



KARPMAN
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Performance-based Compliance for Submittal Reviewers

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Learning Objectives

- Name the key submittal review steps.
- Understand the organization of the Manual and Compliance Form, and how to use both as a reference when performing reviews.
- Describe how to identify high priority review checks based on the project design and simulation results.
- Describe how to use the Compliance Form and the Manual to document the scope and outcome of the review.

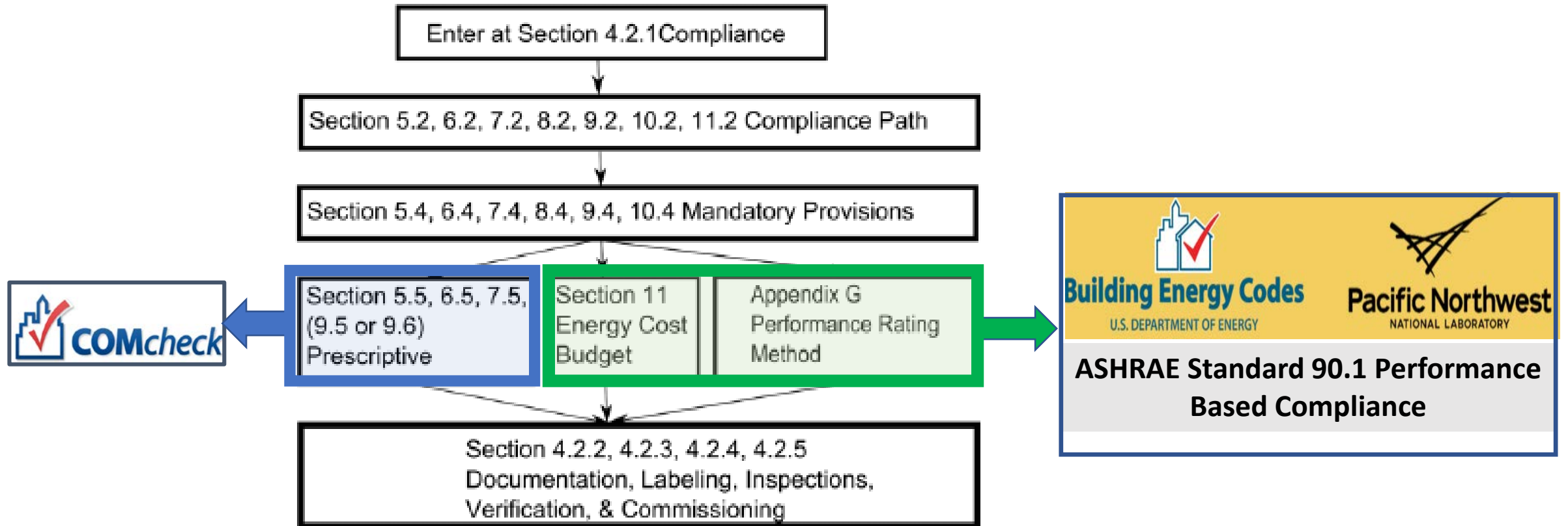
Agenda

1. Introduction (10 Minutes)
2. General Submittal Review Concepts (20 Minutes)
3. Demonstration of Review Process and Checks with Case Study
 - a. Review Process (25 Minutes)
 - b. Review Check Demonstrations (45 Minutes)
4. Questions (20 Minutes)

Training Format

- Power Point Presentation
 - Introduction
 - General Submittal Review Concepts
 - Review Check Demonstrations
- Review Process Demonstration in the Compliance Form
- Questions

ASHRAE Standard 90.1 Compliance Documentation



DOE/PNNL 90.1 Section 11 and Appendix G Compliance Form Overview

1. Supports 90.1 2016 and 2019 Section 11 and Appendix G
2. Posted at [DOE Building Energy Codes Program](#) website and is called “The Compliance Form”
3. Summary of features
 - MS Excel format
 - provides a format for submitters to meet the reporting requirements of 90.1
 - helps establish the necessary modeling inputs using built-in code look-ups and calculators
 - allows importing simulation results from BEM tools including DesignBuilder, EnergyPlus, eQUEST, Trane TRACE 3D Plus, Trane TRACE 700, and OpenStudio
 - automates compliance calculations
 - includes Quality Control Checks tab to facilitate submittal reviews

**Focus of
this
training**

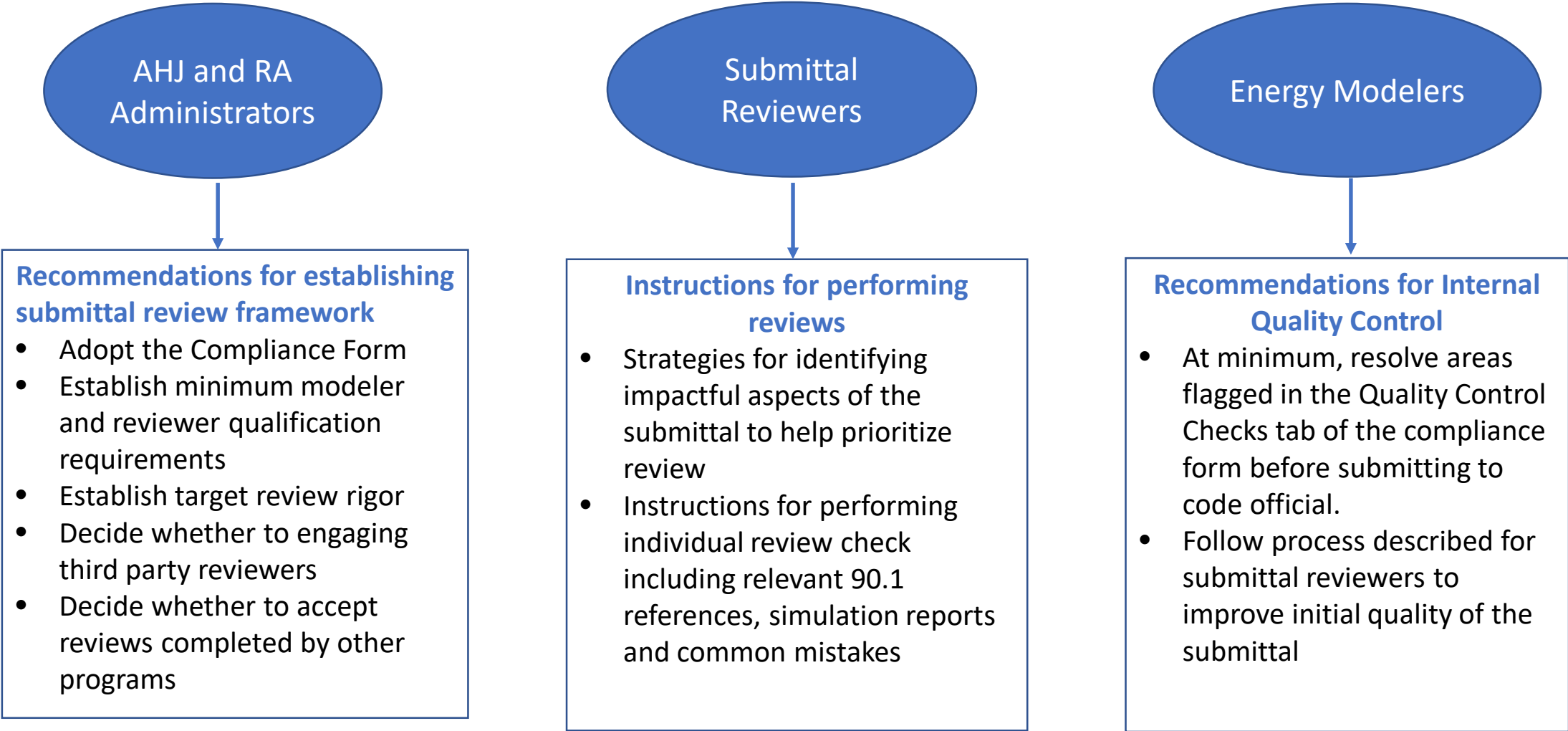
90.1 Section 11 and Appendix G Submittal Review Manual Overview

1. Companion to 90.1 Section 11 and Appendix G compliance form
2. Supports ASHRAE 90.1 2016/2019 Section 11 and Appendix G
3. PDF document posted at [DOE Building Energy Codes Program](#) website
4. Includes the following

- Strategies for prioritizing submittal review
- The list of review checks included in the Quality Control Checks tab of the Compliance Form
 - For each check, summarizes the relevant 90.1 requirements and provides review tips including the specific steps, where to locate the information in the Compliance Form and common mistakes.
- Simulation reports for common BEM tools annotated with tips on performing specific checks

Focus of this training

Submittal Review Manual User Groups

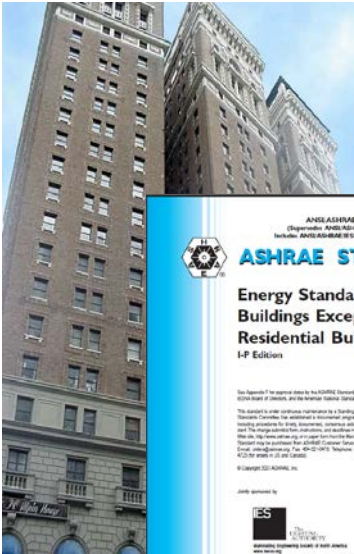


GENERAL SUBMITTAL REVIEW CONCEPTS

General Concept of Performance-based Compliance

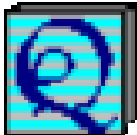


Proposed Design



Baseline/Budget Design

- Developed following the rules of 90.1 Section 11 or Appendix G
 - Same simulation tool, weather file and utility rates

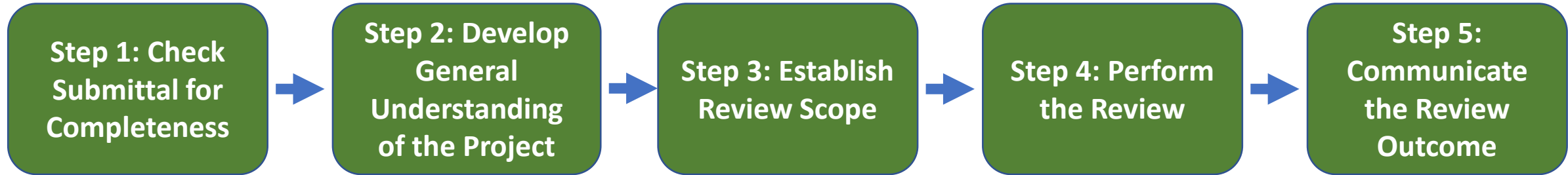


eQUEST



TRACE 3D Plus
TRACE™ 700

Review Process



Item	Item Description	Item Status	Item Action
1	Submittal checklist	Yes	Submittal checklist
2	General information	Yes	General information
3	Energy performance summary	Yes	Energy performance summary
4	Quality control checks	Yes	Quality control checks
5	Simulation reports	Yes	Simulation reports

Compliance Form tabs

- Submittal Checklist

Table 1: Building Area
Instructions
1. Enter building area based upon the design documents.

