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

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

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

<b>Section IBC-GEN</b>	<a href="#"><u><b>IBC Program POC and Committee</b></u></a>
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## 1.0 Purpose, Scope, and Applicability

- A. Purpose of this Chapter: To establish the LANL building code program (“Program”), including the authority and duties of the LANL Building Official (LBO). The LBO function is integral to enforcement of the International Building Code (IBC), International Existing Building Code (IEBC), other building codes and standards referenced by them, and other building-related LANL Engineering Standard requirements. The LBO performs this enforcement through design reviews, permitting, and inspections primarily<sup>1</sup>.
- B. Scope: The IBC and IEBC apply to all LANL Management Levels (MLs; for quality etc.) of building work covered by their code scopes.
- The IBC addresses the construction, use, and occupancy of new buildings and connected/attached appurtenances,<sup>2</sup> building systems and components, and certain standalone structures (e.g., large non-utility signs, towers).<sup>3</sup>
  - The IEBC addresses repair, alteration, change of occupancy, additions, relocation, and demolition of same when they are existing.

NOTE: See program applicability flowchart on next page for graphical summary of the remaining paragraphs in Article 1.0.

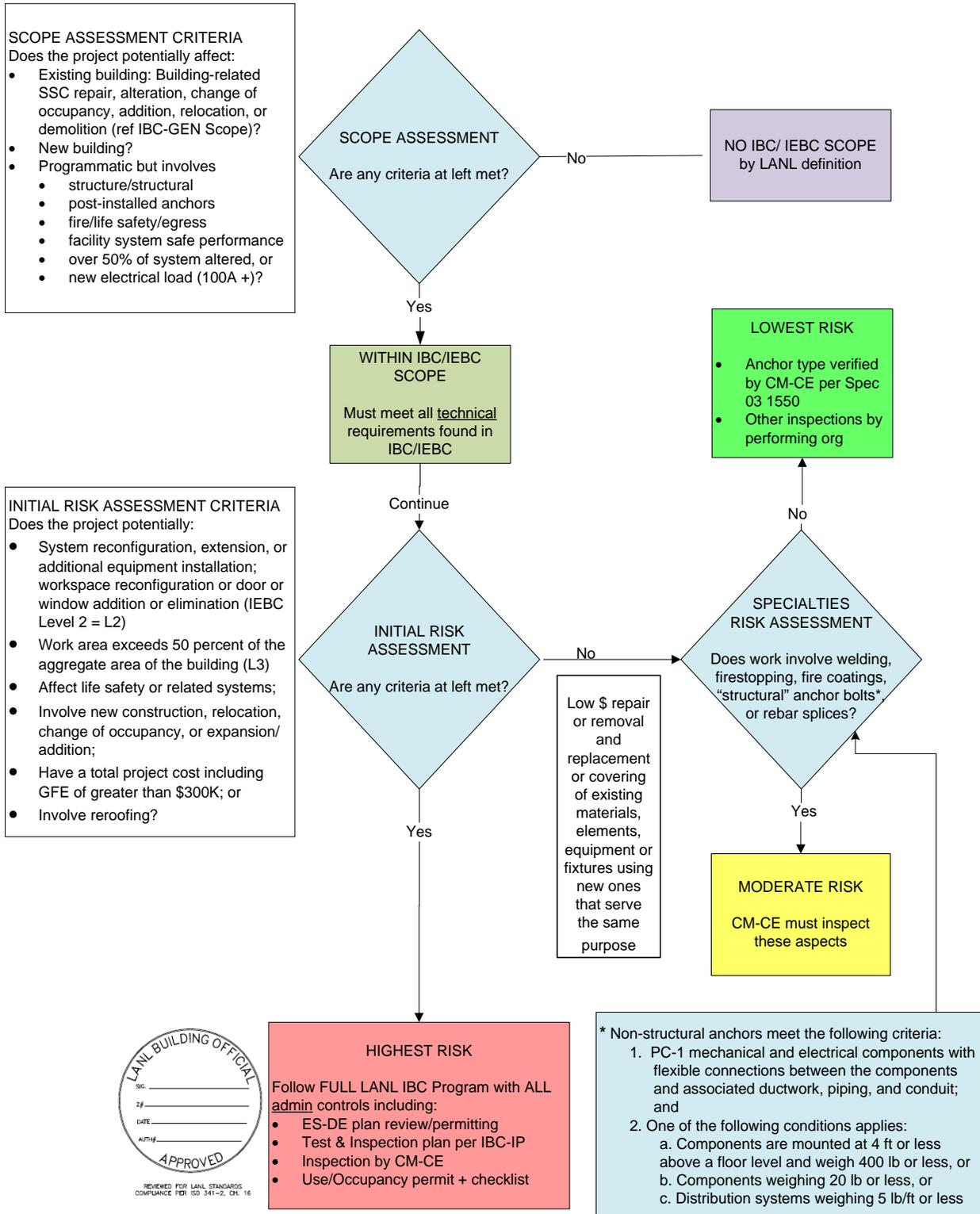
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<sup>1</sup> Those performing such work must be delegated by the LBO to act on the LBO’s behalf

<sup>2</sup> Including transportables. [NMAC](#) 14.12.2.8.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.” Modular units are also per IBC but because of NMAC 14.12.3, Modular Structures. IBC is N/A to RV trailers with license plates (governed by DOT).

