SECTION 01 4525

Nondestructive Examination (NDE) REQUIREMENTS

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LANL MASTER SPECIFICATION SECTION

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| Rev. 0: Initial issue expanding and clarifying NDE expectations currently in the 01 4444 and 01 4455 welding sections, which are being revised to refer to this section. |

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

This Section includes administrative and procedural requirements for Nondestructive Examination (NDE) activities. It is designed to be used in conjunction with other specification sections that invoke project-specific requirements and/or applicable codes & standards requiring NDE including those involving welding.

**This section is only intended for subcontracted (not LANL self-perform) NDE work, because LANL NDE personnel follow LANL’s program (e.g., ESM Ch. 13 Vol. 6) directly; therefore, for LANL self-perform NDE work, either (1) include this section and shorten to clearly indicate that it does not apply and use internal procedures, or (2) eliminate this section and all references to it in other specification sections.**

Certified examiners, and thus this section, are required when specified by other sections (e.g., piping, structural, glovebox and vessel fabrication).

Certified examiners are required for most code work and when tests are performed in support of nuclear safety or nuclear safety related SSCs (ML-1, ML-2, ML-3) and procurements (QL-1 and QL-2). See P330-5 and P841-1 Exhibit H requirements.

For piping code leak tests, certified examiners are not always required, rather only when specified by the code; e.g., they are required for ASME B31.3 para. 345.8 sensitive leak tests and 345.2.4 Externally Pressured Piping, and ASME B31.5 538.4.3 Leak Test. All examination personnel shall have documented training and qualification for the activity, even if certification is not required. Additionally, all activities where certification is not required still must be performed in accordance with a documented procedure or work instruction.

That said, the consensus documents for which this section may be applicable include:

1. American Institute of Steel Construction
	1. AISC 341: *Seismic Provisions for Structural Steel Buildings*
	2. AISC 360: *Specification for Structural Steel Buildings*
2. American Society of Mechanical Engineers
3. ASME B31.1: *Power Piping*
4. ASME B31.3: *Process Piping*
5. ASME B31.5: *Refrigeration Piping*
6. ASME B31.9: *Building Services Piping*
7. ASME BPVC Section V: *Nondestructive Examination*
8. American Welding Society:
9. AWS A2.4: *Standard Symbols for Welding, Brazing and Nondestructive Examination*
10. AWS D1.1/D1.1M: *Structural Welding Code – Steel*
11. AWS D1.3/D1.3M: *Structural Welding Code – Sheet Steel*
12. AWS D1.4/D1.4M: *Structural Welding Code – Steel Reinforcing Bars*
13. AWS D1.6/D1.6M: *Structural Welding Code – Stainless Steel*
14. AWS D1.8/D1.8M: *Structural Welding Code – Seismic Supplement*
15. AWS D14.4/D14.4M: *Specification for the Design of Welded Joints in Machinery and Equipment*
16. AWS QC1: *Specification for AWS Certification of Welding Inspectors*

Design of structures, systems, and components (SSC) shall meet the requirements of the subcontract documents and the code(s) of record (design basis) and, as a minimum, identify applicable codes and standards including requirements of graded application.

1. For NDE activities that would normally fall outside the defined scope of specified national consensus codes and standards, such codes and standards shall be adopted and used to the appropriate extent.
2. Engineering drawings shall specify locations requiring NDE and type of NDE where required by code of record.

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) NDE [POC](https://engstandards.lanl.gov/POCs.shtml#welding) (ESM Ch. 13 Vol. 6). Please contact POC with suggestions for improvement as well. 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.

When assembling a specification package, include sections from all applicable Divisions, especially Division 1, General Requirements.

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

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PART 1 GENERAL

# SUMMARY

1. Section includes requirements for Subcontractor nondestructive examination (NDE) — offsite, onsite, or both — as required by other specification sections, applicable consensus codes and standards, other project engineering design documents, or the subcontract. NDE-type examination may be referred to as testing (NDT) or inspection in such documents, but are all governed by this section and referred as NDE herein for simplicity.
2. Section includes the performance of visual inspection of welds by American Welding Society (AWS) Certified Welding Inspectors (CWIs) or AWS Senior CWIs. That work is included when the term visual testing (VT) appears in the section.
3. Firms performing NDE for building code-related work shall be listed on the [LANL Building Official Listing of LBO-Approved IBC Testing, NDE, and Inspection Agencies; Fabricators; and Products](https://engstandards.lanl.gov/ESM_Chapters.shtml#esm16)). Successful completion of the assessment and the subsequent listing does not relieve the firm from providing submittals as required by this or other specification sections.

