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This mandatory functional series document is available online at <http://engstandards.lanl.gov>.

It derives from P342, Engineering Standards, which is issued under the authority of the Associate Director of Engineering and Engineering Sciences (ADE) as part of the Conduct of Engineering program implementation at the Laboratory.

HISTORY (Record of Revisions)

Rev	Date	Description	POC	RM
0	8/25/10	Initial issue. Includes material formerly in Z10 body and Master Specs Manual Sections 100-200. Added material on acceptance methods, procurement-only specs, other updates.	Tobin Oruch, <i>CENG</i>	Larry Goen, <i>CENG</i>

PLEASE CONTACT THE ESM GENERAL POC
for upkeep, interpretation, and variance issues

Section Z10 Attachment F	General POC/Committee
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1.0 PURPOSE AND APPLICABILITY

This document contains LANL’s minimum technical requirements for specifications – when they must be written and allowable formats. It applies equally to LANL personnel and those subcontracted to produce design.

The process of development and control of LANL-produced specs is addressed by [AP-341-609](#), *Engineering Specifications for Non-Safety SSCs (future)* and AP-341-610, *Engineering Specifications for Safety SSCs (future)*.

2.0 INTRODUCTION

Specifications and drawings provide the principal means of capturing and conveying system, structure, and component design requirements. The specifications provide the written technical descriptions of materials, equipment, systems, standards, and workmanship that complement the engineering drawing set’s graphical descriptions of scope, extent, and character of the work to be performed. Specifications may be for items and/or services (statements of work are also used for certain services).

Level of rigor in specifications must be commensurate with risk. Important design and quality characteristics must be specified and means to verify addressed. Selection of those critical characteristics, whether or not related to the item dedication process ([AP-341-703](#)), should be based on safety function (if present) and other performance functions. See that and “Management Levels, Technical Evaluation, Critical Characteristics, and Quality Requirements, COE-LG-001 (future)” for further discussion. For ML levels other than ML-4, also see discussion at Article on MLs below (4.5), and under Procurement-Only heading (6.0).

LANL recognizes two major types of specifications:

1. CSI Specs: These follow Construction Specifications Institute (CSI) format and are generally used to define the work of a construction or fabrication project. They generally involve either (1) onsite

construction or (2) offsite fabrication and/or installation, but can also include services (e.g., testing). They are prepared by a Design Agency (LANL or external AE).

2. Procurement specs. These generally do not include instructions for both physical items and onsite work or installation and address only a single system, item, or work result. They are often not associated with a construction project and are most often prepared in-house, e.g., by the system engineer or a Technical SME (TSME) for repair/replacement parts or services (e.g., repair, calibration). A format is shown in this document.

3.0 KEY TERMS AND DEFINITIONS

Term	Definition
CSI format	In this document, both the spec section numbering and 3-part spec format defined by the Construction Specifications Institute’s MasterFormat and SectionFormat documents
hold point	A mandatory verification point in the sequence of work that is designated for review, for which work must be held pending arrival of the designated organization, and that cannot be bypassed without the specific release of the designated organization.
LMS	LANL Master Specification(s) in the STD-342-200 document. These are CSI format specifications addressing construction-type work, fabrication, and maintenance (maintenance examples: piping repairs and testing, carpet and other similar replacements).
preparer	A qualified individual who authors or edits specifications; the specifier
section	In this document, a CSI-format document addressing a single work result. Generally several sections make up the Specification.
specification	A complete, stand-alone requirements document for construction or procurement of goods or services. When per CSI format, composed of sections.
witness point	A verification point in the sequence of work which is designated for review, which requires notification, and for which work may proceed after notification of the designated organization.

4.0 REQUIREMENTS FOR ALL SPECIFICATIONS

4.1 General

- A. **Usage:** A specification is normally required for construction and fabrication work where one cannot specify a particular part/model number from a catalog or website or build to a fabrication drawing. A CSI-format spec package is required for all construction projects over a \$300K cost threshold.
 1. Beyond that, the test for determining whether an item needs a formal specification is whether the requirements of the item are beyond the simple identification of critical characteristics that can be described in a purchase request.
 2. *Guidance: Specs are recommended for all other projects, and especially when multi-discipline or complex. Very basic projects may be able to capture needed instructions elsewhere (in ECN or DCP instructions, sketches, or drawings). Specifications are preferred over extensive drawing notes.*

3. The spec **management level** shall be the same management level as the highest management level (ML-1 is the highest and ML-4 is the lowest) of any item or service described in the specification.
 - i. Where items with different MLs are covered by the same spec, the ML for each item shall be stated and the varying expectations made clear for vendor submittals, receipt inspection, inspection and acceptance testing, packaging handling, shipping, and storage, identification markings, etc.
- B. LANL has approximately 180 LANL master guide specification [sections](#) in the CSI format. When such a section (“spec”) applicable to the work exists, its [requirements](#) must be followed regardless of who performs the work or the authorizing or contractual methods used to initiate the work.
- C. Revisions to the specifications after issuance require the same level of review and approval as the initial issuance.
- D. *Guidance: Buy American Act: Projects should comply with this Act ([41 U.S.C. 10a – 10d](#)) as promulgated in the Federal Acquisition Regulation ([FAR](#)) Section 52.225-9. LANL policy for compliance is that American products must be specified except when they are unavailable or the lowest acceptable offer for a domestic end product or construction material will exceed the lowest acceptable offer for a foreign end product or foreign construction material, inclusive of duty, by more than 6% if the domestic offer is from a large business, or more than 12% if the domestic offer is from a small business concern.”¹*
- E. *Sole Sourcing: Be aware that, at time of writing, procurements that sole source a product (i.e., spec does not allow substitution) in excess of \$100,000 may require an approved Non-competitive Justification Form 3300 in accordance with LANL ASM [AP 3300](#).*

4.2 Subcontractor Deviation Disposition Request (SDDR)

- A. Reference (including an external link) to LANL SDDR Form [2178](#) was added to pro forma Exhibit D boilerplate for procurements of equipment, materials, and technical services in August 2010 (an SDDR is not necessary for procurement of off-the-shelf items). The form has detailed instructions/explanation. The form need not be included with specifications, but can be referenced if desired.

4.3 Submittal Procedures

- A. Most specifications will require that certain documents or samples are submitted for design agency approval prior to fabrication, delivery, and/or installation. Ideally (and always if proper CSI format), these are discussed in a single article or paragraph or two in the spec section, not scattered throughout.
- B. When a single spec is involved (e.g., a procurement), a separate document summarizing the required submittals is not needed. For spec packages (“books”), submittal procedures must be addressed and summary of required submittals (and timing) is required.
- C. Construction and Fabrication Spec packages:
 1. LANL Subcontract pro forma [Exhibit I](#), *Subcontractor Submittal Requirements*, is the “boilerplate” document for communicating the requirements for submittal transmittal to LANL and any required follow-up action following LANL review. *Exhibit I consolidates*

¹ 2010 FAR [52.225-9](#) through 13. LANL ASM Acquisition Practices Section 3251 Buy American Act Rev 1 10/22/07 driven by LANS Prime Contract.

requirements that were throughout the pro forma including what was in LANL Master Specification Section [01 3300](#), Submittal Procedures.

2. Exhibit I Attachment B, Subcontractor Submittal Requirements Summary, combines multiple submittal lists including the list was attached to Section 01 3300. The Att B points to a template of all the submittals required by all of the LANL Master Specifications; that template is maintained on the Master Spec [webpage](#).
- D. Unless otherwise noted in their scope, the project’s design agency must edit and complete the technical and quality requirements template of Exhibit I for construction subcontracts, deleting submittals for spec sections and submittals that aren’t involved and adding for spec sections and submittals they create.
- E. From July 2009 forward, new construction subcontract project RFPs were directed by ASM to use Exhibit I; when doing so, references to Section 01 3300 in LANL Masters must be removed.
- F. When it is certain a project will be **self-performed (constructed in-house)**, either Section 01 3300 or Exhibit I may be used (LANL Project Engineer decision) -- so long as Section 01 300 remains available on the website.

