ISSUED BY
RPP-WTP PDC

R11125703

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

POSITIVE MATERIAL IDENTIFICATION (PMI) FOR SHOP FABRICATION

Content applicable to ALARA? ☐ Yes ☒ No

ADR No.
NA

Rev

Specification changes retroactive? ☐ Yes ☒ No
☐ N/A (alpha revision or revision 0)

NOTE: Contents of this document are Dangerous Waste Permit affecting.

Quality Level
Q
DOE Contract No. DE-AC27-01RV14136

REV	DATE	BY	CHECK	REVIEW	E&NS	DPEM/EM
8	1/4/10	[signature]	[signature]	[signature]	[signature]	[signature]
7	5/26/05	DAdler	APRangus	SWVail	NA	SWVail for MWHoffmann
6	10/4/04	DAdler	APRangus	SWVail	NA	MHoffmann
5	11/12/03	DAdler	SWVail	APRangus	NA	MHoffmann for GDuncan
4	4/1/03	DAdler	HKrafft	SWVail	NA	MHoffmann for GDuncan
3	3/19/03	DAdler	HKrafft	SK	NA	MHoffmann for GDuncan
2	1/25/03	DAdler	HKrafft	NA	NA	MHoffmann for GDuncan
1	8/19/02	DAdler	GSingh	NA	NA	BRao for GDuncan
0	4/22/02	DAdler	SAtri	NA	NA	GDuncan

SPECIFICATION No.
24590-WTP-3PS-G000-T0002

Rev
8

Revision History

Revision	Reason for Revision
0	Issue for Purchase
1	Revised to clarify wording of Field PMI Requirement
2	Sect 4.2.1: Revision per SDDR 24590-WTP-SDDR-PROC-02-0151, 24590-WTP-SDDR-PROC-02-0152, 24590-WTP-SDDR-PROC-02-0161, 24590-WTP-SDDR-PROC-02-0162. Alternative marking method. Sect. 4.4: Correct and further define limitations on marking materials
3	Sect. 2.2/2.4/3.1: Editorial Sect 2.3.2: Update analyzers available; correct in-document reference Sect. 3.3.1: Correct Pipe Class Sect: 3.3.2: Update Black Cell Rooms Sect: 6/6.3: Correct in-document references Sect. 7: SDDR: 24590-WTP-SDDR-PROC-02-0124 Incorporated by reference. Revision 2 Reason for Revision: Sect 4.2.1 should be Sect. 4.1. Sect. 4.4 should be Sect. 4
4	Editorial changes Sect. 3.3.1/3.3.2: eliminate reference to specific Pipe Classes. Modify text to clarify requirement. Sect. 6: include 304 in the element identification table. Table 1: amend 304/304L exclusion statement. Sect. 7: remove "new" designation of SDDR incorporated by reference
5	Editorial changes to clarify intent . Section 2: added Applicable Document Sect. 3.3.2.a: include additional approved analyzer Sect. 3.3.4/5.3: include info regarding small parts/fasteners Sect. 4.2: extensive revision of requirements for piping Sect. 5.2: additional approved marking method Section 7: clarification of weld composition requirements Section 8: revised to include change documents incorporated by reference Incorporate 24590-WTP-FCR-P-03-046 Extensive revision of Table 1 - PMI Requirements Added Table 2 Systems, Facilities and Fluid Codes Requiring PMI Testing Added Table 3 – Base Material and Weld Filler Metal Composition Requirements
6	Incorporate 24590-WTP-3PN-G000-00006, -00007, -00008 and -00009. Incorporate 24590-WTP-SDDR-PROC-03-0415, and 24590-WTP-SDDR-PROC-04-00023 Eliminate field PMI requirements, section 4.3. Re-title to specify "SHOP FABRICATION" Clarify wording in sections 3.1, 3.3.4, 4.2.1, 6.e and 7.1. Revise section 8 – incorporate SDDRs by reference
7	Incorporate SCNs: 24590-WTP-3PN-G000-00012, 24590-WTP-3PN-G000-00015, 24590-WTP-3PN-G000-00016, and 24590-WTP-3PN-G000-00019. Incorporate SDDRs by reference into section 8 Add section 2.1.2, reference document Expand Table 3 to include additional base material/weld filler material combinations. Revise section 3.1 to include additional definition. Revise section 7 table and Table 1 to include additional materials.
8	Revision to incorporate already approved change documents. Incorporate 24590-WTP-SDDR-PL-09-00054, 24590-WTP-SDDR-PL-08-00071, 24590-WTP-SDDR-ML-05-00055, 24590-SDDR-M-05-00466, 24590-WTP-FC-P-08-0253 Incorporate 24590-WTP-3PN-G000-00026 – Modify Table 1 – Alloy piping section Incorporate 24590-WTP-3PN-G000-00031 All instances of "black cell" throughout are modified to "black cell and hard-to-reach areas". Section 1/Paragraph 3.1 – remove "in contact with process fluids".

