

SUSTAINABLE DESIGN OF FACILITIES

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This mandatory functional series document is available to all online at <https://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.

CONTACT THE SUSTAINABLE DESIGN STANDARDS [POC](#) for interpretation, variance, and [suggestions](#) (LANL-only)

New in this revision (older revisions listed in Record of Revisions at the end)

Rev. 12.1: Revised Table 1 summary of requirements for \$50M and Sections A & H to reflect later sections.

Rev. 12: Changed GSF threshold for GP requirement. Added Net-Zero Emissions Building requirements per DOE Orders 436.1A and 413.3B Chg. 7, and updated definitions. For 10CFR433, updated formula to calculate percentage of improvement to align with current version. Reformatted Table 1 and adopted ASHRAE 90.1 vice IECC-2018. Clarified Bases and requirements throughout. Removed solar hot water requirements and other USC citations.

ACRONYMS, TERMS, AND DEFINITIONS

| Acronym | Definition |
|--------------------|--|
| ASHRAE 90.1 | <i>ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings</i> |
| EPP | Environmentally Preferable Products |
| FEMP | Federal Energy Management Program (DOE organization behind DOE-specific energy mandates) |
| GBCI | Green Business Certification Inc.: the certifying agency for LEED and other certification systems. |
| GP | The group of criteria defined by Guiding Principles for Sustainable Federal Buildings and Associated Instructions issued by the Council on Environmental Quality in December of 2020. Often referred to as "The Guiding Principles," the document outlines a set of sustainable principles and practices to guide agencies in designing, locating, constructing, maintaining, and operating Federal buildings in a sustainable manner. |
| IEBC | <i>International Existing Building Code</i> , published by the International Code Council (ICC) |
| LCC | Life Cycle Cost (discussed in detail at this link) |
| LEED | Leadership in Energy and Environmental Design: a green building rating systems developed by United States Green Building Council (USGBC) and certified by Green Business Certification Inc. (GBCI). |
| SD | Sustainable Design (green building) |
| USGBC | United States Green Building Council: the organization that developed the Leadership in Energy and Environmental Design (LEED), a green building certification system. |

| Term | Definition (adapted from <i>Guiding Principles for Sustainable Federal Buildings</i> and elsewhere) |
|--|--|
| Federal high-performance building | A federal building that does not meet all requisite criteria outlined in the <i>Guiding Principles for Sustainable Federal Buildings</i> due to its inherent function, mission, safety, or other factor; but which has optimized the GP's criteria on a life-cycle basis. |
| Green building certification system | A type of building certification system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements. Rating systems and certification systems are terms frequently used interchangeably. Examples include Guiding Principles, LEED, Green Globes , and Living Building Challenge . |
| Modernization | The comprehensive replacement or restoration of virtually all major systems (such as plumbing, mechanical, electrical), interior finishes (such as ceilings, partitions, doors, and floor finishes), and building features (as in space reconfiguration or exterior wall, window, or roof replacement). |
| Net-zero emissions building | A highly efficient building, connected to any combination of on-building, on-site, local utility-scale, or purchased carbon pollution-free energy, designed, and operated such that its scope 1 and 2 greenhouse gas emissions from all operational end uses are zero on an annual basis |

| | |
|-------------------------------------|--|
| Net-zero waste building | A building that is operated to reduce, reuse, recycle, compost, or recover solid waste streams (with the exception of hazardous and medical waste) thereby resulting in zero waste disposal. |
| Net-zero water building | A building that is designed, constructed, or renovated and operated to greatly reduce total water consumption, use non-potable sources as much as possible, and recycle and reuse water in order to return the equivalent amount of water as was withdrawn from all sources, including municipal supply, without compromising groundwater and surface water quantity or quality. |
| Remodel/Renovation | Less than "modernization," but more than a Level 1 Alteration or "Change of Occupancy or Use (e.g., whereby those over 25k GSF must follow Guiding Principles) |
| Sustainable federal building | A federal building that has been designated to meet the requisite criteria outlined in the <i>Guiding Principles for Sustainable Federal Buildings</i> . |

1.0 REQUIREMENTS

CAUTION: The project impact of this chapter can be significant and warrants review early in the project planning and programming phases and is required by CD-1 Approve Alternative Selection and Cost Range (the OK to start preliminary design) in DOE Orders 436.1A and 413.3B.

