in the short-circuiting transfer mode shall be restricted to:
        - a. Austenitic stainless steel and nickel alloys not exceeding 3/16 inch nominal thickness.
        - b. Nonstructural, nonpressure retaining attachments, such as insulation clips and nameplates where the material being attached does not exceed 3/16 inch nominal thickness.
        - c. Tack welds, temporary attachments, double welded joints or other applications where weld metal deposited by the GMAW short-circuiting process is subsequently removed.
        - d. Root pass welding of single sided welds in piping in the flat and rolled (IGR) position regardless of the thickness.
        - e. Specific applications, other than those listed above may be submitted to WSRC. Full particulars, such as filler metal classification, material type, thickness, joint design, weld bead sequence and welding position shall be included with the Weld Procedure Specification utilizing the GMAW short-circuiting transfer process.
    - 6.4.1.1.2 The globular transfer and spray transfer modes (pulsed or non-pulsed) may be used on nickel alloys and stainless steels, provided transfer mode qualifications are included in the Weld Procedure Specification submittal.
    - 6.4.1.2 Gas Tungsten Arc Welding (GTAW) - No Limitations
    - 6.4.1.3 Flux Cored Arc Welding (FCAW)
      - 6.4.1.3.1 FCAW welding is not permitted on nickel alloys.
      - 6.4.1.3.2 A separate shielding gas shall be used for all pressure retaining or process boundary applications.
      - 6.4.1.3.3 Requests to modify the requirement listed in 6.4.1.3.1 and 6.4.1.3.2 may be submitted to WSRC. Full particulars, such as filler metal classification, material type, thickness, joint design, weld bead sequence, welding position and application shall be included in the Weld Procedure Specification and shall be submitted to WSRC for review and acceptance prior to use.
  - 6.4.2 Welding Materials
    - 6.4.2.1 Filler metal classification E308L and ER308L shall be used for the welding of Type 304L base materials.
    - 6.4.2.2 Filler metal classifications ENiCrMo-4 and ERNiCrMo-4 shall be used for the welding of nickel alloys to nickel alloys and to austenitic stainless steels.
  - 6.4.3 General Requirements
    - 6.4.3.1 Surfaces shall be cleaned thoroughly by filing, grinding, wire brushing and/or solvent cleaning prior to welding.

- 6.4.3.2 Stainless steels and nickel alloys shall be cleaned to remove surface marking and extraneous materials, including lubricants, temperature indicating crayons, marking inks, adhesive-backed tapes, liquid penetrants, cleaning solvents, and wrapping films prior to welding. Weld bevel surfaces of UNS N10276 material shall be scrubbed with a suitable solvent and wiped clean before welding.
- 6.4.3.3 Only stainless steel brushes and aluminum oxide grinding wheels shall be used on austenitic stainless steels, and they shall not have been previously used on ferritic material.
- 6.4.3.4 The root pass of all single welded circumferential butt welds in piping shall be welded by the GTAW process. Backing rings are not permitted.
- 6.4.3.5 Peening is not permitted. A pneumatic tool for slag removal is not considered peening.
- 6.4.3.6 Block welding shall not be used without WSRC's specific permission.
- 6.4.3.7 The application of heat, other than by welding, to correct weld distortion and dimensional deviations in austenitic stainless steels and nickel alloys, is not permitted.
- 6.4.3.8 The individual weld layer thickness shall not exceed 3/8 inch.
- 6.4.3.9 An internal purge shall be used for the root pass and second layer of all single sided butt welds made in austenitic stainless steel and nickel alloys.
- 6.4.4 Preheat and Interpass Temperature
- 6.4.4.1 Preheat and interpass temperatures recommended or required by ASME B31.3 for pressure retaining components is mandatory. In addition, the following requirements apply:
- 6.4.4.2 The maximum interpass temperature for welding austenitic stainless steels shall be 350°F and 200°F for nickel alloys.
- 6.4.4.3 Preheat and interpass temperature shall be determined by temperature indicating crayons, infrared noncontact pyrometers, contact pyrometers or other equally suitable means permitted by WSRC. Temperature indicating crayons or pellets used on austenitic stainless steels and nickel alloys shall comply with M-SFC-S-00005.
- 6.4.4.4 Preheat and interpass temperature requirements listed above shall also apply to tack welding, fillet and attachment welds, and thermal gouging and cutting.
- 6.4.4.5 When the base metal temperature is below 32°F, preheat to hand warm prior to welding.
- 6.4.5 Postweld Heat Treatment (PWHT)
- 6.4.5.1 Postweld heat treatment of austenitic stainless steel and nickel alloy piping materials is not permitted.
- 6.4.6 Workmanship and Visual Quality Examination
- 6.4.6.1 Each layer of welding shall be smooth and essentially free of slag inclusions and porosity. Cracks and lack of fusion are not permitted. In addition, the surface of the final weld layer shall be such as to permit the performance of any required examination. Arc strikes, starts, and stops shall be confined to the welding groove or shall be removed by grinding.

