MINNESOTA B3 GUIDELINES®

An Introduction to the B3 Guidelines Small Building Method

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Agenda

1. Logistics: webinar and education credits
2. Introduction, goals, and background B3 Guidelines Small Building Method
3. Integration with SB 2030 Small Building Method, tracking tool, and timeline for implementation
4. General overview of the Small Building Method
5. Deep Dive on specific guidelines
    1. P.1A & P.1C – Combined OPR/BoD
    2. S.5 - Bird Safety
    3. E.2A & E.2B - Renewable Energy
    4. I.1 - Low Emitting Materials
    5. I.5C - Daylighting
    6. I.6 - Acoustics
    7. M.2A – Environmentally Preferable Materials
6. Questions (collected via the chat)

Webinar Logistics & Education Credits

Logistics

- We will be posting a recording of this session on our training page at b3mn.org
- Those needing AIA credit – please send your AIA # to the presenters in the chat
- Attendees will be muted throughout the presentation
- Please send questions in the chat. Questions can be addressed at each deep dive and at the end

Introduction – B3 Guidelines Small Building Method

Goals

1. Significantly decrease cost and administration for small projects

2. Refocus guidelines on topics with a high impact-to-burden ratio for small projects

3. Retain as many of the environmental and IEQ benefits as possible

Introduction – B3 Guidelines Small Building Method

Applicability

1. Proposed for buildings </= 20,000 gross conditioned sf
   - Size requirement aligns with SB2030 Small Buildings Method, EDA programs, ASHRAE small building design guides
   - More detail in following slides
2. Renovations and additions </= 20,000 sf would follow this approach as well
   - Pure renovations </= 10,000sf not required to participate in B3 or SB2030 program

Introduction – B3 Guidelines Small Building Method

Example small projects </= 20,000sf

- Maintenance & shop buildings
- Small offices
- Testing labs & animal facilities
- Libraries
- School additions & training facilities
- Multipurpose armory buildings (renovations)
- Camper cabins
- Airport additions
- Visitor centers & museums
- Kitchen & cafeteria additions
- (in the future) multifamily housing

Introduction – B3 Guidelines Small Building Method

Overall Approach

- Retain existing guideline structure and Tracking Tool for familiarity/ease of use.
- Small Buildings Method exists as a subset of guidelines within the existing B3 Guidelines.
  - Some of the credits remain unchanged.
  - Others are removed.
  - Many simply have components/subsections removed or submittal requirements altered a bit.
- Sections of the existing guidelines turned on/off in the Tracking Tool as required.

Introduction – B3 Guidelines Small Building Method

Rubric for evaluating guidelines:

- How impactful (i.e. does it result in meaningful changes to design and construction compared to business as usual?)
- How much effort is required for compliance?
- How expensive is it to achieve compliance?
- Is it appropriate for small buildings?

Timeline of B3 Guidelines Small Building Method Rollout

- Version 3.2 projects will have access to this as an update; both posted on the guidelines and with available updates in the tracking tool. Older versions won't see this method available; though can upgrade to the newer version if they choose.
- Tracking tool programming is underway, anticipate going live in April.
- In the meantime—project teams are recommended to use the "provisional variances" where the guideline requirements differ from what's currently available in the tool. Current summary of this revision posted on www.B3mn.org/guidelines
- The Small Building Method guidelines are being posted as a revision to version 3.2 rather than a new version.
- A similar evaluation of the Site and Water related guidelines is in early stages; please reach out if you would like to participate in those discussions. Note that building-related items (bird safety and indoor water use) were picked up in this update.
- Also slated as an upcoming revision: inclusion of recommended guidelines on resilience.

SB 2030 Small Buildings Method

SB 2030 & B3 Small Buildings Method Integration

SB 2030 Small Buildings Method covers the energy efficiency target and requirements, B3 Small Buildings Method now covers all other topic areas except for site guidelines.

SB 2030 Small Buildings Method

- Energy efficiency target, including renewable energy (onsite and RECs)
- Prescriptive Efficiency Path
- Energy Star rated equipment
- Building water efficiency

Updated 2020

B3 Guidelines Small Buildings Method

All other topic areas except site:

- Performance Management
- Bird Safety
- Energy consumption documentation
- Atmospheric Protection
- Renewable & EV Ready
- IEQ Guidelines
- Materials & Waste Guidelines

Created 2021

B3 Guidelines Small Sites Method

- Site & Water Connections
- Site Water Quality & Efficiency
- Soil
- Vegetation

Scheduled for 2022

Timeline of B3 Guidelines Small Building Method Rollout

Notable revisions since the December draft guidelines:

- Clarification of types of spaces contributing to the 20,000gsf cutoff
- Guideline changes:
  - I.1A Required for 5 most prevalent interior materials (previous draft had 3)
  - I.6 Apply a portion of guideline I.6C for small, non-education projects rather than new guideline I.6E, quite close overall requirement
  - I.8B Adjustable chairs for workstation seating retained
  - I.9C Universal design requirements retained
  - M.2B Required for most prevalent materials in project (down from 10)
  - M.4B Mercury limits on fluorescent lamps retained

Applicability of B3 Guidelines Small Building Method

"Small Buildings" are defined as those that include less than 20,000 gross square feet (gsf) of conditioned space. Upon approval from the B3 Guidelines Administrators, several other space types may be eligible for exclusion from the building area calculation, including:

- Spaces that are not regularly occupied and are indirectly conditioned or semi-heated
- Spaces that are not regularly occupied and are primarily used to enclose industrial or similar processes
- Spaces that are not regularly occupied and are primarily used to provide inactive storage

Applicability of B3 Guidelines Small Building Method

	Regularly occupied	Not regularly occupied	Not regularly occupied, and primarily inactive storage/industrial process
Conditioned space	Include for both B3, SB 2030	Include for both B3, SB 2030	Include for SB 2030, potentially excluded from B3*
Indirectly conditioned	Include for both B3, SB 2030	Include for SB 2030, potentially excluded from B3*	Include for SB 2030, potentially excluded from B3*
Semiheated space	Include for both B3, SB 2030	Include for SB 2030, potentially excluded from B3*	Include for SB 2030, potentially excluded from B3*
Unconditioned space	Do not include for B3, SB 2030	Do not include for B3, SB 2030	Do not include for B3, SB 2030

*Spaces noted as “potentially excluded” above must be approved by the B3 Guidelines Administrators.

SB 2030 Small Buildings Method

SB 2030 Small Buildings Method

- Developed to reduce the need for energy simulations for small buildings and permit the minimum efficiency measures to be established using a prescriptive approach
- This process aligns with the hierarchical approach that larger buildings will use
- SB 2030 Energy Standard tool is still used to set energy target, modified by an adjustment factor
- Updated in 2020; updated to include newer prescriptive requirements + renewables + off-site options
- Aligns with the approach that larger projects but doesn't require the same level of energy modeling by looking at on-site options

Hierarchy of renewables under SB 2030

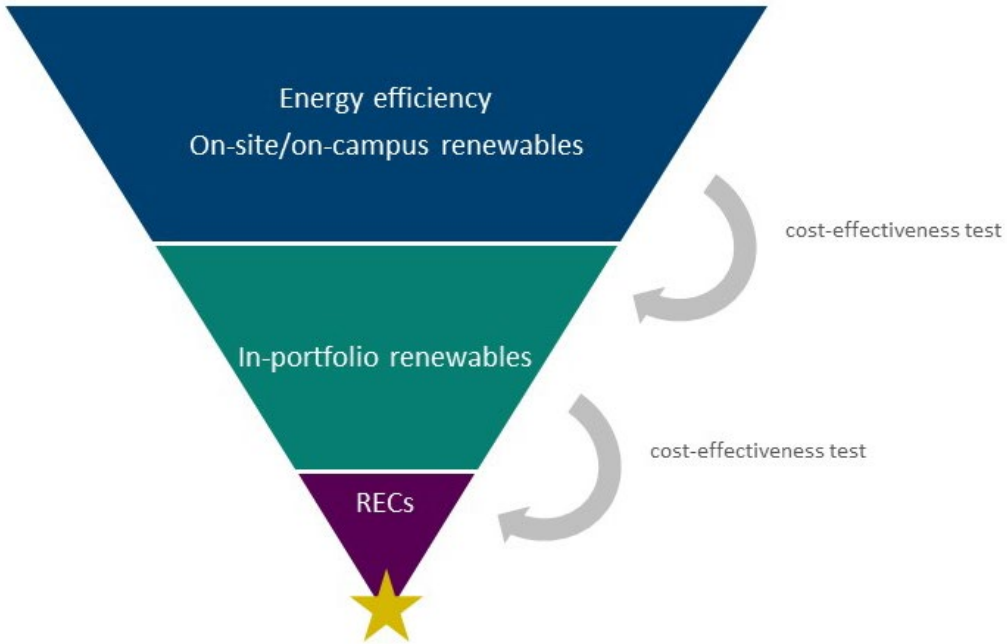
SB 2030 Program Energy Efficiency and Renewable Energy Supply Options Hierarchy

