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**REVISION RECORD**

<b>Rev</b>	<b>Date</b>	<b>Description</b>	<b>POC</b>	<b>OIC</b>
0	2/9/04	Initial issue as ESM Ch 1 Section Z10 App A. Includes and expands 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 Certification for line items, other minor changes.	Tobin H. Oruch, <i>ENG-CE</i>	Gurinder Grewal, <i>ENG-CE</i>
3	10/27/06	Administrative changes only. Organization and contract reference updates from LANS transition. IMP and ISD number changes based on new Conduct of Engineering IMP 341. Other administrative 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>

**CONTACT THE SUSTAINABLE DESIGN STANDARDS POC  
for upkeep, interpretation, and variance issues**

ESM Ch 14	<a href="#">Sustainable Design POC / Committee</a>
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## SUSTAINABLE DESIGN REQUIREMENTS FOR FACILITIES

### 1.0 ACRONYMS/DEFINITIONS

<b>EE</b>	Energy efficiency
<b>LEED</b>	U. S. Green Building Council’s Leadership in Energy and Environmental Design (LEED) Green Building rating systems (used herein shall be taken to mean LEED-NC)
<b>LEED-NC</b>	LEED New Construction rating system
<b>SD</b>	sustainable design (or green building)

### 2.0 REQUIREMENTS

**NOTE:** The sustainable design requirements that appear in this section will need to be incorporated early in the project planning and programming phases.

- A. Energy Efficiency: Design to achieve 30% better than ASHRAE 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential Buildings.<sup>1</sup> Meeting above requirement supersedes and satisfies any other ESM requirements suggesting ASHRAE 90.1 latest edition is required.
  - 1. Other building additions and substantial renovations with HVAC retrofits are also subject to this requirement. **Note:** Even projects “underway” per ESM Chapter 1 Section Z10 as of Jan 3, 2007 may be subject to this requirement.<sup>2</sup>

<sup>1</sup> 10 CFR Part 433-434, entitled “Energy Code for New Federal Commercial and Multi-Family High Rise Residential Buildings” as revised 12/4/06 in the Federal Register, effective 1/3/07, required this when life-cycle cost effective. The ASHRAE guide for small office buildings and several other studies suggest that 30% would be cost-effective, and with the ability to handle plug loads separately per 10CFR part 433.5, achievement of goal is less challenging. Consultation with POC ensures latest available data is utilized and CFR requirements for LCCA are followed. For interim rule only search “10 CFR Part 433” in quotes on Fed Register at <http://www.gpoaccess.gov/fr/index.html>. Was Vol 71 No 232 pg 70275 time of writing.

<sup>2</sup> **Final rule** was issued 12/21/2007, added:  
 § 434.101 Scope. 101.1.1 (a) (2) An addition for which design for construction began before January 3, 2007, that adds new space with provision for a heating or cooling system, or both, or for a hot water system; or  
 (3) A substantial renovation of a building for which design for construction began before January 3, 2007, involving replacement of a heating or cooling system, or both, or hot water system, that is either in service or has been in service.

**Consolidated Final Rule** text is at [http://www.access.gpo.gov/nara/cfr/waisidx\\_08/10cfr433\\_08.html](http://www.access.gpo.gov/nara/cfr/waisidx_08/10cfr433_08.html)

For renovations, a case might be made that 20% improvement over pre-renovations 2003 baseline is appropriate (per [MOU](#) on *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings*)

2. The building energy use shall be modeled (with model submitted to LANL for acceptance; IECC and other prescriptive methods not sufficient), and compliance shown by a computerized analysis tool meeting ASHRAE 90.1 requirements.<sup>3</sup>
3. Designer shall determine energy consumption levels for both the baseline building and proposed building by using the Performance Rating Method found in Appendix G of *ANSI/ASHRAE/IESNA Standard 90.1–2004, Energy Standard for Buildings Except Low-Rise Residential Buildings*, January 2004, except the formula for calculating the Performance Rating in paragraph G1.2 shall read as follows:<sup>4</sup>

$$\text{Percentage improvement} = 100 \times \frac{\text{Baseline building consumption} - \text{Proposed building consumption}}{\text{Baseline building consumption} - \text{Receptacle and process loads}}$$

4. Designer shall include laboratory fume hoods and kitchen ventilation systems as part of the ASHRAE-covered HVAC loads subject to the 30 percent savings requirements, rather than as process loads.
  5. If project believes that 30% is not life-cycle cost-effective, then this chapter's POC shall be consulted; given properly prepared LCC analysis (ref. ESM Ch 1 Z10 App E), a reduction in this requirement may be allowed as a variance.
- B. Prepare an EE/SD report for new GPP buildings under \$5M per Attachments 1 and 2.
- C. For new buildings and major building renovations and additions in excess of \$5M:
1. Obtain LEED-NC Gold rating through the U.S. Green Building Council (including registration, submission of documentation, USGBC verification, and installation of plaque). USGBC fees will be paid directly by LANL. Ref <http://www.usgbc.org>.<sup>5</sup>
  2. Design to address all elements of the full text of the “Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding” ([MOU](#)) and submit for Chapter 14 POC approval in a report.<sup>6</sup>
  3. For new buildings, meet or exceed EPA’s “Designed to Earn Energy Star” (ENERGY STAR) Building criteria, applying the more stringent of (1) standard set forth in the ENERGY STAR [Table of Target Energy Performance Results](#) (achieve rating of 75 or higher) and (2) the 30-percent-better-than ASHRAE 90.1-2004 criteria above. Also: [http://www.energystar.gov/index.cfm?c=new\\_bldg\\_design.new\\_bldg\\_design](http://www.energystar.gov/index.cfm?c=new_bldg_design.new_bldg_design)<sup>7</sup>
  4. Develop and follow a Waste Minimization Plan. Develop prior to construction start and follow throughout project. *The goal encouraged is that subcontractor recycle or*

<sup>3</sup> [http://www.eere.energy.gov/buildings/tools\\_directory/](http://www.eere.energy.gov/buildings/tools_directory/) lists several tools. See also Selecting Appropriate Building Energy Simulation Software at [http://www.energycodes.gov/news/sts/pdfs/standard\\_october06.pdf](http://www.energycodes.gov/news/sts/pdfs/standard_october06.pdf)

<sup>4</sup> Plug load and fume hood paragraphs from 10CFR433.5 (final).

