41st Annual State Construction Conference

Common Design Missteps

March 3, 2022

NC DOA
Department of Administration
State Construction Office

NC DOA
Department of Administration
State Construction Office

Architectural Design Review

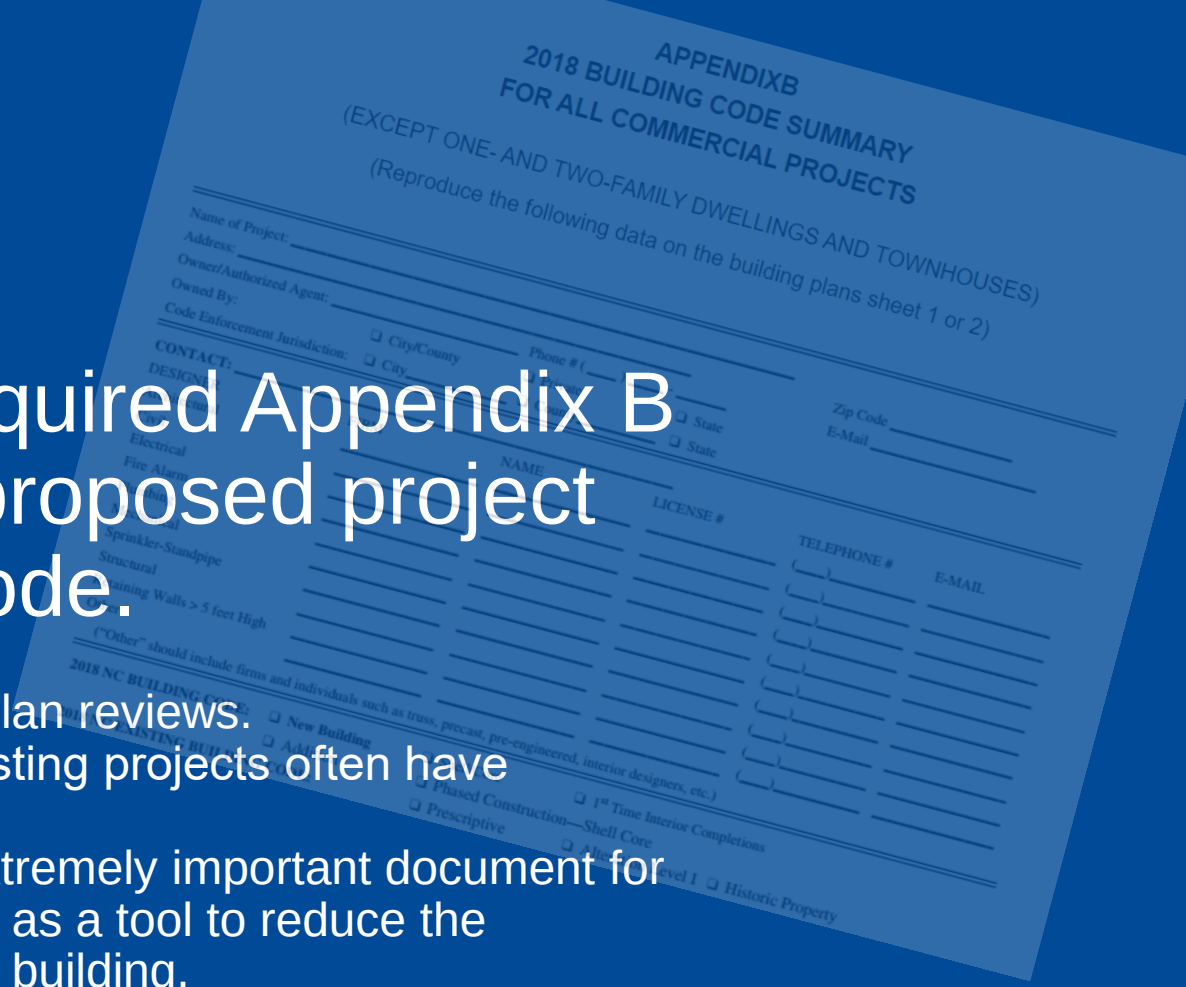
Common Design Missteps

Jerry Phillips, RA

Our Vision...