A project’s scope will determine the sustainable design and construction requirements for the project based on the following list of Federal Regulations (CFR), U.S. Code, and DOE/NNSA orders, as well as by LANL-adopted building codes; this chapter implements them, and Table 1 summarizes the chapter sections to be followed. **This subject is evolving rapidly, so check the materials included with the [Chapter Resources](#) for latest mandates and guidance.**

| | |
|--|---|
| 7 USC 8102 (FAR clause 52.223-2) | Title 7-Agriculture, Chapter 107-Renewable Energy Research and Development, 8102-Biobased markets program. Requires the use of biobased products. |
| 10 CFR 433 | <i>Energy Efficiency Standards for the Design and Construction of New Federal Commercial and Multi-Family High-Rise Residential Buildings</i> . Para. 433.8 requires life-cycle cost-effectiveness. Subpart A establishes energy efficiency performance requirements and Subpart C establishes green building certification requirements for Federal buildings. |
| 10 CFR 436 | <i>Federal Energy Management and Planning Programs</i> . Sets rules for energy management and planning to reduce energy consumption and promoting life cycle cost analysis. Subpart C requires the use of efficient energy using equipment. |
| 42 USC 6962 (FAR clause 52.223-17) | Title 42-The Public Health and Welfare, Chapter 82-Solid Waste, Subchapter VI-Federal Responsibilities, 6962-Federal procurement. Requires the use of materials with recycled content. |
| DOE O 413.3B, Chg. 7 | Program and Project Management for the Acquisition of Capital Assets |
| DOE O 436.1A | Departmental Sustainability |

TABLE 1. Chapter Section Applicability

| CHAPTER SECTION | | PROJECT SCOPE | | | | | | | | |
|-----------------|--------------------------------|---|--------------------|----------------|----------------|----------------|----------------|----------------------------|----------------|----------------|
| | | "Alteration" ¹ or "Change of Occupancy or Use" | Remodel/Renovation | | Modernization | | | New Buildings or Additions | | |
| | | | <25,000 GSF | >25,000 GSF | <25,000 GSF | >25,000 GSF | Over \$50M* | <25,000 GSF | >25,000 GSF | Over \$50M* |
| A | ASHRAE 90.1 | X | X | X | X | X | X | | | |
| B | 10 CFR 436 (Subpart C) | X | X | X | X | X | X | X | X | X |
| C | 10 CFR 433 | | | | | | | X | X | X |
| D | Guiding Principles | | X | | | X | | | X | |
| E | LEED Gold ² | | | | | | X | | | X |
| F | Efficient Labs ³ | X | X | X | X | X | X | X | X | X |
| G | Green Purchasing | X | X | X | X | X | X | X | X | X |
| H | Net-Zero Emission Buildings | | | | | X | X | | X | X |
| I | Other SD Requirements | X | X | X | X | X | X | X | X | X |

* When over \$50M, such requirements are in addition to those based on gross square footage

When multiple, separate projects, in their entirety, may result in extensive alterations or modernization of a building greater than 25,000 square feet, projects should coordinate with the Sustainability Program, and other projects, to design with the intent to meet the Guiding Principles for Sustainable Federal Buildings. See Guiding Principles section below and guidance posted with Chapter.

¹ LANL-centric IEBC alteration-type definitions are in ESM Ch 16, Section [IBC-GEN FM01\(I\) Preliminary Project Determinations Instructions](#) or [GLOS-COE-1 \(future\)](#). If other Table 1 columns are also applicable, follow them preferentially to this column.

² Compliance with LEED will not automatically equate to compliance with the GPs.

³ Efficient Lab best-practices to be followed when scope of work includes design or alterations to fume hoods or other exhaust systems in laboratory spaces.

USAGE NOTE: Refer to Table 1 above to determine which sections (A–I) apply for a given project scope.

A. ASHRAE 90.1 (Requirement 14-0001):

1. **New systems⁴ and equipment⁵** in existing buildings, whether part of an alteration or stand alone, shall follow the ASHRAE 90.1-2019. Efficiency of equipment must meet the more stringent of ASHRAE 90.1-2019 or 10 CFR 436 (Section B.1. below) when applicable.
2. **All other building alterations** shall follow the ASHRAE 90.1-2019.
3. **Change in Space Conditioning or Change of Occupancy or Use that would result in an increase in demand for energy** (such as warehouse to office space) shall follow the ASHRAE 90.1-2019, Section 4.1.1.5. A change of use that does not result in an increase in demand for energy shall follow 1 or 2 above for all alterations taking place with the change.
4. **Compliance** shall be shown through the use of [COMCheck](#) or [ASHRAE Compliance Form](#).