Building Area Type(s)	Area, ft ²	Conditioned Floor Area, ft ²	Semi-Heated and Unconditioned Floor Area, ft ²
Construction	104,700		
Renovation			
Total	104,700		

Compliance Form tabs

- Dashboard
- General Information
- Energy Performance Summary

Table 2: Enduses with the Highest Contribution Towards the Total Energy Use of the Proposed Design

Rank	Site Energy	Source Energy	Energy Cost
#1	Space heating (42%)	Misc equipment (29%)	Misc equipment (29%)
#2	Service water heating (17%)	Space heating (29%)	Space heating (22%)
#3	Misc equipment (17%)	Space cooling (12%)	Space cooling (12%)
#4	Space cooling (17%)	Fans - interior ventilation (11%)	Fans - interior ventilation (12%)
#5	Fans - interior ventilation (7%)	Interior lighting (11%)	Interior lighting (12%)

Compliance Form tabs

- Quality Controls Checks
- Energy Performance Summary
- Review Manual sections
- Review Methodology

Table 3: Enduses with the Highest Contribution Towards Savings of the Proposed Design vs. Baseline Design

Rank	Site Energy	Source Energy	Energy Cost
#1	Interior lighting (39%)	Interior lighting (40%)	Interior lighting (38%)
#2	Space heating (25%)	Space cooling (22%)	Space cooling (17%)
#3	Space cooling (17%)	Fans - interior ventilation (20%)	Fans - interior ventilation (20%)
#4	Service water heating (15%)	Space heating (14%)	Misc equipment (9%)
#5	Fans - interior ventilation (15%)	Service water heating (8%)	Space heating (7%)

Compliance Form tabs

- Quality Controls Checks
- Review Manual sections
- Review Checks
- Simulation Reports

Table 4: Energy Performance Benchmarks
Notes
1. Modeling results for the Baseline/Budget and proposed design may be compared to a peer-reviewed benchmarks to verify that it enduses follows the expected pattern.

QC Checks Navigator	Total Checks	Qty of Checks Included	Checks with Outstanding Comments	Responses to Outstanding Comments
Submittal Checklist	58	13	1	0
Simulation General	8	8	1	0
Utility Status	3	3	1	0
Compliance Calculations	4	2	1	0
Uncovered	45	25	2	0
Interior Lighting	18	17	3	0
Exterior Lighting	8	8	0	0
Plus, Process and Other Loads	19	13	5	0
Service Water Heating	11	4	0	0
Air Side HVAC Systems	63	13	6	0
Water Side HVAC Systems	42	22	0	0
Serviceable Loads	3	0	0	0

Compliance Form tabs

- Quality Controls Checks

Step 1: Check Submittal for Completeness

90.1 4.2.2 Compliance Documentation

4.2.2.1 Construction Details

Compliance documents shall show all the pertinent data and features of the *building, equipment, and systems* in sufficient detail to permit a determination of compliance by the *building official* and to indicate compliance with the requirements of this standard.

4.2.2.2 Supplemental Information

Supplemental information necessary to verify compliance with this standard, such as calculations, worksheets, compliance forms, vendor literature, or other data, shall be made available when required by the *building official*.

Dashboard						
Table of Contents Compliance Summary Tabs Navigator						
Compliance Summary						
Compliance Path	ASHRAE Standard 90.1 2016 Appendix G, Above Code Performance					
Energy Modeling Outcome	Pass					
Design Professional Sign-off	Yes					
Modeler Sign-off	Yes					
Tabs Navigator						
	Design Professional Sign-off			Modeler Sign-off		
	Status	Name	Date	Status	Name	Date
Instructions	N/A	-	-	N/A	-	-
Documentation Process Overview	N/A	-	-	N/A	-	-
Contact Information	Complete	Sam Smith	3/21/2020	Complete	Jones Blake	3/21/2020
General Information	Complete	Johnson Avery	3/21/2020	Complete	Jones Blake	3/15/2020
Energy Sources	Complete	Johnson Avery	3/29/2020	Complete	Jones Blake	3/30/2020
Operating Schedules	Complete	Johnson Avery	3/29/2020	Complete	Jones Blake	3/30/2020
Proposed Envelope Assemblies	Complete	Johnson Avery	4/15/2020	Complete	Jones Blake	4/20/2020
Envelope Areas	Complete	Johnson Avery	4/15/2020	Complete	Jones Blake	4/20/2020
Infiltration	Complete	Johnson Avery	4/15/2020	Complete	Jones Blake	4/20/2020

Submittal Checklist				
			Return to Dashboard	Adjust Column Widths and Row Heights
#	Required Documentation per ASHRAE 90.1-2016 Sections 11.7 and G1.3	Submitted?	Resolved?	File or document name where information is found, and location of the information within the document if applicable
1	Modeler resume documenting years of full-time equivalent modeling experience.	Yes		PDF labeled resumes.
2	Design documents that submittal is based on which was reported as the 100% Construction Documents.	Yes		PDF with submittal labeled 100% CD.
3	Weather file used in the simulation.	Yes		See model output reports.
4	An explanation of any significant modeling assumptions, such as systems and components that could not be explicitly modeled in the simulation tool and required work-arounds.	Yes		n/a
5	An explanation of any error messages noted in the simulation program output.	Yes		No error messages
6	All applicable tabs of this Compliance Form are fully filled out.	Yes		
7	Supporting documentation for utility rate referenced on the "Energy Sources" tab, except for the default Energy Information Administration (EIA) rates.	Yes		Tariff has been provided as a pdf.
8	A site plan showing all adjacent buildings and topography that may shade the proposed building, with the estimated height or number of stories.	Yes		See the 100% CD pdf.
10	NFRC certifications and/or labels for the following fenestration: W1,W2	No		Not available
15	A diagram showing the thermal blocks used in the computer simulation.	Yes		See pdf labeled "Thermal block graphic".
17	Supporting documentation that the specified DOAS meets DX-DOAS efficiency requirements in 90.1 Tables 6.8.1-13 and 6.8.1-14.	Yes		See mechanical schedule M-103.
21	Supporting calculations for the custom performance curves that were referenced in Table 7a on the Proposed HVAC tab.	Yes		See Excel spreadsheet created with manufacturer data for the condensing boilers called "Boiler curves".

Step 2: Develop General Understanding of the Project

? Table 1: Building Areas

Instructions

1. Enter building areas based upon the design documents.

Building Area Type(s)	Conditioned Floor Area, ft ²		Semi-Heated and Unconditioned Floor Area, ft ²		Spaces not Enclosed, ft ²		Total, ft ²	# of Above Grade Floors	# of Below Grade Floors
	New Construction	Renovation	New Construction	Renovation	New Construction	Renovation			
	Multifamily	84,365							
Retail	24,750						24,750	3	0
Sub-total	109,115	-	-	-	-	-	-	-	-
Total	109,115		-		-		109,115	13	-

Add Row Delete Row

Building Areas Summary

Total New Construction Floor Area, ft ²	Total Renovation Floor Area, ft ²	Total # of Floors (populated from Table 1 override as needed)	
		Above Grade	Below Grade
109,115	-	13	0

Notes

Please include applicable notes as needed.

[Instructions](#)
[Documentation Process Overview](#)
[Contact Information](#)
[General Information](#)
[Dashboard](#)
[Energy Sources](#)
[Operating Schedules: ...](#)

Renovations and Yet to Be Designed Systems and Components

Project is 100% new construction

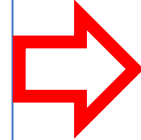
Describe yet to be designed building systems and components that are excluded from building permit

None

Step 3: Establish Review Scope - Impactful End Uses

Criteria described in the **Review Methodology** section of the Manual

- Contribution toward the difference in energy use between the baseline/budget and proposed design.
- Contribution toward the total energy of of the proposed design except when trade-offs are not allowed
- Contribution toward the total energy use of the baseline/budget except when trade-offs are not allowed



Energy Performance Summary Tab of the Compliance Form

Table 2: Enduses with the Highest Contribution Towards the Total Energy Use of the Proposed Design

Rank	Site Energy	Source Energy	Energy Cost	GHG Emissions
#1	Space heating (42%)	Misc equipment (27%)	Misc equipment (29%)	Space heating (34%)
#2	Service water heating (17%)	Space heating (25%)	Space heating (22%)	Misc equipment (22%)
#3	Misc equipment (17%)	Space cooling (12%)	Space cooling (13%)	Service water heating (14%)
#4	Space cooling (7%)	Fans - interior ventilation (11%)	Fans - interior ventilation (12%)	Space cooling (10%)
#5	Fans - interior ventilation (7%)	Interior lighting (11%)	Interior lighting (12%)	Fans - interior ventilation (9%)

Table 3: Enduses with the Highest Contribution Towards the Total Energy Use of the Baseline Design

Rank	Site Energy	Source Energy	Energy Cost	GHG Emissions
#1	Space heating (36%)	Interior lighting (21%)	Interior lighting (24%)	Space heating (29%)
#2	Service water heating (17%)	Space heating (20%)	Misc equipment (20%)	Interior lighting (18%)
#3	Interior lighting (14%)	Misc equipment (18%)	Space cooling (17%)	Misc equipment (15%)
#4	Misc equipment (12%)	Space cooling (16%)	Fans - interior ventilation (16%)	Service water heating (13%)
#5	Space cooling (10%)	Fans - interior ventilation (14%)	Space heating (15%)	Space cooling (13%)

Table 4: Enduses with the Highest Contribution Towards Savings of the Proposed Design vs. Baseline Design

Rank	Site Energy	Source Energy	Energy Cost	GHG Emissions
#1	Interior lighting (30%)	Interior lighting (40%)	Interior lighting (38%)	Interior lighting (35%)
#2	Space heating (25%)	Space cooling (22%)	Space cooling (23%)	Space cooling (19%)
#3	Space cooling (17%)	Fans - interior ventilation (20%)	Fans - interior ventilation (20%)	Space heating (18%)
#4	Service water heating (15%)	Space heating (12%)	Misc equipment (9%)	Fans - interior ventilation (17%)
#5	Fans - interior ventilation (15%)	Service water heating (8%)	Space heating (7%)	Service water heating (11%)

...	Renewable Energy	Compliance Calculations	Energy Performance Summary	Quality Control Checks	Submittal Checklist	Revision Log
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Step 3 (continued): Impactful Systems and Components and Their Characteristics

Review Methodology section of the Manual

Helps identify systems and components associated with the impactful end uses

Performance characteristics and operating conditions that drive their energy use

Table 1 Impactful Systems and Components

Lighting End Use	
Performance Characteristics	Operating Conditions
i. Wattage of the lighting fixtures which account for at least 10% of the lighting power based on the fixture wattage and quantity. ii. Lighting controls in a representative sample of spaces.	i. Lighting runtime hours in a representative sample of spaces.
Service Water-heating End Use	
Performance Characteristics	Operating Conditions
i. Type, capacity and efficiency at full and part load of the service water heaters that account for 25% or more of the total specified or installed capacity.	i. Volume of hot water consumed. ii. Supply hot water temperature.
Space Heating End Use	
Performance Characteristics	Operating Conditions
i. Type, capacity and efficiency at full and part load of the space heating systems accounting for 25% or more of the total specified or installed capacity. Where there are multiple systems of the same type, the combined capacity of all systems of that type shall be compared to the 25% threshold. ii. In envelope-dominated building types including multifamily, hotels/motels, dormitories and schools: <ul style="list-style-type: none"> - For each opaque surface type?: U-factors and area of assemblies accounting for 25% or more of the total opaque surface area of this 	i. Hourly heating thermostat setpoints ii. HVAC control setting iii. Mechanical ventilation schedule



Quality Control Checks Tab of the Compliance Form

- Some of the checks are pre-set to be included in review based on the methodology described in the Review Manual

CheckID	QC Check	Include in Review?	Review Outcome
Ref BE01-P	Thermal properties of the above-grade walls in the proposed design are established correctly.	Yes	
Ref BE02-P	Thermal properties of below-grade walls in the proposed design are established correctly.	n/a	n/a
Ref BE03-P	Thermal properties of the roof in the proposed design are established correctly.	Yes	
Ref BE04-P	Thermal properties of the exterior floors in the proposed design are established correctly.	n/a	n/a
Ref BE05-P	Thermal properties of the slab-on-grade floor in the proposed design are established correctly.	Yes	
Ref BE01-B	Thermal properties of the above-grade walls in the baseline design are established correctly.	Yes	Pass

Step 4: Perform Review – Review Checks

Nomenclature

- Review Checks are organized in the following categories:
 - Simulation General (SG)
 - Utility Rates (UR)
 - Building Envelope (BE)
 - Interior Lighting (LI)
 - Exterior Lighting (LE)
 - Plug, Process and Other Loads (PPO)
 - Service Water Heating (SWH)
 - Air-Side HVAC Systems (AHVAC)
 - Water-Side HVAC Systems (WHVAC)
 - Renewable Energy (RE)
 - Exceptional Calculations (EC)
- Each check has CheckID expressed using the abbreviated check category and number
- Checks may be also designated as applying to baseline/budget (B) or proposed (P) design.

