



FSEC Energy Research Center

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Comparison of the 2023 Commercial Florida Building Code, Energy Conservation, 8th Edition with 2021 IECC & ASHRAE 90.1-2019

Draft Interim Report

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Summary

The State of Florida desired to conduct a qualitative and quantitative comparative analysis of commercial provisions of the 8th Edition (2023) Florida Building Code, Energy Conservation (FBCEC) against IECC-2021 and ASHRAE 90.1-2019. The primary tasks of the project include:

- Review and compare the 2023 FBCEC against 2021 IECC and 2019 ASHRAE 90.1
- Identify and list code changes with an energy impact
- Conduct quantitative analysis of the 2023 FBCEC, 2021 IECC, and 2019 ASHRAE 90.1 and determine the relative energy use performances of the codes

For this purpose, the 2023 FBCEC, the 2021 IECC, and the 2019 ASHRAE 90.1 code changes were reviewed, code changes with energy impact were identified, and code changes excluded from the 2023 FBCEC were also identified. The code change review, comparison, and identification of the most impactful listing tasks are complete. The details of the listing of the code changes with energy impact, along with a brief description of each code change, are provided in this interim report.

The quantitative analysis and relative energy use performance comparison involves updating the commercial prototype building energy models based on the published code changes. There are sixteen commercial prototype building energy models each for the IECC and ASHRAE 90.1-based compliance options of the 2023 FBCEC, the 2021 IECC, and the 2019 ASHRAE 90.1 codes for climate zones 1A and 2A. These prototype building energy models are currently updated. The update covers the IECC and ASHRAE 90.1 code bases and the two Florida climate zones. The quantitative analysis task is in progress.

1. Introduction

The State of Florida desired to conduct a qualitative and quantitative comparative analysis of commercial provisions of the 8th Edition (2023) Florida Building Code, Energy Conservation (FBCEC) against IECC-2021 and ASHRAE 90.1-2019. For this purpose, the 2023 FBCEC, the 2021 IECC, and the 2019 ASHRAE 90.1 code changes were reviewed, and code changes with energy impact were identified. This interim report describes the progress made thus far.

Code Changes Qualitative Analysis:

- Comparison of the 2023 FBCEC and the 2021 IECC
- Identifying the 2021 IECC changes excluded from the 2023 FBCEC
- Comparison of the 2023 FBCEC ASHRAE compliance option and the 2019 ASHRAE 90.1
- Identifying and listing code changes with energy impact

Reviewed and compared the IECC-based 8th Edition (2023) FBCEC and the 2021 IECC and identified the code modifications with energy impact included in the 8th Edition (2023) FBCEC. Identified code changes with energy impact that are part of the 2021 IECC but excluded from the 2023 FBCEC. A brief description of each code modification with energy impact included in the 2023 FBCEC is summarized in [Appendix-A](#).

Also reviewed and compared the ASHRAE-based 8th Edition (2023) FBCEC and the 2019 ASHRAE 90.1 code. Identified code changes with energy impact and listed the changes excluded from the 2023 FBCEC. A brief description of each of the code changes of the 2019 ASHRAE Standard 90.1 is listed in [Appendix-B](#). The qualitative analysis tasks are complete and are summarized in Sections 2 and 3.

Energy Performance Analysis:

The quantitative and relative energy use performance analysis involves updating commercial prototype building energy models for the IECC and ASHRAE 90.1-based compliance options of the 2023 FBCEC, the 2021 IECC, and the 2019 ASHRAE 90.1 codes for climate zone 1A and 2A. Sixteen commercial prototype building energy models for each climate zone represent each of the four codes. These prototype building energy models are currently updated based on the published code changes, and the quantitative analysis is in progress. The final report will analyze the energy use intensity and energy cost index comparative analysis and quantify the relative energy performance of the 2023 FBCEC codes against the 2021 IECC and the 2019 ASHRAE Standard 90.1.

2. The 2023 FBCEC Qualitative Comparison with IECC-2021

The 8th Edition (2023) FBCEC code changes were reviewed and compared with the IECC-based 7th Edition (2020) FBCEC and the 2021 IECC. The Florida Building Commission approved 101 code modifications and included them in the IECC-based 2023 FBCEC. A summary of the code change distribution by section is shown in Table 1.

Table 1 Distribution of Code Modifications Included in the 2023 FBCEC

Commercial Code Section	Code Changes, Count
Chapter C1: Scope and Administration	3
Chapter C2: Definitions	11
Chapter C3: General Requirements	2
Chapter C4: Commercial Energy Efficiency	81
Chapter C5: Existing Buildings	3
Appendix CC: Electric Vehicle Charging Provisions For New Commercial Construction	1
Total	101

The IECC-based 2023 FBCEC change review identified twenty-five code modifications with energy impact, and fourteen will be quantitatively analyzed. A brief description of each code change with Energy impact included in the 8th Edition (2023) FBCEC relative to the 2020 FBCEC is summarized in Table A-1 of [Appendix-A](#). This table also identifies whether a code change is included in the quantitative analysis.

The quantitative analysis is intended to compare the 8th Edition (2023) FBCEC against the 2021 IECC. Thus, the review identified code changes with energy impact between the 2021 IECC and 2018 IECC and excluded modifications from the 2023 FBCEC. The code changes listed in Table 2 are those with energy impact included in the 2021 IECC but excluded from the 8th Edition (2023) FBCEC. The excluded code changes are expected to adversely impact the relative energy performance of the IECC-based 2023 FBCEC.

Table 2 Code Changes with Energy Impact Excluded from 2023 FBCEC

2021 IECC Section and Title	ICC Code Change No.	Include in the 2021 IECC Quantitative Analysis, Yes/No	Description
Table C402.1.4 Opaque Thermal Envelope Assembly Maximum Requirements, <i>U</i> -Factor Method, C402.5.1 Opaque swinging doors	CE70-19	Yes	Decreases opaque swinging door <i>U</i> -Factor from 0.61 to 0.37 Btu/h-ft ² -°F. Impacts fourteen prototype buildings in climate zones 1A and 2A.
Table C402.4 Building Envelope Fenestration Maximum <i>U</i> -Factor and SHGC Requirements	CE84-19, CE85-19, CE87-19	Yes	It reduced SHGC and <i>U</i> -Factor of fenestrations in all sixteen prototype buildings in climate zones 1A and 2A.
C405.2.4.2 Sidelit daylight zone	CE187-19	Yes	Adds secondary sidelit area control requirements. Impacts thirteen prototype buildings.
C405.11 Automatic Receptacle Control, C405.11.1 Automatic receptacle control function	CE216-19	Yes	Applies reduction factors to the plug load schedules to account for automatic receptacle control. Impacts all sixteen prototype buildings.
C403.7.4.1 Nontransient dwelling units	CE133-19	Yes	Adds ERV requirement for the non-transient dwelling units. Impacts high-rise and mid-rise apartment prototype buildings.
C406.1 Additional energy efficiency credit requirements	CE218-19 CE226-19 CE237-19 CE239-19 CE240-19	No	Renames the title and revises section C406.1. Now, new buildings must achieve a total of 10 credits from new Tables C406.1(1) through C406.1(5) depending on the building use group and climate zone using credit calculations as specified in relevant subsections of C406 where a building complies with one or more of the prescribed additional efficiency options in sections C406.2 through C406.12.

