FSEC Energy Research Center

UNIVERSITY OF CENTRAL FLORIDA

Comparison of the 2023 Commercial Florida Building Code, Energy Conservation, 8th Edition with 2024 IECC & ASHRAE 90.1-2022

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Executive 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-2024 and ASHRAE 90.1-2022. The primary tasks included in this interim report are:

- Review and compare the 2023 FBCEC against 2022 ASHRAE 90.1
- Identify and list code changes with an energy impact
- Conduct a preliminary analysis of the ASHRAE 90.1-based 2023 FBCEC and 2022 ASHRAE 90.1 and determine the relative energy use performances of the codes

For this purpose, a review of the ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE 90.1 code changes was conducted. This review identified code changes with energy impact and code section excluded from the 2023 FBCEC. The ASHRAE 90.1-based 2023 FBECE change review, comparison, and identification of the most impactful listing tasks are complete. The details of the listing of the ASHRAE 90.1 code changes with and without energy impact and a brief description of each code change are summarized in Appendix A. The ASHRAE 90.1-2022 changes review identified eighty-eight code modifications. Twenty-nine of the eighty-eight code modifications have energy impacts, of which fifteen were quantitatively analyzed.

A preliminary energy use performance analysis of the ASHRAE 90.1-based 2023 FBCEC, and the 2022 ASHRAE 90.1 U.S. National Building Energy Code was conducted. The comparative analysis was conducted using modified DOE commercial prototype building energy models. Sixteen commercial prototype building energy models for each climate zone and code base were used in the analysis. EnergyPlus, a whole-building energy simulation program, was used to analyze those energy-impactful changes quantitatively.

The annual site Energy Utilization Intensity (EUI) of the ASHRAE 90.1-based 2023 FBCEC and ASHRAE 90.1-2022 code by prototype building types were determined and are shown in Table I. The annual site EUI aggregated across the sixteen prototype buildings was 45.47 kBtu/ft^2-yr and 40.95 kBtu/ft^2-yr for the ASHRAE 90.1-Based 2023 FBCEC and the 2022 ASHRAE 90.1 code, respectively. The ASHRAE 90.1-based 2023 FBCEC weighted average energy use was higher by about 9.94 percent due to the exclusion of Section 8.4.2 Automatic receptacle control and Section 9.4.1.1(g) Automatic partial-off interior lighting control, and due to the fifteen energy impactful code modification added to the 2022 ASHRAE 90.1 code. The analysis demonstrates that the ASHRAE 90.1-based 2023 FBCEC needs to catch up with the latest 2022 ASHRAE Standard 90.1 U.S. National Building energy code if equivalency is desired.

Table-I Florida Average Site EUI of the ASHRAE 90.1 Building Energy Code

	ASHRAE 90.1-Based 2023 FBCEC, kBtu/ft^2-yr	ASHRAE 90.1-2022, kBtu/ft^2-yr	Difference, %
Florida Average	45.47	40.95	9.94

Acknowledgments

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Acronyms and Abbreviations

ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
DOE	U.S. Department of Energy
ECI	Annual Energy Cost Index, $/(ft^2-yr)
EUI	Annual Energy Utilization Intensity, kBtu/(ft^2-yr)
FBCEC	Florida Building Code, Energy Conservation
FBCEC-2023	2023 Florida Building Code, Energy Conservation
FSEC	Florida Solar Energy Center
HVAC	Heating, ventilation, and air-conditioning
IES	Illuminating Engineering Society of North America
IECC	International Energy Conservation Code
PNNL	Pacific Northwest National Laboratory

Simulation Prototype Terminology

IECC-Based 2023 FBCEC	is a building energy model designed to simulate the 8th Edition (2023) FBCEC, which is IECC-based.
ASHRAE 90.1-Based *2023* FBCEC	is a building input designed to simulate the 8th Edition (2023) FBCEC, the 2019 ASHRAE Standard 90.1 compliance option.
ASHRAE 90.1-2019	is a building energy model that simulates the 2019 ASHRAE standard 90.1.
ASHRAE 90.1-2022	is a building energy model that simulates the 2022 ASHRAE standard 90.1.

Contents

List of Figures

List of Tables

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 the 2024-IECC and the 2022-ASHRAE 90.1. This interim report only summarizes the code changes between the ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE 90.1. The ASHRAE 90.1-based 2023 FBCEC is a modified version of the 2019 ASHRAE 90.1. The changes between the IECC-based 2023 FBCEC and the 2024-IECC were not reviewed, as the latter has yet to be published. This interim report reviewed the changes between the ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE 90.1, identified code changes with energy impact and determined the energy use performance using simulation. This report summarizes the progress made thus far.

Code Changes Qualitative Analysis:

- Review and compare the code changes between the ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE Standards 90.1
- Provide code change listing and identifying changes with energy impact

Reviewed and compared the ASHRAE 90.1-based 8th Edition (2023) FBCEC and the 2022 ASHRAE 90.1 code, the latest U.S. National Building Energy Code. Identified code changes with energy impact and those excluded from the ASHRAE 90.1-based 2023 FBCEC. A brief description of each of the 2022 ASHRAE Standard 90.1 code changes is listed in Appendix A. The IECC-based 2023 FBCEC and the 2024-IECC qualitative and quantitative comparison have yet to start due to delays in the 2024 IECC publication.

Code Change Quantitative Analysis:

FSEC conducted a preliminary energy use comparative analysis of the ASHRAE 90.1-based compliance options of the 2023 FBCEC and the 2022 ASHRAE 90.1 for climate zones 1A and 2A. Each code base and climate zone is represented using sixteen commercial prototype building energy models. These prototype building energy models were created by modifying the DOE/PNNL prototype building model energy codes. The ASHRAE 90.1-based 2023 FBCEC is a modified 2019 ASHRAE 90.1 code that excludes Sections 8.4.2, 8.4.3, and 9.4.1.1(g). A preliminary comparative energy use analysis between the ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE 90.1 code is summarized in Section 4.

Reviewing the IECC-2024 changes, identifying the changes with energy impact, and conducting cost-benefit analysis tasks resume when the 2024 IECC is available.

2. The 2023 FBCEC Qualitative Comparison with 2024 IECC

The 8th Edition (2023) FBCEC code was not compared with the 2024-IECC as the latter has yet to be officially published.

