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This mandatory functional series document is available online at <http://engstandards.lanl.gov>
 It derives from P342, Engineering Standards, which is issued under the authority of the Division Leader of Engineering Services as part of the Conduct of Engineering program implementation at the Laboratory.

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

Section IBC-GEN	<u>IBC Program POC and Committee</u>
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<p>The LANL-adopted IBC edition is: 2015 See Att. A for additional code adoptions and amendments</p>
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1.0 PURPOSE

- A. To establish the LANL building program (“IBC Program”).¹
- B. *LANL is unique in that it is responsible for both major IBC roles: the project owner and the jurisdiction. This chapter addresses both roles, establishing (1) code-related expectations for projects and (2) the authority and duties of the LANL Building Official (LBO). The LBO function is integral to enforcement of the Program, and the LBO² performs this enforcement through design reviews, permitting, and inspections primarily. Some activities are delegated as indicated throughout the chapter.*
- C. “Project” in the LANL Standards means any task subject to the Standards. (see Definitions article below).

2.0 APPLICABILITY

- A. LANL organizations and their Subcontractors are required to comply with this Chapter and to support the LBO and related activities in support of the IBC Program.
- B. This chapter and the IBC, IEBC, and other LANL-adopted building codes apply to all Management Levels (MLs; for risk management, etc.) of work covered by this chapter’s scope.
 - 1. *The IBC addresses the construction, use, and occupancy of new buildings and connected/attached appurtenances, building systems and components, and certain R&D, tenant, process, and standalone equipment and structures.*³
 - 2. *The IEBC addresses existing structure, system, and component (SSC) repair, alteration, change of occupancy, additions, relocation, and demolition of same.*

3.0 SCOPE

- A. LANL has three main SSC categories: (i) facility; (ii) utility, infrastructure, and environmental; and (iii) programmatic (tenant, R&D, or process).⁴ Of these, facility is always subject to LANL’s IBC Program (this chapter) while the other two may be; see Tables IBC-GEN-1 & -2 for detailed rules and examples of work in the IBC Program scope.
- B. Exclusion from the IBC Program does not include exclusion from other applicable codes such as the NEC or ASME, nor exclusion from other requirements elsewhere in the ESM including [10CFR851](#) (pressure, fire, etc.) and required inspections based on ML level, written LANL policy, or otherwise. *Guidance: Also, the legal concept of standard of care suggests that even SSCs that are not IBC (e.g., stairs in the wild) meet IBC requirements (e.g., dimensional) to provide the generally accepted level of safety.*

Table IBC-GEN-1 Work Always in IBC Program (also see Table GEN-2)

Facility-owned building systems, building equipment, and building components , including those outside the building. Examples: A remote boiler or emergency generator (equipment providing services to and owned by the facility).
Repair, alteration, change of occupancy, additions, relocation, and demolition of all in-scope SSCs (<u>will be per IEBC</u>).

¹ Drivers include the International Building Code (IBC), International Existing Building Code (IEBC), LANL amendments to them, other building codes and standards referenced by them, and other construction-related LANL Engineering Standard requirements. These codes are required by LANL Contract including Appendix G (DOE O 420.1(rev C, Att 1, 1.c). See also ESM Ch.1 Z10.

² Those performing such work must be delegated by the LBO to act on the LBO’s behalf by this chapter or other method.

³ Building repair, alteration, etc. scope is governed by the IEBC version adopted and amended by IBC-GEN Att B, LEBC

⁴ CMMS uses R (real property), U, and P to designate these.

<p>Work listed at IBC-2015 105.2 as excluded from permitting, but still subject to the code. Examples: low fences, sidewalks and driveways, sheds/containers under 120 sq. ft., retaining walls that could affect a building or personnel if they failed, etc.</p>
<p>New buildings including prefabs (see that article heading later in this document) and appurtenances regardless of ownership, parking lots, retaining walls near pedestrians, tanks, towers, and large signs and other structures that are IBC 312 “U” occupancy.</p>
<p>Temporary SSCs that are in IBC Program per other criteria in these two tables</p>
<p>Geotechnical work: soils testing firm must be on LBO approval listing</p>
<p>Programmatic equipment that could negatively affect:</p> <ul style="list-style-type: none"> • facility structural integrity (floor or wall loading, etc.)⁵ • fire/sprinklers/life safety/firestopping/means of egress⁶ (e.g., by normal location), or • facility system performance. <p>Examples:</p> <ul style="list-style-type: none"> • adding electrical service or new, large loads (75KVA [~100A] and hardwired-in), or demands on other common utilities • glovebox location, anchorage, major use of building services • office cubicle installation (e.g., egress) • modular rooms like cleanrooms, PERMACONS, etc.⁷ <p>NOTE: In some examples above, the equipment itself might be outside the IBC’s scope if not listed elsewhere in this table or GEN-2 as in-scope (and thus IBC review and fab inspection), but <u>ESM Chapter 16, IBC Program</u> must be used for installation to ensure life safety and to control anchorage and hookup, both technically and administratively.</p>

⁵ Most prog equip itself is not subject to the tech req’ts of the IBC/IEBC, but Ch 16 Program is used to control safety of installation (anchorage, adequacy of structure). When new programmatic equipment is to be installed without the removal of equipment, components, etc. of at least the same weight, the following is required: compare the weight of the new equip., plus all weight currently supported by the floor or wall (that will remain after installation of equip.) to the gravity-load (i.e., dead load &/or live load) capacity to which the floor or wall was designed. If the new weight exceeds the original design capacity, request guidance on how the project must proceed from Standards Structural POC; if less than original design capacity, project can document and proceed. Finally, if the new weight consists of a concentrated load(s) and the original design capacity is based solely on distributed load(s), the “new-vs-original comparison” must account for this difference (i.e., by either distributing the concentrated load such that it’s \leq distributed-load capacity, or proving via analysis that adequate capacity exists to resist the concentrated load).

⁶ An NFPA 101 egress evaluation is required before moving any equipment into a potential egress pathway.

⁷ Issues include egress, sprinklering, anchorage where structural calcs support floor loading in multi-stories. May not require structural calcs for seismic resistance. Ensures safety and controls anchorage and hookup.

Restraint (i.e., anchorage and/or bracing) of Non-Facility (e.g., programmatic) Equipment is “in Program” and required per the following three criteria:

1. When required by the **manufacturer** for normal operations.⁸
 - a. If this is the sole reason restraint is required (i.e., seismic restraint per criterion 2 or 3 below not required), then the design need not be per ESM Ch. 5 if the manufacturer provides alternative design requirements.
2. **In a non-nuclear facility**, seismic restraint is required unless the equipment is “Seismically Exempt” per LANL ESM [Ch. 5](#) Section II Appendix A (*para. A.7 of Rev. 10*).
 - a. If seismic restraint is required, the design must comply with Ch.5 Section II, the installation and quality control per the appropriate LANL Master Spec(s), and the QA per ESM Ch. 16.
 - b. An alternative method may be proposed to the LBO for approval provided:
 - i. An analysis that indicates the interaction effects of the unrestrained equipment⁹ is acceptable at the DBE, or
 - ii. The equipment will be located in an essentially unoccupied area and is protected as such through administrative or engineering control.
 - c. In an existing facility, unless the building is undergoing more than a limited structural alteration as defined in the IEBC (907.4.4 in 2015), it may be that anchorage can be designed to lesser requirements; see Code of Record/Structural discussion in IBC-GEN Att. B., 301.1.
3. **In a nuclear facility**, restraint is always required. The design must be per ESM [Ch.5](#) Section III, the installation and quality control per the appropriate LANL Master Spec Sections, and the QA per ESM Ch.16 (as a minimum). There are two exceptions:
 - a. **SDC-1 and SDC-2 SSCs.** Subject to the provisions pertaining to SDC-1 and SDC-2 SSCs in Ch. 5 Sect. III (p. 5 para. H of Rev. 7), seismically-exempt equipment (ref. criterion 2 above) need not be restrained provided that adverse interactions won't result* and, subject to Requirement 2.b above, non-seismically-exempt equipment might not require restraint provided that adverse interactions won't result.*

* If equipment is to be unrestrained, adverse interaction with safety SSCs (i.e., Safety Class, Safety Significant, Other Hazard Control¹⁰) must be considered, documented as part of the design, and, if necessary, prevented. It is expected that determining the significance of potential interaction effects will require interaction between the structural SME and safety basis SME. For more detail on interactions, refer to Ch. 5 Sect. III (*paras. 1.7.2 and A.6.A of Rev. 7*).
 - b. **SDC-3 SSCs.** If the equipment is to be installed on a floor structure and the provisions of ASCE/SEI 43 Section 7.1, *Rocking and Sliding of Unanchored Rigid Bodies* are met to the satisfaction of the LBO, then seismic restraint is not required.

NOTE for Equipment Outside: Criterion 1-3 above also apply outside of a building; if the above require an item to be restrained for wind and/or seismic were it inside, then restraint must either be provided or shown/proven unwarranted. Ref ASCE-7-10 Section 15.1.1, *Nonbuilding Structures*, and Ch. 29, *Wind Loads on Other Structures and Building Appurtenances*.

⁸ Reasons related to performance, functionality, operability, etc. (e.g., motor, centrifuge, certain suspended items/systems, etc.)