C406.1.1 Tenant spaces		No	<p>Revises the compliance requirement with new predetermined credits by building group and climate zone.</p> <p>The revised code requires tenant spaces to comply with sufficient options from Tables C406.1(1) through C406.1(5) to achieve a minimum number of 5 credits, where credits are selected from Sections C406.2, C406.3, C406.4, C406.6, or C406.7. Where the entire building complies using credits from Section C406.5, C406.8, or C406.9, tenant spaces within the building must comply with this section.</p>
C406.2 More efficient HVAC equipment performance	CE113-19 CE218-19 CE226-19 CE240-19	No	<p>Reorganize the section and revise the code language such that equipment must exceed the minimum efficiency requirements listed in Section C403.3.2 and required to comply with the new sub-sections C406.2.1, C406.2.2, C406.2.3, or C406.2.4. Energy efficiency credits for heating must be selected from C406.2.1 or C406.2.3, and energy efficiency credits for cooling must be selected from C406.2.2, C406.2.4, or C406.2.5. Selected credits must include a heating or cooling efficiency credit or both.</p>
C406.2.1 Five percent heating efficiency improvement			<p>Adds new sub-section that equipment must exceed the minimum heating efficiency requirements by 5 percent.</p>
C406.2.2 Five percent cooling efficiency improvement			<p>Adds new sub-section that equipment must exceed the minimum cooling and heat rejection efficiency requirements by 5 percent.</p>
C406.2.3 Ten percent heating efficiency improvement			<p>Adds new sub-section that equipment must exceed the minimum heating efficiency requirements by 10 percent.</p>

C406.2.4 Ten percent cooling efficiency improvement			Adds new sub-section that equipment must exceed the minimum cooling and heat rejection efficiency requirements by 10 percent.
C406.2.5 More than ten percent cooling efficiency improvement			Adds a new section that requires equipment to exceed the minimum annual cooling and heat rejection efficiency requirements by more than 10 percent, determined using Equation 4-12.
C406.3 Reduced lighting power			Revises the code such that buildings must comply with Section C406.3.1 or C406.3.2, and dwelling units and sleeping units within the building must comply with Section C406.3.3.
C406.3.1 Reduced lighting power by more than 10 percent			Adds new sub-section. The total connected interior lighting power calculated per Section C405.3.1 must be less than 90% of the total lighting power allowance calculated per Section C405.3.2.
C406.3.2 Reduced lighting power by more than 15 percent	CE226-19	No	Adds new sub-section. Where the total connected interior lighting power calculated per Section C405.3.1 is less than 85% of the entire lighting power allowance calculated per Section C405.3.2, additional energy efficiency credits are determined per Equation 4-13.
C406.3.3 Lamp efficacy			Adds new sub-section. Not less than 95% of the interior lighting power from lamps in permanently installed light fixtures in dwelling units and sleeping units must be provided by lamps with a minimum efficacy of 65 lumens per watt.
C406.5 On-site renewable energy	CE218-19 CE226-19 CE240-19	No	Re-organizes the section by adding two new sub-sections. Now, buildings must comply with Section C406.5.1 or C406.5.2.

C406.5.1 Basic renewable credit			Adds new sub-section. Creates renewable credit Section C406.5.1 that requires reduced total minimum ratings of on-site renewable energy systems that do not include Section C406.7.2 and must comply with either of (1) not less than 0.86 Btu/h/ft ² of conditioned floor area or (2) not less than 2% of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Section C405.
C406.5.2 Enhanced Renewable Credits			Adds a new sub-section that requires the total minimum ratings of on-site renewable energy systems to exceed the rating in C406.5.1 and the additional energy efficiency credits determined using Equation 4-14.
C406.7 Reduced energy use in service water heating			Adds new section. Buildings must comply with sub-sections C406.7.1 through C406.7.4.
C406.7.1 Building Type	CE218-19 CE226-19 CE240-19	No	Re-numbers section C406.7 edits the title and revises the code language. To qualify for this credit, the building must contain one of the building use groups defined in this section, and the additional energy efficiency credit must be prorated by the conditioned floor area of the portion of these building use groups in the building.
C406.7.2 Recovered or renewable water heating			Renumbers section C406.7.1, edit the title, and revise the code language. Revises the code provision that the building service water heating system must be sized to provide not less than 30% of the building's annual hot water requirements or sized to provide 70% of the building's annual hot water requirements.

C406.7.3 Efficient fossil fuel water heater			Adds a new section requiring the combined average equipment rating of all building fossil fuel water heating equipment to be at least 95% Et or 0.95 EF. This option receives only half the listed credits for buildings required to comply with C404.2.1.
C406.7.4 Heat pump water heater			Adds new section that requires all SHW system heating requirements to be met using heat pump technology with a combined average EF of 3.0 where electric resistance water heaters are allowed and air-source heat pump water heaters must not draw conditioned air from within the building except air exhausted to the exterior.
C406.10 Energy Monitoring	CE237-19	No	Adds a new section that buildings must be equipped to measure, monitor, record, and report energy consumption data in compliance with sub-sections C406.10.1 through C406.10.5.
C406.11 Fault detection and diagnostics system	CE239-19	No	A new section fault detection and diagnostics system must be installed to monitor the HVAC system's performance and automatically identify faults.
C406.12 Efficient Kitchen Equipment	CE240-19	No	A new section requires buildings and spaces designated as Group A-2 or facilities that include a commercial kitchen must comply with (1) performance levels listed in Tables C406.12(1) through C406.12(4) for commercial appliances, (2) appliances must be installed before the issuance of the certificate of occupancy, and (3) performance levels must match the values on the construction documents submitted for permitting.

3. The 2023 FBCEC Qualitative Comparison with ASHRAE 90.1-2019

The qualitative comparison is based on the code addenda published in informative appendix I of the 2019 ASHRAE Standard 90.1. Furthermore, the qualitative analysis identified which changes result in increased or decreased energy use. This section summarizes the code changes based on the review of the addenda to ASHRAE 90.1-2016 (ASHRAE, 2016) and compares the previous (ASHRAE, 2016) and current (ASHRAE, 2019) of ASHRAE Standard 90.1. Table 3 summarizes the number of changes by code sections and those changes that directly impact building energy use.

