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HISTORY (Record of Revisions)

Rev	Date	Description	POC	RM
0	8/25/10	Initial issue. Included material formerly in Z10 body and Master Specs Manual Sections 100-200. Added material on acceptance methods, procurement-only specs, and other updates.	Tobin Oruch, <i>CENG</i>	Larry Goen, <i>CENG</i>
1	3/23/15	New: Critical characteristics per AP-341-607 for ML-1/2; Sect 01 3300 vice Exh I; Exh H coordination; submittal reduction. General reorg.	Tobin Oruch, <i>ES-DO</i>	Mel Burnett, <i>ES-DO</i>
2	04/05/2018	Clarified implementing requirements of specs versus using them, design and safety critical characteristics, editing.	Tobin Oruch, <i>ES-FE</i>	Larry Goen, <i>ES-DO</i>

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

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

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

The processes for development and control of LANL-produced specs for facilities and all nuclear facility work are addressed by [AP-341-609](#), *Specifications for Non-Safety SSCs* and [AP-341-610](#), *Specifications for Safety Related SSCs*.

2.0 INTRODUCTION (GUIDANCE)

Specifications and drawings provide the principal means of capturing and conveying system, structure, and component design requirements. The specifications provide the written technical and quality descriptions of materials, equipment, systems, standards, and workmanship. These 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 should be commensurate with risk. Design and quality characteristics should be specified and the means to verify them 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. For ML levels higher than ML-4, also see discussion at article on MLs below (4.5).

LANL recognizes two major types of specifications:

- A. 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 before installation, but can also include services (e.g., testing). They are prepared by a Design Agency (LANL or external AE).

- B. 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).
 - 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 contains the preferred order of headings within a spec but allows preparers latitude. 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 of Appendix D of this document.
 - 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.¹*

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 which is designated for review, which work must be held pending arrival of the designated organization. It cannot be bypassed without the specific release by an approved Hold Point Waiver. [P330-8].
hold point waiver	As described in applicable work control documents (e.g. field change, design change process, etc.), documentation approved by authorized personnel that govern the configuration management for the item and state that a specified Hold Point may be waived. [P330-8].
LMS	LANL Master Specification(s) in the STD-342-200 collection. 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.

¹ For equipment on larger projects (i.e., over \$300k), when CSI format specs are not used for procurement, one or two page data (specification) sheets should be produced. These are common in the chemical processing industry. They are useful for procurement and later by LANL, and examples are in Z10 Att F. Equipment Data Books (EDBs) are also useful for operations and maintenance; they contain organized and indexed submittal information. TA-55 had developed about 100 EDBs for glovebox systems, stand-alone laboratory systems, and facility systems (hardcopy form and eventually electronic form). A draft procedure has also been written for developing EDBs at TA-55 (Guide for Preparing and Maintaining Equipment Data Books) and is available upon request from ES-55.

Term	Definition
witness point	A point in the process where an inspection, test, or activity point is reached that requires notification of the designated individual that the items are available for the designated inspection, test, or activity. Work may proceed past the point and work is not required to stop if the requester is not present. [P330-8]

4.0 REQUIREMENTS FOR ALL SPECIFICATIONS

A. General

1. **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.²
 - a. 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 design characteristics that can be described in a purchase request.
 - b. *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 DCF or work package instructions, sketches, or drawings). Specifications are preferred over extensive drawing notes.*
 - c. 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.
 - 1) 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.
2. Specifications must implement the sustainable acquisition requirements of ESM Chapter 14.³
3. Revisions to the specifications after issuance require the same level of review and approval as the initial issuance.
4. Guidance in the appendices to this document includes:
 - App A. Considerations in Developing Engineering Specifications (Guidance)
 - App B. Engineering Specifications Checklist (Guidance); and
 - App C. Equipment Data Sheet Examples

² This threshold has existed since 2004 (Z10 r0) and has proved to be appropriate. ES-EPD Group Leader may vary in writing.