⁹ E.g., from rocking, swaying, overturning, sliding, impact, etc.

¹⁰ Formerly “Other Equipment Important to Safety.”

Table IBC-GEN-2 Work in IBC Program as Noted

Criteria (work scope)	Outside IBC Program	In IBC Program
Programmatic equipment installation, minor modification, or removal	NOT meeting any other criteria in Tables IBC-GEN-1 & -2. Examples: <ul style="list-style-type: none"> • Photocopiers • Small, table-top, plug-fed pieces of analytical equipment¹¹ 	If meeting any other criteria in Tables IBC-GEN-1 & 2, then installation is in IBC Program. Examples: <ul style="list-style-type: none"> • SSCs requiring restraint, new large beamline, transformer, motor, pump, etc.
Utilities or Environmental Programs installed or owned equipment and civil structures¹²	<u>Utilities</u> : Distribution of electrical and other services <u>Infrastructure</u> : Roads and roadway retaining walls, wells and monitoring equipment, flood control	Buildings, utility service laterals to buildings, parking lots, retaining walls near pedestrians, electric gates, tanks, and other structures that are IBC 312 “U” occupancy, etc.
Gloveboxes, Fume Hoods, and stands¹³	shell/stand and contents design/fab	installation
Rad protection systems¹⁴	component design/fab	installation
Security systems¹⁵	component design/fab and some Material Access Area features (e.g., PIDAS/PIDADS)	installation
Telecom (unsecure or secure) in/on a building¹⁶	component design/fab	installation

NOTE: “Installation” includes anchorage per ESM Ch 5, other life-safety issues (location/egress, fire suppression, fire stopping), and service connections/tie-ins.

- C. For in-scope work, applicable code technical requirements must be met. LANL uses a three-tiered tailored approach for administrative control relative to permitting, inspection, etc. It is described by Table IBC-GEN-3 which follows.

¹¹ Based on the IBC and IEBC scope and purpose statements, code topics addressed, and typical use by jurisdictions.

¹² Based on IBC-2015 101.2 Scope—and 105.2.3 which exempts public service agency utilities. UI acts in this capacity and controls utility and infrastructure work following other, non-IBC codes and standards, both national and LANL (ESM Ch.3 Civil, Ch. 7 Electrical). For electrical utilities, the IBC/IBC Program breakpoint is the UI ownership interface (normally the low voltage terminals of the secondary unit substation transformer, per Ch.7). Traditional LANL breakpoints for sewer, water, gas, and steam ownership by UI are the respective dividing points.

¹³ GBs are considered facility in some FODs and programmatic in others but, either way, aren’t traditional building systems

¹⁴ Rad monitoring not a traditional building system but same issues as security systems above

¹⁵ Security can be traditional building systems but many at LANL are specialized. Regardless, most interface with other building systems.

¹⁶ Telecom is a utility but same issues as security systems above

Table IBC-GEN-3 Three-Tiered Graded Approach, Part 1 of 2

This graded approach relates to administrative requirements only; there is no grading on the quality of design, nor the need to comply with all LANL Standards.¹⁷

	Requirements Work Type	Test & Insp Plan ¹⁸	Design Review ¹⁹	Permit	Inspection/Test ²⁰	Cert. of Occupancy
Sub-Permit	Work Exempt from Permit per IBC 105.2	Optional				
Lowest Risk	IEBC Repair or replacement in kind (Level 1 Alteration = removal and replacement or covering of existing elements, equipment, or fixtures using new ones that serve the same purpose) Low-risk demolition	Optional ²¹	IBC-List SMEs	FDAR ²²	As indicated in design package	n/a
Moderate Risk	Level 2A Alteration: System reconfiguration, extension, additional equipment installation, or removal (except when 2B below)*	Required when PIO-CM is inspecting				

* Exception to above for Level 2A electrical alterations: When adding ML-4 circuits in panels of existing buildings, reduced admin controls may be employed provided they do not exceed 240v or 50A per circuit. This effectively makes the task an enhanced “Lowest Risk” with the required admin controls as follows:

The grounding system must be sound. In lieu of the normal Level 2A/Moderate Risk administrative requirements, the following alternate methods are allowed: Design work shall be performed and checked by technically competent individuals, and design documents bear the signatures of both. Permitting will consist of the PRID and/or work control processes. Inspection

¹⁷ Thus, comply with ESM, CAD Standards Manual, etc.

¹⁸ Nuclear SSC work must always use these plans. Otherwise, only required as shown above (and when not fully covered by an SSI). SSI: When required by IBC 1704.3, Statement of Special Inspections per IBC-IP and its Att B must be developed/used. For FDAR-permitted tasks, FDAR signs in LBO stamp field.

¹⁹ An IBC SME listing is maintained by EPD Group Leader and Ch. 16-webposted.

²⁰ Inspections shall be performed to design documents. If code-required inspections are indicated, inspectors qualified per Ch. 16 Section IBC-IP (i.e., by PIO-CM) shall be used. Other inspections may be performed by performing organization.

²¹ Formal TIP or VIT per IBC-IP Att H not required, but must perform code- and spec-required inspections/tests per that column.

²² FDAR PPD Forms/log and control of change meets IBC annual permit control needs (no LBO stamp). (2015: 105.1.1). Also has basis in NMAC 14.5.2.19: “The scope of this permit is repair or maintenance performed on existing [electrical/mechanical/general] systems in [commercial/industrial] facilities. Repair and maintenance as used in the scope of this permit type means work that is necessary to maintain an established, approved... installation, which work is required to keep the installation operating in its approved function and configuration. Repair and maintenance includes a like-for-like exchange of a portion or portions of an approved... installation, but does not include work on systems that are generally considered in the industry to be related to be life safety systems, or work that entails new construction, relocation, expansion or alteration of an... installation or any portion thereof...” ICC document “2009 IEBC Q&A” 1-15 suggests annual permit is not an exemption from inspection, but self-inspection satisfies where allowed. FDAR signature on Level 2A design indicates permitting approval (no LBO stamp). 2A/2B split is LANL-specific for admin purposes and not present in IEBC.

shall be done by a qualified inspector when required by LANL electrical safety program, and shall include a polarity check. Final acceptance and evidence of inspection shall be the completed post-modification test (PMT). Panel schedule shall be updated.²³

Table IBC-GEN-3 Three-Tiered Graded Approach, Part 2 of 2

	Requirements Work Type	Test & Insp Plan ²⁴	Design Review	Permit	Inspection/Test ²⁵	Cert. of Occupancy
Highest Risk	<p>Level 2B Alteration. Same criteria as 2A but also has:</p> <ul style="list-style-type: none"> Possible egress aspects (workspace reconfiguration or door or window addition or elimination) and/or Life safety or related systems affected** <p>Level 3 Alteration:</p> <ol style="list-style-type: none"> Work area exceeds 50 percent of the aggregate area of the building, Complex reroofing (parapet bracing, overlays, changing from low slope to steep slope or adding a ballast, or Partial or complex structural demolition (see IBC-GEN article [11] on this) <p>New Building or Structure²⁶, relocation, change of occupancy, or expansion/addition</p>	Required	EPD Core IBC SMEs ²⁷ + FP-DO + PIO- CM ²⁸	LBO	As indicated in design package	LBO

** Exception to 2B criteria for fire protection: The following are also considered 2A: The addition of up to 9 exit signs, emergency lights, and/or sprinkler heads (or lowering of same), or other simple tasks deemed such by Fire Marshal. Either PIO-CM or FP-DO shall inspect sprinkler mods.

C. Where the LANL Engineering Standards or any design for LANL refers to the IBC or IEBC, also refer to the LANL amendments in Attachments A and B of this document.

²³ Generally incorporates and supersedes VAR-2015-058. Justification: (1) All code technical requirements shall be met. (2) ESM Chapter 16, IBC-GEN considers large electrical loads to be 75 kVA and above based on ESM Chapter 7 Section D5000 requirements for formal design when over 100A (~75 kVA). P101-13, Electrical Safety Program, P101-13 Class 1.2A uses 230V/125 kVA as a threshold in hazard control. (3) NMAC 14.5.2 (Permits), para 10.K.1, notes that "installation with a calculated service capacity over 100 kVA single-phase or over 225 kVA three phase must be stamped by an electrical engineer." The implication is that work under those thresholds is lower risk.

²⁴ Nuclear SSC work must always use TIP-type plans. Otherwise, only required as shown above (and when not fully covered by an SSI). SSI: When required by IBC 1704.3, Statement of Special Inspections per IBC-IP and its Att B must be developed/used. For FDAR-permitted tasks, FDAR signs in LBO stamp field.

²⁵ See footnote 22.