6.4.6.2 Temporary attachments shall be removed flush with the base metal without encroaching on the required minimum wall thickness. Where a surface has been restored by welding, all areas from which attachments have been removed shall be examined by the same methods required for permanent attachments.

## 6.5 Cleaning

6.5.1 Stainless steel and nickel alloy piping assemblies shall be furnished with the interior and exterior visually clean and free of mill scale, rust, grease, oil, dirt, flux, weld splatter, oxidation (not heat tint), and other contaminants. Wire brushing shall be performed only with austenitic stainless steel brushes that have not been previously used on any ferritic material. Solvent cleaning shall be used to remove grease, oil, or other foreign matter. Acetone or alcohol (ethyl, methyl, or isopropyl) are recommended solvents. Solvent containing more than 250 PPM chlorides shall not be used. All cleaning materials shall comply with M-SPC-S-00005.

6.5.2 As a minimum, cleaning shall be performed after all fabrication, welding and testing have been completed.

## 7.0 SHIPPING, HANDLING, AND STORAGE

### 7.1 Sealing Openings

7.1.1 Immediately after cleaning and inspection, openings shall be tightly sealed in accordance with this section.

7.1.2 Stainless steel and nickel alloy pipes shall be sealed as follows:

- a. An aluminum cap shall be placed over the pipe openings and sealed to the pipe exterior with at least three passes of sealing tape. (Plastic pipe caps may also be used.)
- b. The tape used to seal the cap shall comply with M-SPC-S-00005.

### 7.2 Marking

7.2.1 Each section of fabricated pipe, pipe assembly, or separate fitting shall be clearly marked with the line number.

7.2.2 Any paint markings shall be placed so that no paint is within 1/2 inch of a surface to be welded.

7.2.3 Marking materials used on austenitic stainless steels and nickel alloys shall comply with M-SPC-S-00005.

### 7.3 Protection During Shipping

7.3.1 Pipe and fittings shall be blocked, strapped, or otherwise held in position during shipment, and they shall be further separated by dunnage as may be necessary to prevent damage in transit. Materials used in contact with stainless steel and nickel alloy piping shall comply with M-SPC-S-00005.

7.3.2 Refer to M-SPC-S-00001, section 6.0, 'Preparation for Shipment' for instructions regarding storage procedure submittals.

## 8.0 INSPECTION AND TESTING

**8.1 Examination of Fabrication Welds**

Welds shall be examined in accordance with Chapter VI, Paragraphs 341-344 of the ASME B31.3 Code and to the extent specified in Attachment 9.3.

In addition, the root pass of all single-side welded, full penetration, pressure boundary welds shall be examined by the liquid penetrant method.

8.2 Liquid penetrant examination materials shall meet the requirements of M-SPC-S-00005.

**8.3 Pressure Tests**

8.3.1 A pressure test shall be performed in accordance with Paragraph 345 of ASME B31.3 on all piping subassemblies containing welds. (Supplier to test only those piping lines on which fabrication is completed (Ref. paragraph 7.2.1 of Specification M-502)).

8.3.2 Minimum test pressure shall be as stated in Figure 8.3.2. The maximum test pressure shall not exceed the pressure stated in Attachment 9.3 or the maximum allowable test pressure of any nonisolated components.

SYSTEMS	TEST PRESSURE	TYPE TEST
ARG	25 PSI	PNEUMATIC
ISA	160 PSI	PNEUMATIC
MRW	90 PSI	HYDROSTATIC
MSW	90 PSI	HYDROSTATIC
OGP	50 PSI	PNEUMATIC
PLA	150 PSI	PNEUMATIC

Figure 8.3.2

8.3.3 Test water shall be in accordance with Specification M-SPC-S-00005. After testing, piping shall be blown dry using clean dry filtered air. Dryness of air shall be measured using a Dew Point Analyzer. Piping shall be blown dry (starting with less than 10°F air dew point) until there is less than 20°F (differential) between the supply and return air dew points.

8.3.4 Piping which will be tested after assembly on the melter frame shall have drains provided at low points. Drains may consist of 304L stainless steel screwed half couplings and pipe plugs.

**9.0 ATTACHMENTS**

9.1 Engineering Document Requirements

9.2 Quality Verification Document Requirements

9.3 Material P-Codes

9.4 WRC Delta Ferrite Diagram



# Engineering Document Requirements Form Instructions

**Purpose** The Engineering Document Requirements (EDR) form is prepared by the originator, establishes a basis for actions required of a Supplier and provides the schedule for the submittal of engineering documents by the Supplier.