³ May require research and subsequent alteration of some LANL masters and project-created sections

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5. *Guidance: Buy American Act: Projects should comply with this Act ([41 U.S.C. Chapter 83](#)) 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.”⁴*
 6. Software: When items with software are being specified, refer to ESM Chapter 21 for requirements that may need to be addressed in the spec.
- B. Subcontractor Deviation Disposition Request (SDDR)
1. Reference (including an external link) to LANL SDDR Form [2178](#) was added to [pro forma](#) Exhibit D (for Construction) boilerplate for procurements of equipment, materials, and technical services in August 2010 (an SDDR is not necessary for procurement of off-the-shelf items). As such, the form need not be included with specifications, but can be referenced if desired. The form has detailed instructions/explanation.
- C. Submittal Procedures
1. 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.*
 - a. These headings must be used to categorize the submittal requirements:⁵
 - 1) Action⁶
 - 2) Informational
 - 3) Sustainable Design (incorporates specific sustainable design requirements, tracks info separately from Action submittals – e.g., for LEED)
 - 4) Closeout (includes the maintenance materials)
 - 5) Delegated Design (incorporates LANL design review specific process, tracks separately from Action submittals)
 2. When a single-topic 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. For the technical and quality submittals required by the CSI specs, this must be accomplished by use of Master Specification Section [01 3300, Submittal Procedures](#) (*Note, this is a change away from use of Exhibit I Attachment B, Subcontractor Submittal Requirements Summary for these types of submittals as used from 2009 until March 2015. Exh I remains in use for commercial submittals like bonding.*).
 - a. The project’s design agency must edit and complete the submittal schedule template in 01 3300, deleting submittals for spec sections and

⁴ 2010 FAR [52.225-9](#) through 13. LANL ASM Acquisition Practices Section 3251 Buy American Act Rev 1 10/22/07 driven by LANL Prime Contract

⁵ Adaptation of CSI SectionFormat

⁶ TLW used Priority and Review as subcategories of Action submittals. Priority submittals were required to be shown in the subcontractors construction schedule. Such practice is allowed but optional.

submittals that aren't involved and adding for spec sections and submittals they create.

D. Verification

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

Table Z10-F-1. Acceptance Method Suggestions

References	
AP-341-703 , Commercial Grade Dedication	LMS 01 4444 , Offsite Welding and Joining Requirements
AP-350-406 ; Start-up and Commissioning*	LMS 01 4455 , Onsite Welding and Joining Requirements
AP-CMP-401, Systems/Process Component Testing*	P840-1 , Quality Assurance for Procurements
LANL Master Spec (LMS) 01 4216 , Definitions	WI-400-282, Acceptance Inspection and Testing*

* Available on LANL's [EDMS](#)

Acceptance Method	Best Use	Conditions	Examples	Reference
Supplier Evaluation and Source Verification				
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 or services if CGD 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 party audit and 3 rd party certifications. Can include audits of Designer, major subcontractor or constructor/fabricator.	P840-1
Source Verification	Focused look at important attributed, less comprehensive than above	Supports critical test/inspection witness or hold points. Can be used in support of item and service dedications	First time use of supplier typically when not on the IESL	P840-1 , AP-341-703
Submittal Review				
C of C⁷	Reputable supplier	Needs supplier evaluation for confidence, so generally not useful except for ML-1/2	Vague functional needs/assemblies/fabrications	LMS 01 4216; P840-1
CMTR⁸	Facilitates welding/strengths/structural elements	Special, high strength, or key materials	Structural steel weld rod, metallics, fasteners	LMS 01 4216; P840-1
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	LMS 01 4444 and 01 4455; P840-1
Testing (Factory or Onsite)				
Item test	Material/items tests per codes/standards	M&TE, skill, resource availability	Backfill, concrete slump, cylinder breaks (ASTMs)	AP-CMP-401
Source inspection or test	Special equipment needed	Major shippers, manufacturers, fabricators	Rebar, batch plant, structural steel, assemblies	P840-1

⁷ From LMS 01 4216, 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)

⁸ From LMS 01 4216 References, "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).