Option Number	NZEB Supply-Side Options	Examples
0	Reduce site energy use through energy efficiency and demand-side renewable building technologies.	Daylighting; insulation; passive solar heating; high-efficiency heating, ventilation, and air-conditioning equipment; natural ventilation, evaporative cooling; ground-source heat pumps; ocean water cooling
On-Site Supply Options		
1	Use RE sources available within the building footprint and connected to its electricity or hot/chilled water distribution system.	PV, solar hot water, and wind located on the building
2	Use RE sources available at the building site and connected to its electricity or hot/chilled water distribution system.	PV, solar hot water, low-impact hydro, and wind located on parking lots or adjacent open space, but not physically mounted on the building
Off-Site Supply Options		
3	Use RE sources available off site to generate energy on site and connected to the building's electricity or hot/chilled water distribution system.	Biomass, wood pellets, ethanol, or biodiesel that can be imported from off site, or collected from waste streams from on-site processes that can be used on site to generate electricity and heat
4	Purchase recently added off-site RE sources, as certified from Green-E (2009) or other equivalent REC programs. Continue to purchase the generation from this new resource to maintain NZEB status.	Utility-based wind, PV, emissions credits, or other "green" purchasing options. All off-site purchases must be certified as recently added RE. A building could also negotiate with its power provider to install dedicated wind turbines or PV panels at a site with good solar or wind resources off site. In this approach, the building might own the hardware and receive credits for the power. The power company or a contractor would maintain the hardware.

NZEB Supply Options 0, 1, and 2 must be considered first and implemented if cost-effective. On-campus development of Supply Option 2 is included in this evaluation and considered equivelant to on site Supply Option 2.

If the SB 2030 Standard cannot be met cost-effectively using supply options above, additional RE should be developed from within the project owner's portfolio (note that this in-portfolio RE development is not listed as a supply option number here). NZEB Supply Option 3 is also permitted, subject to evaluation by the SB 2030 Project Team.

The remainder of RE needed to meet the SB 2030 Standard shall be procured through Renewable Energy Credits (RECs).



Program Update 2020: Cost effective method reevaluation

From 2009:

- Used a societal test, participant test, and utility test perspectives – determined that a simple payback threshold of longer than **15 years** would likely lead some individual building projects not being cost-effective.
- Initially was performed using a parametric analysis of 115 buildings to find this cost effective boundary.

From 2019:

- Updated analysis concludes that a payback period of **12 years** is now the cost-effective boundary for measures under the SB 2030 program.

SB 2030 Small Buildings Method

SB 2030 Small Buildings Method—Minimum Efficiency Required

Meet a minimum level of efficiency—available options for commercial buildings:

(Note that all of these are related to ASHARE 90.1-2019)

- ASHRAE 90.1 – 2019
- NBI 40% off – Path B Stretch Prescriptive Measures
- AEDG – ZNE (currently available for small to medium offices and k-12 school buildings)
- IgCC

Residential:

- DOE Zero Energy Ready Home

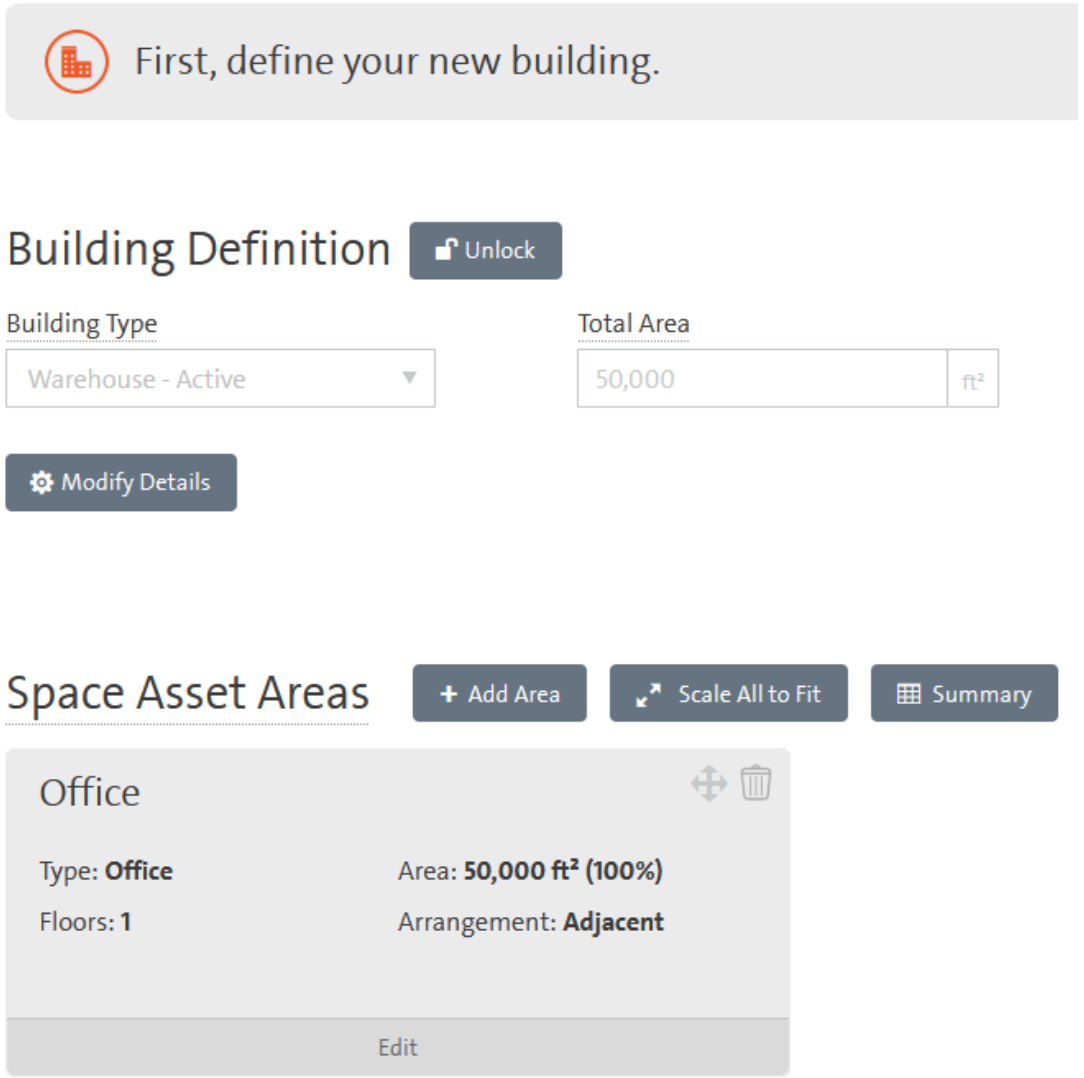
SB 2030 Small Buildings Method

SB 2030 Small Buildings Method – Establish Energy Standard and needed remaining renewable energy needed to meet target

Based on which prescriptive standard is selected and building type the remaining renewable energy need is determined (by ratios established by the SB 2030 Team by modeling a group of comparison buildings).

Remaining renewable energy (demand if any) should be pursued on-site, subject to cost-effective criteria.

