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

Exterior Lighting Requirements and COM*check*:

IECC 2006
ASHRAE/IESNA 90.1-2004


Speakers
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Building Energy Codes

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The Basis for Energy Requirements

- Energy Conservation and Production Act, as amended by EPAct, requires States to adopt a commercial energy code
- ……This drives state adoption of energy codes
- DOE determines the effective stringency level to meet or exceed – currently ASHRAE/IESNA 90.1-1999
- Many code/standard versions available and currently adopted – varies by state:
  - Some adopt nationally available codes/standards (IECC, ASHRAE/IESNA 90.1)
  - Some develop state-specific codes
  - Some have no code!

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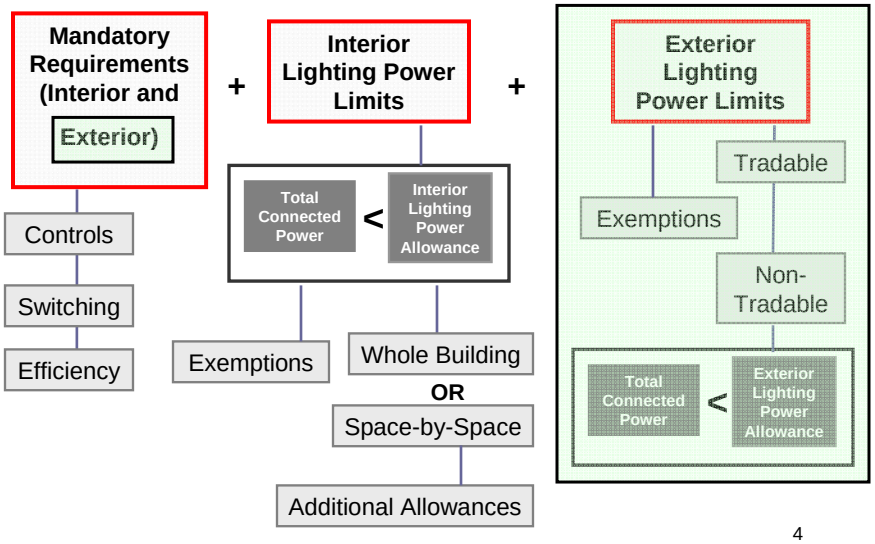
Basic Lighting Requirements



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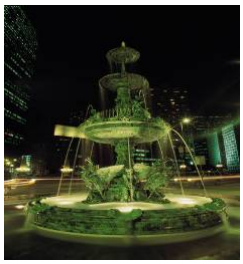
Mandatory: Exterior Controls

- Photocell (for dusk-to-dawn lighting) **OR**
- Seven-day/seasonal programmable with astronomic correction and 4 hour battery backup
- Exceptions: (where required for safety, security, or eye adaptation)
  - Covered vehicle entrances
  - Exits from buildings or parking structures



Intent: Eliminate exterior lighting left on during the day

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Mandatory: Lamp Efficacy

Building grounds lighting luminaires over 100 watts must have source efficacy of at least 60 lumens per watt

Light Source	Typical System Efficacy Range in LPW (varies depending on wattage and lamp type)
Incandescent	10-18
Halogen incandescent	15-20
Compact fluorescent (CFL)	35-60
Linear fluorescent	50-100
Metal halide	50-90

Exceptions:

- Controlled by motion sensor
- Any of the exterior lighting power allowance exceptions
- As approved for a historical, safety, signage, or emergency consideration

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Exterior Lighting Power Limits

Total Connected Power < **Exterior Lighting Power Allowance**

- Calculate proposed connected lighting power
  - Exempted lighting
- Calculate exterior Lighting Power Allowance
  - Lighting power densities by exterior function
  - Additional 5% added to total allowance
- Compare Total Connected Power to Total Power Allowance

Intent of 5% adder: Allow flexibility in design for critical or unusual applications!

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Exempted Exterior Lighting Power

- Specialized signal, directional, and marker lighting associated with transportation;

- Lighting that is integral to advertising signage or directional signage;

- Lighting that is integral to equipment or instrumentation and is installed by its manufacturer;

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Exempted Exterior Lighting Power

- Lighting for theatrical purposes, including performance, stage, film, and video production;
- Lighting for athletic playing areas;
- Temporary lighting;
- Lighting for industrial production, material handling, transportation sites, and associated storage areas;

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Exempted Exterior Lighting Power

- Theme elements in theme/amusement parks;
- Lighting used to highlight features of public monuments and registered historic landmark structures or buildings.

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Exterior Lighting LPD Allowances

Tradable: Common exterior lighting applications where unused power can be traded where needed.

For example, wattage allowed for parking lot lighting can be “traded” and used for canopy lighting.

Non-Tradable: Less common exterior lighting needs that **cannot** be traded. These applications have more specific security or task illuminance needs.