<sup>5</sup> DOE O [430.2B](#) CRD (Att 1), added to LANS contract 6/11/08 by [Mod 46](#). Also see Endnote 3 on pg 12 of this document regarding TEAM Initiative and EISA 2007.

<sup>6</sup> Ibid. This will result in meeting the Guiding Principles of Executive Order (EO) 13423. Constructing to LEED Gold will generally ensure elements are met so this is not burdensome.

<sup>7</sup> Ibid.

*salvage at least 50 percent of construction, demolition and land clearing waste, excluding soil, where markets or on-site recycling opportunities exist.*

5. Conduct an 8-hour-minimum SD charrette (brainstorming/decision-making) at project outset (described below).
  - i. Design Charrette. A design charrette, focused on sustainable design and development, shall be conducted at the beginning of the sustainable design process. A charrette is a focused and collaborative brainstorming session held at the beginning of the project. The charrette encourages an exchange of ideas and information and allows truly integrated solutions to take form. Team members are encouraged to "cross fertilize" and address problems beyond their field of expertise. Participants shall include a facilitator, LEED AP, pollution prevention representative, the A/E design team, user representatives, and the Project Team. The product of the charrette will be a "roadmap" for incorporating sustainable design and development into the project. *Guidance: It will be most effective if the charrette is performed separately from value engineering efforts required by ADPMGT Procedure 105 Value Engineering.*
  - ii. Finalists for A/E services are expected to propose potential sustainable design and energy conservation measures for the project during the A/E interviews. These and other measures will be evaluated and further developed during the charrette.

#### Sustainable Design Charrette Deliverables:

- A list of sustainable energy design measures that will be incorporated in the design.
  - Establishment of sustainable design targets and goals.
  - An assessment of the feasibility of installing distributed, renewable power generation.<sup>8</sup>
  - A list of sustainable design measures for which the A/E will determine their life-cycle costs. These measures will be incorporated in the design if cost effective and within project budget constraints.
  - Establishment of Performance Metrics.
  - A summary report that provides direction for the design team.
  - Requirements to conduct and document the design charrette shall be identified in contract documents.
6. Projects constructing new laboratories shall follow Labs21 principles where life-cycle-cost-effective<sup>9</sup>. Refer to [Labs21](#) and Lawrence Berkeley Lab's [Design Guide for Energy-Efficient Research Laboratories](#) for additional SD guidance. Such projects shall consider using the Environmental Performance [Criteria](#) of Labs21.
    - a. *Guidance: Labs21 Best Practice Guides (may have value for non-lab applications, too): <http://www.labs21century.gov/toolkit/>*

<sup>8</sup> Ibid.

<sup>9</sup> Ibid; requires use of programs such as this.

### 3.0 GENERAL GUIDANCE

- A. Designing, constructing, and operating facilities in an efficient and environmentally sound manner is important to LANL. The LANL Prime Contract and Implementing Procedure 300 (Integrated Work Management) call for all work at the Laboratory to be conducted in an environmentally sound manner and with the application of preventive measures. High-performance facilities are intended to minimize impacts to the site and surrounding areas, optimize energy and water use, enhance worker productivity, provide good indoor environmental quality, incorporate environmentally preferable building products, and manage construction and building operation waste in a resource-conserving manner. This approach to building design, construction, and operation is commonly referred to as sustainable (or green building) design and development (SD). The primary objectives of SD are to:
- minimize, during design, the anticipated waste generation and resource consumption of a facility in all of its life cycle phases: construction, operation, closure, and disposition,
  - provide, during design and construction, for the comfort, productivity well-being of building occupants,
  - decrease operating and maintenance costs,
  - limit, during design, operation, and construction, facility impacts on the surrounding environment and environmental processes (such as the water cycle).
- B. It is LANL’s goal to apply sustainable design and development principles to all new buildings, additions, and HVAC renovation projects to provide a healthful, resource-efficient and productive working environment. To achieve this goal requires an awareness of and a commitment to sustainable design through an integrated, whole-building design approach.
- C. The [LANL Sustainable Design Guide](#) was created to provide guidance on incorporating the latest sustainable building strategies and technologies on LANL-specific projects. It is a thorough, complete, and comprehensive resource for implementation of sustainable design principles and practices specific to LANL project. This resource should be applied to all new facilities and major renovation projects.  
<http://engstandards.lanl.gov/engrman/4arch/pdfs/Sustainable.pdf>
- D. ASHRAE’s “Advanced Energy Design Guide for Small Office Buildings” (2004), provides a hands-on approach to design through use of products that are practical and commercially available as "off-the-shelf technology from major manufacturers," and is oriented to achieving a 30% energy savings over ANSI/ASHRAE/IESNA Standard 90.1-1999 (would be about 25% improvement over 2004). The guide focuses on office buildings of up to 20,000 sq. ft. (SD and Mechanical POCs have copies).
- E. ASHRAE 90.1-2004 includes a new informative appendix to rate the energy efficiency of building designs that exceed its minimum requirements. The guidance provided in this appendix should be beneficial to HVAC designers.
- F. Guidance: The DOE et al has released a report titled “Contrasting the Capabilities of Building Energy Performance Simulation Programs.” The report discusses 20 energy-modeling computer programs: BLAST, BSim, DeST, DOE-2.1E, ECOTECH, Ener-Win,

Energy Express, Energy-10, EnergyPlus, eQUEST, ESP-r, HAP, HEED, IDA ICE, IES <VE>, PowerDomus, SUNREL, Tas, TRACE, and TRNSYS. Drawing from information provided by the program developers, the report compares the programs' handling of a range of parameters, including daylighting, renewable energy systems, and climate data availability. The report is online at [www.energytoolsdirectory.gov](http://www.energytoolsdirectory.gov)