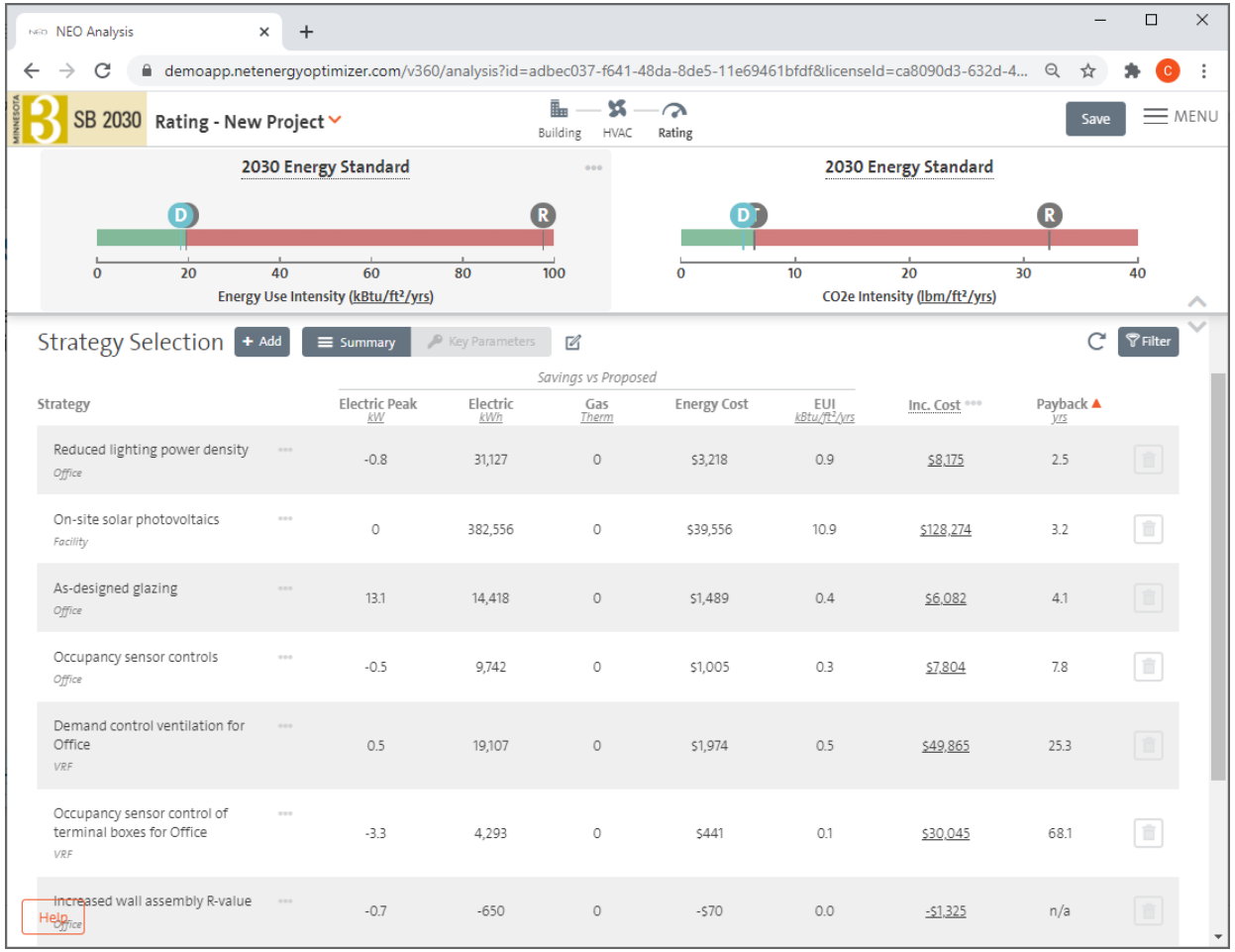
If cost-effective on-site RE is unavailable, the project would look to in-portfolio, then to Renewable Energy procurement.



SB 2030 Small Buildings Method

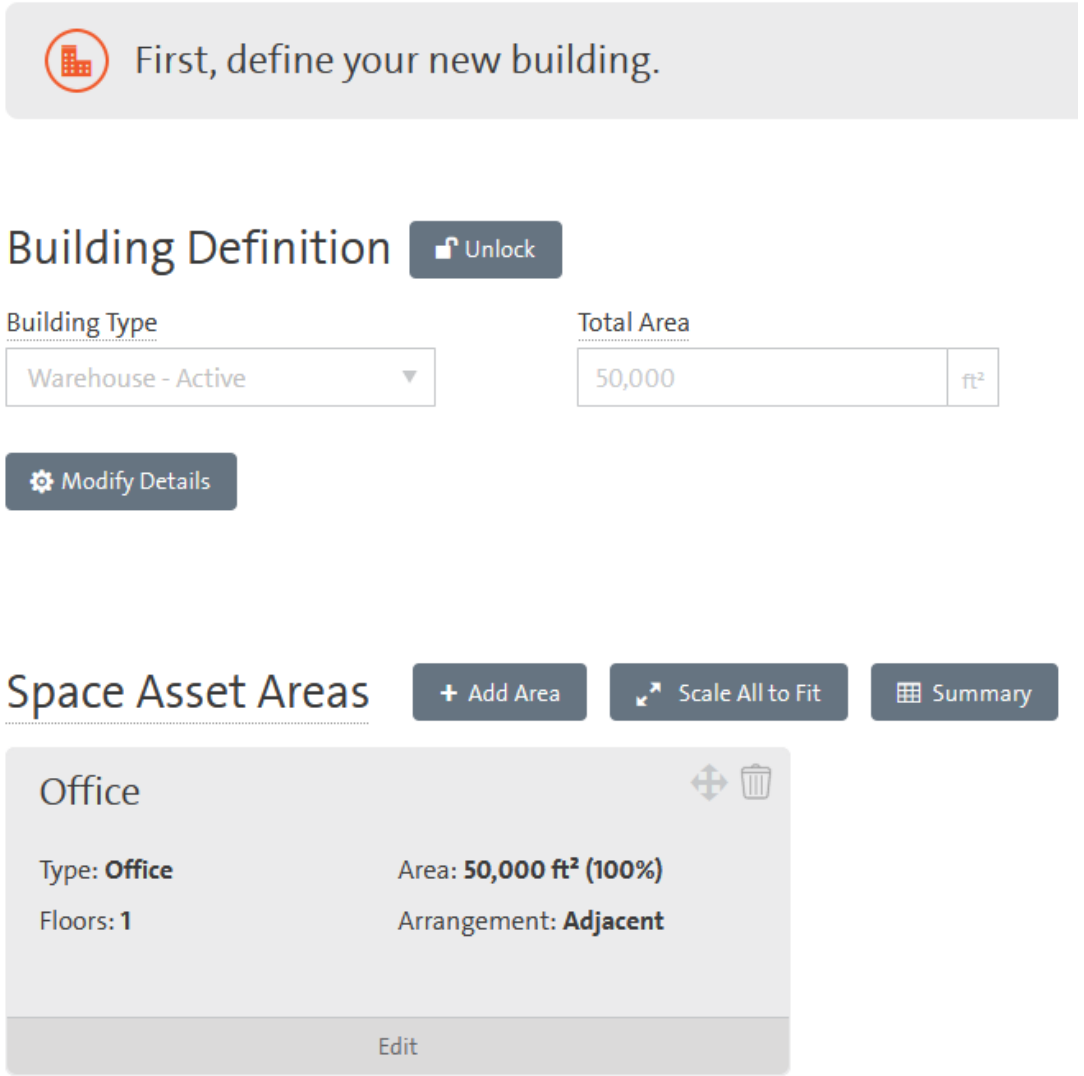
Limitations

- Projects that are doing more efficiency measures that the minimum laid out in the prescriptive standards aren't readily able to take credit for those improvements.
- Limited in applicability for small renovations where complete assemblies may be unable to be improved
- The updated As-Designed tool may be useful to use in these cases to document improved performance.



SB 2030 Small Buildings Method

Questions? (post in the chat)



Overview of B3 Small Buildings Method

Performance Management		
P.1	**Design and Construction Process**	
Simplified	P.1A - Develop Owner's Project Requirements (OPR) Document	A new template will be available for small buildings streamlining the P.1 requirements and combining OPR and BoD documents into one.
Simplified	P.1B - Commissioning Plan (Cx Plan)	Small buildings may scale back commissioning to only HVAC systems and lighting controls.
Simplified	P.1C - Develop Basis of Design (BOD) Document	A new template will be available for small buildings streamlining the P.1 requirements and combining OPR and BoD) documents into one.
Simplified	P.1D - Safety Risk Assessment of indoor air quality issues	A new template will be available for small buildings combining the P.1D IAQ safety risk assessment plan for occupied buildings under construction with the other IAQ plans in P.1E.
Simplified	P.1E - Construction & Warranty Period Air Quality Management Plans	For the Construction IAQ plan, protection of HVAC equipment, replacement of filtration media, and building flush out are required for all buildings. Temporary construction ventilation, protection of absorptive/porous materials, offsite product preconditioning, and removal of moisture-damaged materials are not required for small buildings. For the Warranty Period IAQ plan, requirements for small buildings are reduced to just one CO2 test at 10-12 months after occupancy, plus a follow-up test if above the thresholds. The template for these plans is combined with P.1D for occupied buildings.
P.2	**Operations Process**	
Not required	P.2A - Energy Efficient Operations Manual	Already not required for small buildings
No change/ possibly not required	P.2B - Post -Occupancy Evaluation	Buildings with less than 25 occupants are currently exempt. POEs are only available for buildings with office, lab, classroom/training, residence hall space types.

