Agenda

- Applicable Codes and AHJs
- Fire/Life Safety Codes
- NFPA 99
- FGI Guidelines
- ASHRAE 170
- Common areas of confusion
POV of Speaker

- Always check with the Authorities Having Jurisdiction (AHJ).
  - Confirm codes adopted and amendments
  - Multiple AHJ in Healthcare
- Be aware of liability of ignoring the code, even if the AHJ “lets” you.
- This presentation based on what the code says, not any specific AHJ interpretation.
  - mostly
- Existing building vs. new?
- AHJs have different ways of looking at the code

>>>
CODES AND AHJs

- Colorado Department of Public Safety, Division of Fire Prevention and Control
- For healthcare facilities licensed by the State Health Department.
  - 2012 International Codes
  - 2011 NEC
  - 2010 FGI Guidelines, including 2008 ASHRAE 170 with addenda issued as of July 1, 2013
  - 2012 NFPA 101 and referenced codes.
  - 2012 NFPA 99
CODES AND AHJs

- Centers for Medicare and Medicaid Services (CMS)
- Healthcare Facilities seeking reimbursement for Medicare and Medicaid
  - Proposed adopting 2012 NFPA 101
    - Public Review Comment Period NOW!
CODES AND AHJs

- The Joint Commission (TJC)
- Formerly known as JCAHO – private accreditation agency, used by insurance companies to qualify healthcare facilities.
  - 2000 NFPA 101
    - Expected to follow CMS to the 2012
  - 2010 FGI Guidelines
    - Expected to adopt 2014 “shortly”
CODES AND AHJs

- Local Building/Fire Departments
- All Buildings
  - 2009 – 2012 International Codes
CODES AND AHJs

- Healthcare must observe the “worst case” of I-Codes and NFPA 101
- 2000 NFPA 101 supersedes 2012 version in conflicts where CMS is an AHJ
- Multiple versions of referenced standards
OCCUPANCY TYPES

☐ I CODES (Local AHJs)

☐ B (Business) – Typical Dr. Office. Can include treatment and fancy imaging.

☐ B, plus Ambulatory Healthcare – “...provide ...care on a less than 24-hour basis to individuals who are rendered incapable of self-preservation by the services provided.”
OCCUPANCY TYPES

- I CODES (Local AHJs)
  - I-2 - "medical care on a 24-hour basis for more than five persons who are incapable of self-preservation. This group shall include, but not be limited to, the following:

  Foster care facilities
  Detoxification facilities
  Hospitals
  Nursing homes
  Psychiatric hospitals
OCCUPANCY TYPES

- NFPA 101- Business
  - An occupancy used for the transaction of business other than mercantile.
OCCUPANCY TYPES

- NFPA 101- Ambulatory Healthcare
  - A building or portion thereof used to provide services or treatment simultaneously to four or more patients that provides, on an outpatient basis, one or more of the following: (1) treatment for patients that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others; (2) anesthesia that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others; (3) emergency or urgent care for patients who, due to the nature of their injury or illness, are incapable of taking action for self-preservation under emergency conditions without the assistance of others.
OCCUPANCY TYPES

- NFPA 101- Healthcare
  An occupancy used for purposes of medical or other treatment or care of four or more persons where such occupants are mostly incapable of self-preservation due to age, physical or mental disability, or because of security measures not under the occupants’ control
MIXED USE AND OCCUPANCY

- NFPA 101 - Healthcare must be separated from non healthcare by a 2 hour Fire Barrier, 1 hour for Ambulatory Healthcare.
  - 2000 version - openings between Healthcare and other occupancies only in Corridors
- IBC - If non-separated, must use worst of construction and area requirements.
- “Accessory Use” if < 10% of area
- If separated Fire Barriers at separations
**MIXED USE AND OCCUPANCY**

- **Fire Barriers or Smoke Partitions at specific areas**
  - **NFPA 101** – Hazardous Areas
  - **IBC** – Incidental Use Areas