Example: **BE08-P** is check #8 related to building envelope (BE) for the proposed design (P).

Step 4 (continued): Types of Checks

TYPES of CHECKS	PROPOSED DESIGN	BASELINE/BUDGET DESIGN
1. General requirements 90.1 Section 11/App G	Always	
2. Specified systems reported in the Compliance Form reflect design document	Always, based on sampling	NA
3. Specified systems meets mandatory requirements	Always, based on sampling	NA
4. Budget/baseline systems reported in the Compliance Form meet 90.1 Section 11/Appendix G	NA	Only for impactful systems, based on sampling
5. Simulation inputs reflect systems and components reported in the Compliance Form	Only for impactful systems, based on sampling	Only for impactful systems, based on sampling
6. Simulation outputs are consistent with systems and components reported in the Compliance Form	Only for impactful systems, based on sampling	Only for impactful systems, based on sampling
7. Modeled end uses are consistent with benchmark	Always	Always

Consistency with the benchmark is always checked for the total site energy use intensity (EUI) and the following end uses: interior lighting, miscellaneous and process equipment, space heating, space cooling, ventilation fans, heat rejections, service water heating and elevators.

Step 4 (continued): Sampling Strategies

- **Review Checks section of the Review Manual** provides recommendations for the sampling strategies for each category of checks
- Interior Lighting example:
 - ✓ For checks that verify the specified fixture wattages, focus on fixtures that account for the largest total wattage on the project and spot-check the rest.
 - ✓ For checks that verify the specified fixture counts, focus on space types that account for the largest total wattage and spot-check the rest.
 - ✓ For checks that verify that the lighting wattage is modeled as reported, check the thermal blocks that account for the highest wattage.



- Helper tables on the **Quality Control Checks tab of the Compliance Form** summarizes project information to facilitate sampling
- Interior Lighting example: space types, thermal blocks and fixture types used on the project ranked by wattage

Space Type, Thermal Block, and Fixture Type Rank by Total Wattage

Rank based Upon Total Wattage Associated with Each	Space Types	Thermal Blocks	Fixture Types
	Name, Total Wattage	Name, Total Wattage	Name, Total Wattage
1	Dwelling Unit, 45,600	Retfl1Sales, 5,904	E, 17,712
2	Sales Area, 17,712	Retfl2Sales, 5,904	D, 3,840
3	Corridor/All Other, 2,610	Retfl3Sales, 5,904	A, 2,610
4	Storage Room/ ≥ 50 ft ² , 2,400	MF1ESE Perim Spc (M.ESE15), 4,620	C, 1,426
5	Stairwell, 1,196	MF1WSW Perim Spc (M.WSW22), 4,620	
6	Lounge/Breakroom/All Other, 768	MF1ENE Perim Spc (M.ENE18), 4,578	
7	Office/Enclosed, 480	MF1WNW Perim Spc (M.WNW19), 4,578	
8	Storage Room/ < 50 ft ² , 230	MF1East Perim Spc (M.E17), 4,524	
9	Restroom/ All Other, 192	MF1West Perim Spc (M.W20), 4,524	
10		MF1East Perim Spc (M.E16), 4,518	

Step 4 (continued): Compliance Form Quality Control Checks Tab Automation Features

- Certain checks are set to “Yes” by default based on the prioritization logic described in the Review Manual
- Pass/Fail outcome is automatically established for certain checks based on the information available in the Compliance Form.
- For check that are automatically set to FAIL, default review comment is populated and may be edited

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Review Comments
Ref UR02	The difference between the virtual baseline and proposed utility rates for electricity, natural gas and other energy sources applicable to the project is as expected.	Yes	Fail	The average energy rate for one or more of the energy sources varies by more than 0.2% (per the Compliance Calculations tab) between the baseline and proposed simulation results. Please correct or provide an explanation.
Ref UR03	The modeled utility rates for electricity, natural gas and other energy sources applicable to the project are as reported on the Compliance Form and are the same in the baseline and proposed design model.	Yes		

Step 4 (continued): Review Check Organization in the Review Manual

1. Check ID and Title
2. Descriptions of the relevant sections of 90.1 for 2016 and 2019
3. Review Tips
 - Point to where to find the relevant information in the Compliance Form or design documents
 - Provide recommendations to review in cases where 90.1 allows AHJ/RA approve projects deviating from general rules
 - Discusses common mistakes
4. List of the applicable simulation reports

eQUEST	BEPU, SS-R, SS-O, LS-C, CSV Space Loads Report
Trane TRACE 700	Energy Cost Budget/PRM Summary, LEED Summary Section 1.3
Trane TRACE 3D Plus	LEED Summary report Section 1.3
IES-VE	Unmet Hours Report, PRM Compliance Report, ECB Compliance Report
EnergyPlus	eplustbl.html 'LEED Summary' report, section EAp2-2 Advisory Messages
OpenStudio	eplustbl.html 'LEED Summary' report, section EAp2-2 Advisory Messages
Carrier HAP v5	"LEED Summary" report, Section 2 "Minimum Energy Performance Calculator", table titled "Unmet Loads")
Design Builder	LEED Minimum Energy Performance Calculator

Step 4 (continued): Simulation Reports Section of Review Manual

Annotated simulation reports for the following tools:

- Carrier HAP v5
- DesignBuilder
- EnergyPlus
- eQUEST
- OpenStudio
- Trane TRACE 700
- Trane 3D Plus

BEPS Building Energy Performance

REPORT- BEPS Building Energy Performance

SG03: Weather WEATHER FILE- NEW YORK LAGUARDI NY

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT MTR	EXT USAGE	TOTAL
EMI ELECTRICITY MBTU	173.0	231.5	637.0	289.0	261.4	0.0	0.0	132.2	0.0	7.0	0.0	6.7	1737.7
FMI NATURAL-GAS MBTU	0.0	0.0	0.0	33.5	0.0	0.0	0.0	0.0	0.0	0.0	850.0	0.0	883.5
MBTU	173.0	231.5	637.0	322.5	261.4	0.0	0.0	132.2	0.0	7.0	850.0	6.7	2621.2

TOTAL SITE ENERGY 2621.21 MBTU 31.1 KBTU/SQFT-YR GROSS-AREA 31.1 KBTU/SQFT-YR NET-AREA

TOTAL SOURCE ENERGY 6096.65 MBTU 72.3 KBTU/SQFT-YR GROSS-AREA 72.3 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 5.30

PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00

HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 5

HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 459

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

SG10: Site

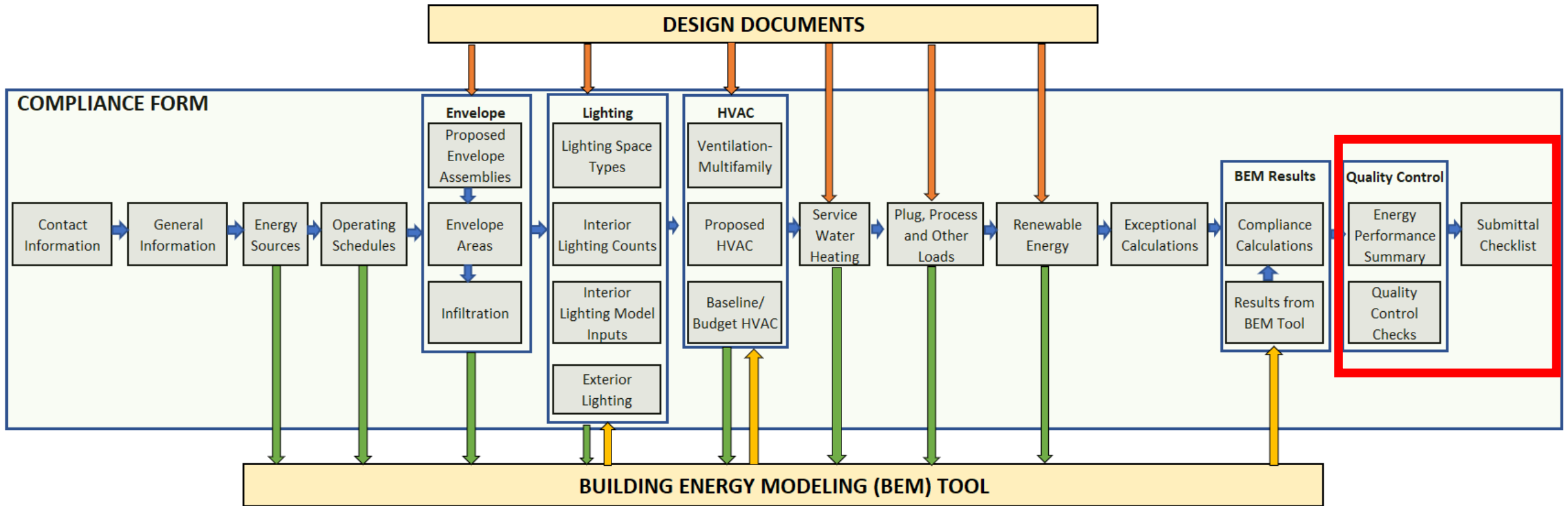
SG08: UMLH>300 exceeds the prescribed limit.

Step 5: Communicate the Review Outcome

CheckID	QC Check	Include in Review? <i>Reviewer Only</i>	Review Outcome <i>Reviewer Only</i>	Rev 0 Compliance Form Generated Review Comments	Rev 0 Response	Rev 1 Review Comments	Rev 1 Response to Comments
Ref SG07	The number of unmet load hours (UMLH) for the baseline and proposed design reported in the Compliance Form for the baseline and proposed designs does not exceed the prescribed limit.	Yes	Fail	The unmet load hours exceed allowable limits. Please correct.	Only applies to a small storage room. No changes were made.		

- Reviewer comments and submitter responses are entered in the Compliance Form on the **Quality Control Checks tab** for each review iteration.

DEMONSTRATION OF REVIEW PROCESS



REVIEW CHECK DEMONSTRATIONS

Case Study

General

- New mixed-use multifamily building located in New York, NY, climate zone 4A.
- Floors 4-13 are multifamily with 80 apartments and floors 1-3 consist of retail.
- Fully designed.

HVAC

- Dwelling units: 4-pipe fan coil units served by condensing boiler and air-cooled chiller systems.
 - Exhaust and makeup air: direct outdoor air system (DOAS).
- Corridor and retail areas: constant volume, gas-fired with DX cooling package units.

Lighting

- LED in all areas.