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Grouped template

Grouped template

Overview of B3 Small Buildings Method

Site & Water Guidelines		
S.1	**Site and Water Connections** - to be updated separately	
S.2	**Site Water Quality and Efficiency** - to be updated separately	
S.3	**Soil** - to be updated separately	
S.4	**Vegetation** - to be updated separately	
S.5	**Animal Habitat Support**	
Simplified	S.5A - Bird-safety Whole Buildling Threat Factor	If no "traps", alternative pathway S.5O can be used for small buildings
Simplified	S.5B - Bird-safety Non-Enclosure Threat Factor	If no "traps", alternative pathway S.5O can be used for small buildings
Simplified	S.5C - Bird-safety High Risk Surfaces	If no "traps", alternative pathway S.5O can be used for small buildings
Simplified	S.5D - Bird-safety Traps	If no "traps", alternative pathway S.5O can be used for small buildings
Simplified	S.5E - Bird-safety Lights Out Management procedures	If no "traps", alternative pathway S.5O can be used for small buildings
Simplified	S.5F - Bird-safety First Year Monitoring	If no "traps", alternative pathway S.5O can be used for small buildings
No change	S.5G - Protection of rare, threatened, endangered species	No change in this revision—to be updated separately
No change	S.5H - Animal habitat provisions	No change in this revision—to be updated separately
No change	S.5I - Aggregate illumination levels (Dark Sky Model Lighting Ordinance)	No change in this revision—to be updated separately
Simplified	S.5O - Bird-safety Small Buildings Path - Average Glazing Threat Factor	New optional pathway that can replace S.5A through S.5F for small buildings that don't include any "traps" (see-through conditions less than 20 feet across). Requires windows to meet an average glazing threat factor based on window-to-wall ratio and whether or not the building is located in a "critical site" for bird habitat.

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Overview of B3 Small Buildings Method

Energy & Atmosphere Guidelines		
E.1	**Energy Efficiency**	
Simplified	E.1A - Meet SB 2030 Energy & Carbon target	Use the SB 2030 Small Buildings Method (updated for 80% reduction) in lieu of energy modeling
No change	E.1B - Document energy consumption by energy type	No change
Not required	E.1C - Submetering and load disaggregation	Not required for small buildings
E.2	**Renewable Energy**	
No change	E.2A - supply 2% of project's total energy consumption with renewables	Levelized Cost of Energy (LCOE) calculator (predesign phase) updated with adjusted costs for small installations
Simplified	E.2B - Renewable Energy-Ready Roof or Site	For small buildings, solar-ready sites can be considered instead of solar-ready roofs
E.3	**Efficient Equipment and Appliances**	
No change	E.3A - Equipment & appliances meet Energy Star criteria	No change
Not required	E.3B - Process load equipment efficiency (FEMP)	Not required for small buildings
E.4	**Atmospheric Protection**	
No change	E.4A - Refrigerant selection using EPA SNAP guidelines	No change, though likely limited applicability based on equipment size cutoffs in guideline
No change	E.4B - Refrigerant leakage (automatic leak detection devices, inspections, etc)	No change, though likely limited applicability based on equipment size cutoffs in guideline
E.5	**EV Ready**	
No change	E.5A - Electric Vehicle Supply Equipment (EVSE) infrastructure (conduit)	No change, guideline based on number of long-term parking spots provided

Overview of B3 Small Buildings Method

Indoor Environmental Quality		
I.1	**Low-Emitting Materials**	
Simplified	I.1A - Interior Materials (green certifications)	Only required for top 5 interior materials by surface area for small buildings
No change	I.1B - Wet Applied Materials (VOC limits and chemical restrictions)	No change
Not required	I.1C - Composite Wood Products (formaldehyde restrictions)	Not required for small buildings
Not required	I.1D - New furniture and furnishings (green certifications for VOC limits)	Not required for small buildings
I.2	**Moisture and Water Control**	
No change	I.2A - Bulk water management	No change
Not required	I.2B - Moisture-safe design (Qualitative & Quantitative moisture analysis)	Not required for small buildings, but strongly recommended for projects incorporating high R-value assemblies (above code)
No change	I.2C - Moisture safe construction (blower door test/building enclosure consultant)	No change
I.3	**Ventilation**	
No change	I.3A - Outdoor air ventilation rate minimums per ASHRAE 62.1 or 62.2	No change
Not required	I.3B - Ventilation rate monitoring or yearly measurement	Not required for small buildings
Not required	I.3C - Ventilation requirements for printer/copier & chemical storage rooms	Not required for small buildings
No change	I.3D - Minimum filtration requirements	No modifications for small buildings. Revised requirement for recirculated air from MERV 8 to MERC 11 for all projects.
Not required	I.3E - Permanent entryway dust/dirt control systems	Not required for small buildings
No change	I.3F - Outdoor air intake minimum separation distances	No change
No change	I.3G - ANSI CC-1000 Soil Gas Control Systems and radon testing	No change
I.4	**Thermal Comfort**	
No change	I.4A - Passive thermal comfort (window properties and shading)	No change
Simplified	I.4B - Active thermal comfort	ASHRAE 55 compliance documentation not required for small buildings. Commissioning and occupant control requirements retained.

Overview of B3 Small Buildings Method

Indoor Environmental Quality		
I.5	**Lighting and Daylighting**	
Not required	I.5A - Meet IES lighting level and contrast guidelines	Not required for small buildings
Not required	I.5B - Bulbs provide CRI >/= 80 and RoHS compliant	Not required for small buildings
Simplified	I.5C - Daylighting levels	Daylight modeling may be replaced with an average 40% window-to-wall ratio (plus a minimum glazing visible transmittance of 0.65) for regularly occupied spaces at the building perimeter. This is combined with I.7B to ensure that most regularly occupied spaces are at the perimeter and receive adequate daylight. Requirement for controllable glare control devices is retained.
I.6	**Effective Acoustics**	
No change	I.6A - ANSI Design Requirements for classrooms and other learning spaces	No change for educational facilities, clarification that this is intended to also apply to higher education
Not required	I.6B - Exterior source noise control (OITC ratings/background noise levels)	Not required for small buildings
Simplified	I.6C - Internal source noise control (mech. noise, STC/IIC ratings, reverb time)	Only need to meet STC, IIC and prescriptive area-weighted noise reduction requirement (NRC)
No change	I.6D - Audio induction loops in gathering spaces	No change
No change	I.6E - Sound masking for spaces requiring additional sound privacy	No change
I.7	**View Space and Window Access**	
Not required	I.7A - Focal relief	Not required for small buildings
No change	I.7B - Access to vision glazing in 75% of regularly occupied spaces	No change
I.8	**Ergonomics and Physical Activity**	
No change	I.8A - Adjustable height workstations for 25%	No change, only applicable if this furniture part of the project scope
No change	I.8B - Fully Adjustable chairs for all workstation seating	No change, only applicable if this furniture part of the project scope
Not required	I.8C - Bike storage	Not required for small buildings
Not required	I.8D - Easily visible and accessible staircase within sight of main entrance	Not required for small buildings
I.9	**Wayfinding and Universal Access**	
Not required	I.9A - Lighted exterior signs for parking and building entrances	Not required for small buildings
Not required	I.9B - Lighted interior signs and route design for visitors	Not required for small buildings
No change	I.9C - Universal design principles (equitable and flexible use)	No change
No change	I.9D - Quiet use/lactation room	No change