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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; AP-350-406 ; AP-CMP-401
System Test	Where system functionality is critical	Boundary integrity / condition dependent	Ventilation, lighting, fire detection/suppression	ESM Ch 15, Commissioning; AP-350-406 ;
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; AP-350-406 ; AP-CMP-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 NDE
Receipt inspection	Form and fit determinations	Critical Characteristics, needed for best use	Critical items requiring pedigrees. Required for all ML-1, ML-2, and (currently) ML-3 items. Also done for frequently counterfeited items such as hoisting and rigging, fasteners, stand-alone circuit breakers. ⁹	P840-1
Installation inspection	Process- and time-dependent items	Skill and tool dependent – may be inaccessible later	Rebar, concrete, earthwork	ESM Ch 16 Section IBC-IP; WI-400-282

E. Management Level 1, 2, and 3

1. ML-1 and -2 specs, at a minimum, must delineate the safety function of the item or service. *For hazard category 2 and 3 nuclear facilities, critical characteristics should also be specified if known and the item or service will be procured through commercial grade dedication and a third party dedicator is not responsible for developing and documenting the critical characteristics¹⁰. See [AP-341-607](#), *Determining Critical Characteristics for Design of Safety Related Items*. There are a number of EPRI and other guides related to technical evaluations and CGD available internally [here](#). Guidance: FMEA: When it is known that the ML-1 and ML-2 active equipment procurement will be from a nuclear-qualified supplier (IESL), consider requiring a basic failure modes and effects analysis (FMEA) submittal from the equipment supplier that shows how the components or parts support the credited ML-1 and ML-2 functions and performance criteria per a national standard or AP-341-607, *Determining Critical Characteristics for Design of Safety Related Items* (e.g, Att A) with assistance from the “A Guide to FMECA” in the CoE Learning Guide library.¹¹ (if CGD by third party dedicator, they would develop this in support of the CGD package).*
2. 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 lack necessary QA measures -- and did not receive a verification review/ before issuance. Sections that were intended for ML1-3 use reflect this in the prefacing author’s notes.
3. Draft changes from LMS spec sections for ML-1, 2, and 3 SSCs for review must be “Track Changes” unless Project Engineer waives this practice (*deletions should be strikethrough and additions bold text with a vertical border line*).
4. *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*

⁹ When an LMS both (1) contains a requirement for receipt inspection (RI) and (2) is to be used for an ML-4 SSC work result, the RI requirement should be considered Not Applicable. As such, when editing the LMS template for a project, the Design Agency must delete the RI requirements unless the rationale for retaining is documented in the project files. (incorporates VAR-10122).

¹⁰ AP-341-607 (Section 2.2 as of 1/2015)

¹¹ Determination of component or part management level during design is generally not necessary, but this information will be useful to LANL in obtaining replacement components and parts in the future.

documented safety analysis. For these (and for ML-3 specs, when added measures above ML-4 include procurement quality matters), appropriate strengthening may include:

- a. *Submittal/acceptance of Subcontractor/Supplier QA program including qualifications of designers, inspectors and installers, non-conformance program, etc.*
 - b. *Submittal of external supplier CGD Plans for LANL review and approval prior to procurement if items or services are procured in accordance with ASME NQA-1, Subpart 2.14, Quality Assurance Requirements for Commercial Grade Items and Services. Submittal of results and documentation of Commercial Grade Dedication such as verification reports, results of tests and inspections, dedication packages.*
 - c. *Vendor (subcontractor) qualifications*
 - d. *For nuclear or radiological facilities, invoking the requirements of DOE Order 414.1D, 10CFR830.122, and/or ASME NQA-1 use the nuclear version of Master Specification 01-4000, Quality Requirements*
 - e. *Identification of safety functions and/or critical characteristics (see notes and tables above)*
 - f. *More detailed construction submittals,*
 - g. *Submittal of CMTRs for items that are credited with a structural related safety function*
 - h. *More rigorous material receipt and control, possibly including segregation and inventory control,*
 - i. *Storage, maintenance, and handling requirements in accordance with ASME NQA-1, Subpart 2.2 Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Facilities. Specify the Classification (i.e., Level A, B, C, or D) for each individual item (e.g., in specs and/or a consolidated bill of materials– CBOM).*
 - j. *More rigorous field quality control including submittal of test procedures and test and inspection personnel qualifications (Note, 01 4000 nuclear version includes much of this),*
 - k. *Increased test and inspection and associated Hold and Witness points including in-shop, receipt inspection, and in-place. Submittal of test and inspection reports per Specification 01-4000 requirements*
 - l. *Traceability of materials with CMTRs, possibly including installation map for steel, rebar, welds/filler material, etc.*
 - m. *Seismic and other environmental qualification requirements including system interaction, and/or*
 - n. *Independent technical review/design verification per NQA-1.*
5. *Examples of ML-1/ML-2/ML-3 specs are LMS Sections on nuclear gloveboxes ([11 5311 series](#)), concrete (03 3021), and concrete anchors ([05 0521](#)). See also [P840-1](#), Quality Assurance for Procurements.*

5.0 CSI FORMAT AND LANL MASTER GUIDE SPEC TEMPLATES (LMS)

- A. LANL has approximately 200 LMS templates in the CSI format in LANL Master Specification's collection ([STD-342-200](#)) online. When such a section applicable to LANL

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work exists, its applicable requirements must be followed regardless of who performs the work or the authorizing or contractual methods used to initiate the work.¹²

- B. When required (see 4.0 General above), a CSI-format specification book must be created for the project by combining multiple specification sections. Follow CSI [MasterFormat](#) latest update (e.g., 2014) for organization of Division 00 through 49 sections.
- C. LMS are templates upon which the designer must start when they exist on a topic required by the project.
1. LMS are not finished products -- designers **MUST** tailor LANL Masters to the project's needs, modifying and augmenting the existing verbiage. Unedited sections are cause for rejection.
 2. **The specifications must also be edited to delete verbiage for matters like submittals, materials, and methods that are not applicable or appropriate to the project. Also, author must hide or delete preparer notes. Such edits as well as reducing submittals does not require a variance or other permission.**¹³ This direction supersedes any conflicting direction in LMS authors notes or elsewhere.
 - a. NOTE, however, that neither an author nor project can reduce applicable technical or quality verbiage (this is different than submittals) without LMS POC permission per Z10 main section on variance. *Alteration of quality verbiage should receive LANL QPA representative permission as well.*¹⁴
 - 1) When in doubt on applicability, consult POC who has final authority.
 - 2) A few LMS are entirely optional; when so stated in ESM, spec index, or similar method, POC permission is clearly not necessary.
 3. Square brackets ([]) and/or carets (< >) are used in the text to indicate additional designer choices or locations where text must be modified by the designer (remove all brackets during editing).
 4. When editing sections for a project, the preparer must add job-specific requirements.
 5. Product callouts may be changed if new callouts meet original design intent and all stated requirements (unless "no substitution" is indicated) without permission, and must be when products are not available.

¹² Requirements can be conveyed on drawings for very small jobs; see Article 4.0 above. Design choices are sometimes but not always limited by the relatively small LMS collection of products specs. Design criteria are generally in the ESM and any LANL product and method limitations are either in the ESM or the LMS. As an example, there's an LMS on mod-bit roofing; the LMS establishes requirements when using mod-bit that must be followed. There is not a LMS on foam roofing; this in itself doesn't preclude foam -- but the ESM itself does.

