



U.S. Department of Energy
Energy Efficiency and Renewable Energy



Building Energy Codes

How to Use *COMcheck* *Energy Code Compliance Software*

U.S. Department of Energy
Building Energy Codes Program

Building Energy Codes Program



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About the Program

Compliance Tools

- Residential (REScheck)
- Commercial (COMcheck)
- On-line Commercial Code
- Federal Building Codes
- Commercial

Training/Education

- Training Presentations
- State Training
- Consumer Education
- Energy Codes Glossary
- 2004 National Workshop

Implementation Tools

- DOE 2004 Proposals
- DOE Determinations
- DOE Assistance
- Resource Materials
- Status of State Energy Codes
- Setting the Standard

Technical Support/FAQs



DOE's Building Energy Codes Program is an information resource on national model energy codes. We work with other government agencies, state and local jurisdiction, national

The Program recognizes that energy codes maximize energy efficiency only when they are fully embraced by users and supported through education, implementation, and enforcement.

Free Software



REScheck

[REScheck](#), [REScheck-Web](#), [REScheck Package Generator](#)



COMcheck

[COMcheck-EZ](#), [COMcheck Package Generator](#)

[Site Map](#)

[HELP - Ask a Codes Expert](#)

[EERE Information Center](#)

[Helpful Links](#) [Printable Format](#)

EVENTS

2004 National Workshop on State Building Energy Codes
July 15-20, 2004



NEWS

[REScheck Now Includes the 2003 IECC](#)

[Newly Released — Setting the Standard Update](#)
July 2004

[ICC Final Action Hearings](#)
May 17-20, 2004

[REScheck-Web™](#)



[COMcheck-EZ™ Package](#)



www.energycodes.gov
techsupport@becp.pnl.gov

Commercial Compliance Tools

Desktop Software Tools



Web-Based Tools



Printed Materials



Compliance Guides

Prescriptive Tables

Free

Residential Compliance Tools

Desktop Software Tools



Web-Based Tools



Free

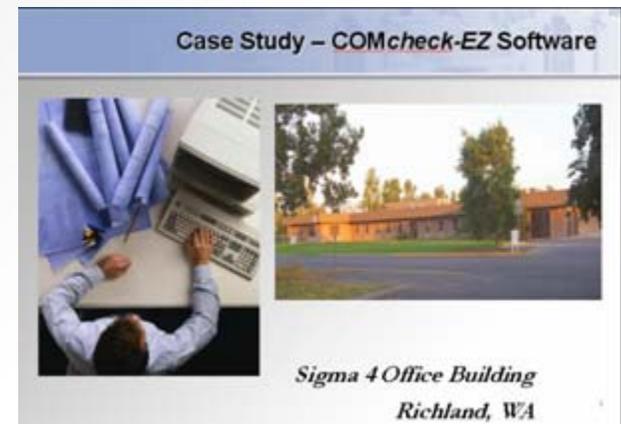
Printed Materials

Compliance Guides

Prescriptive Tables

Training Tools

- PowerPoint presentations with faculty notes
- Case studies
- Online training
- Online videos



BECP Resource Center



Graphics Search Results

Keywords: *duct system approach HVAC*

Viewing: 1-9 of 92

 [Printer-friendly Format](#)

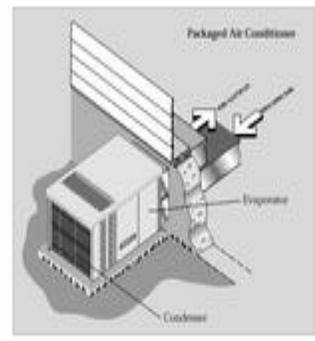
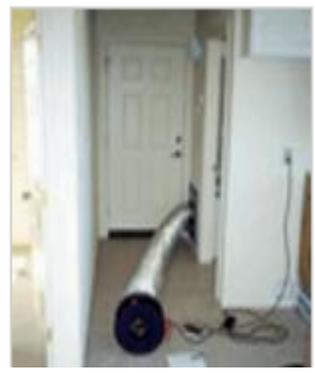
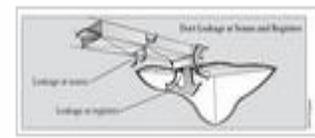
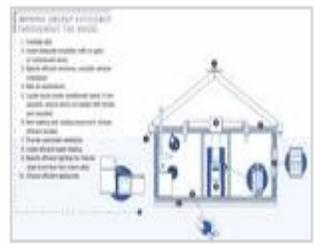
ADDITIONAL RESOURCES

[Articles](#)

[Online Tools](#)

[Presentations](#)

[Videos](#)



BECP Commercial Code Compliance Tools

Prescriptive Approach

- Simple, fast and easy
- Generally most stringent

- Requires minimum input
- Based on climate and WWR
- Uses a prototype building

1 Printed guides on www.energycodes.gov



Trade-off Approach

- Trade-off between components
- Provides design flexibility
- Requires area & U/R-factors

Free

Windows version or
Mac version

1



2



All COMcheck tools available from www.energycodes.gov

When does COMcheck apply?

Commercial New Construction, Alterations and Additions

- Commercial Buildings include all buildings except
 - Single family
 - Low rise multi-family < 3 stories in height

- State Dependent
 - Not all states have the same code, some states have state-specific energy codes
 - Check to see what code is applicable in your state and if *COMcheck* is accepted
 - [Status of State Codes](#)
 - http://www.energycodes.gov/implement/state_codes/index.stm

Commercial Buildings

Building System

Compliance Options

Envelope

Lighting

Mechanical

HVAC

SWH

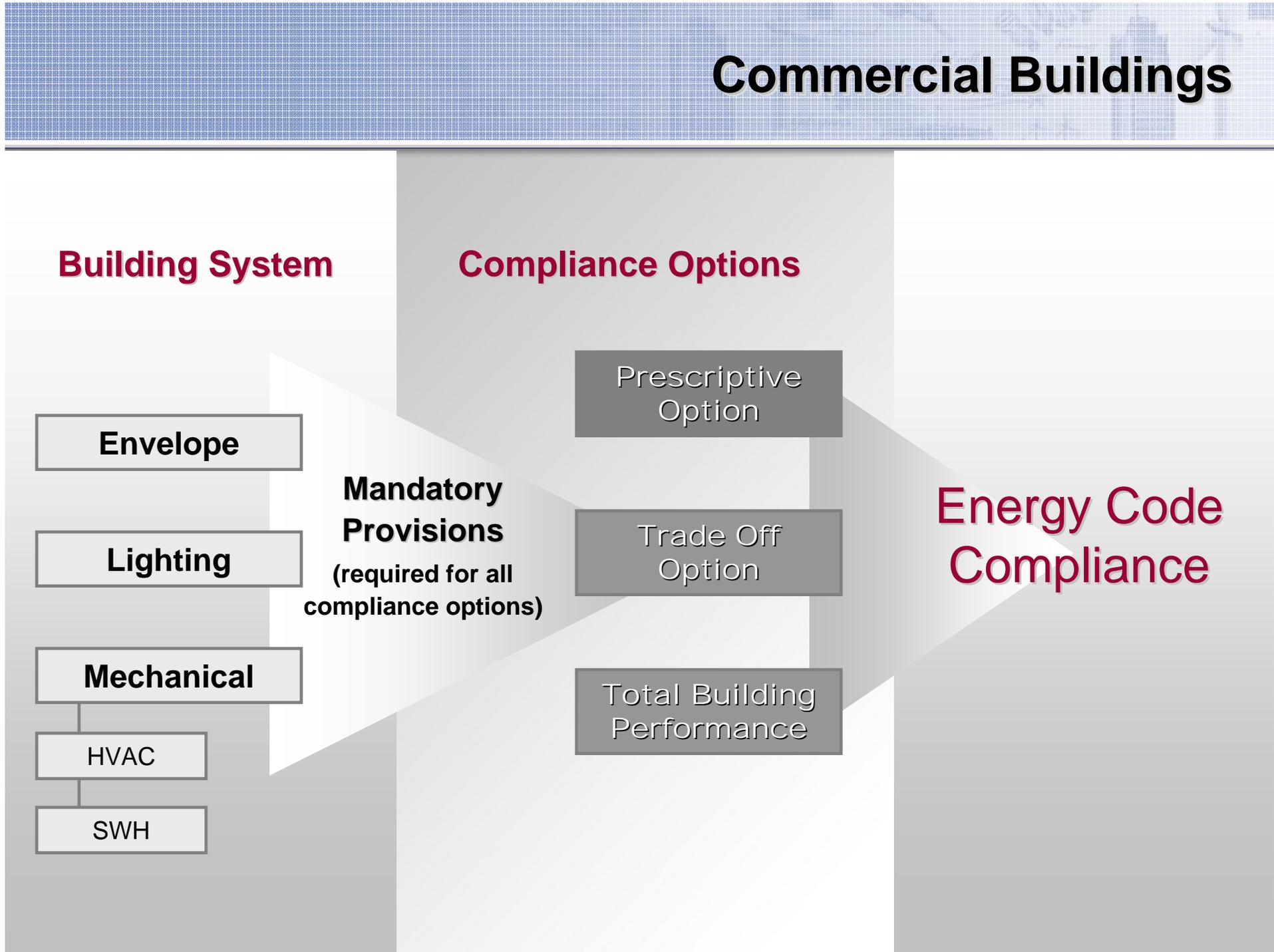
Mandatory Provisions
(required for all compliance options)

Prescriptive Option

Trade Off Option

Total Building Performance

Energy Code Compliance



Components that Must Comply with the Energy Code

Building Envelope

- construction assembly (materials & insulation levels)
- windows, doors & skylights

Mechanical Systems

Service Water Heating

Lighting Systems



How do they correlate in *COMcheck*?
No trade-offs between systems!

Commercial Building Envelope Requirements

➤ Mandatory Requirements:

- Moisture Control
- Air Leakage

➤ Climate Specific Requirements:

- Roof
- Above Grade Walls
- Below Grade Walls
- Floor
- Slab
- Skylights, Windows, and Doors



What is COMcheck-EZ?

- Envelope
 - trade-off calculations are based on envelope loads only
 - defines a proposed design and a budget design
- Lighting
 - Watts/square foot (LPDs)
- Mechanical
 - short wizard to customize a list of requirements applicable to the system identified

What Do I Need to Know?

Information you need to use COMcheck-EZ:

1. General Understanding of Windows-based Computer Programs
2. Basic Information about the Builder and Project to be Constructed
3. Building Plans including Exterior Wall Areas, Glazing Areas, Roof/Ceiling Areas, Basement Wall Areas, etc.
4. Insulation R-Values, NFRC Glazing and Door U-Factors, etc.
5. Lighting
6. Heating and Cooling System Efficiencies
7. Service Water Heating

The image shows a Windows XP desktop environment. The background is a landscape with Stonehenge under a blue sky. A central window titled "COMcheck-EZ" is in the process of loading. The desktop is populated with various application icons, including Microsoft Office products, Firefox, and Adobe software. The taskbar at the bottom shows the Start button and several open applications.



COMcheck-EZ™

DOE's Building Energy Codes Program

Internet Address: www.energycodes.gov

Technical Support: techsupport@becp.pnl.gov



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Loading...