Table 3 Number of code changes addenda to ASHRAE Standard 90.1-2016

Section	Number of Addenda	Number of Addenda with Energy Impact
3. Definitions, Abbreviations, and Acronyms	4	-
4. Administration and Enforcement	4	-
5. Building Envelope	6	1
6. Heating Ventilation and Air Conditioning	33	20
7. Service Water Heating	1	1
8. Power	-	-
9. Lighting	10	7
10. Other Equipment	1	1
11. Energy Cost Budget Method	5	1
12. Normative References	2	-
13. Appendices A – G	22	4
Total	88	35

There are eighty-eight code changes included in the 2019 ASHRAE Standard 90.1. Of the eighty-eight additions, thirty-five were identified to have an energy use impact. Twenty of the thirty-five changes were identified as suitable for the quantitative analysis using a building energy simulation program. The twenty changes will be quantitatively analyzed to determine the 2019 ASHRAE 90.1 code change on energy impact. A brief description of each addendum with energy impact is summarized in Table B-1 of [Appendix-B](#). The 8th Edition (2023) FBCEC excludes Sections 8.4.2 Automatic Receptacle Control, 8.4.3 Electrical Energy Monitoring, and 9.4.1.1(g) Automatic Partial OFF from the 2019 ASHRAE Standard 90.1.

References:

ASHRAE 2019. ANSI/ASHRAE/IES Standard 90.1-2019 -- Energy Standard for Buildings Except Low-Rise Residential Buildings. 1791 Tullie Circle NE., Atlanta, GA 30329.

ASHRAE 2016. ASHRAE 2016. ANSI/ASHRAE/IES Standard 90.1-2016 -- Energy Standard for Buildings Except Low-Rise Residential Buildings. 1791 Tullie Circle NE., Atlanta, GA 30329.

FBCEC-2023. Florida Building Code, Energy Conservation, 8th Edition (2023). ISBN: 978-1-960701-27-5 (PDF download). International Code Council, Inc. July 2023.

FBCEC-2020. Florida Building Code, Energy Conservation, 7th Edition (2020). ISBN: 978-1-952468-17-9. International Code Council, Inc. July 2020.

IECC-2021. 2021 International Energy Conservation Code. ISBN: 978-1-60983-961-1 (Soft-cover edition). International Code Council, Inc. January 2021.

Complete Revision History to the 2021 I-Codes. 2020. International Code Council, Inc. <http://shop.iccsafe.org/codes/2018-international-codes-and-references/2018-international-building-code-and-references/complete-revision-history-to-the-2018-i-codes-successful-changes-and-public-comments-pdf-download.html>.

Appendix-A: Commercial 2023 IECC Based FBCEC Changes Summary

The commercial 8th Edition (2023) Florida Building Code Energy Conservation (FBCEC) changes with respect to the 7th Edition (2020) FBCEC are summarized in Table A-1. This table has six columns defined as follows:

2023 FBCEC Section and Title: This is the code Section and title for the 2023 FBCEC.

ICC Code Change No: Proposed code change number in the ICC's *Complete Revision History to the 2021 I-Codes* document.

Change Summary b/t 2020 FBCEC and 2023 FBCEC: A brief description of the code change between the 2020 FBCEC and 2023 IECC.

Anticipated Energy Impact on FBCEC: Anticipated energy use impact from the code change. This is usually a decrease in energy use, an increase in energy use, or none. "None" means the code change has no or negligible impact on energy use.

Included in quantitative Analysis: if the energy impact can be predicted using whole building simulation programs and DOE reference prototype buildings. This is "Yes" or "No". "Yes" means the energy impact can be predicted using a building energy simulation program. "No" means building an energy simulation program cannot determine the effect on energy use.

Discussion: describes how the change impacts the quantitative analysis, the prototype buildings affected, and why the change is not included in the quantitative analysis.

Table A-1: Commercial Code Change Summary Between 7th Edition (2020) FBCEC vs. 8th Edition (2023) FBCEC

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
Chapter C4: Commercial Energy Efficiency					
C402.1.1 Low-energy buildings and greenhouses	CE56-19	Modifies the title by adding “Greenhouses.” Greenhouses are still exempted if they are low energy use. Moves exception item #3 to a new subsection, C402.1.1.1.	None	No	There is no prototype building with greenhouse space; hence, it is not included in the quantitative analysis.
C402.1.1.1 Greenhouses		Adds new sub-section C402.1.1.1. Greenhouse structures or areas that are mechanically heated or cooled and comply with exterior opaque envelope assemblies sections C402.2 and C402.4.5, interior partition building thermal envelope assemblies that separate the greenhouse from conditioned space comply with sections C402.2, C402.4.3 and C402.4.5, and fenestration assemblies that comply with Table C402.1.1.1 is exempted from the building envelope requirement of this code. Unconditioned greenhouses are exempted.	Decreases	No	There is no prototype building with greenhouse space; hence, it will not be included in the quantitative analysis.
C402.1.2 Equipment buildings	CE58-19	Reduces the stringency by increasing the separate buildings' floor area maximum limit from 600 to 1200 ft ² for exemption from the thermal envelope requirement of this code.	Increase	No	There is no prototype building with a separate building block; hence, it will not be included in the quantitative analysis.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
Table C402.1.4 Opaque Thermal Envelope Assembly Maximum Requirements, <i>U</i> -Factor Method	CE61-19 CE73-19	Decreases the roof <i>U</i> -Factor of metal buildings to U-0.035 from U-0.044 for climate zone 1 to make it consistent with the R-value in Table C402.1.3.	Decrease	Yes	Impacts warehouse prototype building only; hence, it is included in the quantitative analysis.
C402.5.1.2 Air barrier compliance	CE96-19 CE97-19 CE97-19	Revises the continuous air barrier testing requirements for opaque building envelope and provides three compliance options by adding buildings' thermal envelope performance testing requirements. Buildings in Group R and Group I occupancies must meet provisions of section C402.5.1.2.1 or C402.5.1.2.2; buildings other than Group R and Group I occupancies must meet either the new thermal envelope performance testing provisions of section C402.5.1.2.3 or meet the requirements of section C402.5.1.2.1 or C402.5.1.2.2. The thermal envelope performance testing requirement has three new exceptions depending on the building's floor area and climate zones. <ul style="list-style-type: none"> 1. Buildings in Climate Zones 2B, 3B, 3C, and 5C. 2. Buildings larger than 5000 ft² floor area in Climate Zones 0B, 1, 2A, 4B, and 4C. 3. Buildings between 5000 and 50,000 ft² floor area in Climate Zones 0A, 3A and 5B. 	Decrease	No	<p>For FBCEC, buildings other than group R and group I occupancy and larger than 5000 ft² floor area are exempted from envelope air leakage testing requirements.</p> <p>This change is an air leakage measurement requirement option. There is no impact on any prototype building models; hence, it is not included in the quantitative analysis.</p>