<sup>3</sup> Based on IBC 101.2 Scope. UI controls utility and infrastructure work and follows standards listed in ESM Ch 3 Civil. Since LANL uses IEBC also, IBC’s repair, alteration, etc scope is governed by IEBC. See IBC-GEN App B, LEBC.

**ESM Ch 16 IBC Program Applicability**  
(must meet other applicable ESM Chapters regardless)



1. Out of Scope: The IBC and IEBC (and thus this chapter) generally do not apply to utilities or small process or analytical equipment.<sup>4</sup> Installation, modification, and demolition of such equipment and similar “tenant improvements” or installations therefore need not follow the IBC, IEBC, or this chapter except:
  - i. When such equipment could affect structural integrity, fire/life safety/means of egress, or facility system safe performance. Examples of in-program work: (1) adding electrical service or new, large loads<sup>5</sup> or demands on other common utilities or (2) “structural” post-installed anchors per ESM [Chapter 5](#) Section II Appendix A or Section III App A (or LMS 03 1550).<sup>6</sup> For these exceptions, the installation and/or anchorage must meet the IBC (the equipment itself may be outside the IBC’s scope).
  - ii. In addition, when programmatic or process systems are being modified greater than 50% of their replacement value, the “50% Rule” for programmatic system upgrades in IBC-GEN App B, *LANL Existing Building and System Code*, must be applied so that older systems are brought up to current safety standards (seismic, mechanical , electrical, etc.).
  - iii. Facility Design Authority Representatives (FDAR, ref PD340) may make determinations as to whether proposed work is subject to the IBC/IEBC within this section’s definition and after consideration of the examples below. When there is any doubt, they must consult the Chapter POC or LBO/Deputies for final determination, and all such decisions are subject to review/revision by the LBO.

Examples of modifications not requiring IBC Program compliance: Installation or removal of plug-fed analytical equipment; removal of system furniture; security systems (although anchorage must meet IBC, ESM Ch. 5, and applicable Master Specifications for anchorage); and glovebox and fume hood removal (not exempt are matters of new gb/hood installation location and their anchorage due to life safety concerns).

Note: Exclusion from the IBC does not include exclusion from other codes such as the NEC, nor exclusion from other requirements elsewhere in the ESM including [10CFR851](#) (pressure, fire, etc.) and inspections required based on ML level, written LANL policy, or otherwise.

2. The IBC-driven quality requirements must not be diminished, changed, or influenced by the funding source, type of project or job, or any other designation unless approved by the LBO.
3. Additional requirements are expected for ML-1 and ML-2 (nuclear) and ML-3 work; such higher-quality processes cannot reduce IBC levels of quality or inspections unless specifically authorized by the LBO in writing.

<sup>4</sup> Based on the IBC and IEBC scope and purpose statements, code topics addressed, and typical use by jurisdictions. For electrical utilities, the IBC/IEBC 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 water, gas, and steam ownership by UI are the respective division points.

<sup>5</sup> Large is 75KVA (~100A) and hardwired in.

<sup>6</sup> Several of these criteria come from PC-2 definition of DOE-STD-1021-93 (r2002) and 10/2009 Steinberg memo 10-002 on anchorage of programmatic equipment; others are LBO decision to apply IBC program rigor to other safety related modifications.

4. *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.*
- C. Applicability: LANL organizations and their Subcontractors are required to comply with this Chapter and to support the LBO and its activities in support of the IBC/IEBC.
1. Special inspections are always required for specialty work involving proprietary structural components (e.g., anchor bolts, rebar joints), welding, firestopping, and fire-resistive coating repair<sup>7</sup>; however, a formal inspection plan and special inspections other than for specialty items like those listed above are not required when they meet the criteria for Annual Maintenance Permit work below.
  2. Annual Maintenance Permit: Certain small facility maintenance and modification projects (see below) are exempt from the IBC-specific plan review and building occupancy permit requirements described by this chapter.<sup>8</sup> Such work must, however, follow the technical requirements of the IBC and IEBC and LANL amendments to same in this chapter, certain inspections (see flowchart above), as well as other requirements in the ESM, Conduct of Engineering, and elsewhere (including design review and QA appropriate to risk).
    - a. May NOT perform under Annual Permit (full Program applies) if it:
      - i. Meets IEBC definitions of a Level 2 or 3 alteration;
      - ii. Affects life safety or such systems<sup>9</sup>;
      - iii. Is new construction, relocation, change of occupancy, or expansion/addition;
      - iv. Has a total project cost including GFE of greater than \$300K<sup>10</sup>; or
      - v. Involves reroofing<sup>11</sup>
    - b. When the above are not involved, personnel are authorized to perform certain repair or maintenance on existing systems without LBO review/permitting. CM-CE Inspection is still required when indicated in flowchart above. The intent is to allow:
      - i. Work necessary to maintain an established installation or to keep the installation operating in its function and configuration (low cost IEBC “Repairs”).
      - ii. A like-for-like exchange of a portion or portions of an installation (many IEBC Repairs and Level 1 Alterations, except as noted above).

<sup>7</sup> These items have history of benefitting significantly from inspection by CM-CE.

<sup>8</sup> IBC provision for an annual permit (105.1.1). Also has basis in [NMAC](#) 14.5.2: “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...”