<table>
<thead>
<tr>
<th>ROOM OR AREA</th>
<th>SEPARATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUEL FIRED EQUIPMENT OVER 400 MBH; BOILERS OVER 15 PSI AND 10 HP; REFRIGERANT MACHINERY ROOM</td>
<td>SPRINKLERED BUSINESS - SMOKE PARTITION NON-SPRINKLERED BUSINESS/AHC - 1 HOUR HEALTHCARE - 1 HOUR</td>
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<td>SOILED LINEN ROOM</td>
<td>NFPA HEALTHCARE - 1 HOUR NFPA SPRINKLERED AHC, BUSINESS – SMOKE PARTITION NFPA NON SPRINKLERED AHC, BUSINESS - 1 HOUR IBC 1-2, AHC, - 1 HOUR IBC B – OVER 100 SF UNSPRINKLERED -1 HOUR IBC B OVER 100 SF SPRINKLERED – SMOKE PARTITION</td>
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<tr>
<td>STORAGE OVER 100 SF</td>
<td>NFPA HEALTHCARE - 1 HOUR NFPA SPRINKLERED AHC, BUSINESS – SMOKE PARTITION NFPA NON SPRINKLERED AHC, BUSINESS - 1 HOUR IBC IF LESS THAN 10% FLOOR AREA - NONE</td>
</tr>
</tbody>
</table>
Fire/Life Safety Plans

- Shaft Enclosure
- Fire Walls
- Fire Barriers
- Fire Partitions
- Smoke Barriers
- Smoke Partitions
- Construction capable of resisting the passage of smoke

- Horizontal Assemblies
  - Floor/Ceiling
  - Roof/Ceiling
- Horizontal Exit
- Exit Enclosure
- Exit Passageway
- Fire Area

- Make sure these are identified on FLS plans using the code language.
- Identify NFPA vs. IBC required FLS features
Smoke Resistance Rated Construction

- SMOKE BARRIERS (Defend-in-place strategy)
  - NFPA: Healthcare or Ambulatory Healthcare
    - Floor below HC/AHC as well
      - 2012 Revision – not if mechanical only
    - No dampers for ducted penetrations.
      - NFPA 90A Requires Smoke Dampers to isolate AHU
  - I Codes: I-2 or B with AHC
    - HC/AHC floor only
    - Smoke Dampers at transfer and ducts
      - Exception steel ducts serving only one smoke compartment.
  - Also a 1-hour Fire Barrier
Smoke Resistance Rated Construction

- **Smoke Partitions**
  - Healthcare/I-2 and Ambulatory Healthcare corridors, or where Hazardous Areas/Incidental Use Areas utilize the sprinkler exception
  - No Fire rating
  - IBC – To Deck, Smoke Dampers in transfer openings, not ducted penetrations
  - NFPA – To lay-in ceiling, Therefore there is no barrier above ceiling
ASHRAE 170

- ASHRAE 170 is integrated into 2010 FGI Guidelines, and 2012 NFPA 99.
  - Joint Commission Reference
  - Not adopted by CMS (yet)
  - Continuing Maintenance

- Not limited to Hospitals.
  - Scope based on use of facility
  - Can include outpatient if similar space use
FGI Guidelines

- Facility Guidelines Institute
- Consider it Code where it applies
  - State – licensed Facility
  - The Joint Commission
- Code language, new vs. renovation, partial upgrades, interpretations, equivalencies
- ALL types of Healthcare – Hospital, Psych/Rehab, Outpatient, ASC, Endo, Imaging
FGI Guidelines

- Planning Design Construction and Commissioning:
  - Functional Program
  - Infection Control Risk Assessment (ICRA)
  - Acoustics
FGI Guidelines

- Table 1.2-2 Minimum-Maximum Design Criteria for Noise
FGI Guidelines

- Commissioning
  - Basis of Design
  - Pre-functional Checklists
  - Functional Performance Tests
  - TAB
  - O&M
FGI Guidelines

- Common elements
  - Toilet Rooms
  - Handwashing
  - Windows (operable not required)
  - Finishes
  - Ceilings
FGI Guidelines

