Los Alamos NATIONAL LABORATORY EST.1943

Conduct of Engineering
Request for Variance or Alternate Method

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1.0 General

1.1 Document Number: VAR-10761	1.2 Revision: 0
1.3 Brief Descriptive Title: TIP Template Renamed "Test & Inspection Summary (TIS) Template (Guidance)" and Related Changes	
1.4 Affected Program: Engineering Standards	1.5 Request Type: Variance
1.6a Affected Tech Area 99	1.6b Affected Buildings Sitewide
1.7 Requestor: Oruch, Tobin H Organization: ES-FE	

1.8 Revision History

Revision Number	Changes and Comments
0	Initial issue.

2.0 Affected Conduct of Engineering Program/Documents

2.1 Affected "P" Document: P342 Engineering Standards If against the P document itself, revision (or ***N/A***): N/A	2.2 Subordinate or related document(s) [AP, master spec, LANL ESM chapter & section; or code, Order, standard, etc.]: Document Title/No.: ESM Ch. 16, *Building Code Program*, Section IBC-GEN Revision 12 Document Title/No.: Ch. 16, Section IBC-IP, *Inspection Process* Revision 10 Document Title/No.: LMS Section 01 4000 *Quality Requirements* (Non-Nuclear) and similar in 01 4000 – Nuclear Revision r8 and 9; r1 and 2

2.3 Section/Paragraph: see 2.4

2.4 Specific Requirement(s) as Written in the Document(s):

IBC-GEN: Table IBC-GEN-3 Three-Tiered Graded Administrative Approach footnote 19 discussing the generation of and need for a TIP:

TIP: Template is IBC-IP Att. I. Otherwise, only required as shown above (and when not fully covered by an SSI). Nuclear SSC work should always use these plans (or a VIT).

IBC-IP

3.0 RESPONSIBILITIES AND DUTIES (INSPECTION-RELATED)

C. Constructor (Prime Subcontractor, or LANL when self-perform)

1. TIP: Prepare Test and Inspection Plan using minimum requirements in the Attachment I TIP template posted with this Section here[1]. The TIP template outlining common test and inspection requirements, organized by installation type, must be edited by the Constructor[2] to reflect project scope. The Constructor shall provide a TIP prior to commencement of the Work. LANL will review and may add additional inspections and witness or hold points. The TIP shall include inspections required by specifications, applicable codes, and applicable standards in tabular form and integrated with a Work Breakdown Structure (WBS) or within a 30 day look ahead to identify milestones/ prerequisites for each test and inspection[3]. Specification Section 01 4000, Quality Requirements has detailed requirements. Maintain TIP current should scope or understanding of requirements change during execution.
2. QC: Constructors are required to perform QC inspections and testing as required by their contract. Such duties are addressed primarily in LANL Master Specification Section 01 4000, Quality Requirements and summarized in the TIP template. Testing agencies must be from LBO Approval listing posted with this chapter.

LMS Section 01 4000 (Non-Nuclear) R8, and similar in 01 4000 – Nuclear, r1

Definition at 1.2.S.1:

TIP Template: A comprehensive list of tests and inspections invoked by LANL's adopted codes, standards, and DOE directives. The TIP Template is not specific to a project and is available electronically within Chapter 16 of the ESM.

Main statement at 1.4 Action Submittals

D. Test and Inspection Plan (TIP): Submit a TIP as described below:

The TIP template outlining common test and inspection requirements for LANL construction projects, organized by construction installation type, is available in electronic form in the ESM Ch 16 and shall be edited by the Constructor to reflect project scope. The Constructor shall provide a TIP a minimum of 30 days prior to commencement of the Work. LANL will review and may add additional inspections and witness or hold points. The TIP shall include inspections required by specifications, applicable codes, and applicable standards in tabular form and shall be integrated with a Work Breakdown Structure (WBS) or within a 30 day look ahead to identify milestones/prerequisites for each test and inspection:

1. Test or inspection ID.
2. Brief description of the test or inspection.
3. Identify if inspection or test is a witness or hold point.
4. Entity responsible for performing each test and inspection (e.g., subcontractor qualified personnel, third party inspector, LANL building inspector, LBO-approved special

[1] TIPs are typically not required for lower-risk work; see ESM Ch. 16 (e.g., IBC-GEN). Other formats providing same information in equally useable manner are acceptable. E.g., a VIT (verification, inspection, and test plan, a term more common in the nuclear facilities) may serve as the TIP or vis-versa, assuming it meets requirements of both.