3. The 2023 ASHRAE-Based Florida Building Energy Code

Qualitative analysis of code changes is performed for every code development cycle. The qualitative analysis is performed based on the code addenda published in informative appendix M of the 2022 ASHRAE Standard 90.1 (ASHRAE, 2022) and the addenda forward published on the ASHRAE website[1]. Furthermore, the qualitative analysis identifies which code changes impact energy use. Appendix A briefly describes each code change, indicating whether they have energy impacts and should be included in the quantitative analysis. Table 1 summarizes the number of changes by code section and those that directly impact building energy use.

Table 1 Code changes addenda to ASHRAE Standard 90.1-2019

Section	Number of Addenda	Number of Addenda with Energy Impact
3. Purpose and Scope	1	-
4. Definitions, Abbreviations, and Acronyms	2	-
5. Administration and Enforcement	4	-
6. Building Envelope	6	2
7. Heating Ventilation and Air Conditioning	29	9
8. Service Water Heating	1	1
9. Power	3	-
10. Lighting	13	12
11. Other Equipment	3	3
12. Additional Efficiency Requirements	1	1
13. Energy Cost Budget Method	10	1
14. Normative References	1	-
15. Appendices A – M	14	0
Total	88	29

ASHRAE Standard 90.1-2022 includes eighty-eight code change addenda. Twenty-nine of the addenda were identified to impact energy use. Fifteen of the twenty-nine addenda items were identified as suitable for quantitative analysis using a building energy simulation program. These fifteen addenda items were quantitatively analyzed to determine the ASHRAE 90.1-2022 code's energy impact on the State building energy code and compared with the 2023 (8th Edition)

[1] https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda/addenda-to-standard-90-1-2019

Florida Building Code, Energy Conservation. The 8th Edition (2023) Florida Building Code, Energy Conservation, excludes Sections 8.4.2, 8.4.3, and 9.4.1.1(g) of the 2019 ASHRAE Standard 90.1. Thus, the ASHRAE 90.1-based 2023 FBCEC lags behind the 2022 ASHRAE 90.1 code due to the new changes included in the 2022 ASHRAE 90.1 and the code sections excluded from the 2019 ASHRAE Standard 90.1.

4. Preliminary Analysis of 2023 FBCEC and ASHRAE 90.1-2022

The 8th Edition (2023) Florida Building Code, Energy Conservation, allows ASHRAE Standard 90.1-2019 as a compliance option. However, the 2019 ASHRAE 90.1-based compliance option of the 2023 FBCEC excludes code sections 8.4.2 Automatic receptacle control, 8.4.3 Energy monitoring, and 9.4.1.1(g) Automatic partial-off of the 2019 ASHRAE 90.1 standard. This analysis compares the ASHRAE 90.1-based 2023 FBCEC against the 2022 ASHRAE 90.1 U.S. National Building Energy Code. Sixteen prototype building models and two climate zones were used for the energy use comparison analysis. There are 32 prototype building energy models, each representing the ASHRAE 90.1-based 2023 FBCEC and the 2022-ASHRAE 90.1 Code.

Prototype building models of the ASHRAE 90.1-based 2023 FBCEC buildings were created by removing impacts of the interior lighting automatic partial-off section 9.4.1.1(g) and the automatic receptacle control section 8.4.2 from the 2019 ASHRAE 90.1 DOE reference prototype building models. The automatic receptacle control impacts all sixteen prototype buildings, and the automatic full-off control replaced the partial-off interior lighting control. Automatic receptacle control in the prototype building energy models was accounted for using reduced hourly fractions for receptacle loads. Section 8.4.3 Energy monitoring is not amenable to simulation-based quantitative analysis; hence, it is not included in this analysis. The 2022-ASHRAE 90.1 prototype building model energy code includes some code modifications with energy impacts listed in Appendix A. Table 2 summarizes energy impactful changes of the 2022 ASHRAE 90.1 included in the quantitative analysis.

The Energy Utilization Intensity (EUI) of each prototype building for each climate zone was aggregated by Florida climate zone floor area weighing factors to determine the EUI by prototype building. The energy performance of the ASHRAE 90.1-based 2023 FBCEC was determined by comparing the annual site EUIs against the 2022 ASHRAE 90.1 standard by prototype buildings. As expected, the ASHRAE 90.1-based 2023 FBCEC prototype building models use higher energy than the ASHRAE 90.1-2022 U.S. National Building Energy Code. The Florida's average EUI were 45.47 kBtu/ft^2-yr and 40.95 kBtu/ft^2-yr for ASHRAE 90.1-based 2023 FBCEC and ASHRAE 90.1-2022, respectively. Florida's average EUI of the ASHRAE 90.1-based 2023 FBCEC was higher by about 9.94% relative to the ASHRAE 90.1-2022 U.S. National Building Energy Code. The U.S. national site energy use savings[2] estimate of the 2022 ASHRAE 90.1 compared to the 2019 ASHRAE 90.1 code was 9.8 percent.

Figure 1 shows the annual site EUI plots of the ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE 90.1 standard by prototype buildings. Figure 2 shows the annual site Energy Cost Index (ECI) plots of the ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE 90.1 standards by prototype buildings.

[2] https://www.energycodes.gov/determinations

Table 2 Impactful code changes added to ASHRAE Standard 90.1-2022

Addendum	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Discussion
t	This amendment requires whole-building air leakage testing and measurement on buildings less than 10,000 ft2, specifies performance requirements for compliance, references the applicable ASTM standard, and modifies the relevant definition.	Adds whole-building air leakage and measurement requirements. Increases stringency for buildings less than 10,000 ft^2 floor area. Impacts small office and restaurant prototype buildings.
bc	It requires condensing boilers for new construction to achieve condensing-level efficiency (i.e., 90% Et) for large boiler systems (i.e., between 1 and 10 MBtuh) and, to ensure condensing occurs, requires the boiler entering water to be within the prescribed limits for temperature or flow rate.	Increases efficiency requirements for large boilers in new construction. It may impact large hotel prototype buildings.
a	Establish minimum fan efficacy requirements for low-power ventilation fans and reference Standard 62.2 to determine the minimum ventilation rates for nontransient dwelling units.	This amendment adds minimum fan efficiency requirements for smaller ventilation fans not covered by section 6.5.3.6.
b	Revises demand control ventilation parameters to be determined based on climate zone and Standard 62.1 airflow requirements.	For cost-effectiveness, the DCV requirement is based on occupancy, floor-area size, and climate zone.
c	Requires residential HVAC systems greater than 2.1 kW to be equipped with start/stop and setback controls.	Adds advanced HVAC controls in dwelling units. These control features impact apartment prototype buildings.
am	to communicate exceptions to those requirements better	.Reduces the exterior lighting power allowances and adds control requirements based on specific applications.
o	This change reduces the minimum connected load that triggers daylighting responsive control requirements for sidelighting and toplighting.	Improved LED technology reduces the minimum connected load for daylighting responsive controls for side-lighting from 150 to 75 W and top-lighting from 300 W to 150 W.
br	Increases the efficacy threshold for lamps and luminaires in dwelling units and specifies interior and exterior lighting control requirements.	Increased lighting efficacy and added control requirements for interior and exterior lighting. This change also removed the exception due to permanent control requirements.