¹³ LANL retains the right to require certain submittals be included or excluded. Tailoring shall be to the extent practical. For example, performance specs for the Fire Alarm Replacement Program cannot be fully tailored because of the varying existing conditions and because they must allow task subs some flexibility in final system selection and configuration during shop drawing development (and continue to allow for some installation flexibility during construction). Any conflicts between SOW, specs, and drawings are subject to order of precedence discussed in Z10 main section. When expected outcomes are unclear to field inspectors or others, project/design engineers must communicate via FCR or other written method.

Z10 draft: POC permission shall be documented. This can be by email exchange, email documenting verbal permission, a SharePoint system for capturing issues/responses, or other method. Written requests should be specific about revision and citation in question and justification for change. Also, where ESM, spec index, or similar method indicates that a given spec section is to be considered guidance, then POC permission is not necessary (but user input regarding improvement is desired).

¹⁴ Need for permission rather than formal variance assumes LANL POC spec preference (if ESM or other LANL policy is violated then a variance is required).

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6. Self-Perform: It is not necessary to edit language such as STR and Subcontractor when project is to be self-performed.¹⁵ *Such terminology changes in the Specifications may be helpful for clarity when LANL is only performing part of the work (and the design funding source desires to pay for making such distinction for additional clarity beyond what should be stated in the scope of work documents).*
 7. The designer must correct LMS sections to properly reference other LANL sections used as necessary—and designer-added sections (and visa-versa). Alternatively, NOT referencing related Sections is also allowable.¹⁶
 8. The designer must update LMS Sections where they are incorrect, incomplete, uncoordinated, or have become outdated (one example is modifications to achieve sustainable procurement per ESM Chapter 14 requirements).
 9. 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 direction regarding ML-1, 2, and 3 above.
- D. Proprietary Language
1. Wherever possible, allow competition in products and services by not sole sourcing.
 - a. Sole sourcing is indicated in LMS and project specs by the addition of the phrase “No substitutions.” after any brand name.¹⁷
 2. Include LMS Section 01 2500 *Substitution Procedures* since it effectively adds “or approved equal” after every brand name not also bearing “No substitutions.”¹⁸
 - a. *Even when 01 2500 is included, poor understanding of this approach leads users to incorrectly believe that a listed product must be used regardless. Thus, if the LMS and/or spec author lists two or more manufacturers/model numbers it is helpful (and is still “or approved equal”).*
- E. Submittals
1. *Submittals listed in LANL Masters generally represent those potentially appropriate for the highest risk project—a large building (or nuclear SSC, for those specs in the collection)—because it is more efficient to reduce these for less risky projects than develop what to add for higher risk.*
 2. As such, the Design Agency shall reduce the required submittals so that the number of submittals required is limited to those that are critical to ensure the design is installed in accordance with the construction documents and to provide quality records and documents and materials needed for operation and maintenance.
 3. Submittals shall not be reduced for the following categories without agreement of the applicable LANL Standards Spec POC:
 - a. When concurrent review by LANL is required by 01 3300 Att A
 - b. egress-related (doors, hardware, safety lighting/signs, ADA)

¹⁵ Use of LMS 01 1117 Work by Owner—Self-Perform, if used, addresses this. Furthermore, in these cases it should be understood from Div 01 or other work statements that LANL is to do all the work; this is also made clear in the Div 01 definitions section (e.g., 01 4216 Definitions). Finally, on 1/26/15 in a telecon, the MOF-CM manager, superintendents’ mgr, and CE mgr agreed that LANL craft and field engrs will interpret these to mean LANL without need to modify specs.

¹⁶ E.g., a section may reference other sections that are future LANL Masters. Until they exist, the design agency shall either delete these anticipatory references or create a project spec on the topic (whichever is more appropriate for the project). Re not referencing at all, constructors should be capable of navigating without referencing, so it adds clutter.

¹⁷ So-called closed proprietary specifying. Sole sourcing a product in excess of \$100k may require an approved Non-competitive Justification Form 3300 in accordance with LANL ASM AP 3300.

¹⁸ Where appropriate. This is open proprietary specifying.