Microsoft Outlook

Internet Explorer

Firefox Setup 1.0PR

ETR

Microsoft Photo Editor

Mozilla Firefox

Adobe Reader 6.0

Work_Pkg

URL's and Emails

Software Analysis

URL's

Attendee_List

Microsoft PowerPoint

Link Check

Implementati...

Microsoft Word

Desktop Stuff

COMcheck-EZ 3.0 Release 1a

Microsoft Outlook

Emails

Microsoft Excel

Articles

PhotoStudio 5

Adobe Acrobat 6.0 Professi...

Recycle Bin

Microphone

start

Windows Media Pl...

Inbox - Microsoft ...

2004 workshop

Microsoft PowerPo...

EZ-Casestudy.cck ...

2:16 PM



Untitled.cck - COMcheck-EZ Code: 2003 IECC

File Edit View Options Code Help

- 90.1 ('89) Code
- 90.1 ('99) Standard
- 90.1 (2001) Standard
- 1998 IECC
- 2000 IECC
- 2001 IECC
- ✓ 2003 IECC
- Georgia
- Louisiana
- Massachusetts
- Minnesota
- New York
- Vermont

Project Envelope

State Texas

City Abbott

Building Use

Whole Building

Whole Building

Click to select building type

Envelope and/or Mechanical Compliance Only
Check this box if Lighting Compliance will not be used.

Project Type

New Construction Addition

Project Information

Project

Design

Document

Notes

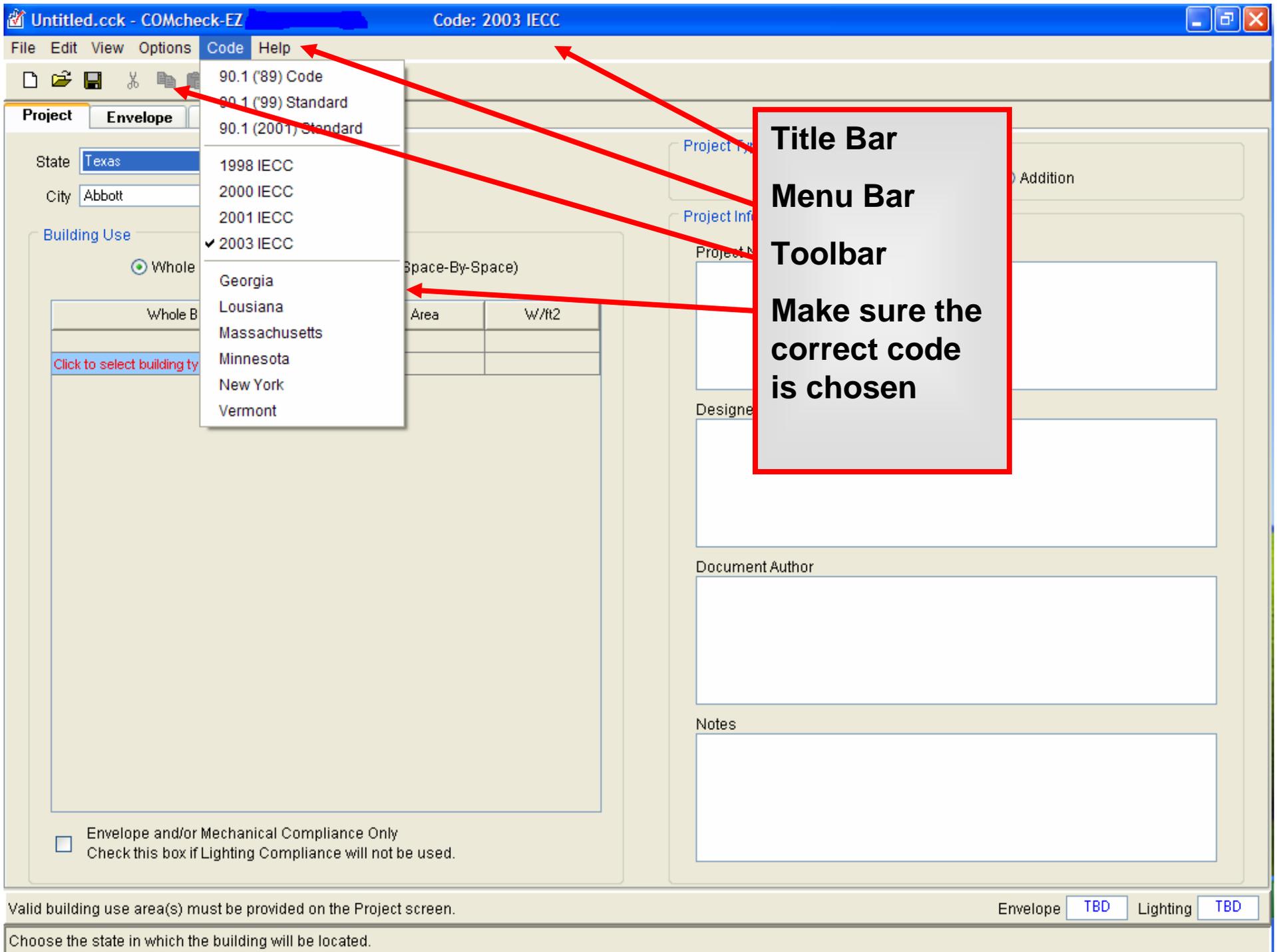
Envelope TBD Lighting TBD

Valid building use area(s) must be provided on the Project screen.

Choose the state in which the building will be located.

**Expand the Screen
like other programs.**

**Let's take a closer
look at this area.**



EZ-Casestudy.cck - COMcheck-EZ : Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting Mechanical

State Washington

City Richland

Building Use

Whole Building Area Category (Space-By-Space)

Add Category

	Area Category	Area	W/ft2
1	Office	15849	1.5
2	Corridor, Restroom, Support Area	3838	0.8
3	Kitchen	505	2.2
4	Lobby - Other	340	1.0

Total Area 20532

Project Type

New Construction Addition

Project Information

Project Name
Sigma 4 Office B
5170 George Wa
Richland, WA 99

Designer/Contractor
Joe's Construction
George, Washington

Document Author
KRT

Notes
ing construction major renovation with lighting modification (existing fixtures and existing mechanical equipment.

Envelope +22% Lighting -10%

Choose the state in which the building will be located.

Four Main Screens

Building Use

- Whole Building
- Area Category

Compliance Results

**Project**

Envelope

Lighting

Mechanical

State Washington

City Richland

Building Use

 Whole Building Area Category (Space-By-Space)

Add Category

	Area Category	Area	W/ft2
1	Office	15849	1.5
2	Corridor, Restroom, Support Area	3838	0.8
3	Kitchen	505	2.2
4	Lobby - Other	340	1.0

Total Area 20532

Project Type

 New Construction Addition

Project Information

Project Name

Sigma 4 Office Building
3170 George Washington Way
Richland, WA 99352

Designer/Contractor

Joe's Construction
George, Washington

Document Author

KRT

Notes

ing construction major rennovation with lighting modifie
gn (existing fixturesand existing mechanical equipment.

Construction Type

Basic Information

Envelope

+22%

Lighting

-10%



Project

Envelope

Lighting

Mechanical

State Washington

City New York

Build North Carolina

North Dakota

Ohio

Oklahoma

Oregon

Pennsylvania

Puerto Rico

Rhode Island

South Carolina

South Dakota

1 Tennessee

2 Texas

3 Utah

4 Vermont

Virginia

Washington

West Virginia

Wisconsin

Wyoming

(Space-By-Space)

	Area	W/ft2
1	15849	1.5
2	3838	0.8
3	505	2.2
4	340	1.0

Total Area 20532

Project Type

 New Construction Addition

Project Information

Project Name

Sigma 4 Office Building
3170 George Washington Way
Richland, WA 99352

Designer/Contractor

Joe's Construction
George, Washington

Document Author

KRT

Notes

ing construction major rennovation with lighting modifie
gn (existing fixturesand existing mechanical equipment.

Envelope

+22%

Lighting

-10%

EZ-Casestudy.cck - COMcheck-EZ : Code: 2001 IECC

File Edit View Options Code Help

Project **Envelope** Lighting Mechanical

Roof Skylight Ext. Wall Int. Wall Window Door Basement Floor

	Component	Assembly	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	
	Building										
1	Roof 1	Non-Wood Joist/Rafter/Tr...		20532	ft2	19.0	8.0	0.040			
2	Exterior Wall 1	Metal Frame, 16" o.c.		8172	ft2	10.0	0.0	0.145			
3	Window 1	Metal Frame, Double Pane	Glazing: Tin...	998	ft2			0.690	0.57	0.50	
4	Door 1	Glass	Glazing: Cl...	126	ft2			0.920	0.47	0.00	
5	Door 2	Opaque		21	ft2			0.700			
6	Floor										

Main Building Envelope

- Use the blue-on-white buttons at the top of the *Envelope* screen to create a list of building components present in your proposed design. Each component you select is added to the building components displayed on the *Envelope* screen.
- Gross area (or perimeter) of assembly components, cavity R-value , continuous R-value, assembly U-factor , construction details, SHGC, and/or projection factor are entered by the user.

Envelope +22% Lighting -10%

Ready

Envelope Screen

EZ-Casestudy.cck - COMcheck-EZ

Code: 2001 IECC

File Edit View Options Code Help



Project

Envelope

Lighting

Mechanical

Roof

Skylight

Ext. Wall

Int. Wall

Window

Door

Basement

Floor

	Component	Assembly	Construction Details	Gross Area		Cavity Insulation R-Value	C
	Building						
1	Roof 1	Non-Wood Joist/Rafter/Tr...		20532	ft2	19.0	

Building Components are added by clicking on these.

Adding Roofs – Step 1

EZ-Casestudy.cck - COMcheck-EZ

Code: 2001 IECC

File Edit View Options Code Help



Project

Envelope

Lighting

Mechanical

Roof

Skylight

Ext. Wall

Int. Wall

Window

Door

Basement

Floor

	Component	Assembly	Construction Details	Gross Area		Cavity Insulation R-Value	C
	Building						
1	Roof 1	Non-Wood Joist/Rafter/Tr...		20532	ft2	19.0	

Step 1: Click on Roof

Adding Roofs – Step 2

EZ-Casestudy.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting Mechanical

Roof Skylight Ext. Wall Int. Wall Window

	Component	Assembly	Co						
	Building								
1	Roof 1	Non-Wood Joist/Rafter/Tr...			20532	ft2	19.0	8.0	0.040
2	Exterior Wall 1	All-Wood Joist/Rafter/Truss			8172	ft2	10.0	0.0	0.145
3	Window 1	Non-Wood Joist/Rafter/Truss	in...		998	ft2			0.690
4	Door 1	Structural Slab	Cl...		126	ft2			0.920
5	Door 2	Metal Roof without Thermal Blocks			21	ft2			0.700
6	Floor 1	Metal Roof with Thermal Blocks	...		681	ft			

Step 2:

- Select Roof Type (different roof types and any number of skylights can be added individually.)

Note: A red circle highlights the dropdown menu for the roof assembly type, and a red box highlights the Step 2 instructions.