Addendum	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Discussion
ba	Updates space-by-space lighting power density (LPD) values and interior control requirements in Section 9.4.1.1 and Table 9.5.2.1.	Increased lighting efficacy and added control requirements for interior lighting.
bf	This change updates the decorative and retail lighting power allowances, adds allowance for videoconferencing, and moves the additional power allowances and required controls to a table for easy reference.	Reduces decorative and retail lighting power allowances. Impacts retail prototype buildings.
ah	Increases the thermal efficiency required for high-capacity gas-fired service water-heating equipment and provides the U.S. DOE criteria for defining high-capacity water heaters.	A single high-capacity water heater supplies a system, or if multiple high-efficiency water heaters provide a single system, the minimum efficiency increases to 92 %. This change may impact large hotel prototype buildings.
by	Adds a minimum prescriptive requirement for on-site renewable energy.	The building site must have equipment for on-site renewable energy with a rated capacity >= 0.5W/ft² multiplied by the sum of the gross conditioned floor area for all floors up to the three largest floors.
cf	Introduces provisions that improve elevator fan, lighting, and movement efficiency.	This change increases elevator fan efficiency, reduces lighting allowance, and improves standby mode energy use.
ci	Lowers the threshold for air-economizer for packaged fan cooling units installed outside the building to 33 kBtuh from 54 kBtuh. Not applicable to interior installation.	It reduces the cooling energy required for smaller packaged systems where applicable.
ap	This section introduces a new section to ASHRAE Standard 90.1, enabling energy credits to save approximately 4% to 5% of energy costs. There are 32 individual measures from which users can earn the required number of credits for their building type and climate zone.	Thirty-three cost-effective energy credit prescriptive requirements are included in a new Section 11. Supports eight building use types.

The 2023 FBCEC prototype building energy models of ASHRAE 90.1 consume more energy in one part due to the exclusion of Sections 8.4.2 Automatic receptacle control and 9.4.1.1(g) Partial-off interior lighting control and in another part due to the addition of fifteen code modifications to the 2022 ASHRAE 90.1, which is the latest U.S. National Building Energy Code. Therefore, if equivalency is desired, the ASHRAE 90.1-based 2026 (9th Edition) FBCEC needs to catch up with the latest U.S. National Building Energy Code.