<b>Legend</b>	
<b>Entry No.</b>	<b>Information Required</b>

- 1 Document category number — see below.
- 2 Applicable specification number and appropriate paragraph.
- 3 Description corresponding to document category number.
- 4 Permission to proceed with fabrication or other specific processes is marked yes, if required.
- 5 List a milestone after award (i.e., prior to fabrication, prior to test, prior to shipment, or with shipment that the listed document is to be submitted by Supplier.
- 6 Number of copies required for submittal.
- 7 Reproducible, Mylar, Vellum, etc.
- 8 Enter remarks when appropriate.

### Document Category Number and Descriptions

- 1.0 Drawings
  - 1.1 Outline Dimensions, Services, Foundations and Mounting Details — Drawings providing external envelope, including lugs, centerline(s), location and size for electrical cable, conduit, fluid, and other service connections, isometrics and details related to foundations and mountings.
  - 1.2 Assembly Drawings — Detailed drawings indicating sufficient information to facilitate assembly of the component parts of an equipment item.
  - 1.3 Shop Detail Drawings — Drawings which provide sufficient detail to facilitate fabrication, manufacture, or installation. This includes pipe spool drawings, internal piping and wiring details, cross-section details and structural and architectural details.
  - 1.4 Wiring Diagrams — Drawings which show schematic diagram equipment, internal wiring diagrams, and interconnection wiring diagram for electrical items.
  - 1.5 Control Logic Diagrams — Drawings which show paths which input signals must follow to accomplish the required responses.
  - 1.6 Piping and Instrumentation Diagrams — Drawings which show piping system scheme and control elements.
- 2.0 Parts Lists and Costs — Sectional view with identified parts and recommended spare parts for one year's operation and specified with unit cost.
- 3.0 Complete WSRC Data Sheets — Information provided by Supplier on data sheets furnished by WSRC.
- 4.0 Instructions
  - 4.1 Erection/Installation — Detailed written procedures, instructions, and drawings required to erect or install material or equipment.
  - 4.2 Operations — Detailed written instructions describing how an item or system should be operated.
  - 4.3 Maintenance — Detailed written instructions required to disassemble, reassemble and maintain items or systems in an operating condition.
  - 4.4 Site Storage and Handling — Detailed written instructions, requirements and time period for lubrication, rotation, heating, tilting or other handling requirements to prevent damage or deterioration during storage and handling at jobsite. This includes shipping instruction for return.
- 5.0 Schedules: Engineering and Fabricator/Erection — Bar charts or critical path method diagram which detail the chronological sequence of activities, i.e., Engineering submittals, fabrication and shipment.
- 6.0 Quality Assurance Manual/Procedures — The document(s) which describe(s) the planned and systematic measures that are used to assure that structures, systems, and components will meet the requirements of the procurement documents.
- 7.0 Seismic Data Reports — The analytical or test report which provides information and demonstrates suitability of material, component or system in relation to the conditions imposed by the stated seismic criteria.
- 8.0 Analysis and Design Reports — The analytical data (stress, electrical loading, fluid dynamics, design verification reports, etc.) which demonstrate that an item satisfies specified requirements.
- 9.0 Acoustic Data Reports — The noise, sound and other acoustic vibration data required by the procurement documents.
- 10.0 Samples
  - 10.1 Typical Quality Verification Documents — A representative data package which will be submitted for the items furnished as required in the procurement documents.
  - 10.2 Typical Material Used — a representative example of the material to be used.
- 11.0 Material Descriptions — The technical data describing a material which a Supplier proposes to use. This usually applies to architectural items, e.g., metal siding, decking, doors, paints, coatings.
- 12.0 Welding Procedures and Qualifications — The welding procedure, specification and supporting qualification records required for welding, hard facing, overlaying, brazing and soldering.
- 13.0 Material Control Procedures — The procedures for controlling issuance, handling, storage and traceability of materials such as weld rod.
- 14.0 Repair Procedures — The procedures for controlling material removal and replacement by welding, brazing, etc.; subsequent thermal treatments; and final acceptance inspection.
- 15.0 Cleaning and Coating Procedures — The procedures for removal of dirt, grease or other surface contamination, and preparation and application of protective coatings.
- 16.0 Heat Treatment Procedures — The procedures for controlling temperature and time at temperature as a function of thickness, furnace atmosphere, cooling rate and methods, etc.
- 19.0 UT — Ultrasonic Examination Procedures — Procedures for detecting discontinuities and inclusions in materials by the use of high frequency acoustic energy.
- 20.0 RT — Radiographic Examination Procedures — Procedures for detecting discontinuities and inclusions in materials by x-ray or gamma ray exposure of photographic film.
- 21.0 MT — Magnetic Particle Examination Procedures — Procedures for detecting surface or near surface discontinuities in magnetic materials by the distortion of an applied magnetic field.
- 22.0 PT — Liquid Penetrant Examination Procedures — Procedures for detecting discontinuities in materials by the application of a penetrating liquid in conjunction with suitable developing materials.
- 23.0 Eddy Current Examination Procedures — Procedures for detecting discontinuities in materials by distortion of an applied electromagnetic field.
- 24.0 Pressure Test — Hydro, Air, Leak, Bubble or Vacuum Test Procedures — Procedures for performing hydrostatic or pneumatic structural integrity and leakage tests.
- 25.0 Inspection Procedures — Organized process followed for the purpose of determining that specified requirements (dimensions, properties, performance results, etc.) are met.
- 26.0 Performance Test Procedures — Test performed to demonstrate that functional design and operational parameters are met.
- 26.1 Mechanical Tests — e.g., pump performance, data, valve stroking, load, temperature rise, calibration, environmental, etc.
- 26.2 Electrical Tests — e.g., impulse, overload, continuity, voltage, temperature rise, calibration, saturation, loss, etc.
- 27.0 Prototype Test Reports — Reports of a test which is performed on a standard or typical examination of equipment or item, and which is not required for each item produced in order to substantiate the acceptability of equal items. This may include tests which result in damage to the item(s) tested.
- 28.0 Personnel Qualification Procedures — Procedures for qualifying welders, inspectors and other special process personnel.
- 29.0 Supplier Shipping Preparation Procedures — Procedures used by a Supplier to prepare finished materials or equipment for shipment from its facility to the jobsite.