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C402.5.1.2.3 Building thermal envelope testing		<p>Adds new sub-section C402.5.1.2.3.</p> <p>Building thermal envelope must be tested per ASTM E779, ANSI/RESNET/ICC 380, or ASTM E1827 or an equivalent method approved by the code official. The measured air leakage must not exceed 0.40 cfm/ft² at a pressure differential of 0.3-inch water gauge (75 Pa).</p> <p>Where the measured air leakage rate is > 0.4 cfm/ft² and < 0.6 cfm/ft², a diagnostic test is conducted using a smoke tracer or infrared imaging, leaks are sealed, and an additional report identifying the corrective actions taken to seal leaks is submitted to code official and the building owner is considered to comply this section.</p>	Decrease	No	This is an air leakage measurement performance testing requirement. There is no impact on any prototype buildings; hence, it is not included in the quantitative analysis.
C402.5.11 Operable openings interlocking	CE106-19	<p>Adds new mandatory section C402.5.11.</p> <p>For occupants utilizing operable openings towards the outdoors that are larger than 40 square feet in area, such openings must be interlocked with the heating and cooling system to raise the cooling set-point to 90°F and lower the heating set-point to 55°F within 10 minutes of opening the operable opening.</p>	Decrease	Yes	Thermostat cooling and heating set-points were reset for about 10 minutes based on the detected infiltration rate due to door opening using the EMS program. Impacts hotel and apartment prototype buildings.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C403.3.2 HVAC equipment performance requirements	CE113-19	<p>Revised this section's code language and footnotes for clarity and updated efficiency values in Tables C403.2.3(1) through C403.2.3(8) per the federal minimum efficiency requirements.</p> <p>Reorganized, substantially revised Tables C403.2.3(9) and C403.2.3(11), and updates minimum efficiency.</p> <p>Adds minimum efficiency requirement for new HVAC equipment in tables C403.2.3(12) through C403.2.3(17).</p> <p>Introduces new efficiency metrics SEER2 and HSPF2 for unitary air conditioners and heat pumps with a capacity less than 65kBtu/h effective as of 01/01/2023.</p>	Decreases in most equipment	Yes	<p>Some of the 2020 FBCEC equipment efficiency tables are equivalent; some already have higher efficiency requirements, and some have lower efficiency requirements.</p> <p>The update added six new tables, including indoor pool dehumidifiers, DOAS units without energy recovery, DOAS units with energy recovery, water source HPs, HP and heat reclaim chiller packages, and ceiling-mounted CRACs.</p> <p>Efficiency upgrade impacts all sixteen prototype buildings in climate zones 1A and 2A; hence, it is included in the quantitative analysis.</p>

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C403.4.4.5 Supply-air temperature reset controls	CE125-19	<p>Adds clarifications on how the supply air temperature (SAT) reset is applied.</p> <p>The change allows controls that adjust the reset based on zone humidity in Climate Zones 0B, 1B, 2B, 3B, 3C, and 4 through 8.</p> <p>Revises existing exemptions: Systems in Climate Zones 0A, 1A, and 3A with less than 3000 cfm of design outside air.</p> <p>Adds two new exemptions: (1) Systems in Climate Zone 2A with less than 10,000 cfm of design outside air. (2) Systems in Climate Zones 0A, 1A, 2A, and 3A with not less than 80% outside air and employing exhaust air <i>energy</i> recovery complying with Section C403.2.7.</p>	Decrease	Yes	<p>This code revision provides design Flexibility in Florida climate zones. SAT reset may not be required for some prototype buildings because of the change in the design airflow threshold. This change sometimes decreases the stringency.</p> <p>Supply air temperature reset impacts six prototype buildings: <i>A large Office, primary school, secondary school, outpatient healthcare, hospital, and a large hotel</i> in Climate Zone 1A only.</p>
C403.4.4.5.1 Dehumidification control interaction		<p>Adds new sub-section C403.6.5.1, which says that in climate zones 0A, 1A, 2A, and 3A, the system design must allow supply-air temperature reset while the dehumidification is provided. When dehumidification is active, the air economizer must be locked out.</p>	Decreases	No	<p>The change may sometimes increase energy use for some system designs.</p> <p>This change may impact the large office, large hotel, and hospital prototype building models. It is being investigated.</p>

