PART 1 - GENERAL

1.01 OVERVIEW

A. This Section addresses the energy and sustainability required documents, energy simulation aided design for MD Anderson construction projects and the timeline for submittal.

B. All references to “Owner” for deliverables shall include submissions to the project as well as copies to the Owner’s Engineering and Energy Management departments.

C. All references to building energy consumption simulation model(s) refer at a minimum to the creation of both a reference (baseline) model, the proposed after case model, and the input/output files for each.

D. Interim review meetings may be necessary to discuss comments and responses to required compliance forms, list of proposed energy and sustainability initiatives, and energy model inputs/outputs.

E. Refer to Part 7 of this element for a summary and timeline of required deliverables related to energy and sustainability.

PART 2 - ENERGY DESIGN STANDARD COMPLIANCE

2.01 GENERAL

A. Requirements listed may exceed compliance with State adopted energy design standards and will supersede the requirement.

B. All State-funded buildings and facilities must comply with energy design standards as adopted by the State Energy Conservation Office (SECO) with a design assignment made on or after the date as per SECO’s code history table. SECO adopted by reference, the energy conservation design standard ANSI/ASHRAE/IESNA Standard 90.1. Draft compliance forms shall be submitted to the Owner for review as part of the Design Development Submittal. Finally, to certify compliance with this standard, the A/E must complete and submit the finalized and Owner approved Energy Design Compliance Certification forms to Owner as part of the Construction Document Submittal.

C. Upon MD Anderson’s approval of the A/E’s completed forms, MD Anderson will submit the compliance forms that certify the A/E’s compliance with ANSI/ASHRAE/IESNA Standard 90.1 to SECO prior to beginning construction. This procedure applies to new building construction, additions, and major renovation projects.

D. Refer to Z2005 for the versions required for compliance with Owner and SECO energy codes.

2.02 ENERGY DESIGN COMPLIANCE FORMS

A. Energy Conservation Design Standard Compliance Certification for Nonresidential Buildings.

1. Building Envelope Compliance Documentation.
2. Energy Cost Budget (ECB) Compliance Report, as appropriate per ASHRAE 90.1 Section.
3. HVAC Compliance Documentation as appropriate to the Project:
    a. HVAC Simplified Approach Option.
    b. HVAC Mandatory Provisions.
    c. HVAC Prescriptive Requirements.
4. Lighting Compliance Documentation.
5. Performance Rating Report Documentation.
6. Service Water Heating Compliance Documentation.

B. Submit compliance forms to Owner as specified under Part 7 Timeline.

PART 3 - ALTERNATIVE ENERGY SYSTEMS

3.01 GENERAL

A. Prepare an alternate energy analysis in accordance with Section 2166.403, Title 10 of the Texas Administrative Code.

B. The purpose of the code is to provide an economic feasibility analysis of the use of alternate energy sources for potential applications to this Project.

C. Submit analysis to Owner for review as specified under Part 7 Timeline.

PART 4 - WATER CONSERVATION DESIGN STANDARDS COMPLIANCE

4.01 GENERAL

A. All new buildings or major renovations projects shall comply with SECO's latest "Water Conservation Design Standards for State Buildings and Institutions of Higher Education Facilities." A draft compliance form and appropriate associated documents shall be submitted to the Owner for review as part of the Design Development Submittal. To certify compliance with this standard, the A/E must complete and submit the finalized and Owner approved form, as well as appropriate associated documents, to Owner as part of the Construction Document Submittal. Upon Owner approval of the completed form and associated supporting documents, Owner will submit form to SECO prior to beginning construction.

B. The A/E will design into the Project on-site reclaimed system technologies or submit to the Owner a written determination as to the impracticality of installing on-site reclaimed system technologies as defined in GOVERNMENT CODE SECTION 447.004 PARAGRAPH C-1 & C-2: Design Standards.

C. The Owner will notify SECO of any impracticality determinations and provide to the office the

A/E's documentation supporting the determination.