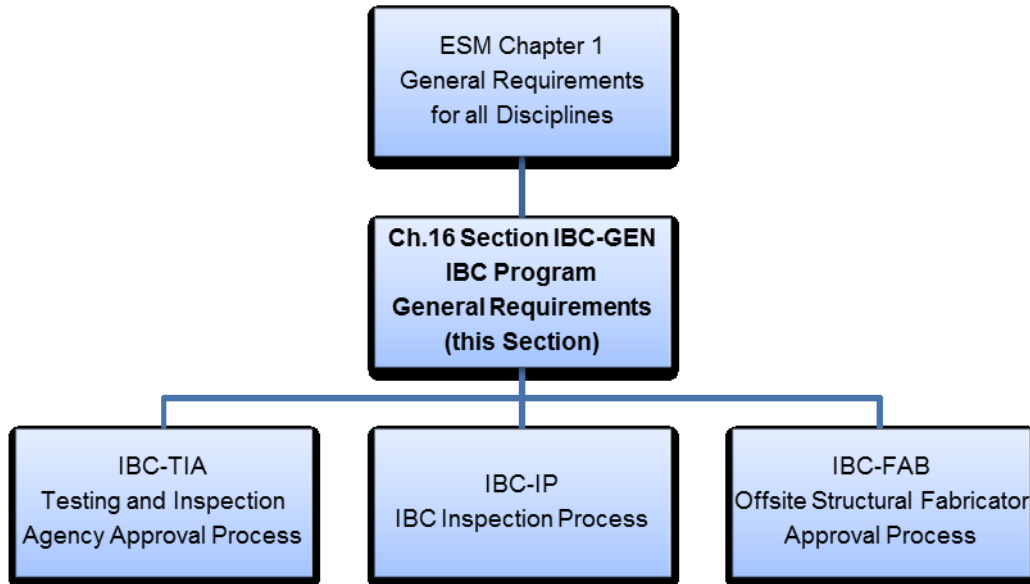
²⁶ Includes prefab (see article 10)

²⁷ This Ch. 16-webposted SME listing is maintained by EPD Group Leader.

²⁸ For constructability and inspectability, unless waived by EPD GL. These were performed approx.. 2006-10 and 2013-present and proved invaluable for identifying and resolving these and other problems in design phase.

- D. Additional requirements are typical for ML-1 and ML-2 (nuclear) and ML-3 work; such higher-quality processes may not reduce IBC levels of quality or inspections unless specifically authorized by the LBO in writing. *Guidance: ML-1, ML-2, and ML-3 work will normally require additional controls above the IBC-driven basics due to the nature of these projects.*

4.0 CHAPTER ORGANIZATION



5.0 CHAPTER ACRONYMS/DEFINITIONS

ACRONYM/TERM	DESCRIPTION
ASTM	ASTM International
Building services	Plumbing, heating, electrical, ventilating, air conditioning, refrigerating, controls, fire alarm and suppression, elevators, boilers, pressure vessels, telcom/data, building security systems, and other mechanical and electrical systems or components required to make a facility fully functional for the required occupancy.
Chief Inspectors (IBC)	Selected individuals delegated by LBO to oversee program day-to-day. See organization chart posted with Ch 16.
Contractor	The LANL Managing and Operating organization (e.g., Triad)
Deputy Building Officials	Individuals delegated total or partial authority to act for the LBO. The ES Division Engineering Project Delivery Group Leader is delegated as a Deputy to act in the LBO’s absence. The LANL Fire Marshal is delegated as Deputy acting for fire and life-safety related matters. See organization chart posted with Ch 16. [IBC-GEN Att A (LBC) 103.3]
DPIRC or RDPIRC	(Registered) design professional in responsible charge; the engineer or architect of record; the person(s) sealing (stamping) the documents. Non-LANL DPIRCs are IDed to LBO per Form 3; if no Form 3 is produced, then by default the DPIRC is LANL. [Note: professional registration is normally not required for LANL designers (see ESM Ch.1 Z10 Design Output section), but DPIRC must be appointed by the project/Engineering Manager]. Term from IBC-2015 107.3.4.
EOR	Engineer of record. Often the same as DPIRC but term may also be used for the

	designer for a portion of the whole (e.g., structural).
EPD	Engineering Project Delivery Group of Eng Services Division of LANL
ESM	Engineering Standards Manual
fabricator	For this chapter only, the firm fabricating structural steel, concrete, etc. offsite
FDAR	Facility Design Authority Representative. A delegate of the Site Chief Engineer [PD340]
IAS	International Accreditation Service, a subsidiary of ICC
IBC	International Building Code, published by ICC. Internal link via IHS.
ICC	International Code Council
ICC-ESR	Evaluation Service Report issued by ICC-ES subsidiary of ICC.
IEBC	International Existing Building Code, a product of ICC. Internal link via IHS.
LANL Inspector	A LANL (e.g., Triad) or subcontractor employee performing duties approved by the LANL Chief Inspector. May be written simply as inspector.
LBC	LANL Building Code; the IBC as amended by LANL (i.e., Att. A of this Section IBC-GEN). Where the LANL Standards including this chapter invoke the IBC, interpret to mean the LBC (except in obvious references to the source document; the term “IBC” is used at this time due to higher recognition).
LBO	LANL Building Official. The Division Leader of Engineering Services or successor, as delegated to LANL by NNSA.
LEBC	LANL Existing Building Code. Amendments to the IEBC for buildings and systems.
ML	Management level, from LANL’s 4-tiered graded approach to rigor per AP-341-502 .
PRID (internal only)	Permits Requirements Identification (PRID). LANL intranet-based project planning tool that provides interactive communication among project participants and institutional Subject Matter Experts (SMEs). Its objective is to identify institutional, state, and/or federal requirements early in the planning phase of a project, facilitate SME communication and review, and to document compliance with requirements. P 351
Process	Manufacturing, process, or production equipment of tenant organizations, as distinguished from utilities or building services equipment.
Programmatic	Work or equipment that is tenant, R&D, or process; not facility, utility, or infrastructure
Project	Any type of work/job/task/or any other terminology that is subject to IBC’s scope regardless of funding source or facility arrangement.
R&D	See PD 370 , Conduct of Engineering for Research and Development (R&D)
Routine inspection (or inspection)	Inspections done by LANL or LANL’s agent for general conformance to the design and LANL Standards, including those required by the IBC.
Special inspection	A process of inspection, testing, and reporting by approved special inspectors and testing agencies to assure the LBO that the construction of critical elements, materials, and life safety systems is being performed in accordance with the approved construction documents and IBC Ch.17. Described by the Statement of Special Inspections (see IBC-IP and its Att. B)
Special Inspection Agency (SIA)	Organization providing special inspectors and managing their training and qualification in accordance with this Chapter. Also known as Inspection Agency. This is LANL or Subcontractors it may approve to perform this work
Special Inspector (SI)	Individual who has specialized knowledge, training, experience, and certification(s) for one or more of the types of construction subject to special inspection
Subcontractor	Firm hired by LANL, who is DOE’s Prime Contractor
Testing Agency	A firm providing independent, certified test results.

6.0 RESPONSIBILITIES AND DUTIES²⁹

Note: A building department organization chart is maintained on the Chapter 16 webpage, directly [here](#).

6.1 Facility Design Authority Representatives (FDARs)

- A. FDARs shall make day-to-day determinations as to:
 - 1. Whether proposed work is subject to this chapter within the rules and examples in Tables IBC-GEN-1 & -2;
 - 2. Work category per Preliminary Project Determination (IBC-GEN FM01) definitions. PPD must be completed for every IBC Program job for which engineering becomes aware or involved.
 - a. Key determinations from PPD must be captured in design inputs and outputs (ideally drawing title sheet).
 - b. PPD forms and other records of FDAR actions must be filed per form instructions and will be assessed by LBO.³⁰
 - 3. FDAR decisions are subject to revision by the LBO.

6.2 LANL Project and Maintenance Management, Project Engineering, and facility personnel that manage work.

- A. Through Acquisition Services Management (ASM Procurement and the Contract Administrator), assure that proper ESM (including this program) direction is included in subcontracts (or work packages).³¹ Require the Design Professional's and construction contractor's (e.g., prime Subcontractor) compliance with the LANL Engineering Standards.
- B. Assure that the project/job or any other designated work under IBC Program purview does not commence until they have obtained IBC Program approval. In addition, they are responsible for assuring compliance to the IBC and/or IEBC on the project.
- C. Have necessary programs and procedures in place to address the controls and process within their organization to assure that IBC and IEBC requirements are fully implemented. This includes instructing personnel and passing-down necessary controls to sub-tier levels on a project and assuring that the LBO Chief Inspector will be properly notified of non-conforming conditions on any IBC-related work.
- D. Use PRID system when required to ensure such projects are tracked and properly reviewed; proof of appropriate reviews is necessary to receive LBO approval to construct.
- E. For new buildings and existing building modifications, obtain FDAR determination of IEBC Alteration Level, occupancy category, seismic category, and other matters using Form 1, Preliminary Project Determinations associated with this document; communicate input to design agency in design agreement.
- F. For new buildings and existing buildings changing chemical inventory, complete Form 2, HazMat Determination, as required (see Forms 1 and 2).

²⁹ Much of this Chapter's material is derived from IBC Chapters 1 and 17. For qualification, IBC-GEN Att. A LBC amendments to IBC govern along with this subsection. Other source materials for this Chapter are from "Model Program for Special Inspection," ICC Item 1035S4 and "2006 IBC Special Inspections: Understanding and Developing a Special Inspection Program," ICC Item 1045S06. Also consulted: Clark Co, NV Building Development program Technical Guidelines, etc.

³⁰ Determining code and other key design inputs prior to getting underway with design helps minimize rework. Failing to select correctly and/or communicate used to occur prior to form existence. Also helps ensure that changes in use or occupancy result in new Certificate of Occupancy per IBC-2015 111.1. Intent of "every" is not to force change to maintenance work package flows that don't already involve engineering (e.g., repairs in some cases). Assessment nominally January for previous CY.