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C403.2.4.8.1 Temperature setpoint controls	CE135-19	<p>Unrented and unoccupied guest room mode must be initiated within 16 hours of the guest room being continuously occupied or where a networked guestroom control system indicates that the guestroom is unrented and unoccupied for more than 20 minutes.</p> <p>Modifies the code provision that guestroom HVAC controls must be capable of and configured with three modes of temperature control:</p> <p>(1) When the guest room is rented but unoccupied, the controls must automatically raise the cooling set-point and lower the heating set-point by $\geq 4^{\circ}\text{F}$ (2°C) within 30 minutes after the occupants have left the guest room.</p> <p>(2) When the guest room is unrented and unoccupied, the controls must automatically raise the cooling set point to $\geq 80^{\circ}\text{F}$ (27°C) and lower the heating set point to $\leq 60^{\circ}\text{F}$ (16°C).</p> <p>(3) When the guest room is occupied, HVAC set points must return to their occupied set points once occupancy is sensed.</p>	Decrease	Yes	Reduced the cut-off or reset time from 30 to 20 minutes. The change impacts large and small hotel prototype buildings, which is included in the quantitative analysis.
C403.2.4.8.2 Ventilation controls	CE135-19	The time-out period for unoccupied guestroom indication was reduced from 30 to 20 minutes for consistency between HVAC and the lighting control in Section C405.2.1.1.	Decrease	Yes	It impacts large and small hotel prototype buildings. Hence, it is included in the quantitative analysis.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C403.2.6.2 Enclosed parking garage ventilation controls	CE129-19	<p>Replaces “contaminant sensing devices” with “carbon monoxide and nitrogen dioxide detectors.”</p> <p>Reduces the exhaust fan flow threshold for the enclosed parking garage to 8000 cfm from 22,500 cfm and requires using occupant sensors to activate the full rate of ventilation needed.</p>	Decrease	No	There is no prototype building with an enclosed parking garage. Hence, the change is not included in the quantitative analysis.
C403.2.12.7 Low-capacity ventilation fans	CE140-19	<p>Adds new section C403.2.12.7 Low-capacity ventilation fans.</p> <p>This new code provision requires that mechanical ventilation system fans with motors less than 1/12 horsepower in capacity must meet the efficacy of Table C403.2.12.7.</p> <p>This provision is exempted where ventilation fans are a component of a listed heating or cooling appliance or when part of a dryer exhaust duct power ventilators, domestic range hoods, and domestic range booster fans that operate intermittently.</p> <p>Adds new Table C403.2.12.7. Minimum efficiency requirements for low-capacity ventilation fans.</p>	Decrease	Yes	Impacts in Out-Patient HealthCare prototype buildings only. The total efficiency of several low-capacity zone exhausts meeting the criteria was updated.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C403.4.2.3.3 Two-position valve	CE122-19	Revised the section that each hydronic heat pump on the hydronic system having a total pump system power exceeding 10 hp (7.5 kW) must have a two-position “automatic” valve, and the value must be “interlocked with the compressor to shut off the water flow when the compressor is off.”	Decrease	No	This code change is a clarification. There is no impact on the prototype buildings; hence, it is not included in the quantitative analysis.
C403.4.2.4 Part-load controls		<p>Hydronic systems control requirement stringency increases by reducing the heated or chilled water design output capacity threshold to 300 kBtu/h from 500 kBtu/h.</p> <p>Reduces the minimum combined motor capacity to 2 hp from 10 hp with three or more control valves or other devices for automatically varying fluid flow by at least 50% for hydronic systems.</p> <p>Also, it reduces the minimum combined motor capacity to 2 hp from 10 hp for automatically varying pump flow by at least 50% on heating-water systems, chilled-water systems, and heat rejection loops serving water-cooled unitary air conditioners.</p>	Decrease	No	Chilled and hot water plant loop pumps already use variable speed drives. There is no need to update the prototype buildings impacted by this change.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C404.2.1 High input service water-heating systems	CE156-19	Increases service hot water systems minimum efficiency to 92% from 90% for a singular piece of water-heating equipment that serves the entire building whose rated capacity is 1.0 MBtu/h or larger. There is no minimum efficiency requirement change for multiple-service hot water equipment.	Decrease	No	This requirement is not a typical design, and none of the prototype buildings has this large capacity; hence, it is not included in the quantitative analysis.
C405.2.1.1 Occupant sensor control function	CE167-19 CE169-19	Adds a code provision that occupant sensor controls in <i>corridor</i> spaces must comply with a new section C405.2.1.4. Modified an exception that full automatic-on controls with no manual control are allowed in <i>corridors, interior parking areas, stairways, restrooms, locker rooms, lobbies, library stacks, and areas</i> where the manual operation would endanger occupant safety or security.	Decrease	Yes	Impacts eight prototype buildings: <i>Primary School, Secondary School, Out-Patient Health Care, Hospital, Small Hotel, Large Hotel, Mid-Rise Apartment, and High-Rise Apartment.</i> The occupancy sensor impact on interior lighting control is modeled by adjusting the hourly schedule fraction values of the corridor space lighting.
C405.2.1 Occupant sensor controls	CE169-19	Adds “Corridor” space type to the list of space types where occupant <i>sensor controls</i> must be installed to control lights. Adds new exceptions; luminaires requiring specific application controls per section C405.2.5 are exempted from occupancy sensor-based light control.	Decrease	Yes	It is already included in Section C4052.1.1 analysis.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C405.2.1.4 Occupant sensor control function in corridors	CE169-19	<p>Adds new section C405.2.1.4</p> <p>Occupant sensor controls in corridor spaces must uniformly reduce lighting power to an unoccupied set point not exceeding 50 % of full power within 20 minutes after all occupants have left the space.</p> <p>Exception: Corridor spaces designed with less than 2-foot candles of illumination on the floor at the darkest point with all lights on are exempted.</p>	Decrease	Yes	This is already included in the Section C405.2.1.1 analysis. Occupancy sensor impact on lighting control is modeled by adjusting the corridor space lighting hourly schedule fraction values.
C405.2.4.1 Daylight-responsive control function	CE170-19	<p>Renumbers section and updates referenced code section due to section renumbering.</p> <p>Adds a new requirement item #6; when occupant sensor controls have reduced the lighting power to an unoccupied set point per sections C405.2.1.2 through C405.2.1.4, daylight responsive controls must continue to adjust electric light levels in response to available daylight, but must be configured not to increase the lighting power above the specified unoccupied set point.</p>	Decrease	No	No impact on the prototype buildings.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C405.2.1.3 Occupant sensor control function in open plan office areas	CE171-19	General lighting in each control zone shall be permitted to turn on upon occupancy within the control zone automatically. <i>General lighting</i> in other unoccupied zones within the open-plan office space must be allowed to turn on to not more than 20 percent of full power or remain unaffected. General lighting in each control zone shall turn off or uniformly reduce lighting power to an unoccupied set point of not more than 20 percent of full power within 20 minutes after all occupants have left the control zone.	None	No	This clarifies the control requirement—no impact on the prototype buildings.
C405.2.4.1 Daylight-responsive control function	CE185-19	<p><i>Daylight responsive controls</i> must dim lights continuously from full light output to 15 percent of full light output or lower in all <i>space types</i>. This change expands daylight-responsive controls to all space types. Previously, it was limited to offices, classrooms, laboratories, and library reading rooms.</p> <p>When occupant sensor controls have reduced the lighting power to an unoccupied set point per Sections C405.2.1.2 through C405.2.1.4, daylight-responsive controls must continue to adjust electric light levels in response to available daylight. They must be configured not to increase the lighting power above the specified unoccupied set point.</p>	Decrease	Yes	Impacts thirteen prototype buildings: small office, medium office, large office, standalone retail, strip mall primary school, secondary school, outpatient healthcare, hospital small hotel, large hotel, warehouse, fast food restaurant, and sit-down restaurant.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
C405.2.4.2 Sidelit zone	CE192-19	Renumbers the section and updates referenced code sections due to section renumbering. Adds two new requirements: (1) A new provision for sidelit daylight zone area calculation when the fenestration is located in a rooftop monitor by moving it from the toplit zone section. (2) Requires overhang projection factor limits depending on fenestration orientation.	None	No	Secondary sidelit area control is not required in the 2023 FBCEC; hence, it is not included in the quantitative analysis.
C405.2.8 Parking Garage Lighting Control	CE199-19	Adds new Section C405.2.8. Adds multiple control requirements for parking garage lighting: an automatic time-switch reduces lighting by 30% when no activity is detected, lighting power reduction in transition zones at night, and automatic reduction of lighting near perimeter openings and fenestration in response to daylights. Adds three automatic lighting control exemptions at perimeter wall openings in response to daylight.	Decrease	No	There are no prototype buildings with parking garages. It will not be included in the quantitative analysis.
Table C405.3.2(1) Interior Lighting Power Allowances: Building Area Method	CE206-19	Updates the interior lighting power allowances table for the building area method. Reduces the LPD values for all building types except for the automotive facility, exercise center, library, parking garage, and workshop.	Decrease	Yes	Reduces lighting power allowance using the building area method in the three offices and part of the warehouse prototype buildings.