B. 10 CFR 436 Subpart C Agency Procurement of Energy Efficient Products. Projects that involve installation, alterations, repair, or replacement of energy using equipment or services, shall meet the Federal requirements.

1. Select energy-consuming products and services consistent with the criteria of [ENERGY STAR](#) and [FEMP-designated energy-efficient products](#) per 10 CFR 436.40-436.43.

*Guidance: ENERGY STAR qualified and FEMP designated products may be assumed to be LCCE. In making a determination that a product is **not** LCCE, rely on analysis methods in 10 CFR 436, subpart A.*

C. Code of Federal Regulations: 10 CFR 433 Subpart A (New construction only)

1. Design new buildings and additions in accordance with 10 CFR 433 by meeting ASHRAE 90.1-2019 and, if life-cycle cost-effective, achieve energy consumption levels that are at least 30% below the levels of the 2019 ASHRAE Baseline Building. (Requirement 14-0002)
 - a. If a 30-percent reduction is not life-cycle cost-effective, the design shall be modified to achieve an energy consumption level at or better than the maximum level of energy efficiency that is LCC effective, but at a minimum complies with ASHRAE 90.1-2019.
 - b. Energy consumption for the purposes of calculating the 30% savings requirement shall include the building envelope and energy consuming systems normally specified as part of the building design by ASHRAE 90.1 such as space heating, space cooling, ventilation, service water heating, and lighting and all receptacle and process loads, except for energy-intensive process loads that are driven by mission and programmatic/operational requirements, not necessarily buildings, and not influenced by conventional building energy conservation

⁴ A system, as defined by ASHRAE 90.1-2019, is a combination of equipment and auxiliary devices (e.g., controls, accessories, inter-connecting means, and terminal elements) by which energy is transformed so it performs a specific function, such as HVAC, service water heating, or lighting.

⁵ Equipment, as defined by ASHRAE 90.1-2019, are devices for space or cooling, ventilation, humidification, dehumidification, electric power, lighting, transportation, refrigeration, cooking, or service water heating. See ASHRAE 90.1-2019 for full definition and examples of equipment type.

measures such as specialized medical or research equipment and equipment used in manufacturing processes.

- c. Energy consumption levels for both the ASHRAE Baseline Building and proposed building shall be determined by using the **Performance Rating Method found in Appendix G of ASHRAE 90.1** (the [ASHRAE Standard 90.1 Performance Based Compliance Form](#) shall be provided for LANL review at 30% design completion). The formula for determining percentage of improvement shall be as follows (Sections in 90.1-2019):

Percentage improvement = $100 \times (1 - \text{PCI}/\text{PCIt})$, where:

PCI = Performance Cost Index calculated per Section G1.2

PCIt = Performance Cost Target calculated by formula in Section 4.2.1.1.

- d. De minimis usage: When the total energy consumption from all sources is less than 12.7 kBtu/GSF/yr, ASHRAE Performance Rating Method (Appendix G) energy modeling is not required; however, in lieu of, and no later than preliminary design (30%), a simple calculation estimating energy use shall be provided to LANL SD (e.g., [UI-OSI](#)) and Mechanical SMEs for concurrence. Then, no later than final design (90%), a [COMCheck](#) report shall be provided to demonstrate compliance with mandatory provisions of ASHRAE 90.1-2019. No documentation of any kind is needed for facilities without external power or only lighting.

Guidance: ASHRAE 90.1 training slides may be posted with this Chapter's "References." Also, the 90.1 "User's Manual" is a 'must have' when addressing anything in the Standard.