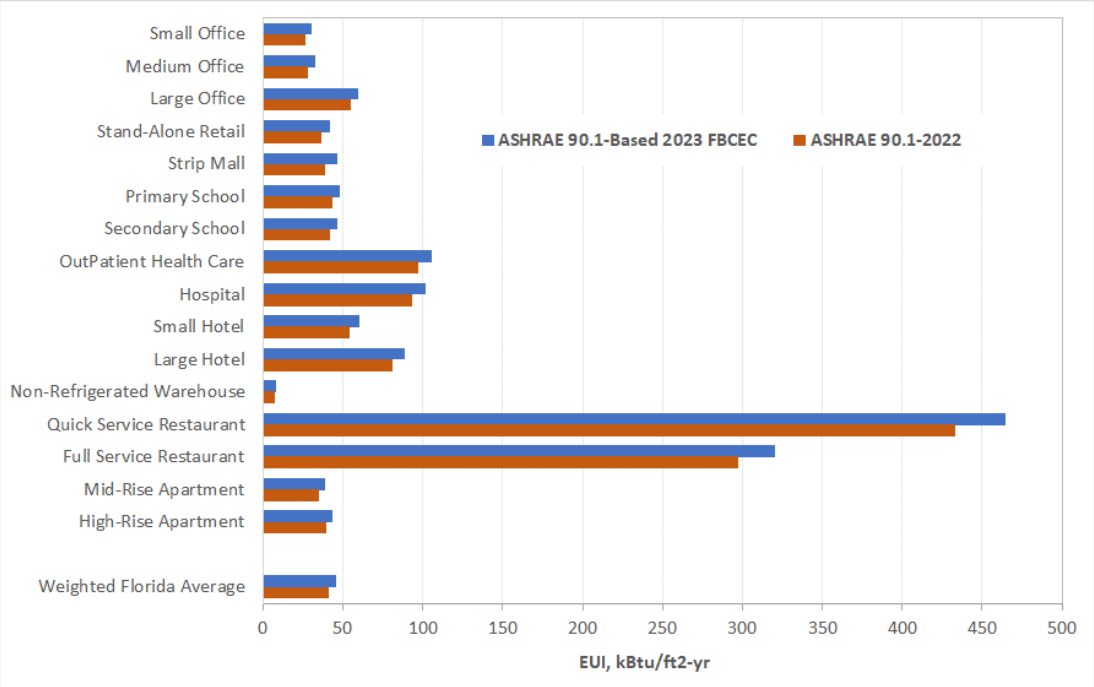

Figure 1 Site EUI of the 2023 FBCEC and ASHRAE 90.1-2022 by Prototype Building

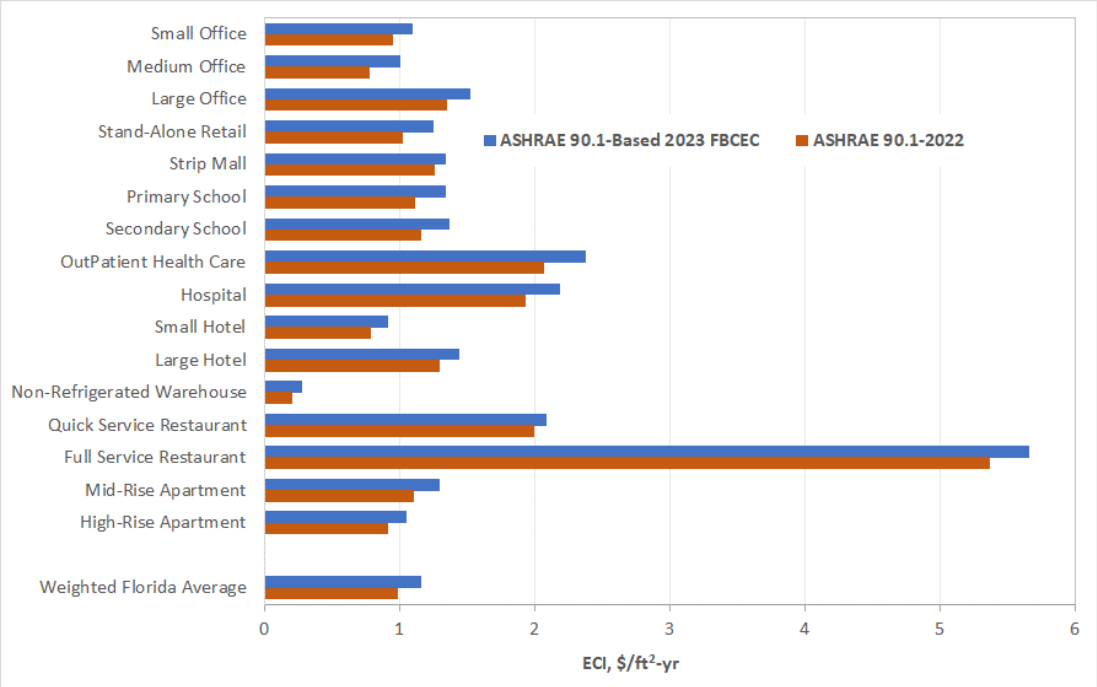

Figure 2 Site ECI of the 2023 FBCEC and ASHRAE 90.1-2022 by Prototype Building

Table 3 and Table 4 summarize the annual site EUIs and ECIs of the ASHRAE-based 2023 FBCEC and the 2022 ASHRAE 90.1, respectively.

Table 3 Site EUI of the 2023 FBCEC and ASHRAE 90.1-2022 by Prototype Building

Building Type	Weighting Factors, %	ASHRAE 90.1-Based 2023 FBCEC, kBtu/ft^2-yr	ASHRAE 90.1-2022 kBtu/ft^2-yr	ΔEUI, %
Small Office	5.27	29.86	26.07	12.67
Medium Office	5.94	32.43	27.73	14.50
Large Office	2.30	59.21	54.20	8.46
Stand-Alone Retail	11.60	41.16	35.97	12.59
Strip Mall	6.21	46.39	38.63	16.72
Primary School	4.28	47.83	43.44	9.18
Secondary School	7.33	45.97	41.60	9.51
Outpatient Health Care	2.83	105.49	96.65	8.38
Hospital	2.25	101.55	93.20	8.23
Small Hotel	0.65	59.91	53.51	10.69
Large Hotel	3.81	88.33	80.75	8.58
Non-Refrigerated Warehouse	14.50	7.49	6.82	9.03
Full Service Restaurant	0.56	464.27	432.94	6.75
Quick Service Restaurant	0.46	319.76	297.05	7.10
Mid-Rise Apartment	5.75	38.55	34.74	9.90
High-Rise Apartment	26.25	43.04	39.32	8.65
Weighted Florida Average	100.00	45.47	40.95	9.94

Table 4 Site ECI of the 2023 FBCEC and ASHRAE 90.1-2022 by Prototype Building

Building Type	Weighting Factors, %	ASHRAE 90.1-Based 2023 FBCEC ECI, $/ft^2-yr	ASHRAE 90.1-2022 ECI, $/ft^2-yr	ΔECI, %
Small Office	5.27	1.09	0.95	12.86
Medium Office	5.94	1.00	0.78	22.34
Large Office	2.30	1.52	1.35	11.21
Stand-Alone Retail	11.60	1.25	1.02	17.90
Strip Mall	6.21	1.56	1.25	19.66
Primary School	4.28	1.34	1.11	16.86
Secondary School	7.33	1.36	1.15	15.30
Outpatient Health Care	2.83	2.38	2.07	13.13
Hospital	2.25	2.18	1.93	11.58
Small Hotel	0.65	0.91	0.78	14.29
Large Hotel	3.81	1.44	1.30	10.04
Non-Refrigerated Warehouse	14.50	0.27	0.20	25.57
Full Service Restaurant	0.56	2.09	1.99	4.66
Quick Service Restaurant	0.46	5.66	5.36	5.22
Mid-Rise Apartment	5.75	1.29	1.10	14.68
High-Rise Apartment	26.25	1.04	0.91	12.40
Weighted Florida Average	100.00	1.157	0.984	14.91

5. Conclusion

Reviewed the 2022 ASHRAE Standard 90.1 code changes and identified code changes with energy impact. The list of code changes is summarized in Appendix A. This appendix lists all the code changes, briefly describes each change, and identifies if the change has an energy impact and whether the changes were included in the quantitative analysis. The qualitative analysis identified eighty-eight code change addenda. Twenty-nine of the eighty-eight addenda were identified to impact energy use. Fifteen of the twenty-nine addenda items were identified as suitable for quantitative analysis using a building energy simulation program. The fifteen addenda were analyzed quantitatively to determine the ASHRAE 90.1-2022 code's impact on the State building energy code relative to the 2023 Florida Building Code.

The impacts of these changes were quantitatively compared with the ASHRAE 90.1-based 2023 (8th Edition) Florida Building Code, Energy Conservation (FBCEC). The ASHRAE 90.1-based 2023 FBCEC excludes Sections 8.4.2, 8.4.3, and 9.4.1.1(g) of the 2019 ASHRAE Standard 90.1. Thus, this quantitative analysis entails the impacts of the new codes included in the 2022 ASHRAE 90.1 and the code sections excluded from the ASHRAE 90.1-Based 2023 FBCEC.

The quantitative analysis results aggregated across the commercial building sector show that the ASHRAE 90.1-based 8th Edition (2023) Commercial FBCEC was determined to lag significantly behind that of the 2022 ASHRAE Standard 90.1, the latest U.S. National Building Energy Code. The ASHRAE 90.1-based 2023 FBCEC and the 2022 ASHRAE 90.1 code average EUIs were 45.47 kBtu/ft^2-yr and 40.95 kBtu/ft^2-yr, respectively. This analysis demonstrated that the ASHRAE 90.1-based 2023 FBCEC, a modified version of the ASHRAE Standard 90.1-2019 code, annual site's energy use was higher than that of the 2022 ASHRAE Standard 90.1 by about 9.94 percent. Therefore, if code equivalency is the desired target, then the 9th Edition (2026) FBCEC must catch up with the latest U.S. National Building Energy Code.