2023 FBCEC Section and Title	ICC Code Change No.	Change Summary b/t 2020 FBCEC and 2023 FBCEC	Anticipated Energy Impact on FBCEC	Included in quantitative Analysis	Discussion Summary
Table C405.3.2(2) Interior Lighting Power Allowances: Space-by-Space Method	CE208-19	Updates the interior lighting power allowances table for the space-by-space method. Reduces the LPD values for almost all space types.	Decrease	Yes	Reduces lighting power allowance using the space-by-space method. Impacts all prototype buildings except the three office prototype buildings.
C405.9 Lighting for plant growth and maintenance (Mandatory)	CE209-19	Adds “mandatory” new section. This new mandatory section requires that at least 95 % of the permanently installed luminaires used for plant growth and maintenance must have a minimum photon efficiency of 1.6 $\mu\text{mol}/\text{J}$ per ANSI/ASABE S640 standards. Adds new reference standard ASABE S640-2017.	Decrease	No	There are no prototype buildings with a plant growth block; hence, it will not be included in the quantitative analysis.
C405.8.2.1 Energy Recovery (Mandatory)	CE213-19	Renames the section “ <i>Energy recovery</i> ” and designates it as mandatory. They revised the code language that escalators must be designed to recover electrical energy when resisting over-speed in the down direction regardless of the load.	Decrease	No	There are no prototype buildings with an escalator; hence, it will not be included in the quantitative analysis.

Appendix-B: Commercial 2023 ASHRAE-Based FBCEC Changes Summary

ASHRAE Standard 90.1-2019 changes with respect to ASHRAE Standard 90.1-2016 are summarized in Table B-1. This table has six columns and is defined as follows:

Addendum: This is the code change addenda for the ASHRAE Standard 90.1-2019.

Code Sections Affected: This is the ID of the proposed code change defined in the 2016 ASHRAE 90.1 addenda. This code number is used to identify the history of the code change.

Code Change Summary b/t ASHRAE 90.1-2016 and ASHRAE 90.1-2019: A brief description of the code change between the 2016 ASHRAE Standard 90.1 and the 2019 ASHRAE Standard 90.1.

Anticipated Energy Impact on FBCEC if Adopted: Energy use impact from the code change. This is usually a decrease in energy use, an increase in energy use, or none. None means the code change has no or negligible impact on energy use.

Included in quantitative Analysis: if the energy impact can be predicted using whole building simulation programs and DOE reference prototype buildings. This is “Yes” or “No”. “Yes” means the energy impact can be analyzed using a building energy simulation program. “No” means a simulation program cannot determine the effect on energy use.

Discussion: describes how the change impacts the implementation in the quantitative analysis, the prototype buildings are impacted, and why the quantitative analysis is included.

Table B-1: Commercial Code Change Summary for ASHRAE 90.1-2016 vs. ASHRAE 90.1-2019

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2016 and ASHRAE 90.1-2019	Anticipated Energy Impact on FBCEC if Adopted*	Included in quantitative Analysis	Discussion
3. Definitions, Abbreviations, and Acronyms					
4. Administration and Enforcement					
aw	3.2; Tables 5.5-0 through 5.5-8, 5.8.2.5, 12	<p>Revises the fenestration prescriptive criteria in Tables 5.5-0 through 5.5-8.</p> <p>Fenestration classification is now material neutral and instead grouped into “fixed”, “operable”, and “entrance door” categories. The SHGC is slightly stringent across all types due to glass quality improvement. The U-factor stringency depends on the fenestration framing material. It is tougher for metal framing products and less stringent for wood framing fenestration.</p>	Decrease	Yes	Improves thermal performance of most fenestration products. Impacts all prototype buildings.
6. Heating, Ventilating, and Air Conditioning					
a	6.4.3.3.3, 6.3.3.4.2, 6.5.1.1.4	<p>Changes term “ventilation air” to “outdoor air” in multiple locations. Revises tables and footnotes. Clarifies requirements for economizer return dampers.</p> <p>Changes term "ventilation air" to "outdoor air" in multiple locations. Adds an exception to allow systems intended to operate continuously, not to install motorized outdoor air damper. Changes return air dampers to require low leakage ratings.</p>	Decrease	Yes	Reduces fan energy by allowing systems intended to operate continuously, not to install motorized outdoor air damper (less pressure drop), and reduces cooling energy for systems with air economizers because of lower leakage through return air dampers.

g	3.2, 6.3.2, 6.5.3.8	<p>Defines “occupied-standby mode” and adds new ventilation air requirements for zones served in <i>occupied-standby mode</i>. Adds new definition.</p> <p>Unoccupied space doesn’t need to be ventilated per standard 62.1 when room air temperature is within the allowed limits. Reduces ventilation air requirements to zero and setbacks cooling and heating thermostats by at least 1°F for zones served in <i>occupied standby mode</i>. Also, this change ties the HVAC control to the lighting control requirement in section 9.4.1.1.</p>	Decrease	Yes	Impacts high and medium-rise apartments, offices, outpatient healthcare, and schools prototype buildings.
h	6.5.6.1, 6.5.6.1.1	Exhaust air energy recovery systems should be sized to meet heating and cooling design conditions unless one mode is not required for the climate zone by existing exceptions.	Decrease	Yes	Impacts prototype buildings with ERVs.
j	6.4.3.8	<p>Revises the exception to demand control ventilation (DCV) requirements to clarify that the exception only applies to systems with ERV required to meet Section 6.5.6.1.</p> <p>Reduces HVAC energy by preventing a bad design practice of using ERVs rather than DCVs in climate zones where ERVs are not required, and DCVs would save more energy.</p>	Decrease	No	It is not a typical design; hence, it is excluded from quantitative analysis.
k	3.2, 6.4.3.3.5	<p>Revises “networked guest room control system” definition and aligns HVAC and lighting timeout periods for guest rooms.</p> <p>Reduces the HVAC timeout period from 30 to 20 minutes to match the 20-minute timeout period for lighting control.</p>	Decrease	Yes	Impacts prototype buildings, small and large hotels.

v	6.5.6.3	<p>Adds section 6.5.6.3 containing heat recovery requirements for space conditioning in acute inpatient hospitals. Adds new sub-section.</p> <p>Heat recovery chillers are required in acute inpatient hospitals where the building operates 24 hours, the chilled water system rated capacity is greater than 300 tons, uses simultaneous heats and cools above 60°F, and the heat recovery chiller cooling capacity is greater than 7% of chilled water system rated design capacity. This section has exceptions depending on on-site recovered or generated energy and climate zones.</p>	Decrease	Yes	It is included in the quantitative analysis. The change impacts hospital prototype building.
ai	3.2, 4.2.5, 5.2.9, 6.7.2.4, 9.4.3, 5.9 through 10.9, 11.2	Reorganizes commissioning and functional testing requirements in all sections of Standard 90.1 to require verification for smaller and simpler buildings and commissioning for larger and more complex buildings. This change is a clarification.	Decrease	No	Excluded from the quantitative analysis because it cannot be modeled.
am	6.5.6.4	Adds an indoor pool dehumidifier energy recovery requirement in new section 6.5.6.4. Requires 50% energy recovery efficiency for indoor pool dehumidifier energy recovery.	Decrease	No	It is excluded from the quantitative analysis because the prototype buildings do not have an indoor pool.
ao	3.2; 6.5.3.1.3;	<p>Introduces the revised fan product efficiency requirement Fan Energy Index (FEI) and complements the fan power limitation in section 6.5.3.1.1.</p> <p>FEI is DOE's new fan efficiency metric that better represents fan energy use performance.</p>	Decrease	No	It does not apply to the model input.