Revision	Reason for Revision
	Paragraph 3.1 – definition of "black cell" and "hard-to-reach areas" (editorial modification to SCN) Section 4 title modified Paragraph 4.2.1 – include non-autogenous longitudinal weld requirement Modify Table 1 alloy piping and pressure-retaining welds section and notes. Paragraph 3.3.2.a – include X-Met 3000TA as an acceptable analyzer Paragraph 3.3.2.b – include SpectroLab as an acceptable analyzer. Table 3 – include additional base metal/weld filler combinations. Section 8 – remove asterisk from SDDRs previously listed. Add new Incorporate by Reference SDDRs.

Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Contents

Notice ii
1 Scope 1
2 Applicable Documents 1
2.1 Reference Documents/Drawings 1
3 Technical Requirements 1
3.1 General 1
3.2 Responsibility 2
3.3 Verification Method 2
3.4 Welding Consumable Control 3
4 Extent of PMI 3
4.1 Vessels, Exchangers, Tanks, Filters and other Manufactured Equipment 3
4.2 Shop Fabricated Piping 3
4.3 Deleted 3
4.4 Valves and Pumps 3
4.5 Bulk Materials (Straight Run Piping, Fittings, Stock Valves, Etc.) 4
5 Identification 4
5.1 General 4
5.2 Marking Materials 4
5.3 Equipment and Equipment Components 4
5.4 Piping Materials 4
5.5 Fasteners and Small Parts 4
6 Records of PMI 4
7 Acceptance, Rejection and Retesting Requirements 5
8 Design Changes Incorporated by Reference 10

Tables

Table 1 PMI Requirements for Shop Fabricated Items/Pieces 6
Table 2 Systems, Facilities and Fluid Codes Requiring PMI Testing (Shop Fabricated Piping) 8
Table 3 Base Material and Weld Filler Metal Composition Requirements (Wt %) 9

1 Scope

This Specification covers the minimum requirements for and the extent of application of Positive Material Identification (PMI) testing of shop fabricated pressure retaining equipment and piping. This Specification applies to shop fabrication only. For field fabrication requirements see 24590-WTP-3PS-G000-T0010.

2 Applicable Documents

2.1 Reference Documents/Drawings

2.1.1 Deleted

2.1.2 24590-WTP-3PS-G000-T0010 Engineering Specification For Positive Material Identification (PMI) For Construction

3 Technical Requirements

3.1 General

The purpose of PMI is to ensure that the material is correctly supplied. Materials, equipment, and piping requiring PMI per this Specification are identified in Table 1. Specifically, within the black cell and hard-to-reach areas, PMI is required for all radioactive and non-radioactive systems and all fluid codes. Outside the black cell and hard-to-reach areas, PMI is required for shop fabricated items fabricated from the alloys identified in Table 1 when used in radioactive and dangerous waste systems as identified in Table 2. Table 2 lists systems, facilities, and fluid codes requiring PMI testing for shop fabricated piping. When required by this Specification, PMI testing will be done on each component of a pressure retaining assembly. This shall include each individual segment of pipe, each plate, and all other pieces of base materials (e.g., forgings, fittings, and tubing) and all required pressure retaining welds.

For purposes of this Specification, the following definitions are used:

Alloy: Metallic materials (including welding filler materials) which contain alloying elements including but not limited to: Chromium (Cr), Nickel (Ni), Molybdenum (Mo), Copper (Cu) or Tungsten (W).

300 Series Stainless: Austenitic Stainless Steels (304L, 316L, etc.)

6 % Mo: AL6XN, 254 SMO, etc.