D. DOE O 436.1A and 413.3B: Guiding Principles (GP) for Sustainable Federal Buildings

1. New construction, additions, and modernization of buildings⁶ over 25,000 square feet shall comply with the requisite criteria of the most current [Guiding Principles for Sustainable Federal Buildings](#) by meeting 18 core and 9-out-of-12 non-core criteria of the GP [DOE O 436.1].
 - a. The building's inherent function, mission, safety, or designation may preclude it from meeting the minimum threshold of requisite criteria in a life cycle cost-effective manner [U.S.C. § 17061(12)]. Buildings that have only met the criteria that are life cycle cost-effective may be designated as a "Federal high-performance building." GP performance must be tracked and reported throughout the project regardless of expected outcome.
2. Project management must establish roles and responsibilities for project verification and identify such in RCD, RFP, A/E Subcontract, or other pertinent project documents.
 - a. Guiding Principles Appendix C allows for certification through other Green Building Certification Systems. Note that many statutory and regulatory requirements are not included in the third-party systems and must still be met and documented.

Additional resources can be found on GSA's [SFTool: Guiding Principles for Sustainable Federal Buildings](#).

⁶ Includes joined transportables when over 25,000 square feet.

3. Buildings that are exempt from compliance with the GP:
 - a. are non-building assets; or
 - b. are leased; or
 - c. slated for disposal (as a status indicator of report of excess [ROE] submitted or ROE accepted, Determination to Dispose, or Surplus; or
 - d. meet all these conditions:
 - i. Unoccupied: The building is occupied 1 hour or less per person per day on average,
 - ii. Low/No Energy Use: Total usage from all sources is less than 12.7 kBtu/GSF/year, and
 - iii. Low/No Water Use: Consumption is less than 2 gal/day on average.

E. DOE O 413.3B: New buildings, additions, and modernizations over \$50M TEC must meet LEED Gold certification absent an approved waiver from the NNSA Project Management Executive.

1. New construction and building renovation or modernizations over \$50M Total Estimated Cost (TEC) must meet U.S. Green Building Council's LEED v4 Gold or higher certification (including registration, submission of documentation, verification, and installation of plaque).⁷

Guidance: New construction and major renovations normally follow LEED BD+C; Refer to www.usgbc.org. LEED applies prerequisite and optional credits for the siting, design, construction, commissioning, and operation of new facilities and modernizations of existing facilities.

2. The design agency (Engineer of Record or Architectural and Engineering subcontractor), is responsible for registering, submitting documentation, and ensuring certification through [GBCI](#) including costs related to registration and certification. Project management may establish different roles and responsibilities, and identify such in RCD, RFP, A/E Subcontract (Exhibit D) or other Project documents.
3. LEED-Ineligible Projects
 - a. When the Federal Project Management Executive (PME) confirms LEED v4 Gold requirements cannot be met for a National Nuclear Security Administration (NNSA) capital asset project with a Total Project Cost of \$50M or greater, a LEED waiver process shall be implemented. The NNSA LEED waiver process is outlined [here](#) (Ch 14 references).
 - b. LEED certification depends on a project meeting LEED Minimum Program Requirements ([MPRs](#)).⁸ Parking structures, exclusively process and power-generating buildings, and distribution systems are exempt. (Requirement 14-0003).

⁷ [DOE O 413.3B](#) Chgs 4–7. Also applies to multiple new, collocated buildings where combined project cost meets threshold. Can be LEED for New Construction, Campus, etc. See USGBC [Rating System Selection Guidance](#).

⁸ For v4, MPRs include: minimum 1000 gross square footage; complete, permanent location on existing land, and other criteria.

- c. Major Renovations under LEED BD+C
 - i. If planned renovations are less than either (1) 50% of building's aggregate gross square footage⁹ or (2) Total Estimated Cost (TEC) under 25% of the replacement value of the building, then the project is ineligible for LEED certification. (Requirement 14-0004).
- F. DOE O 436.1A and 10 CFR 436 Subpart C: Efficient Labs.** When constructing new lab spaces¹⁰, and per 42 USC 8252 when adding or renovating fume hoods or laboratory exhaust systems, follow energy efficient laboratory design principles when safe and LCC effective. If judged not possible, or not LCC effective, a reduction in this requirement will be allowed through a formal process (e.g., Variance Form 2137). (Requirement 14-0005).
1. Applicable projects shall consider using the International Institute of Sustainable Laboratories' (I2SL) [Sustainable Strategies Checklist](#). *The criteria and checklist will assist in meeting the required energy efficiency metric for GP and 10 CFR 433 and includes these seven key elements:*
 - a. Dynamic, direct-digital control systems,
 - b. Real time demand-based ventilation to control air changes per hour,
 - c. Efficient lighting (LEDs with occupancy sensors or timers),
 - d. Optimization or reduction of the exhaust fan discharge velocity (design study of exhaust dispersion based on site conditions),
 - e. Pressure drop optimization,
 - f. Fume hood flow optimization: apply AIHA/ANSI Z9.5 Standard to analyze if fume hood standby ventilation can be reduced,
 - g. Final commissioning and continuous commissioning with automated cross platform fault detection diagnostics. Guidance: Fault detection diagnostic software is managed by UI FOD and is easily achievable with a digital control system on the yellow network.