ap	6.5.3.5	<p>Revises supply air temperature reset controls.</p> <p>Applies supply air temperature reset strategy. This code change will bring up to a 5°F supply temperature difference reduction depending on outdoor air temperature or load. This code requirement has exemptions depending on climate zone and system design outdoor air flow rate.</p>	Decrease	Yes	Impacts large offices, large hotels, hospital, outpatient healthcare, and schools prototype buildings.
au	6.5.2.1	<p>Eliminates the requirement that zones with DDC have air flow rates that are no more than 20% of the zone design peak flow rate.</p> <p>Zone reheated air flow rate can be a ventilation requirement per ASHRAE Standard 62.1 instead of 20% of the peak flow rate.</p>	Decrease	Yes	Impacts prototype buildings: Medium Office, Large Office, Primary School, Secondary School, OutPatient Health Care, and Large Hotel.
ay	3.2, 6.5.6	<p>Provides separate requirements for nontransient dwelling unit exhaust air energy recovery.</p> <p>New section 6.5.6.1.1 Nontransient Dwelling Units.</p> <p>Requires exhaust energy recovery at least 50% efficiency for cooling and 60% for heating for non-transient dwelling units (apartments and condos four-story and higher).</p>	Decrease	Yes	Impacts the non-transient Dwelling Units in High and Medium Rise Apartment prototype buildings.
bd	Table 6.8.1-16	<p>Adds the minimum efficiency requirements of Heat Pump and Heat Reclaim Chiller Packages.</p> <p>Adds minimum efficiency requirement for Heat Pump and Heat Reclaim Chiller Packages as a new HVAC equipment category.</p>	Decrease	Yes	Impacts hospital prototype building.
be	6.4.1.1; Table 6.8.1-10, 6.8.1-17	<p>Revises the minimum efficiency requirements for Computer Room air conditioners.</p> <p>Upgrades the minimum efficiency requirement based on federal minimum efficiency.</p>	Decrease	Yes	Requires higher efficiency CRAC—impacts building with computer rooms and air conditioners.

bl	Table 6.8.1-1	Revises Table 6.8.1-1 Electrically Operated Unitary Air Conditioners and Condensing Units—Minimum Efficiency Requirements. Upgrades the minimum efficiency requirement based on federal minimum efficiency.	Decrease	Yes	
bm	Table 6.8.1-2, 6.8.1-15	Revises Table 6.8.1-2 Electrically Operated Air Cooled Unitary Heat Pumps—Minimum Efficiency Requirements. Adds Table 6.8.1-15. Upgrades the minimum efficiency requirement based on federal minimum efficiency.	Decrease	Yes	
bn	3.2, Table 6.8.1-4, Table F3	Revises Table 6.8.1-4 Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps—Minimum Efficiency Requirements. Adds Table F-3. Upgrades the minimum efficiency requirement based on federal minimum efficiency.	Decrease	Yes	
bo	3; Table 6.8.1-5; Table F-4	Revises Table 6.8.1-5 Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters—Minimum Efficiency Requirements and adds Table F-4 Residential Warm Air Furnaces – Minimum Efficiency Requirements for sale in the US. (see 10 CFR Part 430). Upgrades the minimum efficiency requirement based on federal minimum efficiency.	Decrease	Yes	Impacts prototype buildings with this equipment depending on the capacity.

bp	Table 6.8.1-6; Table F-5	Revises Table 6.8.1.6 – Gas and Oil-Fired Boilers – Minimum Efficiency Requirements and adds Table F-5 - Residential Boiler Minimum Efficiency Requirements for applications in the US (Refer to 10 CFR 430). Upgrades the minimum efficiency requirement based on federal minimum efficiency.	Decrease	Yes	Impacts prototype buildings with boilers.
bq	Table 6.8.1-7; 12	Revises Table 6.8.1-7 Performance Requirements for Heat Rejection Equipment—Minimum Efficiency Requirements. Upgrades the minimum efficiency requirement of some heat rejection equipment categories based on federal minimum efficiency.	Decrease	Yes	Requires higher efficiency dry cooler.
br	Table 6.8.1-11	Revises the previous Tables 6.8.1-12 & 13 and combines them into Table 6.8.1-11 Commercial Refrigerators, Commercial Freezers and Refrigeration—Minimum Efficiency Requirements. Updates the efficiencies levels.	Decrease	No	They were excluded from the quantitative analysis because they are federally regulated.
cm	6.5.2.1	Revises exceptions related to DDC-enabled zones. Removes exception 2(a), which exempts when the minimum supply air flow rate is less than 25% of the peak design flow rate. This code change makes the section consistent with the addenda “ao”.	Decrease	Yes	Similar to Addendum au. Impacts prototype buildings: Medium Office, Large Office, Primary School, Secondary School, Out Patient Health Care, and Large Hotel.
cn	6.4, 6.4.1.1, 6.4.5m Tables 6.8.1-18,19, & 20.	Cleans up outdated language regarding walk-in cooler and walk-in freezer requirements, and make the requirements consistent with current federal regulations that either already came into effect June 5, 2017, or will go into effect July 10, 2020. Adds new section 6.4.5(m) and Tables 6.8.1-18, -19, and -20. It makes the code consistent with federal minimum requirements.	Decrease	No	This change is a clarification.