## Quality Verification Document Requirements Form Instructions

**Purpose** The Quality Verification document Requirements (QVDR) is initiated by SRS and completed by the Supplier when providing quality verification documents. The QVDR is a multipurpose form to

Transmit quality verification documents from the Supplier,  
Provide evidence of SSR release of documentation and/or work, and  
Provide evidence of an SRS inspection check of documentation received at SRS.

### WSRC Entries

Entry No.	Information Required	Supplier Entries	Information Required
1	Enter Document Category Number — see below.	7	Enter number of pages of quality verification document being submitted.
2	Enter Specification Number and Paragraph Reference.	8	Enter information required.
3	Enter Description corresponding to the Document Category Number.	9	Enter information required.
4	SSR to initial upon item release.	10	Enter information required.
6	Enter "Remarks: as appropriate.	11	Enter the quantity of units covered by the documents submitted. For each item on Entry No. 12 being released, provide a separate copy of this completed form and the supporting quality verification documents.
16	SSR and dates release.		

### Field Entries

Entry No.	Information Required
5	SRS inspector at the jobsite to complete check-in.
17	The SRS Inspector will review the quality verification documentation package. If found satisfactory, he signs and dates the check-in statement.

### Document Category Numbers and Descriptions

- 12.0 Welding Verification Reports — Reports of welding performed to include weld identification, and certification that qualified welding procedures and welders were used.
- 13.0 Material Verification Reports — Reports relative to material which confirm, substantiate or assure that an activity or condition has been implemented in conformance with code and material specifications imposed by the procurement documents.
- 14.0 Major Repair Verification Reports — Reports may include weld repair locations (maps), material test reports for filler metal, pre- and post-weld heat treatment records, NDE records, etc. The resolution of whether a repair is major or not is an SRS responsibility.
- 15.0 Cleaning and Coating Verification Reports — Reports include a certification of visual examination for surface preparation, surface profile, materials, etc.; and also humidity data, temperature data and coating thickness data as required by the procurement documents.
- 16.0 Heat Treat Reports — Reports normally include furnace charts and similar records which identify and certify the item(s) treated, the procedure used, furnace atmosphere, time at temperature, cooling rate, etc.
- 17.0 Material Property Reports
  - 17.1 MTR (Material Test Reports) — These reports include all chemical, physical, mechanical, and electrical property test data required by the material specification and applicable codes. These are applicable to cement, concrete, metals, cable jacket materials, rebar, rebar splices, etc.
  - 17.2 Impact Test Data — Reports of Charpy or drop weight tests including specimen configuration, test temperature and fracture data.
  - 17.3 Ferrite Data — Reports of the ferrite percentage for stainless steel materials used, including castings and welding filler metals as deposited.
  - 17.4 Material Certificate of Conformance — Documents which certify conformance to the requirements of the applicable material specification.
  - 17.5 Electrical Property Reports — Reports of electrical characteristics, e.g., dielectric, impedance, resistance, flame tests, corona, etc.