Adding Roofs – Step 3

EZ-Casestudy.cck - COMcheck-EZ

Code: 2001 IECC

File Edit View Options Code Help



Project Envelope Lighting Mechanical

Roof Skylight Ext. Wall Int. Wall Window Door Basement Floor

	Component	Assembly	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	L
	Building							
1	Roof 1	Non-Wood Joist/Rafter/Tr...		20532	ft2	19.0	8.0	
2	Exterior Wall 1	Metal Frame, 16" o.c.		8172	ft2	10.0	0.0	
3	Window 1	Metal Frame, Double Pane	Glazing: Tin...	998	ft2			
4	Door 1	Glass	Glazing: Cl...	126	ft2			
5	Door 2	Opaque		21	ft2			
6	Floor 1	Slab-On-Grade:Unheated	Insulation: ...	681	ft			

Step 3:

- Add square footage (In this case 20532 square feet)

Adding Roofs – Step 4

EZ-Casestudy.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting Mechanical

Roof Skylight Ext. Wall Int. Wall Window Door Basement Floor

	Component	Assembly	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	
	Building							
1	Roof 1	Non-Wood Joist/Rafter/Tr...		20532	ft2	19.0	8.0	
2	Exterior Wall 1	Metal Frame, 16" o.c.		8172	ft2	10.0	0.0	
3	Window 1	Metal Frame, Double Pane	Glazing: Tin...	998	ft2			
4	Door 1	Glass	Glazing: Cl...	126	ft2			
5	Door 2	Opaque		21	ft2			
6	Floor 1	Slab-On-Grade:Unheated	Insulation: ...	681	ft			

Step 4:

- Add insulation R-Value (R-19 cavity and R-8.0 continuous in this example)

Adding Roofs

EZ-Casestudy.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting Mechanical

Roof 1 Skylight Ext. Wall Int. Wall Window Door Basement Floor

	Component	Assembly	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	L
	Building							
1	Roof 1	Non-Wood Joist/Rafter/Tr...		20532	ft2	19.0	8.0	
2	Exterior Wall 1	Metal Frame, 16" o.c.		8172	ft2	10.0	0.0	
3	Window 1	Metal Frame, Double Pane	Glazing: Tin...	998	ft2			
4	Door 1	Glass		100	ft2			
5	Door 2	Opaque			ft2			
6	Floor 1	Slab-On-G			ft			

Step 1: Click on "Roof"

Step 2: Select Roof type

Step 3: Add square footage

Step 4: Add insulation R-Value

Skylights

- 3% of area is exempted from inclusion in the proposed and budget building loads calculations
 - Requirements based on
 - U-value (NFRC tested) or
 - Default U-value table



**TABLE 102.3(1)
U-VALUE DEFAULT TABLE FOR WINDOWS,
GLAZED DOORS AND SKYLIGHTS**

FRAME MATERIAL AND PRODUCT TYPE ^a	SINGLE GLAZED	DOUBLE GLAZED
Metal without thermal break		
Operable (including sliding and swinging glass doors)	1.27	0.87
Fixed	1.13	0.69
Garden window	2.60	1.81
Curtain wall	1.22	0.79
Skylight	1.98	1.31
Site-assembled sloped/overhead glazing	1.36	0.82
Metal with thermal break		
Operable (including sliding and swinging glass doors)	1.08	0.65
Fixed	1.07	0.63
Curtain wall	1.11	0.68
Skylight	1.89	1.11
Site-assembled sloped/overhead glazing	1.25	0.70
Reinforced vinyl/metal clad wood		
Operable (including sliding and swinging glass doors)	0.90	0.57
Fixed	0.98	0.56
Skylight	1.75	1.05
Wood/vinyl/fiberglass		
Operable (including sliding and swinging glass doors)	0.89	0.55
Fixed	0.98	0.56
Garden window	2.31	1.61
Skylight	1.47	0.84

For SI: 1 inch = 25.4 mm.

^a Glass block assemblies with mortar but without reinforcing or framing shall have a U-value of 0.60.

Adding Exterior Walls

EZ-Casestudy.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting Mechanical

Roof Skylight **1** Ext. Wall Int. Wall Window Door

Exterior walls, windows and doors can be added as a total sum or each exposure can be added separately

2

3

4

Step 1: Click on "Wall"
Step 2: Choose Assembly
Step 3: Add square footage
Step 4: Add the R-Values

	Construction Details	Gr					
1			20532	ft2	19.0	8.0	0.040
2			8172	ft2	10.0	0.0	0.145
3	Window 1	Metal Frame, Double Pane	998	ft2			0.690
4	Door 1	Glass	126	ft2			0.920
5	Door 2	Opaque	21	ft2			0.700
6	Exterior Wall 2	Click here to select Asse...	0	ft2			0.101
7	Floor 1	Wood Frame, Any Spacing	681	ft			

- Wood Frame, Any Spacing
- Metal Frame, 16" o.c.
- Metal Frame, 24" o.c.
- Metal Wall without Thermal Blocks
- Structural Masonry Wall
- Other

Adding Windows

Untitled.cck - COMcheck-EZ 3.0 Release 1a Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting Mechanical

Roof Skylight Ext. Wall Int. Wall **Window** Door Basement Floor

Component	Assembly	Construction Details	Gross Area	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor
Building								
1 Window 1	Click here to select Asse...		0 ft2			0.000	0.00	0.00

- Metal Frame ▶ Single Pane
- Metal Frame with Thermal Break ▶ Double Pane
- Wood Frame ▶ Double Pane with Low-E
- Vinyl Frame ▶ Triple Pane
- Other ▶ Triple Pane with Low-E

Step 1: Choose window type

Step 2: Enter gross area (rough opening)

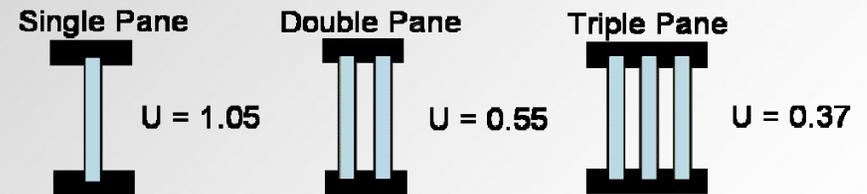
Step 3: Enter U-Factor, SHGC

Step 4: Projection Factor

Windows – U-Factors

Table 102.3(1)
U-Value Default For Windows
Glazed Doors and Skylights

Frame Material and Product Type	Single Glazed	Double Glazed
Metal without thermal break		
Operable (including Sliding and swinging glass door)	1.27	0.87
Fixed	1.13	0.69
Garden Window	2.60	1.81
Curtain Wall	1.22	0.79
Skylight	1.98	1.31
Site-assembled Sloped/overhead glazing	1.36	0.82
Metal with thermal break		
Operable (including Sliding and swinging glass door)		
Fixed	1.08	0.65
Garden Window	1.07	0.63
Curtain Wall	1.11	0.68
Skylight	1.89	1.11
Site-assembled Sloped/overhead glazing	1.25	0.70
Reinforced vinyl/metal clad wood		
Operable (including sliding and swinging glass doors)	0.90	0.57
Fixed	0.98	0.56
Skylights	1.75	1.05
Wood/vinyl/fiberglass		
Operable (including sliding and swinging glass doors)	0.89	0.55
Fixed	0.98	0.56
Garden Window	2.31	1.61
Skylight	1.47	0.84



- NFRC tested and certified or default window U-value range
- Use assembly U-value
- All windows must meet or exceed

Basement Walls

EZ-Casestudy.cck - COMcheck-EZ

Code: 2001 IECC

File Edit View Options Code Help



Project Envelope Lighting Mechanical

Roof Skylight Ext. Wall Int. Wall Window Door **Basement** Floor

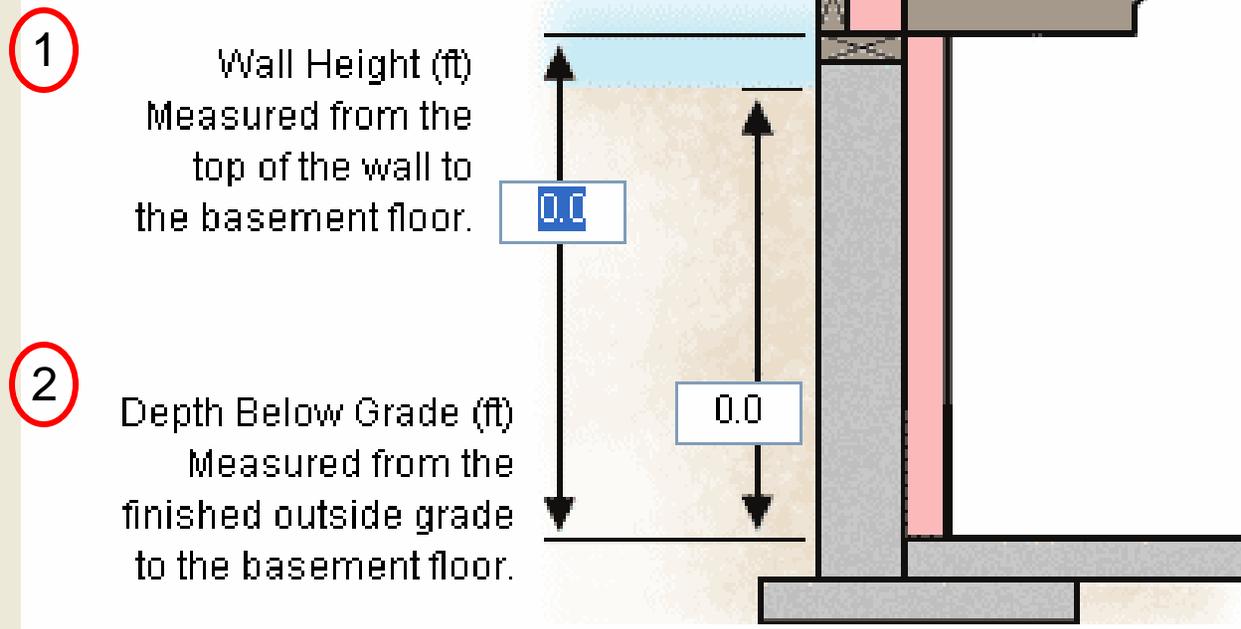
	Component	Assembly	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor
	Building							
1	Roof 1	Non-Wood Joist/Rafter/Tr...		20532	ft2	19.0	8.0	0.04
2	Basement Wall 1	Click here to select Asse...		0	ft2		0.0	0.00
3	Exterior Wall 1	Solid Concrete or Masonry <= 8"		8172	ft2	10.0	0.0	0.14
4	Window 1	Solid Concrete or Masonry > 8"	in...	998	ft2			0.69
5	Window 2	CMU <=8" with Empty Cells		0	ft2			0.00
6	Window 3	CMU >8" with Empty Cells		0	ft2			0.00
7	Door 1	CMU <=8" with Integral Insulation	l...	126	ft2			0.92
8	Door 2	CMU >8" with Integral Insulation		21	ft2			0.70
9	Exterior Wall 2	Other		0	ft2			0.10
10	Interior Wall 1	Click here to select Asse...		0	ft2			0.15
11	Interior Wall 2	Click here to select Asse...		0	ft2			0.15
12	Floor 1	Slab-On-Grade:Unheated	Insulation: ...	681	ft			

Basement Walls

Basement Walls



Enter the specified dimensions in feet (not inches) in the boxes provided.
Basement walls are walls that are partially or fully below grade.
Ignore portions of walls that are more than 10 ft below grade.