<sup>9</sup> As described by NFPA 101 Life Safety Code or otherwise designated by the LANL Fire Marshal

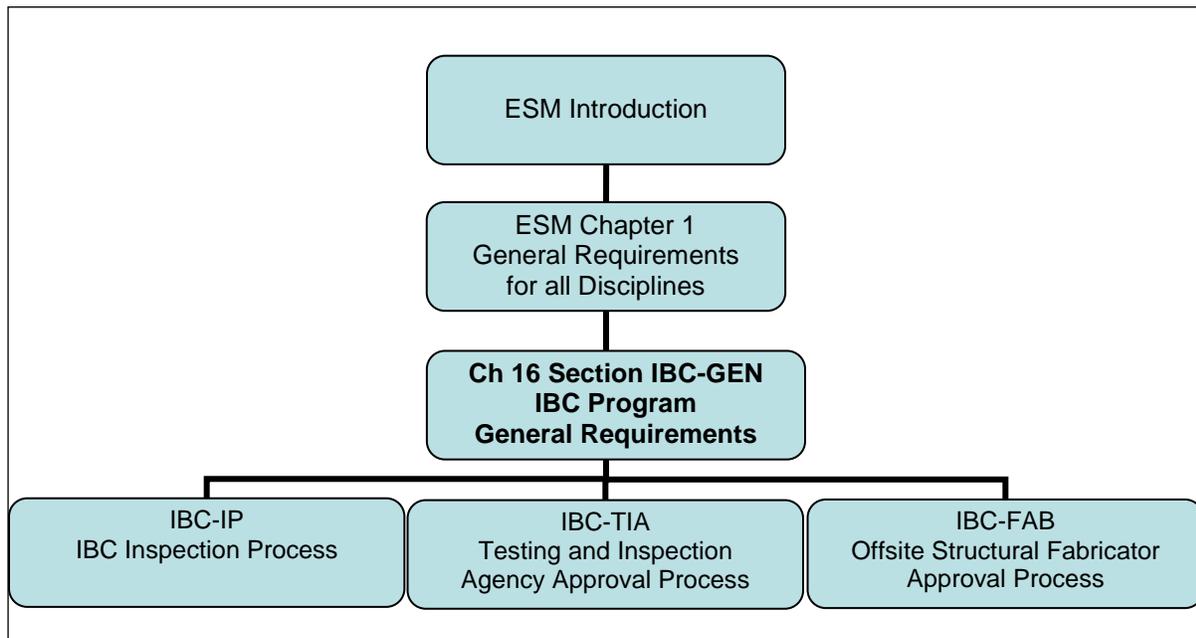
<sup>10</sup> A \$300k mod cutoff is consistent with ESM Ch 1 cutoff for a full spec package and affords a very modest renovation or system addition. TPC includes design, construction, and any facility-type Gov’t Furnished Equipment (GFE) such as chillers and furniture, but not process-typical GFE like analytical equipment. LBO decides where uncertain.

<sup>11</sup> Meet IEBC definitions of a Level 1 alteration for reroofing -- or replacement of equipment resulting in additional dead loads greater than 5 percent (except for slab on grade)

3. The requirements of this chapter new to the ESM are required for new project starts after 10/27/06 (ref Chapter 1 Section Z10 Code of Record subsection regarding projects underway). Exceptions to this grandfathering:
  - a. Requirements in this chapter which are not new. This includes the requirement for the structural engineer to submit “special inspection, test, and structural observation requirements” per IBC Ch. 17 (required for projects underway after 2/9/04 per definition in ESM Ch. 1 Section Z10).<sup>12</sup>
  - b. The new requirement for Final Inspection Certificate (and Certificate of Occupancy for facilities) must be implemented for all projects, both new starts and those underway.<sup>13</sup>

D. Where the LANL Engineering Standards or any design for LANL refers to the IBC or IEBC, also refer to the LANL amendments in Appendices A and B of IBC-GEN.

## 2.0 Chapter Hierarchy



## 3.0 Acronyms /Definitions

ACRONYM/TERM	DESCRIPTION
ASTM	ASTM International
Chief Inspectors	Specific LANL individuals delegated by LBO to oversee LBO program day-to-day. They are typically in a QA role or the Construction Engineering Group of Construction Management Division, with the CM-CE Group Leader being the primary Chief Inspector.

<sup>12</sup> Inspection/test/observation QA plan has been required by the ESM Structural Chapter 5 since 2/9/04. Ref [Section I](#), Subsection on Project Records for Structural Design, paragraph E on Test and Inspection Requirements.

<sup>13</sup> These documents are from LANL-internal process that should not affect existing subcontract awards, and has minimal impact on overall project cost, and was requested by LASO fire safety management circa 2007.