Reviewing the IECC-2024 changes, identifying the changes with energy impact, and conducting cost-benefit analysis tasks resume when the 2024 IECC is available.

6. Reference

ASHRAE. 2022. ANSI/ASHRAE/IES Standard 90.1-2022. Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Atlanta, Georgia.

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Appendix-A: The ASHRAE 90.1–2022 Code Changes

Table A-1 summarizes the 2022 ASHRAE 90.1 changes with respect to ASHRAE Standard 90.1-2019. The summary briefly describes the code modification, energy impact, and whether it is included in the quantitative analysis. This table has six columns, and the headers are defined as follows:

Addendum: This is the code change addenda for the ASHRAE Standard 90.1-2022.

Code Sections Affected: This is the ID of the proposed code change defined in the 2019 ASHRAE 90.1 addenda. This code number is used to identify the history of the code change.

Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022: This briefly describes the code change between the 2019 ASHRAE Standard 90.1 and the 2022 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: This describes whether 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: This describes how the change impacts the implementation in the quantitative analysis, how the prototype buildings are impacted, and why the quantitative analysis is included.

Table A-1: Commercial Code Change Summary between ASHRAE 90.1-2019 vs. ASHRAE 90.1-2022

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
1. PURPOSE and 2. SCOPE					
cb	1.1, 2.1, 2.2, 2.3, 3.2, 4.1.1.6, 4.2.1.4, 4.1.2.5, 10.4.6, Table G3.1	This amendment revises the 90.1 Purpose and Scope to apply to areas outside of the physical building that qualify under the new definition of "site."	None	No	Has no direct impact on energy use.
3. DEFINITIONS, ABBREVIATIONS, AND ACRONYMS					
ab	3.2, 3.3, G3	It clarifies the process for selecting baseline HVAC systems using the Appendix G Performance Rating Method (PRM); it includes new acronyms for HVAC systems and a new definition for "residential associated HVAC zone."	None	No	This change is for clarification only.
ag	3.2, 3.3, 6.2.26.6, Appendix K	Introduces an optional Mechanical System Performance Path that allows HVAC system efficiency trade-offs based on a new metric—total system performance ratio (TSPR)—to ensure that equivalent energy savings are maintained compared to the prescriptive approach.	None	No	Adds new optional compliance method called TSPR. Provides compliance method flexibility.
4. ADMINISTRATION AND ENFORCEMENT					
cp	4.2.1.1, G2.2, Table G3.1	This change explains Appendix G modeling requirements for proposed designs that utilize a trade-off for the renewable energy requirements in Section 10.5.1.	None	No	This change is for clarification only.
h	4.2.1.1	Clarifies that the gross floor area should be used when calculating the area-weighted building performance factor (BPF).	None	No	This change is for clarification only.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
co	4.2.1.1, 4.2.1.3, G3.1, G3.2, G3.3	Adds new performance requirements for alterations, allowing larger retrofit projects a 5% increase in Building Performance Factor (BPF) relative to new construction vs. smaller retrofit projects, which are subject to a new Section G3.3.	None	No	Impacts existing buildings during alterations and relaxes stringency.
as	4.2.4, 5.9, 6.9, 7.9, 8.9, 9.9, 10.9	Rearrange envelope inspection requirements and improve commissioning language throughout.	None	No	This change is for clarification only.
5. BUILDING ENVELOPE					
bi	3.2, 5.1.3, 5.5.3.1	Creates specific provisions to distinguish roof replacements from other types of alterations.	None	No	This change is for clarification only.
bj	5.5.3, A1, A9, Appendix E	Reformats and clarifies Normative Appendix A requirements for thermal performance calculations to demonstrate compliance with Section 5.5	None	No	This change is for clarification only.
ao	5.4.3.3.3, 6.4.3.9, 10.4.5, Table H-3	Revises the requirements for air curtain units and controls and indicates that installation is to be performed following the manufacturer's instructions.	None	No	Code enforcement clarification.
s	3.2, 5.5.3.1.1, 5.5.3.2, 5.5.4.5, Table 12.5.1, C3.6, Table G3.1	Replaces the term *solar reflectance index (SRI)* with *solar reflectance* (for walls only) and establishes a minimum solar reflectance requirement for east-, south-, and west-oriented walls in Climate Zone 0.	None	No	It does not increase the stringency.
t	3.2, 4.2.5, 5.1.3, 5.4.3, 5.7.2, 5.7.3.1, 5.8, 5.9.1.2, 6.4.4.2.1, 6.4.5, 6.5.1, Table 12.5.1 (5),	This amendment adds a requirement to perform whole-building air leakage testing and measurement on buildings less than 25,000 ft^2, specifies performance requirements for compliance, references the applicable ASTM standard, and modifies relevant Section 3 terminology.	Decreases	Yes	Adds whole-building air leakage and measurement requirements. Increases stringency for buildings less than 25,000 ft^2 floor area.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
	12.5.3, 13, C1.5, C3.5.5.3, C3.6, C3.1.1.4, Table G3.1 (5), Table H-3				
av	3.2, 3.3, 5.5.3.2, 5.5.5, 5.6.1.1, 5.7.2, 5.8.2.3, Table 12.5.1 (5), 13, A1, A10, C1.2.7, C2.9, C3.5.5.4, C3.6, Appendix E, Table G3.1 (5), Appendix J	Adds requirements to address the impacts of thermal bridges in the building envelope.	Decreases	No	It adds a prescriptive requirement for thermal bridging in the exterior envelope. This change will not be included in the quantitative analysis.
6. Heating, Ventilating, and Air Conditioning					
bc	6.5.4.8	It requires condensing boilers for new construction to achieve condensing-level efficiency (i.e., 90% Et) for large boiler systems (i.e., between 1 and 10 million Btuh) and, to ensure condensing occurs, requires the boiler entering water to be within the prescribed limits for temperature or flow rate.	Decrease	Yes	Increases efficiency requirements for large boilers in new construction. It may impact large prototype buildings.
cd	6.5.6.1.2	Establishes a minimum enthalpy recovery ratio for energy recovery systems and specifies how bypass or control of the energy recovery system must operate to ensure proper economizer performance.	None	No	This change is intended to clarify that a heat recovery bypass and control allow economizer operation.
a	6.5.3.7, 6.5.3.8, 13	Establish minimum fan efficacy requirements for low-power ventilation fans and reference Standard 62.2 to determine the minimum ventilation rates for nontransient dwelling units.	Decrease	Yes	This change adds minimum fan efficiency requirements for smaller ventilation fans not covered by section 6.5.3.6. It impacts apartment and outpatient healthcare