• The State Construction Office is in a unique position of reviewing many diverse North Carolina construction projects and we have the time to focus intensely on a wide array of State Building Code and construction related issues. Our plan review process uses this broad body of knowledge to assist each project in becoming as successful as possible! For very large and complex projects it is typically a good idea to set up early meetings with the State Construction office to go over the key Building Code issues as they are being integrated into design decisions. Think of us as a resource and let us know how we can better serve you, our client!

The Appendix B

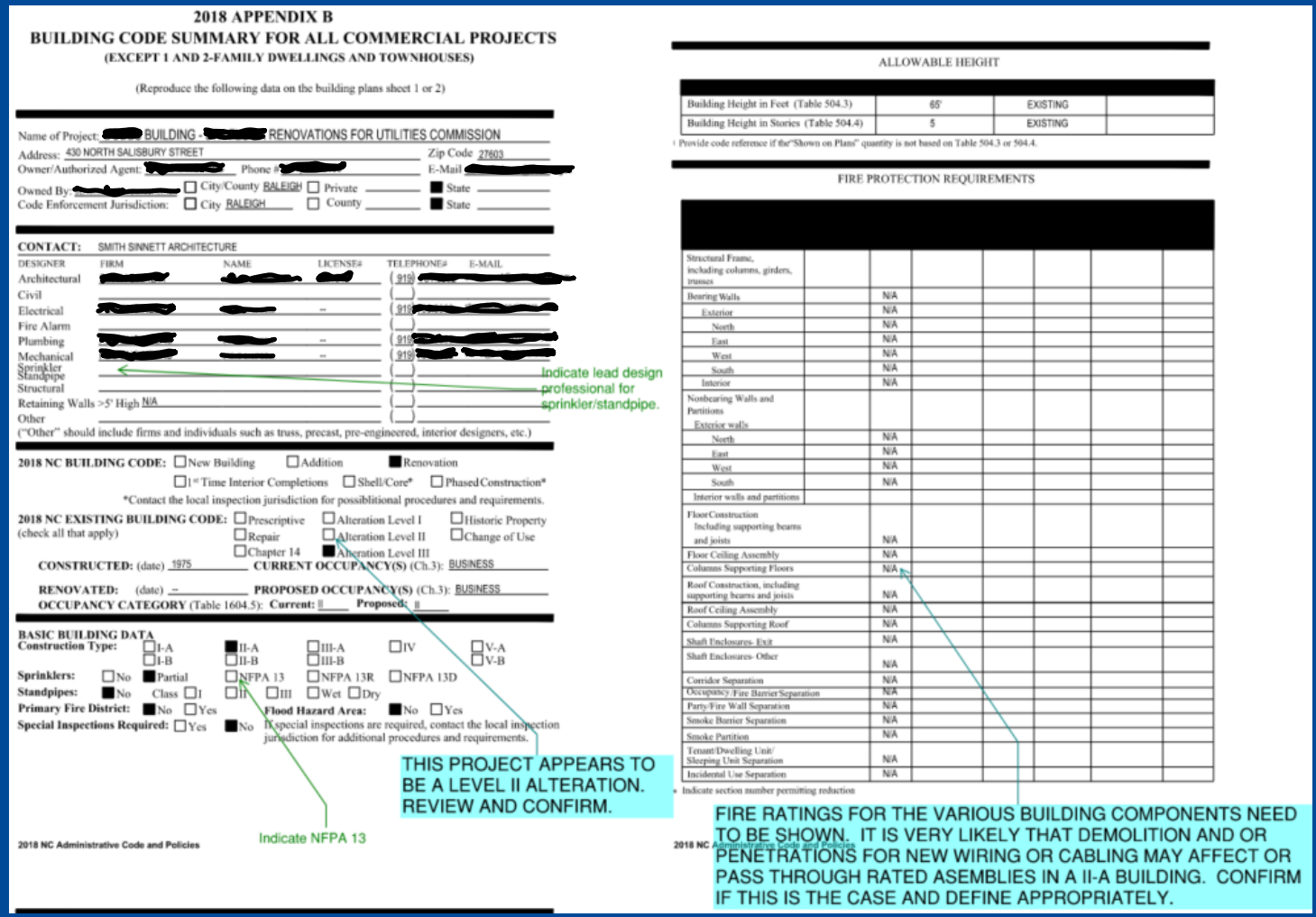

APPENDIXB
2018 BUILDING CODE SUMMARY
FOR ALL COMMERCIAL PROJECTS
(EXCEPT ONE- AND TWO-FAMILY DWELLINGS AND TOWNHOUSES)
(Reproduce the following data on the building plans sheet 1 or 2)

- The primary purpose of the required Appendix B is to concisely illustrate how a proposed project meets the NC State Building Code.

- This document becomes the starting point for all my plan reviews.
- Typically, new projects have better Appendix B's. Existing projects often have improperly completed or incomplete Appendix B's.
- This document, if properly completed, becomes an extremely important document for managing a building from cradle to grave and can serve as a tool to reduce the degradation of life safety systems over the life span of a building.
- All shareholders in a project should be well educated in the purpose and value of this document!
- Properly executed, it makes our job easier, and therefore expedites the review process.

The Appendix B

- We experience the most issues with incomplete information on projects involving existing buildings.
