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USACE / NAVFAC / AFCESA / NASA **UFGS-23 31 13.20 40 (July 2007)**

Preparing Activity: NASA **Superseding UFGS-23 31 13.20 40 (October 2006)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2007

Latest change indicated by CHG tags

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DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

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WELDING METAL DUCTWORK

07/07

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SECTION 23 31 13.20 40

WELDING METAL DUCTWORK
07/07

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NOTE: This specification covers the requirements for welding of metals for mechanical use.

This section covers work requiring steel welding. Accordingly, the specifier shall include Section 05 05 23 WELDING, STRUCTURAL; in this specification if any such welding is required.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASME INTERNATIONAL (ASME)

ASME B31.1	(2004; Addenda 2005) Power Piping
ASME B31.3	(2004) Process Piping
ASME B31.5	(2001; Addenda 2004) Refrigeration Piping and Heat Transfer Components
ASME BPVC SEC IX	(2004; 2005 Addenda; 2006 Addenda) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME BPVC SEC V	(2004; 2005 Addenda; 2006 Addenda) Boiler and Pressure Vessel Code; Section V, Nondestructive Examination
ASME BPVC SEC VIII D1	(2004; 2005 Addenda; 2006 Addenda) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage
ASME BPVC SEC VIII D2	(2004) Boiler and Pressure Vessel Code; Section VIII, Rules for Construction of Pressure Vessels Division 2 - Alternatives Rules

INTERNATIONAL CODE COUNCIL (ICC)

ICC IPC	(2003; Errata 2003; Errata 2004; Errata 2004; Errata 2005) International Plumbing Code

NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS (NBBPVI)

NBBPVI NB-23	(2004) National Board Inspection Code

PIPE FABRICATION INSTITUTE (PFI)

PFI ES 1	(1992; R 2004) Internal Machining and Solid Machined Backing Rings for

	Circumferential Butt Welds
PFI ES 21	(1998; R 2004) Internal Machining and Fit-up of GTAW Root Pass Circumferential Butt Welds
PFI ES 3	(2004) Fabricating Tolerances
PFI ES 31	(1992; R 2004a) Standard for Protection of Ends of Fabricated Piping Assemblies
PFI ES 35	(1998; R 2004a) Nonsymmetrical Bevels and Joint Configurations for Butt Welds
PFI ES 7	(1994; R 2004) Minimum Length and Spacing for Welded Nozzles
PFI TB1	(1994; R 1999) Pressure Temperature Ratings of Seamless Pipe Used in Power Plant Piping Systems

1.2 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

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

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

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control

approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's catalog data shall be submitted for Welding Equipment and Welding Rods and Accessories in accordance with paragraph entitled, "Welding Equipment," of this section.

SD-04 Samples

Welder's Pre-Qualification Samples shall be submitted prior to start.

SD-06 Test Reports

Test reports shall be submitted for Radiographs.

SD-07 Certificates

Certificates for the following shall be submitted in accordance with paragraph entitled, "Quality Assurance," of this section.

Certified Welding Procedure Specifications (WPS)
Certified Brazing Procedure Specifications (BPS)
Certified Procedure Qualification Records (PQR)
Certified Welder Performance Qualifications (WPQ)
Certified Brazer Performance Qualifications (BPQ)

1.3 QUALITY ASSURANCE

Within [fifteen] [ ] calendar days after receipt of Notice to Proceed, the Contractor shall submit for [approval] [review] to the Contracting Officer Certified Welding Procedure Specifications (WPS), Certified Brazing Procedure Specifications (BPS) and Certified Procedure Qualification Records. (PQR)

[Fifteen] [_____] calendar days prior to any employee welding on project material, the Contractor shall submit for [approval] [review] to the Contracting Officer [two] [_____] copies of each Certified Welder Performance Qualifications (WPQ) and Certified Brazer Performance Qualifications (BPQ).

1.3.1 Personnel Qualifications

This specification contains the minimum requirements for qualifying welding procedures, welders, and welding operators for making and inspecting welds in mechanical fabrications of carbon steel, low alloy steel, extra-high-strength quenched and tempered low alloy steels, and austenitic stainless steel materials.