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When no ML-1 or 2 work in project, delete the paragraph below and all section references to QL-1 and CGD.

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1. For ML-1 or ML-2 nuclear safety work, the NDE agency services must, in addition to the subparagraph above on the firm beinglisted in the *LANL Building Official Listing of LBO-Approved IBC Testing, NDE, and Inspection Agencies*, be (1) procured from a supplier who meets the applicable Quality Level (QL)-1 Exhibit H requirements, or (2) procured (based on the safety function identified in the Division 02-48 sections for the work product) under an approved Commercial Grade Dedication (CGD) program as described in Section 01 4000, *Quality Requirements* (Nuclear). For CGD of NDE services, the action submittals in Article *Action Submittals* form the basis for determination of critical characteristics.
2. This section does not apply to LANL self-performed work (which follows LANL’s NDE Program directly).

# RELATED SECTIONS

1. Section 01 4000, *Quality Requirements [Non-nuclear, Nuclear]*
2. Section 01 4444, *Offsite Welding & Joining Requirements*
3. Section 01 4455, *Onsite Welding & Joining Requirements*
4. Section 01 4631, *Welding, Brazing, and Soldering of ASME B31 Piping*
5. Section 01 4731, *Flange Assembly for ASME B31 Systems*
6. *[list all applicable piping and pressure vessel sections]*
7. *[list all applicable structural sections]*

# REFERENCES

1. American Society for Nondestructive Testing (ASNT)
2. ANSI/ASNT CP-189 - *ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel*
3. ASNT SNT-TC-1A - *Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing*
4. ASTM International
5. ASTM E165/E165M - *Standard Practice for Liquid Penetrant Testing for General Industry*
6. ASTM E709 - *Standard Guide for Magnetic Particle Testing*
7. ASTM E1316 - *Standard Terminology for Nondestructive Examinations*

# 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, Examination, Examiner, Inspection, Inspector, Nondestructive Examination (which includes testing/NDT and inspection), and Qualification, among others.

# ACTION SUBMITTALS

1. The following documents shall be submitted and reviewed for acceptability by a LANL NDE Program SME (Method Level III) prior to the start of NDE activities (exception: submit NDE reports after the work). Submit documents per 01 3300, *Submittal Procedures*.  Do not submit with reference to this Section 01 4525, 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.
2. Written Practice or Procedure for Qualification and Certification of NDE Personnel

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The submittal for Level III(s) is as applicable because some examinations do not require a Level III to be involved (e.g., Visual inspection of welds requiring an AWS CWI).

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1. Evidence of qualification and certification of the Subcontractor or Subcontractor’s sub-tier Level III(s), as applicable.
2. Certification summaries/records for individuals performing NDE, to include certification dates, technical performance reviews, recertification dates, and dates and levels of training for initial certification.
3. A listing of NDE personnel (this also includes any AWS Certified Welding Inspector certifications in addition to ASNT), including the information below. The intent is a single listing, revised as required with updates to any of the information required, that facilitates confirmation of personnel qualification and/or certification when LANL review of NDE reports is performed.

Name

Stamp number (if used)

Certificate number (for ASNT- or AWS-issued certifications)

Method/Technique, and any limitations or restrictions

Certification expiry date

Vision acuity examination expiry date

Employer’s name

Signature of Subcontractor or Subcontractor’s sub-tier Level III or Quality Management

1. NDE Procedures; each different NDE procedure should be a separate submittal
2. NDE Procedure Qualification (and/or demonstration) Records (when required by code)
3. Integrated NDE Test and Inspection Plan (NTIP), if either (1) tasks are not included in the Project’s Test and Inspection Plan (TIP) – note, listing tasks in the TIP is generally preferred, or (2) when required by other specification section(s) or the Integrated Project Team. Submit NTIP to this specification section when present.
4. NDE Reports

# CERTIFIED PERSONNEL

1. NDE shall be performed by personnel certified in accordance with ASNT SNT-TC-1A, ANSI/ASNT CP-189, or other nationally or internationally recognized program accepted by the LANL NDE SME.
2. Visual weld inspection, unless specifically allowed by the Welding Program Administrator, shall be performed by personnel who are currently certified as an AWS Certified Weld Inspector or Senior Certified Weld Inspector. Prior to performing weld inspection, all weld inspectors shall be evaluated by the Welding Program Administrator or designee.
3. NDE where certification is not required by code, standard, or generally recognized industry practice shall be performed by personnel who have had appropriate documented training and verification of qualification to conduct the NDE.
4. Documentation shall include evidence of training, experience, and demonstration of practical ability to perform the NDE, attested to by signature of the appropriate Subcontractor authority. Submit this in addition to that required by subparagraphs on *certification summaries/records* and *listing of NDE personnel* in Article *Action Submittals*.