<b>Contractor</b>	The LANL Managing and Operating organization (e.g., LANS)
<b>CQAP</b>	Construction Quality Assurance Plan
<b>DAR</b>	Design Authority Representative. A delegate of the Site Chief Engineer [P 342, Design Authority]
<b>Deputy Building Officials</b>	Individuals delegated total or partial authority to act for the LBO. The ES Division Design Engineering Group Leader is delegated as a Deputy to act in the LBO’s absence. The LANL Fire Marshal is delegated as Deputy acting for all fire and life-safety related matters. [IBC-GEN App A (LBC) 103.3]
<b>DPIRC</b>	Design professional in responsible charge; the engineer or architect of record; the person(s) sealing (stamping) the documents [note: professional registration is normally not required for LANS designers (see ESM Ch 1 Z10 Design Output section), but these DPIRCs must be appointed by the Engineering Manager]. DPIRC term from IBC 106.3.4.
<b>EOR</b>	Engineer of record, essentially the same as DPIRC.
<b>ES-DE</b>	Design Engineering Group of Eng Services Division of LANL
<b>ESM</b>	Engineering Standards Manual
<b>Fabricator</b>	For this chapter only, the firm fabricating structural steel or prefab concrete offsite
<b>FDAR</b>	Facility DAR
<b>IAS</b>	International Accreditation Service, a subsidiary of ICC
<b>IBC</b>	International Building Code, published by ICC. <a href="#">Internal link</a> via IHS.
<b>ICC</b>	International Code Council
<b>ICC-ESR</b>	Evaluation Service Report issued by <a href="#">ICC-ES Subsidiary of ICC</a> . ERs are legacy Evaluation Reports issued for the UBC.
<b>IEBC</b>	International Existing Building Code, a product of ICC. <a href="#">Internal link</a> via IHS.
<b>LANL Inspector</b>	A direct-hire (i.e., LANS) or subcontractor employee performing duties approved by the LANL Chief Inspector. May be written as inspector.
<b>LBC</b>	LANL Building Code; the IBC as amended by LANL (i.e., App 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).
<b>LBO</b>	LANL Building Official. The Division Leader of Engineering Services.
<b>LCI</b>	LANL Chief Inspector. Selected <a href="#">individuals in ADPMGT CM-CE Group</a> or other organization appointed by the LBO to oversee test and inspection aspects of LBC/LEBC enforcement.
<b>LEBC</b>	LANL Existing Building Code, amendments to IEBC for buildings and systems including programmatic ones.
<b>ML</b>	Management level, from LANL’s 4-tiered graded approach to rigor per <a href="#">AP-341-502</a> , Management Level Determination.
<b>Occupiable (space)</b>	A room or enclosed space designed for human occupancy in which individuals...are engaged for labor, and which is equipped with means of egress and light and ventilation facilities meeting the requirements of this code (IBC 202)
<b>PRID</b>	Permits Requirements Identification system, a LANL intranet-based system for determining and tracking requirements.
<b>Project</b>	Any type of work/job/task/or any other terminology that is subject to IBC’s scope regardless of funding source or facility arrangement.
<b>Routine Inspection (or Inspection)</b>	Inspections done by LANL or LANL’s agent for general conformance to the design and LANL Standards, including those required by the IBC, but not a special inspection.
<b>Special Inspection</b>	A process of inspection, testing, and reporting by approved special inspectors 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.
<b>Special Inspection Agency (SIA)</b>	Organization providing Special Inspectors and managing their training and qualification in accordance with this Chapter. Also known as Inspection Agency.

	This is LANL or its subcontractors.
<b>Special Inspector (SI)</b>	Individual who has specialized knowledge, training, experience, and certification(s) for one or more of the types of construction subject to special inspection.
<b>Subcontractor</b>	Firm hired by LANS who is DOE’s Prime Contractor.
<b>Testing Agency</b>	A firm providing independent, certified test results.

## 4.0 Responsibilities and Duties<sup>14</sup>

### 4.1 LANL Building Official (or Designee)

- A. Implement this chapter and the activities and duties herein.
- B. Enforce the IBC/IEBC.
- C. Review construction documents for erection, alterations, demolitions, and moving of buildings and structures.
- D. Inspect (as necessary) the premises for compliance and enforce compliance with the provisions of 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 telecommunications are inspected by LANL groups responsible for those systems.
  - 3. Others as recognized or delegated by the LBO.
- E. Keep all related records required by the IBC for the period required per the LANL Records Inventory and Disposal Schedules (RIDS).
- F. Make all the required inspections or have the authority to accept/reject reports of inspection by approved agencies or individuals.
- G. Approve Special Inspection Agencies (SIAs) and Special Inspectors (SIs) to perform the duties specified by the Code, this ESM Chapter, and approved Inspection Plans developed for individual projects/jobs. This includes the authority to revoke approvals as warranted.
- H. Approve field and laboratory test agencies and inspection agencies and offsite structural element fabricators to preclude in-shop special inspections (per ESM Ch 16 Section IBC-FAB).
  - 1. The LBO maintains a list of approvals linked from the ESM Chapter 16 [webpage](#).
- I. Approve special inspection program. The LBO is responsible for approving the special inspection program submitted by the DPIRC when acceptable (see IBC Section 1704.1) and may require a preconstruction conference to review the program with all applicable members of the construction team. This is accomplished through design review process (see IBC-GEN. The inspection program is further discussed in ESM Chapter 16 Section IBC-IP, IBC Inspection Process.

<sup>14</sup> Much of this Chapter’s material is derived from IBC 2006 Chapters 1 and 17. For qualification, LBC amendments to IBC App A 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. [http://dsnet.co.clark.nv.us/dsweb/bldg\\_tech\\_guides.html](http://dsnet.co.clark.nv.us/dsweb/bldg_tech_guides.html)