- G. The U. S. Green Building Council's Leadership in Energy and Environmental Design (LEED-NC) Green Building Rating System, ([www.usgbc.org](http://www.usgbc.org)) also has [LEED-NC Multiple Buildings and On-Campus Building Projects](#), an application guide that provides direction in applying LEED-NC to projects in a campus or multi-building setting, such as corporate campuses, college campuses, and government installations (i.e. a single owner or common property management and control). It is intended for projects where a) several buildings are constructed at once or in phases, or b) a single building is constructed in a setting of existing buildings with common ownership or planning with the ability to share amenities or common design features. <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=276>
- H. A new How-To Guide to LEED Certification for New Mexico Buildings is to be available at [www.cleanenergyNM.org](http://www.cleanenergyNM.org) and <http://chapters.usgbc.org/newmexico/>
- I. The Whole Building Design Guide ([www.wbdg.org](http://www.wbdg.org)) has tools that can help ensure that sustainable elements are incorporated into the facility design.
- J. Data center projects should consider Best Practices Guidelines and other materials at <http://hightech.lbl.gov/datacenters.html>
- K. The GSA has documented which LEED credits are most easily achieved in their *GSA LEED Applications Guide, 2/1/2005*. <http://www.wbdg.org/ccb/GSAMAN/gsaleeda.pdf>
- L. New Buildings Institute's (NBI) Advanced Buildings initiative has a number of free resources for energy reduction through its PowerYourDesign.com website <http://www.advancedbuildings.net/>. NBI's Core Performance method may be employed for LEED credits, however, modeling may be required anyway due to 10CFR433.
- M. Specific items for consideration as part of this sustainable design effort are referenced by specific discipline in other sections of the ESM. Additionally, key concepts and components of sustainable design, and suggested elements for consideration, are described below. The A/E is encouraged to suggest other measures and develop integrated solutions to meet the intent of sustainable design, and conduct a benefit/cost analysis of selected options. The A/E should coordinate with the ESM Discipline POCs with regards to green building materials, pollution prevention issues, and associated benefit/cost analysis. In all cases, it is essential to evaluate these items from a whole building (integrated) design approach (whole building design looks at how materials, systems and products of a building connect and overlap, and how the building and its systems can be integrated with supporting systems on its site and in its community). To demonstrate a commitment to LANL SD goals and objectives, the following strategies, as confirmed by the responsible LANL Project Manager, will be pursued for all new building and major renovation projects at LANL:
  - Adopt energy and environmental performance goals to minimize energy consumption and reduce environmental impacts. General Note: energy efficiency also includes the office products and appliances purchased for new facilities. LANL has requirements

to purchase Energy Star compliant equipment (covers offices, appliances, and conference rooms) <http://www.energystar.gov/>.<sup>10</sup>

- Assess opportunities from a whole-building approach to maximize energy and water conservation through comprehensive, integrated evaluations of all components, systems, and, as appropriate, processes.
- Use life-cycle-cost decision-making balanced with first cost constraints. See ESM Chapter 1 Section Z10 ([App E](#)) on LCC.
- Commission equipment and controls in all new construction and major renovation projects as an integrated effort during design and construction to verify building system performance and functionality for the Users and for Facilities operations and maintenance. Reference ESM Ch 15, Commissioning (future).
- Develop environmental performance objectives to minimize waste generation (low-level waste, hazardous waste, etc) from the mission operations going into the new facility.
- Employ a broad range of advanced energy and water efficiency strategies, including but not limited to central plant optimization, airside supply and exhaust distribution optimization, energy recovery methods, lighting design optimization, and water use reduction measures.
- Site selection, minimizing site disturbance, and comfort and well-being of building occupants are covered in other areas of this document.
- Measure energy and water consumption using direct digital control (DDC) monitoring systems or by other means if DDC not available.
- Specify environmentally preferable construction materials and construction waste reduction methods. General note: environmentally preferable products also includes office furniture, recycling containers, trash containers, park benches, picnic tables, plastic fencing, etc. These things are often purchase during the construction project.
- Enhance indoor environmental quality by including features such as daylighting, low emitting materials, indoor air quality protection measures and practices during the construction process, and controllability of individual occupant spaces for temperature, lighting, and air flow.

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<sup>10</sup> DOE O 430.2B

## **4.0 ADDITIONAL GUIDANCE BASED ON LEED CATEGORIES**

Designers should apply the following guidance on SD principles and practices to the design of all new facilities and major renovation projects:

### **A. SUSTAINABLE SITES**

1. General: The location of a building affects a wide range of environmental factors such as the energy consumed by occupants for commuting, the impact on local ecosystems, and the extent to which existing structures and infrastructures are utilized. Site planning should consist of a whole system approach that seeks to reduce environmental impacts, and protect habitat and open space. A separate site analysis will be conducted as part of Line Item projects. Optimize potential of selected site through site planning, which evaluates solar and wind orientation, local microclimate, drainage patterns, utilities and existing site features to develop optimal building site design and low maintenance landscaping.
2. Specific: Protect and/or develop sustainable site conditions by:
  - Providing erosion and sedimentation control during construction
  - Appropriately managing storm water runoff and its contact with potential pollutants
  - Minimizing the extent of site clearing, excavations, and material and equipment storage activities on previously undisturbed land.
  - Designing onsite collection, conveyance, and storage capacity for storm water that enables infiltration into the subsurface,
  - Reducing heat islands through use of highly reflective materials for impermeable surfaces (such as roof, walkways, parking lots, etc.)
  - Minimizing light pollution from exterior lighting fixtures, preventing light trespass beyond the project boundary, and specifying shielded or full cutoff-type fixtures.

### **B. WATER EFFICIENCY**

1. General: Reducing water consumption and improving water quality are key objectives of Sustainable Design. To the maximum extent feasible, projects should increase their dependence on water that is collected, used, treated (if applicable), and reused on site. The protection and conservation of water will be considered throughout the life of the building, and be incorporated within the whole building-integrated design approach.
2. Indoor Water. Employ strategies that in aggregate use a minimum of 30 percent less potable water than the indoor water use baseline calculated for the building, after meeting the Energy Policy Act of 1992 fixture performance requirements.<sup>11</sup>
3. Outdoor Water. Use water efficient landscape and irrigation strategies to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). Employ design and construction strategies that reduce storm water runoff and polluted site water runoff.<sup>12</sup>
4. Specific: Protect and conserve water through design considerations, including:
  - Use of roof runoff and/or gray water to irrigate landscaping.

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<sup>11</sup> [MOU](#) Among The Undersigned Federal Agencies For Federal Leadership In High-Performance Sustainable Buildings Circa February, 2006, FEMP.