D. Refer to Part 7 Timeline for compliance form milestones.

4.02 GOVERNMENT CODE SECTION 447.004 PARAGRAPH C-1 & C-2:

A. (c-1) The procedural standards adopted under this section must require that on-site reclaimed system technologies, including rainwater harvesting, condensate collection, or cooling tower blow down, or a combination of those system technologies, for non-potable indoor use and landscape watering, be incorporated into the design and construction of:

1. Each new state building with a roof measuring at least 10,000 square feet; and

2. Any other new state building for which the incorporation of such system is feasible.

B. (c-2) The procedural standards required by Subsection (c-1) do not apply to buildings if the state agency or institution of higher education constructing the building:

1. Determines that compliance with those standards is impractical; and

2. Notifies SECO of the determination and provides to the office documentation supporting the determination.

PART 5 - HIGH PERFORMANCE BUILDING DESIGN

5.01 PROPOSED ENERGY AND SUSTAINABILITY INITIATIVES

A. The A/E shall furnish a document titled "Project Energy and Sustainability Initiatives" as part of the Schematic Design Phase deliverable for all new building construction, building additions, and major renovations. The document shall include A/E recommendations for energy conservation opportunities for the Owner to consider into the Project Scope, including columns for the cost of the measure, energy units saved, estimated carbon equivalents, utility cost savings, operational expense/savings, and ROI. The document shall also list the title and proposed submittal date of each energy related compliance form and associated analysis that will be transmitted to the Owner.

B. Load reduction strategies should include at least, but not limited to, all items from the list below. Items noted with an asterisk (*) shall be evaluated and included for every project unless Owner directs otherwise:

1. Building envelope
    a. * 6” Batt insulation and meet continuous insulation code requirement
    b. * Continuous insulation behind spandrel mullions
    c. Window-to-wall ratio options per 5.02
    d. Shade glazing on South and West Facades
    e. Green roofs

2. Internal equipment load control
    a. * Sensible cooling options for high internal heat load areas
    b. Chilled beams
    c. Underfloor air systems
    d. Displacement ventilation
    e. Chilled doors in datacenters

3. Occupancy dependent, energy optimized outdoor air and building pressurization measurement and control

4. Energy and Water Recovery
    a. * Optimization of airside heat recovery as applicable (e.g. Enthalpy Wheels, Energy Cores, etc. for exhaust streams)
    b. * Heat recovery chillers (HRCs) for hospitals, laboratories, and clinics
    c. Optimization of waste heat recovery for low grade hot water requirements
    d. Variable Refrigerant Flow (VRF) systems
    e. Microturbines/CHP
    f. Alternative energy systems complying with Part 3 of this document, including but not limited to:
        - Photovoltaics
        - Fuel cells
    g. Water recovery strategies complying with Part 4 of this document, including but not limited to:
        - * Condensate recovery
        - Rainwater recovery
        - Other greywater collection opportunities

5. Exhaust stack velocity control (based on wind speed/direction and/or based on exhaust contaminant sensing)

6. Building electrification
    a. * Minimum 5% EV charging and provisions for additional future 10%
    b. High efficiency domestic hot water systems (e.g. solar, heat pumps)
    c. Electric heating, reheating (compare with heat pump opportunities)
    d. Electric steam production (e.g. sterilization)
    e. Cooking equipment

7. * Construction site recycling

8. * Options for lower embodied carbon, healthy materials, etc.

9. Enhanced commissioning based on LEED definition

10. Any additional sustainability and decarbonization suggestions

C. The “Project Energy and Sustainability Initiatives” document shall be updated and submitted for each subsequent Design Phase deliverable. See Part 7 Timeline for milestones.

5.02 ENERGY EFFICIENCY AND EXTERIOR DESIGN

A. During Schematic Design of new buildings or major additions, the A/E shall submit relative energy performance data for each design option proposed to inform the owner’s selection process. For each massing option explored, submit the following. Include minimum energy code values for comparison:

1. Building gross square feet

2. Roof area square feet

3. Area of exterior wall face

4. Window/wall ratio (WWR) of each façade by cardinal direction

5. Skylight area in square feet and percentage of roof area

6. Proposed wall, roof and glazing performance metrics, including U-values or insulation values, SHGC, Light to Solar Gain ratio (LSG).