Overview of B3 Small Buildings Method

Materials and Waste		
M.1	**Life Cycle Assessment of Materials**	
Simplified	M.1A - Whole building life cycle assessment (LCA) and embodied GWP reduction	A whole building LCA model is not required. Small buildings may demonstrate compliance using the material selection impact calculator, unless a whole building LCA model is necessary to show required embodied carbon reduction is achieved.
Not required	M.1B - Product Life Cycle Assessments	Not required for small buildings
M.2	**Environmentally Preferable Materials**	
Simplified	M.2A - Salvaged, recycled, bio-based, regional, responsibly sourced	Only required for most prevalant 5 materials by mass, volume, or cost; with the option to include additional materials if needed to achieve compliance.
M.3	**Waste Reduction and Management**	
Not required	M.3A - Material Conservation and Waste Management Plan	Not required for small buildings
No change	M.3B - Construction waste reduction	No change
M.4	**Health**	
Not required	M.4A - Materials free of likely hazardous materials	Not required for small buildings
No change	M.4B - Mercury limits in compact flourescent lamps	No change

Overview of B3 Small Buildings Method

Major Workload Reductions

Performance Management

- Commissioning scaled back to HVAC and lighting systems

Overview of B3 Small Buildings Method

Major Workload Reductions

Site and Water Guidelines

- Bird safety guidelines significantly scaled back to the average glazing threat factor calculation (if no traps, i.e. see-through conditions)

Overview of B3 Small Buildings Method

Major Workload Reductions

Energy and Atmosphere Guidelines

- SB 2030 Small Buildings Method prescriptive approach (i.e. no energy modeling)
- No submetering requirements unless required by code

Overview of B3 Small Buildings Method

Major Workload Reductions

Indoor Environmental Quality Guidelines

- Green certifications are only required for the top 5 interior materials (by surface area)
- No moisture performance analysis for enclosure assemblies
  (i.e., no WUFI modeling, Glaser analysis, or qualitative moisture analysis)
- No IES light level and contrast ratio calculations
- Daylight simulations can be replaced by WWR requirements
- Acoustic calculations significantly simplified

Overview of B3 Small Buildings Method

Major Workload Reductions

Materials and Waste Guidelines

- Whole building LCA models not required, can be replaced by Material Selection Impact Calculator
- No product-level life cycle assessment documentation required (i.e. no collecting EPDs)
- Environmentally Preferable Materials tracking only required for top 5 materials (i.e. 55% of top 5 materials must have one of the following attributes: salvaged/reused, recycled content, bio-based, responsibly sourced, regional)

Deep Dive: P.1A & P.1C: OPR and BoD

P.1A & P.1C - Owner's Project Requirements (OPR) & Basis of Design (BoD)

- Development of these documents is still required.
- However a new template is available that combines these documents into one and provides an outline structure following ASHRAE Standard 202

OPR

- Lays out the key requirements for the building's design, (including SB 2030 Energy Target)
- Describes WHAT the building is intended to do
- Drafted by the owner/owner's rep with review from commissioning agent

- Required submittal in the Predesign Phase.

BoD

- Describes the design of the project
- Intended to highlight HOW the building will meet the requirements outlined in OPR
- Drafted by the design team with review from the commissioning agent and owner

- Required submittals in the Design and Final Design phases

Deep Dive: S.5: Animal Habitat Support (Bird Safety)

Full Guidelines

S.5A Bird safety: Whole Building Threat Factor (WBTF)

S.5B Bird safety: Non-Enclosure Threat Factor (NETF)

S.5C Bird safety: High Risk Surfaces

S.5D Bird safety: traps

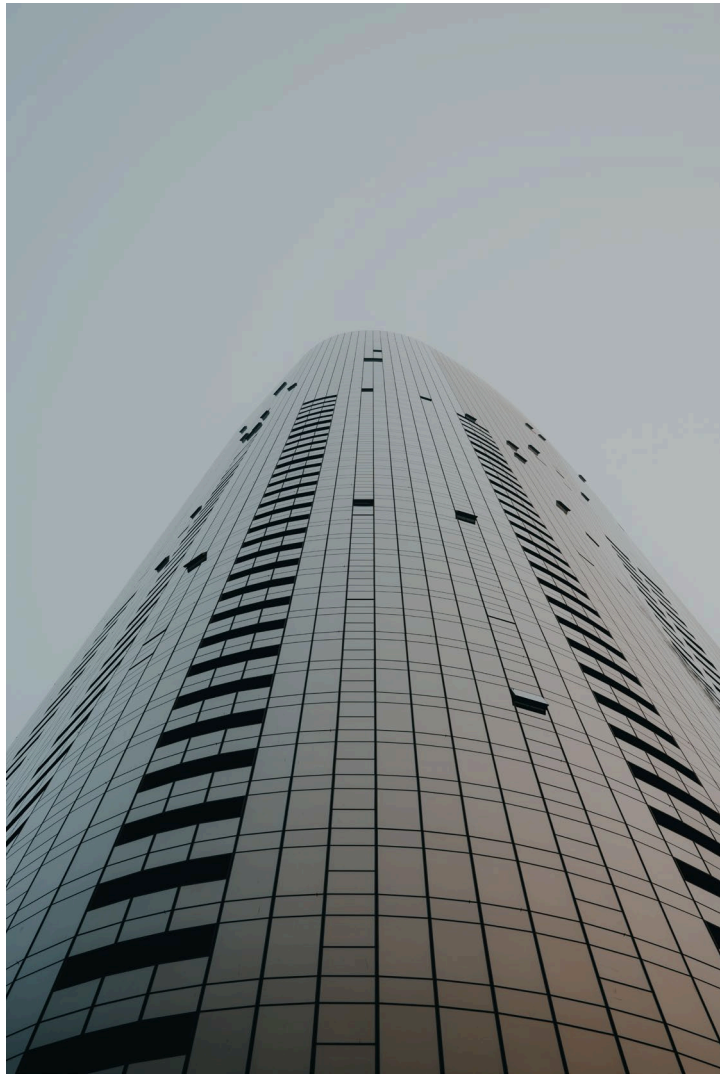
S.5EBird safety: Lights Out management procedure

S.5F Bird safety: first-year monitoring

S.5G Protection of rare, threatened, or endangered species.

S.5H Provisions for animal habitat

S.5I Aggregate illumination levels



Deep Dive: S.5: Animal Habitat Support (Bird Safety)

Projects that include less than 20,000 gsf of conditioned space that do not include any traps (e.g. skyways, corner windows, or other see-through condition less than 20 ft. across):

S.5A Bird safety: Whole Building Threat Factor (WBTF)

S.5B Bird safety: Non-Enclosure Threat Factor (NETF)

S.5C Bird safety: High Risk Surfaces

S.5D Bird safety: traps

S.5EBird safety: Lights Out management procedure

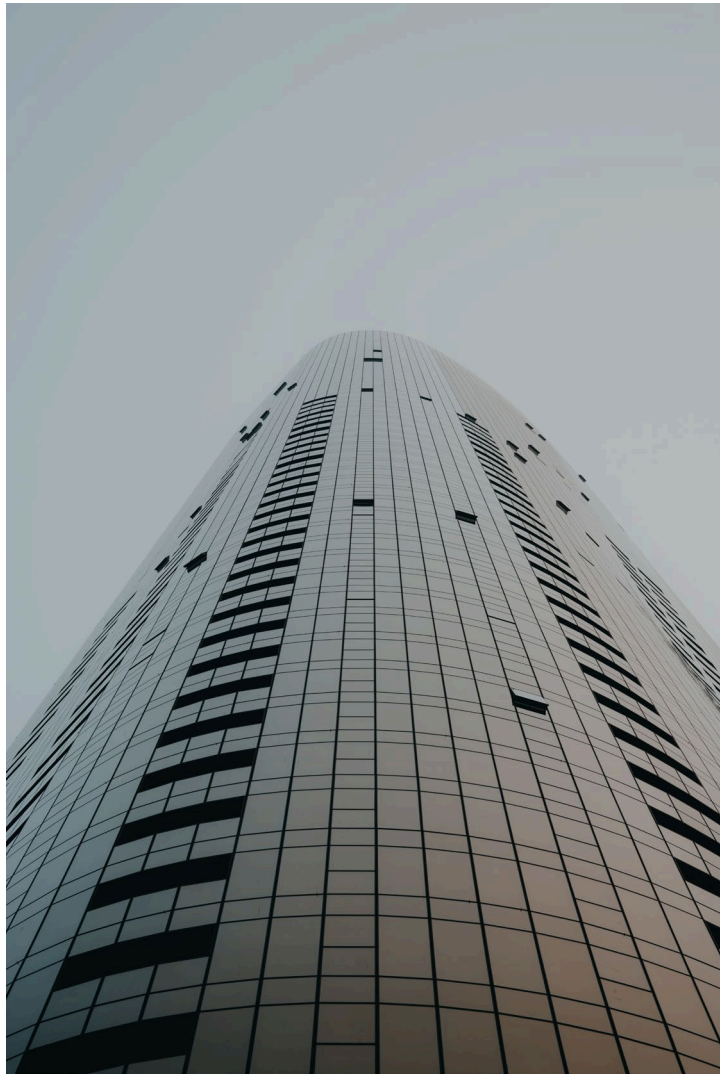
S.5F Bird safety: first-year monitoring

S.5G Protection of rare, threatened, or endangered species.