³¹ Work packages when self-performing.

- G. Notify the LBO Chief Inspector as soon as possible when non-LBO-permitted or sub-standard construction has occurred on the project (including work by testing agency or in fabrication/manufacture shops).
- H. Designate the Registered Design Professional in Responsible Charge and submit at time of first design review, and if ever the DPIRC changes, using Form 3.³²

6.3 Constructor (e.g., Prime Subcontractor or LANL)

- A. Perform as described by Subcontract with LANL.
- B. Follow requirements specific to IBC and quality primarily in Project Specification Section 01 4000, *Quality Requirements*.

6.4 Design Professional in Responsible Charge (DPIRC)

- A. Develop the design.
- B. Develop statement of special inspections (SSI) when required by IBC 1704.3, and test and inspection plan (TIP or VIT); see Section IBC-IP.
- C. Submit required structural observations³³ to the LANL Lead Chief Inspector. Structural observations are the responsibility of the structural engineer of record (EOR) unless otherwise stated in the Subcontract. EOR must subcontract observations if he/she is in the same company as the prime Subcontractor,³⁴ and LBO must approve observation performance by persons other than the structural EOR.
- D. Submit any revised occupancy and use categories [and IEBC alteration level(s) for existing building modifications] per Form 1 through LANL Project personnel.
- E. Delegated design: The DPIRC is ultimately responsible for delivering all engineering products required by the ESM/Subcontract to the LBO, even those specialties that are delegated [exception: design by constructing firm's subtiers (e.g., fire protection), in which case such design is accepted by DPIRC]. When retained for engineering services during construction, this includes managing change control, as-built construction documents (where required by contract), etc.; see also this topic below under Process (7.0.A).
- F. Edit LANL Master Specification Section [01 4000](#), *Quality Requirements* and include in Project Specification.

6.5 LANL Building Official (or Designee)

- A. Implement this chapter and the activities and duties herein.
- B. Enforce the IBC Program; take action on non-permitted or significant life safety affecting nonconforming work by interacting with project owners/managers (see Form 4, LBO Notice of Violation).
- C. Approve field and laboratory test agencies, inspection agencies, and offsite structural element fabricators to preclude in-shop special inspections (per ESM Ch.16 Section IBC-FAB).
 1. *List of approvals is a reference on ESM Chapter 16 [webpage](#).*

³² Required by [NMAC 14.5.2](#).10.G-2004 on permits

³³ IBC-2015 104.7 and 1704.6. This is expected to be required in under half of all IBC jobs (e.g., when high occupancy, critical buildings, and/or hazardous contents).

³⁴ Ibid. SER best understands design, load path, and critical fabrication issues, so is best person to perform observations. Clark County, NV does not consider it a conflict of interest for SER to perform observations ([TG100-2008](#) 7.4), nor does Phoenix as of Apr 2008 (latter cautioned against SER who is in same company as builder). N/A when LANL self-performs since LANL will always protect government's interests.

- D. Designate deputies, chief inspectors, and other key staff through maintenance of an organization chart on the chapter webpage.
- E. Chair program staff meetings (*nominally monthly*). *Invitees should include Deputy Building Officials, ESM Chapter POC/Alternate, Chief Inspectors, permitting stamp holders, quality assurance, project engineering, and project management representatives. The agenda should include a safety topic, relevant building safety and quality incidents, and ongoing and new issues/business. Notes should be taken.*
- F. Perform program self-assessments (e.g., MAs).³⁵ *Possible criteria for self-assessment can be found in IAS [AC251](#), Accreditation Criteria for Building Departments/Code Enforcement Agencies, including the applicable sections of ISO/IEC Standard 17020, Conformity Assessment — Requirements for the Operation of Various Types of Bodies Performing Inspection. http://www.iasonline.org/Accreditation_Criteria/*
 - 1. *In addition to self-assessments, LBO may consider external assessments. These could include assessment of plan review effectiveness through occasional use of contracted plan reviewers (e.g., advertisers in ICC publications). LBO may also consider an outside assessment of overall program effectiveness via IAS accreditation to AC251 or the ISO Building Code Effectiveness Grading Schedule (BCEGS) program.*

6.6 LANL Chief Inspectors and Staff

- A. Must be assigned and designated by the LBO to administer parts of the program including the specific electrical, mechanical, and plumbing codes adopted and amended by the ESM. *The listing of LANL Chief Inspectors is on both the [Chapter 16](#) organization chart and the [contacts](#) webpage.*
- B. Delegated by the LBO, Chief Inspectors act on behalf of the LBO to perform duties of evaluating testing and offsite structural fabrication agencies and managing or performing oversight of inspection and welding personnel who work onsite -- their training and certification, evaluating their performance, performing surveillances related to IBC work on site, developing related LANL inspection procedures, and acting as subject matter experts (SMEs). Duties are further described in other ESM Chapter 16 sections.
- C. CM-Construction Engineering Group is responsible for oversight of all inspections of IBC Program work. SSI-required testing by third-party LBO-approved agencies shall be at the constructor's expense. CE Chief Inspector also approves Special Inspectors (SIs) to perform the duties specified by the Code, this ESM Chapter, and approved inspection plans developed for individual projects/jobs; and revoke approvals as warranted. CE Chief Inspector may, in writing, delegate or authorize other qualified organizations (Special Inspection Agencies) to perform such SI within the qualification limitations imposed by the Program.

Note: CM-Construction Engineering Group responsibility for construction inspection may extend beyond the IBC Program scope through WI-400-282, *Acceptance Inspection and Testing*, and other policies or agreements. Two examples of this are ASME B31.3 piping inspections and certain "tenant improvement" type work where the majority of the work is not IBC-related but aspects affect the facility to the extent the work is subject to the overall IBC Program as discussed above under Scope.

³⁵ DOE O 414.1D Quality Assurance includes criterion for management self-assessment. See also PD328, Assessment Program.

- D. Construction or work for which a permit is required is to be inspected. Inspect for compliance with the approved design documents and the provisions of the national consensus codes and standards referenced in the ESM. Exceptions:
 - 1. Fire system inspections are delegated to the Fire Marshal (a Deputy Building Official) or Fire Group as applicable.
 - 2. Security and telecom/data is inspected by LANL groups responsible for those systems.
 - 3. Others as recognized or delegated by the LBO.
- E. Maintain all related records required by the IBC for the period required per the LANL Records Inventory and Disposal Schedules (RIDS).

6.7 LANL Design (Plan) Reviewers

- A. Responsibility for reviews against the building codes as amended by the LANL Standards rests with the LBO.
 - 1. The LBO may rely on other organizations for aspects of such reviews, including when they are authorized by LANL policy (*thus reflected in PRID*) to do so (e.g., Fire Protection Group reviews).
 - a. Review for CAD Standards Manual (CSM) compliance is required whenever drawings are present (at all design reviews, e.g., 30-60-90) *and should also be done for CSM sketch requirements.*
 - b. *Other LBO-mandated reviews may be captured in the Permitting Checklist/process.*
 - 2. LBO may subcontract review activity to outside firms (i.e., third parties), or may augment Engineering Services staff by, in writing, appointing other qualified LANL or outside individuals to perform review functions.
 - 3. LBO delegates review assignment responsibility to ES Group Leaders and FDARs.
 - a. *Guidance: A listing of approved ES and FP reviewers is linked on the [Ch.16](#) and ES-Div webpages (SME Listing), Internal Only.*
 - b. *Review assignments should be made to persons with the following knowledge and skills:*
 - 1) *Knowledgeable in the ESM, adjunct LANL documents, and building codes in the areas of review assigned*
 - 2) *Knowledgeable in the specific area(s) of design or analysis involved*
 - 3) *Capable of performing similar design or analysis*
 - 4) *Have the proper security clearance for access to sufficient information to perform the review;*
 - 5) *Did not participate in development of the design;*
 - 6) *Did not specify a singular design approach; and*
 - 7) *Did not rule out certain design and analysis considerations.*
- B. The LBO further delegates to ES Group Leaders and FDARs the role of ensuring compliance with the applicable design review procedures, including complete resolution of comments, on behalf of all code-reviewing organizations, when granting permits for construction, and should do so for non-code reviewing organizations (see procedure

steps later). *Guidance: Those procedures include the Conduct of Engineering APs, PD1220 Fire Protection Program, and others. Such procedures require that designs be reviewed by others as needed per PRID including Fire Protection Group, the Fire Marshal, Security & Safeguards, Utilities, and others including ESH, QA, Rad Protection Engineering, etc.*

7.0 PROCESS OVERVIEW

This table reflects major steps or the administrative program all risk levels; some steps are not necessary for low or moderate risk activities as noted. See Table IBC-GEN-3 for details on risk approach.