- Common elements - MEP
  - Plumbing
    - 25 ft max non-recirc hw
    - no dead ends
    - Bedpan washers
    - Handwash sink size, faucets
      - Wrist Blade OK, auto not required.
      - Scrub sinks – knee, foot, or auto
    - No storage under sinks
  - Med Gas – NFPA 99
    - Outlet requirements here
  - Electrical – NEC, NFPA 110, receptacle count, Nurse Call, Paging, IT systems,
    - 24 hours on site generator fuel storage
      - “Where stored fuel is required”
FGI Guidelines

- Common elements - MEP
- HVAC
  - Room pressure monitors – Isolation, Bronchoscopy
  - No Duct Liner in specific critical areas
  - Where allowed, in-room units must have a central, filtered OA system
  - Natural Ventilation limited, Mech vent still required

- ASHRAE Standard 170-2008
  Ventilation of Health Care Facilities
  - Continuous Maintenance Standard
  - CDPS - addenda issued up to July 1, 2013.
ASHRAE 170

- Redundancies for Equipment and Essential Accessories serving critical areas.
  - OR, LDR, Recovery, ED, ICU, Nursery, Patient Rooms
  - Subject to breakdown or routine maintenance.
  - Heating: N+1
    - Heating Sources
    - Pumps and return units
    - Fans
    - Not controls
  - Cooling: Level of redundancy required to “meet Facility Plan”
  - Domestic Hot Water
Air Handling System Components
- OA Intakes 6’ above grade, 3’ above roof, 3’ above bottom of areawell
- Min 25 feet from contamination sources
- Exhaust discharge 10’ above roof -
  - Isolation, Bronch, ED, Fume Hood, …
- ASHRAE 62
- Radiant/Chilled Beam - dew point control
- Humidifiers – Steam only.
Air Handling System Components

- Filtration:
  - MERV 7 pre, MERV 14 final most inpatient care, ALL B and C Surgery
  - Protective Environment – MERV 7/HEPA
  - MERV 14 – Class A Surgery, lab
  - MERV 7 most other

- Ducted return for areas requiring pressure relationships, PACU,

- Diffuser types:
  - Non Aspirating (Laminar) - Surgery (all), Trauma, Protective Environment, Wound/Burn.
  - Mixing or laminar – all others
ASHRAE 170

- **Class A surgery**: provides minor surgical procedures performed under topical, local, or regional anesthesia without preoperative sedation. Excluded are intravenous, spinal, and epidural procedures, which are Class B or C surgeries.

- **Class B surgery**: provides minor or major surgical procedures performed in conjunction with oral, parenteral, or intravenous sedation or performed with the patient under analgesic or dissociative drugs.

- **Class C surgery**: provides major surgical procedures that require general or regional block anesthesia and/or support of vital bodily functions.
ASHRAE 170