OK

Cancel

Adding Floors

EZ-Casestudy.cck - COMcheck-EZ

Code: 2001 IECC

File Edit View Options Code Help



Project Envelope Lighting Mechanical

Roof Skylight Ext. Wall Int. Wall Window Door Basement Floor

	Component	Assembly	Construction Details	Gross Area or Slab Perimeter		Cavity Insulation R-Value	Continuou Insulation R-Value
	Slab-On-Grade should be entered in linear feet						
1				20532	ft2	19.0	8.0
2	Skylight 1	Click here to select Asse...		0	ft2		
3	Floor 1	Slab-On-Grade:Unheated	Insulation: ...	681	ft		
4	Basement Wall 1	Solid Concrete or Masonr...	No Insulation		ft2	0.0	0.0
5	Basement Wall 2	Solid Concrete or Masonr...	Horizontal Insulation		1 ft		0.0
6	Basement Wall 3	Solid Concrete or Masonr...	Vertical Insulation		2 ft		0.0
7	Exterior Wall 1	Metal Frame, 16" o.c.		8172	3 ft		0.0
8	Window 1	Metal Frame, Double Pane	Glazing: Tin...	998	4 ft		
9	Window 2	Click here to select Asse...		0			
10	Window 3	Click here to select Asse...		0	ft2		
11	Door 1	Glass	Glazing: Cl...	126	ft2		



Component	Assembly
Building	
1 Floor 1	Slab-On-Grade:Unheated

Slab-On-Grade Floors

Construction Details... Insulation:

No Insulation
Horizontal Insulation ▶
Vertical Insulation ▶

Insulation position and depth (ft.):
1 ft
2 ft
3 ft
4 ft
Continuous

**Horizontal Insulation (A + B = Insulation Depth)
(If A > B, Enter As Vertical Insulation)**

Vertical Insulation (A = Insulation Depth)

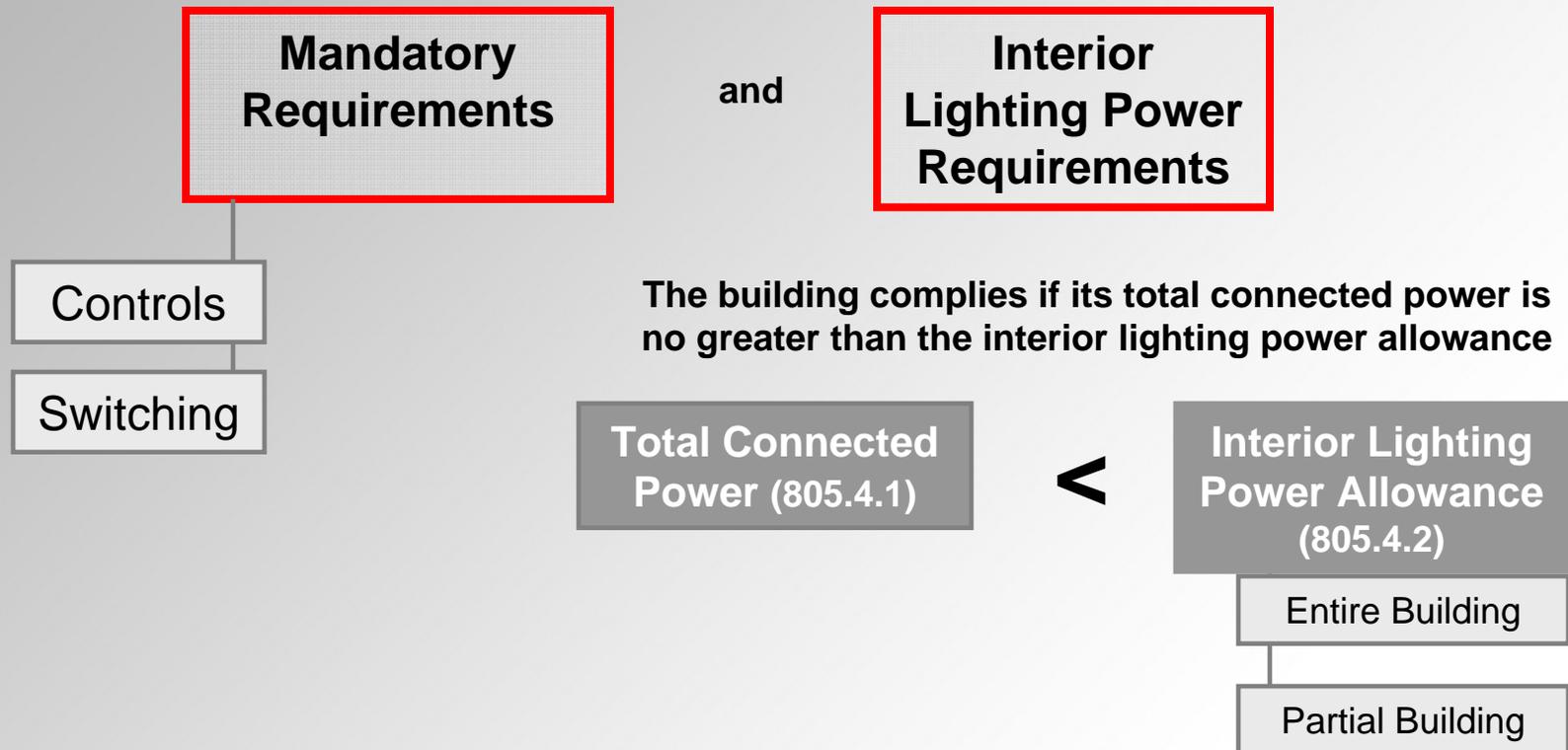
OK Cancel

Valid building use area(s) must be provided on the Project screen.

Envelope TBD Lighting TBD

Click the Assembly fields to display a list of assembly choices. "Other" assembly types are editable.

Interior Lighting Compliance



Adding Lighting

EZ-Casestudy.cck - COMcheck-EZ : Code: 2001 IECC

File Edit View Options Code Help

Project Envelope **Lighting** Mechanical

T8/T12 Fluorescent Compact Fluorescent HID Incandescent Add Space

	Component	Fixture ID	Fixture Description	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage
	Building							
1	Space 1							
2	Recessed Troffer		Recessed Troffer	48" T12 40W	Magnetic	4	174	139
3	Recessed Troffer		Recessed Troffer	48" T12 40W	Magnetic	2	31	70
4	Recessed Troffer		Recessed Troffer	48" T12 40W	Magnetic	2	5	70
5	T8 / T12 Fluorescent 4	D	2 x 2 Prismatic Troffer	24" T12U 40W	Magnetic	2	53	70
6	T8 / T12 Fluorescent 2	E	2 x 4 Prismatic Troffer	48" T12 40W	Magnetic			

Lighting components are added by clicking on these

Lighting Results

Allowed Wattage 28295 Proposed Wattage 31186

Envelope TBD Lighting -10%

Use the Options Menu to Arrange Lighting Fixtures by Spaces.



Project **Envelope** **Lighting** **Mechanical**

T8/T12 Fluorescent Compact Fluorescent HID Incandescent Add Space

	Component	Fixture ID	Fixture Description	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage	Exemption Allowance	
	Building									
1	- Space 1									
2	T8 / T12 Fluorescent 1	A	2 x 4 Parabolic Troffer	48" T12 40W	Magnetic	4	174	139	None	
3	T8 / T12 Fluorescent 6	B	2 x 4 Parabolic Troffer	48" T12 40W	Magnetic	2	31	70	None	
4	T8 / T12 Fluorescent 3	C	1 x 4 Parabolic Troffer	48" T12 40W	Magnetic	2	5	70	None	
5	T8 / T12 Fluorescent 4	D	2 x 2 Prismatic Troffer	24" T12U 40W	Magnetic	2	53	70	None	
6	T8 / T12 Fluorescent 2	E	2 x 4 Prismatic Troffer	48" T12 40W	Magnetic	2	11	70	None	
7	T8 / T12 Fluorescent 8			Click here to select L...			0	0	None	

- 24" T8 17W
- 24" T8U 32W
- 24" T12U 40W
- 24" T12U ES 34W
- 36" T8 25W
- 36" T12 30W
- 36" T12 ES 25W
- 48" T8 32W
- 48" T10 42W
- 48" T12 40W
- 48" T12 ES 32W
- 48" T12 ES 34W
- 48" T12 Slim 39W
- 48" T12 Slim ES 32W
- 60" T8 40W
- 96" T8 75W
- 96" T8 ES 60W
- 96" T12 Slim 75W
- Other

Allowed Wattage 21936 Proposed Wattage 31186

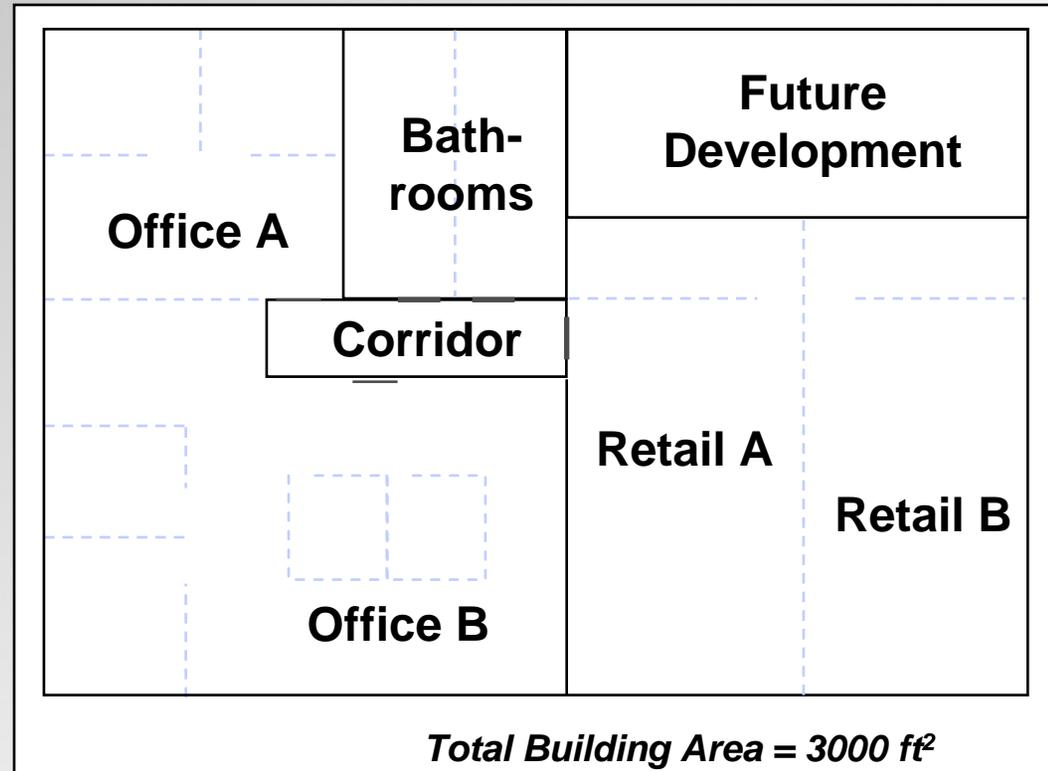
Invalid or Incomplete Lighting Data

Envelope **+13%** Lighting TBD

Use the Options Menu to Arrange Lighting Fixtures by Spaces.