- 18.0 Code Compliance — Verifying documents (such as data Forms U-1, M-2, State, etc.), which are prepared by the manufacturer or installer and certified by the Authorized Code Inspector.
- 19.0 UT — Ultrasonic Examination and Verification Reports — Examination results of certain characteristics of discontinuities and inclusions in material by the use of high frequency acoustic energy.
- 20.0 RT — Radiographic Examination and Verification Reports — Examination results of certain characteristics of discontinuities and inclusions in materials by x-ray or gamma-ray exposure of photographic film, including film itself.
- 21.0 MT — Magnetic Particle Examination and Verification Reports — Examination results of surface (or near surface) discontinuities in magnetic materials by distortion of an applied magnetic field.
- 22.0 PT — Liquid Penetrant Examination and Verification Reports — Examination results of surface discontinuities in materials by application of a penetrating liquid in conjunction with suitable developing techniques.
- 23.0 Eddy Current Examination and Verification Reports — Examination results of discontinuities in material by distortion of an applied electromagnetic field.
- 24.0 Pressure Test — Hydro, Air, Leak, Bubble or Vacuum Test and Verification Reports — Results of hydrostatic or pneumatic structural integrity and leakage tests.
- 25.0 Inspection and Verification Reports — Documented findings resulting from an inspection.
- 26.0 Performance Test and Verification Reports — Reports of Test Results
  - 26.1 Mechanical Test, e.g., pump, performance data, valve stroking, load, temperature rise, calibration, environment, etc.
  - 26.2 Electrical Tests, e.g., load, impulse, overload, continuity, voltage, temperature rise, calibration, saturation, loss, etc.
- 27.0 Prototype Test Report — Report of the test which is performed on a standard or typical example of equipment, material or item, and which is not required for each item produced in order to substantiate the acceptability of equal items. This normally includes tests which may, or could be expected to, result in damage to the item(s) tested.
- 28.0 Certificate of Conformance—A document signed or otherwise authenticated by an authorized individual certifying the degree to which items or services meet specified requirements.

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MATERIAL P-CODES

P-CODE	PAGE
P-69	2
P-70	4
P-138	5
P-232	7
P-240	8
P-247	9

**P-CODE P69**

DESIGN PRESSURE, PSIG 135  
DESIGN TEMPERATURE, °F 400  
MAXIMUM TEST PRESSURE, PSIG 425  
FLUID SERVICE CATEGORY M FOR LINES PLA245 AND PLA250  
CATEGORY D FOR ALL OTHERS

M-SPEC-S-000005 IS APPLICABLE.  
CORROSION EVALUATION NOT REQUIRED.

PIPE

SIZE (IN.) SCHEDULE SPECIFICATIONS  
½ - 4 10S ASTM A312/A312M GRADE TP304L SEAMLESS PIPE,  
ANSI/ASME B36.19M

FITTINGS

SIZE (IN.) WEIGHT SPECIFICATIONS  
½ - 12 10S ASTM A403/A403M GRADE WP304L BUTTWELD  
STAINLESS STEEL FITTINGS, ASME B16.9

JOINTS

SIZE (IN.) TYPE SPECIFICATIONS  
½ - 12 RUNS BUTTWELD

NONDESTRUCTIVE EXAMINATION

PARAGRAPH 341.4.1 OF THE ASME B31.3 CODE PLUS 10% RADIOGRAPHY

WELDED BRANCHES

THE FOLLOWING BRANCH WELDS MUST BE REINFORCED.

45 DEGREE BRANCH ANGLE	
RUN NPS (IN)	BRANCH NPS (IN)
4	4
6	¾, 1½ - 6
8	½ - 8
10	½ - 10
12	½ - 12

**P-CODE P69**

60 DEGREE BRANCH ANGLE	
RUN NPS (IN)	BRANCH NPS (IN)
6	2 - 6
8	½ - ¾, 1½ - 8
10	½ - 10
12	½ - 12

75 DEGREE BRANCH ANGLE	
RUN NPS (IN)	BRANCH NPS (IN)
6	3 - 6
8	¾, 1½ - 8
10	½ - 10
12	½ - 12

90 DEGREE BRANCH ANGLE	
RUN NPS (IN)	BRANCH NPS (IN)
6	4 - 6
8	¾, 1½ - 8
10	½
12	½ - 12

**P-CODE P70**

DESIGN PRESSURE Atmospheric  
DESIGN TEMPERATURE, °F 140  
MAXIMUM TEST PRESSURE, PSIG 1950  
FLUID SERVICE CATEGORY D  
M:SPC-S-00005 IS APPLICABLE.