AR	as required by Subcontract or elsewhere in ESM
PE	LANL person performing project engineer functions
PIO-CM	LANL’s construction engineering (inspection) group
RE	responsible engineer
WP	When present (e.g., if applicable/required or used optionally)

Step	Responsible Person	Action	Lowest Risk	Moderate Risk	Highest Risk
Pre-Permit					
1	RE or PE	Complete Form 1 (PPD). Obtain FDAR initial determination on (1) whether the work is in IBC Program per Tables IBC-GEN-1 and 2, (2) whether repair or a higher work category per Preliminary Project Determination (Form 1) definitions, and (3) risk level per Table IBC-GEN-3. Include data as design input.	X	X	X
2	DPIRC	Develop design (may be phased/multiple packages). [by 60%, develop preliminary inspection plan(s) delineating the degree of test, inspection, and Statement of Special Inspections (SSI, when required by IBC 1704.3) for the work being done. Produce Test and Inspection Plan (TIP or VIT) unless specifically directed to NOT produce TIP by LANL subcontract. See Chapter 16 Section IBC-IP, IBC Inspection Process, for details.] Submit to LANL person acting as Project Engineer, who then submits to PIO-CM, ES-EPD reviewers, and other policy mandated (e.g., PRID) reviewers for LBO review per IBC Permitting Process (EPD desk instruction DI-ES-EPD-001 (internal link) ³⁶	AR	AR	X
3	IBC SME reviewers	Review and comment on design (e.g., at 30 and 60% completion). Return comments to DPIRC via PE.	X	X	X

³⁶ Ref. ESM Chapter 1 Section Z10 including Att C, 30-60-90% Deliverables. Also, Moderate Risk tasks normally require design per applicable ICC-ESR.

Step	Responsible Person	Action	Lowest Risk	Moderate Risk	Highest Risk
4	DPIRC	Develop final design and test and inspection plan(s) delineating the degree of test, inspection, and Statement of Special Inspections (SSI, when required by IBC 1704.3) for the work being done. Produce Test and Inspection Plan (TIP or VIT) unless specifically directed to NOT produce TIP by LANL subcontract. See Chapter 16 Section IBC-IP, IBC Inspection Process, for details. Designs shall document final design inputs (including Alt Level if applicable) and fire ratings of any walls being penetrated. Submit to LANL person acting as Project Engineer	AR	AR	X
5	PE	Submit 90% design/inspection package as per Step 3.	AR	AR	X
6	IBC SME reviewers	Review and comment on design and test and inspection plans. Ensure such plans are aligned to the drawings and specifications. Return comments to DPIRC via PE.	X	X	X
7	PE	Once all “C” comment comments are successfully resolved, submit 100% design and inspection plans(s) per LBO Permitting Procedure and checklist. ³⁷	WP	WP	X
8	LBO Permit Stamp Holder “DPR” (ES-EPD)	Approve 100%, correct submission for approval to construct by applying approval stamp. ³⁸ Return one set of materials to project. Note: Documents must be sealed by the DPIRC before LBO approval. <i>Guidance: Projects with both IBC and non-IBC work will generally be LBO-stamped throughout; non-IBC projects may receive an “Accepted by LANL Engineering” stamp.</i>	WP	WP	X
Post-Permit					
9	Constructor	Follow the Offsite Structural Fabricator Approval Process (Ch.16 Section IBC-FAB) for seeking approval of fabricators to perform certain IBC work without mandatory in-shop special inspection/expense, then submitting a	X	X	X

³⁷ Building Dept approval ensures compliance with engineering change control procedures and municipal practice. Also, LANL Construction Inspection needs to be able to determine approved design quickly.

³⁸ This process is LANL equivalent to obtaining plan reviews for a building permit. Site placarding is not used. In the case of pre-engineered buildings, structures, and transportable, the preferred approach is one-time submittal of complete design including shop and foundations drawings; in any case, shop drawings must be approved before purchase, lease, or installation.

Step	Responsible Person	Action	Lowest Risk	Moderate Risk	Highest Risk
		Certificate of Conformance. Submit any requests to LANL; PIO-CM requires two (2) weeks lead time.			
10	Constructor	Ensure only LBO-approved third party testing agencies are used (listing on ESM Ch.16). If the testing agencies they prefer to use are not on that list they may submit the necessary data for evaluation (see IBC-TIA). Submit any requests to LANL; PIO-CM requires two (2) weeks lead time.	X	X	X
11	Constructor	Begin work when authorized. Construction work including offsite structural element fabrication work must not start until authorized by the IBC Program after evaluating that the project has complied with all necessary IBC and LBO requirements. (Exceptions: grading, excavation, and storm water protection may proceed ³⁹). Note: Only the LBO may authorize construction at risk by approving a variance with sufficient justification. ⁴⁰ Project must follow the approved inspection plan(s), and Subcontractors submit “Statements of Responsibility with respect to Special Inspection” per IBC-IP App H.	X	X	X
12	PIO-CM	Conduct or oversee inspections per Section IBC-IP, IBC Inspection Process.	Limited; see Table IBC-GEN-3	X	X
13	PE	Route Form 5, Final Inspection Checklist and Certificate of Occupancy, to completion. <i>When temporary (e.g., transportable less than 3 years), LBO may elect to initiate/own an Issue Management task for FOD to remove.</i>	WP	WP	X

A. Delegated and/or Deferred Design:

Note: Delegated refers to design activities performed by those other than the DPIRC. Deferred refers to design performed after permit is granted (ref. IBC-2015 107.3.4 and 202).

³⁹ These activities are not normally inspected under IBC, while compaction, formwork, are rebar installation are. See ESM Ch. 1 Section Z10 for in-house design sealing exceptions.

⁴⁰ Helps ensure safety of construction workers, limits LANL risk with unacceptable work.

1. The LBO normally permits construction start with a package that lacks final design for specialties such as structural detailing, HVAC, fire alarm and suppression, and equipment anchorage (i.e., this detail submission is deferred).
2. For such a permit to be issued, the permit package shall have sufficiently detailed performance requirements that intent can be reviewed, and shall clearly identify what design will be furnished later. Notes regarding deferred design shall be stated on both the affected construction documents including Test & Inspection Plan, and, if present, the Statement of Special Inspections (SSI).
3. Deferred design submissions shall follow the same workflow as the permit package but at a later time, and with the following differences:
 - a. It is the DPIRC's responsibility to communicate applicable requirements of this and other sections of the ESM to the delegated subcontractor through drawing notes and/or specifications to assure that the requirements are implemented in the subcontractor's design submittal. *Guidance: Many times exact details of implementation are based on the brands selected. The delegated sub-tier subcontractor is typically guided by the specification and drawings for the project, not the entire ESM.*
 - b. Drawings need not follow the LANL CAD Manual in its entirety, but must at least meet all its sketch requirements (*ref. Sections 102.2.J and 103.4.0 in Rev. 5*). Submit electronic media in AutoCAD or compatible with third-party conversion. Conformance to the National CAD Standard/Uniform Drawing System is desirable as is use of the LANL title block. Include TA and building numbers regardless.
 - c. When not produced by the DPIRC: As with any delegated design, submissions must first be reviewed/approved by the DPIRC to ensure acceptability (including interdisciplinary reviews as appropriate). As with any design, they must be sealed by a registered engineer when required by ESM Ch.1 Section Z10 ("Design Outputs/Sealing" article)].
 - d. The DPIRC is also responsible for revising the submittal summary, Test & Inspection Plan, and the SSI as necessary to match the deferred design, then submitting these revised documents with the deferred design.
 - e. Submissions must be reviewed/approved by the IBC Program process prior to fabrication and installation. *Guidance: Reviewers will comment using a special delegated design review form attached to Spec Section 01 3300; design becomes 100% upon IBC Program approval.*

B. Changes to previously-permitted design:

1. LBO re-approval is required when the changes (a) do or could affect code compliance including but not limited to fire, life safety, and/or egress or (b) change the scope. Thus, it is not required for every DRN and FCR, only when individually or cumulatively meeting criterion above.⁴¹
2. Even where re-approval is not required per criteria above, the design change must be acceptable to the affected original or equivalent reviewer(s).
3. *Guidance: The project may request or receive re-approval (e.g., LBO stamping) even when not necessary.*

⁴¹ IBC-2015 107.4. Re-approval for code impact because that is a primary purpose of the permit and 2009 IEBC Q&A document 1-19 suggests so; re-approval for substantive changes ensures reviews to control risk and to lesser degree because inspectors look for approved documents. Re-approval not required for record drawing updating or as-built that occurs after work is complete.

8.0 QUALIFICATION OF SUPPLIERS AND MANUFACTURED PRODUCTS FOR IBC STRUCTURAL AND OTHER WORK⁴²

Note: Qualification here refers to IBC matters, not nuclear ones.

- 8.1. Under 104.9, 104.11, and the Special Cases section of the IBC (1705.1.1), proprietary products must be approved by the LBO. Structural examples are anchor channels, mechanical reinforcing steel splices/couplers, and post-installed (PI) anchors. As such, from an IBC standpoint only:
- A. Such components are automatically approved by the LBO if they are PI anchors used in a seismically exempt application (see definition).⁴³ For other products, they are also automatically approved if they meet both of the following:
 - 1. The components chosen are IBC-compliant-labeled (has been accepted by the most recent ES report from ICC-ES or ER report from IAPMO valid for the code edition in use or newer edition⁴⁴) AND
 - 2. The design and installation complies with the conditions of use and restrictions specified in the ICC report (in addition to and including following manufacturer instructions, particularly where more stringent). Installation must be verified by special inspector(s) when required by ICC ES Report and/or IBC Ch.17 on special inspection.
 - B. Products accepted by Los Angeles Dept. of Buildings (see footnote) are also acceptable at LANL except where specifically limited by the LANL Standards including Master Specs, when used in non-nuclear service and with any applicable conditions placed by LADBS.⁴⁵
 - 1. LADBS are at <http://netinfo.ladbs.org/rreports.nsf>
 - C. Other special case components not automatically approved as noted above must be submitted to the ES-EPD Structural Team which will broker LBO approval prior to use.⁴⁶ *Guidance: This may involve derating; e.g., using less tension and/or shear capacity than documented for a concrete anchor /embedding, using a mechanical rebar splice /coupler capacity that results in the final assembly 'performing' only within elastic region, etc.*

⁴² LBO approval is required for all non-code-prescribed work per IBC 104.11, but LANL has these additional requirements for structural. [Per 104.11, any new "material, design and methods of construction and equipment" must be provided to the LBO in writing using the 2176 Form, including what is it designed for or to do and what documentation, testing or other objective evidence shows it will perform as expected to support the design. This must be reviewed by the appropriate standards POC before submitting to LBO.]