- J. Chair Program staff meetings at least quarterly (*monthly ideally*). *Invitees should include Deputy Building Officials, ESM Chapter POC/Alternate, Chief Inspectors, design review 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. Minutes should be taken.*
- K. Perform program self-assessments (e.g., MSAs)<sup>15</sup>. *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, General Criteria for the Operation of Various Types of Bodies Performing Inspection. [http://www.iasonline.org/Accreditation\\_Criteria/](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.*
- 4.2. **Chief Inspectors** and staff personnel must be assigned and designated by the LBO to administer parts of the provisions of the IBC and the LANL Engineering Standards including the specific Electrical, Mechanical, and Plumbing Codes adopted and amended by the ESM. As delegated by the LBO, Chief Inspectors must act on behalf of the LBO to perform duties of evaluating test 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, acting as subject matter experts (SME), and other duties assigned by the LBO. Duties are further described in other Chapter 16 sections.
- CM-Construction Engineering Group is responsible for all inspections of IBC/IEBC scope work. CE Group Leader may, in writing, delegate or authorize other qualified organizations to perform such inspections within the qualification limitations imposed by the LANL IBC Program.
- Note: CM-Construction Engineering Group responsibility for construction inspection may extend beyond the IBC Program scope through Construction Management Procedure CMP [282](#), *Construction 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.
- The listing of LANL Chief Inspectors is on the Chapter 16 contacts webpage [here](#).
- 4.3. **Design (Plan) Reviewers** must be qualified engineers, architects, and others in various disciplines whose LANL organizations are established as design reviewers by LANL institutional procedures (thus reflected in PRID).
- A. Responsibility for reviews against the primary building codes (LANL versions of IBC, UPC, UMC, and NEC) rests with the ES-DE Group Leader (GL). DE GL will rely on other organizations for aspects of such reviews when they are authorized by LANL policy to do so (e.g., fire reviews by Fire Protection Group). DE GL may subcontract

<sup>15</sup> DOE O 414.1C Quality Assurance includes criterion for management self-assessment. See also [PD328](#), Assessment Program.

review activity to outside firms (i.e., third parties), or may augment DE staff by, in writing, appointing other qualified LANL individuals to perform review functions.

- B. The LBO further delegates to ES-DE (and successors) the role of ensuring compliance with the applicable design review procedures, including complete resolution of comments, on behalf of all 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 the ES-DE organization, plus others as needed per PRID including Fire Protection Group, the Fire Marshal, Security & Safeguards, Utilities, and others including ESH&Q, Rad Protection Engineering, etc.*

- 4.4. **LANL Project and Construction Management, Project Engineering, and other facilities personnel**, through Acquisition Services Management (ASM; Procurement and the Contract Administrator), are responsible to assure that proper ESM (including IBC) direction is included in subcontracts<sup>16</sup>. This must be done by requiring the Design Professional's compliance with the LANL Engineering Standards.

- 4.5 **Project Management, Project Engineering, and other facilities personnel** that manage the work must assure that the project/job or any other designated work under IBC purview does not proceed until they have obtained LBO approval to proceed. In addition, they are responsible for assuring compliance to the IBC on the project down to the various sub-tier subcontractors and suppliers.

- A. Project management or other facilities personnel that manage the work must have necessary programs and procedures in place to address the controls and process within their organization to assure that IBC 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.
- B. Project management must notify the LBO Chief Inspector as soon as possible when sub-standard construction has occurred on the project (including work by testing agency or in fabrication/manufacturing shops).
- C. LANL project managers must use the PR-ID system to ensure such projects are tracked and properly reviewed; proof of use/reviews is necessary to receive LBO approval to construct.

- 4.6 **Duties and Responsibilities of the Constructor (e.g., Prime Subcontractor or LANL)**

- A. Subcontractor duties are as described by their contract with LANL
- B. Requirements specific to IBC and quality are detailed primarily in LANL Master Specification Section [01 4000](#), Quality Requirements.

- 4.7 **Duties and Responsibilities of the Design Professional in Responsible Charge**

- A. Develop initial Test and Inspection and Plan which includes special inspections and other critical inspections and tests based on the design (see Section IBC-IP).
- B. Submit required structural observations<sup>17</sup> to the LANL Lead Chief Inspector. Structural observations are the responsibility of the structural engineer of record (EOR) unless

<sup>16</sup> Work packages when self-performing.

<sup>17</sup> IBC-2006 104.7 and 1709.1. This is expected to be required in under half of all IBC jobs (e.g., when high occupancy, critical

otherwise stated in the Subcontract. EOR must subcontract observations if he/she is in the same company as the prime Subcontractor,<sup>18</sup> and LBO must approve observation performance by persons other than the structural EOR.

- C. Edit LANL Master Specification Section [01 4000](#), Quality Requirements and include in Project Specification. That section must include the following constructor (e.g., prime Subcontractor) requirements:
1. Assure that they use only LBO-approved testing agencies.
  2. Notify the inspector. The holder of the LBO's authorization to proceed or their duly-authorized agent is responsible for notifying the LANL building code inspectors regarding individual inspections required by the LBO.<sup>19</sup> Adequate notice must be provided so that the inspectors have time to become familiar with the project.
  3. Assure that off-site structural steel and concrete fabrication activities are performed by an LBO-approved shop, when such shops exist in approval listing. Until they exist, or with LBO permission, arrange for the IBC-related activities to be inspected in the shop by an LBO-approved special inspector during fabrication.<sup>20</sup> As an alternative, LANL will provide Special Inspectors in-shop at Subcontractor's expense and the Subcontract Sum will be adjusted by Change Order. Note: SI or shop approval not required for burning and cutting of mild steel (e.g., ASTM A36).<sup>21</sup>

## 5.0 Process Overview

- 5.1. Project, job, and/or work planning must determine if the work involves the IBC or IEBC. If any part of the work involves them, then the project must inform the LANL Chief Inspector. The LBO has appointed the design reviewers (plans examiners) and chief inspector(s) that will review the design drawings, specifications, inspection plan(s), test agencies, etc.
- 5.2. The design review and chief inspectors reviews will be submitted back to the design professional in responsible charge via the Project Engineer along with any required corrections or improvements. These reviews will include evaluation that the CQAP/inspection plan is aligned to the drawings and specifications.
- 5.3. The project must assure that applicable test agencies and inspection agencies are on the LBO-approved listing on the ESM Chapter 16 [webpage](#). Also, offsite structural element fabricators may be approved and listed so as to preclude LANL special inspection in-shop. If the testing agencies or fabricators that they prefer to use are not on that list they may submit the necessary data to the LBO for evaluation and approval (see IBC-TIA and IBC-FAB Sections). The project/work/job team is responsible for submitting any requests with at least two (2) weeks lead time to the Chief Inspector.