SIMULATION GENERAL

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Compliance Form Generated Review Comments
Ref SG01	The same approved simulation program is used for the baseline and proposed design models.	Yes	Pass	
Ref SG02	The same approved simulation program is used for the baseline and proposed design models.	Yes	Pass	
Ref SG07	The number of unmet load hours (UMLH) for the baseline and proposed design reported in the Compliance Form for the baseline and proposed designs does not exceed the prescribed limit.	Yes	Fail	The unmet load hours exceed allowable limits. Please correct.
Ref SG10-B	Site Energy Use Intensity (EUI) of the baseline design is generally consistent with the selected benchmark, with difference of less than 20%.	Yes	Pass	
Ref SG11-P	Site EUI of the lighting energy enduse in the proposed design is generally consistent with the selected benchmark, with a difference that does not exceed -50%/50%.	Yes	Fail	Site Energy Use Intensity (EUI) of the lighting energy enduse in the proposed design differs from the benchmark by more than -50%/50%. See Table 6 on the Energy Performance Summary tab for more detail. Please check model inputs and revise or provide an explanation.
Ref SG11-B	Site EUI of the lighting energy enduse in the baseline design is generally consistent with the selected benchmark, with a difference that does not exceed -50%/50%.	Yes	Pass	
Ref SG12-B	Site EUI of the miscellaneous and process equipment enduse in the baseline design is generally consistent with the selected benchmark, with a difference that does not exceed -50%/50%.	Yes	Pass	
Ref SG20	Baseline energy use is correctly allocated to regulated versus unregulated energy uses and the compliance outcome is established correctly.	Yes	Fail	There is no modeled energy associated with elevator and escalators which is unexpected. Please provide an explanation or revise the model.

SG07 The number of unmet load hours reported in the Compliance Form does not exceed the prescribed limits

Review Tips (from Review Checks section of the Review Manual)

1. Unmet load hours (UMLH) are reported in **Table 1 on the Compliance Calculations tab** of the Compliance Form.

Table 1: Unmet Load Hours

Unmet Loads	Proposed Design	Baseline Design
Number of hours heating loads are not met	392	6
Number of hours cooling loads are not met	250	2
Total	642	8
Compliance	No	

2. Unmet load hour indicate that even though the two models have the same thermostat setpoints, the actual space temperatures in the proposed design were lower during the heating season and/or higher during the cooling season. This will reduce energy use of the proposed design, which is not an allowed trade-off.

SG07 The number of unmet load hours reported in the Compliance Form does not exceed the prescribed limits

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Compliance Form Generated Review Comments
Ref SG07	The number of unmet load hours (UMLH) for the baseline and proposed design reported in the Compliance Form for the baseline and proposed designs does not exceed the prescribed limit.	Yes	Fail	The unmet load hours exceed allowable limits. Please correct.

Pass/Fail auto-populated based on information available in the **Compliance Calculations tab** of the Compliance Tag.

Table 1: Unmet Load Hours

Unmet Loads	Proposed Design	Baseline Design
Number of hours heating loads are not met	392	6
Number of hours cooling loads are not met	250	2
Total	642	8
Compliance	No	

Review Tips (from Review Checks section of the Review Manual)

Extenuating circumstances for considering acceptance:

1. Only exceed limit by small margin, 315 versus 300.
2. Floor area with unmet low hours is low. For example, unmet load hours are in a 100 ft² storage room.
3. How far the indoor temperature drops or rises out of the acceptable range.

SG11-P Modeled interior lighting energy use of the proposed design is generally consistent with the selected benchmark, with the difference less than set threshold

Review Tips (from Review Checks section of the Review Manual)

1. If the default values in **Table 6 of the Energy Performance Summary tab**, the “Acceptable Difference Before QC Flag” columns, the “Interior Lighting” row are overwritten, confirm that the entered values are justified.
2. Question results if the difference between the modeled interior lighting EUI and the benchmark EUI is outside the limits set in the last two columns of **Table 6 on the Energy Performance Summary tab**.
3. **Common mistakes**
 - Lighting wattage too high/low
 - Lighting runtime hours are too high/low
 - Savings from occupancy sensors and daylighting are too high/low

SG11-P Continued

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Compliance Form Generated Review Comments
Ref SG11-P	Site EUI of the lighting energy enduse in the proposed design is generally consistent with the selected benchmark, with a difference that does not exceed -50%/50%.	Yes	Fail	Site Energy Use Intensity (EUI) of the lighting energy enduse in the proposed design differs from the benchmark by more than -50%/50%. See Table 6 on the Energy Performance Summary tab for more detail. Please check model inputs and revise or provide an explanation.

Table 6: Proposed vs Benchmark Energy Use Intensity (EUI) by Enduse

Notes

1. % Difference = (Benchmark - Proposed)/Benchmark

Enduse	Site Energy Use Intensity (kBtu/sf/yr)			Source Energy Use Intensity (kBtu/sf/yr)			Energy Cost Intensity (\$/sf/yr)			GHG Emissions Intensity (kg CO ₂ /sf/yr)			Acceptable Difference before QC Flag	
	Proposed	Benchmark	% Difference	Proposed	Benchmark	% Difference	Proposed	Benchmark	% Difference	Proposed	Benchmark	% Difference	% below benchmark	% above benchmark
Interior lighting	1.8	3.9	54.1%	5.0	10.8	54.1%	\$0.07	\$0.15	54.1%	0.15	0.33	54.1%	50.0%	50.0%

BUILDING ENVELOPE

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Compliance Form Generated Review Comments
Ref BE01-P	Thermal properties of the above-grade walls in the proposed design are established correctly.	Yes		
Ref BE01-B	Thermal properties of the above-grade walls in the baseline design are established correctly.	Yes	Pass	
Ref BE02-P	Thermal properties of below-grade walls in the proposed design are established correctly.	n/a	n/a	
Ref BE02-B	Thermal properties of below-grade walls in the baseline design are established correctly.	n/a	n/a	
Ref BE03-P	Thermal properties of the roof in the proposed design are established correctly.	Yes		
Ref BE03-B	Thermal properties of the roof in the baseline design are established correctly.	Yes	Pass	
Ref BE06-P	Modeled U-factors and areas of the above-grade walls in the proposed design are as reported in the Compliance Form.	Yes		
Ref BE06-B	Modeled U-factor and areas of the above-grade walls in the baseline design are as reported on the Compliance Form.	Yes		
Ref BE13-B	Fenestration area in the baseline design reported in the Compliance Form is established correctly.	Yes	Fail	The autopopulated window to wall ratio on the Envelope Areas tab in Tables 3 and 4 appears to have been overridden. Please provide an explanation for the overridden values or correct.
Ref BE15-P	Proposed fenestration U-factor, SHGC and VT are established correctly and required documentation is provided.	Yes		
Ref BE18-B	Modeled infiltration rate for the baseline design reflects the values reported in the Compliance Form.	Yes		

BE01-P, Thermal properties of the above-grade walls in the proposed design are established correctly.

Review Tips (from Review Checks section of the Review Manual)

1. Locate constructions selected for the review in the design documents based on the reference provided for that construction in the Plans/Specs column of **Table 1 in the Proposed Envelope Assemblies tab** of the Compliance form.
 - Focus the review on constructions that account for the highest wall area, as shown in the table in the **Building Envelope (BE) section of the Quality Control Check tab**.
2. Verify the following:
 - Descriptions of the construction provided in the table reflects design documents.
 - The values reported in “Modeled U/C/F-factor Including Int. and Ext. Air Film” are established correctly.
 - Any uninsulated assemblies such as projecting balconies, perimeter edges of intermediate floor slabs, concrete floor beams over parking garages and roof parapets are captured correctly.
3. **Common Mistakes**
 - The overall assembly U-value is established without accounting for thermal bridging, as required by 90.1 Section 5.5.3

BE01-P, Thermal properties of the above-grade walls in the proposed design are established correctly.

Table 1: Opaque Envelope Constructions Accounting for the Largest Area Within That Surface Type

Surface Type	Proposed Design				Baseline Design U/C/F-factor (Total Area ft ²)		
	Construction Name	Reported U/C/F-factor	Total Area, ft ²	Plans/Spe cs	Residential	Nonresidential	Semiheated
Above-Grade Exterior Wall	AGW1	0.036	41,546	A-601	U-0.064 (26,974 ft ²)	U-0.124 (14,572 ft ²)	-
					-	-	-
					-	-	-
Roof	Roof1	0.026	8,436	A-601	U-0.063 (8,436 ft ²)	-	-
					-	-	-
					-	-	-

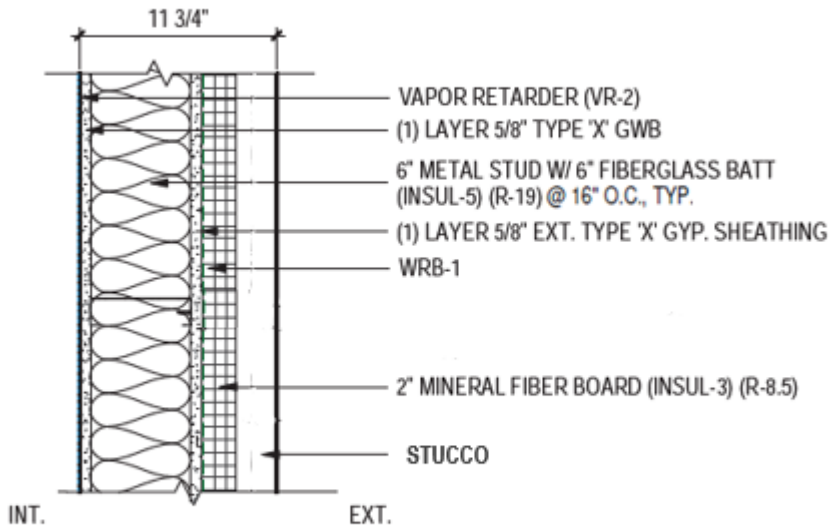
CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Review Comments
Ref BE01-P	Thermal properties of the above-grade walls in the proposed design are established correctly.	Yes		

BE01-P, Continued

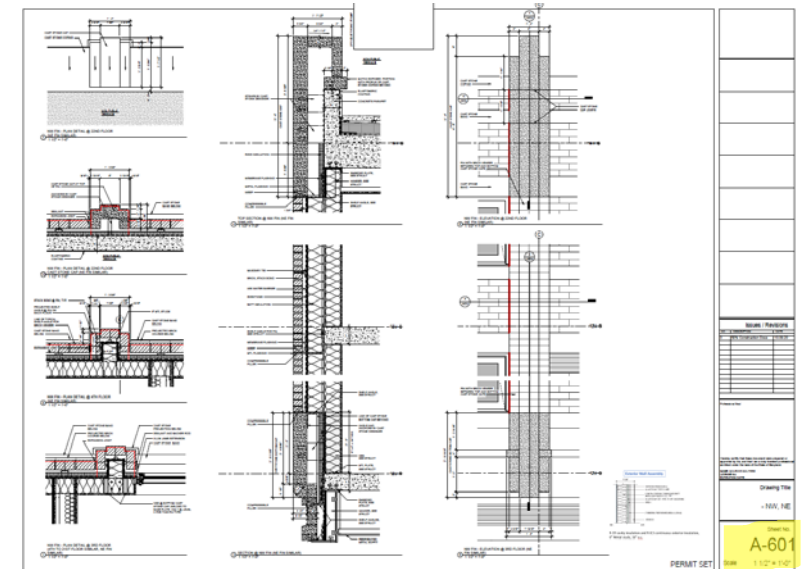
Table 1: Proposed Opaque Envelope Constructions

Modeled Construction Name	Surface Type	Construction Type Legend: AGW = Above Grade Wall	Detailed Description	Rated R-Value of Cavity Insulation	Rated R-Value of Continuous Insulation	Effective U/F/C-Factor of Cont + Cav Insulation Based on 90.1 App A	Total R-value of Materials in Addition to Cont. and Cav. Insulation (If Any)	Modeled U/C/F-factor Including Int. and Ext. Air Film	Modeled U/C/F-factor Includes Uninsulated Assemblies?	Modeled U/C/F-factor Includes Similar Assemblies?	Plans / Specs
AGW1	Above-Grade Exterior Wall	Steel-Framed	16 Inch on Center with a 6.0 Inch Depth (Steel-Frame)	19	8.5	U-0.057, Table A3.3.3.1	n/a	0.036	No	No	A-601

Exterior Wall Assembly



The proposed design thermal properties were not established correctly as the reported modeled U-value is substantially less than the value determined automatically in the Compliance Form using Appendix A table lookups in **Table 1 on the Proposed Envelope Assemblies tab**



R-19 cavity insulation and R-8.5 continuous exterior insulation, 6" Metal studs, 16" o.c.