Duplex Stainless Steel: CD4MCu, etc.

Nickel Base: Alloy C-22, 625, 690, etc.

Black Cells: Closed cells where access is not planned during facility operation or scheduled shutdown periods. In black cells, inspection, maintenance, repair, or replacement of equipment or components is impracticable because no engineered access openings are provided for any of those purposes. The room numbers of the black cells, located in the PTF and HLW facilities are:

Room Numbers P-0102, P-0102A, P-0104, P-0106, P-0108, P-0108A, P-0108B, P-0108C, P-0109, P-0111, P-0112, P-0113, P-0114, P-0117, and P-0117A in the PTF Building

Room numbers H-B005, H-B014, and B-B021 in the HLW Building

Hard-To-Reach Areas: Facility areas located in the rooms listed below where piping and equipment is not designed for manual or remote access, replacement, or repair. Hard-to-reach piping extends out to the first accessible weld:

PTF Facility Room P-B001, P-B001A, P-B002, B-B003, P-B004, P-0123 (piping out to jumper nozzles), P-0123 (components above crane), P-0123A (components above crane), P-0335 (components out of reach of crane and below the filter deck), and P-0335A (components out of reach of crane and below the filter deck).

HLW Facility Room H-B005A, H-B015, H-B032, HCH14, HCH15, H-0104 (components out of reach of crane and below filter deck), H-0115, H-0121, H-0136 (components out of reach of crane or below canister racks or weld table), H-0302, and H-0308.

3.2 Responsibility

The Seller shall submit to the Buyer, for review and comment prior to fabrication, procedures covering how PMI will be conducted and documented. The Seller's procedures shall include the instrument manufacturer's procedures and requirements, operator qualification/re-qualification requirements, instrument calibration method(s), calibration frequency during testing, criteria for acceptance or rejection, material identification method, and record keeping.

3.3 Verification Method

3.3.1 Instruments used for PMI shall be of the type that will provide quantitative, recordable, elemental composition results for positive identification of the alloy elements present.

a PMI shall be done per the procedures outlined by the manufacturer of the PMI instrument being used. Modification of these procedures must be approved by the Buyer.

b Each PMI instrument shall be calibrated according to the manufacturer's requirements.

3.3.2 The methods/instruments listed below are acceptable. In application, they must not be used in a "go-no-go" mode. The only acceptable objective is the positive identification, listing, and quantification of the relevant elements listed in section 7.

a Portable X-ray fluorescence analyzers. Use is limited to the following instruments or their equivalent unless prior approval is given by the Buyer:

- TN Technologies Alloy Analyzer 9266, 9277 (The Metallurgist XR) or 9288
- Outokumpu X-Met 840, or X-Met 880
- Niton metal Alloy Analyzer (800 Series)
- Metorex X-Met 920 or X-Met 3000TA Metal Analyzer
- Innov-X Systems XT Series Analyzer

b Portable optical emission analyzers. Use is limited to the following instruments or their equivalent unless prior approval is given by the Buyer:

- SpectroPort Model TP-07 or TFO-02

- Outokumpu ARC-MET 900 or the New Spectrotest
- SpectroLab, Spectrotest and Spectrotest Jr.

Any other instrument will require Buyer's approval.

Note: Arc strikes, if any, need not be removed.

3.3.3 In lieu of using portable instruments, chemical analysis can be performed on actual material samples. Care must be exercised while collecting samples, as contamination can be contributed by the removal tools. Sample extraction shall not weaken or reduce the functionality of the component. Laboratory analysis reports shall be traceable to the individual component from which the sample was taken (See section 6, below).

3.3.4 Parts that are too small to be tested using an alloy analyzer are exempt from PMI testing. If such exemption is claimed, the PMI procedure shall specify the minimum part size capable of being tested.

3.4 Welding Consumable Control

In addition to PMI testing required by this Specification, the Seller shall have in place, and implement, welding consumable material control systems that can be verified by auditing. PMI of completed pressure retaining welds is required as indicated in Table 1. Production "Run Off" weld test coupons may be used for chemical analysis checks.

4 Extent of PMI

PMI shall be performed on completed equipment, or assembled parts of equipment, at such time as to ensure that only verified materials have been used in the fabrication and final assembly of components. If the assembled equipment configuration prevents PMI of any individual part, then that part shall be tested prior to assembly and be noted as such on the PMI documentation.