- Space Ventilation
  - Room Pressure relationships: Clean to Dirty
    - Maintained at all times, including unoccupied
  - Air Change per Hour (ACH) Requirements
    - Must be maintained whenever occupied
      - Spaces with pressure relationships may be reduced, but can not be shut off.
    - Minimum means minimum – VAV reheat, packaged units.
<table>
<thead>
<tr>
<th>Function of Space</th>
<th>Pressure Relationship to Adjacent Areas (n)</th>
<th>Minimum Outdoor ach</th>
<th>Minimum Total ach</th>
<th>All Room Air Exhausted Directly to Outdoors (j)</th>
<th>Air Recirculated by Means of Room Units (a)</th>
<th>RH (k), %</th>
<th>Design Temperature (l), °F/°C</th>
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</thead>
<tbody>
<tr>
<td>Examination room</td>
<td>N/R</td>
<td>2</td>
<td>6</td>
<td>N/R</td>
<td>N/R</td>
<td>max 60</td>
<td>70-75/21-24</td>
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<td>Medication room</td>
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<td>Endoscopy</td>
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<td>N/R</td>
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<td>30-60</td>
<td>68-73/20-23</td>
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<td>Endoscopy cleaning</td>
<td>Negative</td>
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<td>10</td>
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<td>Treatment room</td>
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<td>Hydrotherapy</td>
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<td>Sterilizer equipment room</td>
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<td>CENTRAL MEDICAL AND SURGICAL SUPPLY</td>
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<td>Soiled or decontamination room</td>
<td>Negative</td>
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<td>6</td>
<td>Yes</td>
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<td>Clean workroom</td>
<td>Positive</td>
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<td>4</td>
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<tr>
<td>Sterile storage</td>
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<td>Food preparation center (i)</td>
<td>N/R</td>
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<td>N/R</td>
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<tr>
<td>Warewashing</td>
<td>Negative</td>
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<td>N/R</td>
<td>N/R</td>
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<tr>
<td>Dietary storage</td>
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<td>N/R</td>
<td>2</td>
<td>N/R</td>
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<td>N/R</td>
<td>72-78/22-26</td>
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<tr>
<td>Laundry, general</td>
<td>Negative</td>
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<td>Yes</td>
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<td>N/R</td>
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<td>Soiled linen sorting and storage</td>
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<td>10</td>
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<td>No</td>
<td>N/R</td>
<td>N/R</td>
</tr>
<tr>
<td>Clean linen storage</td>
<td>Positive</td>
<td>N/R</td>
<td>2</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
<td>72-78/22-26</td>
</tr>
<tr>
<td>Linen and trash chute room</td>
<td>Negative</td>
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<td>10</td>
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<td>N/R</td>
<td>N/R</td>
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<td>Bedpan room</td>
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<td>10</td>
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<td>No</td>
<td>N/R</td>
<td>N/R</td>
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<td>Bathroom</td>
<td>Negative</td>
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<td>10</td>
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<td>No</td>
<td>N/R</td>
<td>72-78/22-26</td>
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<td>Janitor's closet</td>
<td>Negative</td>
<td>N/R</td>
<td>10</td>
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<td>N/R</td>
<td>N/R</td>
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<td>SUPPORT SPACE</td>
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<tr>
<td>Soiled workroom or soiled holding</td>
<td>Negative</td>
<td>2</td>
<td>10</td>
<td>Yes</td>
<td>No</td>
<td>N/R</td>
<td>N/R</td>
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<tr>
<td>Clean workroom or clean holding</td>
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<td>4</td>
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<td>N/R</td>
<td>N/R</td>
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<td>Hazardous material storage</td>
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<td>Yes</td>
<td>No</td>
<td>N/R</td>
<td>N/R</td>
</tr>
</tbody>
</table>

Note: N/R = no requirement
ASHRAE 170

Addendum d

<table>
<thead>
<tr>
<th>Function of Space</th>
<th>Pressure Relationship to Adjacent Areas (n)</th>
<th>Minimum Outdoor ach</th>
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<tr>
<td>SURGERY AND CRITICAL CARE</td>
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<tr>
<td>Class B and C operating rooms, (m), (n), (o)</td>
<td>Positive</td>
<td>4</td>
<td>20</td>
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<td>20/60</td>
<td>68–75/20–24</td>
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<td>Operating/surgical cystoscopic rooms, (m), (n), (o)</td>
<td>Positive</td>
<td>4</td>
<td>20</td>
<td>N/R</td>
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<td>20/60</td>
<td>68–75/20–24</td>
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<td>Delivery room (Caesarean) (m), (n), (o)</td>
<td>Positive</td>
<td>4</td>
<td>20</td>
<td>N/R</td>
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<td>20/60</td>
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<td>Treatment room (p)</td>
<td>N/R</td>
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<td>N/R</td>
<td>N/R</td>
<td>20/60</td>
<td>70–75/21–24</td>
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<tr>
<td>Trauma room (crisis or shock) (c)</td>
<td>Positive</td>
<td>3</td>
<td>15</td>
<td>N/R</td>
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<td>20/60</td>
<td>70–75/21–24</td>
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<td>Laser eye room</td>
<td>Positive</td>
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<td>15</td>
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<td>20/60</td>
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<tr>
<td>Class A Operating/Procedure room (o), (d)</td>
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<td>20/60</td>
<td>70–75/21–24</td>
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<tr>
<td>DIAGNOSTIC AND TREATMENT</td>
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<tr>
<td>Gastrointestinal endoscopy procedure room</td>
<td>Positive</td>
<td>2</td>
<td>6</td>
<td>N/R</td>
<td>No</td>
<td>20/60</td>
<td>68–73/20–23</td>
</tr>
</tbody>
</table>
ASHRAE 170