7. Relative energy performance of each option proposed. Include at least three (3) options that vary WWRs, glazing performance/shading devices (effect of better glass or added shading devices).

5.03 ENERGY EFFICIENCY AND LEED

A. United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Building Design and Construction (BD+C) New Construction (NC) Gold Certification is to be pursued on all projects, using the most recent version of LEED in place with the State of Texas at the date of design or version approved by Owner.

B. For the purposes of LEED Certification, the start date of design will be decided by the Owner, and is typically defined as one of the following applicable milestones:

1. Date of Capital Improvement Program (CIP)

2. Date of Schematic Design Authorization (Notice to Proceed)

3. Date of Design Development Authorization (Notice to Proceed)

C. All LEED BD+C:NC prerequisites shall be met.

D. Design Charettes: A minimum of three (3) design charettes, at least two (2) occurring during Design Development shall be conducted with representation from all applicable stakeholders. Topics to include:

1. Project goals and their evolution

2. Total Cost of Ownership Assessments (TCOA) of possible design options

3. Energy simulation inputs and reporting submittals, as required and needed.

4. Energy load reduction design opportunities and strategies

5. Water and wastewater reduction design opportunities and strategies

E. Enhanced Commissioning: Unless instructed otherwise, energy and water consuming systems and thermal envelope systems shall achieve LEED BD+C:NC EA Credit: Enhanced Commissioning, Option 1, and Option 2.

F. Integrative Process is required, including submittal of the credit's Integrative Process Worksheet.

G. The project will track all prerequisites, credits, and associated supporting documentation for each claimed point (e.g. each “Y” or “?”).

H. Refer to other Design Guideline Elements for energy recovery and conservation requirements related to specific building systems and components.

I. Refer to Part 7 Timeline for LEED Checklist milestones.

5.04 ENERGY SIMULATION AIDED DESIGN

A. The A/E shall develop building energy consumption simulation models (e.g. EnergyPlus, eQUEST, TRACE 3D Plus, IES' VE, or other Owner approved modeling method) of the Project early in the Design Phase for all new building construction, building additions, and major renovations unless instructed by the Owner to exclude.

B. The baseline model shall be developed in accordance with Appendix G of the energy code version required by the Owner at the time of project award (see Z2005). Baseline models using other versions of 90.1 may be required or requested for processes including but not limited to SECO compliance, LEED, or utility incentives.

C. A/E shall submit the energy modeling method to the Owner's Energy Management department as part of the Schematic Design Phase deliverable.

D. The intent of the energy models is to assist in the decisions of HVAC strategies and evaluate a total cost of ownership. The energy model will be used to estimate and to improve energy performance as the project progresses through the design phases and will allow the project team to assess energy implications of different system strategies. The Owner shall provide applicable target EUI for the building type and relevant utility rates.

E. The A/E shall submit the energy model to the Owner for review at completion of Schematic Design, Design Development, Construction Document, and at Substantial Completion (i.e. As-Built). At each stage, provide the following deliverables for the *design energy cost* and the *energy cost budget*.

1. Energy model executable files

2. Executive Report: Provide a summary of inputs and results. This report shall at least include a monthly breakdown of energy consumption and annual EUI in kBTU/GSF/Year. Alternative methods to benchmark energy consumptions can be considered for projects that are not new construction or whole building renovations.

3. Output Files: Provide summary reports for at least the following:
   - Energy consumption and cost by end use
   - Energy consumption and cost by energy source
   - Energy consumption and cost by month
   - HVAC equipment data (i.e. input summaries, capacities, efficiencies, etc.)
   - Example input summary of occupancy patterns
   - Example input summary of envelope components

4. At Substantial Completion, all inputs should be reported and deviations explained as part of final energy model submittal.