<sup>12</sup> Ibid.

- Use of only native, drought tolerant plants for landscaping.
  - Use of recycled content water for cooling tower feed.
  - A minimum of 5 cycles of concentration for cooling tower operation.
  - Exceeding the requirements of the Energy Policy Act of 1992 for plumbing fixtures.
5. Water Efficiency Guide for Laboratories: Labs21 has published a Water Efficiency Guide for Laboratories, a new Best Practice Guide outlining opportunities for laboratories to make cost-effective improvements in water efficiency, especially with respect to the amount of water used in cooling towers and for special process equipment. This guide, as well as others on related topics, can be accessed at [http://www.labs21century.gov/toolkit/bp\\_guide.htm](http://www.labs21century.gov/toolkit/bp_guide.htm)

**C. ENERGY EFFICIENCY AND CONSERVATION**

1. General: To successfully design and construct an energy-efficient building it is necessary to design from the outside in. Therefore, the building envelope is the first item of concern in the design process. Once energy conservation features (i.e. insulation levels, spectrally selective glazing, daylighting, etc.) have been determined, equipment (i.e. HVAC, lighting) can be right-sized to meet the building’s energy requirements. Energy analysis software is an extremely useful tool to evaluate alternatives. The preferred energy analysis software is DOE-2 for PCs. <http://simulationresearch.lbl.gov/dirsoft/d2whatis.html> Many popular modeling softwares are compared at [http://www.eere.energy.gov/buildings/tools\\_directory/pdfs/contrasting\\_the\\_capabilities\\_of\\_building\\_energy\\_performance\\_simulation\\_programs\\_v1.0.pdf](http://www.eere.energy.gov/buildings/tools_directory/pdfs/contrasting_the_capabilities_of_building_energy_performance_simulation_programs_v1.0.pdf)
2. *Guidance: Energy efficiency also includes the office products and appliances purchased for new facilities. LANL has requirements to purchase Energy Star Compliance Equipments (covers offices, appliances, and conference rooms)* <http://www.energystar.gov/>
3. Specific: Minimize energy consumption through Building orientation and massing, natural ventilation, day lighting and other passive strategies that can lower a facilities energy demand. Exceed Federal energy performance standards for energy efficiency (10CFR435). Consider the following measures:
  - Effectively employ daylighting technologies and associated daylighting controls to reduce artificial (dimmable) lighting when possible.
  - Select energy-efficient products and equipment such as Energy Star products, multi-stage boilers and chillers, etc.
  - Orient building’s major axis on an east-west line to maximize passive solar heating on the long south face. Provide a Trombe wall, integrated as part of the building design, to provide passive solar heating of the building.
  - Building-integrated photovoltaics (BIPV) to meet a pre-selected amount of non-critical building power needs. This analysis should be coordinated with the ESM Electrical POC and may be considered a demonstration project.

**D. MATERIALS AND RESOURCES**

1. General: Building materials affect the environment throughout their life-cycle starting with the extraction of raw materials and manufacturing the final product through transporting, installing, using and finally disposing of the product. In fact, construction debris accounts for over half the volume of America's landfills. Environmentally preferable building materials minimize life cycle environmental impacts and minimize impact on occupant health.
2. Specific: Projects should seek to meet environmentally preferable products requirements and use environmentally preferable products and processes that do not pollute or unnecessarily contribute to the waste stream and do not deplete limited natural resources, by:
  - Maximizing the recycled content of all new materials, especially from a post-consumer perspective. To the extent feasible, consider materials containing recycled content and salvage/recycle of construction waste during construction. Consult 40 CFR 247, Comprehensive Procurement Guide for Products Containing Recovered Materials. <http://www.epa.gov/cpg/products.htm>. *Guidance: Consider use of "P2-EDGE" Software for design and construction evaluation. Free BEES software is useful for product evaluations <http://www.bfrl.nist.gov/oae/software/bees.html>.*
  - Specifying materials harvested on a sustained yield basis such as lumber from certified forests.
  - Encouraging the use of recyclable assemblies and products that can be easily "deconstructed" at the end of their useful lives.
  - Limiting construction debris and encouraging the separation of recyclable waste streams during the construction process. A construction waste management plan is useful in achieving this aim.
  - Eliminating the use of materials that pollute or are toxic during their manufacture, use or reuse.
  - Giving preference to locally produced products and other products with low embodied energy content.
  - Providing a dedicated area for the collection of materials for recycle.
3. A reasonable goal is to use materials with recycled content such that post-consumer recycled content constitutes at least 10 percent of the total value of the materials in the project or combined post-consumer and 1/2 post-industrial recycled content constitutes at least 20 percent.<sup>13</sup>

**E. INDOOR ENVIRONMENTAL QUALITY**

1. General: The ultimate success or failure of a project often rests on the quality of its indoor environment, because healthy, comfortable employees are invariably more satisfied and productive. Projects should be designed and constructed to provide high-quality, interior environments for all users. A construction Indoor Air Quality plan is helpful to ensure construction methods and practices result in a building is healthy for occupancy.

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<sup>13</sup> [MOU](#) Among The Undersigned Federal Agencies For Federal Leadership In High-Performance Sustainable Buildings Circa February, 2006, FEMP.

2. Protect Indoor Air Quality during Construction. Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60%.<sup>14</sup>
3. Specific: Enhance indoor environmental quality through appropriate ventilation, moisture control, and the avoidance of materials and products with high VOC emissions will enhance occupant health and comfort. The integrated design approach for projects should seek to:
  - Value aesthetic decisions, such as the importance of views and the integration of natural and man-made elements.
  - Provide thermal comfort with a maximum degree of personal control over temperature and humidity.
  - Supply adequate levels of ventilation and outside air to ensure indoor air quality;
  - Avoid the use of materials that emit pollutants, such as volatile organic compounds (VOCs) or other toxins.
  - Assure acoustic privacy and comfort through the use of sound absorbing material and equipment isolation.
  - Control disturbing odors through contaminant isolation and careful selection of cleaning products.
  - Create a high performance luminous environment through the thoughtful integration of natural and artificial light sources.