[2] Guidance: For self-performed work, the responsible engineer (who is typically a field engineer but can be a system engineer, design engineer or any individual designated by management) will develop a project-specific TIP that not only identifies the applicable tests and inspections based on project scope, but also integrates test and inspection requirements within a Work Breakdown Structure for the project. The draft TIP will be provided to the LANL construction organization for review and, once acceptable to them (and AHJs/engineering), issued and maintained by ES Field Engineering on behalf of constructor (e.g., LOG or MSS.

[3] TIP shall include: Test or inspection ID.; brief description of the test or inspection; identify if inspection or test is a witness or hold point; entity responsible for performing each test and inspection (e.g., subcontractor qualified personnel, third party inspector, LANL building inspector, LBO-approved special inspector, or structural engineer-of-record); and reference to code, standard, or specification requiring the test or inspection.

inspector, or structural engineer-of-record).

Any other location in Conduct of Engineering directives or guides requiring or implying the need for a standalone TIP or the use of a LANL template for same and, for Statements of Special Inspection (SSI), any requiring or implying that such must be standalone documents for very simple scope.

2.5 Contractual, preference, or other basis for requirement in 2.4:

Test and inspection planning is required by P330-8 Inspection and Test, R7, and by NQA-1. In most cases, the specifics are LANL preference based on industry best practice and/or LANL experience since 2006; see Justification in 3.4 for details.

2.6 Type of VAR from ESM Chap 1, Z10 [*Applies only to standards variances*)	2.7 Discipline
Type 2	General

3.0 Request Information & Comments

3.1 NCR required (work has occurred)? No

If Yes, NCR Number: Enter text.

3.2 System/Component Affected	3.3 Highest ML Level
OpSystem Acronym & Name BLDG - Building System Number or Name BLDG	ML-1

3.4 Proposal with Justification/Compensatory Measures:

Proposal

Wherever the LANL Engineering Standards require or imply a standalone Test & Inspection Plan or TIP, the following interpretation shall apply:

1. When required by ESM Chapter 16, Section IBC-GEN, Table IBC-GEN-3 *Three-Tiered Graded Administrative Approach* (or a statement of work), the Constructor shall develop a plan identifying all required tests & inspections (T&I) — a TIP — and submit it for Design Agency and LANL review.

    a. Terminology and TIP Expectations:

    For convenience, the term "Test & Inspection Plan (TIP)" will continue to be used to refer to any document containing project-specific T&I planning requirements.

    1) For most projects, the T&I planning is expected to be integrated into the project construction execution sequence/schedule (possibly filtered for the T&I tasks).

        i. For small projects for which a TIP is produced — but that do not warrant a formal schedule or work breakdown structure, as determined by the Integrated Project Team (IPT) —T&I tasks may be documented as standalone information, on affected drawings or sketches, or (if only a final acceptance test is warranted) a Post-Modification Testing form — so long as such are reviewed/approved by Design Agency and LANL. When a Statement of Special Inspections (SSI) is present and addresses all necessary T&I, that is also sufficient.

    2) The project's Specification Section 01 4000 or 01 4001 (Quality Requirements) must reflect the applicable expectations, where not elsewhere.

b. Appropriate minimum TIP Content:

1) Unique test or inspection ID (controlled by the Constructor).

2) Brief description of the test or inspection.

3) Identification of inspection or test as a witness or hold point.

4) Entity responsible for performing each test and inspection (e.g., Subcontractor's Qualified Personnel, Subcontractor-engaged Third-Party Inspector, LANL Building Code Inspector, LBO-approved Special Inspector, Structural Engineer-of-Record).