4.1 Vessels, Exchangers, Tanks, Filters and other Manufactured Equipment

Vessels, exchangers, and other manufactured equipment shall have PMI testing performed at the Seller's facilities. This shall include piping and components supplied as part of an equipment "package" or skid.

4.2 Shop Fabricated Piping

4.2.1 PMI is required for all piping and piping components, circumferential pressure retaining welds, and non-autogenous longitudinal welds as indicated in Tables 1 and 2.

4.2.2 PMI is not required on autogenous welds, fillet welds, or socket welds.

4.3 Deleted

4.4 Valves and Pumps

PMI of valves and pumps is required for materials as indicated in Table 1 and Piping Fluid Codes as indicated in Table 2.

4.5 Bulk Materials (Straight Run Piping, Fittings, Stock Valves, Etc.)

PMI is required as indicated in Table 1.

5 Identification

5.1 General

All shop fabricated items/pieces that have been successfully subjected to the required PMI shall be marked. The mark shall be durable and last through transportation and receiving inspection at the Buyer's facility. See section 7 for items that do not pass PMI.

5.2 Marking Materials

Marking materials and adhesive tape selected shall not cause corrosion or other harmful effects. Requirements for marking materials:

- The total chloride/flouride content shall not exceed 200 ppm.
- The total sulfur content shall not exceed 400 ppm.
- The total of low melting point metals such as lead, zinc, copper, tin, antimony, and mercury shall not exceed 1 percent. Of this mercury shall not exceed 50 ppm.

5.3 Equipment and Equipment Components

When it has been verified that the material has a composition consistent with the material specified, then it must be stamped with letters "PMIV". Use low stress stamps for identification. Items that cannot be stamped shall have an alternate system of marking. Heat exchanger tubing shall not be stamped. Any alternate system, and the items for which it will be used, must have Buyer approval. To the maximum extent possible, the stamping/marking shall be located for ease of future reference/verification.

5.4 Piping Materials

When it has been verified that the material has a composition consistent with the material specified, then a colored adhesive tape, or other approved marking method, shall be applied at one end to facilitate proper identification.

5.5 Fasteners and Small Parts

Fasteners and small parts shall be marked in accordance with the Seller's procedure using a hard marking method, an indelible ink, or paint.

6 Records of PMI

Results shall be recorded on PMI report forms, which shall indicate, as a minimum, the following for each examination:

a Name of inspector
b Date of testing
c Test method, including PMI instrument name and serial number
d Equipment tag number or pipe spool number (PO No. For bulk items) for the specific piece tested
e Quantitative analysis results for relevant elements (see section 7)

A map shall be prepared for fabricated equipment or pipe spool, including components and welds, showing the locations of PMI testing.

An extended Shop Spool Sheet shall be provided for each individual spool number where PMI was done.

In the case of bulk items, PMI results may be submitted in the form of a certificate verifying that parts were tested according to the requirements of this specification. Results shall be reported by heat/lot and shall include the following:
a Name of inspector
b Date of testing
c Test method, including PMI instrument name and serial number
d Type and number of pieces tested
e Acceptable composition ranges for the relevant elements (see section 7)
f Material identified

PMI forms shall become a part of the permanent inspection records. Seller shall submit the completed forms as part of the Final Document Package when required by the Form G-321-V in the Purchase Order.

7 Acceptance, Rejection and Retesting Requirements

All materials tested shall be identified by the PMI instrument as being consistent with the composition of the specified material. The results shall fall within the chemical composition requirements of the ASTM, AWS or other applicable material specification allowing for the accuracy of the instrument. Any questionable PMI result shall be re-analyzed by the same or another instrument, after verification of proper surface preparation. See section 7.1, below, for materials and welds that fail to meet requirements on the second analysis.

The following elements shall be identified and recorded, even if the instrument does provide immediate identification (e.g. display of "316", "6 Mo", etc.):

Alloy	Elements
304, 304L	Ni, Cr
316, 316L	Ni, Cr, Mo
347	Ni, Cr, Nb
Duplex, 6% Mo, 254 SMO, AL6XN, etc.	Ni, Cr, Mo, Cu
Nickel base alloys, C-22, 625, 690, etc.	Ni, Cr, Mo, W

Welds joining dissimilar base materials or that do not match the base material composition may include an allowance for dilution. Acceptable composition ranges for commonly used combinations of base material and weld filler metals are included in Table 3. Other combinations, when required, shall be identified to the Buyer for approval.