BE06-B - Modeled U-factors and areas of the above-grade walls in the baseline design are as reported in the Compliance Form.

Review Tips (from Review Checks section of the Review Manual)

- 1. Use simulation reports to verify that modeled U-factors and areas of the exterior walls reflect the values reported in the Compliance Form. The reported values for the baseline/budget are located in **Table 1 on the Envelope Areas tab.**
- 2. Focus on constructions that account for the largest above grade wall area based on the **table in the Building Envelope section of the Quality Control Checks tab.**
- 3. **Building Energy Modeling Tool Output Reports**

eQUEST Reports	LV-D
Trane TRACE 700	Building U-Values, Building Areas
Trane TRACE 3D Plus	Envelope Summary report
IES-VE	Room Loads Report, Zone Loads Report
EnergyPlus	eplustbl.html 'Envelope Summary' report
OpenStudio	eplustbl.html 'Envelope Summary' report
Carrier HAP v5	Surface Areas: "LEED Summary Report", Section 2 "Minimum Energy Performance Calculator", table titled "Above Grade Wall & Vertical Glazing Areas" Wall Assembly U-Value: "Wall Constructions" report.
Design Builder	Opaque Exterior Table in Output Summary Document

BE06-B - Modeled U-factors and areas of the above-grade walls in the baseline design are as reported in the CF.

Table 1: Opaque Envelope - Baseline and Proposed Surface Areas and Properties

Modeled Construction Name	New, Existing to Remain, or Retrofitted	Building Area Type (for Appendix G Projects Only, 90.1 Section G3.1.1-1)	Orientation	Building Envelope Conditioning Category	Proposed Design			Baseline Design	
					Net Area, ft ²	Plans / Specs	Software Reports	Assembly U/E/C-Factor	Roof Solar Reflectance/ Thermal Emittance
AGW1	New	Other	North	Residential	3,606	A-301		U-0.064	n/a
AGW1	New	Other	East	Residential	9,881	A-301		U-0.064	n/a
AGW1	New	Other	South	Residential	3,606	A-301		U-0.064	n/a
AGW1	New	Other	West	Residential	9,881	A-301		U-0.064	n/a
AGW1	New	Retail (stand alone)	North	Nonresidential	2,498	A-302		U-0.124	n/a
AGW1	New	Retail (stand alone)	East	Nonresidential	2,736	A-302		U-0.124	n/a
AGW1	New	Retail (stand alone)	South	Nonresidential	2,498	A-302		U-0.124	n/a
AGW1	New	Retail (stand alone)	West	Nonresidential	6,840	A-302		U-0.124	n/a
Roof1	New	Other	Horizontal	Residential	8,436	A-3030		U-0.063	0.3 / 0.9

REPORT- LV-D Details of Exterior Surfaces

NUMBER OF EXTERIOR SURFACES 65
(U-VALUE INCLUDES OUTSIDE FILM; WINDOW INCLUDES FRAME AND CURB, IF DEFINED)

SURFACE	W I N D O W S		W A L L	
	U-VALUE (BTU/HR-SQFT-F)	AREA (SQFT)	U-VALUE (BTU/HR-SQFT-F)	AREA (SQFT)
MF1North Wall (G.N2.E1) in space: N Stair1	0.539	19.25	0.124	35.75
MF1North Wall (G.ENE7.E7) in space: MF1ENE Perim Spc (G.ENE7)	0.539	87.50	0.063	162.50
MF1North Wall (G.WNW8.E10) in space: MF1WNW Perim Spc (G.WNW8)	0.539	87.50	0.063	162.50
MF1North Wall (M.N13.E15) in space: N Stair2	0.539	154.00	0.124	286.00
MF1North Wall (M.ENE18.E21) in space: MF1ENE Perim Spc (M.ENE18)	0.539	700.00	0.063	1300.00
MF1North Wall (M.WNW19.E24) in space: MF1WNW Perim Spc (M.WNW19)	0.539	700.00	0.063	1300.00
MF1North Wall (T.N24.E30) in space: N Stair3	0.539	19.25	0.124	35.75
MF1North Wall (T.ENE29.E41) in space: MF1ENE Perim Spc (T.ENE29)	0.539	87.50	0.063	162.50
MF1North Wall (T.WNW30.E45) in space: MF1WNW Perim Spc (T.WNW30)	0.539	87.50	0.063	162.50

90.1 and Simulation Tool References - Click on Text to Activate Scroll Bar

90.1 References:
N/A

Software References:
LV-D

Close

U-values are ~=. Small deviations (up to 3%) may be due to accounting for exterior air films. In 90.1 the prescriptive U-factors in Section 5 are captured using fixed R-values; in simulation tools they may be determined dynamically based on hourly weather conditions.

BE06-B Cont'd

Table 1: Opaque Envelope - Baseline and Proposed Surface Areas and Properties

Modeled Construction Name	New, Existing to Remain, or Retrofitted	Building Area Type (for Appendix G Projects Only, 90.1 Section G3.1.1-1)	Orientation	Building Envelope Conditioning Category	Proposed Design			Baseline Design	
					Net Area, ft ²	Plans / Specs	Software Reports	Assembly U/F/C-Factor	Roof Solar Reflectance/ Thermal Emittance
AGW1	New	Other	North	Residential	3,606	A-301		U-0.064	n/a
AGW1	New	Other	East	Residential	9,881	A-301		U-0.064	n/a
AGW1	New	Other	South	Residential	3,606	A-301		U-0.064	n/a
AGW1	New	Other	West	Residential	9,881	A-301		U-0.064	n/a
AGW1	New	Retail (stand alone)	North	Nonresidential	2,498	A-302		U-0.124	n/a
AGW1	New	Retail (stand alone)	East	Nonresidential	2,736	A-302		U-0.124	n/a
AGW1	New	Retail (stand alone)	South	Nonresidential	2,498	A-302		U-0.124	n/a
AGW1	New	Retail (stand alone)	West	Nonresidential	6,840	A-302		U-0.124	n/a
Roof1	New	Other	Horizontal	Residential	8,436	A-3030		U-0.063	0.3 / 0.9

$$\text{North} = 3,606 + 2,498 = 6,104 \text{ ft}^2$$

Wall areas are equal.
6,104 ft² = 6,104 ft²

REPORT- LV-D Details of Exterior Surfaces

WEATHER FILE- New York CityNY TMY2

(CONTINUED)

	AVERAGE U-VALUE/WINDOWS (BTU/HR-SQFT-F)	AVERAGE U-VALUE/WALLS (BTU/HR-SQFT-F)	AVERAGE U-VALUE WALLS+WINDOWS (BTU/HR-SQFT-F)	WINDOW AREA (SQFT)	WALL AREA (SQFT)	WINDOW+WALL AREA (SQFT)
NORTH	0.539	0.090	0.198	1942.50	6104.00	8047.50

INTERIOR LIGHTING

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Compliance Form Generated Review Comments
Ref IL01	The floor area used in the lighting calculations is consistent with the reported project floor area.	Yes	Pass	
Ref IL02-P	Proposed Lighting Power in the Compliance Form reflects design documents for spaces where lighting is fully specified.	Yes		
Ref IL03-P	Proposed LPD to be modeled for spaces where lighting is not specified or partially specified is established correctly in the Compliance Form.	Yes	Fail	There are residential space types (dwelling units, guest rooms, etc.) in this project per the entries on the Interior Lighting Counts tab but no area with unspecified lighting was entered which is unexpected. Please correct or provide an explanation.
Ref IL05-P	Specified lighting controls meet mandatory requirements in 90.1 Section 9.	Yes	Fail	Based upon the inputs on the Interior Lighting Counts tab it appears that mandatory lighting control requirements may not be met. Please review and correct or provide an explanation.
Ref IL06-B	Modeled interior lighting peak demand is consistent with the baseline design lighting wattage reported in the Compliance Form.	Yes	Pass	
Ref IL07-P	Proposed interior lighting wattage entered into simulation tool reflects values reported in the Compliance Form.	Yes		
Ref IL07-B	Baseline Design interior lighting wattage entered into simulation tool reflects values reported in the Compliance Form.	Yes		
Ref IL10-B	Modeled interior lighting runtime hours of the baseline design are realistic.	Yes	Pass	

LI02-P Proposed lighting power reported in the Compliance Form reflects design documents for spaces where lighting is fully specified

Review Tips (from Review Checks section of the Review Manual)

1. Refer to the **table in the Interior Lighting section on the Quality Control Tab** to identify lighting fixtures with the highest total wattage and space types that account for the greatest total lighting wattage.
2. Locate selected fixture make and model #s on the lighting schedule drawings and verify that the manufacturer maximum rated wattage reported for the fixtures in **Table 1 of the Interior Lighting Counts tab** is aligned with the manufacturer's maximum rated fixture wattage shown on the cutsheets.
3. Locate several high wattage spaces on **the Interior Lighting Counts tab**. Refer to the lighting plans to confirm that fixture types and counts for these spaces reported in the Compliance Form match design documents.
4. **Common Mistakes**
 - Fixture wattage is not based on a complete fixture including lamp and ballast and does not reflect manufacturer rated fixture wattage.
 - Track lighting is not calculated according to the allowed methods as described in 90.1 Section 9.1.4.
 - Proposed LPDs are based on partially specified or temporary lighting. For example, in hotel guest rooms the hardwired fixtures shown on drawings are typically supplemented by plug-in floor and table lamps.