4.4 Verification

Guidance on critical characteristic verification methods is contained in the following table.

Table Z10-F-1. Acceptance Method Suggestions

Acceptance Method	Best Use	Conditions	Examples	Additional Discussion
Supplier Evaluation and Surveillances				
Supplier Evaluations	For major dollar or on-going purchase(s). Exceptions can be made to use non-IESL Suppliers for ML-1/ML-2 items services if Item Dedication or Compensatory Action Plan is in place	Required for ML-1 & ML-2 items and services resulting in placement on the LANL Institutional Evaluated Suppliers List (IESL)	QA Program evaluation by direct audit or 3 rd part audit and 3 rd party certifications. Can include audits of Designer, major subcontractor or constructor/fabricator.	P840-1 , Procurement Quality
Surveillance	Quick look, less comprehensive than above	Supports critical test/inspection witness or hold points. Can be used in support of Item Dedications	First time use of supplier typically when not on the IESL	P840-1 , Procurement Quality
Submittal Review				
C of C²	Reputable supplier	Needs supplier evaluation for confidence	Vague functional needs/assemblies/fabrications	LMS 01 4200

² From LMS 01 4200, a [Document certified](#) by a [competent authority](#) that the [supplied](#) good or [service](#) meets the [required specifications](#). “Certificate of Compliance” is similar but attests to the [supplier](#) of goods or services meeting spec. (from [businessdictionary.com](#))

CMTR³	Facilitates welding/strengths/structural elements	Special, high strength, or key materials	Structural steel weld rod, metallics, fasteners	LMS 01 4200
Special process control	Critical tolerances with skilled workers needed	Skill dependent, material & equipment dependent	Welding: Approve welder qualification, QC and material control procedures, specs NDE: See that topic above	LANL Master Specs 01 4444 and 01 4455
Testing (Factory or Onsite)				
Item test	Material/items tests per codes/standards	M&TE, skill, resource availability	Backfill, concrete slump, cylinder breaks (ASTMs)	CMP 401
Source inspection or test	Special equipment needed	Major shippers, manufacturers, fabricators	Rebar, batch plant, structural steel, assemblies	P840-1 , Procurement Quality
Assembly/subassembly test	Bench checks, I&C and electrical components	Critical to broader system operation	Pump, fan and motor sets, motor-generator sets	ESM Ch 15, Commissioning CMP 400, 401
System Test	Where system functionality is critical	Boundary integrity / condition dependent	Ventilation, lighting, fire detection/suppression	ESM Ch 15, Commissioning CMP 400
Hot function test or commissioning test	Where operability under environmental conditions is critical	High risk w/out prerequisite test	Shake table (seismic qual) or commissioning/startup tests	ESM Ch 15, Commissioning; CMP 400, 401
Inspection/Examination				
Non-destructive examination (NDE)	Homogeneous metals, high confidence needed	Surface or volume, skill dependent	Materials / metals checking	ESM Ch 13 Vol 6
Receipt inspection	Form and fit determinations	Critical Characteristics, needed for best use	Critical items requiring pedigrees. Required for all ML-1, ML-2, and ML-3 items.	P840-1 , Procurement Quality
Installation inspection	Process- and time-dependent items	Skill and tool dependent – may be inaccessible later	Rebar, concrete, earthwork	ESM Ch 16 Section IBC-IP CMP 282

4.5 Management Level 1, 2, and 3 Specs

- A. ML-1, 2, and 3 projects must ensure that their final specs contain adequate QA requirements. *Guidance: Typical additions for ML-1/2 specs (and such designs in general) are intended to increase reliability as appropriate for the credited functions in the documented safety analysis. For these (and for ML-3 specs, when added measures above ML-4 include procurement quality matters), appropriate strengthening may include:*
1. *Submittal/acceptance of QA program including qualifications of designers and installers, non-conformance program, etc.*
 2. *Vendor(subcontractor) qualifications*
 3. *For nuclear or radiological facilities, invoking the requirements of 10CFR830.122 and/or ASME NQA-1.*
 4. *For non-nuclear facilities, invoking DOE Order 414.1C.*

³ From LMS 01 4200, “Certified Material Test Reports (CMTR)”; “Mill Traceability Report” (composition); and “Material Test Report” (mechanical properties): All must have actual test results. CMTRs shall be certified by a nationally-accredited lab (notary not required).

5. *identification of critical characteristics (see tables below)*
 6. *more detailed construction submittals,*
 7. *more rigorous material receipt and control, possibly including inventory control,*
 8. *storage, maintenance, and handling requirements*
 9. *more rigorous field quality control,*
 10. *increased test and inspection including in-shop, receipt inspection, and in-place*
 11. *traceability of materials, possibly including installation map for steel, rebar, welds/filler material, etc.*
 12. *seismic and other environmental qualification requirements including system interaction, and/or*
 13. *Independent technical review/design verification per NQA-1.*
- B. *Good examples of ML-1/ML-2/ML-3 specs are LMS Sections on gloveboxes ([11 5311 series](#)) and certain concrete anchors ([03 1512](#) and [03 1550](#)). See also [P840-1](#), Procurement Quality.*

4.6 Guidance

The appendices of this document contain non-mandatory guidance for specification development and review.

5.0 CSI FORMAT AND LANL MASTER SPECS (LMS)

- A. When required (see above), a CSI-format specification must be created by combining multiple specification sections. Follow CSI [MasterFormat](#) (i.e., 2010 Update) for organization of Division 00 through 49 sections.
- B. LANL Master Specifications (STD-342-200) are templates that the designer must start from when they exist on topic required by the project.
- C. Like all master guide specs throughout industry, LMS templates are not finished products. Designers must tailor LANL Masters to the project's needs, modifying and augmenting the existing verbiage (to facilitate this, the Specs are webposted in Word). When editing sections for a project, the preparer must add job-specific requirements. Brackets are used in the text to indicate designer choices or locations where text must be modified by the designer (remove all brackets during editing). The specifications must also be edited to delete specification requirements for processes, items, or designs that are not included in the project — and hide or delete preparer notes. Product callouts may be changed if new callouts meet original design intent and all stated requirements (unless “no substitution” is indicated).
 - a. For those nuclear and high hazard projects that need additional rigor beyond the ordinary, the need to augment ordinary LANL Masters is particularly important; see guidance regarding ML-1, 2, and 3 above.
- C. The designer must update LMS Sections where they are incorrect, incomplete, uncoordinated, or have become outdated. When subcontracting the construction work, quality- and ES&H-related sections (e.g., 01 3545, 01 4000, 01 5705) must be coordinated with Subcontract [Exhibits](#) H (quality) and F (ES&H) which will be produced and provided by LANL Project Engineer or other LANL project team members.

- D. The forgoing activities are not considered a variance, but to seek a variance from a Standard Detail requirement that is applicable, contact the Engineering Standards Discipline POC (see Clarifications etc. article in Z10).
- E. Because most projects require specs for work results beyond what the LANL Masters cover, creating additional spec sections is normally also required.
1. When adding non-LMS specification sections, number them in accordance with the CSI [MasterFormat](#) 2010 Update system rules⁴. The minor numbering differences between MasterFormat and the major guide spec collections are allowed (i.e., [UFGS/NAVFAC/VA](#), [MasterSpec](#), [SpecText](#), and [BSD](#)). *Guidance: Engineering firms generally have their own office masters they draw from and/or they access generic masters like the above. LANL normally subscribes to some of these also.*
 2. Summary of Work (01 1100): If created, this section must be coordinated with work scope statements in the Subcontract's Exhibit D, Scope of Work and Technical Specifications (do not put the same information in both locations). To prevent conflict, 01 1100 should refer to Exhibit D and, ideally, vice versa. Exhibit D examples can be found [here](#) (internal only; look under "Construction").
 3. The designer must correct LMS sections to properly reference other LANL sections used as necessary — and designer-added sections (and visa-versa).
 4. In general, also conform to the recommendations of the Construction Specification Institute's Project Resource Manual/CSI Manual of Practice except to the extent this document requires departures from those recommendations.
 5. Following CSI SectionFormat, if a PART is not to be used in a particular specification, (e.g., a Division 01 Specification's PART 2 PRODUCTS and PART 3 EXECUTION), enter "Not Used" under the heading. At the end of each Section put "END OF SECTION" and at the end of the last Specifications Section put both "END OF SECTION" and "END OF SPECIFICATIONS".
- F. Ultimately, the designer must produce a clear, concise, complete, and correct project work description in accordance with the industry standard of care.
- G. Specification packages ("books") must comply with wording requirements below including Table of Contents, approval sheet, format, language, and tailoring of spec to match project requirements (including deletion of unneeded subsections and paragraphs). Books and single sections must also have footers with Project ID; change footer rev. to 0 and current date. Also, the content requirements identified below under the Procurement-Only heading of this document must be included in CSI format specifications as appropriate.
- H. When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General requirements. (e.g., *Submittal Procedures, Product Options & Substitutions, and Project Record Documents, etc.*).
- I. ML-1, 2, and 3 LANL Masters: Most LMS specs are not intended for use on ML-1, 2, or 3 projects as-is and therefore did not receive an independent technical review/design verification required before issuance of such documents. Those sections that have received such a review reflect this in the prefacing authors' notes.