## **F. GENERAL**

1. Utilize the “LANL Sustainable Design Guide” described above.

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### **ENDNOTES :** (supplement to footnotes)

1. The LEED rating system is the internationally recognized primary standard for measuring conformance; as of 12/2006, 87 states, cities, and Federal agencies had adopted or had incentives for LEED, and there were 670 LEED-certified buildings and 5000+ registered projects. A ~2004 report from the California Sustainable Building Task Force indicates that a 2% investment in greener construction pays off with a life-cycle savings of more than 10 times the initial investment.
2. SD has been shown to increase energy efficiency and occupant productivity. Higher energy efficiency will pay for itself over the facility life cycle. Similarly, higher occupant productivity will pay back based on the fact that salaries represent 92% of a building cost versus 2% for construction. Source:

Sustainable Building Technical Manual, Produced by Public Technology Inc., US Green Building Council; Sponsored by U.S. Department of Energy; U.S. Environmental Protection Agency; Copyright © 1996 by Public Technology, Inc. <http://www.wbdg.org/ccb/SUSTDGN/sbt.pdf> from bottom of file pg 16:

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<sup>14</sup> [MOU](#) Among The Undersigned Federal Agencies For Federal Leadership In High-Performance Sustainable Buildings Circa February, 2006, FEMP.

"Viewed over a 30-year period, initial building costs account for approximately just two percent of the total, while operations and maintenance costs equal six percent, and personnel costs equal 92 percent. [footnote 3] Recent studies have shown that green building measures taken during construction or renovation can result in significant building operational savings, as well as increases in employee productivity. Therefore, building related costs are best revealed and understood when they are analyzed over the life span of a building." Footnote 3 Joseph J. Romm, Lean and Clean Management (Kodansha International, 1994), 94.

3. This and other footnoted requirements will contribute to Order requirements meeting the following objectives of CRD Section 5 regarding having an executable plan for TEAM initiative:
  - By 2015, achieve no less than a 30 percent energy intensity reduction across the contractor's facility/site in accordance with Executable Plans in place for all facilities/sites no later than six months after the addition of this CRD to the contract, relative to the baseline of the contractor's energy use in FY 2003.
  - Maximize installation of on-site renewable energy projects at the contractor's facility/site where technically and economically feasible to acquire at least 7.5 percent of each site's annual electricity and thermal consumption from on-site renewable sources by in FY 2010.
  - Reduce potable water consumption at least 16 percent relative to the baseline of the facility/site's potable water consumption in FY 2007. Contractor facilities/sites must meet the water reduction goal or have Executable Plans in place to meet this goal no later than December 31, 2008.
  - Achieve the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Gold certification for all new construction and major building renovations in excess of \$5 million. All buildings falling below this threshold are required to comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles)

Note: Neither DOE O 430.2 Rev B nor Ch. 14 Rev 5 addresses the Energy Independence and Security Act of 2007 (EISA), which requires federal agencies to reduce the fossil fuel based energy consumption of new and renovated buildings to zero by 2030. Requirements also were placed on existing buildings.

## **ATT 1 GPP BUILDING SD REQUIREMENTS AND DOCUMENTATION GUIDANCE**

1. Design and construct the facility using the latest, green-building technologies and integrated sustainable design (SD) approaches. The completed facility will provide a healthful, resource-efficient and productive working environment, and serve as a model for similar LANL facilities. The Subcontractor is encouraged to suggest measures and develop integrated solutions to meet the intent of sustainable design, and shall conduct a benefit/cost analysis of selected options.
2. Develop and follow a Waste Minimization Plan. Develop prior to construction start and follow throughout project.
3. Provide documentation of sustainable features for the facility in an EE/SD Report, organized according to the LEED rating categories. Requirements for the EE/SD report are contained in Section 3 below. This will be helpful if project submits the facility for certification as a LEED green building or EPA Energy Star building. Documentation includes the elements listed below. The bolded items are required for all projects. The non-bolded items are encouraged.
  - a. Sustainable Sites
    - (1) **Erosion and Sediment Control. Completed Erosion and Sediment Control Plan if the project is not covered by a NPDES Construction General Permit and associated Storm Water Pollution Prevention (SWPP) Plan.**
    - (2) **Reduced Site Disturbance. Construction measures and methods that reduced the extent of site disturbance and/or restore damaged areas.**
    - (3) **Stormwater Management. Temporary and permanent approaches and implemented measures that mitigate storm water flow volume and velocity due to site development, and minimize the contact with and transport of sediment and other potential pollutants.**
    - (4) Alternative Transportation. Adopted measures to promote the use of alternative transportation.
    - (5) Heat Islands. Landscape and exterior design features that reduce the heat island effect.
    - (6) Light Pollution Reduction. Adopted measures to reduce the amount of light leaving the site at night.
  - b. Water Efficiency
    - (1) **Water Use Reduction. A description of selected systems and quantification of water use reduction resulting from the incorporation of water conserving features into the design of the facility.**
    - (2) Irrigation Efficiency. Limit or eliminate the use of potable water for landscape irrigation.
  - c. Energy and Atmosphere
    - (1) **Energy Conservation Report** [10 CFR435 compliance, based on guidance in the Federal Users Manual], and additional details as required by DOE O 430.2. Provide the following minimum information:
      - Brief narrative of alternatives considered and description of selected systems, with results of life-cycle analyses.
      - Results of energy analysis, including projected energy use index [BTU/GSF/yr] of selected design.
      - Performance metrics [such as lighting watts/SF, AFUE, CFM/peak fan kW].
      - Cross Reference with the design basis and design analysis.

- Summary and Recommendations.
  - (2) **Commissioning. Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.**
  - (3) Ozone Protection.
  - (4) Measurement and Verification. Describe any continuous monitoring equipment installed.
- d. Materials and Resources
- (1) **Recycled Content. Percentage of building materials (by cost) that contain post-consumer and/or post-industrial recycled content.**
  - (2) **Locally Manufactured. Percentage of building materials (by cost) manufactured regionally within a 500-mile radius.**
  - (3) Locally Harvested. Percentage of building materials (by cost) harvested and extracted within a 500 mile radius.
  - (4) Rapidly Renewable. Percentage of building materials (by cost) that are rapidly renewable
  - (5) Resource Reuse. Percentage of building materials (by cost) that are salvaged, refurbished or reused.

Present the information above in the form of a table with columns reflecting the as-designed and as-constructed material percentages.