- While we understand that certain parts of the Appendix B are not applicable, we still need any information that is relative to the scope of work!
- Even simple demolition and limited Level I Alterations typically impact wall, floor, and/or ceiling assemblies. As such, all contractors must know which assemblies are or which are not fire or smoke rated!



2018 APPENDIX B

BUILDING CODE SUMMARY FOR ALL COMMERCIAL PROJECTS

(EXCEPT 1 AND 2-FAMILY DWELLINGS AND TOWNHOUSES)

(Reproduce the following data on the building plans sheet 1 or 2)

Name of Project: [redacted] BUILDING - [redacted] RENOVATIONS FOR UTILITIES COMMISSION

Address: 430 NORTH SALISBURY STREET Zip Code 27603

Owner/Authorized Agent: [redacted] Phone # [redacted] E-Mail [redacted]

Owned By: [redacted] ☐ City/County RALEIGH ☐ Private ■ State

Code Enforcement Jurisdiction: ☐ City RALEIGH ☐ County ■ State

CONTACT: SMITH SINNETT ARCHITECTURE

DESIGNER	FIRM	NAME	LICENSE#	TELEPHONE#	E-MAIL
Architectural	[redacted]	[redacted]	[redacted]	(919 [redacted]	
Civil				( )	
Electrical	[redacted]	[redacted]	--	(919 [redacted]	
Fire Alarm				( )	
Plumbing	[redacted]	[redacted]	--	(919 [redacted]	
Mechanical	[redacted]	[redacted]	--	(919 [redacted]	
Sprinkler				( )	
Standpipe				( )	
Structural				( )	
Retaining Walls >5' High	N/A			( )	
Other				( )	

("Other" should include firms and individuals such as truss, precast, pre-engineered, interior designers, etc.)

Indicate lead design professional for sprinkler/standpipe.

2018 NC BUILDING CODE: ☐ New Building ☐ Addition ■ Renovation

☐ 1st Time Interior Completions ☐ Shell/Core* ☐ Phased Construction*

*Contact the local inspection jurisdiction for possiblitional procedures and requirements.