# EXAMINATION AND INSPECTION

* + 1. NDE shall be performed by qualified personnel in accordance with this document and applicable consensus codes and standards, and as specified in the drawings and/or specification sections in the absence of applicable codes and standards.
		2. Examiner or Inspector Qualification/Certification – Qualifications of NDE personnel must be acceptable to LANL’s NDE SME prior to those personnel performing any NDE (i.e., as shown by LANL-accepted action submittal above).
		3. NDE Procedures and Qualification Records
1. NDE procedures shall be signed by the cognizant Subcontractor or Subcontractor’s sub-tier Level III.
2. When NDE procedures are required by the referenced code and standards, procedures shall be reviewed and accepted by a LANL NDE Level III in the applicable NDE method, and authorization to proceed granted or the procedure revised and resubmitted, per Section 01 3300, *Submittal Procedures*.
3. NDE Procedure Qualification Records - When NDE procedures are required to be qualified or demonstrated by the referenced code and standard, procedure qualification and/or demonstration records must be reviewed and approved by a LANL NDE Level III in the applicable method. All NDE qualification or demonstration reports shall be signed by the cognizant Subcontractor or Subcontractor’s sub-tier Level III.
4. When NDE procedures are not required by Code, at a minimum, a technical instruction or work instruction shall be used for guidance in performing the examination. Those documents shall be made available for review upon request and shall be part of the test record and submitted with the test report.
	* 1. Performance – LANL may elect to have its own NDE and/or other personnel present during all NDE activities for oversight.

Hold Points or Witness Points shall be identified in the test and inspection plan and construction/fabrication schedule to allow for LANL’s NDE personnel to observe project NDE activities. These points must include those required by the design, codes of record, and any listed in the Subcontract including Exhibit H (on quality).

When applicable codes and standards specify two levels of inspection, LANL will perform the higher level.

* + 1. NDE Reports – All required NDE shall be documented; reports shall identify at least the following:

Method, type, date, and extent of NDE

Acceptance/rejection as based on the criteria specified by the design documents; reference to information on action taken in connection with nonconformances

Code or standard used for acceptance and class, category, or service

Record findings and acceptance/rejection

Identification and location of welds inspected and/or discontinuities detected (e.g., maps sufficient to locate each weld)

Measuring and Test Equipment (M&TE) – Identification and date of calibration expiration for measuring and test equipment (M&TE) used

Name, date, identification number (employee or Z-number) & signature (may be electronic, or stamp) of personnel who performed the NDE

Software program name and version for electronic data

* + 1. Results Submission – NDE results, including weld maps, shall be submitted to LANL within five (5) days after completion of associated examination work. If a shorter timeline is required, it will be communicated by LANL.

Where electronic data acquisition is utilized (e.g., using Phased Array Ultrasonic Testing or Digital Radiography), the raw data are considered part of the record, and shall be submitted with the report. If too large for standard submittal transmittal method, the electronic data shall be submitted using the [LANL transfer drive](https://transfer.lanl.gov), or by other LANL-approved means. The data must be readable in a readily available software for such data (e.g., OmniScan™), and the software program identified in the NDE Inspection report.

# SUB-TIER SUBCONTRACTOR NDE

1. Submittal requirements apply to all sub-tier NDE activities. Subcontracted NDE activities shall have all applicable specification sections and drawings and their applicable requirements flowed down to any sub-tier who is to perform those NDE activities.

PART 2 PRODUCTS

LANL does not supply consumable materials. Subcontractors are responsible to procure, store, maintain certifications, and utilize consumable materials (penetrant, couplant, etc.) as required for the specific nondestructive examination. Waste product (soiled rags, runoff, etc.) shall be disposed in accordance with site- or facility-specific LANL requirements as required by the Subcontract.

PART 3 EXECUTION

This Section addresses both offsite and onsite work together in PART 1 for brevity, hence onsite work requirements are not repeated here.

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 4525 Rev. 0, dated August 6, 2024.