- (6) **Construction Waste Management Plan. The Subcontractor shall complete a construction waste management plan with recommended strategies to divert materials from the landfill during construction, and provide an estimate of the percentage of these diverted materials.**
- e. Indoor Environmental Quality – provide the following:
- (1) **Construction Indoor Air Quality (IAQ) Plan, During Construction Prevent IAQ problems from the construction process to help sustain comfort and well-being of construction workers.**
  - (2) **Construction IAQ Management Plan, Before Occupancy. Prevent IAQ problems from the construction process to help sustain comfort and well-being of the building occupants.**
  - (3) Low Emitting Materials. Reduce the quantity of indoor air contaminants that are harmful to the well-being of the occupants.
  - (4) Other Design Features. Describe other design features that promote a better indoor environmental quality.
4. Sustainable Design Report. Sustainable design attributes incorporated in to the facility shall be documented in an EE/SD Report. The EE/SD report format is as follows:
- I. Introduction and Overview. This section will be an executive summary that presents a short overview of the sustainable design elements included in the facility.
  - II. Results. This section presents descriptions of each of the SD elements included in the Facility. The results will be presented in a table format. This format and instructions for completion are contained in the attachment [Attachment 2].

III. Appendices. In some cases supporting documentation will be required to document compliance with SD elements. This supporting documentation shall be referenced in the table and included in an Appendix.

The final EE/SD report is due at the completion of construction. Interim reports shall be submitted at 50 or 60%, and at 100% design.

**ATT 2 GPP BUILDING EE/SD REPORT: RESULTS SECTION COMPLETION  
SAMPLE GUIDANCE**

This document provides guidance to the Subcontractor and serves as a template for completion of Section II (Results) and Section III (Appendices) of the EE/SD report discussed [in Attachment 1]. This guidance and template is included in Table 1 below. The intent of Table 1 is threefold:

1. Provide guidance to the design build subcontractor on LANL's expectations and requirements for the items that should be included in an EE/SD report.
2. Track progress in incorporating SD into the design of the Facility.
3. Compile the SD features that were incorporated into the final design and construction of the Facility.

The use of Table 1 and information entered will change as the project progresses. As it exists now, Table 1 is a guidance document. It is organized by LEED™ category (column 1) and SD requirement (column 2), as presented in Attachment 1, Section 2. Column 3 is intended to assist in assigning responsibility and tracking progress of each SD element. The information presented in the "Guidance, Features included in Design" (column 4) presents additional guidance to assist the subcontractor in incorporating SD into the design and to complete the required EE/SD report. This column cross-references SD requirements in other parts of the design criteria and details the information that is required to document compliance with the EE/SD report. This documentation will be included as Section III of the EE/SD Report. As the design proceeds, information in Column 4 should be replaced with text indicating the progress in implementing each of the requirements.

The first two columns of Table 1 will remain the same for all reports; however, columns 3 and 4 will change for each of the three SD submittals, as described below.

**EE/SD Report (50-60% Design)**

Column 3, "Responsible discipline/ Actions required/ Status" should be complete for each requirement, indicating the status and progress toward implementing the requirement. A responsible discipline and a specific individual responsible for implementation shall be identified. Use the last column (4) to describe the feature(s) to meet the requirement. The guidance text shall be removed and replaced with the feature description. At this stage of the design, it is likely that many of the design features will not be complete. In those cases the anticipated design feature will be described with an explanation of how this will meet the requirement. As documentation is completed it will be entered in the appropriate appendix and referenced in the table.

**EE/SD Report (100% Design)**

The 100% EE/SD Report should have the same format as the 50-60% EE/SD Report. As in the 50-60% report, Column 3, "Responsible discipline/ Actions required/ Status" should be complete for each requirement, indicating the status and a responsible discipline and individual. At this stage of the design, many of the actions will be complete. The last column should also reflect the progress in the design. Only those items that require documentation during construction should be open. As documentation is completed it will be entered in to the appropriate appendix and referenced in the table.

**EE/SD Report (Construction Complete)**

For this final EE/SD Report, column 3, "Responsible discipline/ Actions required/ Status" shall be removed. Column 5, "Features included in Design" will contain a complete description of the implemented feature, how the feature meets the requirement, and a reference to supporting documentation in the appendix.

TABLE 1. SUSTAINABLE DESIGN FEATURES INCLUDED IN BUILDING XXX (Template)

	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
Sustainable Sites	Erosion & Sedimentation Control	Erosion and Sediment Control Plan		<p>Incorporate sediment and erosion control measures into the project through implementation of the project SWPP Plan. If the project does not have a SWPP Plan, utilize the information and requirements associated with the current NPDES Construction General Permit for development of a sediment and erosion control plan. For additional information, see <a href="http://cfpub.epa.gov/npdes/stormwater/const.cfm#generalinfo">http://cfpub.epa.gov/npdes/stormwater/const.cfm#generalinfo</a>. <i>(The EPA document that was listed here is actually a document on how to prepare a SWPP Plan. It is outdated with regard to current requirements and is not the best source of information.)</i> Incorporate temporary and permanent measures into the design documents (i.e., drawings, specifications, performance criteria). Sediment and erosion control measures shall meet the following objectives.</p> <ul style="list-style-type: none"> <li>• Prevent off-site transport of soil during construction by storm water runoff and/or wind erosion, including protecting the topsoil.</li> <li>• Prevent sedimentation of storm sewer or receiving streams.</li> <li>• Prevent polluting the air with dust and particulate matter.</li> <li>• Maintain existing vegetation to the extent practicable.</li> </ul> <p>If documentation is prepared and submitted separately (i.e. Storm Water Pollution Prevention Plan, design documents), they should be referenced here. Otherwise, summarize the measures implemented and include the sediment and erosion control plan in the appendix</p>