2018 NC EXISTING BUILDING CODE: (check all that apply) ☐ Prescriptive ☐ Alteration Level I ☐ Historic Property ☐ Repair ☐ Alteration Level II ☐ Change of Use ☐ Chapter 14 ■ Alteration Level III

CONSTRUCTED: (date) 1975 **CURRENT OCCUPANCY(S)** (Ch.3): BUSINESS

RENOVATED: (date) -- **PROPOSED OCCUPANCY(S)** (Ch.3): BUSINESS

OCCUPANCY CATEGORY (Table 1604.5): **Current:** II **Proposed:** II

BASIC BUILDING DATA

Construction Type: ☐ I-A ☐ I-B ■ II-A ☐ II-B ☐ III-A ☐ III-B ☐ IV ☐ V-A ☐ V-B

Sprinklers: ☐ No ■ Partial ☐ NFPA 13 ☐ NFPA 13R ☐ NFPA 13D

Standpipes: ■ No Class ☐ I ☐ II ☐ III ☐ Wet ☐ Dry

Primary Fire District: ■ No ☐ Yes **Flood Hazard Area:** ■ No ☐ Yes

Special Inspections Required: ☐ Yes ■ No If special inspections are required, contact the local inspection jurisdiction for additional procedures and requirements.

THIS PROJECT APPEARS TO BE A LEVEL II ALTERATION. REVIEW AND CONFIRM.

Indicate NFPA 13

2018 NC Administrative Code and Policies

ALLOWABLE HEIGHT

Building Height in Feet (Table 504.3)	65'	EXISTING	
Building Height in Stories (Table 504.4)	5	EXISTING	

[1] Provide code reference if the "Shown on Plans" quantity is not based on Table 504.3 or 504.4.

FIRE PROTECTION REQUIREMENTS

Structural Frame, including columns, girders, trusses		N/A					
Bearing Walls		N/A					
Exterior		N/A					
North		N/A					
East		N/A					
West		N/A					
South		N/A					
Interior		N/A					
Nonbearing Walls and Partitions Exterior walls							
North		N/A					
East		N/A					
West		N/A					
South		N/A					
Interior walls and partitions							
Floor Construction Including supporting beams and joists		N/A					
Floor Ceiling Assembly		N/A					
Columns Supporting Floors		N/A					
Roof Construction, including supporting beams and joists		N/A					
Roof Ceiling Assembly		N/A					
Columns Supporting Roof		N/A					
Shaft Enclosures- Exit		N/A					
Shaft Enclosures- Other		N/A					
Corridor Separation		N/A					
Occupancy/Fire Barrier Separation		N/A					
Party/Fire Wall Separation		N/A					
Smoke Barrier Separation		N/A					
Smoke Partition		N/A					
Tenant/Dwelling Unit/ Sleeping Unit Separation		N/A					
Incidental Use Separation		N/A					

[a] Indicate section number permitting reduction

FIRE RATINGS FOR THE VARIOUS BUILDING COMPONENTS NEED TO BE SHOWN. IT IS VERY LIKELY THAT DEMOLITION AND OR PENETRATIONS FOR NEW WIRING OR CABLING MAY AFFECT OR PASS THROUGH RATED ASEMBLIES IN A II-A BUILDING. CONFIRM IF THIS IS THE CASE AND DEFINE APPROPRIATELY.