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Exterior LPDs

Applications	Lighting Power Densities
Tradable Surfaces **(Lighting Power Densities for open parking areas, building grounds, building entrances and exits, canopies and overhangs, and outdoor sales areas may be traded)**	
Uncovered Parking Areas	
Parking lots and drives	0.15 W/ft^2
Building Grounds	
Walkways less than 10 feet wide	1.0 W/linear foot
Walkways 10 feet wide or greater, Plaza areas and Special feature areas	0.2 W/ft^2
Stairways	1.0 W/ft^2

Note: Covered parking areas and interior stairways are included in the interior LPD table

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Exterior LPDs (Continued)

Applications	Lighting Power Densities
More Tradable Surfaces…	
Building Entrances and Exits	
Main entries	30 W/linear foot of door width
Other doors	20 W/linear foot of door width
Canopies and Overhangs	
Canopies (free standing & attached) and overhangs	1.25 W/ft^2
Outdoor Sales	
Open areas (including vehicle sales lots)	0.5 W/ft^2
Street frontage for vehicle sales lots in addition to "open area" allowance	20 W/linear foot

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Exterior LPDs (Continued)

Applications	Lighting Power Densities
Non-Tradable Surfaces **(Lighting Power Density calculations for the following applications can only be used for the specific application and cannot be traded between surfaces or with other exterior lighting. The following allowances are in addition to any allowance otherwise permitted in the Tradable Surfaces section of this table.)**	
Building facades	0.2 W/ft^2 for each illuminated wall or surface or 5.0 W/linear foot for each illuminated wall or surface length
Automated teller machines & night depositories	270 W per location plus 90 watts per additional ATM per location
Entrances and gatehouse inspection stations at guarded facilities	1.25 W/ft^2 of uncovered area (covered areas are included in the Canopies and Overhangs section of Tradable Surfaces)

Note: two methods for façade calculation – use one or the other but not both.

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Exterior LPDs (Continued)

Applications	Lighting Power Densities
Non-Tradable Surfaces	
Loading areas for law enforcement, fire, ambulance and other emergency service vehicles	0.5 W/ft^2 of uncovered area (covered areas are included in the Canopies and Overhangs section of Tradable Surfaces)
Drive-up windows at fast food restaurants	400 W per drive through
Parking near 24-hour retail entrances	800 W per main entry

Note: Drive-up allowance applies to any type of drive-up including pharmacy, bank, etc.

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What if My Design Does Not Comply?

Check calculations

- Appropriate exterior applications used?
- Actual lighting equipment wattages used?
- Applicable exemptions taken?

…and design

- Reasonable illuminance levels provided?
- Efficient light sources used?

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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

COMcheck™ Package Generator

Trade-off Approach

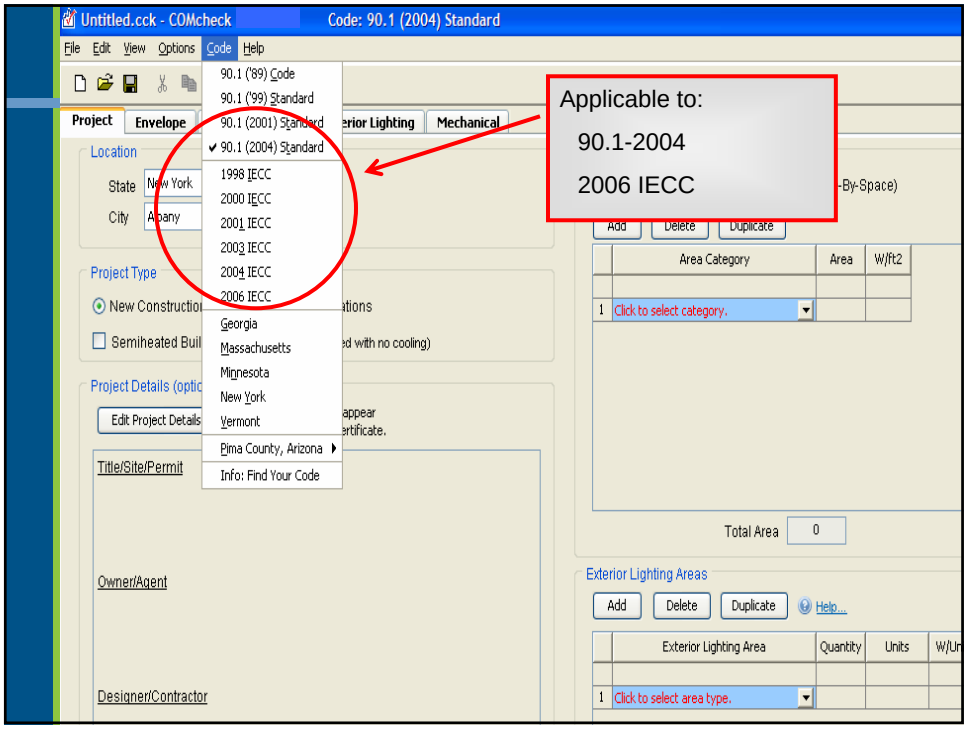
- Trade-off between components
- Provides design flexibility
- Requires area & U/R-factors