- c. engineered, custom, specialty, or complex items
 - d. fire alarm/suppression SSCs and material flame spread documentation
 - e. pressure safety (including LMS 01 4115, Pressure Safety Submittals)
 - f. project record documents such as:
 - 1) quality--welding, test record
 - 2) O&M – manuals, other materials (when available)
- F. 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 F (ES&H) and H (quality) which will be produced and provided by LANL Project Engineer or other LANL project team members.
- G. *Exhibit H Guidance:*
1. *Table Z10-F-3 (below) notes where QA requirements should be addressed in Technical scope documents (i.e., outside of Exhibit H where they are always referenced/addressed). Exhibit D (or other specified technical scoping document that may be used for internal procurements) specifies the item-specific or service-specific QA requirements. Exhibit H specifies the QA program requirements that are applicable to the entire procurement.*
 2. *For example, if concrete were being procured and the LANL Master Specification 03 3001, Reinforced Concrete were used, then the specification may require the concrete supplier to perform a slump test in accordance with ASTM C 143, Standard Test Method for Slump of Hydraulic-Cement Concrete. This is a technical requirement specific to the concrete supplier (only) and should be included in a concrete specification in Exhibit D. It meets the technical requirement in NQA-1, Requirement 11 for “Characteristics to be tested and test methods to be employed shall be specified.” For this same procurement, Exhibit H may then specify the QA program requirements for the test, such as requiring that the test results be documented and maintained, and evaluated by the responsible authority to ensure the test requirements have been satisfied.*

Table Z10-F-3. Recommended Distribution of QA Requirements in Scope Documents -- Guidance

DOE Order 414.1D Requirement	Requirement Title	Also appropriate in Technical Scope Documents (e.g., Exhibit D)
Att. 1	General Quality Requirements	
Att. 2. Sec. 1	Management/Criterion 1 - Program	
Att. 2. Sec. 2	Management/Criterion 2 - Personnel Training and Qualification ²	X
Att. 2. Sec. 3	Management/Criterion 3 - Quality Improvement	
Att. 2. Sec. 4	Management/Criterion 4 -Documents and Records ^A	X
Att. 2. Sec. 5	Performance/Criterion 5 - Work Processes ²	X
Att. 2. Sec. 6	Performance/Criterion 6 - Design	
Att. 2. Sec. 7	Performance/Criterion 7 - Procurement	
Att. 2. Sec. 8	Performance/Criterion 8 - Inspection and Acceptance Testing ^B	X
Att. 2. Sec. 9	Assessment/Criterion 9 - Management Assessment	
Att. 2. Sec. 10	Assessment/Criterion 10 - Independent Assessment	
Att. 3	Suspect/Counterfeit Item Prevention	
Att. 4	Safety Software QA Requirements for Nuclear Facilities ²	X

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Table Notes:

^A Technical scope documents apply document and records requirements specific to technical specification submittals. Exhibit H applies this requirement to documents and records other than specification submittals.

^B Exhibit H may require a supplier to have a QA program that meets work process requirements whereas the technical scope documents (e.g., Exhibit D) may specify what items or service the requirement applies to and the technical standard that is must satisfy. **Example:** Exhibit H may specify that a supplier have a QA program, and the associated requirements, for calibration and maintenance of equipment. Exhibit D may specify which specific items in the procurement require calibration (e.g., temperature gauges), and the item-specific calibration standards (e.g., the ASTM test method).

- H. Non-LMS Sections: Because most projects require specs for work results beyond what the LMS cover, creating additional spec sections is normally also required.
1. When adding non-LMS specification sections, number them in accordance with the latest CSI [MasterFormat](#) system rules¹⁹. 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. ES-EPD/CoE normally subscribes to some commercial masters also.*
 2. Summary of Work (01 1100): If present, 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, perhaps, visa-versa. Best Exhibit D examples can be found on ES-EPD ESR page [here](#), but also exist as ASM pro forma [here](#) (internal only; look under "Construction").*²⁰
 3. In general, also conform to the recommendations of CSI's Project Resource Manual/CSI Manual of Practice and its Construction Specifications Practice Guide except to the extent this document requires departures from those recommendations.
- I. Ultimately, the designer must produce a clear, concise, complete, and correct project work description in accordance with the industry standard of care.
- J. 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.
- K. 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*²¹, etc.).
- L. Submittal of Specification Package (adapt for non-CSI)
1. 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.

