**SCHOOLS ENERGY AND CARBON DESIGN CHECKLIST**

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*School District logo – click to place*

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| --- | --- |
|  | The following is an example of a Checklist for Energy and Carbon that Districts can customize for their own climate zone and location. This checklist should be used by the District and consultant design team starting in Concept Design to identify critical energy and carbon considerations. Teams should refer to and complete this checklist throughout the design process. After the completion of each of the Schematic Design, Design Development, and Construction Documents phases, submit the completed the checklist to the project or sustainability manager to confirm that the team has taken these critical considerations into account and will meet school district requirements.  The examples included in each section provide clarifying detail and are not intended to be prescriptive requirements or exhaustive lists. Teams are encouraged to research, analyze, and select the best energy conservation measures (ECMs) and emission reduction strategies for the project based on energy and emissions goals and outcomes, project budget, equipment availability, site constraints, and other key factors. |

**EARLY DESIGN**

Describe how the approach and design have been optimized to meet the District’s Energy and Carbon goals. Please explain if any questions aren’t applicable.

Provide description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Has the team discussed and set energy and performance goals with the team? |  |  |  |
| Has the target EUI been incorporated from the goals listed in the School District Name Decarbonization Roadmap? |  |  |  |
| Have other goals from the School District Name Decarbonization Roadmap been incorporated?  If yes, list:   * Insert item here * Insert items here * Insert items here * Insert items here * Insert items here |  |  |  |
| Has a pre-design site assessment taken place? |  |  |  |
| *Existing buildings:* Does the team have the facility’s historic documents and information? (Drawings, utility bills, energy studies, equipment surveys, etc.) |  |  |  |
| Have the owners project requirements (OPR) been developed?  *A template OPR can be found in the* [*School Decarbonization Toolkit*](https://newbuildings.org/resource/decarbonization-roadmap-guide-for-school-building-decision-makers) |  |  |  |
| *If applying for LEED:* is the LEED credit for Integrative Process being implemented? |  |  |  |
| Has the energy breakdown by end use been determined and developed? |  |  |  |
| Has an iterative energy modeling schedule been developed and agreed upon? |  |  |  |
| Have at least two unique bundles of proposed ECMs been developed and evaluated? |  |  |  |
| Is a life cycle cost analysis planned for the project? |  |  |  |
| *Existing buildings:* If retaining existing fossil fuel equipment, is the building electrification-ready? (Outlet adjacent to fossil fuel equipment, electrical panel sized for future loads, low temperature hot water design, etc.) |  |  |  |
| Are all energy-consuming systems and equipment electrically powered? If no, please describe the system and the fuel used (utility gas, propane, etc.): Enter description here |  |  |  |

**ENVELOPE**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Does the building orientation and massing enhance energy outcomes?  *Examples: Building orientation and massing optimizes solar energy production; Building orientation and massing allows proper shading; Building orientation and massing utilizes natural ventilation and prevailing winds; Building orientation and massing balances daylight against electric lighting and mechanical HVAC needs; Prepare for future adjacent site development impacts* |  |  |  |
| Are exterior insulation levels optimized?  *Examples: Continuous exterior rigid insulation; Thermal bridging breaks; Total wall R-value; Total roof R-value* |  |  |  |
| Is the air barrier adequately sealed?  *Examples: Continuous air barrier; Joints and seams sealed; Seal transitions between two or more materials; Seal envelope penetrations with caulk and/or gasket systems; Blower door test to identify leak target* |  |  |  |
| Is the window to wall ratio (WWR) optimized per orientation?  *Examples: Optimize WWR per each façade orientation; Target appropriate WWR* |  |  |  |
| Is high-performance glazing identified for each façade/orientation?  *Examples: Select window glazing that balances daylighting, views, and energy performance (Double or triple glazing, specialized transparent coatings, insulating gas between panes, and improved frames and glazing optimized per each building orientation); Whole product windows and doors with low U-factor and high solar heat gain coefficient (SHGC); Appropriate visible light transmittance (VLT) for each space* |  |  |  |