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
					prototype buildings.
b	6.4.3.8	Revises demand control ventilation parameters to be determined based on climate zone and Standard 62.1 airflow requirements.	Decrease	Yes	For cost-effectiveness, the DCV requirement is based on occupancy, floor-area size, and climate zone. As needed, depending on the prototype building design.
c	6.3.2, 6.4.3.3	Requires residential HVAC systems greater than 2.1 kW to be equipped with start/stop and setback controls.	Decreases	Yes	Adds advanced HVAC controls in dwelling units. These control features impact apartment prototype buildings.
d	3.2, 6.4.3.4.5	Adds new term to define parking garage section so that fan requirements can be refined for different configurations. It requires fans to be able to modulate airflow and power as specified.	Decreases	No	It improves contaminant control and requires a lower fan flow and power threshold. It also replaces the exception limit from a 3000 ft^2 parking garage floor size to a ventilation fan system power of 5 hp. The prototype building models do not have an interior parking garage; hence, the analysis will not include it.
f	Table 6.5.1-2	Clarifies the efficiency improvement required to eliminate an economizer.	None	No	This change is for clarification only.
g	6.5.1.1.5	It adds more specific language about relieving excess outdoor air during air economizer operation through fans or dampers.	None	No	This change clarified excess air relief requirements.
m	6.4.3.4.1	This change clarifies the requirements for motorized dampers on vents in elevator shafts and stairwells and adds an exception to allow non-motorized dampers in mild climates and low-rise buildings.	None	No	This change is for clarification only.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
n	6.5.2.6	This adds an exception to Section 6.5.2.6, which allows units to heat the ventilation airstream above 60°F if they exclusively use series energy recovery.	None	No	The impact of the heat recovery on the cooling system compressor offsets the increased reheating load.
r	6.4.3.3.3	Clarifies that residential spaces are not required to have optimal start controls.	None	No	This change is for clarification only.
x	6.4.1.2, Table 6.8.1-3	Updates the cooling efficiency adjustment for centrifugal chillers and the requirements for chillers utilizing freeze protection. Replaces “fluid” and “water” with “liquid” throughout.	None	No	This change is for clarification only.
y	Table 6.8.1-16	This change modifies the minimum efficiency requirements for air-source heat pumps, updates the related AHRI rating standards, and introduces a new metric (COP_{HR}) for units that perform heat recovery during chiller operation.	None	No	This change clarifies new efficiency metrics for heat pumps.
aq	6.8.3, Table 6.8.3-1, Table 6.8.3-2, 7.4.3, Table 7-4	Introduces requirements for service water heating pipe insulation based on typical operating conditions.	None	No	This change is for clarification of the enforcement without changing the standard stringency.
bk	6.3.2, 6.4.3.3.2, 6.4.3.3.5, 6.4.5, 6.4.6, 12.4.1.1, 12.5.2, G2.2.1	Updates humidity control requirements following the latest Standard 62.1-2019.	None	No	This change aligns this standard with changes in Standard 62.1-2019.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
bm	6.5.3.8	This change modifies occupied standby controls from multiple-zone systems to explicitly require an outdoor air reset when ventilation is reduced to zero.	Decrease	No	Reduces the amount of outdoor air at the air handler, saving energy for outdoor air treatment. This change impacts the control device but does not impact the prototype building energy model since the model has already correctly interpreted it.
bv	Table 4.2.1.1	This update provides the building performance factors (BPFs) used to determine compliance with Normative Appendix G based on energy-efficiency improvements in the 2022 standard.	None	No	This change impacts an optional performance path in the standard designed to provide increased flexibility. It does not affect the prototype building energy code models; hence, it will not be included in the quantitative analysis.
bw	6.5.3.1.3	Clarifies that the fan efficiency metric must be applied at the highest design airflow rate.	None	No	This change is for clarification only.
bx	Table 6.8.1-5	This amendment to Table 6.8.1-5 for warm air furnace efficiency requirements will more accurately distinguish between different products and test procedures based on their locations and status as DOE or non-DOE-covered products.	None	No	This change is for clarification only.
bz	6.5.6	Adds language to specify the sensible energy recovery ratio requirement for systems that require only sensible heating energy recovery.	None	No	This change has no impact on the Florida code.
ce	A2.5, A3.3, A9.2, 13	It adds new references and requirements for steel-framed walls aligned with ANSI/AISI S250, which provides additional options for wall framing and insulation placement.	None	No	Provides design flexibility.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
cg	5.5.3, A9.4.7	This section adds a definition for insulated metal panels (IMPs) and a new section explaining how the U-factor of a given IMP is determined.	None	No	Provides design flexibility.
ci	Table 6.5.1-1	Fan cooling units outside the building must have an economizer at the indicated capacity range.	Decrease	Yes	It extends the economizer requirements to 33 kBtu/h from the 54 kBtu/h threshold for the cooling unit installed outside the building. This change may impact the small hotel prototype building.
cj	Table 6.8.1-16	Corrects numerical errors in the centrifugal chiller category when it was updated in Addendum y.	None	No	This change is a correction only.
at	3.2, 4, 5, 6, 7, 8, 10	Establishes a consistent numbering system for each standard section and revises the definition for alteration.	None	No	This change is editorial only.
au	6.2, 6.3.2	Heating and cooling equipment, under the simplified compliance approach, must meet the requirements of Section 6.4.1.5.	None	No	An alternative simplified compliance option for the HVAC System provides compliance flexibility. This change compliance option is not used in the prototype buildings.
aw	3.2, 3.3, 6.4.1.1, Table 6.8.1-21, Table F-6, 13	This amendment adds the minimum energy efficiency requirements (and new CFEI metric) for large-diameter ceiling fans from 10 CFR 430.	Decrease	No	Minimum efficiency requirement for large-diameter ceiling fans. It is not a typical design; hence, it is not included in the prototype buildings.
ay		Updates Tables 6.8.1-8 and 6.8.1-9 for variable refrigerant flow (VRF) equipment efficiency based on the new AHRI 1230-2021 test procedure, which required an EER and IEER values adjustment.	Decrease	No	Federal minimum efficiency requirements and none of the prototype buildings use a VRF HVAC system.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
cu	6.5.6.3	This specifies that the return water from a heat pump chiller is the heat source for heat recovery, as most acute inpatient hospitals require.	None	No	This change is a clarification of an existing requirement.
7. SERVICE WATER HEATING					
ah	7.5.3	Increases the thermal efficiency required for high-capacity gas-fired service water-heating equipment and provides the U.S. DOE criteria for defining high-capacity water heaters.	Decrease	Yes	A single high-capacity water heater supplies a system, or if multiple high-efficiency water heaters provide a single system, the minimum efficiency increases to 92 %. This change may impact large hotel prototype buildings.
8. Power					
bg	3.2, 8.1, 8.7.3.2, 9.1.1, 9.4.1, 9.6.3, 10.1.1, Table 12.5.1 (12), G1.2.2, Table G3.1	Updates Sections 8, 9, 10, 12, and Appendix G to reflect the new purpose and scope (Addendum cb), utilizing the new site definition.	None	No	This change is for clarification only. It has no impact on the prototype buildings.
bq	8.4.3	Adds a requirement to perform electrical energy monitoring with separate metering for refrigeration systems where refrigeration accounts for 10% or more of the building load.	None	No	This is an instrument for making operational decisions. It does not impact the prototype building models; hence, it will not be included in the analysis. 2023 FBCEC excludes Section 8.4.3.
ae	8.4.4	This update includes exceptions and footnotes associated with Section 8.4.4's requirements for the minimum efficiency of low-voltage dry-type transformers in commercial buildings.	None	No	This change updates the footnotes to Table 8.4.4 to clarify the language needed to show no requirements for transformers