Lighting Using Space-by-Space

Office A:	400 ft ²
Office B:	850 ft ²
Bathrooms:	350 ft ²
Corridor:	50 ft ²
Retail A:	500 ft ²
Retail B:	500 ft ²
Future:	350 ft ²



Lighting Options

EZ-Casestudy.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Comments/Description (Envelope)
Orientation (Envelope)
Daylight Control Factor (Envelope)
Spaces (Lighting)
Exemptions and Allowances (Lighting)

Project Env
T8/T12 Fluorescent Add Space

Comp	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage
Building					
1 Space 1					
2 T8 / T12 Fluorescent 1 A	2 x 4 Parabolic Troffer 48" T12 40W	Magnetic	4	174	139
3 T8 / T12 Fluorescent 6 B	2 x 4 Parabolic Troffer 48" T12 40W	Magnetic	2	31	70
4 T8 / T12 Fluorescent 3 C	1 x 4 Parabolic Troffer 48" T12 40W	Magnetic	2	5	70
5 T8 / T12 Fluorescent 4 D	2 x 2 Prismatic Troffer 24" T12U 40W	Magnetic	2	53	70
6 T8 /	48" T12 40W	Magnetic	2	11	70

Lighting Options:

- Spaces
- Exemptions and Allowances

Allowed Wattage 28295 Proposed Wattage 31186

Envelope TBD Lighting -10%

Ready



File Edit View Options Code Help



Project Envelope **Lighting** Mechanical

T8/T12 Fluorescent Compact Fluorescent HID Incandescent **Add Space**

Fixture ID	Fixture Description	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage	Exemption Allowance
Incandescent 1 A	2 x 4 Parabolic Troffer	48" T12 40W	Magnetic	4	174	139	None
Incandescent 6 B	2 x 4 Parabolic Troffer	48" T12 40W	Magnetic	2	31	70	None
Incandescent 3 C	1 x 4 Parabolic Troffer	48" T12 40W	Magnetic	2	5	70	None
Incandescent 4 D	2 x 2 Prismatic Troffer	24" T12U 40W	Magnetic				None
Incandescent 2 E	2 x 4 Prismatic Troffer	48" T12 40W	Magnetic				None

- None
- Special Medical/Dental/Research
- Professional Sports Arena Playing Field
- Gallery/Museum/Monument Exhibits
- Lighting in Residential Dwelling Units
- Emergency Lighting (Automatic Control)

Allowed Wattage 28295 Proposed Wattage 31186

Envelope +22% Lighting -10%

Mechanical Requirements

Simple Systems (Section 803.2)

- 803.2.1 - Heating and cooling loads
- 803.2.2 - HVAC Equipment Performance Requirement
- 803.2.3 - Temperature & Humidity Controls
- 803.2.4 - Hydronic System Controls
- 803.2.5 - Ventilation
- 803.2.6 - Economizers
- 803.2.7 - Shutoff Damper Controls
- 803.2.8 - Duct and Plenum Insulation and Sealing
- 803.2.9 - Piping insulation

Complex Systems (Section 803.3)

- 803.3.1 - Heating and Cooling Loads
- 803.3.2 - HVAC Equipment Performance Requirement
- 803.3.3 –HVAC System Controls
- 803.3.4 – VAV Systems Serving Multiple Zones
- 803.3.5 - Ventilation
- 803.3.6 - Duct and Plenum Insulation and Sealing
- 803.3.7 - Piping insulation
- 803.3.8 – System Completion

Mechanical

EZ-Casestudy.cck - COMcheck-EZ 3.0 Release 1a Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting **Mechanical**

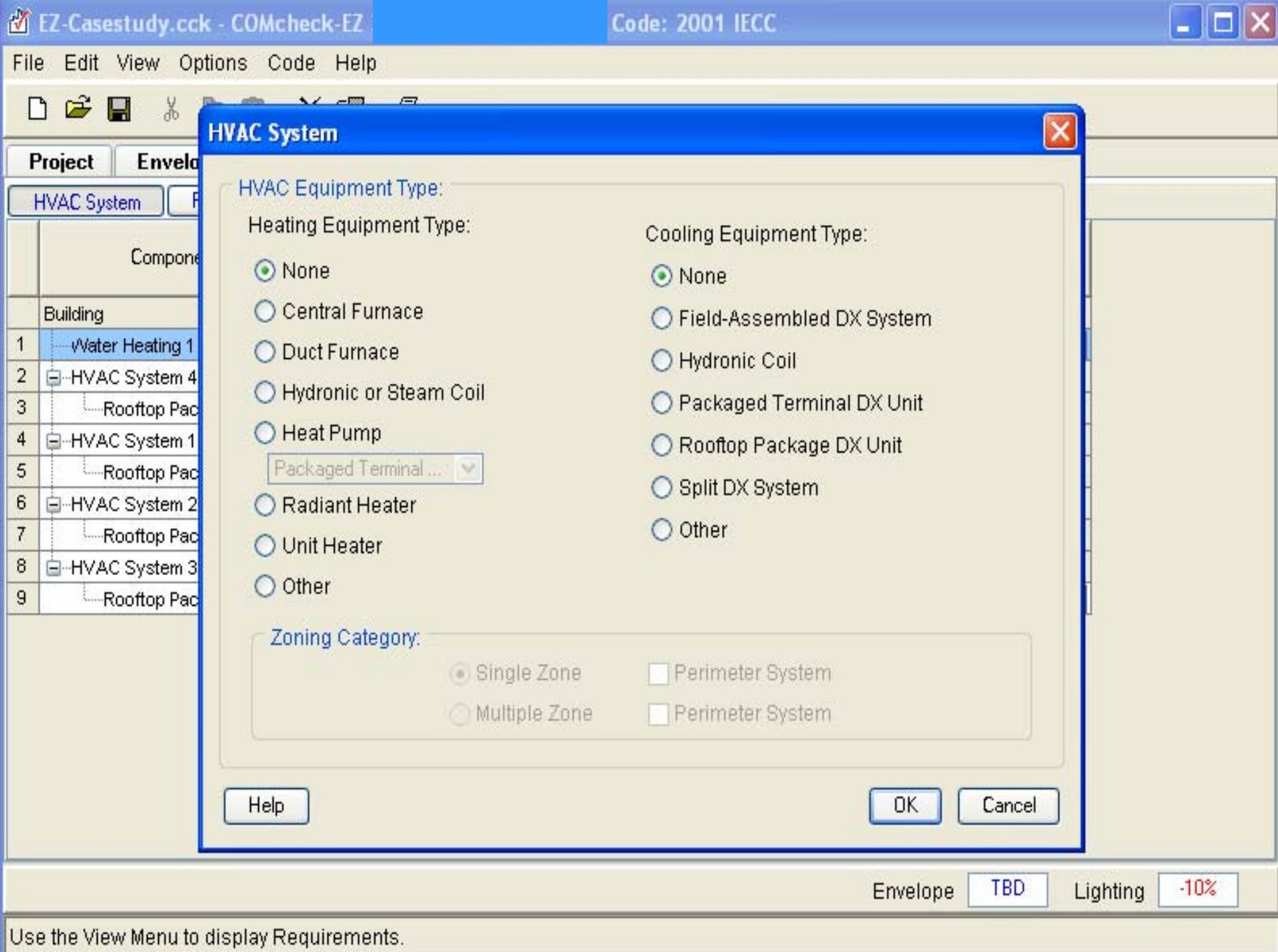
HVAC System Plant Water Heating

	Component	Quantity	Equipment Capacity	Fuel Type/ Heat Source	Condenser Type	System Details
	Building					
1	Water Heating 1	2				Click here...
2	HVAC System 4	1				
3	Rooftop Packaged Heat Pu		Select...		Select...	
4	HVAC System 1	1				
5	Rooftop Packaged Heat Pu		<65 kBtu/h		Air-Cooled	
6	HVAC System 2	7				
7	Rooftop Packaged Heat Pu		<65 kBtu/h		Air-Cooled	
8	HVAC System 3	2				
9	Rooftop Packaged Heat Pu		>=90 - <135 k...		Air-Cooled	Air Economizer

The Mechanical section generates a customized list of mandatory requirements applicable to the mechanical components you identify.

Envelope TBD Lighting -10%

Use the View Menu to display Requirements.



Use the View Menu to display Requirements.

Mechanical

EZ-Casestudy.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Project Envelope Lighting **Mechanical**

HVAC System Plant Water Heating

	Component	Quantity	Equipment Capacity	Fuel Type/ Heat Source	Condenser Type	System Details
	Building					
1	Water Heating 1	2				Click here... <input type="button" value="..."/>
2	HVAC System 4	1				
3	Rooftop Packaged Heat Pu		Select... <input type="button" value="v"/>		Select... <input type="button" value="v"/>	
4	HVAC System 1	1				
5	Rooftop Packaged Heat Pu		<65 kBtu/h <input type="button" value="v"/>		Air-Cooled <input type="button" value="v"/>	
6	HVAC System 2	7	<65 kBtu/h		Air Cooled	
7	Rooftop Packaged Heat Pu		>=65 - <90 kBtu/h		Evaporatively Cooled	
8	HVAC System 3	2	>=90 - <135 kBtu/h		Groundwater Coupled	
9	Rooftop Packaged Heat Pu		>=135 - <240 kBtu/h		Water Cooled	conomizer <input type="button" value="..."/>
			>=240 - <760 kBtu/h			
			>=760 kBtu/h			

Envelope TBD Lighting -10%

Use the View Menu to display Requirements.

Mechanical

Untitled.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Project Envelope **Lighting** Mechanical

HVAC System **Plant** Water Heating

Component	Quantity	Equipment Capacity	Fuel Type/ Heat Source	Condenser Type	System Details
Building					

Use

Plant Equipment

Plant Equipment Type:

Boiler Type:

- Hot Water
- Steam
- None

Cooling Plant Type:

- Condensing Unit
- Water Chiller
- None

Help OK Cancel

en

Envelope TBD Lighting TBD

Use the View Menu to display Requirements.

EZ-Casestudy.cck - COMcheck-EZ Code: 2001 IECC

File Edit View Options Code Help

Project Envelope **Lighting** Mechanical

HVAC System Plant **Water Heating**

	Component	Quantity	Equipment Capacity	Fuel Type/ Heat Source	Condenser Type	System Details
	Building					
1	Water Heating 1	2				Click here...
2	HVAC System 4	1				
3	Rooftop Packaged Heat Pu		Sele			
4	HVAC System 1	1				
5	Rooftop Packaged Heat Pu		<65			
6	HVAC System 2	7				
7	Rooftop Packaged Heat Pu		<65			
8	HVAC System 3	2				
9	Rooftop Packaged Heat Pu		>=90 - <135 k...		Air-Cooled	Air Economizer ...