**SPACE CONDITIONING/PLANT**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Were passive cooling and heating options evaluated?  *Examples: Incorporate thermal mass into the floor or walls (concrete/masonry, chilled water, Ice, phase change materials); Operable windows; Night flush ventilation; Stack effect* |  |  |  |
| Have internal loads been reduced to downsize the mechanical system capacity?  *Examples: Shade glazing; High performance envelope; Less electric lighting; All LED lighting; High performance equipment and appliances* |  |  |  |
| Have high-performance heating and cooling systems been incorporated?  *Examples: Radiant heating and cooling system (slabs, panels, chilled beams, refrigerant/chilled water/hot water, condensation considered and humidity controls integrated); Part-load system performance (variable capacity heat pump (VCHP), variable refrigerant flow, variable refrigerant volume); Ground Source Heat Pumps (GSHP); Right-size HVAC system; Boiler; Thermal energy storage; Heat recovery chiller* |  |  |  |

**VENTILATION**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Does the ventilation use a different delivery system from heating and cooling?  *Example: Dedicated outside air systems (DOAS)* |  |  |  |
| Is ventilation distributed efficiently?  *Examples: Variable air volume (VAV); Low-flow air diffusers; Underfloor air distribution; Limit fan power* |  |  |  |

**DAYLIGHTING/LIGHTING**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Is daylight prioritized over electric lighting?  *Examples: Tall or high windows; glare control; Internal shades; Scheduled automated shades; Daylight controls* |  |  |  |
| Is glare controlled by external and/or internal shading systems?  *Examples: Shade exterior side of window glazing; Interior shade control; Model daylight patterns; Automate shading controls* |  |  |  |
| Are interior and exterior lighting centrally controlled through programmable lighting?  *Examples: Vacancy sensors; Photosensors; Dimmable controls; Schedule exterior lighting; Zoned daylighting controls* |  |  |  |

**DOMESTIC HOT WATER HEATING**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Have hot water demands been reduced?  *Examples: Low-flow water fixtures and appliances* |  |  |  |
| Have high-performance water heating systems been incorporated?  *Examples: Central or unitary heat pump water heaters* |  |  |  |
| Is the distribution system efficient?  *Examples: Pipe insulation; Minimize or eliminate hot water recirculation; Group hot water loads near hot water storage; Serve each fixture directly from the hot water storage; Reduce pipe size* |  |  |  |

**PLUG LOADS**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Have office equipment and workspaces been designed to reduced plug loads?  *Examples: Plug load and workstation vacancy sensors; Power strip monition activation; Energy Star equipment* |  |  |  |
| Have other spaces incorporated measures to reduce plug loads?  *Examples: Equipment and appliance timers, remote switch and master-controlled power strips; night overrides* |  |  |  |

**BUILDING CONTROLS**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Have building automation controls been designed to reduce energy?  Examples: Lighting sensors: occupancy, vacancy, dimmable; Operational hour override; HVAC: temperature, CO2, humidity; Operational hour override; Renewable energy and storage systems |  |  |  |
| Is there a central building automation system that communicates with the campus system and electric grid?  Examples: Controls automation; Provide system performance feedback; Demand response ready |  |  |  |
| Is real-time data available from building metering and sub-metering? |  |  |  |

**RENEWABLE AND STORAGE SYSTEMS**

Is this section applicable to the project scope? Yes  No    
If yes, please answer the following questions.

**Describe the envelope ECMs. Please explain if any questions aren’t applicable.**  
Provide envelope ECMs description here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Is the project designed to include future renewable energy and/or energy storage?  *Examples: Dedicate appropriate roof area and/or site area that meet code requirements; Empty capacity (space) in electrical panel for storage; Space in electrical panel for storage; Structural capacity to incorporate future solar panels: Plans should show a maximum open area by grouping roof penetrations; Dedicated walkways and optimized rooftop equipment removal; Electric diagrams should show future conduit runs and equipment locations;* |  |  |  |
| Can the renewable energy system’s inverter disconnect from the grid to provide energy directly to the building?  *Examples: Automatic transfer switch; Building islanding* |  |  |  |
| Is energy storage included in the project?  If yes, please describe: Provide description here. |  |  |  |

**SPECIAL ENERGY CONSIDERATIONS**

Describe the special energy considerations. Please explain if any questions aren’t applicable.

