



NEW YORK
STATE OF OPPORTUNITY.

Building Standards and Codes

Carbon Monoxide Requirements in Commercial Buildings

A Division of New York Department of State

June 29, 2015

June 29, 2015 2

Overview of Session

- Review of carbon monoxide properties and hazards
- Review of existing carbon monoxide requirements
- Discussion of the law
- Components of new regulations
- Review of NFPA 720
- Example buildings

A Division of New York Department of State 

June 29, 2015 3

Instructor

Daniel E. Nichols, P.E. Fire Protection Engineer New York State Department of State Division of Building Standards and Codes	Heather Roth, P.E. Fire Protection Engineer New York State Department of Homeland Security and Emergency Services Office of Fire Prevention and Control
---	--

E-Mail: dan.nichols@dos.ny.gov E-Mail: heather.roth@dhses.ny.gov
 Phone: 845-334-9768 Phone: (585) 371-9018

A Division of New York Department of State 

June 29, 2015 4

DOS Webinar Format

- The name and NY ID number used to register for this webinar is eligible for NYS DOS in-service training credit
 - 2 hours, Uniform Code
- Webinar technology used by DOS can track participation in answering polling questions along the course of the webinar as well as your computer using other applications during the course (like e-mail)
 - This may be used to validate participation and issuance of in-service training credit
- Questions and comments are at the discretion of the instructor
 - For this session, questions and comments can be forwarded by e-mail for response after the conclusion of the course

A Division of New York Department of State 

June 29, 2015 5

Polling exercise

- On the WEBEX screen, a poll should appear
 - Please pick an appropriate answer as polling is open for a defined amount of time

A Division of New York Department of State 

June 29, 2015 6

Introduction on the Administration and Enforcement of the Uniform Code

- The Uniform Fire Prevention and Building Code (Uniform Code) is a regulation that is a result of the Uniform Code Act
 - In 1981, required a Statewide Fire Prevention and Building Code by 1984
- Applies to all jurisdictions and State entities
 - Except the City of New York

A Division of New York Department of State 

June 29, 2015 7

Introduction on the Administration and Enforcement of the Uniform Code

- Responsibility is with the regulated party
 - Owner, authorized agent, etc.
- Enforcement is a function of local government or State agencies, as applicable by ownership
- Changes to the Uniform Code are the responsibility of the regulated party on the day of adoption
 - Identified on the next inspection of the premises
 - Can be by routine inspection or complaint

A Division of New York Department of State 

June 29, 2015 8

Carbon Monoxide: Basics

- A naturally occurring chemical compound
- Created by incomplete combustion of carbon-based fuels
 - Generally caused when a fuel-fired operation has restricted air intake
- Natural Gas
- Propane
- Wood
- Oil
- Corn
- Coal
- Paper
- Butane

A Division of New York Department of State 

June 29, 2015 9

Carbon Monoxide: Properties

- Has similar physical properties to normal room air
- Does not have an odor or visual aspect
- Since it is the result of incomplete combustion, can reignite at higher temperatures

A Division of New York Department of State 

June 29, 2015 10

Carbon Monoxide: Health

- The respiratory system is designed to charge the blood with oxygen and remove carbon dioxide
- In the presence of carbon monoxide, the attachment of carbon monoxide to hemoglobin (red blood cells) during inhalation is more likely than the attachment of oxygen
 - This causes asphyxiation due to the lower levels of oxygen in the blood stream
- Unlike carbon dioxide, the body does not have a mechanism to sense carbon monoxide or to actively remove it during the respiratory process

A Division of New York Department of State 

June 29, 2015 11

Carbon Monoxide: Statistics

- On average, 430 people die annually nationwide from non-fire, unintentional carbon monoxide poisoning

Source: CDC

Age group (yrs)	Male deaths	Female deaths	Male rates (per 100,000)	Female rates (per 100,000)
0-24	~40	~15	~0.15	~0.05
25-44	~100	~25	~0.35	~0.10
45-64	~110	~30	~0.40	~0.12
65+	~50	~35	~0.20	~0.15

A Division of New York Department of State 

June 29, 2015 12

Carbon Monoxide: Statistics

- In New York State, approximately 450 persons a year are hospitalized and 55 fatalities a year are reported due to non-intentional carbon monoxide poisoning
 - This includes fire-related activities
- Whereas this is significantly lower than the number of fire deaths, carbon monoxide poisoning events do receive significant media attention