⁴ The weblink leads to the numbering system but this lacks the usage rules and notes in the bound editions.

- a. Draft changes from LMS spec sections for ML-1, 2, and 3 SSCs must be produced using Word “Track Changes” features (*deletions should be ~~Strikethrough~~ and additions bold text with a vertical border line*).
 - i. Electronic review drafts must be made available to LANL reviewers upon Project Engineer request.
 - ii. Hardcopy drafts and finals must not show tracking (e.g., “Final” view; plain, clean text) unless requested.

6.0 PROCUREMENT-ONLY SPECS⁵

GENERAL

This article defines the content and format of procurement-only specs.

1. When procurement-only specs stand alone, these may (but need not) follow CSI format.
 - a. When CSI format is used, CSI MasterFormat allows spec titles and numbers to be created where it is not prescriptive. CSI SectionFormat allows preparers great latitude with headings within a spec. (PART 3 EXECUTION would be followed by “Not Used” except for specs for onsite services such as testing).
 - b. If CSI format is not used in a project or long-term program, then follow the requirements below. Alternatively, the project must issue a procedure on format if only to help ensure key topics (headings) aren’t missed and for consistency to aid staff that review multiple specs.
2. *Guidance: Procurements of various models of pumps, valves, instruments, and the like for a major project might best be procured using a spec with attached data sheets for each required configuration. Examples are in Appendix C; others available from Standards Manager.*

A description of the contents has been provided to illustrate expectations in regards to the content for a given heading; however, there may be variations based on the scope of a particular specification.

The following are general considerations for developing a specification:

- a) Extract the applicable Project-specific design bases requirements from safety analyses, design criteria documents, the facility description document (FDD), system design descriptions (SDDs), and technical reports, and other sources.
- b) Identify elements verified during the design review. These should be considered when developing the specification.
- c) Provide sufficient details to support further facility design, construction, and operation.
- d) Methods materials, parts, and equipment that are essential to the function of the items are selected and reviewed for suitability of application.
- e) Where appropriate, generic specifications (e.g., seismic) may be developed as stand-alone specifications or included as attachments and referenced in the specification.

Include the specification cover sheet and revision history, a contents section and the numbered headings listed below. Specifications as data sheets only are not required to include the numbered sections, but should include specific details to describe the items. Each page shall include the following:

- a) unique identifier assigned by document control
- b) title of the specification
- c) page number.

⁵ Adaptation of CMRR-AP-ENG-0316 draft.

The contents are in italics and are included as appropriate based on the scope of the specification. If a section is not applicable, identify it as such.

1. Scope

1.1. Project Description and Location

Provide a brief description of the project and the location.

1.2. Equipment, Material and Services Required

Identify the scope of the specification, including the equipment, materials, and services to be provided. Include a general description or summary of the deliverables such as required meetings, plans, procedures, schedules, warranties, and other documentation.

1.3. Work by Others

Describe related work excluded or not covered in the specification. For example, identify equipment to be supplied by LANL.

1.4. Definitions

Include a listing of definitions of uncommon terms used in the specifications as needed to provide an understanding of the requirements.

1.5. Acronyms/Abbreviations

Provide a listing of acronyms and abbreviations as needed to provide an understanding of the requirements.

1.6. Safety Classifications/Management Levels

Identify the safety classification(s) of the equipment, material, and/or services. Items classified safety class or safety significant are identified in design documents (e.g., FDD, SDD).

Caution: If a Nuclear Facility specification is prepared prior to or in parallel with an FDD and/or SDD update, the safety classification should be confirmed against the (P)DSA.

1.7. Safety Functions

Safety Class and Safety Significant: Identify the safety functions, functional requirements, and the associated performance criteria as stated in the SDD and/or FDD.

Important to Safety: Identify other safety functions for items important to safety such as security, environmental, or mission.

1.8. Commercial Grade Items/Critical Characteristics

For commercial grade items (see AP-341-703, Item Dedication), identify the critical characteristics (i.e., those that provide reasonable assurance that the item will perform its intended safety function) to be verified for acceptance and acceptance criteria. In some situations the supplier may be better able to define the critical characteristics required to ensure the safety functions of the item. For these cases, include a requirement for the supplier to provide the documentation of the critical characteristics and acceptance criteria (and LANL TSME concurrence with these).

2. Applicable Documents

2.1 Codes/Standards/Regulations

Identify the applicable codes standards, standards, and regulations. Specifications shall implement the applicable codes, standards and regulations identified in the Engineering Standards Manual, the design criteria, the FDD, and the SDD. References to codes, standards, and regulations shall be clear and specific and shall identify the version or indicate latest. References shall be sufficiently detailed to define requirements for fabrication, erection, and

assembly, including its service, type, and category along with inspection and testing acceptance criteria. The versions should be consistent with that defined in the FDD and/or SDD.

Caution: If the specification is prepared prior to or in parallel with an FDD and/or SDD update, the version information should be confirmed against the code of record.

The version of ASME NQA-1 shall be consistent with the code of record for the project.

Caution:

*This section should **not** reference codes, standards or regulations which are not discussed in the text of the specification.*

References to Codes, Standards, and Regulations within the text of the specification:

References to codes, standards and regulations should be specific and identify which portions are applicable. The codes and standards referenced or invoked within the primary code or standard should be reviewed for applicability and to ensure that it is appropriate to invoke these. If a daughter code or standard is not appropriate, exceptions or clarifications should be noted.

Caution:

Do not include statements such as “in accordance with UL Standards,” “in accordance with ASTM standards,” or “in accordance with the ASME Code.” Identify the specific codes or standards that apply.

2.2 Other Reference Documents/Drawings

Provide a reference to other documents (e.g., drawings, specifications) cited in the specification.

Cautions:

- 1) *Revision information for drawings and specifications is typically **not** included if this information is specified in the procurement document.*
- 2) *References should be reviewed to confirm that there are no conflicts.*
- 3) *Care should be taken **not** to repeat information that is controlled by referenced specifications.*

3. Design Requirements

As applicable to the scope of the specification, provide a discussion of basic functions, performance, design conditions, design life, failure modes and failure modes effects analysis requirements, environmental conditions, mechanical requirements, loadings, electrical requirements, instrument and controls requirements, environmental qualification, and accessibility and maintenance.

Additional Considerations for safety class and safety significant items:

a) *Design Verification per NQA-1*

Include requirements for verifying the safety functions. When qualification testing is required, identify or reference standard specifications for the most adverse conditions (e.g., operating modes, environmental, seismic) related to the safety function. Consider operating modes and environmental conditions in determining the most adverse conditions. When qualification testing is intended to only verify specific design features, include provisions for verification of other features by other means (e.g., calculations). Include a requirement for submittal to LANL a verification plan to identify the method(s) of verification. Include a requirement for submittal of a design verification report including test results and any supporting calculations.