Windows version or Mac version

1 COMcheck™

2 COMcheck-Web™

All COM*check* tools available from www.energycodes.gov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2006 IECC
Georgia
Massachusetts
Minnesota
New York
Vermont
Pima County, Arizona
Info: Find Your Code
Project
Envelope
Mechanical
Location
State New York
City Albany
Project Type
New Construction
Semiheated Building
Project Details (optional)
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Title/Site/Permit
Owner/Agent
Designer/Contractor
Applicable to:
90.1-2004
2006 IECC
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Area
W/ft2
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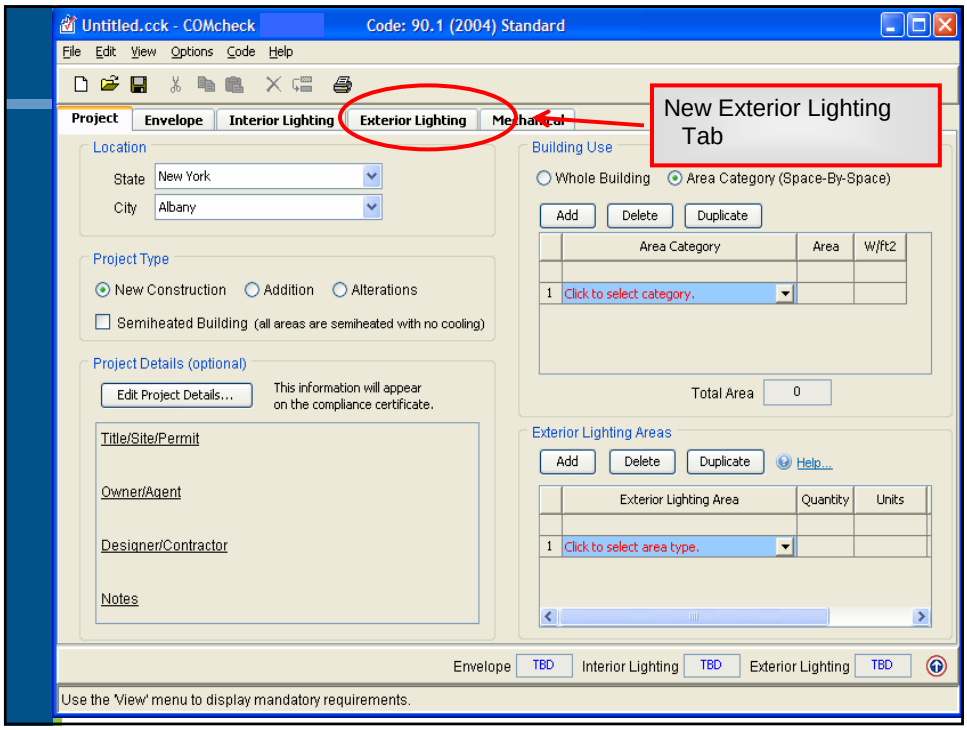
Add
Delete
Duplicate
Help...
Exterior Lighting Area
Quantity
Units
Click to select area type.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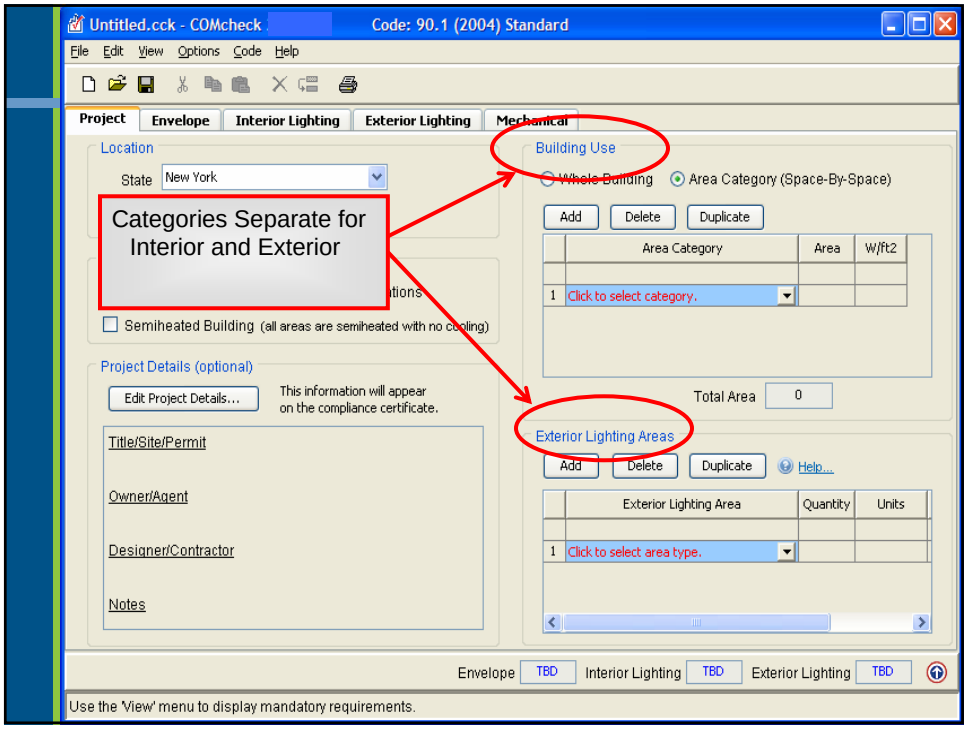
Envelope
Interior Lighting
Exterior Lighting
Mechanical
New Exterior Lighting Tab
Location
State New York
City Albany
Project Type
New Construction
Addition
Alterations
Semiheated Building (all areas are semiheated with no cooling)
Project Details (optional)
Edit Project Details...
This information will appear on the compliance certificate.
Title/Site/Permit
Owner/Agent
Designer/Contractor
Notes
Building Use
Whole Building
Area Category (Space-By-Space)
Add
Delete
Duplicate
Area Category
Area
W/ft2
Click to select category.
Total Area
0
Exterior Lighting Areas
Add
Delete
Duplicate
Help...
Exterior Lighting Area
Quantity
Units