S.5H Provisions for animal habitat

S.5I Aggregate illumination levels

S.5O Average Glazing Threat Factor (New small buildings path)



Deep Dive: S.5: Animal Habitat Support (Bird Safety)

Critical bird habitats clarification (updated from prior critical sites):

Critical bird habitats include all of the following:

- Any land within a conservation easement or existing municipal, county, state parkland.
- Any land within global or state Important Bird Areas, listed at https://www.audubon.org/important-bird-areas/state/minnesota
- Any land within an intact natural community as shown on Minnesota Biological Survey maps (or identified through a NHIS Data Request response) https://www.dnr.state.mn.us/eco/mcbs/maps.html

Deep Dive: S.5: Animal Habitat Support (Bird Safety)

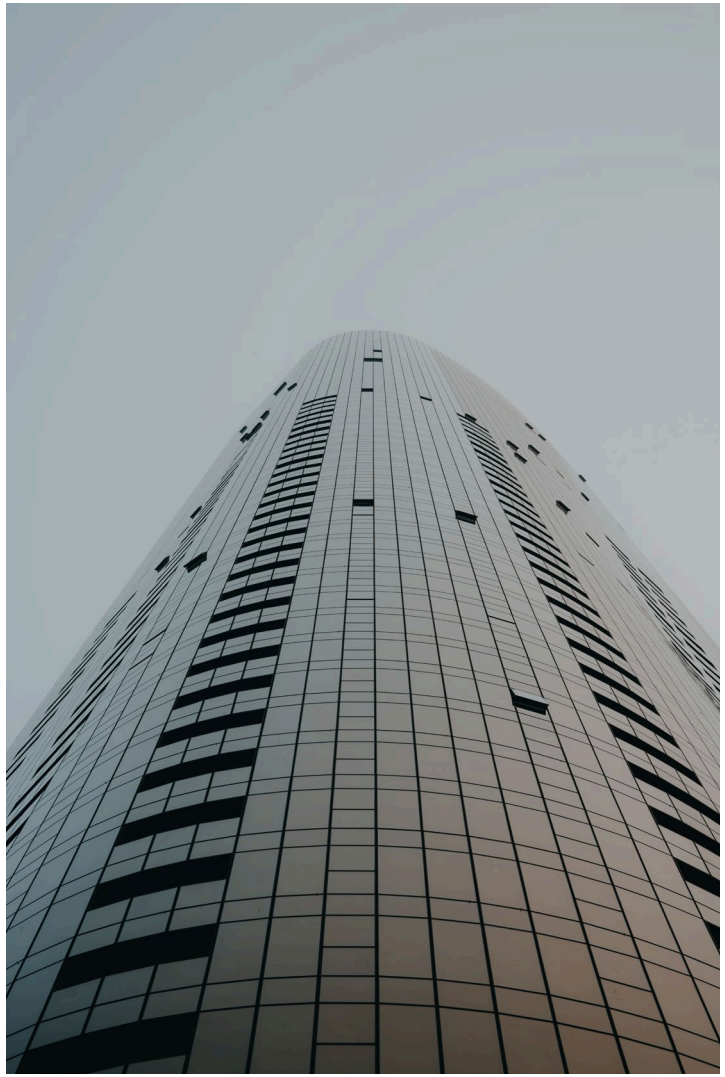
S.5O. Demonstrate that the average threat factor of glazing included in the project is less than the value listed below relative to the project's window to wall ratio (WWR):

Project's Window to wall ratio	Average glazing threat factor—maximum allowed value: not critical bird habitats	Average glazing threat factor—maximum allowed value: critical bird habitats
Less than or equal to 25%	100 (clear glass)	40
Greater than 25%, up to 35%	80	30
Greater than 35%, up to 45%	60	25
Greater than 45%, up to 55%	45	20
Greater than 55%, up to 65%	40	15
Greater than 65%, up to 75%	30	13
Greater than 75%, up to 85%	28	10
Greater than 85%, up to 100%	25	10

When calculating the window to wall ratio and the average glazing threat factor, also include glazing and vertical surfaces of the building which are not part of the enclosure if present, such as glazed railings.

A couple notes on Threat Factors

- Contact us for estimates of threat factors for products that haven't been field tested
  - Estimated based on similar products, percent opacity, and line vs dot patterns
- Films / exterior applied products achieve a compelling threat factor, considerations that have been noted:
  - Durability considerations
  - Increased flexibility of glazing options
  - Exterior application lowers the threat factor relative to surface #2 applications for the same coverage



Deep Dive: S.5: Animal Habitat Support (Bird Safety)

Questions? (post in the chat)

S.5A Bird safety: Whole Building Threat Factor (WBTF)

S.5B Bird safety: Non-Enclosure Threat Factor (NETF)

S.5C Bird safety: High Risk Surfaces

S.5D Bird safety: traps

S.5EBird safety: Lights Out management procedure

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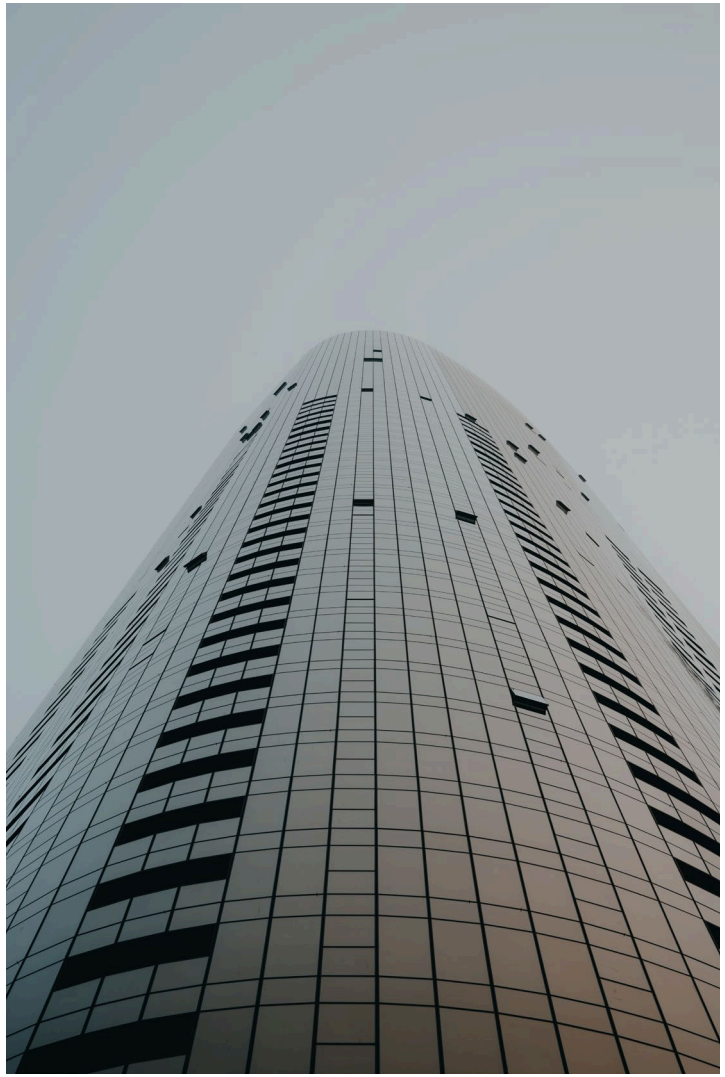


Deep Dive: E.2: Renewable Energy

E.2A – 2% Onsite Renewables

- **E.2A** - Supply 2% of project's total energy consumption with on-site renewables (solar electric, solar thermal, wind, NOT geothermal).
- This guideline is a requirement according to separate state statute. It operates somewhat independently of the SB 2030 renewable energy options, although it can contribute towards meeting the SB 2030 energy target.
- Only **on-site** renewable energy can be considered.
- Standard SB 2030 12 year payback does not apply.