IL02-P Continued

Table 2: Space Type, Thermal Block, and Fixture Type Rank by Total Wattage

Rank based Upon Total Wattage Associated with Each	Space Types	Thermal Blocks	Fixture Types
	Name (Total Wattage)	Name (Total Wattage)	Name (Total
1	Dwelling Unit (21,965 W)	Retfl1Sales (5,314 W)	C2 (23,565 W)
2	Sales Area (15,941 W)	Retfl2Sales (5,314 W)	E (15,941 W)
3	Corridor/All Other (2,560 W)	Retfl3Sales (5,314 W)	D (3,840 W)
4	Storage Room/ ≥ 50 ft ² (2,400 W)	Corr2 (2,232 W)	C (1,426 W)
5	Stairwell (1,196 W)	MF1ESE Perim Spc (M.ESE15) (2,196 W)	C2EM (960 W)
6	Lounge/Breakroom/All Other (768 W)	MF1East Perim Spc (M.E16) (2,196 W)	
7	Office/Enclosed (480 W)	MF1East Perim Spc (M.E17) (2,196 W)	
8	Storage Room/ < 50 ft ² (230 W)	MF1ENE Perim Spc (M.ENE18) (2,196 W)	
9	Restroom/ All Other (192 W)	MF1WNW Perim Spc (M.WNW19) (2,196 W)	
10		MF1West Perim Spc (M.W20) (2,196 W)	
Associated Tab	Interior Lighting Model Inputs		Interior Lighting Counts

IL02-P Continued

Fixture Label from Lighting Schedules	A	B	C	D	E	C2	C2EM
? Maximum Rated Fixture Wattage	26.1	30.1	23.0	32.0	43.2	16.0	16.0
? Exempt Lighting Application?	No	No	No	No	No	No	No
? Decorative Lighting	No	No	No	No	No	No	No
? Sales Area Merchandise Highlighting	No	No	No	No	No	No	No

Table 1: Lighting Fixture Counts

Space Name Reference (e.g. space name(s) from drawings)	Thermal Block Name from Model	Lighting Plans Dwg#	Multiplier	Space/Building Area Type (90.1-Section 9)	Area (ft ²)	RCR LPD Adjustment per Section 9.6.4?	Enter fixture counts for each fixture type							
Corr 101	Corr1	E-101	1	Corridor/All Other	604	No					10	6		

C4RDL Calculite LED 4" Round Downlight

C2	PHILIPS LIGHTING OR ACCEPTABLE EQUIVALENT BY:	C4L -15 -9 -35 -M -Z10 -U C4R -DL -CC SERIES	0'-6" RECESSED CEILING MOUNTED LED DOWNLIGHT LUMINAIRE: GALVANIZED STAMPED STEEL HOUSING; SELF-FLANGED SEMI-SPECULAR FINISHING TRIM; POLYCARBONITE LENS; WIDE DISTRIBUTION; INTEGRAL MOUNTED 0-10V, 1% RATED LED DIMMING DRIVER; FINISHES AS SELECTED BY ARCHITECT.	UNV	16W / FIXTURE 486 / DELIVERED LUMENS 3500K 90 CRI
C2EM	PHILIPS LIGHTING OR ACCEPTABLE EQUIVALENT BY:	C4L -15 -9 -35 -M -Z10 -U C4R -DL -CC SERIES EM	0'-6" RECESSED CEILING MOUNTED LED DOWNLIGHT LUMINAIRE: GALVANIZED STAMPED STEEL HOUSING; SELF-FLANGED SEMI-SPECULAR FINISHING TRIM; POLYCARBONITE LENS; WIDE DISTRIBUTION; INTEGRAL MOUNTED 0-10V, 1% RATED LED DIMMING DRIVER; FINISHES AS SELECTED BY ARCHITECT.	UNV	16W / FIXTURE 486 / DELIVERED LUMENS 3500K 90 CRI

Narrow							Me
Light engine	Input volts	Input freq	Input current	Drive current	Input power	THD power	Power factor
C4L05_	120V	50/60Hz	0.05	110 mA	6W	<20%	>0.95
	277V		0.03			<20%	>0.90
C4L10_	120V	50/60Hz	0.08	230 mA	11W	<15%	>0.95
	277V		0.04			<20%	>0.95
C4L15_	120V	50/60Hz	0.12	360 mA	16W	<10%	>0.95
	277V		0.06			<15%	>0.95
C4L20_	120V	50/60Hz	0.17	490 mA	21W	<10%	>0.95
	277V		0.08			<15%	>0.95
C4L25_	120V	50/60Hz	0.22	640 mA	27W	<10%	>0.95
	277V		0.10			<15%	>0.95
C4L30_	120V	50/60Hz	0.27	790 mA	33W	<10%	>0.95
	277V		0.13			<15%	>0.95

Wattage in the Compliance Form matches the maximum fixture wattage.

IL02-P Continued

Table 2: Space Type, Thermal Block, and Fixture Type Rank by Total Wattage

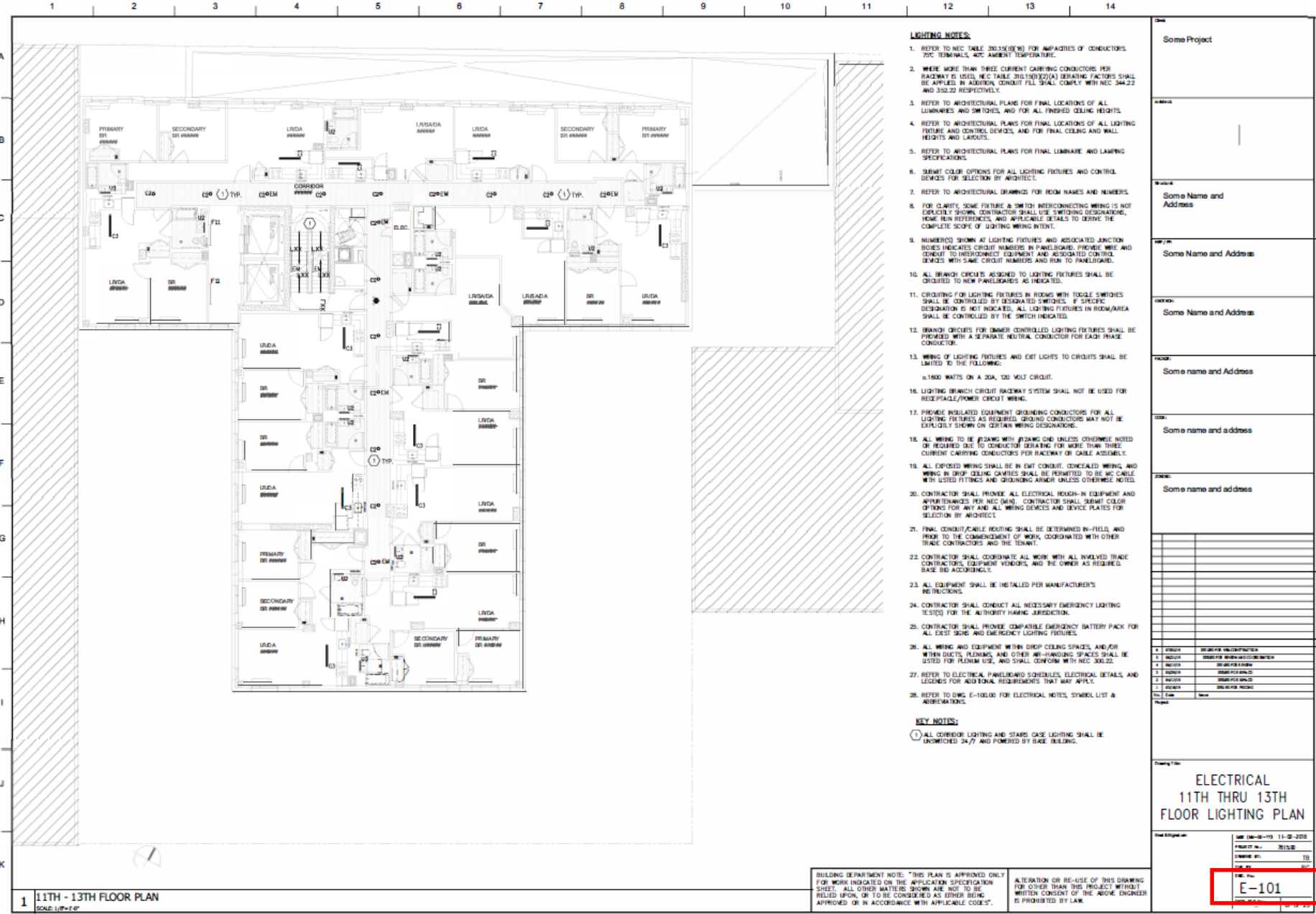
Rank based Upon Total Wattage Associated with Each	Space Types	Thermal Blocks	Fixture Types
	Name (Total Wattage)	Name (Total Wattage)	Name (Total
1	Dwelling Unit (21,965 W)	Retfl1Sales (5,314 W)	C2 (23,565 W)
2	Sales Area (15,941 W)	Retfl2Sales (5,314 W)	E (15,941 W)
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7	Office/Enclosed (480 W)	MF1East Perim Spc (M.E17) (2,196 W)	
8	Storage Room/ < 50 ft ² (230 W)	MF1ENE Perim Spc (M.ENE18) (2,196 W)	
9	Restroom/ All Other (192 W)	MF1WNW Perim Spc (M.WNW19) (2,196 W)	
10		MF1West Perim Spc (M.W20) (2,196 W)	
Associated Tab	Interior Lighting Model Inputs		Interior Lighting Counts

IL02-P Proposed Lighting Power Density (LPD) in the Compliance Form reflects design documents for spaces where lighting is fully specified.

Table 1: Lighting Fixture Counts

Space Name Reference (e.g. space name(s) from drawings)	Thermal Block Name from Model	Lighting Plans Dwg#	Multiplier	Space/Building Area Type (90.1-Section 9)	Area (ft ²)	RCR LPD Adjustment per Section 9.6.4?	Enter fixture counts for each fixture label from lighting schedules						
					Total for Area (ft ²):	Total Fixture Counts:	A	B	C	D	E	C2	C2EM
Corr 101	Corr1	E-101	1	Corridor/All Other	604	No						10	6

IL02-P Continued



LIGHTING NOTES:

- REFER TO NEC TABLE 310.15(B)(7) FOR AMPLICITIES OF CONDUCTORS, 75C TERMINALS, 40C AMBIENT TEMPERATURE.
- WHERE MORE THAN THREE CURRENT CARRYING CONDUCTORS PER RACEWAY IS USED, NEC TABLE 310.15(B)(2)(A) DERRATING FACTORS SHALL BE APPLIED. IN ADDITION, CONDUIT FILL SHALL COMPLY WITH NEC 344.22 AND 352.22 RESPECTIVELY.
- REFER TO ARCHITECTURAL PLANS FOR FINAL LOCATIONS OF ALL LUMINAIRES AND SWITCHES, AND FOR ALL FINISHED CEILING HEIGHTS.
- REFER TO ARCHITECTURAL PLANS FOR FINAL LOCATIONS OF ALL LIGHTING FIXTURE AND CONTROL DEVICES, AND FOR FINAL CEILING AND WALL HEIGHTS AND LOCATIONS.
- REFER TO ARCHITECTURAL PLANS FOR FINAL LUMINAIRE AND LAMPING SPECIFICATIONS.
- SUBMIT COLOR OPTIONS FOR ALL LIGHTING FIXTURES AND CONTROL DEVICES FOR SELECTION BY ARCHITECT.
- REFER TO ARCHITECTURAL DRAWINGS FOR ROOM NAMES AND NUMBERS.
- FOR CLARITY, SOME FIXTURE & SWITCH INTERCONNECTING WIRING IS NOT EXPLICITLY SHOWN. CONTRACTOR SHALL USE SWITCHING DESIGNATIONS, NAME-BUS REFERENCES AND APPLICABLE DETAILS TO DEFINE THE COMPLETE SCOPE OF LIGHTING WIRING INTENT.
- NUMBER(S) SHOWN AT LIGHTING FIXTURES AND ASSOCIATED JUNCTION BOXES INDICATES CIRCUIT NUMBERS IN PANELBOARD. PROVIDE WIRE AND CONDUIT TO INTERCONNECT EQUIPMENT AND ASSOCIATED CONTROL DEVICES WITH SAME CIRCUIT NUMBERS AND RUN TO PANELBOARD.
- ALL BRANCH CIRCUITS ASSIGNED TO LIGHTING FIXTURES SHALL BE CIRCUITS TO NEW PANELBOARDS AS INDICATED.
- CIRCUITING FOR LIGHTING FIXTURES IN ROOMS WITH TOGGLE SWITCHES SHALL BE CONTROLLED BY SEPARATED SWITCHES. IF SEPARATE DESIGNATION IS NOT INDICATED, ALL LIGHTING FIXTURES IN ROOM/AREA SHALL BE CONTROLLED BY THE SWITCH INDICATED.
- BRANCH CIRCUITS FOR DIMMER CONTROLLED LIGHTING FIXTURES SHALL BE PROVIDED WITH A SEPARATE NEUTRAL CONDUCTOR FOR EACH PHASE CONDUCTOR.
- WIRING OF LIGHTING FIXTURES AND EXIT LIGHTS TO CIRCUITS SHALL BE LIMITED TO THE FOLLOWING:
o 1800 WATTS ON A 20A, 100 VOLT CIRCUIT.
- LIGHTING BRANCH CIRCUIT RACEWAY SYSTEM SHALL NOT BE USED FOR RECEPTACLE/POWER CIRCUIT WIRING.
- PROVIDE INSULATED EQUIPMENT GROUNDING CONDUCTORS FOR ALL LIGHTING FIXTURES AS REQUIRED. GROUNDING CONDUCTORS MAY NOT BE EXPLICITLY SHOWN ON CERTAIN WIRING DESIGNATIONS.
- ALL WIRING TO BE PROVIDED WITH PIGTAILING AND UNLESS OTHERWISE NOTED OR REQUIRED DUE TO CONDUIT DERRATING FOR MORE THAN THREE CURRENT CARRYING CONDUCTORS PER RACEWAY OR CABLE ASSEMBLY.
- ALL EXPOSED WIRING SHALL BE IN EMT CONDUIT, CONCEALED WIRING AND WIRING IN DROP CEILING SPACES SHALL BE PERMITTED TO BE MC CABLE WITH LISTED FITTINGS AND GROUNDING ARMOR UNLESS OTHERWISE NOTED.
- CONTRACTOR SHALL PROVIDE ALL ELECTRICAL ROUGH-IN EQUIPMENT AND APPEARANCES PER NEC (MIN). CONTRACTOR SHALL SUBMIT COLOR OPTIONS FOR ANY AND ALL WIRING DEVICES AND DEVICE PLATES FOR SELECTION BY ARCHITECT.
- FINAL CONDUIT/CABLE ROUTING SHALL BE DETERMINED IN-FIELD AND PRIOR TO THE COMMENCEMENT OF WORK, COORDINATED WITH OTHER TRADE CONTRACTORS AND THE TENANT.
- CONTRACTOR SHALL COORDINATE ALL WORK WITH ALL INVOLVED TRADE CONTRACTORS, EQUIPMENT VENDORS, AND THE OWNER AS REQUIRED. BASE BID ACCORDINGLY.
- ALL EQUIPMENT SHALL BE INSTALLED PER MANUFACTURERS' INSTRUCTIONS.
- CONTRACTOR SHALL CONDUCT ALL NECESSARY EMERGENCY LIGHTING TESTS FOR THE AUTHORITY HAVING JURISDICTION.
- CONTRACTOR SHALL PROVIDE COMPATIBLE EMERGENCY BATTERY PACK FOR ALL EXIST SCENE AND EMERGENCY LIGHTING FIXTURES.
- ALL WIRING AND EQUIPMENT WITHIN DROP CEILING SPACES, AND/OR WITHIN DUCTS, PLenums, AND OTHER RE-ENTRY SPACES SHALL BE USED FOR PLenum USE, AND SHALL CONFORM WITH NEC 300.22.
- REFER TO ELECTRICAL PANELBOARD SCHEDULES, ELECTRICAL DETAILS, AND LEGENDS FOR ADDITIONAL REQUIREMENTS THAT MAY APPLY.
- REFER TO DWG E-10100 FOR ELECTRICAL NOTES, SYMBOL LIST & ABBREVIATIONS.

KEY NOTES:

- (1) ALL CORRIDOR LIGHTING AND STAIRS CASE LIGHTING SHALL BE UNSWITCHED 24/7 AND POWERED BY BASE BUILDING.

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BUILDING DEPARTMENT NOTE: "THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE HELD UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES".

ALTERATION OR RE-USE OF THIS DRAWING FOR OTHER THAN THIS PROJECT WITHOUT WRITTEN CONSENT OF THE ABOVE ENGINEER IS PROHIBITED BY LAW.

**ELECTRICAL
11TH THRU 13TH
FLOOR LIGHTING PLAN**

DATE: 04-18-11	11-2-2018
PROJECT NO.: 201510	
DRAWING NO.:	10
SHEET NO.:	07
E-101	

IL02-P Continued



Corridor Fixture Counts
 Quantity: 10, C2 fixtures
 Quantity: 6, C2 EM fixtures



Fixture Label from Lighting Schedules	A	B	C	D	E	C2	C2EM	
? Maximum Rated Fixture Wattage	26.1	30.1	23.0	32.0	43.2	16.0	16.0	
? Exempt Lighting Application?	No	No	No	No	No	No	No	
? Decorative Lighting	No	No	No	No	No	No	No	
? Sales Area Merchandise Highlighting	No	No	No	No	No	No	No	
109,661	Total Fixture Counts:							
?	?	Enter fixture counts for each						
Area (ft ²)	RCR LPD Adjustment per Section 9.6.4?						10	6
604	No							

LI05-P Specified lighting controls meet mandatory requirements in 90.1 Section 9

Review Tips (from Review Checks section of the Review Manual)

1. **Table 1 of the Interior Lighting Counts tab** lists the mandatory lighting control requirements for each space depending on the space type and based upon the inputs in the Compliance Form flags if mandatory control requirements are not met.
2. This check is performed automatically in the Compliance Form.

IL05-P, Specified lighting controls meet 90.1 mandatory requirements.

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Review Comments
IL05-P	Specified lighting controls meet 90.1 mandatory requirements.	Yes	Fail	Based upon the inputs on the Interior Lighting Counts tab it appears that mandatory lighting control requirements may not be met. Please review and correct or provide an explanation.

Table 1: Lighting Fixture Counts

Space Name Reference (e.g. from drawings)	Thermal Block Name from Model	Lighting Plans Dwg#	Multiplier	Space/Building Area Type (90.1-Section 9)	Automatic Daylighting Controls				Automatic Occupancy Sensor								OS Credit Applied to Proposed Modeled Schedules	
					Controlled Lighting [Watt]	Daylight Sidelighting 90.1 9.4.1.1 (e)	Daylight Toplighting 90.1 9.4.1.1 (f)	Exceed Mandatory Requirements?	Total Controlled Lighting [Watt]	Manual ON 90.1 9.4.1.1 (b)	Partial Automatic ON 90.1 9.4.1.1 (c)	Bilevel 90.1 9.4.1.1 (d)	Automatic Partial OFF 90.1 9.4.1.1 (g)	Automatic Full OFF 90.1 9.4.1.1 (h)	Scheduled Shutoff 90.1 9.4.1.1 (i)	Exceed Mandatory Requirements?		Workstation Lighting Controlled by individual OS [Watt]
Total for Area (ft ²):					4,536	-	-	-	23,500	-	-	-	-	-	-	-	0	18.6%
Apt 103B	Vest Perim Spc (G.V.)	E-101	1	Dwelling Unit	0	No	No	No										
Apt 104A	Vest Perim Spc (G.V.)	E-101	1	Dwelling Unit	0	No	No	No										
Apt 104B	W Perim Spc (G.V.)	E-101	1	Dwelling Unit	0	No	No	No										
Corr 201-901	Corr2	E-101	8	Corridor/All Other	0	n/a	n/a	No	0	No	No	No	No	No	No	No	0	-
Trash 202-902	Corr2	E-101	8	Storage Room/<50 ft^2	0	No	No	No	23	No	No	No	No	Yes	No	No	0	45.0%
Stair 203-903	N Stair2	E-101	8	Stairwell	0	n/a	n/a	No	46	No	No	Yes	Yes	No	Yes	No	0	75.0%
Stair 204-904	S Stair2	E-101	8	Stairwell	0	n/a	n/a	No	46	No	No	Yes	Yes	No	Yes	No	0	75.0%

IL10-B Modeled interior lighting runtime hours of the baseline design are realistic.

Review Tips (from Review Checks section of the Review Manual)

1. This check is automatically performed in the Compliance Form.
2. Effective Full Load Hours (EFLH) is equal to the sum of the hourly schedule fractions a year.

$$\text{EFLH} = \text{LEU} / \text{TLW}$$

LEU = simulated annual lighting energy use [kWh]

TLW = total lighting wattage from [Table 1 of the Lighting Model Inputs tab](#) [kW]

3. Typical lighting EFLH for common building types without accounting for controls are included in [Appendix A in the Review Manual](#).
4. EFLH in the Appendix G baseline do not exceed typical provided in [Appendix A](#) by more than 20%.

IL10-B Modeled interior lighting runtime hours of the baseline design are realistic.

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Compliance Form Generated Review Comments
Ref IL10-B	Modeled interior lighting runtime hours of the baseline design are realistic.	Yes	Pass	

Table 1: Lighting Wattages and Equivalent Full Load Hours

	Interior Lighting Power [W]	Non-coincident Lighting Peak Demand [W]	Annual Lighting Use [kWh]	Effective Full Load Hours (EFLH)	Weighted Average EFLHs per ASHRAE 90.1 App C*
ID	A	B	C	$D=C/(A/1000)$	E
Proposed Design	45,732	27,375	81,129	1,774	2,073
Baseline Design	121,503	84,320	246,093	2,025	2,073
Proposed+Baseline	37.6%	32.5%	33.0%	87.6%	n/a
Associated Tab	Interior Lighting Model Inputs	Compliance Calculations		-	-



EFLH values are within 20%.

AIR-SIDE HVAC SYSTEMS (AHVAC)

CheckID	QC Check	Include in Review?	Review Outcome	Rev 0 Compliance Form Generated Review Comments
Ref AHVAC03-P	All specified air-side HVAC systems are reported in the Compliance Form.	Yes		
Ref AHVAC03-B	Baseline system types reported in the Compliance Form are established correctly.	Yes		
Ref AHVAC07-P	Reported air-side HVAC systems cooling and heating efficiencies reflect design documents.	Yes		
Ref AHVAC08-P	Cooling and heating efficiencies of the specified air-side HVAC systems meet the mandatory minimums in 90.1 Section 6.	Yes		
Ref AHVAC08-B	Baseline air-side systems' heating and cooling efficiencies reported in the Compliance Form are established correctly.	Yes	Pass	
Ref AHVAC09-P	Modeling inputs for the proposed heating and cooling efficiency are provided in the Compliance Form and established correctly.	Yes		
Ref AHVAC09-B	Modeling inputs for the baseline heating and cooling efficiency are provided in the Compliance Form and established correctly.	Yes	Pass	
Ref AHVAC19-B	Modeled peak demand of ventilation fans in the baseline design is generally consistent with design fan power and control reported in the Compliance Form.	Yes	Fail	For constant volume systems peak demand is approximately equal to the design fan kW. For the variable volume systems the peak flow usually does not exceed 70% of the design CFM, drawing approximately 50% of the design power . Based upon these relationships the non-coincident peak demand (kW) is greater than expected per Table 2b on the Baseline HVAC Appendix G tab. Please make the appropriate revisions or provide an explanation.
Ref AHVAC26-P	Ventilation rate and control are modeled for the proposed design as reported in the Compliance Form.	Yes		
Ref AHVAC26-B	Ventilation rate and controls are modeled for the baseline design as reported in the Compliance Form.	Yes		

AHVAC03-B Baseline system types reported in the Compliance Form are established correctly.