⁴³ Incorporates and supersedes CIR-16-002 and outcome of a 5/2016 meeting re Electrical-Safety-Based Penetration Rule & Installation of Seismically-Exempt P-I Anchors (GP minutes dated 5/25). Safety class and safety significant items used in nuclear facilities are required to be procured from an ASME NQA-1 qualified supplier or require a commercial grade dedication.

⁴⁴ When a given product's research report isn't compliant with the applicable IBC edition, contact ESM POC for guidance

⁴⁵ LADBS Building Code tab Information Bulletin IB/P/BC-2014-119 — *Alternate Building Materials/Products Approval Requirements* [LADBS IB website](#)

⁴⁶ *In addition to this requirement to obtain LBO approvals, it is important to note that the general focus of ML-1/2 is primarily a quality assurance evaluation of the manufacturer's or supplier's quality program. The focus of IBC Ch. 17 is to assure that proper independent testing has been accomplished.*

9.0 TEMPORARY FACILITIES, STRUCTURES, AND BUILDING SYSTEMS & COMPONENTS (Z1050)

- A. **Temporary** is defined as three years or less for LANL structures.⁴⁷
1. The term “**structures**” includes buildings and facilities—and within this subsection also includes facility systems and components.
 2. Exception: At time of writing, lighting protection impairment due to “temporary” roof railings was limited to 90 days (after which impairment must cease).⁴⁸
 3. Structures intended for less than 3 years are **not** required to meet those IBC or LANL Standards requirements that ensure long-life cost effectiveness of permanent structures such as long-lasting materials, energy efficiency meeting ESM Ch.14, or having formal drawings (sketches are adequate).
 4. Applicable safety and environmental requirements must be met.⁴⁹ Also, see additional requirements below.
- B. Structures includes temporary (relocatable) trailers, prefabricated buildings, tents, sheds, containers, and similar structures. This includes LANL- and Subcontractor-owned structures including leased and owned trailers.
1. At time of writing, relocations and new installations of relocatables also require ALDPM prior approval.⁵⁰
- C. Temporary structures shall meet all DOE contractual requirements including the suite of NM building codes and worker safety-related amendments in IBC-GEN Att. A–LANL *Building Code*⁵¹ and elsewhere in ESM, primarily:
1. Siting: Get siting approval per [P 941](#), Site Planning when required (e.g., when over 6 months, including laydown yards). *Subcontractor trailer siting is covered under laydown siting/approval.*
 2. Signage: For LANL-owned only: As described in ESM Chapter 4 Architectural, structure number signs are required when structure number is required above.
 3. Clearances: Comply with underground utilities and overhead power line right-of-way requirements in ESM Civil and Electrical Chapters (also see Chapter 3 Civil Section G30 *part 9.0 and 10.0*).
 4. Fire: If there will be adjacent structures, follow ESM Fire Chapter 2 for exposure acceptance criteria (e.g., [DOE-STD-1066-2016, Fire Protection Appendix C](#)).
 5. Utilities meet governing codes but not amendments in ESM.
 6. Structural: Foundations and anchorage must be provided and able to resist gravity loads and the forces, including overturning, caused by wind loads⁵² determined in accordance with ESM [Chapter 5](#) Section II. (Seismic forces for

⁴⁷ 3-year timeframe allows construction project trailers to be sited temporarily and cost-effectively. Most other transportables tend to remain much longer than originally planned (often 25+ years) and, as such, are to meet life-cycle cost requirements. Att A LBC of this document, Section 108 allows a 1 year permit with extensions (to 3 years) based on [NMAC 14.5.2.17](#) allowing 1 year with extensions for good cause and NMAC 14.12.3 Manufactured Housing that allows 1 year. Subsection 14.12.3.189 (2-16-2014) states: "A. Modular units may be installed on a temporary foundation for a period of up to one year. Units installed as temporary and remaining in place after the one-year period must be placed on a permanent foundation. B. Modular units installed as temporary shall meet all currently adopted New Mexico building codes, and accessibility requirements."]. The NEC limit of 90 days does not require permanent power for transportables.

⁴⁸ NEC/NFPA 70 uses 90 days for temporary limit for power, for example.

⁴⁹ IBC-2015 3103.11, "...conform to the structural strength, fire safety, means of egress, accessibility, light, ventilation and sanitary requirements of this code as necessary to ensure public health, safety and general welfare." LANL definition of temporary may not satisfy NMED permit expectations, for example.

⁵⁰ Per PD902, Space Management

⁵¹ ICC staff 12/2010 opined that office trailers are addressed by the IRC, but in NM, the NMAC section invoking IRC points to NMAC for manufactured housing ([14.12.1.10.E](#)); that points to CID authority and building code (NMCBC based on IBC).

⁵² http://www.youtube.com/watch?v=EsKb17_pVJk&feature=player_embedded

most temporary trailers do not need to be considered for anchorage.⁵³ Follow Standard Detail [ST-Z1052](#) for soil augers (or provide plan and anchorage acceptable to LANL structural engineering); when soil augers are used, design to IBC soil data unless project-specific geotechnical data is available and provided (see ESM Ch.5 Section IV).

7. Electrical: Following NFPA (NEC/NFPA 70, etc.) is sufficient. *Bonding: Electrical bonding to a ground system (as is done with fences/gates) is suggested for personnel safety reasons should lightning strike nearby.*
8. IBC technical: Meet IBC including Sections 108 and 3103–*Temporary Structures*.
9. IBC administrative: Meet requirements of Table IBC-GEN-3.
10. Hazard: Relocatable installations other than ordinary business and industrial facilities (that present extraordinary hazards) must follow the ESM Chapter 1 Section Z10 (on *Design Goals: Safety*).
11. Non-occupied Subcontractor structures in an approved project lay-down area generally only need to meet Code as amended by LANL (subsection below on Sheds and Containers)
12. Tents under 400 sq. ft.: These are “Low Risk” in Table IBC-GEN-3. They are exempt from the siting, clearances, and signage requirements above.⁵⁴ In lieu of IBC Ch 16 wind requirements (e.g., 1609), tents may be anchored against wind in accordance with the manufacturer’s recommendations (as a compensatory measure, they must be evacuated in high winds and following such events the anchorage must be inspected and loose or damaged anchorage repaired or replaced).
13. *Guidance: Temporary modifications controlled by [AP-341-504](#) should follow the same IBC Program review, approval, and inspection processes as permanent modifications, where they are applicable.*

10.0 PREFAB STRUCTURE REQUIREMENTS (FOR BOTH TEMPORARY AND PERMANENT)

- A. Article 10.0 contains the requirements for the [offsite-built](#) structure types listed in Table Prefab-1. These apply to both permanent and “Temporary” (see article 9.0 above). *These are not all applicable ESM requirements, but are the vast majority.*

Table Prefab-1. Structures within the Scope of this Article

Type	Definition/Notes (for this article only)
Carport	An open-sided (generally), roofed, site-assembled structure, often for vehicle or equipment protection. “U” occupancy.
Container	Intermodal transportainer (aka SeaLand, SeaTrain) built to ISO 1496. ⁵⁵

⁵³ For single- and double-wide trailers, generic calculations (Goen 2010, EMRef-76) indicate that, for anchorage only, wind loads are the more severe loading condition when compared to seismic loads for up to 5 years. No further evaluation of seismic loads is required with anchorage. Permanent foundation is not required because of temporary nature; when for many (5+) years, the benefits of a permanent foundation (full perimeter, etc.) including stability/frost heave, energy, rodent exclusion, etc. may exceed the initial cost.

⁵⁴ Tent size basis is that IBC waives permits up to 120 ft²; LANL wind conditions and care allow this larger size for these low-risk, low occupancy, very temporary structures. The formality of siting, clearances, and signage is impractical. Re the structural requirements, the use of tents, and therefore the occupancy in high winds, is limited. In some cases (e.g., Environmental Programs), procedures prohibit work when high winds are present.