PIPE  
SIZE (IN.) SCHEDULE SPECIFICATIONS  
½ - 3 40S ASTM A312/A312M GRADE TP304L SEAMLESS PIPE,  
ASME B36.10M

FITTINGS  
SIZE (IN.) SCHEDULE SPECIFICATIONS  
½ - 3 40S ASTM A403/A403M TYPE 304L SEAMLESS  
BUTTWELD FITTINGS, ASME B16.9

JOINTS  
SIZE (IN.) TYPE SPECIFICATIONS  
½ - 3 RUN BUTTWELD OR SLEEVE COUPLING

NONDESTRUCTIVE EXAMINATION

PARAGRAPH 341.4.1 OF THE ASME B31.3 CODE PLUS 10% RADIOGRAPHY.

SLEEVE COUPLING MADE FROM 304 OR 304L PIPE OR PLATE, SAME MATERIAL AS PIPE  
MAY BE USED. SLEEVE COUPLING SHALL BE DESIGNED TO AVOID STRIPPING OF WIRE  
OR CABLE AT CONDUIT INSIDE DIAMETER. SLEEVE COUPLING DETAIL SHALL BE  
SHOWN ON APPLICABLE DRAWINGS.

**P-CODE P138**

DESIGN PRESSURE, PSIG 145  
DESIGN TEMPERATURE, °F 150  
MAXIMUM TEST PRESSURE, PSIG 565  
FLUID SERVICE CATEGORY D  
M-SPC-S-00005 IS APPLICABLE.  
CORROSION EVALUATION NOT REQUIRED.

<u>PIPE</u>	SCHEDULE	ASTM SPECIFICATIONS
SIZE (IN.)		
1/4 - 1/6	.049	ASTM A269 GRADE TP304L SEAMLESS STAINLESS STEEL TUBING TO SUPPLEMENTARY REQUIREMENT S2, ANNEALED
1	.065	

NOTE: FOR TUBING, SIZES ARE OUTSIDE DIAMETERS AND SCHEDULES ARE WALL THICKNESS (IN.).

ULTRASONIC TEST PER ASTM A450 WITH A LONGITUDINAL NOTCH ON OUTSIDE AND INSIDE SURFACE OR CALIBRATION TUBE IS ALSO REQUIRED.

<u>FITTINGS</u>	SCHEDULE
SIZE (IN.)	Manufacturer's
1/4 - 1	

SPECIFICATIONS  
'CAJON' TYPE 304L STAINLESS STEEL 'VCO' O-RING VACUUM FITTINGS WITH BUTTWELD ENDS AND EPDM O-RINGS. ID OF FITTING TO MATCH ID OF TUBING.

OR

COMBINATION PUMP VALVE COMPANY (CPV) TYPE 304L STAINLESS STEEL O-SEAL FITTINGS WITH BUTTWELD ENDS AND EPDM O-RINGS. ID OF FITTING TO MATCH ID OF TUBING.

\*"EPDM" - PARKER E740-75 OR ENGINEERING APPROVED EQUAL.

\*\*\* CAUTION \*\*\*

'CAJON' AND CPV FITTINGS ARE NOT INTERCHANGEABLE THEREFORE DO NOT MIX MANUFACTURERS IN THE SAME AREA.

OR

'CAJON' TYPE 304L STAINLESS STEEL VACUUM BUTTWELD FITTINGS. ID OF FITTING TO MATCH ID OF TUBING.

**P-CODE P138**

ALL FITTINGS WILL BE IN THE SOLUTION  
ANNEALED CONDITION.

QUALIFICATIONS

CERTIFIED COPIES OF MATERIAL TEST REPORTS SHALL BE FURNISHED WSRC FOR ALL FITTINGS.

PIPING ELECTRICAL ISOLATION JOINTS SHALL BE USED ONLY WHEN SHOWN IN THE DRAWINGS OR MODEL.

COLD BENDS ARE TO BE USED WHEREVER POSSIBLE TO AVOID FITTINGS.

BENDS MADE TO THE RADIUS OF STANDARD TUBE BENDERS ARE ACCEPTABLE.

THE FOLLOWING BEND RADII ARE MINIMUM.

SIZE (IN.)	1/4	5/16	3/8	1/2	5/8	3/4	7/8	1
BEND RADIUS (IN.)	9/16	11/16	15/16	1-1/4	1-1/2	1-3/4	3-1/2	4

JOINTS

SIZE (IN.)	TYPE	SPECIFICATIONS
1/4 - 1	RUNS	BUTTWELD
1/4 - 1	MAINTENANCE	O-RING COUPLINGS AS SPECIFIED UNDER FITTINGS
1/4 - 1	FIT-UP TO THREADED VALVES AND EQUIPMENT	STAINLESS STEEL THREADED MALE END ADAPTERS AS SPECIFIED UNDER FITTINGS

GENERAL

USE NEOLUBE N-5000 ON THREADED JOINT.