F. Refer to Part 7 Timeline for energy model milestones

5.05 LIFE CYCLE COST ANALYSIS

A. During the Design Phase of a project, the A/E may be directed by the Owner to perform life cycle cost analyses of various building system categories including energy plant, HVAC, electrical, building envelope, building site, and structural systems.

B. Use life cycle cost analysis to access strategies and design alternatives that affect the Project's energy use over a period of time, incorporating energy costs, maintenance costs, and energy savings for the expected system life.

C. The A/E with Owner's input will establish objectives, determine criteria, identify and develop design alternatives, and gather cost information for evaluating design alternates.

5.06 SUBMETERING

A. The A/E shall coordinate location and type of electrical, BTU, and flow sub-meters with the Owner's Energy Management team and the Commissioning Authority during the Design Phase. Reference Owner's Master Construction Specifications for product types and other Design Guideline Elements for specific system requirements.

5.07 FIRST YEAR PERFORMANCE

A. Within 60 days of the final approved BAS Controls Submittal, the Commissioning Authority shall prepare and maintain an Energy Performance Plan that will support efficient operation of the building in the first year during the building's Warranty Phase. The Energy Management team will assist with gathering and providing utility data to the Commissioning Authority and project team as needed. This plan must include the deliverables below:

1. Description of HVAC, Electrical and Plumbing sequences of operation including a summary of building system operations and blank FPT scripts. Include the layout and overall structure of each major system in a one-line diagram form.

2. Time of day, weekly, and/or seasonal:

   a. Detailed building occupancy schedules for all BAS Monitored and Controlled Equipment.

   b. All setpoints and reset parameters for all HVAC equipment including zone level equipment. The CxA will provide the list of equipment, points and layout to the Owner for review and approval prior to populating.

3. Minimum and maximum frequency values for all VFDs, including any frequency ranges that are locked out due to vibration.

4. Minimum and Maximum lighting level settings for daylight control systems with photocells.

5. Outside air requirements (occupied, unoccupied, and standby) for air handling units.

6. TAB configured air flows at both the zone level terminal units and building zones (as needed for compartment pressurization).

B. The Commissioning Authority shall establish a Building Automation System (BAS) trend definition matrix to support energy and operational efficiency. The CxA will provide the list of trends and layout to the Owner for review and approval prior to populating. This matrix shall include, but is not limited to, the following criteria:

   a. Summary of points to be trended by system type. The CxA will provide the list of the layout to the Owner for review and approval prior to proceeding.

   b. Detail of all points (name and description) to be trended

   c. Frequency and duration of trends

   d. Limits of acceptable values for trended points

   e. Methods and criteria to evaluate performance for each trended value

C. Using the As-Built energy model or Owner approved target as a benchmark, the Commissioning Authority shall compare against the actual building utility consumption at the utility level only. Reporting will occur on a quarterly basis starting during the Warranty Phase. The CxA will facilitate a quarterly meeting (4 Meetings) to review the trend definition matrix performance and building utility performance. During the meeting, the CxA will provide and review a corrective action plan for items in the matrix out of range or if the utility performance is not in compliance with benchmarks. Any corrective actions needed will be the responsibility of the Owner to initiate further review, including engaging a 3rd party.

PART 6 - SUSTAINABILITY PROGRAMS

6.01 GENERAL

A. This section is intended to assist the A/E with planning space for waste disposal and recycling containers.

6.02 INTERIOR SITE REQUIREMENTS

A. Public spaces shall offer recycling containers and/or collection systems near building entrances, reception locations, dining areas, and conference spaces. Identifiable alcoves shall be designed for public spaces with high traffic access.

B. Alcoves containing recycling sort systems shall have impervious measures in place to protect wall surfaces. Retail or custom containers developed with protection shields may be substituted; confirm type to be provided with Owner.