Click to select area type.
Envelope TBD
Interior Lighting TBD
Exterior Lighting TBD
Use the 'View' menu to display mandatory requirements.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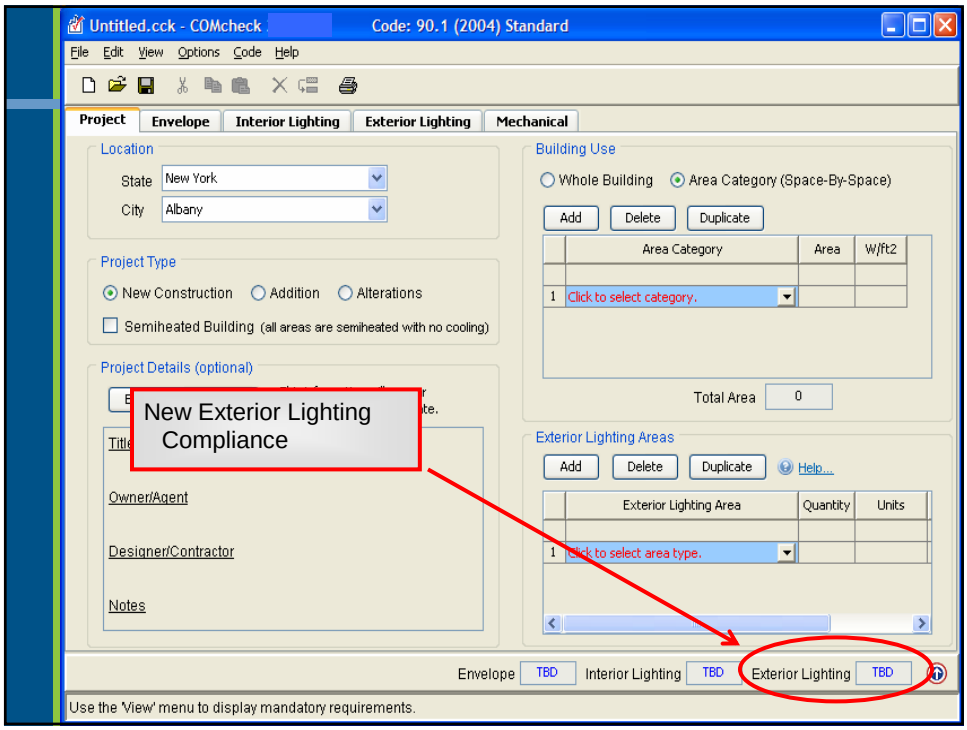
Project
Envelope
Interior Lighting
Exterior Lighting
Mechanical
Location
State New York
Building Use
Whole Building
Area Category (Space-By-Space)
Add
Delete
Duplicate
Area Category
Area
W/ft2
1 Click to select category.
Categories Separate for Interior and Exterior
Semiheated Building (all areas are semiheated with no cooling)
Project Details (optional)
Edit Project Details...
This information will appear on the compliance certificate.
Title/Site/Permit
Owner/Agent
Designer/Contractor
Notes
Total Area
0
Exterior Lighting Areas
Add
Delete
Duplicate
Help...
Exterior Lighting Area
Quantity
Units
1 Click to select area type.
Envelope TBD
Interior Lighting TBD
Exterior Lighting TBD
Use the 'View' menu to display mandatory requirements.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Envelope
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Exterior Lighting
Mechanical
Location
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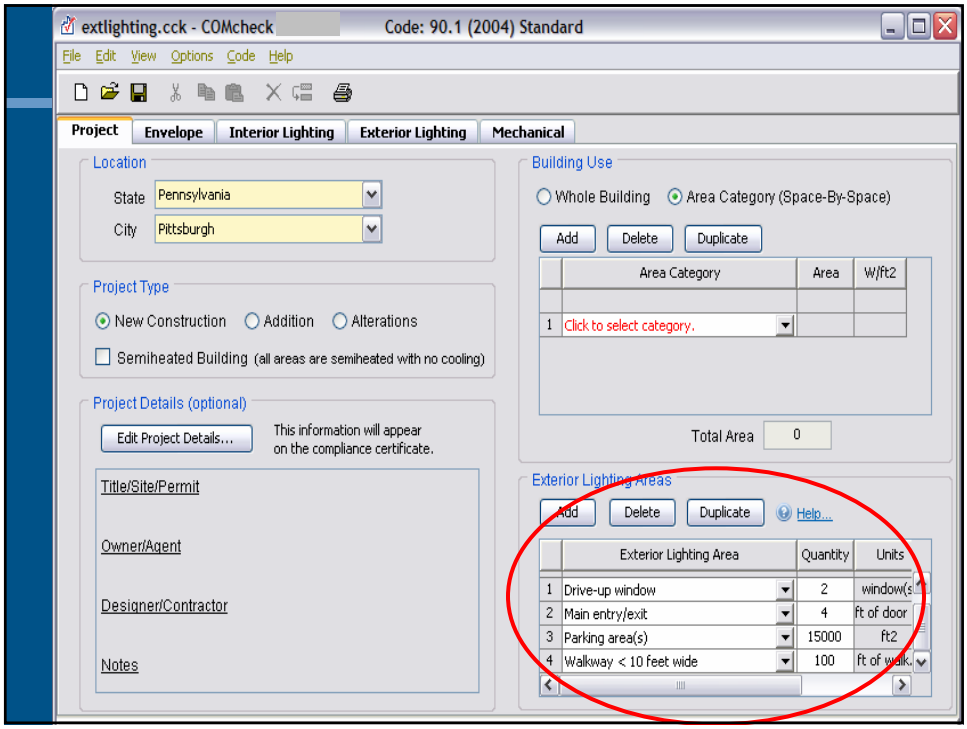
City Albany
Building Use
Whole Building
Area Category (Space-By-Space)
Add
Delete
Duplicate
Area Category
Area
W/ft2
1 Click to select category.
Project Type
New Construction
Addition
Alterations
Semiheated Building (all areas are semiheated with no cooling)
Project Details (optional)
New Exterior Lighting Compliance