Refer to Lawrence Berkeley Lab's [Design Guide for Energy-Efficient Research Laboratories](#) for additional SD guidance.

In addition, LANL is an implementing partner of DOE's [Smart Lab Accelerator Program](#). The Smart Lab concept includes an integrated set of laboratory design criteria and performance standards that improves safety protocols and reduces energy consumption while offering continuous commissioning for real-time monitoring of facility conditions. The [LANL Sustainability Program](#) has more information and SME contacts.

[I2SL Best Practice Guides](#) (may have value for non-lab applications, too).

⁹ Projects not meeting this definition would be rejected by USGBC, who's 2010 Selection Guide defined **Major Renovation as:** "Includes extensive *alteration* work in addition to work on the *exterior shell* of the building and/or *primary structural components* and/or the core and peripheral MEP [mechanical/electrical/plumbing] and service systems and/or site work. Typically, the extent and nature of the work is such that the *primary function space* cannot be used for its intended purpose while the work is in progress and where a new certificate of occupancy is required before the work area can be reoccupied." Standards Program concurrence ensures consistent interpretation.

¹⁰ Refer to ASHRAE 90.1-2019 Section 6.5.7.3 for minimum laboratory design requirements. Selection of the most efficient and LCC effective system design is required by 10 CFR 436.

G. Green Purchasing/Environmentally Preferable Products (EPP) (Requirement 14-0006)

Sustainable acquisition, or "green purchasing," refers to purchasing products with specific environmental or energy attributes. The US Department of Energy (DOE), and therefore LANL and its subcontractors are required to purchase goods and services that can reduce environmental impact.

1. To expedite green purchasing in facility related projects, several LANL Master Spec sections have been revised to specify EPP where appropriate; however, this may not address all potential products for every project, therefore, the project's design agency is responsible for the creation of appropriate project spec sections.
2. Refer to the listing of required EPP and recommended attributes in Attachment 1 of this chapter to guide in the incorporation of EPP products.¹¹ Additional resources are posted with the Chapter.
3. Facility projects, both new construction and alterations, must purchase products with EPA, DOE, and USDA environmental or energy-attribute recommendations unless the product:
 - a. Is not available at a reasonable price (code "CU"),
 - b. Is not available competitively within a reasonable period ("DNI"), or
 - c. Does not meet the Laboratory's performance standards ("DNMS").
4. The following categories of products are required:
 - a. [7 USC 8102](#) and FAR clause 52.223-2: The United States Department of Agriculture (USDA) designates certain biobased products for federal procurement and specifies minimum biobased content levels for those products. Designated products shall meet USDA BioPreferred's minimum biobased content level.
 - b. [42 USC 6962](#) and FAR clause 52.223-17: Under the Comprehensive Procurement Guidelines (CPG) program, the Environmental Protection Agency (EPA) designates products that are or can be made with recovered materials and recommends practices for buying these products. Any designated product shall meet the minimum recommended content levels as identified under the CPG program.
 - c. ENERGY STAR and FEMP-designated products per 10 CFR 436, Subpart C for all energy consuming products and services. See section B of this Chapter.
5. Although not required by a statute or regulation, LANL encourages the LCC-effective use of construction products and building supplies recommended under [EPA's Recommendations of Specifications, Standards, and Ecolabels for Federal Purchasing](#), as appropriate and applicable. One can look for products in the [SFTool](#) (Federal tab).
When purchasing for a GP or LEED facility, low-emitting materials will be required.