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
					below the minimum or above maximum kVA ratings.
9. Lighting					
ad	9	Reorganizes Section 9, "Lighting," to better parallel the structure of the other main sections.	None	No	This change is for clarification only.
p	9.1.2, 9.1.4	Modifies portions of Section 9 about alterations to ensure that such projects meet all applicable lighting requirements.	Decrease	No	All alterations, regardless of size, must meet all of the requirements of Section 9.
z	9.1.4	Lowers the wattage assigned for track lighting to reflect the predominant use of higher-efficiency LED technology.	Decrease	No	LED technology reduces the track lighting requirement from 30 to 10 W per linear foot. Track lighting is not part of the prototype building, so the analysis does not include this change.
ac	3.2, 9.4.1.2, Table 9.2.3.1, Table 9.6.1, Appendix E	This update to interior lighting power and minimum control requirements adds a power exception for the germicidal function in luminaires and sources, removes exceptions for casinos and parking garage daylight transition zone lighting, and defines the latter item.	Decrease	No	It updates interior LPD values for casinos and parking garage space types, removes control requirements for germicidal function, and defines a "parking garage daylight transition zone." It is not a typical design or part of a *prototype building; hence, it is not included in the quantitative analysis*.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
ar	3.2, Table 9.2.3.1, 9.4.4, Appendix E	Adds requirements for indoor horticultural lighting based on a new metric, photosynthetic photon efficacy (PPE), developed in ANSI/ASABE S640.	Decrease	No	Adds minimum luminaire efficiency requirements depending on the building function. It is not a typical building, and none of the prototype buildings has such space; hence, it will not be included in the analysis.
am	9.2.3.2, Table 9.2.3.2, 9.4.1.4, 9.4.2, Table 9.4.2-1, Table 9.4.2-2	Updates exterior lighting power and control requirements based on technological improvements and revised lighting practices; restructure portions of Section 9 to better communicate exceptions to those requirements.	Decrease	Yes	Reduces the exterior lighting power allowances and adds control requirements based on specific applications.
bs	9.3.1, 9.3.2	Updates the lighting power allowances (LPA) in the Simplified Building Method Compliance Path to maintain alignment with the established method (0.9x the Building Area Method LPA values). Removes an exception for alterations that had incentivized the use of LEDs before they became commonplace.	Decrease	No	It provides simplified compliance options and design flexibility. Since it is not part of the prototype building model, it will not be included in the analysis.
o	9.4.1.1	This change reduces the minimum connected load that triggers daylighting responsive control requirements for sidelighting and toplighting.	Decrease	Yes	Reduces the minimum connected load for daylighting responsive controls for side-lighting and top-lighting from 150 to 75 W and 300 W to 150 W due to improved LED technology. Determine prototype building impacted.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
bp	9.4.1.3	Removes the exception for captive card-key controls in the hotel guestrooms	Decrease	No	Removes the exception for captive card critical controls for hotel guests since they are easily and often bypassed, negating potential energy savings.
br	9.4.3	Increases the efficacy threshold for lamps and luminaires in dwelling units and specifies interior and exterior lighting control requirements.	Decrease	Yes	Increased lighting efficacy and added control requirements for interior and exterior lighting. This change also removed the exception due to permanent control requirements.
ba	9.4.1.1 and Table 9.5.2.1	Updates space-by-space lighting power density (LPD) values and interior control requirements in Section 9.4.1.1 and Table 9.5.2.1.	Decrease	Yes	Increased lighting efficacy and added control requirements for interior lighting.
bb	9.5.1	Updates the lighting power density values for the Building Area Method compliance path based on manufacturer-reported improvements in lighting performance.	Decrease	No	Reduced lighting power density (LPD) values but not used in prototype buildings.
bf	9.5.2.2	This change updates the decorative and retail lighting power allowances, adds allowance for videoconferencing, and moves the additional power allowances and required controls to a table for easy reference.	Decrease	Yes	Reduces decorative and retail lighting power allowances. Impacts retail prototype buildings.
10. OTHER EQUIPMENT					

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
by	3.2, 10.2.1, 10.5.1	Adds a minimum prescriptive requirement for on-site renewable energy.	Decrease	Yes	The building site must have equipment for on-site renewable energy with a rated capacity >= 0.5W/ft² multiplied by the sum of the gross conditioned floor area for all floors up to the three largest floors. Five conditions may exempt this requirement. This change may impact all except small office and restaurant prototype buildings.
az	3.2, 10.4.6	Introduces compressed air system requirements with measures for reducing common sources of energy waste.	Decrease	No	This change enforces best design practices. However, the analysis will not include this change because prototype buildings don't have compressed air systems in the model.
cf	10.4.3, 10.9.3	Introduces provisions that improve elevator fan, lighting, and movement efficiency.	Decrease	Yes	This change increased elevator fan efficiency, reduced the lighting allowance, and improved standby mode energy use.
11. ADDITIONAL EFFICIENCY REQUIREMENTS					
ap	3.2, 3.3, 4.2.1, 4.2.2, 9.9.1, 12.2, 13, Section 11	This section introduces a new section to Standard 90.1, enabling energy credits to save approximately 4% to 5% of energy costs. There are 32 individual measures from which users can earn the required number of credits for their building type and climate zone.	Decrease	Yes	A new Section 11 includes 33 cost-effective energy credit prescriptive requirements. It supports eight building use types (office, restaurant, retail, education, warehouse, healthcare, hotel/motel, multifamily, dormitory, and all others) in all climate zones.
12. ENERGY COST BUDGET METHOD					