⁵⁵ And similar steel cargo/freight/shipping boxes built to a consensus standard (e.g., military conex)

Type	Definition/Notes (for this article only)
Hazmat (structure)	“Robust” or other purpose-built structure having necessary certifications for storage of specific hazardous materials. ⁵⁶ Generic sheds and containers must not be used for this; instead; use structures designed for safe storage (and containment if appropriate) and labeled for the purpose (e.g., NFPA 30; NFPA 704 diamond); see also ESM Ch. 1 Section Z10 (on <i>Design Goals: Safety</i>) and Ch.10. Purpose-built example: US Chemical Storage . Robust example: Use or storage of HE inside a magazine that meets specifications (e.g., DoD, ATF, etc.) specific for use or storage of HE (typically H-1 occupancy)
HE	high explosives
Relocatable Building	A transportable trailer—single, double, or multiplex—usually used as an office or change room (B occupancy). MVD-regulated trailers (RV, cargo) are not IBC scope. ⁵⁷
Robust	A blast-resistant building (magazine or bunker) meeting one or more military standards or specs. Typically used for storage of HE or protection of occupants from shrapnel. Examples: Armag , RedGuard
Shed	A light-duty pre-engineered building. Small ones are entirely offsite-built and roadworthy, larger ones partially offsite-built. Garages shall be treated similarly. Normally U occupancy.

B. The following structures are excluded from this article for the reasons stated.

Table Prefab-2. Structures Outside the Scope of this Article

Type	Notes/Why Excluded
Additions to existing structures	These are governed by the IEBC and often have foundation, egress, and fire issues beyond this article.
Permanent modular construction method (e.g., CEFC and MOB projects)	Require extensive use of (and probable alternate method from) ESM; complete, engineered design process.
Pre-engineered metal buildings, e.g., per LANL Master Spec Section 13 3419	Minimal pre-assembly, often custom, offsite inspection, not road-tested, significant onsite erection/inspection, addressed by master spec section.
Short-lived structures that will be promptly destroyed by use, or are props, and not re-entered or reused	Unoccupied but damaged structures are low risk. Props (e.g., movie, training) are exempt from permitting per IBC. As such, this article is n/a. Owner/user, not LBO, is solely responsible for ensuring safety (and any Site Planning, PRID).

C. The following definitions (beyond those in Table Prefab-1) also apply (to this article only).

Table Prefab-3. Additional Definitions for this Article (LANL-specific)

Term	Meaning
Incidental Occupancy	Occupied for a total of less than 2 hours/day, yearly average. ⁵⁸ Not the same as <i>incidental use</i> (IBC sec. 509 term relating to certain adjunct uses).

⁵⁶ Certain hazardous material and chemical storage is subject to management requirements of LANL’s RCRA Permit - *Module VIII, Section B.1, of the Laboratory’s Hazardous Waste Facility Permit (NM0890010515-1) as of 6/2008*

⁵⁷ NMAC 14.12.1.10.E on manufactured housing requires that non-residential transportables/trailers follow NM Building Codes (versus HUD): “Any unit manufactured or installed after May 19, 1988, used for nonresidential, or commercial purposes must be constructed to the appropriate codes or standards as adopted by construction industries division. Construction industries division has full jurisdiction in approval and inspection of nonresidential manufactured units.” These are considered modular units per NMAC 14.12.3, Modular Structures, which also invokes NM Bldg Code at 12.3.8. IBC is N/A to RVs/trailers with license plates (governed by DOT).

⁵⁸ [RP-8](#) exemption 1.3.d utilized herein.

Term	Meaning
“Occupied”	Occupied in excess of incidental occupancy. NOTE: Ordinary, unmodified sheds and containers must not serve as occupied work areas. They are intended by design for storage or shipping purposes only. Personnel time inside must be infrequent, of short duration, and controlled—and comply with basic life safety issues such as asphyxiation/confined space entry, stability of stacked materials, and IBC egress pathway. Structures must conform to the IBC for their specific use and occupancy classification.
“Modified” Container	For this Prefab Structure article only, any change to the basic, off-the-shelf container beyond these de minimis changes: lighting meeting NEC, roof vents, and skylights under 5 sq. ft. each and no closer than 6 feet spaced. Example: MSSI .

D. Information needed from Requestor for procurement Form 410 reviews⁵⁹

1. Completed Preliminary Project Determination Form ([ESM Ch 16](#) IBC-GEN FM01). Fields: Highest Risk (new structure). IBC Sec. 302 occupancy: B, H, S, or U as appropriate.
 - a. Exception: PPD not required for off-the-shelf:
 - 1) sheds and carports 120 sq. ft.⁶⁰ or under or
 - 2) un-“modified” containers (40’ max⁶¹)
 ...both when used only for non-hazardous storage (not H occupancy).
2. Narrative of location, planned site work, utility installation, grading, paving, walks, stairs, and ramps if applicable (narrative on PPD if present).⁶²

E. Submittals: For only the prefab structure types shown, the following submittals are required from the manufacturer or supplier (except where noted) for LANL LBO review/approval prior to approval of any onsite installation work and eventual use. *Ensure available and request in purchase requisition.*

NOTE on Sheds and carports 120 ft sq and under: These are excluded from Table Prefab-4, but they must be anchored in the same manner as larger ones.

⁵⁹ This information is not typically from or pertinent to the structure manufacturer and, as such, should not appear in purchase requisition. It is needed by reviewing SMEs to determine whether procurement will meet ESM requirements. Both Architectural POC and Standards Manager are authorized to reduce these expectations.

⁶⁰ IBC-2015 exempts sheds up to 120 ft sq from permitting, thus review for compliance.

⁶¹ Longer than 40’ may require IBC egress 2-exit-modification; follow table for requirements.

⁶² Requestor may be reminded of ESM requirements for same by Form 410 reviewers (e.g., completion of PRID)—and, for onsite work, LANL shall inspect all on-site construction work, plus mechanical and electrical if not inspected/approved during offsite fab. At time of writing, relocations and new installations of relocatables also require ALDPM prior approval per PD902, Space Management.

Table Prefab-4. Prefab Structure Submittals (spans 2 pages)

	When “Incidental Occupancy” Only			
	“Occupied” (e.g., office trailer ⁶³ or Robust)	“Robust” or “Hazmat”	“Modified” Container	Sheds and Carpports over 120 sq. ft.
Utility interfaces if applicable				
Utilities connection point locations and, for pipes, material type and sizes			X	
Service requirements (how much power, etc.)			X	
Architectural				
R values for insulation	X		if conditioned (HVAC)	
Shop drawings showing, as applicable, windows, doors, door swings, equipment (electrical, HVAC, lightning protection), fire alarm/riser/suppression, plumbing fixtures and count, or casework, location of same (floor plan)			X	
Hazardous materials storage-appropriate certifications (e.g., for flammable NFPA 30, for explosives DOE-STD-1212 and DoD/ATF, NEC Article 500 Class/Div)		X		
Structural				
New or once-used certification (CoC) from supplier ⁶⁴	X		X	
Wall, floor, and roof section drawings with thicknesses (e.g., on shop drawings)	X	X		X
PE-sealed (stamped) calcs and shop drawings ⁶⁵ for IBC-2015 with LANL amendments, including but not limited to: 1. Roof live load (20 psf) 2. Floor live load (50 psf offices, 125 psf light storage) 3. Wind load (RC I: 105 mph, RC II: 115 mph; RC III 120 mph); exposure “C” 4. IBC 1604.5 Risk Category [fill in per row below]	X		only when buried ⁶⁶	
IBC 1604.5 Risk Category	I (under 3 yrs) II (3+ years) ⁶⁷	I or III ⁶⁸	I	I

⁶³ Office trailers/transportables are considered Relocatable Buildings by 2015 IEBC Ch. 2, are governed by IEBC Ch. 13, *Relocated or Moved Buildings*. Multiplexes follow same approach as single- and double-wides, though have greater fire, egress, and other concerns.

⁶⁴ Used-once-maximum at procurement increases likelihood structure is not degraded from as-constructed condition and is a modern design (containers have often been used once to ship goods from overseas); requestor may require new containers or trailers. Robust, Hazmat, and sheds must be new. Criteria does not apply to relocations within LANL that do not circumvent intent of this requirement.

⁶⁵ For Occupied: Non-NM PE license acceptable due to low risk and meeting NM/LANL incidental practice limits for cost and occupancy (ref Z10). For Incidental Occupancy (except buried): PE-sealed design documents are N/A since low person-hours/year results in low risk of personnel injury (also, this aligns with NMAC [14.5.2.10.C](#) exceptions for similar group buildings and low occupancy totals which were used for reference in this situation but not adopted fully herein or in Z10), plus inherent roadworthiness of many types per ESM Ch 5 Sect II App B.

⁶⁶ For buried applications, use load of covering earth for roof/side loads and delete wind load.

	When “Incidental Occupancy” Only			
	“Occupied” (e.g., office trailer ⁶³ or Robust)	“Robust” or “Hazmat”	“Modified” Container	Sheds and Carports over 120 sq. ft.
For any <u>welding offsite</u> : Submit required documents per LANL Master Spec 01 4444 if not “off-the shelf” per spec	for Robust	X	for structural mods	
Any <u>welding onsite</u> : Submit required documents and meet LANL Master Spec 01 4455	X ⁶⁹	X	X	X
Weight (and center of gravity if off-center) ⁷⁰		X		
Anchoring method and locations ⁷¹				X
Mechanical (when present)				
HVAC equipment (sized for altitude)	X	X	X	
Outside air ventilation	X	X	X	
Equipment list	X	X	X	
Electrical				
Load requirements, including HVAC if present	X	when wiring is present		
Location of receptacles				
Electrical one-line diagram				
Grounding diagram				
Lighting locations				
Bill of material/fixture schedule				
Lightning Protection: Note: This is typically not a manufacturer responsibility. Follow ESM Electrical Chapter 7 Section D5090 requirements for making a needs-determination (uses NFPA 780 exposure and importance criteria). <i>Offices, sheds, and containers with non-hazardous, low-value content do not have protection.</i>	n/a	as needed		
Offsite Inspection				
Display NM-issued inspection/compliance decal (or arrange for fab inspection by LANL Building Official) ⁷²	X			

⁶⁷ Correlating IBC-GEN temporary definition with 2015 IBC 1604.5 RC I “certain temporary facilities.”