Model or Mockup Testing

When tests are being performed on models or mockups, include requirements for scaling laws to be established and verified. For model test work, include provisions for performance of error analysis, where applicable, prior to use in the final design.

b) Software

Include applicable software quality program requirements. Include requirements for software documentation to be submitted for review, including the following:

- *software quality assurance procedures*
- *a listing of all software (name and version) that is part of the item(s) or service including embedded software (e.g., Programmable Logic Controllers)*
- *identification of the software baseline documentation*
- *identification of software that performs active safety functions and the requirements for the functions that the software performs*
- *software verification and validation documentation including identification of the capabilities and limitations for intended use as critical characteristics*
- *test plans and test cases for each defined requirements used as the method of acceptance to demonstrate the capabilities within the limitations*
- *instructions for use of the software (e.g., user manual) within the limits of the software capabilities*
- *software error reports including the method for obtaining the error reports.*

For safety significant and safety class items, include a requirement for software to be controlled in accordance with DOE Order O 414.1C, Attachment 2, item 5, Safety Software Requirements and ASME NQA-1, Part I, Requirements 3 and 11 and Part II, Subpart 2.7, Quality Assurance (most stringent of the two).

4. Materials

Specify the materials of construction for the item(s) in the scope of the specification, prohibited materials, and any special requirements for materials.

5. Fabrication and Installation

Identify requirements for fabrication processes, such as welding, heat treatment, material control and painting. As appropriate to the scope of the specification, include the following:

1. *installation requirements or request installation instructions from the supplier*
2. *requirements for hangers and spans*
3. *material requirements and restrictions (e.g., dissimilar materials) to ensure compatibility for the environment such as loads and applied stresses*
4. *torque values, sequencing, and patterns for bolted connections.*

Additional Considerations for Safety Class and Safety Significant Items:

Include requirements for submittal of fabrication procedures to LANL. Include requirements for submittal of qualification records for special processes to LANL. Include requirements for submittal to LANL of qualification records for personnel performing special processes.

6. Test and Inspection

Identify test and inspection requirements for the shop and the field. Include or reference (e.g., code or standard) the acceptance criteria for tests and inspections. Identify requirements for submittal to LANL of test procedures unless testing is performed using standard methods (e.g., ASTM). Include requirements for submittal of test and inspection result to LANL.

Caution: *Include or reference an upper bound, lower bound or range of values for tests and inspection performed for the purpose of acceptance. When testing is performed for data collection purposes only, this should be clearly stated.*

Additional Considerations for Safety Class and Safety Significant Items:

Identify requirements for qualification of testing and inspection personnel (e.g., ASNT SNT-TC-1A is used for qualification of nondestructive testing personnel). Include a requirement for the submittal to LANL of the inspection and/or test personnel qualification procedure and personnel qualification records.

7. Preparation for Shipment

Include cleanliness, tagging, documentation, packaging, handling, shipping, and storage (including shelf life) instructions (ref LANL P840-1 Procurement Quality). Hazardous and radioactive materials should be packaged, labeled, stored, and shipped according to applicable DOE and Department of Transportation (DOT) regulations.

Additional Requirements for Safety Class and Safety Significant Items:

Include a requirement for items to be packaged, shipped, handled and stored in accordance with ASME NQA-1, Part II, Subpart 2.2, Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants. Identify the levels (A, B, C, D) of the equipment and materials in accordance with this standard. For Level A items, identify the specific criteria as applicable.

8. Quality Assurance

Include a reference to Exhibit H of the Subcontract.

Caution: *Do not include administrative details in the specification if these are included in or conflict with Exhibit H of the Subcontract.*

Include provisions for the following, based on the scope of the specification:

- a) requirement for a quality assurance program based on the importance and and/or complexity of the item.*
- b) requirement for the supplier/subcontractor to incorporate appropriate quality assurance program requirements and other requirements of the specification in sub-tier procurement documents.*
- c) identification of any LANL or project-specific instructions, plans, or procedures that apply to the supplier/subcontractor. Version information may be specified in the procurement document.*
- d) requirement for deviations from the specification to be reported using the Subcontractor Deviation Disposition Request Form 2178(optional, in pro forma boilerplate already)*
- e) methodology for initiating a request for information*
- f) access to supplier/subcontractor facilities and records, at all tiers for surveillance, inspections or audit by LANL (including designated representatives), and/or DOE/NNSA representatives.*

- g) *Controls for Suspect/Counterfeit Items Prevention based on DOE Order 414.1C, Attachment 2, Contractor Requirements Document and Attachment 3, Suspect/Counterfeit Item Prevention. See P330-9, Suspect/Counterfeit Items (S/CI).*

Grading of non-safety items (ML-3 and ML-4):

Include a requirement for the supplier/subcontractor to develop and maintain a quality assurance program that ensures compliance with 10 CFR 830, Subpart A and DOE Order 414.1C, Attachment 2, Contractor Requirements Document, through implementation of Standard ANSI/ISO/ASQ Q9001-2000, Quality Management System Requirements.

Additional requirements may be applied based on the relative importance to safety, security and safeguards, environmental and the mission as documented per AP-341-502, Management Level Determination.

Safety Class and Safety Significant Items and Select ML-3 items:

Include a requirement for the supplier/subcontractor to develop and maintain a quality assurance program consistent with the applicable portions of the following documents:

- a) *10 CFR Part 830, Subpart A, Quality Assurance⁶,*
- b) *DOE Order O414.1C, Quality Assurance, Attachment 2, Contractor Requirements Document,*
- c) *ASME NQA-1, Quality Assurance Requirements for Nuclear Facility Applications, Part I –for limited scope specifications, the applicable Requirements should be identified,*
- d) *ASME NQA-1, Quality Assurance Requirements for Nuclear Facility Applications, Part II – identify the specific subparts that are applicable.*

Caution: *The subparts within Part II of ASME NQA-1 invoke technical codes and standards. Confirm that these daughter codes and standards are appropriate before invoking an entire Subpart within Part II.*

Include a requirement for the supplier/subcontractor to submit to LANL the quality assurance program for review prior to the commencement of work. Include a requirement for the plan to include documents and procedures to implement the work and include a matrix of essential Quality Assurance elements cross referenced with the documents/procedures.

9. Configuration Management

Identify or reference requirements for uniquely identifying equipment. See ESM Ch 1 Section 200.

10. Documentation and Submittals

Include a reference to Exhibit I Subcontractor Submittal Requirements of the subcontract.

Caution: *Do not include statements that conflict with Exhibit I of the Subcontract.*

Include a summary of the documentation and the submittals. Use the organization's Records Retention Plan for determining which documents are considered records. As a minimum, extract and

⁶ ASME NQA-1 has recognized that implementation of ASME NQA-1 quality assurance program is not sufficient to meet the requirements in 10 CFR 830 Subpart A and DOE O 414.1C. For details refer to ASME NQA-1-2008, Part IV, Subpart 4.5, *Application Guide on the Use of NQA-1-2000 for Compliance With Department of Energy Quality Assurance Requirements 10 CFR 830 Subpart A and DOE O 414.1.*

include requirements for submittal of documentation considered to be lifetime Quality Assurance Records as defined in the records management plan.

The timing of the submittal should be provided generically (e.g., prior to fabrication). If the supplier/subcontractor is required to maintain specific records, identify the retention times and disposition requirements. Identify any requirements for reviews or approvals of documents if not specified elsewhere. Examples of submittals are listed below:

- a) drawings*
- b) warranties*
- c) Subcontractor proposal data*
- d) quality Assurance Program documents*
- e) procedures*
- f) operating and maintenance manuals*
- g) material traceability documentation*
- h) qualification documentation procedures, certification, testing*
- i) software quality assurance verification and validation documentation*
- j) inspection and test plans*
- k) inspection and test reports*
- l) analyses and calculations*
- m) manuals*
- n) product data*
- o) certificates of conformance*
- p) spare and replacement parts lists and related documentation for ordering these*
- q) certified material test reports*
- r) calibration certificates.*

Attachment A Hold and Witness Points (Include only if applicable)

Include a summary of the hold and witness points and requirements for advance notification.

Attachments B-Z (Other Attachments as needed)

Include other information needed to support the specification, e.g., data sheets, figures, etc.