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
cy	Section 12	Updates the normative references to include the latest published addenda to 90.4-2019	None	No	Reference update.
cr	12.2, G1.2.1	Adds language to limit the extent that envelope trade-offs can be used for compliance with Section 12 and Appendix G based on the amount that a proposed envelope performance factor is permitted to exceed the base value (i.e., envelope "backstop").	Decrease	No	Increases the stringency of the envelope by limiting the envelope trade-off amount allowed with the performance compliance methods. Not part of the prototype building. Hence, it is not included in the quantitative analysis.
ck	12.4.1, 12.4.3, Table 12.5.1	This section explains Section 12 modeling requirements for proposed designs that utilize a trade-off for the renewable energy requirements in Section 10.5.1.	None	No	This change impacts the proposed building design. It does not affect the prototype building model energy code, so it will not be included in the analysis.
be	12.4.1.4, 12, C3.1.4, G2.2.4	This change updates references to the latest ANSI/ASHRAE Standard 140-2020 and specifies which simulation program tests are required for compliance with Appendix C and G of Standard 90.1.	None	No	Reference update.
cs	12.5.2	Clarifies efficiency requirements for HVAC and service water-heating equipment in the Section 12 budget building design.	None	No	This change is for clarification only.
bh	Table 12.5.1	Revises the default PV system in the budget building design so that the temperature coefficient of power is aligned with the PV Watts input for a 19% panel efficiency as required by Addendum ck.	None	No	Documentation update.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
u	12.5.2	Specifies the use of air economizers for budget building systems and clarifies the method for determining prescriptive HVAC requirements based on the budget system type and capacity.	None	No	This change is for clarification only.
k	12.5.2	Adjusts Section 12 budget building fan requirements to avoid creating a fan power credit for energy recovery.	None	No	This change adds an exception to avoid taking fan power credit when energy recovery is not required in the budget building while the proposed design has an energy recovery.
bd	12.5.2, Table 12.5.1, G3.1.2, Table G3.1, Table G3.5.3, Appendix L	This change provides performance curves for modeling chillers in the budget (Section 12), baseline designs (Appendix G), and default performance curves that can be used for chillers in the proposed design.	None	No	It adds two sets of chiller performance curves for the budget and baseline building design to ensure consistency of modeling results rather than relying on software defaults.
v	12.7.2, G1.3.2	This clarifies the documentation that projects must submit to the rating authority or jurisdiction following Section 12 and Appendix G, including simulation files upon request.	None	No	This change is for clarification only.
NORMATIVE APPENDIX G PERFORMANCE RATING METHOD					
af	G3.1, G3.6	This amendment modifies the lighting modeling requirements in Appendix G with more specific guidance on determining lighting power in the baseline compared to the proposed building.	None	No	Provides the standard design with increased flexibility.
db	G3.1, G3.4-9	This document clarifies how to establish the Normative Appendix G baseline space conditioning categories that must be used with Tables G3.4-1 through G3.4-8 so that the baseline envelope will remain consistent should Section 3 undergo changes.	None	No	Provides the standard design with increased flexibility.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
i	G3.1.2.10	Reinstates exception to Appendix G exhaust air energy recovery requirements for laboratory HVAC systems.	None	No	This is a correction and impacts laboratory buildings only.
l	G3.1	Revises Appendix G language describing how to calculate and assign vertical fenestration in the baseline design.	None	No	This change clarifies how the vertical fenestration is distributed in the baseline design in Appendix G.
q	Table G3.7	Corrects Table G3.7 to maintain equivalent space type requirements per the established 2004 baseline.	None	No	Removes duplicate interior LPD values.
w	G3.1.3.7	This indicates that chillers (type and number) shall be modeled in the baseline building design based on the baseline HVAC system's total peak coincident cooling load using chilled water.	None	No	This change clarifies the intent and provides design flexibility for sizing the chilled water cooling system in the baseline.
aa	G3.1.2.9, Table G3.1	Corrects the SI fan power values in Appendix G to make them consistent with the rest of the standard.	None	No	This change is a correction to make SI and IP versions of fan power values calculation in Appendix G.
aj	Table G-1	Updates Appendix G to align with Addendum ae clarifications related to baseline transformer performance.	None	No	This change is for clarification only.
ak	G3.1.1	This section provides criteria for determining when an HVAC zone should be isolated from a multi-zone system in the baseline building model.	None	No	Impacts the process of isolating an HVAC zone attached to a multi-zone system in the baseline building.
bt	G3.1.3.5, G3.1.3.10, G3.1.3.19	This change indicates that baseline system pumps are to be modeled based on the presence of a load, and preheat coil temperature is to be modeled compared to the zone with the highest set point.	None	No	This change allows intermittent hot and chilled water loop pump operation modeling in the baseline.

Addendum	Code Sections Affected	Code Change Summary b/t ASHRAE 90.1-2019 and ASHRAE 90.1-2022	Anticipated Energy Impact on FBCEC if Adopted*	Include in quantitative Analysis	Discussion
cq	G3.1.2.1, Table G3.1 (10), Table G3.1.3.7, Table G3.5.3	Modifies Appendix G to align with Section 6 updates (e.g., removes outdated references, corrects instructions for determining equipment efficiency, converts "water" to "liquid" in the descriptions for chiller equipment.)	None	No	This update is for clarity and consistency with various sections.
ct	Table G3.1 (5)	Provides additional details about the envelope modeling requirements for Appendix G baseline buildings.	None	No	This change details the envelope modeling requirements for Appendix G baseline buildings.
da	G1.3.2, G2.2, G2.3, G2.4.2, G2.5, Table G3.1	Aligns Appendix G requirements for documentation, simulation programs, climactic data, and exceptions with the corresponding portions of Section 12.	None	No	Documentation update.
an	Table G3.1	This change clarifies baseline HVAC fan schedule requirements for projects that rely on ventilation via operable windows that the occupants manually open.	None	No	This change clarifies the baseline HVAC fan operating schedule requirements in Appendix G.
References used in the standard					
cm	13	Updates the normative references used in the standard to the latest applicable versions.	None	No	References update.