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buildings, and/or hazardous contents).

<sup>18</sup> 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.

<sup>19</sup> IBC 2006 109.5

<sup>20</sup> IBC 2006 1704.2

<sup>21</sup> Removal of mild steel should not affect strength/quality in the same way as welding, so LANL interprets as not required for this activity.

- 5.4. The project must develop a construction QA plan that delineates the degree of test, inspection, and special inspection for the work being done. The inspection plan must be approved by the design professional in responsible charge (DPIRC) and submitted to the LANL Contract Administrator for LANL facility engineering review and approval along with the design package. See Chapter 16 Section IBC-IP, IBC Inspection Process, for related requirements. The Plan must also follow IBC Chapter 17 requirements on degree of inspection (“continuous” and “periodic”), and the specific ICC-ESRs and LANL approval documents for special cases (e.g., post-installed anchors).

**Note:** The LANL-approved design documents supersede the ICC ESRs if there is a difference.

- 5.5. Permitting: Following all comment resolution, a review for LBO approval to construct must be performed. The project must submit to ES-DE (1) two copies of the design, (2) a PR-ID printout showing the required reviews, and (3) evidence of having satisfied those reviews (“no comment” statements, Design Review Record [DRR] document comment resolutions initialed by reviewers, or equivalent).<sup>22</sup> *Guidance: Details of the DE process for permitting are captured in an ES Division-level procedure (draft as of 4/2008).*

- 5.6. ES-DE will review the above and, when acceptable, indicate approval on the design package (approval stamp).<sup>23</sup> One set of materials will be returned to project.

- 5.7. Once LBO approval is indicated, the project can allow start of the physical construction work. Physical construction including offsite structural element fabrication work on a project must not start until authorized by the LBO after evaluating that the project has complied with all necessary IBC and LBO requirements.

**Note:** ESM Chapter 1 Section Z10 states that for design-build projects, documents must be sealed by the DPIRC before construction begins. Exceptions: Site preparation and excavation can proceed at risk (prior to sealing) with ADPMSS and LBO approval.

- 5.8. Once the project begins physical construction, the project must follow the approved Construction QA Plan for inspection and Subcontractors submit “Statements of Responsibility with respect to Special Inspection” per IBC-IP App H.

- 5.9. Inspection must be conducted in accordance with ESM Ch 16 Section IBC-IP, IBC Inspection Process.

- 5.10. The Offsite Structural Fabricator Approval Process (Ch 16 Section IBC-FAB) governs the process for approving fabricators to perform certain IBC work without the necessity of having in-shop special inspection, then submitting a Certificate of Conformance.

- 5.11. Testing and inspection agencies must be approved and operate in accordance with the approved inspection and testing agency process procedure (Ch 16 Section IBC-TIA).

- 5.12. All required records will be submitted to the Chief Inspector as required by IBC, this procedure, and the Construction QA Plan.

- 5.13. When **changes occur to previously-LBO-approved design**, re-approval by LBO is only required automatically when the changes either (1) affect life safety, (2) increase scope, or (3) result in new construction documents – i.e., are extensive enough to necessitate a drawing or DCP/DCF/ECN revision to clearly direct the work in the field (not for

<sup>22</sup> Building Dept approval ensures compliance with engineering change control procedures, the LIR-driven requirement to use the PR-ID, and municipal practice. Also, LANL Construction Inspection needs to be able to determine approved design quickly.

<sup>23</sup> 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.

FCR/FCN incorporation or record drawing updating or as-building that occurs after work is complete)<sup>24</sup>. In addition, the Design Authority Representative must review all changes and may request LBO-restamping.

- All design changes must be reviewed by the original or equivalent LANL reviewers in accordance with controlling design review procedures (i.e., follow a process similar to that of the original approval), with the decision for re-review by ES-DE etc. being made by the Design Authority Representative.
- Any proposed deviation from LANL Standards or their referenced national standards requires use of the variance process in ESM Ch 1 Section Z10; any uncorrected field variance from standards or LANL-accepted design requires an NCR to disposition (NCRs further discussed in Z10 and Section IBC-IP).

**Note:** Where the following definitions conflict with those in the Conditions of the Subcontract (any exhibit), those documents take precedence.