7.0 WORDING

7.1 General

The purpose of these additional instructions for writing and editing specifications are to increase clarity, consistency, and uniformity; reduce recurring errors; and improve communications among project personnel. The ESM Chapter 1 POC may grant variance to these.

1. Complete Sentences

Use complete sentences with verbs.

No: "Performance in accordance with ACI 302."

Yes: "Perform work in accordance with ACI 302."

Exceptions: Manufacturer: Company, Model No.

2. Write short sentences

No: The approximate locations of cabinets, panelboards, wiring gutters, switches, light outlets, power outlets, etc. are indicated on the Drawings, however the exact location must be determined after thoroughly examining the general building Drawings and by actual measurements taken during construction to avoid conflicts with structural, architectural, or other trades, with all locations subject to approval by the STR.

Yes: Break into four sentences as follows:

The locations of cabinets, panelboards, wiring, gutters, switches, light outlets, and power outlets indicated on the Drawings are approximations. Determine the exact locations by thoroughly examining the Drawings and by taking actual measurements during construction. Avoid conflicts with structural and architectural work, as well as with work of other trades. Obtain approval of the STR.

3. Delete useless words

No: Special attention must be paid to the following New Mexico State Highway Specifications sections and strict conformance thereto ensured as applicable.

Yes: Conform to the following New Mexico State Highway Specifications.

4. Specification on Drawings

Avoid putting specifications on Drawings. For small projects (<\$100k TPC) using sketches controlled by Engineering Changes Notice or similar it may be the acceptable.

5. Vague Sentences, Specifications and Terms

Use precise terms. Be precise. Do not use "etc." in Specifications. Words such as "as needed," and "as required" are too vague. Say exactly what you require. Do not use approximations unless absolutely necessary.

No: "Install bracing as needed."

Yes: "Install L3x3x1/4 diagonal braces at 48" o.c. as shown on detail...."

6. Active Imperative

The Specifications and Drawings are all directed at the General Subcontractor; therefore, using "the Subcontractor must...." is redundant and unnecessary. Start each sentence with a command verb. If absolutely necessary, "must" can be used. Avoid the "passive must" style; it could infer someone other than the Subcontractor is to perform the action. Never use the "passive will."

No: "The Subcontractor must verify lines before starting formwork."

Yes: "Verify lines before starting formwork."

Never: "The lines will be verified before starting formwork."

Note: When LANL is self-performing work to Specifications based on LANL Masters, it is generally not necessary to change "Subcontractor" to "LANL" or "LANS" since it should be understood that LANS is to do all the work; this can be made clear in the Summary of Work or References section. Such terminology changes in the Specifications may be necessary for clarity when LANL is only performing part of the work.

7. LANL Actions (Will, May)

For LANL action use "will," e.g., "LANL will provide xxx for installation by the Subcontractor."

For soft LANL actions use "may". "The STR may, in his/her discretion, perform additional compaction tests of the trench backfill."

8. Performance Specifying

Avoid dictating the process and procedure. Specify the required salient characteristics of the product.

9. Consistency

Use one term throughout the Drawings and Specifications. Be consistent with terminology, especially between Specifications and Drawings. Do not use "grille, louver, and diffuser" all to describe the same thing. Do not use "gravel" on the Drawings and "granular fill" in the Specifications to describe the same item.

10. Overlap Redundancy

If it's in the boilerplate, don't reword it for the Specifications. If it's in the Specifications, don't repeat it on the Drawings. The more often something is repeated, the greater the likelihood of inconsistency.

No: Concrete strength is called out on both the Drawings and the Specifications.

No: Trench Drawings are in each discipline plus there are trenching Specifications in Division 33.

11. Orchestration of Lower-Tier Subcontractors

Avoid specifying directions to sub-tier subcontractors.

No: "Formwork sub-tier subcontractor is responsible to provide blockouts for mechanical and electrical penetrations."

No: "The Subcontractor must require the applicator to examine areas and conditions under which painting work is to be applied and notify the Subcontractor, in writing, of conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected."

Yes: Examine areas to be painted. Correct unsatisfactory conditions before proceeding.

12. Abbreviations

Use abbreviations sparingly. Don't use abbreviations and acronyms that are only familiar to LANL personnel. Don't use design organization/standards abbreviations unless the full name and address is located in the document.

No: DTL, ES-DE, NECS, ACI, NEMA, NFPA.

13. Specifying Subcontractor Experience

Avoid specifying Subcontractor experience in general, as this should be given to the buyer prior to procurement. If necessary (e.g., when work is likely by subtier subcontractor), do the following:

- Do not specify required experience in number of years. Specify required number of satisfactorily completed jobs of equivalent nature and scope to the current task.
- Identify the experience requirement as a submittal item in the affected Specification section and on the submittal list. Timing of this submittal is important; schedule to allow receipt and acceptance prior to start of work.

Yes: "In performing the work of this Section, the Subcontractor (or his/her sub-tier subcontractor) shall be a firm which:

- has satisfactorily performed at least five jobs of equivalent nature and scope of the job herein in the past X years; and
- is acceptable to the manufacturer of the primary materials."

14. Specifying Project Scheduling

Do not specify project scheduling in the Specifications, except for general and essential phasing guidelines.

No: "Deliver door frames to job site in time to facilitate coordination of work."

Yes: "Prepare septic tank and drainage field for hookup before demolishing existing cesspool."

15. Laundry Lists

Do not use long-list descriptions of project items or project scope. Let the documents overall describe what is to be done. Something is bound to be left out.

No: "Electrical work involves the following":

16. Submittals

Coordinate submittals correctly. Include specific submittals and their description in each Specification section and in the Submittals List in Exhibit I (or Section 01 3300 for self-perform).

No: "Submittals as per Special Provisions".

Yes: "Provide concrete design mix and test data as per ACI 301."

Problem Area: Installation instructions requested in the Specifications that are not itemized in the submittal list.

17. Inspection

Use "will" for inspection to be done by LANL. The Special Provisions and Division 01 Sections generally say that unless specifically stated otherwise in the Specifications, all inspections will be performed and paid for by LANL. Preparation steps and how many days/hours in advance the Subcontractor must notify the STR is to be specified on a section by section basis.

18. Warranty

Specify warranty provisions correctly and completely. Warranties, guarantees, protection plans, etc., must be accurately and fully specified as to what is required and what is to be covered, i.e., labor, materials, types of exposure, usage, modes of failures, etc. Emphasize up front details. Avoid tying warranty obligations to scheduled or preventive maintenance.

19. In-House Standards

Avoid references to in-house or established LANL standards as a substitute for providing a fully detailed Specification. If absolutely necessary to do so, include a copy of the referenced standards in the documents.

No: "Install piping in accordance with the LANL Engineering Standards Manual Chapter 17 Section XYZ."

20. Reference and Code Listings

Cite reference standards correctly. List Codes, References, and Standards, for all disciplines in Specification Section [01 4200](#) with full names and addresses. The list is to be prefaced with the statement "To the extent specified elsewhere in these Construction Documents, comply with the requirements of the following standards and associations." Therefore, a listing of references in Part 1 of each Specification section is undesirable and misleading because the preparer falsely believes he has mandated a requirement when he has only listed a reference. However, the text of individual sections should individually specify conformance to specific codes as required. Include the title of the reference or standard the first time it is listed and just the number thereafter.

Yes: After you have confirmed that ACI is included in the Reference Listing in 01 4200, write: "Formwork: Conform to ACI 301 – Structural Concrete for Buildings." Include the title of ACI 301 only the first time it is mentioned in the Specification section.

21. Scope of Work

Do not include a scope of work for individual Specification sections. *Scope of Work and Technical Specifications* is Exhibit D of the pro forma for subcontracts. Summary of Work is a Div 01 section that must be coordinated (also see discussion above on this coordination).