7.1 If any material, component, or weld of a type not requiring 100% testing is found to be unacceptable, all other materials, components, or welds (same heat, lot, etc.) represented by that failed item shall be considered suspect. The Buyer shall be notified immediately if a component is confirmed to have failed the PMI. The Seller will then have the following options, with Buyer concurrence:

a Scrapping/removing all materials, components, or welds represented by the test piece (all of that heat, lot, etc.) and replacing with new components or filler metals, or

b Performing 100 percent examination of the remainder of the represented materials, components, or welds, and replacing each item that fails the PMI check, or

c Verifying correct chemistry by laboratory chemical analysis.

7.2 If questionable values obtained with portable analyzers are verified by laboratory analysis, the laboratory analysis data shall be used and recorded.

7.3 Any item or component containing materials that have not passed the PMI shall be clearly marked as "DO NOT USE – PMI FAILED" and segregated from the remainder of the stock.

Table 1 PMI Requirements for Shop Fabricated Items/Pieces

ITEM - (Note 1)	VERIFICATION REQUIRED
Type 304 & 304L Stainless Steel Components	Yes – 100 % when in black cell and hard-to-reach areas
Type 316, 316L, & 347 Stainless Steel Components	Yes -- 100 %
6% Mo Components	Yes – 100 %
Duplex Stainless Steel Components	Yes – 100%
Nickel Base Alloy Components	Yes – 100 %
Alloy Valves	Yes – 100 % Body and Bonnet Only
Alloy Pumps	Yes – 100 % Casing Only
Alloy Piping – including non-autogenous longitudinal welds (Spools, Jumper Pipes, Fittings, and Straight-Run Pipe)	Yes – 100 % for 6 % Mo alloys, Nickel base alloys and all Jumper Pipes Yes -- 100 % for 316L used in black cell and hard-to-reach areas irrespective of system/fluid code combination (Table 2 is NOT applicable) Yes -- 100 % for 316L used in the system and piping fluid code listed in Table 2 outside black cell and hard-to-reach areas Yes – 100 % for 304L used in black cell and hard-to-reach areas irrespective of system/fluid code combination (Table 2 is NOT applicable)
Alloy Pressure Retaining Welds	Yes – 100 % of completed welds that join material required to have PMI testing

ITEM - (Note 1)	VERIFICATION REQUIRED
Bolting – B8M used for Pressure Retaining Connections	Yes – 5 % of total bolts, minimum one check per heat
Alloy Heat Exchanger Tubing	Yes – 5 % of total tubes, minimum one check per heat
Venturis	Yes – 100 % pipes and welds

Note:

1. The following items are exempted unless specifically designated for PMI by the Purchase Order:
   - a All type 304L stainless steel components, piping, and welds, except for those located in black cell and hard-to-reach areas
   - b Deleted
   - c Non pressure-retaining parts, such as baffles, trays, tray clips, supports, pall-rings, support rings, etc.
   - d Non pressure-retaining welds and sections of piping, such as drains, vents, overflows, etc.
   - e Gaskets
   - f Tubing and instrumentation (except when in black cells or hard-to-reach areas)
   - g HVAC ducting
   - h Piping components located within piping systems for which PMI is NOT required.

Table 2 Systems, Facilities and Fluid Codes Requiring PMI Testing (Shop Fabricated Piping)