A Division of New York Department of State 

June 29, 2015 13

Carbon Monoxide: Exposure Basics

Smoke from Fire

- Three measurable components (source NFPA 130):
 - Heat
 - Carbon monoxide
 - Visibility
- Exposure to smoke is predicted to be an exponential rise in incapacitating properties within minutes

Carbon Monoxide

- Measured dose in parts per million (ppm)
- Exposure is the product of dose and exposure
- Whereas heat and visibility are generally "pass/fail", carbon monoxide is based on exposures
 - 1200ppm in a short time frame has equal health effects as 35ppm for a long time

A Division of New York Department of State 

June 29, 2015 14

Carbon monoxide: Exposure Basics

[UL 2034 and 2075 exposure graph]

Figure 5B.1
Carbon monoxide concentration (ppm CO) versus time (minutes)
Figure 5B.1 revised October 15, 2007

A Division of New York Department of State 

June 29, 2015 15

Polling Question #1

Check our website at:
www.dos.ny.gov/dcea



POLL ENDED

A Division of New York Department of State 

June 29, 2015 16

Basics of the regulation

Layout

- a. Introduction
- b. Definitions
- c. Buildings Required
- d. Detection Zones Required
- e. Placement
- f. Equipment
- g. Alarms
- h. Systems
- i. Additional Group E
- j. Maintenance
- k. Control Units and Off-premises signaling
- l. Other Uniform Code provisions
- m. Mixed-use buildings
- n. Reference Standards

A Division of New York Department of State



June 29, 2015 17

Definition: Carbon Monoxide Source

The term "carbon monoxide source" means:

Any appliance, equipment, device or system that may emit carbon monoxide (including, but not limited to, fuel fired furnaces; fuel fired boilers; space heaters with pilot lights or open flames; kerosene heaters; wood stoves; fireplaces; and stoves, ovens, dryers, water heaters and refrigerators that use gas or liquid fuel), garages, and other motor vehicle related occupancies.

A Division of New York Department of State



June 29, 2015 18

Definition: Commercial Building

- The term "commercial building" means any new or existing building that is not a one-family dwelling, a two-family dwelling, or a building containing only townhouses.
- This definition does not make "residential" and "commercial" exclusive
 - A building could fall under both requirements

A Division of New York Department of State



June 29, 2015 19

Definition: Commercial Building



- A building is separated by exterior walls or fire walls
 - As defined by the Building Code of New York State

A Division of New York Department of State 

June 29, 2015 20

Definitions: New and Existing

- A building is considered "existing" if:
 - The building is complete prior to December 31, 2015
 - A complete application for the building permit is filed prior to December 31, 2015
- Otherwise, a building is considered "new"
- The consideration of "existing" to the end of the year is to address buildings currently under design

A Division of New York Department of State 

June 29, 2015 21

Definition: Carbon monoxide-producing HVAC system

- "Carbon monoxide-producing HVAC system" means a system that uses ducts to provide heat, ventilation and/or air-conditioning to all or any part of a commercial building, provided that:
 - Such ducts run from a carbon monoxide source to the classroom(s) and/or detection zone(s) served by such system and/or
 - Such system is supplied with recirculated or makeup air from a classroom or detection zone that contains a carbon monoxide source

A Division of New York Department of State 

June 29, 2015 22

Definition: Carbon monoxide-producing HVAC system

- This system is defined as the ducts from the source to the classroom or detection zone
 - Does not include the vent or chimney
- Is applicable if the system has supply air that comes from a space with a carbon monoxide source
- Commonly known systems include:
 - Forced air heat where the ductwork is sourced to the furnace air exchanger
 - Ventilation systems where supply air comes from a garage or area with a carbon monoxide source

A Division of New York Department of State 

June 29, 2015 23

Definition: Classroom

Room or area that meets all of the following three conditions:

1. Located in a school
 - Includes public, private, and religious schools
 - Can include spaces considered Group E, but not required to be a Group E
 - Does not include rooms used by students over the 12th grade
2. In a building where classes are taught
3. Is capable of being occupied by six or more persons, including staff