5) References to the applicable code, standard, and/or specification section requiring the test or inspection, including any sampling methods, when applicable.

c. Approval of the TIP:

Approval by the Design Agency and LANL is required. If the TIP lacks any required T&I (including those by referenced codes and standards), such approval does not indicate approval of the eliminated T&I (Note, review and acceptance of the TIP is typically via submittal to Project's Specification Section 01 4000 or 01 4001.)
Upon IPT request, in addition to a pdf, if the producing software supports it, provide TIP file in Excel or Word format to enable use as an IPT checklist.

d. Alternative approaches may be approved as a Type 1 variance by the LANL ESM Chapter 16 Point of Contact (POC). Approaches specified in LANL Master Specification Section 01 4000 (or 01 4001, if applicable) are always acceptable.

2. Test and Inspection Summary (TIS) Template: The ESM no longer provides a TIP template. The former template (ESM Chapter 16, IBC-IP, Att. I, Rev. 1) has been re-written as a guidance document intended for use by the Design Agency when preparing a summary of appropriate tests and inspections. Accordingly:

a. Att. I has been renamed "Test & Inspection Summary (TIS) Template (Guidance)"

b. The initial issuance of the TIS Template is Rev. 2 (to be issued concurrently with VAR).

Note: A TIS is a valuable tool for facilitating consensus among the Designer, Constructor, and LANL Building Official. It also improves Constructor understanding of T&I requirements derived from the design and applicable codes and standards (see Justification below).

3. Establishing T&I Requirements:

a. The Design Agency is responsible for clearly identifying all required tests and inspections necessary to verify design intent. These requirements shall be documented in the design deliverables, including:
   1) Specifications and/or drawings, and
   2) Applicable codes and standards invoked by reference.

b. Design documents shall define:
   1) Characteristics to be inspected,
   2) Methods of inspection (including any sampling methods, when applicable), and
   3) Acceptance criteria.

c. When T&I requirements are unclear or incomplete in the design (e.g., in-process inspections required by the Authority Having Jurisdiction or ambiguous inspection requirements), Design Agency approval of the TIP may be used to document concurrence.

Designs should explicitly include jurisdiction-required (LANL) T&Is to avoid missed witness or hold points and uncertainty regarding acceptance criteria.

4. Additional QA/QC:

    a. Additional QA/QC processes may be implemented by the Constructor, Owner (LANL), IPT, DPIRC, LANL Building Official, LANL Chief Electrical Inspector, LANL Fire Marshal, and LANL Utilities to promote quality outcomes.

    b. These discretionary activities, based on stakeholder judgment, should be documented in the Project Quality Management Plan, when applicable, and not necessarily in the TIS or TIP.

5. Nuclear Work:

    b. Statements in the LANL ESM regarding TIPs or VITs for nuclear work are deleted.

    c. The expectations outlined above apply to both nuclear and commercial/ conventional projects, with the following exceptions:

        1) T&I planning (i.e., Item 1 above) is mandatory, regardless of scope.

        2) T&I planning requirement applies beyond the thresholds defined in LANL ESM Chapter 16, Section IBC-GEN Table IBC-GEN-3 "Three-Tiered Graded Administrative Approach."

        3) Design Agency T&I planning approval (indicated by signature, submittal review status coding not sufficient) is required.

6. Statement of Special Inspections (SSI):

    a. This variance does not affect the requirement for an SSI (e.g., LANL ESM Chapter 16, Section IBC-IP, Att. B), which is driven by IBC Chapter 17.

    b. For projects with minimal Special Inspection (SI) scope (fewer than six inspection tasks), an SSI need not be a standalone document provided the inspection requirements are clearly conveyed on the drawings or sketches.

    As noted in the SSI template and specifications, seismically exempt components (e.g., post-installed anchors) do not require Special Inspection but do require LBO inspection. Drawings shall clearly indicate this distinction, where applicable.