Owner/Agent
Designer/Contractor
Notes
Total Area
0
Exterior Lighting Areas
Add
Delete
Duplicate
Help...
Exterior Lighting Area
Quantity
Units
1 Click to select area type.
Envelope TBD
Interior Lighting TBD
Exterior Lighting TBD
Use the 'View' menu to display mandatory requirements.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Interior Lighting
Exterior Lighting
Mechanical
Location
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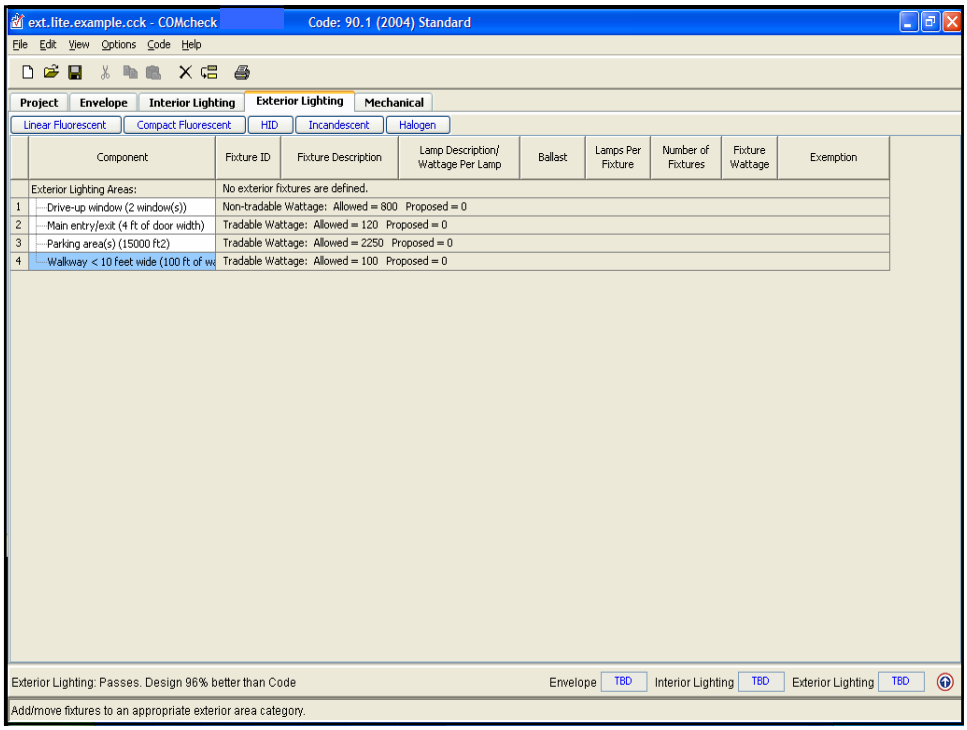
City Pittsburgh
Project Type
New Construction
Addition
Alterations
Semiheated Building (all areas are semiheated with no cooling)
Project Details (optional)
Edit Project Details...
This information will appear on the compliance certificate.
Title/Site/Permit
Owner/Agent
Designer/Contractor
Notes
Building Use
Whole Building
Area Category (Space-By-Space)
Add
Delete
Duplicate
Area Category
Area
W/ft2
1 Click to select category.
Total Area 0
Exterior Lighting Areas
Add
Delete
Duplicate
Help...
Exterior Lighting Area
Quantity
Units
1 Drive-up window 2 window(s
2 Main entry/exit 4 ft of door
3 Parking area(s) 15000 ft2
4 Walkway < 10 feet wide 100 ft of walk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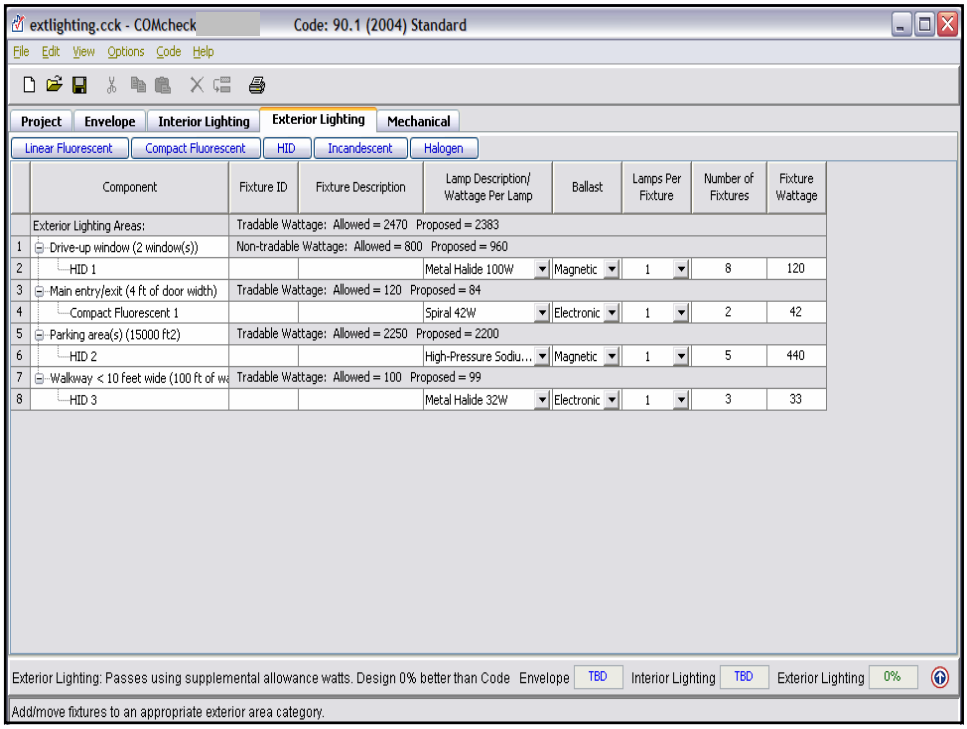
Code: 90.1 (2004) Standard
File Edit View Options Code Help
Project
Envelope
Interior Lighting
Exterior Lighting
Mechanical
Linear Fluorescent
Compact Fluorescent
HID
Incandescent
Halogen
Component
Fixture ID
Fixture Description
Lamp Description/ Wattage Per Lamp
Ballast
Lamps Per Fixture