A Division of New York Department of State 

June 29, 2015 24

Definition: Detection Zone

- The term "detection zone" means a story of a commercial building. However:
 - (i) if a story is arranged so that two or more separate carbon monoxide-producing HVAC systems are used to serve separate portions of the story, each such portion of the story shall be deemed to be a separate detection zone;
 - (ii) if a story contains one or more classrooms, each classroom shall be deemed to be a separate detection zone and the portion, if any, of the story that is not a classroom shall be deemed to be a separate detection zone;
 - (iii) if a portion of a story is used as a garage, the portion used as a garage shall not be deemed to be a detection zone and the portion not used as a garage shall be deemed to be a detection zone; and
 - (iv) if an entire story is used as a garage, such story shall not be deemed to be a detection zone.

A Division of New York Department of State 

June 29, 2015 25

Definition: Detection Zone

4 step process:

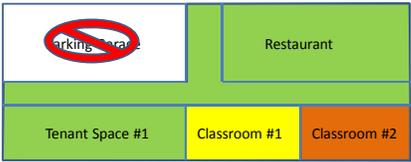
1. Make each story that isn't a parking garage a detection zone
2. Subtract out any portion of a story that is a parking garage from the detection zone
3. Make every Group E classroom it's own detection zone if it has a CO source in it or served by a carbon monoxide producing HVAC system
4. If a story is served by two or more carbon monoxide producing HVAC systems in separate portions of the story, each system area is a separate detection zone

A Division of New York Department of State 

June 29, 2015 26

Definition: Detection Zone

Example #1: Forced air heating from an oil-fired furnace located on the story below and is the common heat throughout the story

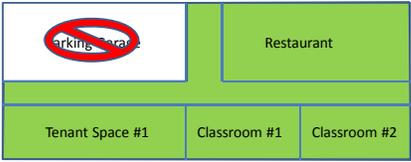


A Division of New York Department of State 

June 29, 2015 27

Definition: Detection Zone

Example #2: Heat provided throughout the story by hydronic baseboard heat from a boiler located on another floor. Restaurant has natural gas ovens and stoves



A Division of New York Department of State 

June 29, 2015 28

Definition: Detection Zone

Example #3: Heat is provided by a propane fired unit heater in each room



A Division of New York Department of State 

June 29, 2015 29

Definition: Detection Zone



A Division of New York Department of State 

June 29, 2015 30

Definition: Detection Zone



A Division of New York Department of State 

June 29, 2015 31

Definition: Detection Zone



A Division of New York Department of State



June 29, 2015 32

Polling Question #2

Visit DOS on social media outlets:

- Facebook- NewYorkDepartmentofState
- Twitter- NYSDOS
- Instagram- NYSDOS
- YouTube- NYSDOSVideos

POLL ENDED

A Division of New York Department of State



June 29, 2015 33

REQUIRED LOCATIONS

A Division of New York Department of State



June 29, 2015 34

Buildings Required

Carbon monoxide detection shall be provided in:

- A commercial building that has a carbon monoxide source
- A commercial building attached to a garage
- A commercial building attached to any other motor-vehicle-related occupancy

Is not required in:

- Group S or Group U occupied occasionally and only for building or equipment maintenance
- Buildings meet the definition of a canopy

A Division of New York Department of State 

June 29, 2015 35

Detection zones required to have detection

1. Presence of a carbon monoxide source in a detection zone
2. A duct opening or other outlet from a carbon monoxide producing HVAC system
 - Exception: When detection is provided in the first room or area served by each main duct and is automatically signaled to an approved location

A Division of New York Department of State 

June 29, 2015 36

Detection zones required to have detection

3. An adjacent garage or motor vehicle related occupancy
 - Exception 1: The adjacent garage or motor vehicle related occupancy is connected by a covered walkway that is open at least 50%
 - Exception 2: The adjacent garage is an open parking garage by the Building Code of NYS

A Division of New York Department of State 

June 29, 2015 37

General exceptions for detection zones that are not classrooms

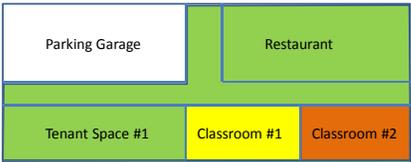
- Ambient conditions that would, under normal conditions, would activate carbon monoxide detection devices and an alternative safety plan is approved
- The detection zone is open for 50% or more of it's perimeter