[No pre-qualified welding procedures are allowed. Contractor shall qualify the welding procedures and welders by tests prescribed in accordance with ASME BPVC SEC IX, not withstanding the fact the code or specification may allow pre-qualified procedures.]

Welder's Pre-Qualification Samples shall be submitted by qualified welding

operators performing work on contract prior to start. Only after acceptance of samples, will qualified welding operator be permitted to begin work.

1.3.2 Pressure Vessels Qualification

Qualification documents [WPS] [BPS], PQR and [WPQ] [BPQ] shall be in accordance with ASME BPVC SEC IX.

1.3.3 Piping Qualifications

1.3.3.1 High Pressure Piping

Qualification documents for 860 kilopascal (125 psig) 125 psig or above, [(WPS] [BPS], PQR and [WPQ)] [BPQ] shall be in accordance with ASME BPVC SEC IX.

1.3.3.2 Low Pressure Piping

Refrigeration Piping: Qualification documents for below 860 kilopascal (125 psig) 125 psig, [WPS] [BPS], PQR and [WPQ] [BPQ] for "Refrigeration Piping" shall be in accordance with ASME B31.5.

Plumbing: Plumbing work shall be performed by a state licensed plumber registered in the state where the work is being performed.

Other Low Pressure Piping: Qualification documents, [WPS] [BPS], PQR and [WPQ] [BPQ] shall be in accordance with ASME BPVC SEC IX.

1.4 WELDING EQUIPMENT

Manufacturer's catalog data shall be provided for welding equipment and welding rods and accessories. Equipment shall meet referenced standards contained in this section.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 CONSTRUCTION

3.1.1 Pressure Vessels

3.1.1.1 New Construction

Contractor shall meet the fabrication, welding/brazing and inspection requirements of the [ASME BPVC SEC VIII D1] [ASME BPVC SEC VIII D2].

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NOTE: Specifier should also reference any companion codes necessary to meet applicable national standards or specific project requirements.
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3.1.1.2 Repairs to Existing Pressure Vessels

Code Stamped Vessels: Contractor shall meet the fabrication,

welding/brazing and inspection requirements of NBBPVI NB-23.

Non-Code Vessels: Contractor shall meet the fabrication, welding/brazing and inspection requirements of NBBPVI NB-23 with the following exception:

a. It is not necessary that a National Board Code Inspector inspect the work.

b. National Board ("R" Stamp) Code stamping is not required.

3.1.2 Piping

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NOTE: Specifier may elect to use any or all of the following fabrication guidelines. Any companion code requirements may be added at the specifier's option.
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3.1.2.1 High Pressure (860 kilopascal 125 Psig or Above)

Steam Piping: Piping systems shall be fabricated, assembled and welded/brazed in accordance with ASME B31.1, and Power Piping Codes, PFI ES 1, PFI ES 3, PFI ES 7, PFI ES 21, PFI ES 31, PFI ES 35, and PFI TB1, of the Piping Fabrication Institute's companion code requirements.

Other High Pressure Piping: Other high pressure piping systems shall be fabricated, assembled and welded/brazed in accordance with ASME B31.3, and Power Piping Codes, PFI ES 1, PFI ES 3, PFI ES 7, PFI ES 21, PFI ES 31, PFI ES 35, and PFI TB1, of the Piping Fabrication Institute's companion code requirements.

3.1.2.2 Low Pressure (Below 860 kilopascal 125 Psig)

Refrigeration Piping: Piping systems shall be fabricated, assembled and welded/brazed/soldered in accordance with the ASME B31.5.

Plumbing: Plumbing systems shall be fabricated, assembled and welded/brazed/soldered in accordance with ICC IPC.

Other Low Pressure Piping: Other low pressure piping systems shall be fabricated, assembled and welded/brazed/soldered in accordance with the ASME B31.1.