7. Service Water Heating					
bs	Table 7.8; F2; Table F-2	Revises Table 7.8 Performance Requirements for Water-Heating Equipment—Minimum Efficiency Requirements and Table F-2 Minimum Energy Efficiency Requirements for Water Heaters.	Decrease	No	They were excluded from the quantitative analysis. The selected equipment efficiency upgrade does not impact prototype buildings.
8. Power					
	8.4.2	The 2023 FBCEC excludes Section 8.4.2 Automatic receptacle control.	Increase	Yes	High Rise Apartment, Med Rise Apartment Hospital, Large Hotel, Small Hotel, Large Office, Medium Office, Small Office, Outpatient HealthCare, Restaurant Fast Food, Restaurant Sit Down, Retail Standalone, Primary School, Secondary School, and Warehouse.
	8.4.3	The 2023 FBCEC excludes Section 8.4.3 of Electrical energy monitoring.	Increase	No	Energy monitoring cannot be included in the quantitative analysis.
9. Lighting					
bg (formerly addendum bg to 90.1-2013)	9.2, 9.3 9.3.1, 9.3.2 Tables 9.3.1-1, 9.3.1-2, 9.3.1-3, and 9.3.2	Adds a new Simplified Building Method Compliance Path for interior lights in offices, schools, retail buildings, and exterior lights. This is a simpler and faster lighting compliance method applicable when at least 80% of the floor area is used for office, school, or retail buildings. The method is used in new construction, additions, or alterations with a floor area of less than 25,000 ft ² . Interior and exterior wattage allowances shall be calculated and complied with separately. All interior	Decrease	No	It provides flexibility for designers but will not impact the prototype buildings. Excluded from quantitative analysis because the exceptions are not used by typical designs as represented by the prototypes.

		lights are counted. The LPD is lower than that of the space-by-space method.			
t	9.4.2, Table 9.4.2-2	It expands the exterior LPD application table to cover additional exterior spaces that are not currently in the exterior LPD table. Non-typical exterior lighting area applications that are not listed in Table 9.4.2 can be covered by this change. Interior LPDs from Table 9.4.1 are reduced and applied to exterior lighting applications not listed in Table 9.4.2.	Decrease	No	It is excluded from the quantitative analysis. Prototype buildings do not have non-typical exterior lighting applications.
aq	9.1.1, 9.2.2.3, 9.4.1.1, 9.4.1.3, 9.4.4, 9.6.2	Clarifies lighting control requirements for applications not covered in Section 9.6.2, the space-by-space method. Clarifies the lighting control requirements for lighting (special) applications not explicitly covered in Table 9.6.1 and aligns them to mandatory control provisions in 9.4.1.	None	No	This is clarification. Needs prototype building models specification check.
bb	Table 9.6.1	Revises the lighting power densities for the Space-by-Space method. The space-by-space method LPDs, on average, were reduced from the 2016 version. Lobby/Hotel reduced from 1.06 to 0.51, Guestroom decreased from 0.77 to 0.41, Classroom reduced from 0.92 to 0.71, Parking area interior increased from 0.14 to 0.15.	Decrease	Yes	It is included in the quantitative analysis depending on the prototype buildings. Impacts all prototype buildings except the three office buildings.
cg	Table 9.5.1	Revises Table 9.5.1 Lighting Power Density Allowances Using the Building Area Method. On average, the building area method LPDs were reduced from the 2016 version. Office reduced from 0.79 to 0.64, Hotel/Motel reduced from 0.75 to 0.56, Retail reduced from 1.06 to 0.84, Warehouse reduced from 0.48 to 0.45.	Decrease	Yes	It is included in the quantitative analysis depending on the prototype buildings. Impacts the three office and warehouse prototype buildings.

cv	9.4.1.2	<p>Updates lighting control requirements for parking garages in section 9.4.1.2. Increases the stringency of lighting control in parking garages:</p> <ul style="list-style-type: none"> Reduces lighting power input from 30% to 50% when no activity Reduces the timeout period from 20 to 10 minutes <p>Continuous daylight dimming down to 50% for luminaires within 20ft of the wall opening.</p>	Decrease	No	It is excluded from quantitative analysis because the prototype buildings do not have parking garages.
cw	9.4.1.1(e), 9.4.1.1(f)	Revises the daylight responsiveness requirements to continuous dimming for sidelight and toplit daylighting controls by (1) eliminating step dimming, (2) using continuous dimming limit set to 20% or less or off, and (3) controlling daylights to unoccupied setpoint when needed.	Decrease	Yes	Impacts prototype buildings with daylighting control, such as small, medium, and large offices, schools, etc.
dn	6.5.6	Modifies exceptions to exhaust air energy recovery requirements.	Decrease	No	Not part of prototype buildings.
	9.4.1.1(g)	The 2023 FBCEC excludes Section 9.4.1.1(g) Automatic partial OFF. The <i>general lighting</i> power in the <i>space</i> must be <i>automatically</i> reduced by at least 50% within 20 minutes of all occupants leaving the <i>space</i> .	Increase	No	<p>Impacts some space types in ten prototype buildings: Large Office, Medium Office, Small Office, Restaurant Fast Food, Restaurant Sit Down, Retail Standalone, Retail Strip Mall, Primary School, Secondary School, and Warehouse.</p> <p>Automatic Full-Off control will be used in the analysis of the 2023 FBCEC.</p>
10. Other Equipment					

an	3.2, 10.4.7, Table 10.8-6; 12; Appendix E	Provides a new table (Table 10.8-6) of information about the new efficiency requirements for commercial and industrial clean water pumps. It also offers new definitions that are needed to accompany the table. Adds new section 10.4.7 and defines Pump Efficiency Index (PEI).	Decrease	No	It is not a prototype building's model input; hence, it is excluded from the quantitative analysis.
11. Energy Cost Budget Method					
bk	3.2, 11.4.3.2, G2.4.2	Clarifies that such projects must model the same electricity generation system in the baseline and proposed design and align with the interpretation IC 90.1- 2013-16 of ANSI/ASHRAE/IES STANDARD 90.1-2013 from January 21, 2018. If the proposed building has on-site electric generation (e.g., CHP or Fuel Cell), the baseline must include the same generation system but no recovered heat.	Decrease	No	It is excluded from the quantitative analysis because the prototype buildings do not include on-site electric generators.
12. Normative References					
co	12	Adds new normative references and updates existing ones with new effective dates, including several addenda to ASHRAE Standard 62.1-2016, which enables Simplified Ventilation Procedure. Updates to include references to addendum <i>f</i> to 62.1-2016, which enables Simplified Ventilation Procedure to be used for VAV box minimum setpoint controls and system ventilation control.	None	No	It updates references with new effective dates and adds some new references.
Appendix: A through G, and I					
bx	3.2, A6.1, A6.3	Appendix A adds heated slab F-factors for multiple under-slab and perimeter insulation combinations. Adds Table A6.3.1-1 and Table A6.3.1-2.	Decrease	No	Additional factors for condition combinations are not currently covered and do not change requirements.

ba	Table G3.1-1 Table G3.1-11	<p>Establishes a methodology for determining the baseline flow rates on projects where service water heating is demonstrated to be reduced by water conservation measures that reduce the physical volume of service water required.</p> <p>Establishes how the baseline is determined when allowed to differ from the proposed design, but the baseline values are unspecified (SWH load, cooking equipment, laboratory equipment, etc.):</p> <ul style="list-style-type: none"> • Use the prescriptive requirement • Use other applicable standards 	Decrease	No	It is not included in the quantitative analysis. This feature may be considered beyond code building design.
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