22. Bid Alternatives

Use bid alternates sparingly and only:

- as additive, not deductive;
- if clearly defined on all documents;
- if it is of significant monetary value; and/or
- for maintenance or protective plans funded from separate, non-capital funds;

Suggest using the following Scope of Work format in the Boilerplate (Special Provisions) when using alternates;

- Base Bid Item: The Subcontractor must provide all labor, materials, and equipment to construct the (_____ building), and to perform certain related work in accordance with these Subcontract Documents, less Additive Alternate(s).
- Additive Alternate XX: If the Subcontract award includes Additive Alternate XX, the Subcontractor must also provide all labor, materials, and equipment to construct Additive Alternate XX (See Drawing No. _____ or Spec Section ____.)
- **Note**: The words "Base Bid Item" should be used only if there is an Alternate.

23. Pre-Bid

Do not specify non-technical "pre-bid" or "with the bid" requirements in the spec proper (e.g., job site inspection, qualifications) that should be handled by the solicitation (RFP).

No: "Attach previous experience records with all bids."

No: "Inspect job site prior to submitting bid."

Products will not be reviewed for "pre-approval" prior to award of Subcontract, so be specific.

24. Related Work

Do not list "Related Work" in the Specifications unless absolutely essential. If related sections are cited, double-check that the name and section number are correct.

25. Salient Characteristics

Do not copy a particular manufacturer's Specification unless that is the only desired product. Do not specify only a brand name followed by "or approved equal," since this is addressed by Section 01 2500 Substitution Procedures (see 202.27 below). Doing so may produce a restrictive spec. Instead, develop a spec that states only salient characteristics. These listed salient characteristics are the only criteria against which an approved equal can be judged.

No: Cabinets are to be "Quaker Maid" or approved equal.

Yes: Provide cabinets 34 1/2" high by 24" deep. Provide doors with self-closing hinges. Mount drawers on roller-type glides in steel tracks. Provide oak or birch wood cabinets, stained-natural and finished with factory-applied polyurethane.

Manufacturer: Quaker Maid, Model No. XXXX, Hass, Yorktown.

26. No Substitution

See discussion above on sole source justification guidance.

Do not state "Use Brand XYZ." That is misleading unless you are specifying XYZ with no substitution. If a sole source justification is approved, state "No substitution" in the following format:

Manufacturer: Company, Model. No substitution.

27. Or Approved Equal

The Section 01 2500 Substitution Procedures disclaimer addresses "or approved equal." Therefore, in a CSI-format spec, use that section and do not state "or approved equal" after each manufacturer. State the manufacturer in the following format:

Manufacturer: Company, Model.

If the AE desires to list two or more manufacturers/model numbers, it still implies "or approved equal."

28. Exceptions (Reference paragraphs 25, 26, 27)

These rules may be disregarded only for products that are specified in accordance with industry standards such as:

- Copper tubing, Type L, hard drawn, ASTM B88.
- Reinforcing bar, #7, ASTM A615, Grade 40.

29. Cross-Reference Check List

Double-check the following lists:

- Submittal list in Exhibit I to individual Specification sections;
- Drawing list to title sheet to actual sheets;
- Nameplates lists;
- Equipment lists;
- RELATED SECTIONS list in each Specification Section to entire Specification;
- REFERENCES SPECIFIED in individual Specification Sections for inclusion in Specification Section 01 4219, Reference Standards;
- LANL furnished testing for inclusion in Specification section 01 1116.

30. Capitalization

For consistency, capitalize the following words:

- Subcontractor/Subcontract
- Subcontract Technical Representative
- Subcontract Documents
- Drawings
- General Provisions
- Special Provisions
- Specifications
- LANL
- Work

31. Coordination

Coordinate the following pro forma (boilerplate) items carefully with the STR:

- Statement of Work and Scope of Work (in pro forma/boilerplate)
- Exhibits F, H, and I
- Monetary magnitude of Work
- Additive Alternatives
- Number of Drawings and drawing package Project and C numbers

32. Terminology

In preparing the Specifications (and Drawings) use the following guidelines:

Don't Use	Use Instead
1. "constructor"	"Subcontractor"
2. "subcontract" (or previously "contract")	"Subcontract"
3. "Laboratory, government, university, Contractor"	"LANL"
4. "Laboratory" (in reference to a testing lab)	"testing laboratory"
5. "Owner (user) supplied"	"GFE" (Government-furnished equipment)
6. "by others"	"by LANL" or "not in Subcontract (NIS)"
7. "Architect, Architect-Engineer, Subcontract(ing) Officer, Owner, User"	"Subcontract Technical Representative (STR)" [STR after first usage as above]. In rare cases, Subcontract Administrator may be correct and should be used.
8. "index"	"table of contents"
9. "(required by) governing regulations"	Be specific.
10. "comply with LANL standards"	Specify what is required.
11. "industry standards"	Specify what is required.
12. "...must be skilled in their trade"	Specify experience required.
13. "(authorities) having jurisdiction"	None.
14. "at no additional cost to LANL"	None.
15. "in addition to those required elsewhere"	None.
16. "options"	None.
17. "General Provisions" in Specs and Drawings	None.

18. "Special Subcontract Provisions"	"Special Provisions," but only in pro forma (boilerplate)
19. "Special Provisions" in Specs and Drawings	None.
20. "Technical Provisions, Technical Specifications"	"Specifications"
21. "Base Bid" if project does not include alternates	"Work"
22. KSL	LANL

7.2 Soils Information

Where applicable, verify that the soils report is cited in the pro forma (boilerplate) "Instructions to Bidders," reproduce the entire "Soils Report" in the Specifications and reproduce the "Boring Logs" on the Drawings as follows:

- Insert into "Physical Data" of "Instructions to Bidders": "The indications on the Subcontract Drawings or in the Specifications are based on site investigations as compiled in (REPORT NAME AND NUMBER), dated (REPORT DATE), which is reproduced in the Specifications of this Solicitation.
- Such information is not a warranty of subsurface conditions and may not reflect subsurface conditions over the entire proposed construction area. The Bidder shall be responsible for his/her interpretations and use of the information. Also note the applicable General Provision and cautionary statements appearing with such information."
- Insert Specifications Section 02 3000 into the Specifications package.
- On one of the project Drawings, photographically reproduce the boring logs and put the following notes on the same Drawing:

"SOIL BORINGS WERE DRILLED BY (Name of Company). INFORMATION SHOWN HERE IS REPORTED IN GREATER DETAIL IN THE REPORT TITLED (report name and number), WHICH IS REPRODUCED IN THE SPECIFICATIONS OF THIS SUBCONTRACT.

SUCH INFORMATION IS NOT A WARRANTY OF SUBSURFACE CONDITIONS AND MAY NOT REFLECT SUBSURFACE CONDITIONS OVER THE ENTIRE PROPOSED CONSTRUCTION AREA. THE SUBCONTRACTOR SHALL BE RESPONSIBLE FOR HIS/HER INTERPRETATIONS AND USE OF THE INFORMATION. ALSO NOTE GENERAL PROVISION "SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK."

THE AVAILABILITY OR USE OF THE SOILS INVESTIGATION REPORT AND LOGS OF TEST BORINGS SHALL NOT BE CONSTRUED AS A WAIVER OF THE SUBCONTRACTOR'S DUTY TO EXAMINE THE SITE AND THE CONDITIONS AFFECTING THE WORK, AND DOES NOT RELIEVE THE SUBCONTRACTOR FROM THE RISK OF SOIL OR SUBSURFACE CONDITIONS WHICH COULD REASONABLY BE ANTICIPATED OR FROM PROPERLY FULFILLING THE TERMS OF THE SUBCONTRACT."

7.3 Submittal of Specification Package (adapt for non-CSI)

The final submittal of the specification package must be bound and include an approval/cover sheet and a table of contents with revision number of each section (these shall be Rev. 0 for all specs and sections

on initial issue; prior to that, draft specs and sections should use Rev. 0a, 0b, etc.). Refer to the approval/cover sheet and table of contents forms included with this document.

When more than one volume of specifications is required for a project, note the volume number on the cover sheet and in the table of contents.

Color coding of some specification sections may be required by the LANL Project Leader. Also, if the LANL Project Leader elects to reproduce the specification package, submit the package unbound on white paper. Information contained on the approval/cover sheet must be approved by the LANL Project Leader.