Deep Dive: E.2: Renewable Energy

E.2A – 2% Onsite Renewables

- **E.2A** is still required for small buildings by state statute.
- Installation is triggered via LCOE calculator, which compares price of utility-derived electricity plus social cost of carbon to levelized cost of on-site renewable generation plus maintenance and financing costs.
- However, the assumed install costs in the predesign phase LCOE calculator are adjusted upward for small buildings, assuming smaller system sizes.

Appendix E-2a: Levelized Cost of Energy Calculator, Pre-design Phase - PV

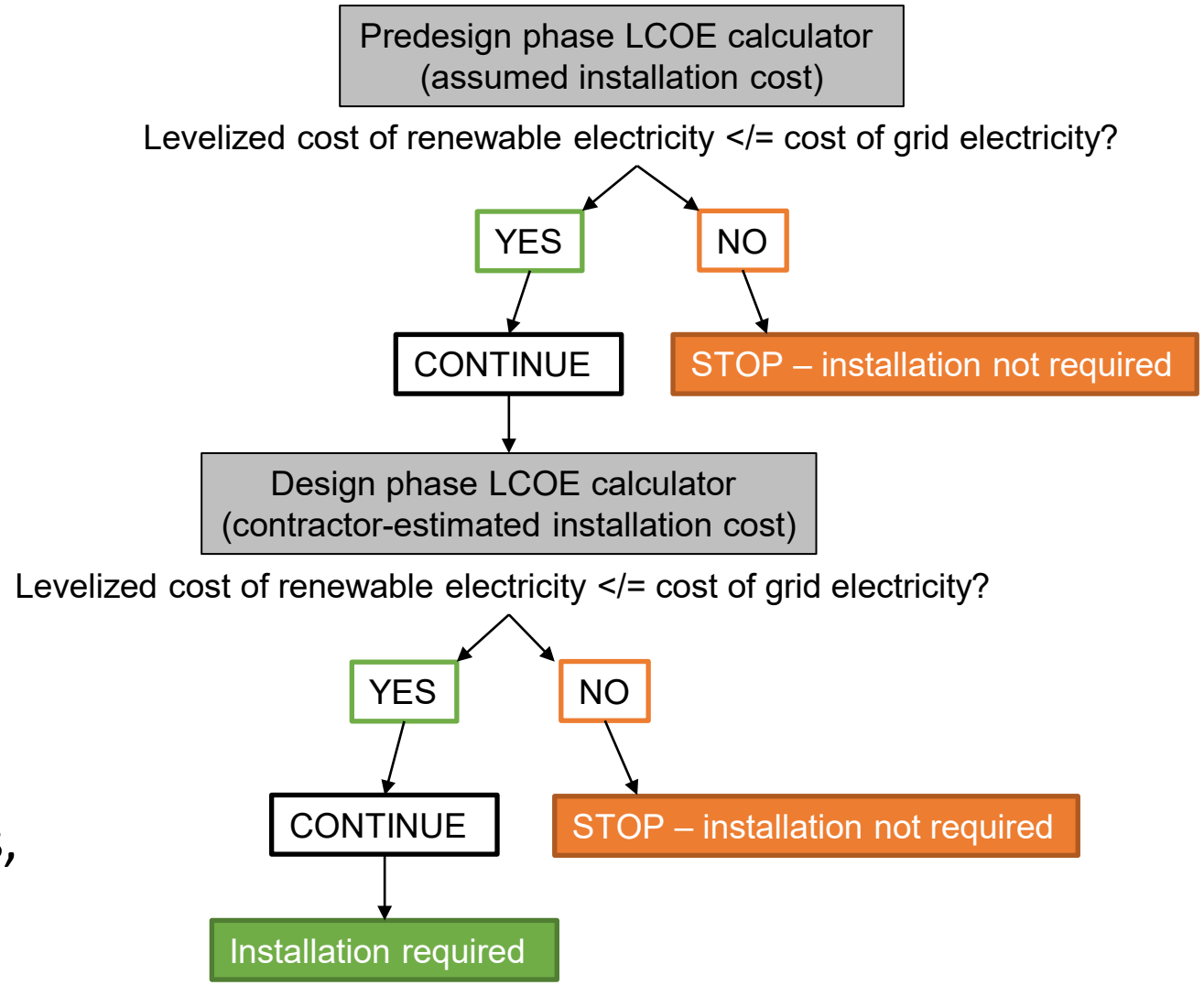
B3 Guidelines - Version 3.0

KEY:		Blue highlighted areas show constants or outputs calculated by the spreadsheet	
		Yellow highlighted areas show required inputs	
Renewable Energy Cost			
Service Life of Equipment (Years)		25	*Default 25 years*
Required Yearly Energy Production (kWh)		40,000	*(should be >/= 2% of total building energy use)*
Lifetime Production (MWh)		1,000	*Calculated*
Total Installation Cost		$190,000	*Calculated*
Installation Cost per MWh (over lifetime)		$190	*Default value = $120*
Financing Costs per MWh (over lifetime)		$0	*Usually $0 for state bonded projects*
Fuel Costs per MWh (over lifetime)		$0	*Usually $0 for renewable project*
Maintenance Costs per MWh (over lifetime)		$11.40	*Default value $11.40 from EIA Annual Energy Outlook 2015*
Total Cost/kWh		**$0.201**	
Utility-delivered Energy Cost			
Cost of kWh		$0.150	*Yearly average price from the utility*
Fees, Demand Charges and Surcharges/kWh		$0.030	
Cost of Carbon/kWh		$0.024	*Based on carbon pricing of $37/metric ton of carbon*
Total Cost/kWh		**$0.204**	
Results			
Requirement to Install Renewable Energy		Yes	

Deep Dive: E.2: Renewable Energy

E.2A – 2% Onsite Renewables

- **E.2A** is still required for small buildings by state statute.
- Installation is triggered via LCOE calculator, which compares price of utility-derived electricity plus social cost of carbon to levelized cost of on-site renewable generation plus maintenance and financing costs.
- However, the assumed install costs in the predesign phase LCOE calculator are adjusted upward for small buildings, assuming smaller system sizes.



Deep Dive: E.2: Renewable Energy

E.2B - Renewable Energy Ready Roof or Site

- **E.2B** Full Guideline prioritizes renewable-ready roof unless specific constraints limit roof viability
- Small Buildings Guideline allows renewable-ready site in lieu of roof

Deep Dive: E.2: Renewable Energy

E.2B - Renewable Energy Ready Roof or Site

- **E.2B** Renewable-ready site requirements
  1) Designated, clear area on site with unobstructed wind or solar access and outside of planned building expansion areas
  2) Stub-outs for buried conduit to designated area(s) of the site
  3) Conveniently located, accessible indoor space reserved for installation of controls and components
  4) Renewable-ready site plan
  5) Verification that local zoning regulations permit construction and use of renewable energy systems on the site

Deep Dive: E.2: Renewable Energy

E.2B - Renewable Energy Ready Roof or Site

- **E.2B** Renewable-ready site requirements
  1) Designated, clear area on site with unobstructed wind or solar access and outside of planned building expansion areas
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  4) Renewable-ready site plan
  5) Verification that local zoning regulations permit construction and use of renewable energy systems on the site

Questions? (post in the chat)

Deep Dive: I.1A Interior Materials

Full Guidelines

I.1A. Low-Emitting Materials—all within the vapor barrier of conditioned space

I.1B. Low-Emitting Wet-Applied Materials

I.1C. Low-Emitting Composite Wood Products

I.1D. Low-Emitting New Furniture

Deep Dive: I.1A Interior Materials

Small Buildings

I.1A. Low-Emitting Materials—only the 5 most prevalent by surface area

I.1B. Low-Emitting Wet-Applied Materials

I.1C. Low-Emitting Composite Wood Products

I.1D. Low-Emitting New Furniture

Deep Dive: I.1A Interior Materials

Small Buildings

I.1A. Low-Emitting Materials—only the 5 most prevalent by surface area

I.1B. Low-Emitting Wet-Applied Materials

I.1C. Low-Emitting Composite Wood Products

I.1D. Low-Emitting New Furniture

Questions? (post in the chat)

Deep Dive: I.5: Lighting & Daylighting

Full Guidelines

- I.5A – Meet IES lighting and contrast levels
- I.5B – Lamp specifications (CRI >/= 80 and RoHS compliant)
- I.5C – Daylight modeling and metrics: one of 3 options
  1) Demonstrate **spatial daylight autonomy (sDA)** for at least 50% of regularly occupied space
  2) Demonstrate daylight provides **illuminance levels** within 20% of IES recommendations for 75% of regularly occupied space at 9 a.m. and 3 p.m. on a clear-sky day at the equinox.
  3) Demonstrate **daylight factor (DF)** of 2% or greater for at least 80% of regularly occupied space

Image credit: Advanced Buildings, Daylighting Pattern Guide

Deep Dive: I.5: Lighting & Daylighting

Small Building Guidelines

- I.5A – Meet IES lighting and contrast levels
- I.5B – Lamp specifications (CRI >/= 80 and RoHS compliant)
- I.5C – Daylight modeling and metrics are replaced with documentation of adequate glazing area ratio for occupied spaces at the perimeter of the building.