- Patient Room
  - 6 ACH, reduced to 4 ACH for supplemental heat or displacement ventilation
  - Addendum ab revised to 4 ACH as standard

- OR – Class B and C
  - Primary array of laminar diffusers, over table + 12” all around, min 70% coverage, 25-35 fpm face velocity,
  - Low return, min 2 separated as far as possible, additional high ones acceptable.
ASHRAE 170

- Isolation Room
  - Monitor required
  - Neg pressure required at all times, switching to neutral or positive is not allowed.
  - Can go to 6 ACH when not used for Isolation
  - Exhaust in ceiling or wall near head
  - HEPA in lieu of 12 ACH exhaust in renovation only where “impractical”
  - Dedicated exhaust unless HEPA
  - Anteroom optional
NFPA 99

- Healthcare Facility Standard/Code
- Referenced by I-Codes for Medical Gasses
- Referenced by NFPA 101 for Electrical, Med Gas, Anesthetizing Locations
- Fully adopted by State, and proposed by CMS (2012)

1999, 2005, 2012 versions all in play
NFPA 99

- Electrical
  - Required Emergency Power
  - Generator Fuel requirements (also NFPA 110)
- IT/Nurse Call (2012)
- HVAC (2012)- ASHRAE170
- Equipment
- Emergency Planning, other Administrative issues
- Fire Protection
  - Sprinkler zones match smoke compartments
- Medical Gasses
  - ASPE Seminar
NFPA 99

- Anesthetizing Location Smoke Evacuation
  (1999 version, CMS proposal)
  - “Windowless” rooms wherever use of inhalation anesthetics are intended
    - Disregard “windowless”
  - Automatically vent smoke with no recirculation
    - Can’t remove smoke from a real fire, CMS/State has allowed neg pressure for fire mode room
    - CMS/State has allowed both use of HVAC system and dedicated system
      - Combined with I-Codes = smoke control
    - Infection Control risk
Common Areas of Confusion

- **Outpatient**
  - FGI, ASHRAE 170, NFPA 99 are applicable where the program has functions covered by those standards

- Question is when are they enforced?
  - Depends upon Licensure and/or Accreditation

- I vs. B vs. AHC vs. HC vs. Business
  - MEP indirectly impacted by Occupancy
  - MEP directly impacted by Function – see above
Common Areas of Confusion

- **Sequence of Control for Smoke/Fire Dampers**
  - Consider effect of damper closure on HVAC system
  - Consider effect of damper closure on smoke migration
  - Code minimum vs. something that works
  - Engineered smoke control vs. just damper control
  - Fire Alarm vs. BAS control
Common Areas of Confusion

- **Medical Gas Rooms**
  - IFC – Triggered at 512 CU Ft. (2 E-cylinders)
  - NFPA 99 – 3000 Cu. Ft. (12 E-cylinders)
  - IFC – over 3000 Cu. Ft, H-3 occupancy, and this reduces with above or below grade floors
  - IFC – Exterior wall louvers or dedicated exhaust and makeup in 2 hour enclosure to the exterior
    - Dampers not allowed
  - 1999, 2005 NFPA 99 – Up to 3000 cu ft 2 exterior wall louvers, each 72 in$^2$, or dedicated exhaust at 1 cfm/sf. 3000 cu ft dedicated exhaust required.
  - 2012 NFPA 99 – 2 exterior louvers, each 24 in.$^2$/1000 ft$^3$, or exhaust (not dedicated), or exhaust at 1 cfm per 5 ft$^3$
  - (mis) Interpretation of NFPA 99 – Electric heat can not be inside med gas room.
Common Areas of Confusion

- **Life Safety Plans**
  - Not all rated construction is treated the same.
  - Not all fire resistive construction requires dampers
    - Fire Stop usually is required
  - Use IBC/NFPA terminology, not just “1 hour wall” or “Smoke Rated”
  - Maintain and update Statement of Condition/Record Documents.