System	System Name	Facility	Fluid Code
ASX	Autosampling System	PTF, LAW, HLW, LAB	PB,ZF,ZJ,ZN,ZS
CNP	Cesium Nitric Acid Recovery Process System	PTF	GV,PA,PB,PC,PF,PH,PP,PW,PX,PZ,ZF,ZH, ZJ,ZL,ZN,ZR,ZS,ZY
CRP	Cesium Resin Addition Process System	PTF	GV,PA,ZF,ZL,ZS
CXP	Cesium Ion Exchange Process System	PTF	GV,PA,PB,PF,PX,ZF,ZJ,ZL,ZS
FEP	Waste Feed Evaporation Process System	PTF	GV,PU,PW,PX,PZ,ZF,ZR,ZS
FRP	Waste Feed Receipt Process System	PTF	GV,PB,PH,PW,PX,PZ,ZF,ZL,ZN,ZS
HCP	HLW Concentrate Receipt Process System	HLW	GV,PC,PW,PX,ZF,ZS
HDH	HLW Canister Decontamination Handling System	HLW	GV,PA,PJ,ZF,ZR
HFP	HLW Melter Feed Process System	HLW	GV,PA,PB,PC,PJ,PW,ZF
HLP	HLW Lag Storage and Feed Blending Process System	PTF	GV,PC,PF,PJ,PW,PX,ZF,ZS
HMP	HLW Melter Process System	HLW	PB,ZF,ZS
HOP	Melter Offgas Treatment Process System	HLW	GV,PA,PB,PW,ZF,ZR,ZS
HPH	HLW Canister Pour Handling System	HLW	PA
LCP	LAW Concentrate Receipt Process System	LAW	GV,PB,PH,PW,ZS
LFP	LAW Melter Feed Process System	LAW	GV,PB,PE,ZH,ZS
LMP	LAW Melter Process System	LAW	PB
LOP	LAW Primary Offgas Process System	LAW	GV,PU,PW,ZR,ZS
LVP	LAW Secondary Offgas/Vessel Vent Process System	LAW	GV,PW,ZF,ZS,ZY
PJV	Pulse Jet Ventilation System	HLW, PTF	GV,PU,PV,PW,ZF,ZS,ZY
PVP	Pretreatment Vessel Vent Process System	PTF	GV,PA,PH,PS,PU,PW,PZ,ZF,ZS,ZY
PVV	Process Vessel Vent	HLW	GV
PWD	Plant Wash and Disposal System	HLW, PTF	GV,PA,PH,PX,PZ,ZF,ZH,ZJ,ZN,ZR,ZS,ZY
RDP	Spent Resin Collection and Dewatering Process System	PTF	GV,PA,ZF,ZL,ZS
RLD	Radioactive Liquid Waste Disposal System	LAB, LAW HLW, PTF	GV,PA,PB,PC,PR,PV,PW,ZF,ZH,ZJ,ZL, ZN,ZR,ZS,ZY
TCP	Treated LAW Concentrate Storage Process System	PTF	GV,PA,PB,PH,PW,PX,ZF,ZR,ZS
TLP	Treated LAW Evaporation Process System	PTF	GV,PA,PB,PH,PU,PW,PZ,ZF,ZJ,ZR,ZS
UFP	Ultrafiltration Process System	PTF	GV,PB,PP,PW,PX,PZ,ZF,ZH,ZS

Table 3 Base Material and Weld Filler Metal Composition Requirements (Wt %)