Describe special energy considerations here.

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Is waste-energy captured for reuse?  *Examples: Heat recovery capture from wastewater, ventilation exhaust, other equipment; Reusing cooking oil* |  |  |  |
| Are peak energy load reduction and energy flexibility strategies incorporated?  *Examples: Shift or save system peak loads; Demand-control; Energy storage; Smart system controls to shift energy consumption (warm-up timing, temperature setbacks, “shut down” schedule, and proactively pre-cooling or pre-warming during opportune times)* |  |  |  |
| If a laboratory project, did the project use the Laboratory Benchmarking Tool? |  |  |  |
| If a kitchen is included in the project, did the project use the [Food Service Technology Center](https://fishnick.com/saveenergy/tools/calculators/fe3/eovencalc.html), [Energy Star](https://www.energystar.gov/sites/default/files/asset/document/commercial_kitchen_equipment_calculator.xlsx), or other regionally specific equipment calculator? |  |  |  |

**CARBON AND ENERGY ANALYSIS REPORT CHECKLIST**

**Instructions**

This checklist should be used by the energy lead on the project team during all phases of design to confirm that the energy analysis has addressed critical energy and carbon considerations in the design. The energy lead should refer to and complete this checklist throughout the design process.

At the end of Schematic Design, Design Development, and Construction Documents, submit the completed checklist to confirm that the team has planned and incorporated measures to meet any requirements for zero net carbon new construction or deep energy retrofits. The energy champion will review the checklist against submitted documents.

**REPORTING**

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Is the project designed to meet the district’s calculated EUI target? |  |  |  |
| Have back-up calculations been provided to demonstrate how the target EUI was calculated? |  |  |  |
| Are the target EUI and proposed design EUI stated? |  |  |  |
| Do the energy model results include all necessary reporting data? (See table below) |  |  |  |
| Is there an interpretation provided of the energy analysis results? |  |  |  |

**Energy Code Analysis or Code Compliance**

Assumptions for energy analysis or code compliance:

|  | Yes | No | N/A |
| --- | --- | --- | --- |
| Have detailed modeling inputs been provided for all energy models? |  |  |  |

Select the accepted form of modeling inputs used:

|  |  |
| --- | --- |
|  | [LEED Minimum Energy Performance Calculator](https://www.usgbc.org/resources/leed-v41-minimum-energy-performance-calculator) |
|  | Other: please fill out what modeling inputs were used |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Energy Analysis Results Matrix | Annual Site Energy | Site Energy Use Intensity | Source Energy | Annual Utility Cost | Annual Utility Cost Intensity | Annual Carbon Emissions | Annual Carbon Emissions Intensity | Net Present Value | Simple Payback |
| ***kBtu/ year*** | ***kBtu/ft2-year*** | ***kBtu/ year*** | ***$/year*** | ***$/ft2-year*** | ***CO2-e/ year*** | ***CO2-e/ ft2-year*** | ***$*** | ***year(s)*** |
| BASELINE |  |  |  |  |  |  |  |  |  |
| PROPOSED |  |  |  |  |  |  |  |  |  |
| ECM 1 |  |  |  |  |  |  |  |  |  |
| ECM 2 |  |  |  |  |  |  |  |  |  |
| ECM 3 |  |  |  |  |  |  |  |  |  |
| ECM 4 |  |  |  |  |  |  |  |  |  |
| ECM X |  |  |  |  |  |  |  |  |  |
| Combo 1 |  |  |  |  |  |  |  |  |  |
| Combo 2 |  |  |  |  |  |  |  |  |  |
| Combo 3 |  |  |  |  |  |  |  |  |  |
| Combo 4 |  |  |  |  |  |  |  |  |  |
| Combo 5 |  |  |  |  |  |  |  |  |  |

*Modeling assumptions to include details on the following inputs: modeling software, weather file, energy modeling standard, conditioned area and gross area, envelope constructions, occupancy, lighting power density, and equipment power density values and variation profiles, HVAC system parameters (air-side and water-side), ventilation rates, utility rates, carbon emission factors, renewable systems, and summary of energy efficiency measure input parameters*