Justification

The following points explain the rationale for this variance and reflect LANL's overall inspection approach.

1. Replacing "Plan" with "Summary" in the template title avoids any misconception that the document defines construction sequencing, which is Constructor's responsibility.

2. Construction T&I planning and scheduling is an industry best practice and is applicable to both LANL and commercial/conventional projects, as reflected in multiple industry guidelines including AIA MasterSpec's Section 01 4000 supporting documentation.

3. Although this VAR eliminates the implication that a TIP must be a single-purpose, standalone document and does not mandate a TIS (although a project SOW could), pre-construction planning of T&I remains required. Such planning facilitates reaching early consensus with LANL (as both AHJ and Owner) on T&I and improves efficiency, reduces rework, lowers cost, and enhances overall quality. This is the reason it is mandatory in many of the references herein.

4. Similar to other jurisdictions, LANL Building Code Officials maintain minimum T&I requirements that

may exceed those identified by the Designer (e.g., electrical rough-in inspections). These requirements are summarized in LANL ESM Chapter 16, Section IBC-IP, Att. I, including all the applicable code-driven inspections and some of the spec-based tasks. These inspections, whether by LANL or managed by the Constructor and overseen by LANL, fulfill numerous direct and indirect prime contract requirements to inspect work (e.g., DOE O 414.1E, DOE O 420.1C, IBC, ASME, other codes and standards, PD330, P330-8).

5. Neither the TIS nor TIP create or eliminate testing or inspection requirements. Both serve to consolidate and summarize the T&I requirements already established by the project design, applicable codes, and invoked standards.

6. Since 2006 a TIP has been a required project tool for applicable projects (a spec-based comprehensive template was available since 2013 and a required submittal in Spec Section 01 4000 since 2022). LANL's experience since inception has demonstrated that the TIS/TIP process provides benefits that outweigh their costs by improving the understanding, coordination, and timing of inspections.

7. T&I planning is required by LANL P330-8, *Inspection and Test*, R7, which allows flexibility in how inspection planning is documented and does not mandate a standalone inspection plan. Excerpt:

   > 5.2.2 Step 2. Plan the Inspection
   > Inspections must be planned. Planning inspections involves scheduling the inspections, preparing a sampling approach, preparing documents to record the inspection, and completing other inspection readiness activities. The requirements document must identify the characteristics to be inspected, methods of inspection, and acceptance criteria. Each of these planning elements is described in Sections 5.2.2.a–5.2.2.d below.
   > Note: Planning inspections may take several forms (i.e., integration of inspection procedures or instructions in work control practices and/or schedules). Separate inspection plan(s) may be developed and/or may be required in the specific requirements documents (i.e., in the form of Test and Inspection Plans [TIPs]); however, such plans are not a required deliverable for this procedure.

8. For nuclear work, T&I planning is mandatory and aligned with ASME NQA-1 2008/2009a requirements which require identification of inspection characteristics, methods, acceptance criteria, and design organization approval. ASME NQA-1, 2008/9a, Pt. I Excerpts:

   a. Requirement 10 Inspection, 401 Planning: Characteristics to be inspected, methods of inspection, and acceptance criteria shall be identified during the inspection planning process.
   b. Requirement 11, Test Control, 200 Test Requirements: (a) Test requirements and acceptance criteria shall be provided or approved by the responsible design organization… (b) Test requirements and acceptance criteria shall be based upon specified requirements contained in applicable design documents, or other pertinent technical documents that provide approved requirements.

REVISED WORDING BASED ON PROPOSAL ABOVE

IBC-GEN r12
[Modify Table IBC-GEN-3 Three-Tiered Graded Administrative Approach footnote 19 discussing the generation of and need for a TIP as follows]:

> Test and Inspection Summary (TIS): A template for a TIP precursor (which SOW or IPT may require) is IBC-IP Att. I. Note, a TIP is only required as shown above (and when not fully covered by an SSI).