A Division of New York Department of State 

June 29, 2015 38

Detection Zone That Require Detection

Example #1: Forced air heating from an oil-fired furnace located on the story below and is the common heat throughout the story

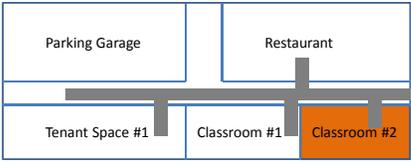


A Division of New York Department of State 

June 29, 2015 39

Detection Zone That Require Detection

Example #1: Forced air heating from an oil-fired furnace located on the story below and is the common heat throughout the story



A Division of New York Department of State 

June 29, 2015 40

Detection Zone That Require Detection

Example #2: Heat provided throughout the story by hydronic baseboard heat from a boiler located on another floor. Restaurant has natural gas ovens and stoves

A floor plan diagram showing a building layout. The top left is a white box labeled 'Parking Garage'. To its right is a green box labeled 'Restaurant'. Below these are three green boxes: 'Tenant Space #1', 'Classroom #1', and 'Classroom #2'. A horizontal line separates the top row from the bottom row.

A Division of New York Department of State Building Standards and Codes

June 29, 2015 41

Detection Zone That Require Detection

Example #3: Heat is provided by a propane fired unit heater in each room

A floor plan diagram showing a building layout. The top left is a white box labeled 'Parking Garage'. To its right is a green box labeled 'Restaurant'. Below these are three boxes: 'Tenant Space #1' (green), 'Classroom #1' (yellow), and 'Classroom #2' (orange). A horizontal line separates the top row from the bottom row.

A Division of New York Department of State Building Standards and Codes

June 29, 2015 42

Location Within Detection Zones

- Detection zone less than 10,000 square feet
 - One located at a central location
- Detection zone 10,000 square feet or greater
 - One located at a central location
 - Additional carbon monoxide detection located

The term "central location" means the point that, in the judgment of the authority having jurisdiction, maximizes (i) the detection of carbon monoxide, (ii) the notification of occupants in normally occupied areas, and (iii) the notification of occupants prior to entering normally unoccupied areas.

A Division of New York Department of State Building Standards and Codes

June 29, 2015 43

Location Within a Detection Zone: Less than 10,000 square feet

DINING/SEATING AREA
KITCHEN
STORAGE
OFFICE

A Division of New York Department of State

NEW YORK STATE Building Standards and Codes

June 29, 2015 44

Location Within a Detection Zone: 10,000 square feet or Greater

< 100 feet
DINING/SEATING AREA
KITCHEN
STORAGE
OFFICE
< 100 feet
< 100 feet
< 100 feet
< 100 feet

IF ANY MEASUREMENT OVER 100 FEET TRAVEL DISTANCE- ADD DETECTION

A Division of New York Department of State

NEW YORK STATE Building Standards and Codes

June 29, 2015 45

Polling Question #3

Join our mailing list to receive updates on technical issues, rulemaking, and administration of the Uniform Fire Prevention and Building Code and the State Energy Conservation Construction Code:

http://www.dos.ny.gov/dcea/code_list.html

POLL ENDED

A Division of New York Department of State

NEW YORK STATE Building Standards and Codes

June 29, 2015 46

Equipment

- Every commercial building can install carbon monoxide alarms or a carbon monoxide detection system
 - Carbon monoxide alarms are self-contained units that sense the presence of carbon monoxide and provide audible notification to occupants
 - Carbon monoxide detection systems use units that sense the presence of carbon monoxide and send a signal to a control unit that then provides notification to occupants and to off-premises monitoring locations
- The performance criteria for sensors to send a signal for notification is the same in both technologies

A Division of New York Department of State 

June 29, 2015 47

Carbon Monoxide Alarms

- Hardwired with battery backup
 - In existing commercial buildings and building without commercial power, units with 10-year batteries are permitted
- Meet UL 2034
- Combination CO/smoke alarms are not permitted

A Division of New York Department of State 

June 29, 2015 48

Carbon Monoxide Alarms

- In new buildings, carbon monoxide alarms placed in normally unoccupied detection zones must be interconnected to an additional alarm or notification device in an adjacent occupied detection zone
 - Signage is to be provided to indicate the location of the normally unoccupied area