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	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
	Reduced Site Disturbance	Construction measures and methods that reduce the extent of site disturbance and/or restore damaged areas.		<p>The intent of this category is to conserve existing natural areas and to restore damaged areas to provide habitat and to promote biodiversity. The approach differs depending on whether the site is newly developed, a “greenfield” site, or previously developed, a “brownfield” site.</p> <ul style="list-style-type: none"> <li>On Greenfield sites, document the limits of site disturbance (including earthwork and clearing of vegetation). The goal is 40 ft beyond the building perimeter, 5 ft. beyond primary roadway curbs, walkways and main utility branches, and 25 ft. beyond constructed areas with permeable surfaces.</li> <li>On Brownfield sites, describe efforts to restore the site by replacing impervious surfaces with native or adapted vegetation. Goal is 50% restoration, with the restored areas achieving growth equivalent to 70% of native background vegetation.</li> </ul> <p>Summarize activities here and provide documentation in the appendix, i.e., construction plan, landscaping plan, planting details and specifications, stabilization measures identified in the SWPP Plan. If these plans are submitted separately, include them as a reference (cite submittal number and date)</p>
Sustainable Sites	Storm water Management	Approaches and implemented measures that mitigate storm water flow due to site development.		<p>At a minimum produce building features and a site, integrated with a storm water management system that meets the civil requirements. The goal will be to mitigate storm water runoff volume and velocity as the site transitions from undeveloped to developed conditions. Mitigate runoff through permanent post-construction controls such that flows leaving the site from developed conditions do not exceed undeveloped condition values. Storm water management features to achieve this include:</p> <ul style="list-style-type: none"> <li>Energy dissipation at drainage outlets and along runoff flow paths.</li> <li>Storm water runoff detention or retention.</li> <li>Reuse/harvesting of runoff</li> </ul> <p>Calculations, based on LEED™ guidance and as required by the NPDES Construction General Permit (included as part of the SWPP Plan if applicable), will be provided in the Appendix to demonstrate this mitigation.</p>

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	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
	Alternative Transportation	Adopted features that promote the use of alternative transportation.		Alternative transportation features, such as: <ul style="list-style-type: none"> <li>- Location of the building within ¼ mile of two or more bus lines. Include a site map in the Appendix to show compliance.</li> <li>- Bicycle racks and convenient changing/shower facilities for at least 5% of the occupants. Provide a calculation to show compliance.</li> </ul>
	Heat Islands	Landscape and exterior design features that reduce the heat island effect		Landscaping and exterior design, which reduces the heat island effect. Include the landscaping plan in the Appendix that demonstrates inclusion of the following features: <ul style="list-style-type: none"> <li>- Shade (within 5 years) on non-roof impervious surfaces (report % coverage)</li> <li>- Use of materials with at least a 0.3 on non-roof impervious surfaces (report % coverage)</li> <li>- Install underground parking (report % of parking)</li> <li>- Use open-grid (net impervious are &lt;50%) pavement system (report % parking)</li> </ul>
	Light Pollution Reduction	Adopted measures that reduce the amount of light leaving the site at night.		Efforts to reduce light Pollution, which may include: <ul style="list-style-type: none"> <li>- Full cut-off fixtures for exterior lighting (provide submittals)</li> <li>- Zero direct beam illumination leaving the site (demonstrate with calculations)</li> </ul> Include the required simulation, per the LEED™ Reference Guide in the appendix to demonstrate compliance.
Water Efficiency	Water Use Reduction	Provide a description of selected systems and quantification of water use reduction resulting from the incorporation of water conserving features.		Identify specific features and fixtures (i.e. ultra-low flow urinals water closets, faucets and showers; sensors to control water flow; point of use water heating) that reduce water use from that mandated by the 1992 Energy Policy Act (EPACT). Provide a summary spreadsheet as an appendix comparing EPACT requirements with installed equipment. Note compliance with section 1.2.5.F.1 to provide water meter.
	Irrigation Efficiency	Limit or eliminate the use of potable water for landscape irrigation		Use high-efficiency irrigation or captured rain or recycled site water as specified in the Civil Requirements to reduce (or eliminate) potable water for irrigation. Describe features, such as high efficiency irrigation and rainwater harvesting to reduce potable water use for irrigation, and estimate the reduced water use. Other civil/architectural requirements (planting and irrigation plans, planting details and specifications) shall either be included in the appendix or referenced (including submittal number and date, if submitted separately)

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	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
<b>Energy &amp; Atmosphere</b>	Energy Conservation Report	<p>Complete an Energy Conservation Report (ECR) for this project based on guidance in the Federal Users Manual, and additional details as required by DOE O 430.2A.</p> <ol style="list-style-type: none"> <li>1) Brief narrative of alternatives considered and description of selected systems, with results of life-cycle analyses.</li> <li>2) Results of energy analysis, including projected energy use index (BTU/GSF/yr) of selected design.</li> <li>3) Performance metrics (such as lighting watts/SF, AFUE, CFM/peak fan kW).</li> <li>4) Cross Reference with the design basis and design analysis.</li> <li>5) Summary and Recommendations</li> </ol>		<p>A brief summary of the ECR will be included here. The complete ECR shall be attached in the Appendix. An ECR is mandatory for buildings &gt; 10,000 SF per DOE Order 430.2 (in LANL Contract App G). The ECR will demonstrate minimum compliance with ASHRAE 90.1 and % improvement over ASHRAE 90.1-1999.</p> <ol style="list-style-type: none"> <li>1) At a minimum address requirements in the architectural requirements for natural day lighting, sustainable design principles, windows, roof construction, thermal resistance/moisture protection, and energy conservation, and in the mechanical requirements for energy efficient mechanical systems, and HVAC.</li> <li>2) Complete computer simulation as required in the mechanical requirements</li> <li>3) Minimum cooling requirements are listed (lighting, equipment, air/person) and (user-equipment loads, ventilation air, conditioned air, cleanliness- air handling systems, minimum air quantity).</li> <li>4) Include a table comparing the design basis with designed systems.</li> </ol>