H. DOE O 413.3B and DOE O 436.1A: Net-Zero Emissions Buildings

1. Design new construction and modernization projects greater than 25,000 gross square feet (gsf) to be net-zero emissions by reducing scope 1 and 2 greenhouse gas emissions, as defined by the Federal Greenhouse Gas Accounting and Reporting Guidance, through

¹¹ Attachment 1 to the Chapter may be updated periodically by Ch 14 POC-only approval and without revision to chapter body based on changing guidance.

electrification strategies, carbon pollution-free energy use, deep-energy retrofits, and energy and water conservation measures. (Requirement 14-0007)

2. Where feasible also design to achieve net-zero water and waste in building operations. (Requirement 14-0008)

Guidance: Designs should focus on elimination of onsite fossil fuel use, and should include infrastructure such as electrical pull boxes, space planning for battery/energy storage, and structural planning for future installation and connection of carbon-emissions-free energy sources. For analysis purposes, work with the UI Sustainability Program to determine LANL's electricity mix projections or assume that LANL's electricity sources will be 100% carbon pollution-free by 2030, making all-electric buildings also net-zero emissions buildings.

I. Other SD Requirements

1. Per DOE O 436.1A and DOE O 413.3B, incorporate and achieve location-specific **climate-resilient design criteria** for all new construction and major renovations. Projects should determine and prioritize no-cost or cost-effective design measures that will ensure resilient operations over the intended service life of the building considering mission criticality, cost, and security. Identify and implement measures, where appropriate, to support passive survivability and functionality during emergencies.

Guidance: Per LANL's Vulnerability Assessment and Resiliency Plan, the main resiliency hazards are: heat wave, increased precipitation and flooding events, increased thunderstorm intensity, severe wind events, and wildfire. Projects over \$50M Total Project Cost will have to address resiliency in Federal infrastructure planning questionnaires.

*Consider implementing **distributed energy systems**, including energy storage systems, in new construction or retrofit projects where LCCE or when such a system enhances energy reliability, resilience, or security and to leverage DOE real property assets for onsite implementation of carbon pollution-free electricity systems.*

2. Provide **electric vehicle (EV) chargers** where dedicated Government Owned Vehicle (GOV) parking is part of the scope of the project. Provide for charging at 25% of GOV spaces (round to the nearest even number). When non-GOV parking is part of the scope of the project, EV chargers may also be needed to fulfill requirements in Guiding Principles or LEED projects. (Requirement 14-0009) *Guidance: A Standard Detail set ([ST-G4090-1 – 6](#)) has been developed to assist with same.*
3. Provide **meters** (building and sub-level) per Attachment 2, *Utility Metering Requirements*.
4. Install **cool roofs** for new construction or when replacing roofs unless determined uneconomical by a life-cycle cost analysis.¹² [Secretarial Memo of June 1, 2010]
5. Develop and follow a **Waste Minimization Plan**. Develop prior to construction start and follow throughout project. *Guidance: The goal is that constructor recycle or salvage at least 50 percent of construction, demolition and land clearing waste, excluding soil, where markets or on-site recycling opportunities exist. Architectural POC may have examples. **Guiding Principles and LEED Projects will have related requirements.** LANL pro forma [Exhibit F: Environment, Safety, and Health Requirements for](#)*

¹² To be considered cool, a low-sloped roof (pitch less than or equal to 2:12) must be designed and installed with a minimum 3-year aged solar reflectance of 0.55 and a minimum 3-year aged thermal emittance of 0.75 in accordance with the Cool Roof Rating Council program, or with a minimum 3-year aged solar reflectance index (SRI) of 64 in accordance with ASTM Standard E1980-01. Steep-sloped roofs (pitch exceeding 2:12) must have a 3-year aged SRI of 29 or higher.

Subcontractors' template for High or Moderate Consequence Work (e.g., clause F18.0) automatically imposes this clause when template is utilized.

- 6. Review: A LANL SD SME (e.g., [UI-OSI](#)) shall review new construction and major modernization projects to ensure compliance with this chapter.¹³