⁶⁸ Hazmat storage (e.g., chemicals, explosives) typically RC III per IBC 1604.5.

⁶⁹ Including stairs.

⁷⁰ Weight/center of gravity for rigging and any foundation and anchor design by LANL.

⁷¹ Anchorage: For single- and double-wide temporary relocatable (trailer) anchoring, LANL uses [STD Details](#). For Robust, Hazmat, and containers, anchors normally not needed when on the ground or pad; where blast loads are possible, need for anchors must be evaluated by design agency (extension of EMRef-77, Volkman to Exner, 10/14/2010, “Copy of Approved MDA-B Cargo Container Anchor Calculations”). Placement on cribbing or parking lot bumpers under 6 inches high is considered on the ground and may reduce moisture buildup; although designed to carry moderate floor loads without intermediate supports, 10-foot-center-spaced supports or similar may be appropriate for heavy loads (e.g., forklifts with pallets). Sheds/carports regardless of size: Tie down with wind straps or other anchorage approved by LANL ES-EPD Civil/Structural Team Leader or designate.

⁷² Thus, for transportables, the State of NM is an LBO-approved Special Inspection agency; those coming into NM as “Modularly Approved” by the State of NM have a 3” X 3” decal similar to the NM Flag, yellow with red Zia symbol (typically under the sink, in an electrical panel, or on a window per Loretta in NM Modular Division 505-476-4675. For incidental occupancy, offsite inspection not required due to lower time-at-risk, roadworthiness, weld certs. UL has a certification program, QXRA in their database, ref <https://library.ul.com/?document=tca-electrical-connections-2013-fall&industry=the-code-authority-electrical-connections>

11.0 DEACTIVATION, DECOMMISSIONING, AND DEMOLITION (D&D) (F30)

- A. Depending on scope and rigor required for D&D execution, the FDAR may request the project prepare a Conceptual D&D Plan. The FDAR, after consultation with the Chief Structural Engineer (*EPD CSA Team Leader*), shall then make a determination⁷³ as to whether D&D warrants formal design and approval by LBO due to unique circumstances associated with removal of the structure.
- B. These unique design aspects may include controlled structural collapse, demolition sequencing, special equipment or technologies, means and methods for demolition, or any construction aspects of a D&D project that require formal design (e.g., finishing adjacent facility edifices impacted by the D&D project).
- C. These unique circumstances may be driven by protection of adjacent facilities and workers, disruption of adjacent programmatic operations, and security or environmental concerns. Also:
1. Highest Risk: When required by the FDAR or LBO, develop a D&D package that satisfies the LBO reviewers. This will typically include (1) the scope of work/plan for structural demo⁷⁴ (otherwise, describe work boundaries), (2) demolition and demolition sequencing, (3) measures to protect adjacent facilities and workers (barriers, fencing, signage), (4) site boundary and access control, (5) site end-state configuration and stabilization, (6) utility de-energizations and locations⁷⁵ and temporary utilities (including lighting and power), (7) traffic management, and (8) waste segregation and management.⁷⁶ (9) Generate any structural calculations requested by LBO⁷⁷. LBO approval of 1–5 above and, if required, (9) prior to work initiation will generally be required.⁷⁸
 2. As appropriate, further describe D&D work using drawings or sketches.
Guidance: Use clouding or other methods as described by the LANL CAD Manual. The addition of photos in the drawings is a common and helpful technique for helping to describe the work.
 3. Plan for proper identification and disposal of toxic or other controlled substances such as PCBs which may be present. *See also AP-350-300.*
 4. For electrical demolition refer to ESM Electrical Chapter 7 and LMS Section 02 4115, *Electrical Demolition*.
 5. *Guidance: The LANL Fire Marshal will likely require the following regarding fire protection/egress: Description of how the structure will be disconnected from the fire loop and/or how fire alarm/fire suppressions systems interfaces with adjacent building will be managed.⁷⁹ Address means of egress (NFPA 101/ IBC Chapter 10 egress evaluation or compliance statement).*

⁷³ An LBO-delegated function that may be overruled by same.

⁷⁴ IEBC-2015 106.2.5.

⁷⁵ Also follow O&M Criterion 303, Utility Disconnects.

⁷⁶ There are the major engineering-type controls; LANL ES&H may have additional admin requirements (e.g., asbestos and other hazardous materials, storm and construction water management plan) but these need not be submitted to LBO (and are not, preferably).

⁷⁷ E.g., protection of adjacent structures from shock, supporting mobile equipment on buildings

⁷⁸ Satisfies LANL Building Official review requirement of IBC 105.1 and 3303.

⁷⁹ Often several small buildings will use the same riser and a transponder panel that connects to a main panel

12.0 HISTORY OF REVISIONS

Rev	Date	Description	POC	RM
0	10/27/06	Initial issue. Included IBC and IEBC requirements formerly in Ch.1 Section Z10 rev. 3 and previous.	Tobin Oruch, <i>CENG-OFF</i>	Kirk Christensen, <i>CENG-OFF</i>
1	6/19/07	Added approval of certain design changes and special structural product qual section; organization and ML level changes; minor clarifications.	Tobin Oruch, <i>CENG-OFF</i>	Kirk Christensen, <i>CENG-OFF</i>
2	7/21/08	Clarified scope, Chief Inspector duties, design review duties, need for control of concrete prefab, occupancy. Removed IAS automatic pathway for testing agencies. Minor changes to Att 1 and 2 related to beneficial occupancy and App A and B.	Tobin Oruch, <i>CENG-OFF</i>	Kirk Christensen, <i>CENG-OFF</i>
3	9/15/09	Revised applicability to reduce work scope excluded from the full program.	Tobin Oruch, <i>CENG-OFF</i>	Gary Read, <i>CENG-OFF</i>
4	3/1/10	Clarified scope and applicability, LBO approved listing on chapter webpage versus IESL (4.1.h); revised regarding SI for seismic-resisting (5.3).	Tobin Oruch, <i>CENG-OFF</i>	Larry Goen, <i>CENG-OFF</i>
5	8/25/10	Revised screening criteria, added flowchart. Fabricator approval again includes seismic-resisting inspections. Added and revised temporary facility and shed requirements formerly in Ch.1 Z10. Added end date on occupancy certificate. Final inspection form renamed, made mandatory for all IBC projects.	Tobin Oruch, <i>CENG-OFF</i>	Larry Goen, <i>CENG-OFF</i>
6	6/20/11	2009 adoption; clarified scope (new tables); added DPIRC designation form 01 and previous FM1&2 became 2&3; SSI need not include other inspections; transportainer anchorage; D&D moved in from Z10.	Tobin Oruch, <i>CENG-OFF</i>	Larry Goen, <i>CENG-OFF</i>
7	9/24/13	Added project determination and hazmat forms as FM1 and FM2, NOV as FM4. Clarified scope, phasing, process, delegated and deferred design, change processing. Updated Att A & B. FM1 became FM3. FM2&3 became 5&6, only required for Highest Risk.	Tobin Oruch, <i>ES-DO</i>	Larry Goen, <i>ES-DO</i>
8	5/22/14	Revised criteria for project determination, put in form; added reviewer qual guidance; combined checklist and CoO forms; addressed tents; other minor changes	Tobin Oruch, <i>ES-DO</i>	Larry Goen, <i>ES-DO</i>
9	3/30/15	Adopted 2015 I-codes. Refined in-scope definitions and High and Moderate Risk criteria. Added IAPMO ER use. Revised FM1 and 5. Other minor wording changes.	Tobin Oruch, <i>ES-DO</i>	Larry Goen, <i>ES-DO</i>

Rev	Date	Description	POC	RM
10	10/6/16	Incorporated with minor changes the streamlined graded admin approach of VAR-16-009 r1 and circuit addition VAR-2015-058. Programmatic anchorage requirements revised. Required that design document the final design inputs (including Alt Level) and fire ratings of walls. Added CAD and CM-CE design reviews. Reduced seismically exempt anchor requirements. Minor revisions for temporary and D&D.	Tobin Oruch, <i>ES-DO</i>	Larry Goen, <i>ES-DO</i>
11	11/29/18	Incorporated VAR-10168 on inspection in 3-tiered table and 6.6.D. Sheds and Containers became Prefab and expanded. Minor revisions for D&D, elsewhere.	Tobin Oruch, <i>ES-FE</i>	Larry Goen, <i>ES-DO</i>

13.0 ATTACHMENTS

Attachment A LANL Building Code (LBC)

Attachment B LANL Existing Building/System Code (LEBC)

Form 1, Preliminary Project Determinations

Form 2, HazMat Determination

Form 3, Registered Design Professional in Responsible Charge Designation (Sample)

Form 4, LBO Notice of Violation

Form 5, Building/System Final Inspection Checklist and Certificate of Occupancy