IBC-IP r10
3.0 RESPONSIBILITIES AND DUTIES (INSPECTION-RELATED)
…
B. Design Professional in Responsible Charge
Addition (e.g., a new B.4):

Establish Test and Inspection (T&I) Requirements:

a. The Design Agency is responsible for clearly identifying all required tests and inspections (T&I) necessary to verify design intent. These requirements shall be documented in the design deliverables, including:
   - Specifications and/or drawings, and
   - Applicable codes and standards invoked by reference.
b. Design documents shall define:
   - Characteristics to be inspected,
   - Methods of inspection (including any sampling methods, when applicable), and
   - Acceptance criteria.
c. ESM Chapter 16, IBC-IP, Att. I, *Test and Inspection Summary (TIS) Template (Guidance)* may be used to prepare a summary of appropriate tests and inspections (e.g., if SOW or IPT requires same).
d. When T&I requirements are unclear or incomplete in the design (e.g., in-process inspections required by the Authority Having Jurisdiction or ambiguous inspection requirements), Design Agency approval of the TIP may be used to document concurrence.

   Designs should explicitly include jurisdiction-required (LANL) T&Is to avoid missed witness or hold points and uncertainty regarding acceptance criteria.

   Note: For nuclear projects, see additional expectations under 3.0.C below.

C. Constructor (Prime Subcontractor, or LANL when self-perform)

Modify C.1 & 2 to read as follows (C.3 & 4 unaffected, renumbering accordingly)

1. QC: Constructors are required to perform QC inspections and testing as required by their contract. Such duties are addressed primarily in LANL Master Specification Section 01 4000, Quality Requirements and the Test and Inspection Plan (TIP), when present (see below). Note, the Test and Inspection Summary (TIS) template provides a generic picture of the nature of this, and if a project issues a TIS, it will have tailored expectations.
2. Testing agencies must be from LBO Approval listing posted with this chapter
3. TIP: Prior to commencement of the Work, the Constructor shall develop a plan identifying all required tests & inspections (T&I) — a TIP — and submit it for Design Agency and LANL review when required by the IPT or Section 01 4000 (or 01 4001) per the minimum requirements in that Section (which should be based on the following):
   - Unique test or inspection ID (controlled by the Constructor).
   - Brief description of the test or inspection.
   - Identification of inspection or test as a witness or hold point.
   - Entity responsible for performing each test and inspection (e.g., Subcontractor's Qualified Personnel, Subcontractor-engaged Third-Party Inspector, LANL Building Code Inspector, LBO-approved Special Inspector, Structural Engineer-of-Record).

- References to the applicable code, standard, and/or specification section requiring the test or inspection, including any sampling methods, when applicable.

a. For most projects, the TIP should be integrated into the project construction execution sequence/schedule (possibly filtered for the T&I tasks) — i.e., integrated with a Work Breakdown Structure (WBS) or within a 30-day look ahead to identify milestones/prerequisites for each test and inspection.

   i. For small projects for which a TIP is produced (e.g., when required by Table IBC-GEN-3 Three-Tiered Graded Administrative Approach) — but that do not warrant a formal schedule or work breakdown structure, as determined by the Integrated Project Team (IPT) —T&I tasks may be documented in a standalone document, on drawings or sketches, or (if only a final acceptance test is warranted) a Post-Modification Testing form — so long as such are reviewed/approved by Design Agency and LANL.

b. LANL will review and may add additional inspections and witness or hold points.

c. Maintain TIP current should scope or understanding of requirements change during execution.

d. Additional QA/QC processes may be implemented by the Constructor, Owner (LANL), IPT, DPIRC, LANL Building Official, LANL Chief Electrical Inspector, LANL Fire Marshal, and LANL Utilities to promote quality outcomes. *These discretionary activities, based on stakeholder judgment, should be documented in the Project Quality Management Plan, when applicable, and not necessarily in the TIS or TIP.*

e. For nuclear projects only

- T&I planning (i.e., a TIP or equivalent) is mandatory, regardless of scope.
- T&I planning requirement applies beyond the thresholds defined in LANL ESM Chapter 16, Section IBC-GEN Table IBC-GEN-3 "Three-Tiered Graded Administrative Approach".
- Design Agency T&I plan approval (indicated by signature, submittal review status coding not sufficient) is required.