Number of Fixtures
Fixture Wattage
Exemption
Exterior Lighting Areas: No exterior fixtures are defined.
1 Drive-up window (2 window(s)) Non-tradable Wattage: Allowed = 800 Proposed = 0
2 Main entry/exit (4 ft of door width) Tradable Wattage: Allowed = 120 Proposed = 0
3 Parking area(s) (15000 ft2) Tradable Wattage: Allowed = 2250 Proposed = 0
4 Walkway < 10 feet wide (100 ft of w Tradable Wattage: Allowed = 100 Proposed = 0
Exterior Lighting: Passes. Design 96% better than Code
Envelope TBD Interior Lighting TBD Exterior Lighting TBD
Add/move fixtures to an appropriate exterior area category.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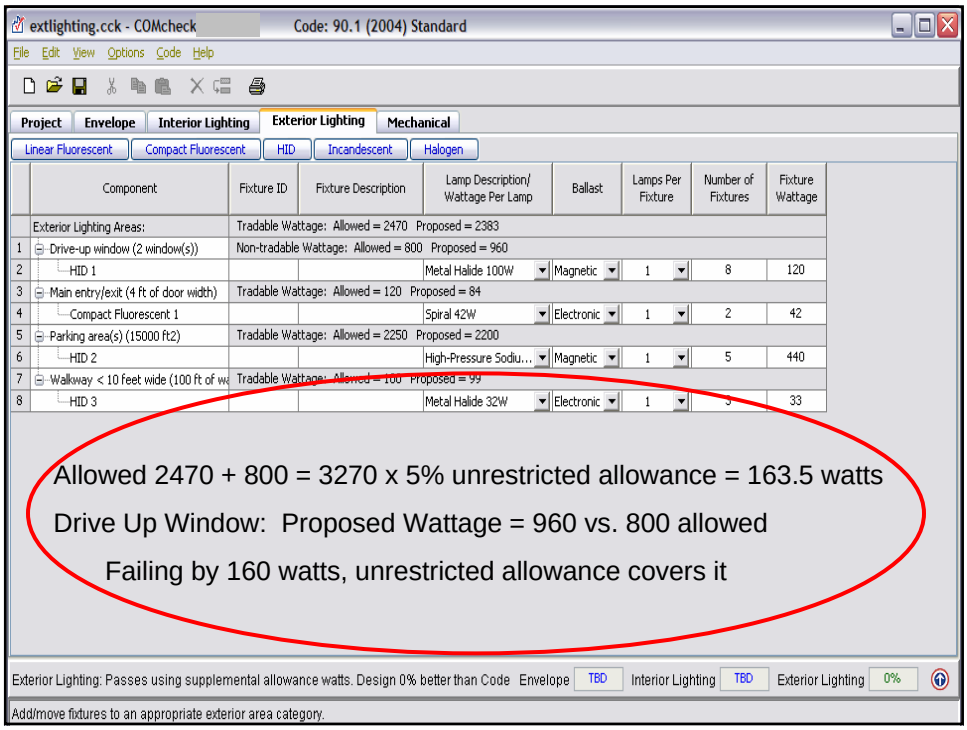
Project Envelope Interior Lighting Exterior Lighting Mechanical
Linear Fluorescent Compact Fluorescent HID Incandescent Halogen
Component Fixture ID Fixture Description Lamp Description/ Wattage Per Lamp Ballast Lamps Per Fixture Number of Fixtures Fixture Wattage
Exterior Lighting Areas: Tradable Wattage: Allowed = 2470 Proposed = 2383
1 Drive-up window (2 window(s)) Non-tradable Wattage: Allowed = 800 Proposed = 960
2 HID 1 Metal Halide 100W Magnetic 1 8 120
3 Main entry/exit (4 ft of door width) Tradable Wattage: Allowed = 120 Proposed = 84
4 Compact Fluorescent 1 Spiral 42W Electronic 1 2 42
5 Parking area(s) (15000 ft2) Tradable Wattage: Allowed = 2250 Proposed = 2200
6 HID 2 High-Pressure Sodiu... Magnetic 1 5 440
7 Walkway < 10 feet wide (100 ft of wa Tradable Wattage: Allowed = 100 Proposed = 99