A Division of New York Department of State 

June 29, 2015 49

Carbon Monoxide Detection Systems

- Systems shall be installed in accordance with NFPA 720
- Detectors shall be listed to UL 2075
- Combination CO/Smoke detectors are permitted

A Division of New York Department of State



June 29, 2015 50

Carbon Monoxide Detection Systems

- Detection appliances
 - Installed in accordance with NFPA 720 and the placements within (d) and (e)
- Notification appliances
 - Installed in accordance with NFPA 720 or in the locations specified for detection in (d) , (e), and (g)(4)

A Division of New York Department of State



June 29, 2015 51

Additional Requirements for Group E

- For Group E occupancies with an occupant load of 31 or more, carbon monoxide alarm signals shall be automatically transmitted to an approved on-site location that is normally staffed by school personnel during normal school hours.

A Division of New York Department of State



June 29, 2015 52

Off-Premises Signal Transmission

- Activation of a carbon monoxide detector shall transmit to an off-premises monitoring location when:
 - Using a carbon monoxide detection system
 - In new commercial buildings when a fire alarm control unit is installed under the requirements of 903 or 907
 - When an automatic fire alarm system is required or a monitored sprinkler system is required, then the carbon monoxide detection must be tied in or off-premises signaling must be provided
 - This doesn't prohibit the use of carbon monoxide alarms, just must be signaled through a control unit to an off-premises location
 - » Similar to wiring smoke alarms in dwelling units

A Division of New York Department of State 

June 29, 2015 53

Arrangement of Circuits

- Applies to new and existing installations
 - Shall not activate a fire signal
 - Shall not activate fire alarm notification devices
 - Approved notification locations for other sections of the regulation can be off-site, but every building must still have at least one notification device on-site

A Division of New York Department of State 

June 29, 2015 54

Polling Question #4

POLL ENDED

A Division of New York Department of State 

June 29, 2015 55

Mixed-Use Buildings

- In buildings that would also be applicable to other CO requirements, such as residential occupancies, both apply
- In new mixed use buildings, detection required by this regulation shall be interconnected with detection required by other requirements

A Division of New York Department of State



June 29, 2015 56

Maintenance

- Be maintained in accordance with NFPA 720

A Division of New York Department of State



June 29, 2015 57

History of Carbon Monoxide Detection

- 2003- Law passed to require CO alarms in homes and certain other residential dwellings that are new or offered for sale
- 2007- Law modified to include an expanded scope of residential-type occupancies, including multiple dwellings and institutional buildings
- 2011- Law modified to be retroactive [Amanda's Law]
- 2015- New law added to require carbon monoxide detection in new and existing commercial buildings

A Division of New York Department of State



June 29, 2015 58

Carbon Monoxide: Law

- Executive Law Article 18, Part 378 directs to State Codes Council to maintain the requirements of the Uniform Code
- Generally, the Codes Council adds, deletes, and modifies items when it sees fit based upon model code documents
- Part 378 also lists certain topics that must be considered and adopted by the Codes Council
 - Carbon monoxide detection is one of those items

A Division of New York Department of State

June 29, 2015 59

The “Law”

Executive Law Article 18, Part 378

* 5-d. Standards for installation of carbon monoxide detecting devices requiring that the owner of every building that contains one or more restaurants and the owner of every commercial building in the state shall have installed in such building and shall maintain operable carbon monoxide detecting device or devices of such manufacture, design and installation standards as are established by the council. Carbon monoxide detecting devices shall only be required if the restaurant or commercial building has appliances, devices or systems that may emit carbon monoxide or has an attached garage.

*Effective June 27th, 2015

A Division of New York Department of State

June 29, 2015 60

Regulation Basics

- The new requirements will be in Title 19, Part 1228.4
- The regulation effective date will be determined by Department of State

A Division of New York Department of State

June 29, 2015 61

Comments?

- Please forward questions or comments to:
 - dan.nichols@dos.ny.gov
- Stay tuned to the Division of Building Standards and Codes website for information regarding public comments on this regulation
- Sign up for the BuildNY e-mail service

A Division of New York Department of State