NONDESTRUCTIVE EXAMINATION

PARAGRAPH 341.4.1 OF THE ASME B31.3 CODE WITH THE FOLLOWING MODIFICATIONS.

1. POROSITY IS NOT ALLOWED.
2. PROTRUSION WILL BE 1/32" MAXIMUM.

**P-CODE P232**

DESIGN PRESSURE, PSIG 25  
DESIGN TEMPERATURE, °F 775  
MAXIMUM TEST PRESSURE, PSIG 410  
FLUID SERVICE CATEGORY D  
CORROSION EVALUATION NOT REQUIRED.

<u>PIPE</u>	<u>SCHEDULE</u>	<u>SPECIFICATIONS</u>
½ - 1	160	ASTM B622 ALLOY C276, SEAMLESS PIPE
2 - 3	80S	
4 - 12	40S	

<u>FITTINGS</u>	<u>SCHEDULE</u>	<u>SPECIFICATIONS</u>
½ - 1	160	ASTM B366 GRADE WPHC276, SEAMLESS BUTTWELD FITTING, ASME B16.9
2 - 3	80S	
4 - 12	40S	
2 - 3	80S	DIELECTRIC FLANGE UNION COMPOSED OF CLASS 150 WELDING NECK FLANGE AND INSULATED BOLTING PER ASTM B574-N10276 AND INSULATING GASKET, ASME B16.5

<u>JOINTS</u>	<u>TYPE</u>	<u>SPECIFICATIONS</u>
½ - 1	RUN	BUTTWELD

QUALIFICATIONS

DIELECTRIC FLANGE WITH MINIMUM 1" SEPARATION SHALL BE USED AS SHOWN IN THE  
DRAWINGS OR MODEL.

NONDESTRUCTIVE EXAMINATION

PARAGRAPH 341.4.1 OF THE ASME B31.3 CODE

**P-CODE P240**

DESIGN PRESSURE, PSIG 240  
DESIGN TEMPERATURE, °F 375  
MAXIMUM TEST PRESSURE, PSIG 425  
FLUID SERVICE CATEGORY D  
CORROSION EVALUATION NOT REQUIRED.

<u>PIPE</u>	SCHEDULE	SPECIFICATIONS
½ - 12	10S	ASTM A312/A312M GRADE TP304L SEAMLESS PIPE

<u>FITTINGS</u>	SCHEDULE	SPECIFICATIONS
½ - 12	10S	ASTM A403/A403M GRADE WP304L BUTTWELD FITTING ASME B16.9
½ - 2	10S	DIELECTRIC FLANGE UNION COMPOSED OF CLASS 300 WELDING NECK FLANGES PER ASTM A182/A182M F304L; INSULATED TYPE 304 BOLTING, ASME B16.5; AND INSULATING GASKET.

<u>JOINTS</u>	TYPE	SPECIFICATIONS
½ - 12	RUN	BUTTWELD

QUALIFICATIONS

PIPING ELECTRICAL ISOLATION JOINT SHALL BE USED ONLY WHEN SHOWN IN THE DRAWINGS OR MODEL.

NONDESTRUCTIVE EXAMINATION

PARAGRAPH 341.4.1 OF THE ASME B31.3 CODE

**P-CODE P247**

DESIGN PRESSURE, PSIG                    ATM  
DESIGN TEMPERATURE, °F                190  
MAXIMUM TEST PRESSURE, PSIG        50  
FLUID SERVICE                              CATEGORY D

PIPE

SIZE (IN.)	SCHEDULE	SPECIFICATIONS
¾ - 3	40S	ASTM A268 TYPE 446 SEAMLESS OR WELDED MAGNETIC STAINLESS STEEL. TP410, TP430 OR E-BRITE 26-1 MAGNETIC STAINLESS STEEL MAY BE SUBSTITUTED.

FITTINGS

NOT REQUIRED.