¹⁹ At time of writing the weblink led to the system's numbers and titles-only document; this is normally adequate but does lack the usage rules and notes in the hardcopy edition of MasterFormat (e.g., listed numbers/titles cannot be altered; made-up titles must use an appropriate made-up number). Also, if renaming or combining or splitting LANL masters for justifiable reason, also renumber to a non-LANL-master, MasterFormat-compliant number.

²⁰ 01 1100 is a valuable section. At time of writing, an LMS 01 1100 was being written.

²¹ If closeout submittals aren't required, PRD section isn't required.

Section Z10 Attachment F Specifications

Rev. 2, 04/05/2018

2. 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.
3. 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.

6.0 FORMS

- Form 1 Approval/Cover Sheet for Externally Produced Specifications
Form 2 Table of Contents Sample

7.0 APPENDICES

- Appendix A Considerations in Developing Engineering Specifications (Guidance)
Appendix B Engineering Specifications Checklist (Guidance)
Appendix C Equipment Data Sheet Examples
Appendix D Procurement-Only, Non-CSI Spec Format Template
Appendix E Wording of Specs

Approval/Cover Sheet for Externally Produced Specifications

SPC – [Project ID] – [CSI Section No.] – [XXXXX] Rev:[] Date:[]

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

OHC

Not Safety Related

Name

Signature

Date

1.9 Submitted by:

1.10 LANL Acceptance:

1.11 Derivative Classifier/UCNI Review:

Classification:

UCNI

OUO

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* and/or [AP-341-610](#), *Engineering Specifications for Safety SSCs*. 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. = optional MasterFormat number to identify a single-topic (e.g., procurement) 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 Document Control Representative or the person who fulfils this function for the project or the facility. Include revision number of the specification and date.</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.

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

Table of Contents Sample

TABLE OF CONTENTS		
<u>SECTION</u>	<u>TITLE</u>	
VOLUME 1		
DIVISION 1 - GENERAL REQUIREMENTS		
01 1117	WORK BY OWNER–SELF-PERFORM	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/2014	

Appendix A. Considerations in Developing Engineering Specifications (Guidance)

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
- Tolerances stated and as liberal (loose) as the design can allow (to reduce fabrication/construction cost)
- 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 (preferred) 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/or tolerances) 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.

Appendix B, Engineering Specifications Checklist

- 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. A listing of 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 and the drawings.
- 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			

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	
Name		Approved By		
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 (CONT'D)

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.			

Appendix D: Procurement-Only, Non-CSI Spec Format Template²²

As an alternative to CSI format²³ or this format, the project may 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.

A description of the contents has been provided below 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, and
- c) page number.

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).

²² Adaptation of CMRR-AP-ENG-0316 draft

²³ Refer to Procurement topic in Article 2.0 of this Attachment F for related discussion

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 Dedication/Critical Characteristics

For commercial grade items or services (see AP-341-703, Commercial Grade 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). These may be combined into a Quality Requirements Section.

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. See ESM Ch 21 Software. [Exhibit H](#) QC-36 provides key requirements; augment as necessary.

For safety significant and safety class items, include a requirement for software to be controlled in accordance with DOE Order O 414. 1D, Attachment 4, Safety Software Quality Assurance Requirements for Nuclear Facilities and ASME NQA-1, Part I, Requirements 3 and 11 and Part II, Subpart 2.7, Quality Assurance.

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 shall be packaged, labeled, stored, and shipped according to applicable DOE and Department of Transportation (DOT) regulations (ref. P151-1, LANL Packaging and Transportation Procedure).