8 HID 3 Metal Halide 32W Electronic 1 3 33
Exterior Lighting: Passes using supplemental allowance watts. Design 0% better than Code Envelope TBD Interior Lighting TBD Exterior Lighting 0%
Add/move fixtures to an appropriate exterior area category.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Project Envelope Interior Lighting Exterior Lighting Mechanical
Linear Fluorescent Compact Fluorescent HID Incandescent Halogen
Component Fixture ID Fixture Description Lamp Description/ Wattage Per Lamp Ballast Lamps Per Fixture Number of Fixtures Fixture Wattage
Exterior Lighting Areas: Tradable Wattage: Allowed = 2470 Proposed = 2383
1 Drive-up window (2 window(s)) Non-tradable Wattage: Allowed = 800 Proposed = 960
2 HID 1 Metal Halide 100W Magnetic 1 8 120
3 Main entry/exit (4 ft of door width) Tradable Wattage: Allowed = 120 Proposed = 84
4 Compact Fluorescent 1 Spiral 42W Electronic 1 2 42
5 Parking area(s) (15000 ft2) Tradable Wattage: Allowed = 2250 Proposed = 2200
6 HID 2 High-Pressure Sodiu... Magnetic 1 5 440
7 Walkway < 10 feet wide (100 ft of wa Tradable Wattage: Allowed = 100 Proposed = 99
8 HID 3 Metal Halide 32W Electronic 1 3 33
Allowed 2470 + 800 = 3270 x 5% unrestricted allowance = 163.5 watts
Drive Up Window: Proposed Wattage = 960 vs. 800 allowed
Failing by 160 watts, unrestricted allowance covers it
Exterior Lighting: Passes using supplemental allowance watts. Design 0% better than Code Envelope TBD Interior Lighting TBD Exterior Lighting 0%
Add/move fixtures to an appropriate exterior area category.