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	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
Energy & Atmosphere	Commissioning	Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.		<ul style="list-style-type: none"> <li>~ Implement the following fundamental best practices</li> <li>~ Engage a commissioning authority</li> <li>~ Review design intent and basis of design documentation</li> <li>~ Include commissioning requirements in the construction documents</li> <li>~ Develop and utilize a commissioning plan</li> <li>~ Verify installation, functional performance, training and documentation</li> <li>~ Complete a commissioning report</li> </ul> <p>In an appendix, provide a copy (or reference as a separate submittal) of the commissioning plan highlighting the six fundamental commissioning procedures as listed above, and demonstrate that these elements were successfully executed and that the design intent has been achieved.</p>
	Ozone Protection			Describe base building HVAC&R and fire suppression equipment and verify that it does not contain HCFCs and halon.
	Measurement and Verification			Describe any continuous monitoring equipment installed. This may include: lighting systems and controls; constant and variable motor loads; variable frequency drive operation; chiller efficiency at variable loads: cooling load; air and water economizer and heat recovery cycles; air distribution static pressures and ventilation air volumes; boiler efficiencies; building-related process energy systems and equipment; indoor water risers and outdoor irrigation systems.
Materials and Resources	Recycled Content	Percentage of building materials (by cost) that contain post-consumer or post-industrial recycled content.		<p>At a minimum, products meeting the recycled content requirements of EPA’s Comprehensive Procurement Guidelines (<a href="http://www.epa.gov/cpg/">http://www.epa.gov/cpg/</a>) will be purchased. The purchase of these products will be reported to RRES-PP quarterly. Contact them for a form and instructions.</p> <p>Additionally, a table, included as an appendix, will be completed. The table will list all products purchased for the building and those with recycled content to determine the percent recycled content. The LEED™ reference template may be used.</p>
	Local/Regional Materials	Percentage of building materials manufactured regionally within a 500 mile radius		Materials that are manufactured within 500 miles of the project site. The table, included as an Appendix, will list all products purchased for the building and those manufactured within a 500 mile radius of the project site to determine the % of locally manufactured building materials. The LEED™ reference template may be used.

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	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
	Locally Harvested Materials	Percentage of materials (by cost) that are locally harvested and extracted within a 500 mile radius.		Materials that are locally extracted, harvested or recovered (within 500 miles of the project site). Examples might include wallboard from the Albuquerque American Gypsum plant. The table, included as an appendix, will list all products purchased for the building and those harvested and extracted within a 500 mile radius of the project site to determine the percent of locally harvested building materials. The LEED™ reference template may be used.
Materials and Resources	Rapidly Renewable Materials	Percentage of building materials (by cost) that are rapidly renewable		Rapidly renewable materials can be planted and harvested in less than a 10 year cycle. Examples include bamboo flooring, cotton batt insulation, poplar OSB (oriented strand board) and linoleum (i.e., marmoleum) flooring. The table, included as an appendix, will list all products purchased for the building and those that are rapidly renewable to determine the % of rapidly renewable building materials. The LEED™ reference template may be used.
	Resource Reuse	Percentage of building materials (by cost) that are salvaged, refurbished or reused		Salvaged or refurbished materials include structural elements (beams and posts), wood flooring and paneling, brick and masonry products, cabinetry and furniture and decorative items such as mantels, ironwork and light fixtures. The table, included as an appendix, will list all products purchased for the building and the equivalent cost of salvaged, refurbished or reused materials to determine the percent reused building materials. The LEED™ reference template may be used.
	Construction Waste Management	The Subcontractor must also complete a construction waste management plan with recommended strategies to divert materials from the landfill during construction, and provide an estimate of the percentage of these diverted materials.		A sample CWM plan may be available from PMD or the Engineering Standards Manager and can be used as a boilerplate. The CWM includes on-site recycling programs that can be used by the subcontractor to meet this requirement. The waste reduction and recycling goal for the project shall be stated here. The completed CWM plan and the results of waste diversion for the completed project will be included in the Appendix.

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	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
Indoor Environmental Quality	Construction IAQ Management Plan, During construction	Prevent IAQ problems from the construction process to help sustain comfort and well-being of construction workers.		<p>Develop and implement an Indoor Air Quality Management Plan for construction and pre-occupancy as follows:</p> <ul style="list-style-type: none"> <li>• Meet or exceed Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, Chapter 3.</li> <li>• Protect stored on-site or installed absorptive materials from moisture damage.</li> <li>• If air handlers are used during construction, filtration media must have a MERV of 8 at each return grill, per ASHRAE 52.2</li> </ul>
	Construction IAQ Management Plan, Before Occupancy	Prevent IAQ problems from the construction process to help sustain the comfort and well-being of the building occupants.		<p>Develop and implement an Indoor Air Quality Management Plan for pre-occupancy. The plan should be based on either:</p> <ul style="list-style-type: none"> <li>• A minimum two-week flush out with new MERV 13 filtration media or 100% outside air, OR</li> <li>• A baseline IAQ testing procedure consistent with the U.S. EPA's current Protocol for Environmental Requirements, Baseline IAQ and Materials for the Research Triangle Park Campus, Section 01445.</li> </ul> <p>The plan shall be submitted prior to construction and included as an appendix in this report</p>
Indoor Environmental Quality	Low Emitting Materials	Reduce the quantity of indoor air contaminants that are harmful to the well-being of the occupants.		<p>Low-emitting materials per the architectural requirements. These should include:</p> <ul style="list-style-type: none"> <li>• Adhesives and Sealants with a volatile organic content (VOC) less than the limits of the South Coast Air Quality Management District Rule #1168.</li> <li>• Sealants used as filler that meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.</li> <li>• Paints and coatings with VOC emissions less than the Green Seal Standard GS-11.</li> <li>• Carpet Systems that meet or exceed the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program.</li> </ul> <p>Include reference to construction specifications requiring these materials and cut-sheets in the appendix for documentation.</p>

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	SD Category	Description of requirement	Responsible discipline/ Actions required/ Status	Features included in Design
	Other Design Features	The Subcontractor will describe other design features that promote a better indoor environmental quality.		<p>Other features should be described in the indoor environmental quality category if they were included in the design. These are:</p> <ul style="list-style-type: none"> <li>• Minimum IAQ performance, consistent with ASHRAE 62-1999 and the mechanical requirements</li> <li>• Carbon Dioxide Monitoring</li> <li>• Ventilation Effectiveness per ASHRAE 129-1997</li> <li>• Indoor Chemical and Pollutant Control</li> <li>• Controllability of Systems, per the mechanical requirements</li> <li>• Thermal Comfort                             <ul style="list-style-type: none"> <li>– Compliance with ASHRAE 55, per the mechanical requirements</li> <li>– Permanent Monitoring System</li> </ul> </li> <li>• Daylight and views                             <ul style="list-style-type: none"> <li>– Describe how day lighting was incorporated into the building per the requirements of the architectural requirements</li> <li>– Describe features to maximize views to the outside</li> </ul> </li> </ul>