Service Water Heating Details

System Has a Circulation Pump

Heat Trace Tape Installed in the System

Help OK Cancel

Envelope TBD Lighting -10%

Use the View Menu to display Requirements.

Mandatory Requirements in COMcheck Software

- Requirements Checklist generated automatically based on input
 - applicable code
 - building location

Permit Number _____

Envelope Compliance Certificate
2001 IECC
COMcheckEZ Software Version 3.0 Release 7
Data filename: C:\Programs Files\Check\COMcheck-EZ300

Section 1: Project Information

Project Name: COMcheck-EZ
Designer/Contractor: Eric Makela
Document Author: Eric Makela

Section 2: General Information

Building Location (for weather data):
Climate Zone:
Heating Degree Days (base 65 degrees F):
Cooling Degree Days (base 65 degrees F):
Project Type:
Window / Wall Ratio:

Building Type
Office

Section 3: Requirements Checklist

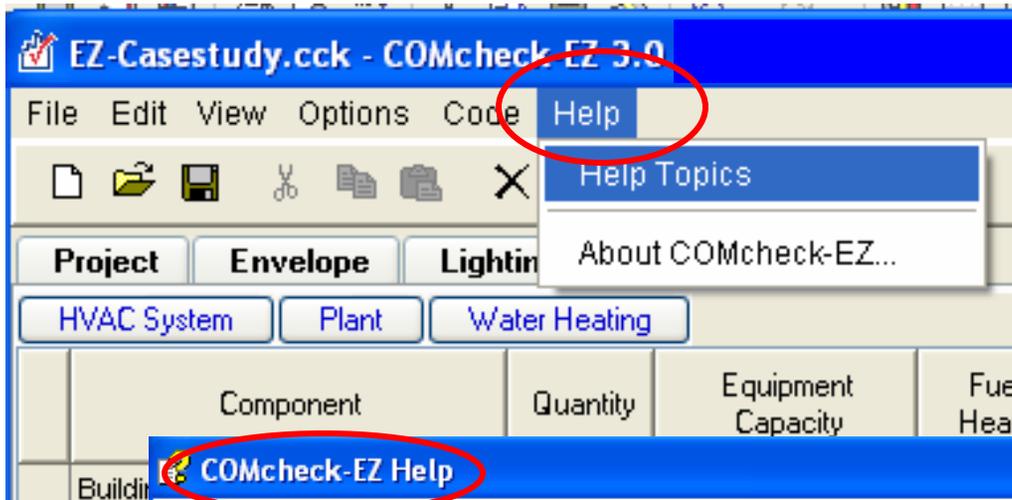
Bldg.	Dept.	Use	
			Air Leakage, Component Certification, and Vapor Retarder Requirements
			1. All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed.
			2. Windows, doors, and skylights certified as airtight leakage requirements.
			3. Component R-values & U-factors labeled as certified.

Air Leakage, Component Certification, and Vapor Retarder Requirements:
All joints and penetrations are caulked, gasketed, weather-stripped, or otherwise sealed

- New Ctrl+N
- Open... Ctrl+O
- Open Recent
- Save Ctrl+S
- Save As...
- Page Setup...
- Print Preview...
- Print Report... Ctrl+P
- Save Report...
- Exit

	Lighting	Mechanical
		Water Heating
	Quantity	Equipment Capacit
	2	
	1	
	Roof Pack	Select...
	1	
	Roof Pack	<65 kBtu/h
6	HVAC System 2	7
7	Roof Packaged Heat Pu	<65 kBtu/h
8	HVAC System 3	2
9	Roof Packaged Heat Pu	>=90 - <135 k

Be sure to save your project
Preview and Print reports



Need Help?

COMcheck-EZ

You can use *COMcheck-EZ*[™] to demonstrate that your commercial or high-rise residential building design complies with the 2000 Edition of the International Energy Conservation Code (IECC). *COMcheck-EZ* includes a software method and a manual method for demonstrating compliance.

The *COMcheck-EZ* software provides a highly flexible way to demonstrate compliance with minimal input. The envelope section allows tradeoffs between envelope components, including roofs, walls, windows, floors, and skylights. The lighting section enables you to quickly determine if your lighting design meets interior-lighting power limits. The mechanical section enables you to assemble a customized list of code requirements that are applicable to the systems and equipment in your building.

COMcheck-EZ Software Case Studies



•Sigma 2 Bldg. Floor Plan



Window/ Door Schedule

D1	6' x 7' Glass Entry Door - single pane tinted	3
D2	3' x 7' Opaque Entry Door	1
W1	3'0" x 4'6" aluminum, double paned, solar bronzed tint	48
W2	8'0" x 7'0" aluminum, double paned, solar bronzed tint	4
W3	6'0" x 7'0" aluminum, double paned, solar bronzed tint	3

•Sigma 2 Bldg. Building Envelope

Roof: 20,532 sq.ft. Wood truss R-19
Insulation

Exterior Walls: 8172 sq.ft. 2 X 4 Metal
Frame at 16" O.C., R-10 Insulation

Walls Perimeter = 681 ln. ft.

Windows: 998 sq.ft. Metal Frame, double
pane, tinted, U-value .69, SHGC-Value .57,
P.F. .50

Window/Wall Ratio = 12%

Glass Doors: 126 sq. ft. Clear Glazing, U-
value .92, SHGC-Value .47

Metal Door: 21 s.f. U-value .70

Floor: 20,532 sq. ft./681 linear
feet, unheated slab on grade, no
insulation

2 Storage Water Heaters, Electric,
80 gal. capacity

Activity Areas

Office: 15,849 sq.ft.

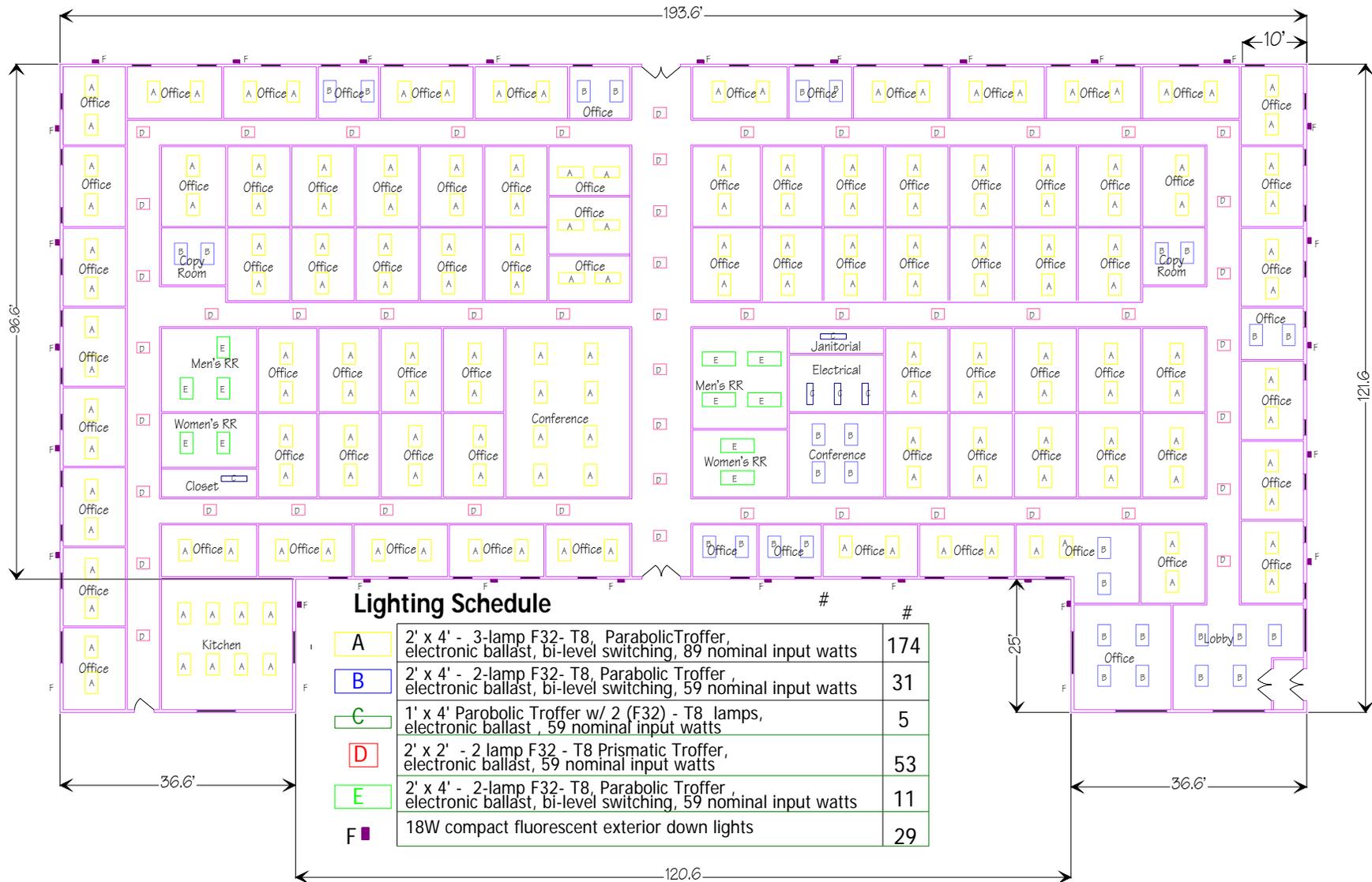
Halls/Corridors/Transitions:
3338 sq.ft.

Restrooms: 500 sq.ft.