Review Tips (from Review Checks section of the Review Manual)

1. Baseline HVAC system types are reported in **Table 1a of the Baseline HVAC App G tab**. Spot-check to confirm that the baseline systems were established correctly based on the applicable 90.1 rules.
 - The building area and space type square footages in **Table 1 on the General Information tab and Table 1 on the Interior Lighting Model Inputs tab** can be used as a starting point for determining the expected baseline system types.

2. Common Mistakes

Appendix G

- Incorrect modeled baseline heating fuel source.
- Modeling dedicated outdoor air system (DOAS) in the baseline on projects with DOAS in the proposed design instead of per 90.1 Section G3.1.1.
- Not modeling System 5 - 8 as one system per floor.

AHVAC03-B Baseline system types reported in the Compliance Form are established correctly.

e. Thermal zones designed with heating-only systems in the proposed design serving storage rooms, stairwells, vestibules, electrical/mechanical rooms, and restrooms not exhausting or transferring air from mechanically cooled thermal zones in the proposed design shall use system type 9 or 10 in the baseline building design.

Table 1: Interior Lighting by Space Type

Space/Building Area Type	Floor Area [ft ²]
Dwelling Unit	76,000
Corridor/All Other	6,040
Stairwell	2,381
Storage Room/<50 ft ²	490
Storage Room/≥50 ft ²	6,012
Lounge/Breakroom/All Other	1,209
Office/Enclosed	771
Restroom/ All Other	318
Sales Area	16,440
Total	109,661

Table G3.1.1-3 Baseline HVAC System Types

Building Type, Number of Floors, and Gross Conditioned Floor Area	Climate Zones 3B, 3C, and 4 to 8	Climate Zones 0 to 3A
Residential	System 1—PTAC	System 2—PTHP
Public assembly <120,000 ft ²	System 3—PSZ-AC	System 4—PSZ-HP
Public assembly ≥120,000 ft ²	System 12—SZ-CV-HW	System 13—SZ-CV-ER
Heated-only storage	System 9—Heating and ventilation	System 10—Heating and ventilation
Retail and 2 floors or fewer	System 3—PSZ-AC	System 4—PSZ-HP
Other residential and 3 floors or fewer and <25,000 ft ²	System 3—PSZ-AC	System 4—PSZ-HP
Other residential and 4 or 5 floors and <25,000 ft ² or 5 floors or fewer and 25,000 ft ² to 150,000 ft ²	System 5—Packaged VAV with reheat	System 6—Packaged VAV with PFP boxes
Other residential and more than 5 floors or >150,000 ft ²	System 7—VAV with reheat	System 8—VAV with PFP boxes

Table 1: Building Areas

Building Area Type(s)	Conditioned Floor Area, ft ²		# of Above Grade Floors	# of Below Grade Floors
	New Construction	Renovation		
Multifamily	84,365		10	0
Retail	24,750		3	0
Sub-total	109,115	-	-	-
Total	109,115		13	-

Based upon the square footages and # of floors entered in Table 1 on the General Information tab and the square footages and space types shown in Table 1 on the Interior Lighting Model Inputs tab and the climate zone, it is expected that at least System 1-PTAC and System 3-PSZ AC would be included in the baseline model. It is also very likely that System 9 – Heating and ventilation would also be included as stairwells and storage rooms are often heated-only spaces.

AHVAC03-B Continued

Table 1a: Air-side HVAC System Type, Capacity and Efficiency

Modeled Sys Name	System Type	Applicable Exception, If Any	Zoning	Areas Served
UH_Stairs	System 9 - Heating and ventilation	G3.1.1 (e)	System per Block	Stairs
RTU-1-6	System 3 - PSZ-AC	G3.1.1 (b)	System per Block	Retail
PTAC_Apt/Cor	System 1 - PTAC		System per Block	Apartments and Corridors



Based upon **Table 1a** inputs on the **Baseline HVAC Appendix G tab** and confirmation that the stairs are heated only spaces on **the Proposed HVAC tab** it appears that the baseline HVAC system types were established correctly.

Table 1a: Air-side HVAC System Type, Capacity and Efficiency

Modeled System Name	Drawing System Name(s)	Drawing Plans/ Spec	Areas Served	Quantity	Single-zone or Multi-zone?	Heating System Type and Capacity					Cooling System Type and Capacity			
						Equipment Type	Heat Pump Type	Fuel Type / Heating Source	Total Capacity for Qty Listed	Cap. Units	Equipment Type	Total Capacity for Qty Listed	Cap. Units	Condensate
UH_HW	UH_1	M-102	Stairs	26	Single Zone Non-Residential	Hydronic or Steam Coil	n/a	n/a	35	kBtu/h	None	n/a	n/a	n/a

AHVAC07-P Reported air-side HVAC systems cooling and heating efficiencies reflect design documents.

Review Tips (from Review Checks section of the Review Manual)

1. Heating and cooling types and capacities of the air-side HVAC systems are reported in **Table 1a of the Proposed HVAC tab**. Cross-check the provided information with the design documents for a sample of systems to confirm alignment.
 - Sample of systems can be determined based upon the rankings in **Table 1 in the AHVAC section on the Quality Control Checks tab**.

Table 1: Proposed Design Air-side Systems Ranked by Impact

Proposed Design Air-side Systems Ranked by Impact				
Rank	Systems By Heating Capacity, [kBtu/hr]	Systems By Cooling Capacity, [kBtu/hr]	Constant Volume Systems by Design Flow Rate, [CFM]	Systems by Design OA, [CFM]
1	FCU_1-80/Apt_Sys, Qty: 80, Total cap: 2,240	FCU_1-80/Apt_Sys, Qty: 80, Total cap: 1,440	FCU_1-80/Apt_Sys, Qty: 80, Total Supply: 48,000	DOAS_1/DOAS_Sys, Qty: 1, Total OA: 6,400
2	DOAS_1/DOAS_Sys, Qty: 1, Total cap: 1,260	DOAS_1/DOAS_Sys, Qty: 1, Total cap: 1,152	RTU-1-6/RTU-1-6, Qty: 6, Total Supply: 14,500	RTU-1-6/RTU-1-6, Qty: 6, Total OA: 5,812
3	RTU-1-6/RTU-1-6, Qty: 6, Total cap: 900	RTU-1-6/RTU-1-6, Qty: 6, Total cap: 768	DOAS_1/DOAS_Sys, Qty: 1, Total Supply: 6,400	RTU_1/Cor_Sys, Qty: 1, Total OA: 363
4	RTU_1/Cor_Sys, Qty: 1, Total cap: 78	RTU_1/Cor_Sys, Qty: 1, Total cap: 98	RTU_1/Cor_Sys, Qty: 1, Total Supply: 4,000	
5	UH_1/UH_HW, Qty: 26, Total cap: 35		UH_1/UH_HW, Qty: 26, Total Supply: 1,500	
Tab	Proposed HVAC			

AHVAC07-P Reported air-side HVAC systems cooling and heating efficiencies reflect design documents.

Table 1a: Air-side HVAC System Type, Capacity and Efficiency

Modeled System Name	Drawing System Name(s)	Drawing Plans/ Spec	Areas Served	Quantity
RTU-1-6	RTU-1-6	M-101	Retail	6

LOUVER SCHEDULE (F&I BY OTHERS)

UNIT	TYPE	SIZE	AREA	HEIGHT	LOCATION	STATUS
LOU-1	EXHAUST	100	100	10	ROOF	EXISTING
LOU-2	EXHAUST	100	100	10	ROOF	EXISTING
LOU-3	EXHAUST	100	100	10	ROOF	EXISTING

DIFFUSERS, REGISTERS, GRILLES

DESCRIPTION	TYPE	SIZE	AREA	HEIGHT	LOCATION	STATUS
REG-1	REGISTER	100	100	10	ROOF	EXISTING
REG-2	REGISTER	100	100	10	ROOF	EXISTING
REG-3	REGISTER	100	100	10	ROOF	EXISTING

FCU SCHEDULE

UNIT	TYPE	SIZE	AREA	HEIGHT	LOCATION	STATUS
FCU-1	FCU	100	100	10	ROOF	EXISTING
FCU-2	FCU	100	100	10	ROOF	EXISTING
FCU-3	FCU	100	100	10	ROOF	EXISTING

FAN SCHEDULE

UNIT	TYPE	SIZE	AREA	HEIGHT	LOCATION	STATUS
FAN-1	FAN	100	100	10	ROOF	EXISTING
FAN-2	FAN	100	100	10	ROOF	EXISTING
FAN-3	FAN	100	100	10	ROOF	EXISTING

AIR-COOLED CHILLER SCHEDULE

UNIT	TYPE	SIZE	AREA	HEIGHT	LOCATION	STATUS
CHL-1	CHILLER	100	100	10	ROOF	EXISTING
CHL-2	CHILLER	100	100	10	ROOF	EXISTING
CHL-3	CHILLER	100	100	10	ROOF	EXISTING

PACKAGED ROOFTOP AC UNIT (DX) SCHEDULE

UNIT	TYPE	SIZE	AREA	HEIGHT	LOCATION	STATUS
RTU-1	RTU	100	100	10	ROOF	EXISTING
RTU-2	RTU	100	100	10	ROOF	EXISTING
RTU-3	RTU	100	100	10	ROOF	EXISTING

MECHANICAL SCHEDULE

UNIT NO.

DESCRIPTION

DATE

BY

REVISION

MECHANICAL SCHEDULE

UNIT NO.

DESCRIPTION

DATE

BY

REVISION

NEW YORK CITY BUILDING DEPARTMENT

MECHANICAL SCHEDULE

UNIT NO.

DESCRIPTION

DATE

BY

REVISION

M-101

DOB NUMBER

AHVAC07-P Continued

Table 1a: Air-side HVAC System Type, Capacity and Efficiency

Modeled System Name	Drawing System Name(s)	Drawing Plans/ Spec	Areas Served	Quantity	Single-zone or Multi-zone?	Specified Efficiency							
						Unitary Heating Eff.	Eff. Units	COP n/heating	Unitary Cool. Full Load Eff.	Eff. Units	Unitary Cool. Part load Eff.	Eff. Units	COPn/cooling
RTU-1-6	RTU-1-6	M-101	Retail	6	Single Zone Non-Residential	0.8	Et	n/a	11.1	EER	12.8	IEER	3.25

PACKAGED ROOFTOP AC UNIT (DX) SCHEDULE

UNIT NO.	SERVICE	EVAPORATOR FAN						GAS FURNACE							
		CFM	MINIMUM OA CFM	ESP (IN WG)	TSP (IN WG)	MOTOR			GAS DATA				CAPACITY (MBH)	MIN. Et,%	
						BHP	HP	RPM	TYPE	REQUIRED PRESSURE	INPUT MBH	EAT (°F)			LAT (°F)
RTU-1-6	FUTURE RETAIL SPACE	2,417	969	1.0	2.0	1.67	2.0	1359	NAT.	7 IN. W.G.	188	60	102.1	150	80%

COOLING						CONDENSER		COMPRESSOR		EER	IEER		
CAPACITY (MBH)		EAT		LAT		FACE VEL (FPM)	MIN. NO. OF ROWS	COIL EDB °F	QTY. OF FANS			QTY.	CAPACITY CONTROL
TOTAL	SENSIBLE	DB °F	WB °F	DB °F	WB °F								
128	98.6	80	64	56.4	56.4	340	6	95	2	2	MODULATING	11.1	12.8

Efficiencies are in alignment between the Compliance Form and design documents.

QUESTIONS



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