Beneficial Occupancy (or “Mechanical Completion” or “Use and Possession prior to Completion”) <sup>25</sup>	Terms used to describe the procedure when LANL occupies or makes use of any part of the work prior to Substantial Completion or Final Completion. This does not refer to LANL Project Team members including inspectors, but could include installers of LANL-furnished/installed equipment or building tenants. The presence of such personnel at the project site may cause disruption of the Subcontractor's activities and is discouraged; furthermore, such occupancy is subject to conditions set forth in the construction contract. LANL is not required to take such occupancy and may wait for Final Completion to use or occupy the site; however, if LANL decides to occupy any portion of the project space prior to Final Completion, LANL is required to issue a <u>Certificate of Beneficial Occupancy</u> . A Certificate of Beneficial Occupancy must not be issued without concurrence of the LBO if Beneficial Occupancy will occur prior to Substantial Completion.
Substantial Completion	Means that stage in the progress of the work, as determined by the Subcontract Tech Representative, when the work is complete and in accordance with the contract documents except only for completion of minor items which do not impair LANL’s ability to occupy and fully utilize the work for its intended purpose (this may require limiting access by the Subcontractor to the site for security or safety reasons). Any liquidated damages are calculated. A <u>Certificate of Substantial Completion</u> must not be issued until after a <u>Certificate of Occupancy</u> is issued by the LBO, all work is in place, all required agency approvals have been received, and all systems and equipment are fully functioning as verified by commissioning. Minor items (punch list) may include only patching, repair or replacement, and clean-up. Examples of acceptable punch list items include replacement of light switches, touch-up painting, repair of scratches on walls or floors, replacement of locks which do not function properly, replacement of filters or light bulbs, and other similar items.
Final Completion (or “Physical Completion”)	The STR performs a final inspection upon receipt of written notice from the Subcontractor that the work is ready for final inspection and acceptance. Final Completion is determined to be when the STR finds that the work is fully completed and in accordance with the contract documents. Once STR accepts, final payment is made to the Subcontractor.

<sup>24</sup> IBC 106.4. LBO re-approval for life safety because that is a primary purpose of the LBO review; re-approval for new work documents because inspectors require work be performed to LBO-approved documents. Lesser change review is delegated to the DAR who reviews all FCRs, FCNs, repair/use-as-is NCRs, etc.

<sup>25</sup> Ben Occ definitions/requirements adapted from UC Office of President Facility Managers [Manual](#). “Use and Possession” is a [FAR](#) term. ADPMSS Proc [606](#) uses many of these terms. Mechanical and physical (full) completion are terms used in CM-Div [CMP 300](#) rev 0. Concepts but not terms above are used in LANL subcontract documents (e.g., GC-29).

- 5.14 Final Inspection Certificate/Certificate of Beneficial Occupancy / Certificate of Occupancy
- A. The person or organization requesting final inspection or occupancy is responsible to identify any substandard construction, safety concerns, or any other safety-impacting information that is not included in the records package.
  - B. Whenever the IBC Program is applicable (Article 1.0 and flowchart above), then IBC-GEN Form 2, Final Inspection Certificate, is mandatory. The LBO staff will perform any IBC-related reviews deemed necessary.
  - C. A Certificate of Beneficial Occupancy (temporary) or Certificate of Occupancy is required before LANL occupation of either new facilities or existing structures being modified or changing occupancy and thus subject to the IEBC.
  - D. Use approval Forms 1 and 2, attached.

## 6.0 Qualification of Suppliers and Manufactured Products for Structural Work

- 6.1 On IBC and IEBC projects, the requirement for LBO approval of agencies and fabricators is summarized as follows (details are elsewhere in this Chapter):
- **Testing agencies:** A list of LBO-approved agencies is available on the ESM Chapter 16 [webpage](#). New requests should be sent to Chief Inspectors.
  - **Offsite Structural Shop Fabricator approval** when conditions associated with IBC Section 1707 and 1704 are applicable. Contact a LANL [Chief Inspector](#) to request fabricator approval; if the project's choice is to use in-shop special inspectors, contact CM-CE Group Leader.
  - **Special inspection and inspectors:** CM-CE Group Leader retains the approved list and evaluates potential special inspectors and compensatory measures.
- 6.2 Under the Special Cases section of the IBC (1704.13), **proprietary structural products** must be approved by the LANL Building Official (LBO) when such work is on buildings or building systems. The products requiring approval are those types of products<sup>26</sup> for which an ICC-ES Report exists. Examples are post-installed anchors and reinforcing steel splices/couplers.
- A. Such components are automatically approved by the LBO if:
    1. The components chosen are IBC-compliant-labeled (has been accepted by the most recent ICC report from [ICC-ES](#) [valid for the code edition in use or newer edition whichever is more stringent]) 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 manufacturers instructions, particularly where more stringent), and verified by special inspector(s).
  - B. Other special case structural-type components not automatically approved as noted above must be submitted to the ES-DE Structural Team which will broker LBO approval prior to use. *Guidance: This may involve derating; e.g., to stay well within elastic region.*
  - C. *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*

<sup>26</sup> That is, if similar products have ES listings, then the SPECIFIC product in question requires LBO approval if not listed by ES.

*manufacturer's or supplier's quality program. The focus of IBC Ch 17 is to assure that proper independent testing has been accomplished. As a good example of this principle, at time of writing, the manufacturer of Bar-Lock brand "S" couplers claims to achieve 1.25% of yield per ACI-318 (for a #8 rebar) using a tube/sleeve of 8 inches while the ICC Evaluation Report (ER-5064) indicates that independent tests show it takes a 10"+ tube or sleeve to achieve 1.25% of yield.*

