SECTION 01 4444SECTION 01 4444

OFFSITE WELDING, BRAZING & JOINING REQUIREMENTS

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| Rev. 3 Summary of changes: Removed Examination requirements in this section, added reference to Section 01 4525 which addresses NDE, added minor clarifications and minor editorial updates. |

Word file at <https://engstandards.lanl.gov>

**This Section includes administrative and procedural requirements for offsite welding activities. This section is designed to be used in conjunction with other specification sections that invoke project-specific requirements as well as applicable codes & standards for welding. This section shall be used with 01 4525 Nondestructive Examination (NDE) Requirements.**

This template must be edited for each project.  In doing so, specifier must add job-specific requirements.  Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.  Once the choice is made or text supplied, remove the brackets. This section must also be edited to delete requirements for processes, items, or designs that are not included in the project -- and specifier’s notes such as these.   To seek a variance from applicable requirements, contact the Engineering Standards Manual (ESM) Welding [POC](https://engstandards.lanl.gov/POCs.shtml#welding). Please contact POC with suggestions for improvement as well.

When assembling a specification package, include applicable sections from all Divisions, especially Division 1, General Requirements. LANL personnel should submit here: [Suggested Change or Request Clarification](https://coe.lanl.gov/APs/_layouts/15/listform.aspx?PageType=8&ListId=%7b27814329-67BF-4CB6-AE52-403529FC5A67%7d&RootFolder=); subcontractors via email to engstandards@lanl.gov.

This specification section is suitable for ML-1 through ML-4 projects.

The commercial-off-the-shelf (COTS) exception below presumes that common manufactured commercial items (welded products) have appropriate technical/engineering design and/or support — and accompanying QC and QA measures — to ensure quality and minimize manufacturer liability. On the other hand, custom or limited-series designs and/or assemblies have much greater chance of errors in execution.
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1. GENERAL
	* + 1. SUMMARY
				1. This Section includes requirements for offsite welding brazing and joining as required by other specification sections, consensus codes and standards, and/or engineering design:

Section includes items designed for LANL i.e., engineered items (for SSI requirements, refer to ESM Ch. 16 IBC-IP, Attachment B [SSI template](https://engstandards.lanl.gov/ESM_Chapters.shtml#esm16)).

Exception: For example, Stair units under 36 inches (these are low risk) and other items listed in LANL ESM Ch. 13 [GWS 1-01](https://engstandards.lanl.gov/ESM_Ch13.shtml#ch13_vol1), Section 5.2.

Section is not applicable to common manufactured commercial items where a part or model number exists and there is no customization (thus truly “commercial-off-the-shelf—COTS”); here, welding requirements are not subject to LANL approval (exception – when ML-1 or ML-2 nuclear safety related).

* + - * 1. Pressure-retaining, code-stamped items shall only be welded on by organizations with the applicable ASME or National Board Certificate(s) of Authorization. Certificate holders are organizations that have been authorized by the ASME or The National Board to perform various activities in accordance with the requirements of the ASME Boiler and Pressure Vessel Code or The National Board.
				2. Onsite welding shall be in accordance with design documents, applicable codes and standards, and Section 01 4455, *Onsite Welding, Brazing & Joining Requirements,* which invokes and implements the LANL Welding Program (ESM Chapter 13).
				3. Examination/Inspection of welding is addressed by Section 01 4525.
				4. The LANL Welding Program and General Welding Standards (GWSs) referenced are available on the [LANL Engineering Standards website](http://engstandards.lanl.gov/ESM_Chapters.shtml#esm13) (LANL ESM Ch. 13).
			1. RELATED SECTIONS
				1. Section 01 3300, *Submittal Procedures*
				2. Section 01 4000, *Quality Requirements [Non-nuclear, Nuclear]*
				3. Section 01 4455, *Onsite Welding, Brazing & Joining Requirements*
				4. Section 01 4525, *Nondestructive Examination (NDE) Requirements*
				5. Section 01 4631, *Welding, Brazing, and Soldering of ASME B31 Piping*
				6. *[list all applicable piping and pressure vessel sections]*
				7. *[list all applicable structural sections]*
			2. REFERENCES
				1. 49 CFR Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*
				2. ASME B31.3, *Process Piping*
				3. ASME B31.8, *Gas Transmission and Distribution Piping Systems*
			3. DEFINITIONS AND ACRONYMS
1. For definitions and acronyms, refer to [COE Glossary of Terms](https://engstandards.lanl.gov/_assets/GLOS-COE-1.pdf). Definitions exist for the following terms: Certified Material Test Report (CMTR), ML, Procedure Qualification Records (PQR), Qualification, SSC, SSI, STR and Welding Procedure Specifications (WPS), among others.
2. ESM: Engineering Standards Manual
3. PQR: Procedure Qualification Records
4. SME: Subject Matter Expert
5. SSI: Statement of Special Inspections
6. WPQR: Welder/Brazer/Bonder Performance Qualification Records
7. WPS/BPS: Welding/Brazing Procedure Specifications with supporting PQRs
	* + 1. ACTION SUBMITTALS
				1. The following documents shall be submitted and approved by a LANL Welding Program SME prior to the start of welding. Submit per 01 3300, *Submittal Procedures*.  Do not submit with reference to this Section 01 4444, but rather to the Div 02–48 sections to which they apply, unless otherwise indicated. Each numbered item should be a separate submittal. These submittals are discussed in greater detail later in this section.

Welding/Brazing/Bonding Procedure Specifications (WPS/BPS) with the associated Procedure Qualification Records (PQRs).