C. Non-public space recycling system installations shall be limited to prevent obstructions. Use of personal bins is preferred to limit installation of large containers. Large containers shall only be placed near work rooms, mail rooms, break rooms, and vending alcoves. Installation at elevator banks is permitted, if space is available.

D. Personal desk-side recycling containers shall be planned for workstations and/or offices. Bins will be self-serviced by occupants to the nearest recycling sort system or recycling bin.

6.03 EXTERIOR SITE REQUIREMENTS

A. As applicable to the Project, the design shall provide space to accommodate at least two (2) waste containers/compactors of varying size to allow for separation of solid waste and recycling materials. The potential for additional containers is optional pending building type and frequency of building maintenance; confirm with Owner.

B. Waste containers/compactors shall be located side by side in the enclosures or in the same central storage area to allow for single point waste/recycling operations. Staging of containers one in front of the other is not permitted.

1. Recycling containers and collection systems, either retail or custom, shall meet MD Anderson design standards for aesthetics, performance, and waste services. Consult with Owner on special requirements for waste containers, compactors, and enclosures.
2. All costs associated with the purchase and placement of recycling containers shall be included in project construction or renovation costs.

PART 7 – ENERGY & SUSTAINABILITY DELIVERABLE TIMELINE

7.01 OVERVIEW

A. The table identified below summarizes A/E deliverables to the Owner. Some items may require interim reviews as directed by the Owner. Written responses to review comments shall be provided within two weeks of receiving them.

B. Submittal Timeline

During SD Phase:
- Submit energy modeling plan for review and approval
- Submit massing options as described in 5.02
- Submit draft of “Project Energy and Sustainability Initiatives” document for review
- Submit draft of State required alternate energy analysis, as described in Part 3
- Submit draft of State required water conservation designs, as described in Part 4
- Establish energy efficiency goal

100% SD Phase:
- Final draft of “Project Energy and Sustainability Initiatives” document including Owner comments
- Finalized energy modeling method and proposed inputs
- Alternate energy analysis (draft) including Owner comments
- SECO’s “Water Conservation Design Standard Compliance Certification For State-Funded Buildings” Form (draft) including Owner comments

100% DD (or prior):

- SECO/ASHRAE 90.1 Compliance Forms (draft)
- LEED Checklist (draft)
- “Project Energy and Sustainability Initiatives” document (final, listing all measures recommended and not recommended)
- Energy Model Outputs (target: load reduction, HVAC design selection and optimization)

100% CD:

- SECO/ASHRAE 90.1 Compliance Forms (final)
- SECO’s “Water Conservation Design Standard Compliance Certification For State-Funded Buildings” Form (final)
- Alternate energy analysis (final)
- LEED Checklist (updated)
- Updated “Project Energy and Sustainability Initiatives” document (final, listing all measures recommended and not recommended)
- Energy Model Outputs (target: optimization and evaluation of conservation measures)

Substantial Completion

- LEED Checklist (final)
- “Project Energy and Sustainability Initiatives” document (final, listing all measures implemented and not implemented from the draft list))
- Energy Model Deliverables (As-Built Model)

Warranty Phase

- First year quarterly energy performance reporting as detailed in Section 5.07 (CxA deliverable)

END OF ELEMENT Z2010003

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DOCUMENT REVISION HISTORY					
Issue	**Date**	**Revision Description**	**Author or SME**	**Approved By**	**Edited By**
Rev. 1	20190301	Original Issuance			FPDC
Rev. 2	20190530	Revisions by Greg Norris	Greg Norris	Greg Norris	Richard Fitzgerald
Rev. 3	20200422	Revisions by Greg Norris based on draft revisions from 20200225	Greg Norris	Greg Norris	Richard Fitzgerald
Rev. 4	20230126	Revised with requested itemized list of load reduction strategies with project specific requirements	Conrad Cane	Greg Norris	
Rev. 5	20241218	Clarify LEED and other provisions	G. Norris	G. Norris	T. Shewan
Rev. 6	20250520	Clarify ASHRE 90.1 and SECO	G. Norris	G.Norris	T. Shewan