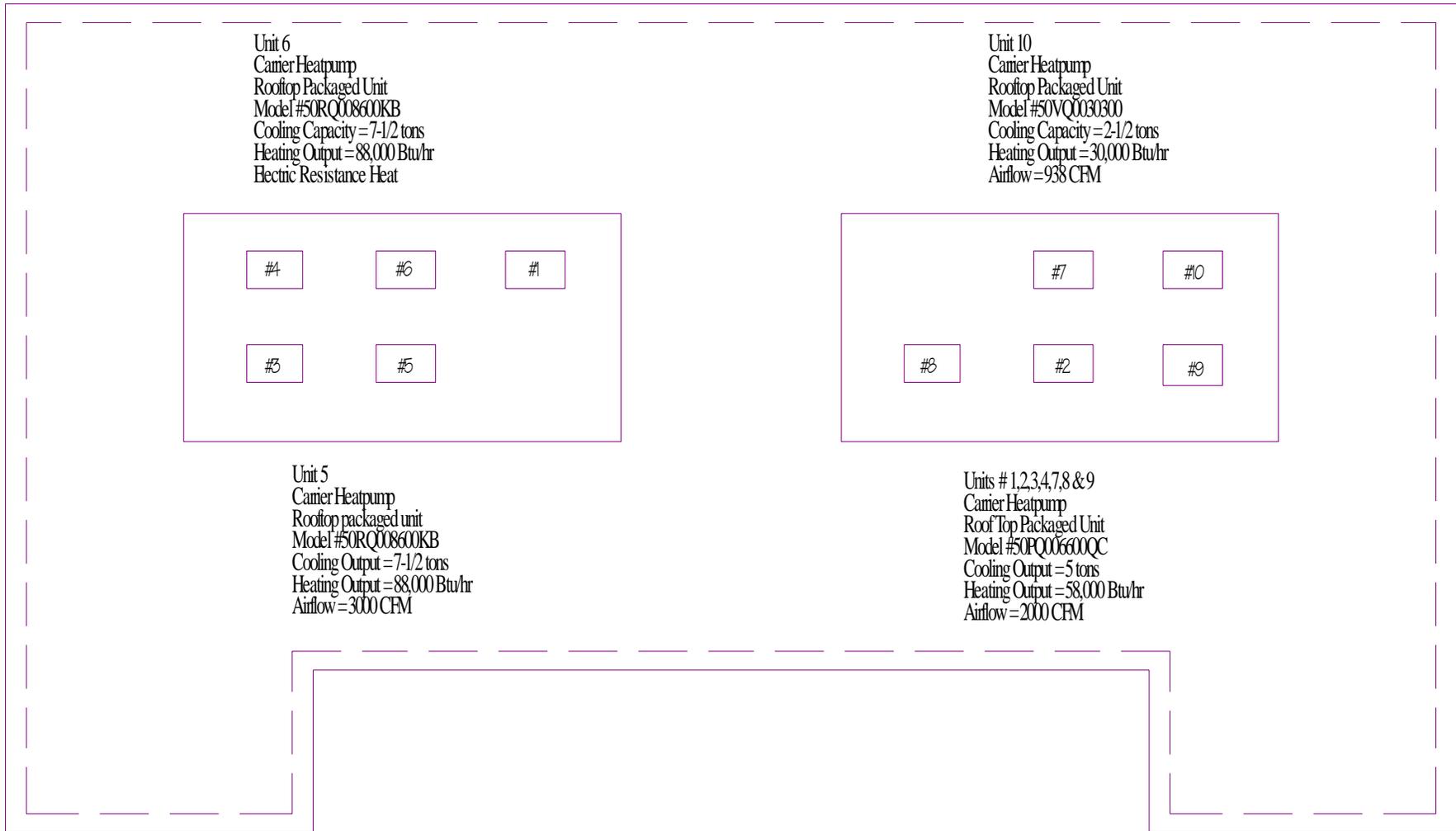
Kitchen: 505 sq.ft.

Lobby: 340 sq.ft.

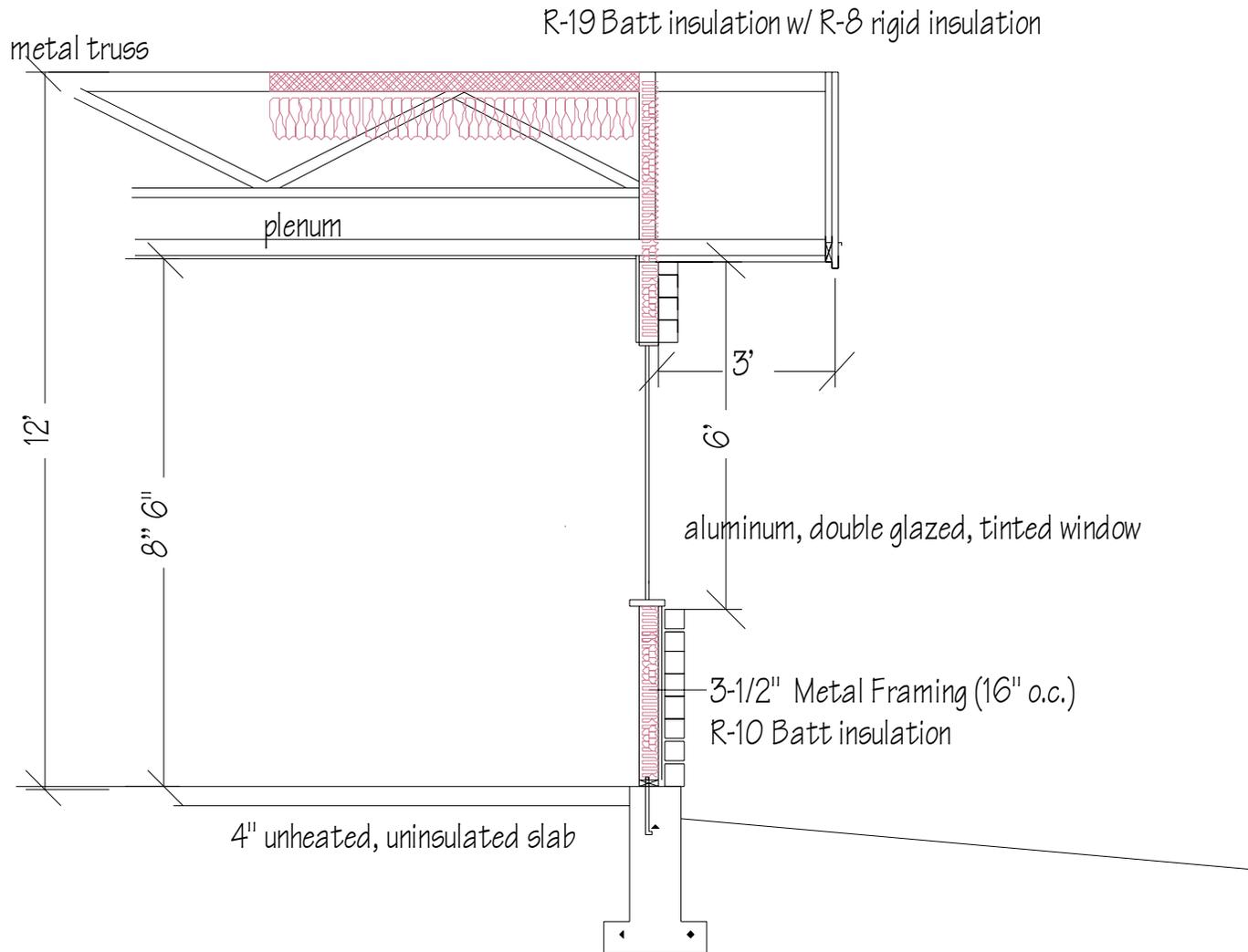
•Sigma 2 Bldg. Lighting Plan – Existing Lighting



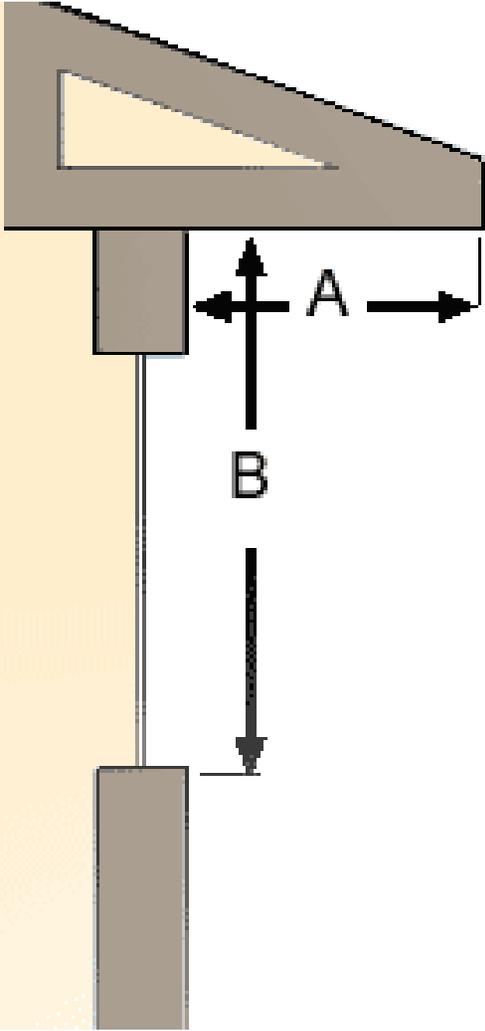
•Sigma 2 Bldg. Mechanical Plan



- **Building Section**



Overhang/Projection Factor (PF)