LMS Section 01 4000 (Non-Nuclear) R8 and 9, and similar in 01 4000 – Nuclear, r1 and 2*

Delete TIP Template definition at 1.2.S.1.

Modify 1.4.D to read as follows, or otherwise but in accordance with VAR-10761:

D. Test and Inspection Plan (TIP): Submit a TIP as described below:

The Constructor shall provide a TIP a minimum of 30 days prior to commencement of the Work. LANL will review and may add additional inspections and witness or hold points. The TIP shall include inspections required by specifications, applicable codes, and applicable standards in tabular form and shall be integrated with a Work Breakdown Structure (WBS) or within a 30 day look ahead to identify milestones/prerequisites for each test and inspection, to include:

1. Test or inspection ID.
2. Brief description of the test or inspection.
3. Identify if inspection or test is a witness or hold point.
4. Entity responsible for performing each test and inspection (e.g., subcontractor qualified personnel, third party inspector, LANL building inspector, LBO-approved special

inspector, or structural engineer-of-record)

5. Reference to code, standard, or specification requiring the test or inspection.

* Also affecting revs. 9 and 2 because they were in final draft at time of VAR issuance.

3.5 Attachments

Document Title or Description none

3.6a Project ID	3.6b: Project Name	3.6c: Code of Record Date
N/A	N/A	N/A

3.7 Duration:	3.8a If Finite Period, Start Date:	3.8b End Date:
Lifetime	Click to enter a date.	Click to enter a date

3.8c Provide the PFITS number for tracking removal/correction: [PFITSNum]

3.9 USQD/USID required (Nuclear, High/Mod Hazard)? No

If Yes, USQD/USID Number Click here to enter text.

3.10 QA Review for process change matters potentially affecting LANL's NQA-1 implementation

Is a QPA Determination required?: No If ***Yes***, then: Choose an item.

QPA Comments: Enter text..

3.11 POC Determination: Accept

POC Comments: Enter text..

3.12 Management Program Owner's (SMPO) Approval for P341 and APs; P342, ESM, ML-1 and -2, and Contract Matters; and P343

SMPO Determination: Accept

Comments: Enter text..

4.0 Participant Signatures

NOTE: *DO NOT ADD NAMES FROM WITHIN WORD! Save and close the form first, then do 1-4 below:*

1. *From the SharePoint library, select the document, then click the **ellipsis** (…) in the second column; a small dialog appears*
2. *In the small dialog click the **ellipsis** again*
3. *Click **Edit Properties** and check out the document if prompted toEnter names using the controls provided, then **Save***

4.1 POC (Management Program Owner's Representative):	Organization	Signature
Oruch, Tobin H	ES-FE	SIGNATURE ON FILE
4.2 Facility Design Authority Representative [FDARName] FDAR signature not required ☒	Organization Enter text..	Signature

4.3 LANL Owning Manager (FOD or R&D/Program) [FODorPrgmMgrName] FOD or Program Manager signature not required ☒	Organization Enter text..	Signature
4.4 Quality Reviewer's Name: [QPAName] QPA review/signature not required ☒	Organization Enter text.	Signature
4.5 Safety or Security Management Program Owner's Approval for P341 and APs; P342, ESM and Contract Matters; and P343 Richardson, Michael Joseph SMPO signature not required (Type 1 variance) ☐	Organization ES-DO	Signature SIGNATURE ON FILE
4.6 Additional Signer 1 Cardon, Tyson Role: Enter text.	Organization ES-IPD	Signature SIGNATURE ON FILE
4.7 Additional Signer 2 [AdditionalSigner2] Role: Enter text.	Organization Enter text.	Signature

4.8 CoE Administrator Signature Leyba, Matthew Anthony NOTE: The CoE Admin is always the last signature placed on this document. The date of that signing is the date of this document.	Signature SIGNATURE ON FILE