8.0 APPENDICES (NON-MANDATORY)

- Appendix A. Considerations in Developing Engineering Specifications
- Appendix B. Engineering Specifications Checklist
- Appendix C. Equipment Data Sheet Examples

Appendix A. Considerations in Developing Engineering Specifications (Guidance)

The Preparer should consider the following when developing engineering specification:

- Project design criteria, item management level, item functional requirements, and design basis documents
- Applicable codes and standards with version expectations
- Applicable requirements of Engineering Standards program
- Appropriate quality standards and acceptance criteria
- The need for design analysis as basis for the specification requirements; examples are structural, materials, thermal, hydraulic, fire hazards, radiation, or accident analysis
- Design or operational/ functional test requirements as necessary to assure that item will perform satisfactorily in service
- Witness and hold points, including drawing review and acceptance
- Requirements for packaging, handling, shipping, storage, cleaning, and protective coatings
- Supplier documentation requirements considering the following :
 1. Information needed for design of interfacing facilities, e.g. equipment foundations, and loads, outline dimensions, electrical wiring information, and interconnecting piping
 2. Assurance that equipment is capable of fulfilling its performance requirements (e.g., critical characteristic verification).
 3. An appropriate degree of control of the supplier's work processes; e.g., welding, heat treatment, non-destructive examination, material tests, and performance test results and reports
 4. Information on painting, packaging, handling, storage, shipping, cleaning, installation, maintenance, and operability requirements necessary for construction
 5. Information on spare and replacement parts or assemblies requirements, and the related data required for ordering these
- Data sheets which are used to convey engineering specification requirements to the Subcontractor or that are to be completed by the Subcontractor for the purpose of furnishing engineering information.
- Quality program requirements
- Applicable construction and operating experience
- Maintenance features and requirements
- Accessibility and other design provisions for maintenance, repair, and in-service-inspection
- Identification, marking, or tagging requirements

Appendix B. Engineering Specifications Checklist (Guidance)

The following provides items to be considered for completeness of the specification. Depending on the nature of the specification and procurement process, items may alternatively be included in other procurement documents or may be deemed not applicable to the specification.

1.0 Scope.

- The scope is clearly defined and is consistent with the Statement of Work.
- Requirements are appropriate for the item.
- Limited “extra” information is provided.

2.0 References

- Used appropriately.
- No conflicts or ambiguity.
- Revisions addressed (e.g., “latest edition” conveyed or specific revision stated).

3.0 Requirements

- Requirements clearly defined.
- As-is conditions, interfaces, and tie-ins are clearly defined and are physically field-verified or required to be verified.
- Performance requirements are used where appropriate with a level of detail appropriate.
- Technical requirements, salient features, and critical characteristics are defined in measurable and verifiable terms with acceptance limits and requirements.
 1. Required items and performance
 2. Design requirements
 3. Materials of construction
 4. Special processes (e.g., welding, heat treating, NDE)
 5. Quality of workmanship, if different from referenced codes.
 6. Special cleanliness or cleaning requirements.
- Special requirements addressed and specified, if appropriate (shelf life, long-term storage, barriers, lifting points, lifting devices, etc.).
- Requirements for personnel qualifications or certifications specified where required by applicable codes and standards.
- Submittals of special process procedures for review are specified.
- Quality requirements are defined and appropriate for procurement level and risk to project or reference is made to the document that defines the quality requirements.
- Critical design and quality assurance hold points and witness points are defined
- Deliverables are clearly defined.
- Partial shipments of equipment parts, components and subassemblies are defined and include acceptance criteria.

- Specific codes and standards governing the work and other references are identified.
- Supplemental requirements of the codes and standards are incorporated as appropriate.
- Acceptance criteria, hold or witness points, submittal of inspection schedules specified.
- Installation requirements specified.
- Tests (including bench tests) and inspections necessary to demonstrate performance requirements are included. Critical design and quality assurance hold points and witness points are submitted for review and approval.
- Performance attribute verification requirements are clearly defined and implement developed test and inspection plans, and source verification plans as appropriate.
- Compliance reviews (e.g., National Electric Code) are developed and included.
- Submittals are linked to technical requirements.
- References are used appropriately.
- There are no conflicts or ambiguities in the references.
- Specific revisions to codes, standards, and other references are used.
- Drawings and sketches contain sufficient detail to define expectations.
- The specification is consistent with the statement of work.
- Documentation and approvals clearly described.
- Applicable quality assurance program documentation is submitted for review and approval prior to commencement of work.
- Those records that the supplier is to maintain are identified, the retention period and disposition requirements are stated, and it is stated that they shall be accessible to project, as applicable.
- Records to be submitted are defined and the schedule for submittal of the records is established and consistent with partial shipments defined.

4.0 Document Quality

- Correct grammar and spellings.
- Sentences and wording is clear.
- Numbering and cross references correct.
- Requirements in one section not in conflict with requirements in other section.
- Document conforms to ESM Chapter Section Z10 Attachment F.
- Completed approval signature sheet.

5.0 Attachments

- Attachments are listed by attachment title or number and revision status, and attached in the same order as listed.

Each page of attachments includes attachment number, revision number, specification number, and page number.

Appendix C. Equipment Data Sheet Examples

Motor Data Sheet

Data Sheet No.: EDS - XXXXXX		Rev.:	Specification No.:	
Project ID:		Project Title:		
TA-	Facility No.:		Facility Name:	
Equipment ID		Equipment Name:		
Selection:	Manufacturer:		Model No.:	
Prepared By		Checked By		Approved By
Name				
Z Number				
Signature				
Date				
Specification				
Rated HP		NEMA Design Letter		
Volts/Phase/Hz		Starting Torque, lb.ft.		
Locked Rotor Current, Amps.		Pull-out Torque, lb.ft.		
Temperature Rise, °F		Duty Rating		
Locked Rotor KVA Code		Sound Level		
Full Load Torque, lb.ft.		Bearings		
Rotation Facing Coupling		Lubrication		
Electrical Type		Insulation		
Enclosure		Couplings Furnished By		
Altitude above sea level, ft		Base Furnished By		
Full Load Current, Amps		Non-Standard Mount or Extension		
Ambient Temperature, °F				
Performance				
Power Factor Percent		Efficiency Percent		
General Information				
Serial Number		Frame Number		
Type Mounting				
Foot, Face, or Flanged		Ceiling, Floor, or Wall		
Horizontal or Vertical				

▪ **Remarks:** Motor shall comply with applicable NEMA Standards

Furnish the following manufacturer's data in the quantities indicated	NUMBER OF COPIES		
	With Bids	Approved	Certified
1. Outline dimensional drawings			
2. Operational and performance data			
3. Literature and parts list			
4. Operating and maintenance instructions			
5. Installation instructions			
6. Test and inspection reports			
7. Materials Certification			
8.			

Heat Exchanger Data Sheet

Data Sheet No.: EDS - XXXXXX		Rev.:	Specification No.:		
Project ID:		Project Title:			
TA-	Facility No.:		Facility Name:		
Equipment ID		Equipment Name:			
Selection:	Manufacturer:		Model No.:		
Prepared By		Checked By		Approved By	
Name					
Z Number					
Signature					
Date					
Specification					
Type of Exchanger	Shell and Tube		Plate and Frame	Other	
Parameter	Fluid 1	Fluid 2	Parameter	Fluid 1	Fluid 2
Fluid Circulated			Specific Heat, Btu/lb F		
Vapor, lb/hr			Thermal Conductivity, Btu/hr ft F		
Liquid, lb/hr.			Latent Heat, Btu/lb		
Liquid Vaporized, lb/hr			Temperature, F		
Vapor Molecular Weight			Operating pressure, psig		
Viscosity, cP			Allowable pressure drop, psig		
Fouling Resistance:					
Heat Transferred, Btu/hr					
Construction					
TEMA Class					
Shell and Tube Configuration					
Front End Head Type:		Shell Type:		Rear End Head Type:	
Design Pressure, psig			Design Temperature, F		
Tube Material			Shell Material		
Corrosion Allowance:					
Code Requirements					
Remarks:					

Furnish the following manufacturer's data in the quantities indicated	NUMBER OF COPIES		
	With Bids	Approved	Certified
1. Outline dimensional drawings			
2. Operational and performance data			
3. Literature and parts list			
4. Operating and maintenance instructions			
5. Installation instructions			
6. Test and inspection reports			
7. Materials Certification			
8.			