## 7.0 Temporary Facilities and Facility Systems & Components

- A. "Temporary" definition is effectively three years or less at LANL.<sup>27</sup>
1. If the project intends to install and then utilize facilities longer than 3 years, then they must be considered permanent and the initial installation must meet all ESM requirements.
  2. Wherever this subsection discusses facilities, the same holds for facility systems and components.
  3. Facilities intended for less than 3 years are **not** required to meet those IBC or LANL Standards requirements that ensure life-cycle cost effectiveness of permanent facilities such as long-lasting materials, energy efficiency meeting ESM Ch 14,<sup>28</sup> or having formal drawings (sketches are adequate).
- B. "Facilities" includes occupiable temporary (relocatable) trailers, prefabricated buildings, tents, and similar structures. This includes LANL- and Subcontractor-occupied facilities including leased and owned trailers. *Guidance: Non-occupied sheds and containers have slightly different requirements (see that heading below).*
1. At time of writing, relocations and new installations of relocatables require ADPMSS's prior approval.<sup>29</sup>
- C. Temporary facilities are required to meet all DOE contractual requirements including the suite of NM building codes and worker safety-related amendments in IBC-GEN Appendix A LANL Building Code and elsewhere in ESM, primarily:
1. Fire: ESM Ch 2 Fire requirements including DOE STD-[1088](#), *Fire Protection for Relocatable Structures* including siting (especially when combustible construction) and other fire protection issues.
  2. Civil: Include necessary utilities (generally tied-in by LANL).
  3. Structural: Permanent foundation is not required. Foundations provided must be able to resist gravity loads and the forces, including overturning, caused by wind loads determined in accordance with ESM [Chapter 5](#) Section II. Seismic forces for temporary facilities do not need to be considered.<sup>30</sup> When soil augers are used, design to IBC soil data unless project-specific geotechnical data is available and provided.

<sup>27</sup> App A LBC of this document, Section 107 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 Section, Off-Site Conventionally Built Modular-Manufactured Unit Standards that allows 1 year. Subsection 14.12.3.18 (2-16-2003) 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 requirements of these standards except the permanent foundation requirement."]

<sup>28</sup> 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.

<sup>29</sup> Per [PD902](#), Space Management

<sup>30</sup> For trailers, transportable and tents, generic calculations (Goen 2010, EMRef TBD) indicate that wind loads are the more

4. Electrical: Following NFPA 70 (NEC) is sufficient.
5. IBC: Meet IBC Section 107<sup>31</sup> and LANL program requirements [primarily that design review, associated inspections, and LBO Certificate of Occupancy (ref. IBC-GEN Att 1 and 2)].
6. Hazard: Relocatable installations other than ordinary business and industrial facilities (that present extraordinary hazards) must follow the ESM Chapter 1 Section Z10 article on Design Goals: Safety.

## 8.0 Sheds and Containers

- A. Sheds include storage buildings, garages, and carports made by Morgan, Tuff Shed, etc. Containers include intermodal transportainer<sup>32</sup> and similar steel cargo/freight/shipping boxes. When occupiable space, they are considered facilities subject to the IBC. When non-occupied, they are subject to the following requirements for customization and installation in addition to national and state code and standard requirements applicable to such structures.

NOTE: Non-occupiable Subcontractor structures in an approved project lay-down area generally only need to meet Code as amended by LANL.

- Anchorage: Tie down with wind straps or other anchorage approved by LANL ES-DE Civil/Structural Team Leader.
- Bonding: Electrical bonding to a ground system (as is done with fences/gates) is suggested for personnel safety reasons should lightning strike nearby.
- Clearances/Siting: Get siting approval via [P 941](#), Site Planning. Comply with underground utilities and overhead power line right-of-way requirements in ESM Civil and Electrical Chapters (see Chpt 3 Civil G30 part 9.0 and 10.0). If there will be adjacent structures, follow ESM Fire Chapter for exposure acceptance criteria (e.g., [DOE-STD-1088](#), *DOE Standard on Fire Protection for Relocatable Structures* — placement in accordance with Table in Section 6.1, a simplification of NFPA 80A techniques [the primary concern from these are the fire exposure they pose to more permanent and valuable structures]; Section 6.2 provides rules of thumb about placement; etc.).
- Hazardous Material Storage: Generic sheds and containers must not be used for this; instead; use lockers or cabinets designed for safe storage (and containment if appropriate) and labeled for the purpose (e.g., NFPA 704 diamond); see also ESM Ch 10.<sup>33</sup>
- Lightning Protection: This is typically not required because containers are normally used for low-value goods; follow ESM Electrical Chapter Section [D5090](#) requirements for making a needs determination (uses NFPA 780 exposure and importance criteria).
- Occupancy: Ordinary, unmodified shipping containers must not serve as occupied work areas. They are intended by design for shipping and storage 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 for use in occupancy are covered by the IBC and must conform for that specific occupancy type.

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severe loading condition when compared to seismic loads. No further evaluation of seismic loads is required

<sup>31</sup> From IBC-2006 Section 107, “...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...” For tents see also Section 3101

<sup>32</sup> aka SeaLand, SeaTrain, etc., generally built to ISO 1496

<sup>33</sup> 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

- Signage: As described in ESM Chapter 4 Architectural, structure number signs are required.

## 9.0 History of Revisions

Rev	Date	Description	POC	RM
0	10/27/06	Initial issue. Also includes IBC and IEBC requirements formerly in Ch 1 Section Z10.	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 wind/seismic resisting inspections. Added and revised temporary facility and shed requirements formerly in Ch 1 Z10. Added end date on Form 1 occupancy permit. Form 2 renamed Final Inspection Certificate and made mandatory for all IBC projects.	Tobin Oruch, <i>CENG-OFF</i>	Larry Goen, <i>CENG-OFF</i>

## 10.0 Attachments

### Records

Form 1, Occupancy/Beneficial Occupancy Approval Template

Form 2, Final Inspection Certificate Template

Appendix A LANL Building Code (LBC)

Appendix B LANL Existing Building/System Code (LEBC)