MATERIAL	Cr	Ni	Mo	Cu	W	Notes
304L BM	18.0 - 20.0	8.0 - 12.0	---	---	---	
308L WFM	19.5 - 22.0	9.0 - 11.0	0.75 max	---	---	E/ER308L & LT
304L Welds	18.0 - 22.0	8.0 - 12.0	0.75 max	---	---	Note 1
304L BM	18.0 - 20.0	8.0 - 12.0	---	---	---	
316L BM	16.0 - 18.0	10.0 - 14.0	2.0 - 3.0	---	---	
316L WFM	17.0 - 20.0	11.0 - 14.0	2.0 - 3.0	---	---	E/ER316L & LT
304L/316L Welds	16.0 - 20.0	8.0 - 14.0	3.0 max	---	---	Note 1
304L BM	18.0 - 20.0	8.0 - 12.0	---	---	---	
316L BM	16.0 - 18.0	10.0 - 14.0	2.0 - 3.0	---	---	
308L WFM	19.5 - 22.0	9.0 - 11.0	0.75 max	---	---	E/ER308L & LT
304L/316L Welds	16.0 - 22.0	8.0 - 14.0	3.0 max	---	---	Note 1
304L BM	18.0 - 20.0	8.0 - 12.0	---	---	---	
308L WFM	19.5 - 22.0	9.0 - 11.0	0.75 max	---	---	E/ER308L & LT
CD4MCu BM	24.5 - 26.5	4.75 - 6.0	1.75 - 2.25	2.75 - 3.25	---	
304L/CD4MCu welds	18.0 - 26.5	4.75 - 12.0	2.0 max	---	---	Note 1
316L BM	16.0 - 18.0	10.0 - 14.0	2.0 - 3.0	---	---	
316L WFM	17.0 - 20.0	11.0 - 14.0	2.0 - 3.0	---	---	E/ER316L & LT
316L Welds	16.0 - 20.0	10.0 - 14.0	2.0 - 3.0	---	---	Note 1
316L BM	16.0 - 18.0	10.0 - 14.0	2.0 - 3.0	---	---	
316L WFM	17.0 - 20.0	11.0 - 14.0	2.0 - 3.0	---	---	E/ER316L & LT
CD4MCu BM	24.5 - 26.5	4.75 - 6.0	1.75 - 2.25	2.75 - 3.25	---	
316L/CD4MCu welds	16.0 - 26.5	4.75 - 16.0	1.75 - 3.0	---	---	Note 1
AL6XN BM	20.0 - 22.0	23.5 - 25.5	6.0 - 7.0	0.75 max	---	
625 WFM	20.0 - 23.0	58.0 min	8.0 - 10.0	0.50 max	---	E/ERNiCrMo-3
AL6XN Welds	20.0 - 23.0	25.5 min	7.0 - 10.0	0.75 max	---	Note 2
C-22 BM	20.0 - 22.5	Remainder	12.5 - 14.5	---	2.5 - 3.5	
CD4MCu BM	24.5 - 26.5	4.75 - 6.0	1.75 - 2.25	2.75 - 3.25	---	
C-22 WFM	20.0 - 22.5	Remainder	12.5 - 14.5	0.5 max	2.5 - 3.5	E/ERNiCrMo-10
C-22/CD4MCu welds	16.0 - 22.5	25.0 min	10.5 - 14.5	---	2.5 - 4.5	
C-22 BM	20.0 - 22.5	Remainder	12.5 - 14.5	---	2.5 - 3.5	
C-22 WFM	20.0 - 22.5	Remainder	12.5 - 14.5	0.5 max	2.5 - 3.5	E/ERNiCrMo-10
C-22 Welds	20.0 - 22.5	52.0 min	12.5 - 14.5	---	2.5 - 3.5	Note 1

BM = Base metal; WFM = Weld filler metal

Notes:

1. Acceptance is based on the combined base metal and WFM spec requirements.
2. Acceptance is based on WFM spec and the expected amount of dilution for molybdenum.

8 Design Changes Incorporated by Reference

24590-WTP-SDDR-PROC-02-0124
24590-WTP-SDDR-PROC-03-0249
24590-WTP-SDDR-PROC-03-0267
24590-WTP-SDDR-PROC-03-0282
24590-WTP-SDDR-PROC-03-0306
24590-WTP-SDDR-PROC-03-0369
24590-WTP-SDDR-PROC-03-0453
24590-WTP-SDDR-PROC-04-00152
24590-WTP-SDDR-PROC-04-00183
24590-WTP-SDDR-PROC-04-00399
24590-WTP-SDDR-PROC-04-00410
24590-WTP-SDDR-PROC-04-00743
24590-WTP-SDDR-PROC-04-00896
24590-WTP-SDDR-PROC-05-00031
24590-WTP-SDDR-PROC-05-00520
24590-WTP-SDDR-PROC-05-00606
24590-WTP-SDDR-PL-05-00004
24590-WTP-SDDR-M-05-00572*
24590-WTP-SDDR-M-05-00588*
24590-WTP-SDDR-M-05-00628*
24590-WTP-SDDR-M-05-00652*
24590-WTP-SDDR-M-05-00757*
24590-WTP-SDDR-M-05-00758*
24590-WTP-SDDR-M-06-00110*
24590-WTP-SDDR-M-06-00190*
24590-WTP-SDDR-ML-07-00058*
24590-WTP-SDDR-ML-07-00191*
24590-WTP-SDDR-MS-08-00086*
24590-WTP-SDDR-MS-09-00015*
24590-WTP-SDDR-PL-05-00043*
24590-WTP-SDDR-PL-06-00023*
24590-WTP-SDDR-PROC-04-00808*

* new