Pump Data Sheet

Data Sheet No.: EDS - XXXXXX		Rev.:	Specification No.:	
Project ID:		Project Title:		
TA-	Facility No.:	Facility Name:		
Equipment ID		Equipment Name:		
Selection:	Manufacturer:	Model No.:		
	Prepared By	Checked By	Approved By	
Name				
Z Number				
Signature				
Date				
General				
Type of Pump		Driver		
Fluid Data				
Fluid Pumped		Viscosity @ Pumping Temperature, Cp		
Specific Gravity		Vapor Pressure@ Pumping Temperature, psia		
Solids, WT%				
Pumping Temperature, F				
Design Data				
Design Capacity, gpm		Total Discharge Pressure, psig		
Differential Pressure, psi		Pump Speed, rpm		
Differential Pressure, ft		Efficiency, %		
NPSH Available, ft		Brake Horsepower, bhp		
Mechanical Data				
Material – Case		Suction Nozzle – size, rating		
Material – Impellor, Piston, Diaphragm		Discharge Nozzle – size, rating		
Seal Type				
Driver				
Driver Horsepower, hp		Motor Data Sheet		
Motor Type				
Remarks:				

Furnish the following manufacturer's data in the quantities indicated	NUMBER OF COPIES		
	With Bids	Approved	Certified
1. Outline dimensional drawings			
2. Operational and performance data			
3. Literature and parts list			
4. Operating and maintenance instructions			
5. Installation instructions			
6. Test and inspection reports			
7. Materials Certification			
8.			

Fan and Blower Data Sheet

Data Sheet No.: EDS - XXXXXX		Rev.:	Specification No.:	
Project ID:		Project Title:		
TA-	Facility No.:		Facility Name:	
Equipment ID		Equipment Name:		
Selection:	Manufacturer:		Model No.:	
Prepared By		Checked By		Approved By
Name				
Z Number				
Signature				
Date				
Gas Data				
Gas Name		Corrosives		
Molecular Weight				
Design Data				
Capacity scfm		Relative Humidity of Gas		
Capacity acfm		Normal Inlet Temperature, F		
Elevation above sea level, ft		Minimum Inlet Temperature, F		
Specific Gravity of Gas		Differential Pressure, in. wg.		
Mechanical Data				
Fan Type:		Blade Type		
Fan Inlet Type		Fan Motor Location		
Fan Class		Rotation and Discharge		
Fan Arrangement		Wheel Construction		
Inlet Size, in		Sound Level		
Outlet Size, in		Drain		
Materials				
Housing Material		Hub		
Housing Material Thickness		Shaft		
Blade Material		Shaft Sleeves		
Blade Material Thickness				
Control				
Outlet Dampers		Variable Speed Drive		
Variable Inlet Vanes		Variable Pitch Blades		
Control Power				
Volts		Phase		
Hertz		Electrical Hazard Class		
Tests				
Mechanical Run-in		Witness Performance		
Non-Witnessed Performance				

Fan and Blower Data Sheet (CONTD)

Included Items			
Common Base Plate		Silencer	
Inlet Screen/ Filter		Ducting Transition Piece	
Control Panel		Housing Drain Connection	
Spark Resistant Construction		Vibration Isolation	
Insulation Studs		Sectional Drawing	
Special Coatings		Inspection Access Panel	
Inlet Box		Paint	
Driver			
Driver Horsepower, hp		Motor Data Sheet	
Motor Type			
Remarks:			

Furnish the following manufacturer's data in the quantities indicated	NUMBER OF COPIES		
	With Bids	Approved	Certified
1. Outline dimensional drawings			
2. Operational and performance data			
3. Literature and parts list			
4. Operating and maintenance instructions			
5. Installation instructions			
6. Test and inspection reports			
7. Materials Certification			
8. Performance Curves			
9.			
10.			

FORMS

Form 1 Approval/Cover Sheet for Externally Produced Specifications

Form 2 Table of Contents Sample

Form 1. Approval/Cover Sheet for Externally Produced Specifications (instructions on back)

SPECIFICATIONS

FOR

[PROJECT TITLE]

AT THE

LOS ALAMOS NATIONAL LABORATORY

PROJECT IDENTIFICATION NUMBER []

TECHNICAL AREA []

BUILDING []

PREPARED BY

[AE NAME AND ADDRESS]

1.7 Management Level ML-1 ML-2 ML-3 ML-4

1.8 Nuclear Functional Classification SC SS DID Not Safety Related

Name

Signature

Date

1.9 Submitted by:

1.10 LANL Acceptance

1.11 Derivative Classifier Review

Classification: UCNI OOU Classified Unclassified

Name

Z Number

Signature

Date

Spec Approval/Coversheet Instructions

These instructions are not part of the completed form, therefore do not attach them. When completing the form, update headers and footers of the form as necessary for clarity and correctness. Minor adaptations are allowed.

LANL-produced specifications shall use the formats required by [AP-341-609](#), *Engineering Specifications for Non-Safety SSCs (future)* and/or AP-341-610, *Engineering Specifications for Safety SSCs (future)*. Externally produced specifications may use or adapt these AP formats also.

Field No.	Entry Information
Header	<p>Enter the specification number, specification revision, and total number of pages of the specification including attachments.</p> <p>Specification number format is SPC – [Project ID] – [CSI Section No.] – [XXXXX], where SPC = Specification</p> <p>Project ID = Project Identification number</p> <p>When a specification is not associated with a project then keep the Project ID field blank, obtain the unique number field from the IRM-DCS Representative, and complete the unique number field.</p> <p>CSI Section No. = MasterFormat number when appropriate to uniquely identify spec</p> <p>XXXXX – optional number assigned by the project (e.g., a unique/sequential number and/or a suffix that relates to the phase of a multi-phase project. Obtain from the IRM-DCS Representative or the person who fulfils this function for the project or the facility.</p>
	Enter the specification title.
	Enter the project identification number. If the specification is not associated with a project, then enter "N/A".
	Enter the project title. If the specification is not associated with a project, then enter "N/A".
	Enter the design package number. If the specification is not associated with a unique design package, then enter "N/A".
	Enter the design package title. If the specification is not associated with a unique design package, then enter "N/A".
	Enter the Operating System ID if the specification is associated with a system in an operating facility. Otherwise, enter "N/A".
1.7	Enter the management level of the SSC described in the specification. The specification ML shall have the same ML as the highest ML (ML-1 is the highest and ML-4 is the lowest) of any item or service described in the specification.
1.8	Enter the nuclear function classification of the SSC described in the specification. This classification is only applicable to Hazard Category 2 and 3 nuclear facilities and operations.
1.9	Preparer of the specification enters name, Z number, signature and date.
1.10	LANL Design Authority Representative (Project Engineer) enters name, signature and date.
1.11	Derivative Classifier/ Reviewing Official completes this field prior to issuance of the specification for review, fabrication, or construction.
	Preparer enters the revision number of the specification.
	Preparer enters the approval date of the revision.
	Preparer notes the pages affected by the revision.

LANL records management representative maintains the project or the facility Master Document List current as specification revisions are approved.

Form 2. Table of Contents Sample

TABLE OF CONTENTS		
<u>SECTION</u>	<u>TITLE</u>	
VOLUME 1		
DIVISION 1 - GENERAL REQUIREMENTS		
01 1116	WORK BY OWNER	Rev. 0
DIVISION 2 – EXISTING CONDITIONS		
02 3000	SUBSURFACE INVESTIGATION	Rev. 1
DIVISION 3 - CONCRETE		
03 3001	REINFORCED CONCRETE	Rev. 0
etc....		
SUPPORTING DOCUMENTS		
	STORM WATER POLLUTION PREVENTION PLAN (SWPPP), r0. XX/XX/2007	