Additional Requirements for Safety Class, Safety Significant, and ML-3 OHC (other hazard controls) 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 and Specification 01 4000, Quality Requirements.

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) 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.
- c) requirement for deviations from the specification to be reported using the Subcontractor Deviation Disposition Request Form 2178 (optional, in pro forma boilerplate already)
- d) methodology for initiating a request for information.

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 Assurance²⁴(applies to nuclear and radiological facilities),
- b) DOE Order O 414. 1D, Quality Assurance,
- c) ASME NQA-1, Quality Assurance Requirements for Nuclear Facility Applications, Part I – for limited scope specifications, the applicable Requirements should be identified, [Use a graded approach for ML-3 items].
- d) ASME NQA-1, Quality Assurance Requirements for Nuclear Facility Applications, Part II – identify the specific subparts that are applicable. [Use a graded approach for ML-3 items].

9. Configuration Management

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

10. Documentation and Submittals

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 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

²⁴ 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 414.1D. 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*. Other CFRs that define quality assurance requirements (e.g., 10CFR Part 50, Appendix B; 10CFR Part 71, Subpart H; etc.) may be applicable based on the scope of work. SD330, *LANL Quality Assurance Program*, defines the applicable requirements and version of ASME NQA-1 for LANL nuclear and radiological facilities. Local quality assurance plans or technical standards may require the use of other versions of ASME NQA-1 or the use of other quality standards for non-nuclear work.

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.

Appendix E: Wording of Specs

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" or "Follow 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 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. Requirements near the beginning of this document discuss when a spec is not strictly required and this practice is allowed.

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 constructor (contractually the 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" (exception next paragraph).

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

Yes: "Verify lines before starting formwork."

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

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 -- nor more than once in the Specifications. *The more often something is repeated, the more voluminous (and thus challenging to maintain consistent and to use) the construction documents become.*

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

No: Trench Drawings are in each discipline -- or include requirements in the trenching section 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-EPD, NECA, ACI, NEMA, NFPA. **Yes:** LANL ES-EPD.

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. 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.

17. 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.

18. Reliance on LANL Standards

Avoid references to LANL standards as a substitute for providing a fully detailed Specification. If absolutely necessary to do so, provide link to website and/or include a copy of the referenced standards in the bid documents.

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

19. Reference and Code Listings

Cite reference standards correctly. An option is to list Codes, References, and Standards, for all disciplines in a Division 01 Section with full names and addresses. The list should 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 they have mandated a requirement when they have 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 Div 01, 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.

20. Scope of Work

Do not include a scope of work in individual Sections. *Scope of Work and Technical Specifications* is Exhibit D of the pro forma for subcontracts. If also used, 01 1100 Summary of Work must be coordinated (also see discussion above on this coordination).

21. 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 pro forma exhibits 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.

22. 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.

23. 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.

24. 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 25 below) and doing so may produce a restrictive spec. Ideally, 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.

25. No Substitution

See discussion on sole source justification in main section of this document ("Proprietary Language") and "Salient Characteristics" above.

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.

26. Cross-Reference Check List

Double-check the following lists:

- Submittal list in 01 3300 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 Div 01 References or equivalent;
- LANL furnished testing for inclusion in Project-created Section 01 1116.

27. Capitalization

For consistency, capitalize the following words:

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

28. Coordination

When subcontracting the work, coordinate the following pro forma (boilerplate) items with the STR:

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

29. Parts and End

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"

30. 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

Don't Use	Use Instead
	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, SSS	LANL

31. Soils Information

Where applicable, verify that the soils report—formally known as Geotechnical report (GR)—is cited in the pro forma (boilerplate) "Instructions to Bidders." Further, it is best practice that both Section 31 2000 and the Structural Gen Notes (typically on Drawing Sheet S-0001) refer to GR – and neither include any content that conflicts with that of GR. An alternative is to 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."
- 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."