JOINTS

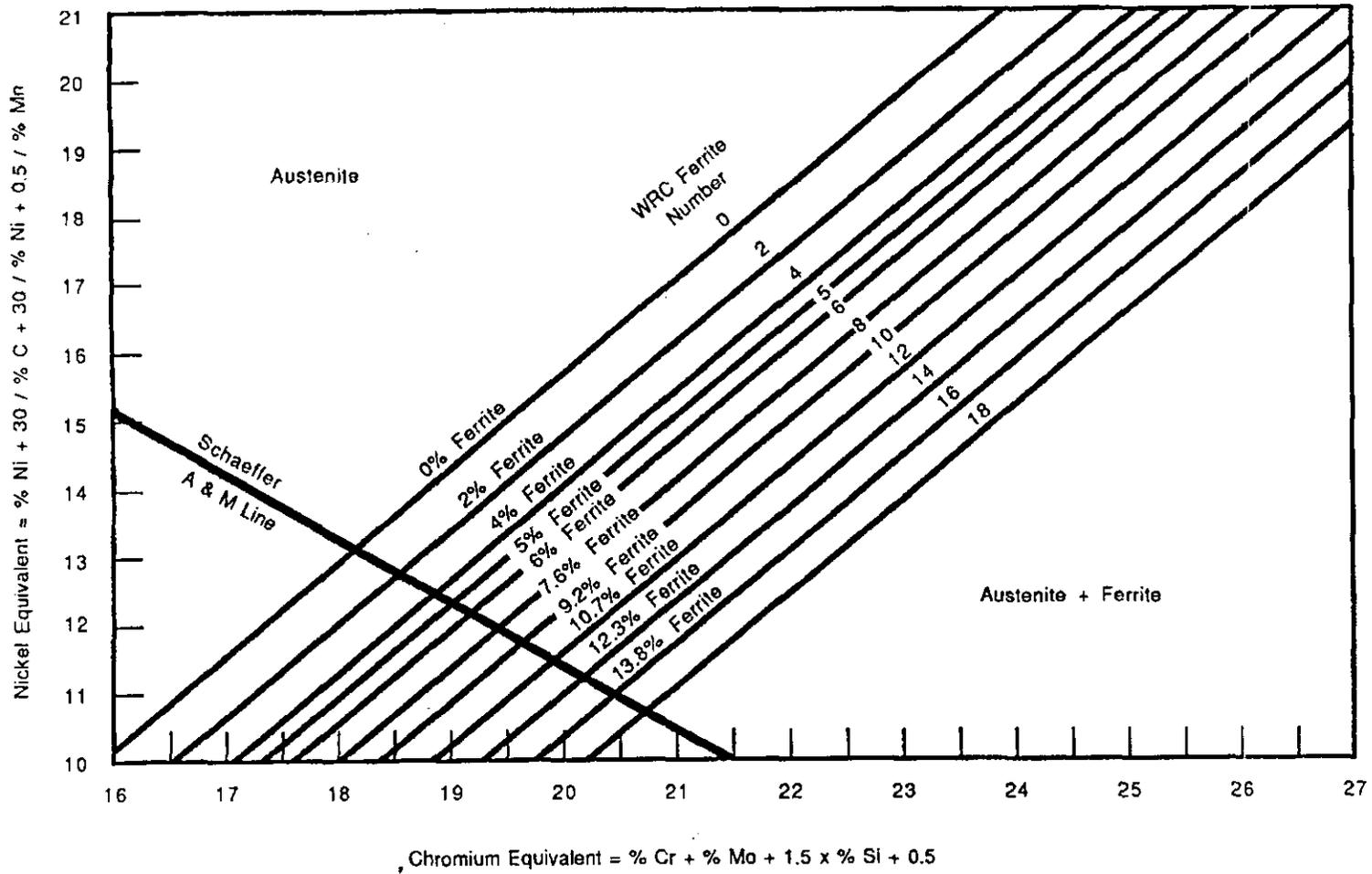
SIZE (IN.)	TYPE	SPECIFICATIONS
¾ - 3	RUNS	BUTT-WELD OR SLEEVE COUPLINGS
2 - 3	FIT-UP TO LOWER HOLDER OR PULL BOX	FILET WELD

QUALIFICATIONS

SLEEVE COUPLINGS MADE FROM PIPE OR PLATE, SAME MATERIAL AS PIPE, MAY BE USED. SLEEVE COUPLING SHALL BE DESIGNED TO AVOID STRIPPING OF WIRE OR CABLE AT CONDUIT INSIDE DIAMETER. SLEEVE COUPLING DETAIL SHALL BE SHOWN ON APPLICABLE DRAWINGS.

NONDESTRUCTIVE EXAMINATION

PARAGRAPH 341 .4.1 OF THE ASME B31.3 CODE.



**GENERAL NOTE:**

The actual nitrogen content is preferred. If this is not available, the following applicable nitrogen value shall be used:

- (a) GMAW welds - 0.08% (except self-shielding flux cored electrode GMAW welds - 0.12%)
- (b) welds of other processes - 0.06%

Figure 1. WRC Delta Ferrite Diagram