Welder/Brazer/Bonder Performance Qualification Records (WPQR) and continuity logs/statement if welding certifications are greater than six months old.

Weld Filler Material Control Procedure for ML-1 and ML-2 applications.

Filler Material Certified Material Test Reports (CMTRs) for ML-1 and ML-2 applications.

Post-Weld Heat Treatment Procedures (where applicable).

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Delete *Design* article if design is provided by LANL. When all welding is to a code, delete second half of *Design* article regarding non-code equivalent work.

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* + - 1. Design
				1. Design of welded Structures, Systems and Components (SSC) shall meet the requirements of LANL ESM and or as a minimum identify applicable codes and standards including requirements of graded application. For welding activities that would normally fall outside the defined scope of specified national consensus codes and standards for fabrication and welding, such codes and standards shall be adopted and used to the extent possible.

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Numerous codes & standards define graded approaches which specify multiple levels of welding requirements. Designs which specify the codes & standards listed below shall also specify service or category and applicable welding requirements these codes identify. For example:

* + - * ASME B31.1 – Material, Temperature & Pressure
			* ASME B31.3 – Service Categories D, Normal, M, & High Pressure
			* ASME B31.5 – Safety Group A3 & B3
			* ASME B31.8 – *Class, location*
			* 49 CFR Part 192 – Class, location
			* AWS D1.1 – Static, Cyclic, and Tubular Structures
			* AWS D1.6 – Static, Cyclic

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* + - * 1. Engineering drawings shall specify all fillet weld sizes and partial penetration weld sizes.
				2. Shop drawings shall show weld symbols and requirements to define the work and enable design review and inspection this shall include fillet weld sizes and partial penetration weld sizes.
				3. Applications that are not similar in materials or processes to a specified Code or Standard shall define and produce the following:

Design basis i.e., mechanical properties, part geometry, acceptance criteria.

A method to verify that the welding procedure can produce acceptable welds.

A method to demonstrate that the welder has the skill to produce sound welds in accordance with the specified welding procedure (reference LANL ESM Ch. 13 [GWS 1-02](https://www.lanl.gov/orgs/eng/engstandards/ESM_Ch13.shtml#ch13_vol1), *Administrative Control of Welding and Brazing (e.g., para 5.3.B in r7*).

Identify methods and define inspections required to judge welds against predetermined acceptance criteria.

Provide documentation that these objectives have been defined and identified.

* + - 1. Qualified Procedures
				1. Welding and brazing shall be performed in accordance with properly qualified and approved welding/brazing procedure specifications (WPS/BPS) that have been qualified in accordance with applicable codes and standards or design criteria:

AWS Standard Welding Procedure Specifications and documented prequalified welding procedures may be used as allowed by applicable codes and standards.

For any nuclear safety or similar work only: WPSs used on structures, systems and components (SSC) which are designated ML‑1 (or safety class) or ML-2 (or safety significant) shall be approved by LANL Welding Program SME prior to welding.

Critical and seismic load-resisting system (SLRS) structural WPSs shall be approved by LANL Welding Program SME prior to welding.

Heat treating as required.

ASME Code and R-stamped welded components shall be approved by LANL Welding Program SME prior to welding.

* + - 1. QUALIFIED/CERTIFIED PERSONNEL
				1. Welding and brazing shall be performed by certified welders and brazers who have demonstrated their welding brazing qualifications by test.
				2. Joining (solvent bonding, adhesive, fusion and electro-fusion joints): When required by consensus codes and standards (e.g., ASME B31.3, ASME B31.8 & 49 CFR Part 192), joining shall be done by qualified personnel following approved procedures.
			2. PROCUREMENT & Control of Consumables
				1. Consumable welding materials shall be properly procured, received, stored, controlled, and issued to ensure weld quality and prevent use by unqualified personnel (refer to LANL ESM Ch. 13 [GWS 1-03](https://www.lanl.gov/orgs/eng/engstandards/ESM_Ch13.shtml#ch13_vol1)).

For SSCs that are designated ML-1 or ML-2, welding consumables shall be provided with Certified Material Test Reports (CMTRs) traceable by heat/lot number to the point-of-use.

CMTRs shall meet the requirements of AWS A5.XX Standards for Welding Filler Materials. Reports shall detail physical and chemical properties of the material(s) and be in accordance with the applicable national or international material standards (e.g., ASTM, ASME) for the material type.  CMTRs must be the results of test performed by the material manufacturer or by a material verification process, if such a process is allowed by the standard governing the material type, and must specify the test method and the source of the acceptance criteria.  Each CMTR must be signed by an authorized representative as per specification section requirements. Filler material inspection records shall be submitted and accepted prior to start of affected work.

* + - 1. Welding, BRAZING, JOINING AND NDE ACTIVITIES
				1. LANL reserves the right of access to all welding, brazing, joining and NDE locations and to have its own inspectors and personnel present during all welding/brazing/joining and NDE activities.

At least five working days’ notice is required prior to inspection and testing activities planned by the fabricator so that LANL can arrange for its staff’s participation.

Hold and Witness Points shall be identified in the construction/fabrication schedule to allow for LANL’s inspection activities.

* + - 1. SUB-tIER Subcontracted Welding
				1. Submittal requirements apply to all sub-tier welding activities.
				2. Subcontracted welding activities shall have all applicable specification sections and drawings and their applicable requirements flowed down to any sub-tier who is to perform those welding activities.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

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Do not delete the following reference information:

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THE FOLLOWING STATEMENT IS FOR LANL USE ONLY

This project specification section is based on LANL Master Specification Section 01 4444 Rev. 3, dated October 8, 2024.