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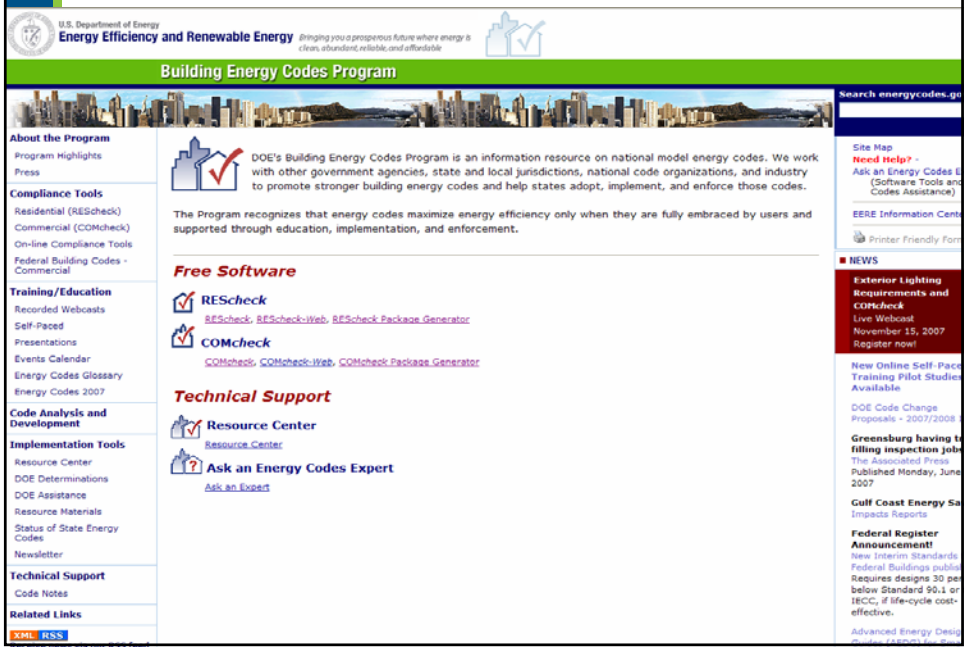
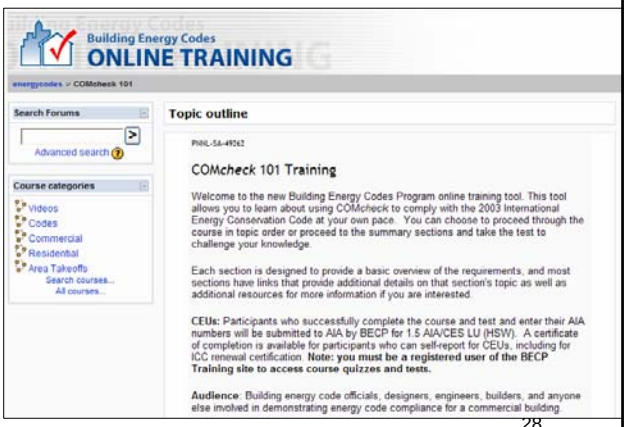
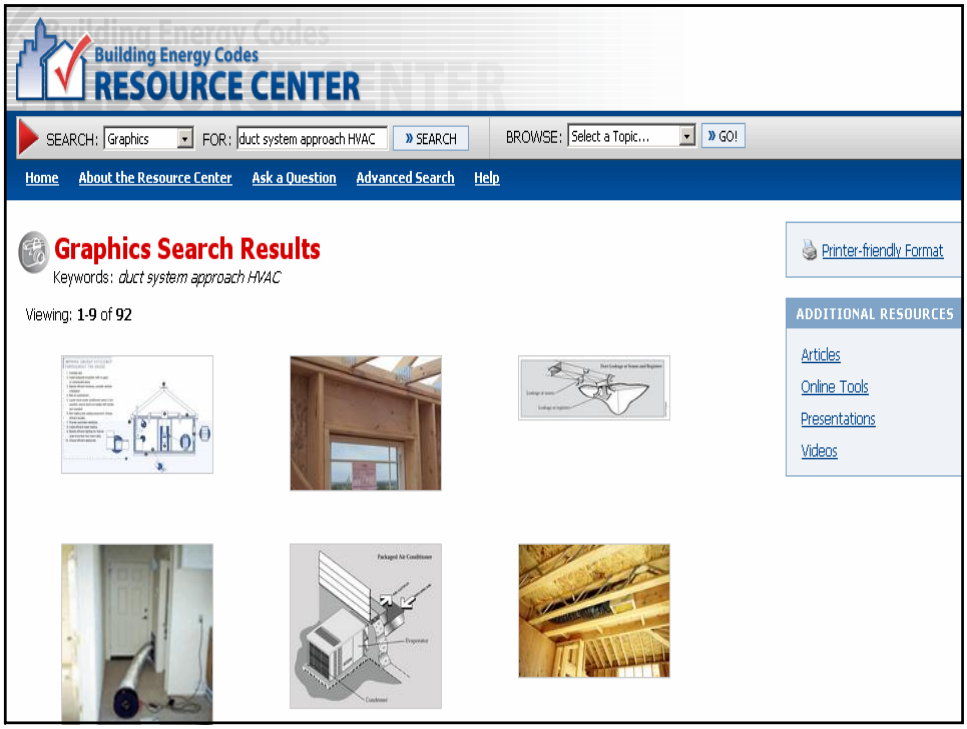


Training Tools

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





Setting the Standard Newsletter

- Register on-line to receive the latest up-to-date information on energy code related issues.

Newsletter

- http://www.energycodes.gov/news/

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More Information?

- More information and detailed training opportunities are available from:

www.ashrae.org

www.iccsafe.org

www.iesna.org

www.energycodes.gov

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Questions/Comments

- Help Desk – on-line electronic form

http://www.energycodes.gov/support/helpdesk.php

- Email

Techsupport@becp.pnl.gov

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