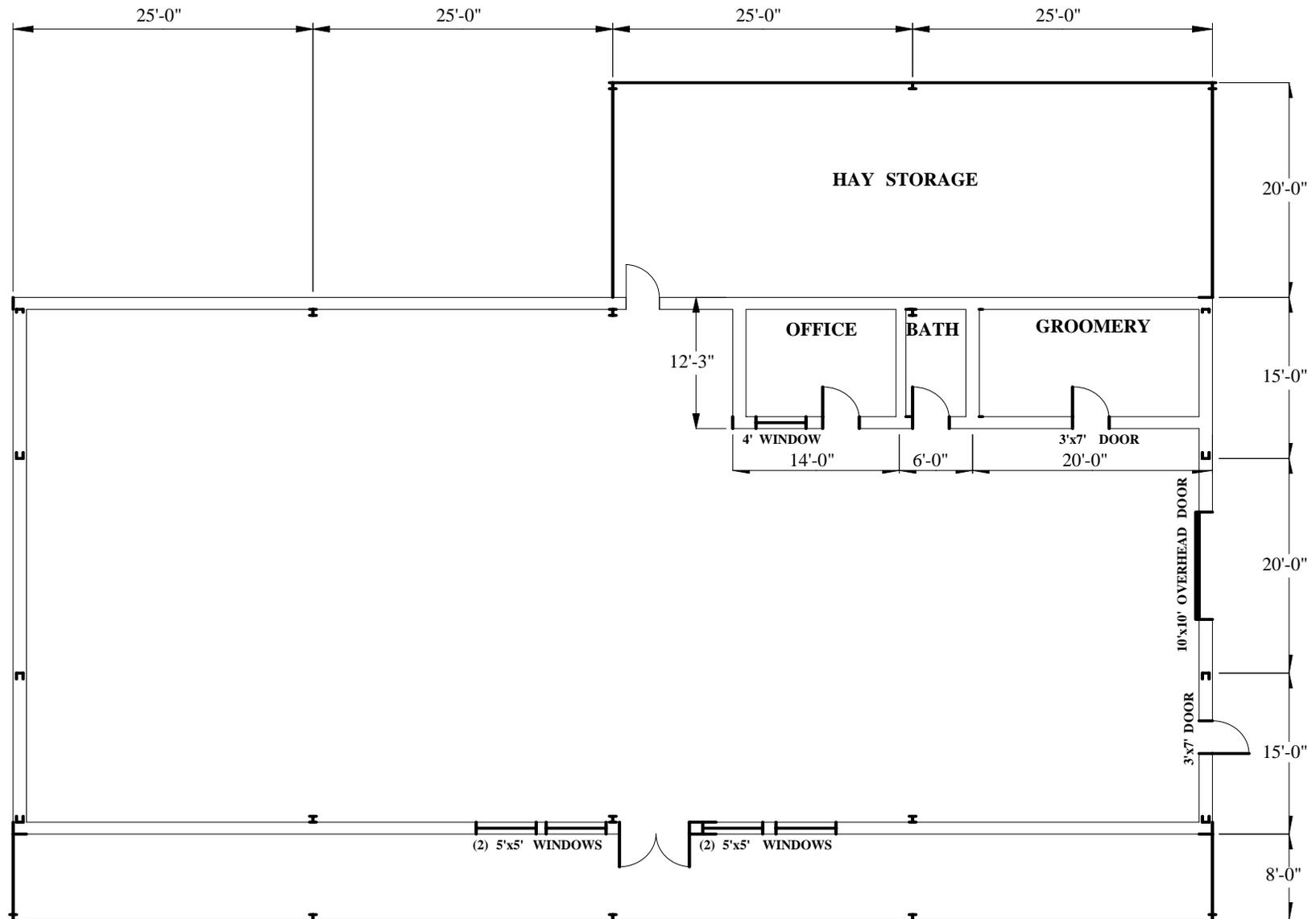


PF= A/B
PF=0.5

Red Mountain Feed & Irrigation



Red Mountain Feed & Irrigation Floor Plan



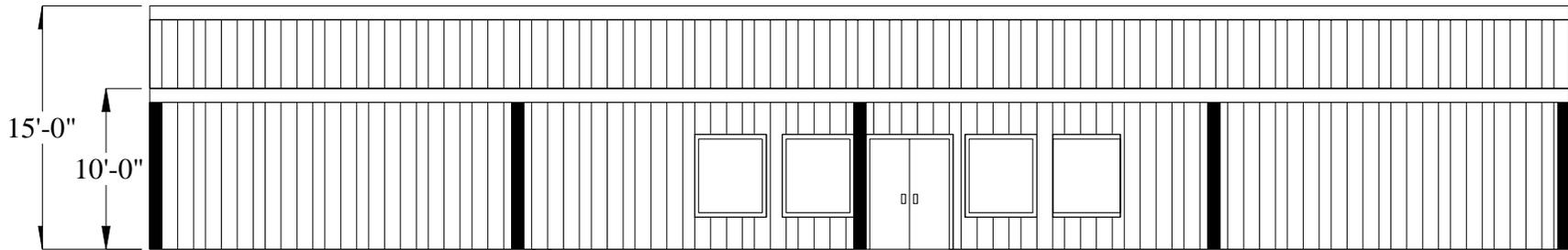
Spaces



Inside Office/Bathroom

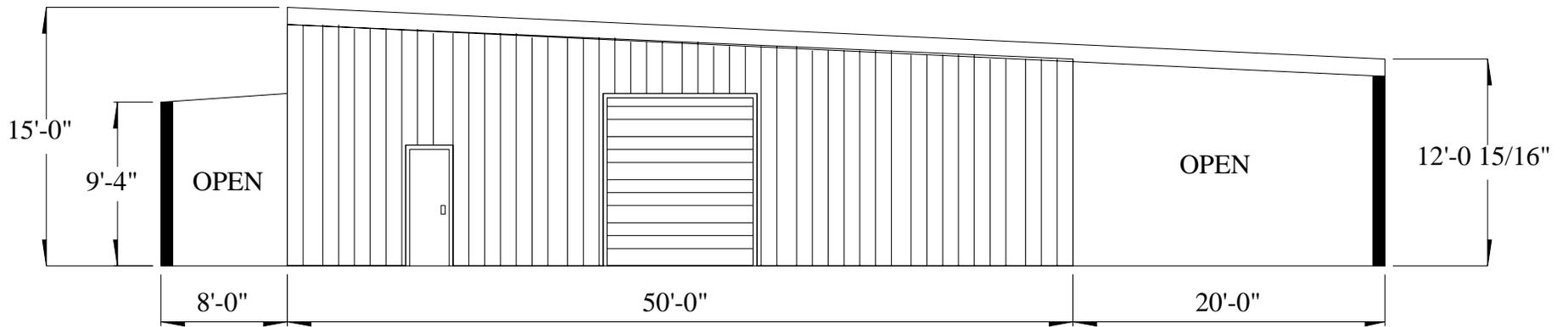


Storage



Exterior Walls: 3,954 sq.ft.

- 10' High: R10 between girt & metal wall + 2x4 R11 metal studs, 0.071 u-factor, heat capacity=1 (2,176 sq. ft.)
- 5' High: R10 between girt & metal wall (928 sq. ft.)



Walls



•Red Mountain Feed Building Envelope

Roof: 5,000 sq.ft. Metal w/1" Styrofoam thermal block, R-13 Insulation

Exterior Walls: 6,397 sq.ft.

Windows: 144 sq.ft. Metal Frame, double pane, tinted, U-factor .75, SHGC .88, PF .33

Glass Doors: 42 sq. ft., Metal Frame, U-factor .92, SHGC .87, PF, .33

Window/Wall Ratio = 2.9%

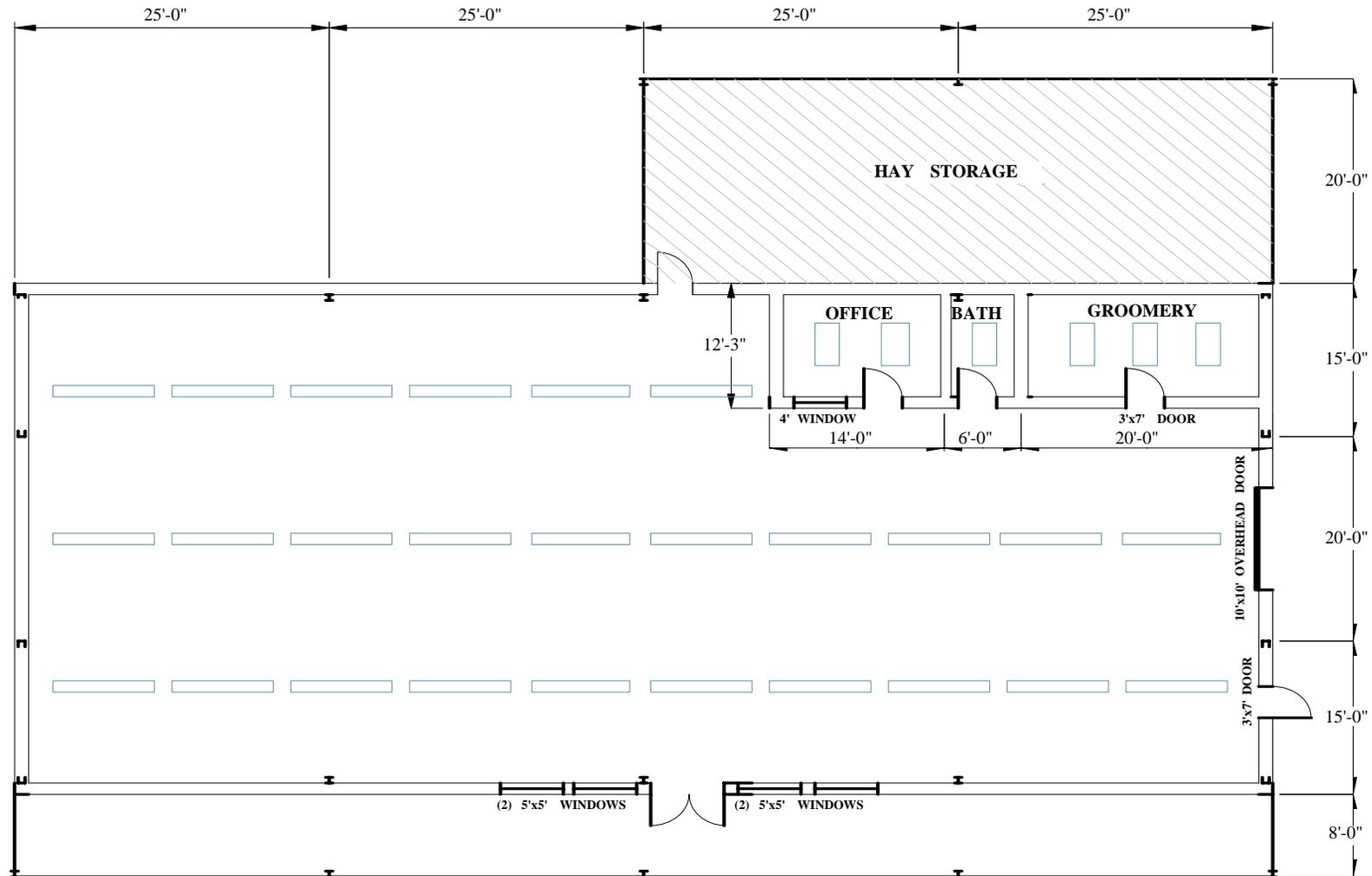
Doors: 100 sq. ft. Overhead Metal, U-value .60, other metal-42', u-value 1.20

Floor: 5000sq.ft./300 linear feet, unheated slab on grade, R10 2' vertical

Lighting



Red Mountain Feed Lighting Plan



Lighting Schedule

8' Industrial Fluorescent, 2 F96T12 Slimline Lamps & Energy Saving Magnetic Ballast

43 Fixtures, 173 watts/fixture

2'x4" Troffer 2 F32T8 lamps and GEB, 6 Fixtures, 59 watts/fixture

Heating System



Pellet Stove



Unit Heater

Building Energy Codes Program



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DOE's Building Energy Codes Program is an information resource on national model energy codes. We work with other government agencies, state and local jurisdiction, national

The Program recognizes that energy codes maximize energy efficiency only when they are fully embraced by users and supported through education, implementation, and enforcement.



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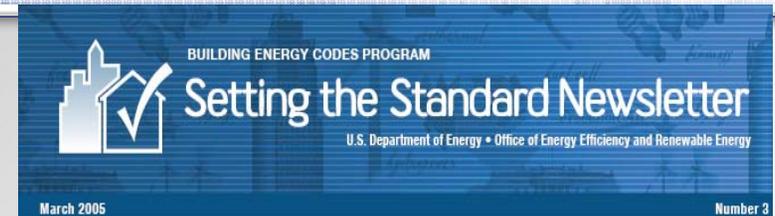
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Basements: Advantages and Disadvantages of Finishing Basements During Initial Construction of the Home

The 2000 and 2003 Editions of the International Energy Conservation Code (IECC) require basement walls to be insulated if the basement is considered part of the heated and/or cooled living space (conditioned space). If the basement is initially designed to be unfinished, insulation is required in the basement ceiling. The 2003 IECC requires floors over unheated spaces or basement walls that define the conditioned space (Section 502.2.3.3 or 502.2.3.6) to meet the applicable overall thermal transmittance factor (U-factor) or the minimum R-value based on the prescriptive specifications on an individual component basis. In basic terms this means, if the basement is unconditioned, the floor above the basement (basement ceiling) must be insulated and meet all the requirements of the IECC for floors over an unconditioned space. If the basement is considered part of the conditioned building envelope, the basement walls must be insulated and meet all the requirements of the IECC for basement walls. The requirements in the code vary depending on location and climate conditions. Requirements in the IECC include some of the following: Insulation Installation (Section 102.4), Moisture Control (Section 502.1.1), and Caulking and Sealants (Section 502.1.4.2).

Many homes are being constructed with unfinished basements to reduce initial costs. In most cases, the homeowner eventually finishes the basement for additional living space by installing basement wall insulation. Because most basements are eventually occupied, the advantages and disadvantages of conditioning the basement should be thoroughly reviewed prior to permitting and construction.

Table 1 provides a list of advantages and disadvantages of basement wall insulation compared to basement ceiling insulation.

Questions/Comments

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Techsupport@becp.pnl.gov

Pam Cole

Pacific Northwest National Laboratory

U.S. Department of Energy's Building Energy Codes Program