    40% minimum window to wall area ratio (WWR) for all regularly occupied spaces located at the building perimeter, on average.

  The glazing used in these calculations must also have an average VT of 0.65 or higher.

Image credit: Advanced Buildings, Daylighting Pattern Guide

Deep Dive: I.5: Lighting & Daylighting

Small Building Guidelines

- I.5A – Meet IES lighting and contrast levels
- I.5B – Lamp specifications (CRI >/= 80 and RoHS compliant)
- I.5C – Daylight modeling and metrics are replaced with documentation of adequate glazing area ratio for occupied spaces at the perimeter of the building.

    Window to floor area ratio (WFAR) is also under consideration as a second compliance option at this time. TBD…

The glazing used in these calculations must also have an average VT of 0.65 or higher.

Image credit: Advanced Buildings, Daylighting Pattern Guide

Deep Dive: I.5: Lighting & Daylighting

Small Building Guidelines

Keep in mind, I.7B is still required for Small Buildings.

- I.7B - requires access to vision glazing in 75% of all regularly occupied spaces.

I.7B works in tandem with I.5C to ensure that most regularly occupied space has access to daylight.

Image credit: Advanced Buildings, Daylighting Pattern Guide

Deep Dive: I.5: Lighting & Daylighting

Small Building Guidelines

Keep in mind, I.7B is still required for Small Buildings.

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I.7B works in tandem with I.5C to ensure that most regularly occupied space has access to daylight.

Questions? (post in the chat)

Image credit: Advanced Buildings, Daylighting Pattern Guide

Deep Dive: I.6: Acoustics

Full Guidelines

I.6A. Newly constructed and renovated classrooms and other education facilities, including both spaces classified as occupancy group E and other learning spaces and facilities for students above the 12th grade must follow ANSI S12.60–2010 Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools.

I.6B Exterior-source noise control: All buildings or spaces not covered under I.6A must meet at least one of the following:

- A-weighted exterior-source background noise in regularly occupied spaces of the building shall be no greater than 45dBA
- Average Outdoor-Indoor Transmission Class (OITC) rating of facades and roof assemblies shall be at least 30, or at least 40 for sites with identified risk of significant exterior-source noise.

I.6C Internal-source noise control: For buildings or spaces not covered under I.6A:

- Air-distributed noise level from mechanical system must not exceed the following Noise Criteria (NC) levels
- Minimum Sound Transmission Class (STC), IIC requirements
- Room acoustics reverberation time or area weighted STC

I.6D Adequate acoustic conditions of gathering spaces and accommodation for hard-of-hearing:

I.7E Occupancy groups listed here are defined in the most recent version of the International Code Council's International Building Code.

Deep Dive: I.6: Acoustics

Small Building Guidelines (note that I.6A is for schools only)

I.6A. Newly constructed and renovated classrooms and other education facilities, including both spaces classified as occupancy group E and other learning spaces and facilities for students above the 12th grade must follow ANSI S12.60–2010 Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools.

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I.6D Adequate acoustic conditions of gathering spaces and accommodation for hard-of-hearing:

I.7E Implement sound masking if certain criteria are met

Deep Dive: I.6: Acoustics

I.6C Internal-source noise control: For buildings or spaces not covered under I.6A

Minimum Sound Transmission Class (STC), IIC requirements

	A	B	F	I	M	R	
A	60	60	60	60	60	60	
B	60	50	60	50	50	50	
F	60	60	60	60	60	60	
I	60	50	60	50	50	50	
M	60	50	60	50	50	50	
R	60	50	60	50	50	50	

Impact Isolation Class (IIC) of floor and ceiling assemblies separating sleeping areas or dwelling units from other sleeping areas or dwelling units or other occupancies is at least 50.

Ensure that wall, floor/ceiling assemblies separating mechanical rooms from other areas of the building achieve at least an STC rating of 50.

Deep Dive: I.6: Acoustics

I.6C Internal-source noise control: For buildings or spaces not covered under I.6A:

Room acoustics reverberation time or area weighted STC:

Calculated reverberation time as evaluated for the 500 Hz, 1000 Hz, and 2000 Hz octave bands must be no less than 0.2 seconds and no greater than 0.7 seconds. This calculation may include furnishings if included in the project.

Or

Use an area weighted NRC greater than 0.45 (or 0.35 for smaller spaces)

Deep Dive: I.6: Acoustics

Questions? (note in chat)

I.6A. Newly constructed and renovated classrooms and other education facilities, including both spaces classified as occupancy group E and other learning spaces and facilities for students above the 12th grade must follow ANSI S12.60–2010 Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools.

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- Room acoustics reverberation time or area weighted STC

I.6D Adequate acoustic conditions of gathering spaces and accommodation for hard-of-hearing:

I.7E Implement sound masking if certain criteria are met

Deep Dive: M.2A: Environmentally Preferable Materials

Full Guidelines

- At least 55% of the **total** building materials used in the project must have one of the following attributes:
  - Salvaged or reused materials and components
  - Recycled content
  - Bio-based
  - Responsible sourced
  - Regional
- Products with more than one characteristic may multiply the value by the number of characteristics

Deep Dive: M.2A: Environmentally Preferable Materials

Small Building Guidelines

- Projects may opt to demonstrate compliance with this guideline by evaluating only the most prevalent materials of the project, subject to the following:
  - The most prevalent materials shall be evaluated by mass, volume, or cost.
  - At least **five** materials must be included in this calculation.
  - Additional materials may be included in the calculation—e.g. the 7 or 10 most prevalent materials may be used
  - Materials of lower prevalence may not be included unless all materials of higher prevalence are included—e.g. the 10th most prevalent material cannot be used unless the 1st through 9th most prevalent materials are also included in this evaluation.

Deep Dive: M.2A: Environmentally Preferable Materials

Appendix M-2: Environmentally Preferable Materials

B3 Guidelines—Version 3.2

KEY:		Blue highlighted areas show constants or outputs calculated by the spreadsheet
		Yellow highlighted areas show required inputs

Quantity used (mass, volume, cost)	Mass in lbs	drop down list: choose mass, volume, or cost
Total Quantity	10000	lbs
Contributing amount	2000	lbs
Percent complying	20%	
M2A theshold met?	No	55% necessary for compliance

Fill out the columns below with an X for each criteria satisfied - leave blank if criteria not met

Material Name[1]	Contributing Material Quantity in lbs	Salvaged or Reused	Recycled content	Recyclable	Bio-Based	Responsibly Sourced	Regional	Amount contributing to threshold	Unit
Material 1	1000	x		x				2000	lbs
Material 2								0	
Material 3								0	
Material 4								0	
Material 5								0	
Material 6								0	
Material 7								0	
Material 8								0	
Material 9								0	
Material 10								0	
Material 11								0	

- Include total quantity of most prevalent 5+ materials only, not total materials in project
- Mass, volume, or cost-based

Deep Dive: M.2A: Environmentally Preferable Materials

Small Building Guidelines

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Questions (post in chat)

Questions

Additional thoughts, comments from today's training?

Contact us:

Pat Smith—patsmith@umn.edu

Rolf Jacobson—jaco0630@umn.edu

Thanks!