3.2 HEAT INPUT REQUIREMENTS

3.2.1 Preheat

Welding shall not be done at ambient temperature below 0 degrees C 32 degrees F, or when the surfaces are wet or exposed to rain, snow, or high wind. Temperature of the metals in the area where the welding is to be done shall be not less than 10 degrees C 50 degrees F. When the ambient conditions are such that the normal temperature of the base metal is below 10 degrees C 50 degrees F, the area surrounding the joint shall be preheated to provide a base metal temperature of 38 degrees C 100 degrees F for a distance of at least 75 millimeter 3 inches in all directions from the joint to be welded. Preheat shall be in accordance with ASME BPVC SEC VIII D1 [ASME BPVC SEC VIII D2] and ASME BPVC SEC V.

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NOTE: Welding a steel which is at an initial temperature below 100 degrees F 38 degrees C may require localized preheating to remove moisture from the surface of the steel.
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3.2.2 Interpass

In a multipass weld, the interpass temperature is the temperature of the weld metal before the next pass is started. Interpass requirements shall be in accordance with [ASME BPVC SEC VIII D1] [ASME BPVC SEC V] [ASME BPVC SEC VIII D2].

3.2.3 Postweld

Weldments shall not be given a postweld heat treatment unless noted in the applicable [NASA approved] code qualified/certified welding documentation, WPS, PQR and WPQ.

3.3 INSPECTION/NONDESTRUCTIVE TESTING (NDT)

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NOTE: Inspection and acceptance requirements of these codes and standards are the minimum requirements. Additional inspections and tighter acceptance requirements may be used, but the specifier must note the additional NDT requirements on the specifications/drawings.
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3.3.1 General

Fabrication/Erection inspection shall be performed prior to assembly, during assembly, during welding and after welding to ensure that materials and workmanship meet the requirements of the contract documents.

Each specified radiograph shall, as a minimum, have the following additional information permanently included in the image:

Agency Weld No. (including repair cycle no.)

Agency drawing No.

Agency View No.

Agency Contract No.

Final interpretation and acceptance of all Radiographs of welded joints, with the exception of code stamped pressure vessel welds, will be by the Contracting Officer.

Final acceptance of all welded/brazed joints shall be by the Contracting Officer.

Prior to the Contracting Officer's inspection, all slag and scale shall be removed from all welds. Procedure employed shall not produce notches in either the weld metal or adjacent base metal.

Unacceptable welds shall be immediately repaired and made ready for Government reinspection at no additional cost to the Government.

After weld joints have been satisfactorily completed by the Contractor and accepted by the Contracting Officer, the joint area shall be cleaned to a bright, unpitted, and unscarred surface and then protected in accordance with the contract documents.

3.3.2 Pressure Vessels

3.3.2.1 Test Method

All nondestructive testing shall be performed in accordance with the requirements of ASME BPVC SEC V.

3.3.2.2 Acceptance Requirements

Acceptance requirements shall be in accordance with [ASME BPVC SEC V] [ASME BPVC SEC VIII D2].

3.3.3 Piping

3.3.3.1 Test Method

NDT (Nondestructive Testing) of all piping systems, except plumbing systems, shall be performed in accordance with the requirements of ASME BPVC SEC V.

[For high pressure (860 kilopascal 125 psig or above) systems. Not less than 10 percent of all butt welds shall be examined fully by random radiography. Welds to be examined shall be selected to ensure that the work product of each welder or welding operator doing the production welding is included. These welds shall satisfy the acceptance standards of the specified code. If any of the butt welds examined reveals an unacceptable indication, all butt welds welded by that welder(s) shall be examined/accepted by radiography.]

3.3.3.2 Acceptance Requirements

High Pressure (860 kilopascal 125 psig or above):

a. Steam piping systems shall meet the requirements of ASME B31.1.

b. Other high pressure piping systems shall meet the requirements of ASME B31.3.

Low Pressure (Below 860 kilopascal 125 psig):

a. Refrigeration piping systems shall meet the requirements of ASME B31.5.

b. Plumbing piping systems shall meet the requirements of ICC IPC.

c. Other low pressure piping systems shall meet the requirements of ASME B31.1.

3.4 PROTECTION OF ADJACENT MATERIALS

Contractor shall sufficiently protect machinery, materials, floor,

furnishings, finishes and other items adjacent to the welding/brazing operations to prevent any damage from these operations.

-- End of Section --