2.0 ATTACHMENTS

Attachment 1, *Environmentally Preferable Products for Specifications*

Attachment 2, *Utility Metering Requirements*

REVISION RECORD

| Rev | Date | Description | POC | OIC |
|-----|----------|--|-------------------------------|--------------------------------|
| 0 | 2/9/04 | Initial issue as ESM Ch. 1 Section Z10 App A, expanding SD material from Arch Chapter. | Tobin H. Oruch, <i>FWO-DO</i> | Gurinder Grewal, <i>FWO-DO</i> |
| 1 | 6/9/04 | Organizational and wording changes for clarity. | Tobin H. Oruch, <i>FWO-DO</i> | Gurinder Grewal, <i>FWO-DO</i> |
| 2 | 5/18/05 | Z10 App A became Ch. 14. Added waste min plan, IECC vice 90.1 option for GPPs, LEED for line items, other minor changes. | Tobin H. Oruch, <i>ENG-CE</i> | Gurinder Grewal, <i>ENG-CE</i> |
| 3 | 10/27/06 | Admin changes only. Org and contract reference updates. Doc number changes based on IMP 341. Other admin changes. | Tobin Oruch, <i>CENG</i> | Kirk Christensen, <i>CENG</i> |
| 4 | 6/11/07 | Added 30% better than ASHRAE 90.1-2004. LANL to pay LEED fees. | Tobin Oruch, <i>CENG</i> | Kirk Christensen, <i>CENG</i> |
| 5 | 6/16/08 | Revised to address changes in final 10CFR433, including additions, HVAC upgrades, plug load calcs, projects underway. Incorporated 430.2B requirements including LEED Gold and ENERGY STAR. Deleted PM 411 and other old reporting requirements. | Tobin Oruch, <i>CENG</i> | Kirk Christensen, <i>CENG</i> |
| 6 | 8/25/10 | Added IECC as minimum requirement for new buildings, additions, and alterations. Deleted 10CFR433/434 for process buildings. Noted \$5M LEED is TEC and deleted restriction to LEED-NC; delivery team to pay fees. Eliminated report for sub-LEED buildings. | Tobin Oruch, <i>CENG</i> | Larry Goen, <i>CENG</i> |
| 7 | 4/5/11 | Deleted 30% > ASHRAE for renovations; clarified HPSB requirement; for LEED, added off-ramps and clarified. | Tobin Oruch, <i>CENG</i> | Larry Goen, <i>CENG</i> |

¹³ PRID PP-1 triggers if a project involves a new structure or facility modifications involving electrical, water, ventilation (excludes demolition).

| Rev | Date | Description | POC | OIC |
|------|----------|--|-----------------------------------|----------------------------------|
| 8 | 8/28/13 | Updated LEED driver, criteria; ASHRAE 2007 or 2010 vice 2004. EPP requirements and Att. 1; other changes. | Tobin Oruch, <i>ES-DO</i> | Larry Goen, <i>ES-DO</i> |
| 9 | 11/26/18 | New summary table, 90.1 and/or IECC, invoked 10CFR433 directly, newer HPSB GPs, new LEED threshold, other changes. | Tobin Oruch, <i>ES-FE</i> | Larry Goen, <i>ES-DO</i> |
| 10 | 7/31/19 | Aligned HPSB and LEED requirements to NNSA Federal Green Buildings Training, stressed Smart Labs, other minor changes throughout. Updated Attachment 1. | Tobin Oruch, <i>ES-FE</i> | Jim Streit, <i>ES-DO</i> |
| 11 | 09/26/22 | Adopted ASHRAE 90.1-2016 (and 2019 when mandated) to align with 2018 IECC. Mandated 2020 GPs. Added Zero Carbon Emissions Ready requirements per EO 14057. Added Attachment 2 on metering per VAR-10538. Added Definitions and Bases for Requirements; clarified requirements throughout, moved much guidance to references maintained on chapter webpage. Deleted references to specific versions. Added Requirements ID Log references and moved bases/footnotes to log (LANL internal-use log posted with chapter). | Dalinda Bangert, <i>UI-OSI</i> | Mike Richardson, <i>ES-DO</i> |
| 12 | 02/09/24 | Changed GSF threshold for GP requirement. Added Net-Zero Emissions Building requirements per DOE Orders 436.1A and 413.3B Chg. 7, and updated definitions. For 10CFR433, updated formula to calculate percentage of improvement to align with current version. Reformatted Table 1 and adopted ASHRAE 90.1 vice IECC-2018. Clarified Bases and requirements throughout. Removed solar hot water requirements and other USC citations. | Dalinda Bangert, <i>UI-OSI</i> | Mike Richardson, <i>ES-DO</i> |
| 12.1 | 04/24/24 | Revised Table 1 summary of requirements for \$50M and Sections A & H to reflect later sections. | Dalinda Bangert, <i>UI-OSI</i> | Mike Richardson, <i>ES-DO</i> |