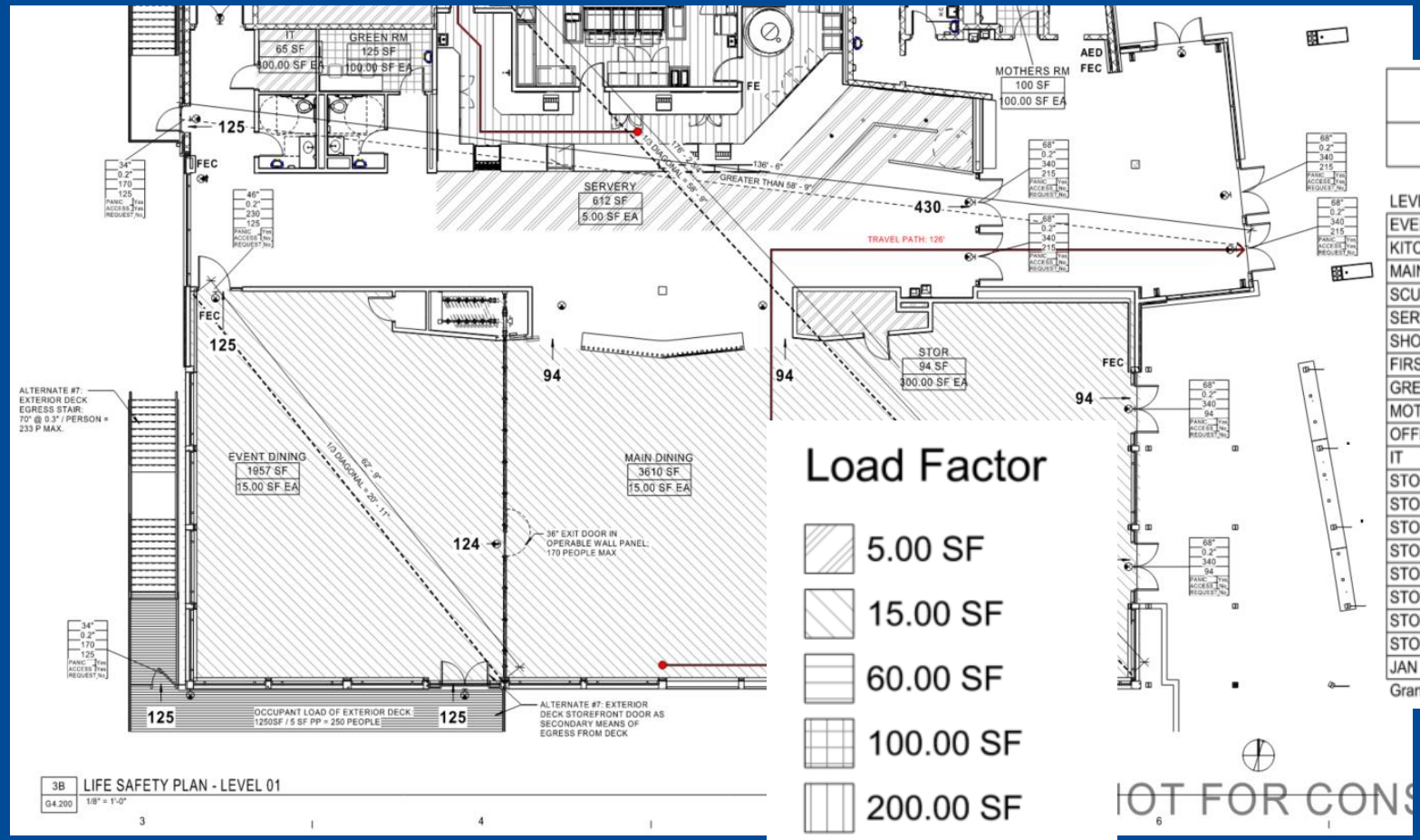
2018 NC Administrative Code and Policies

Life Safety Plans & Sections

- The primary purpose of the Life Safety Plan and sometimes the Life Safety Section is to graphically illustrate how a building is properly designed to meet the NC State Building Code requirements for egress from all parts of a building to the required exits.

- All spaces must be labeled for their use and occupant loads. Exit paths are then clearly shown including required fire-ratings, exit signage, door widths, corridor widths, stair widths, and even panic devices where required etc.
- If the plan is properly created, it can assist project engineers in making their job easier and more accurate because all parties can look at this plan and know various space occupant loads and how occupants could be using the various exits paths. This could impact everything from HVAC design heating and cooling loads to placement of emergency exit lighting and exit signs.
- The Life Safety Plan if done correctly can then become the basis upon which Emergency Evacuation Floor Plans can be created for posting in each building.
- When clearly shown and labeled, it again makes our job easier, and therefore expedites plan review!

Life Safety Plan



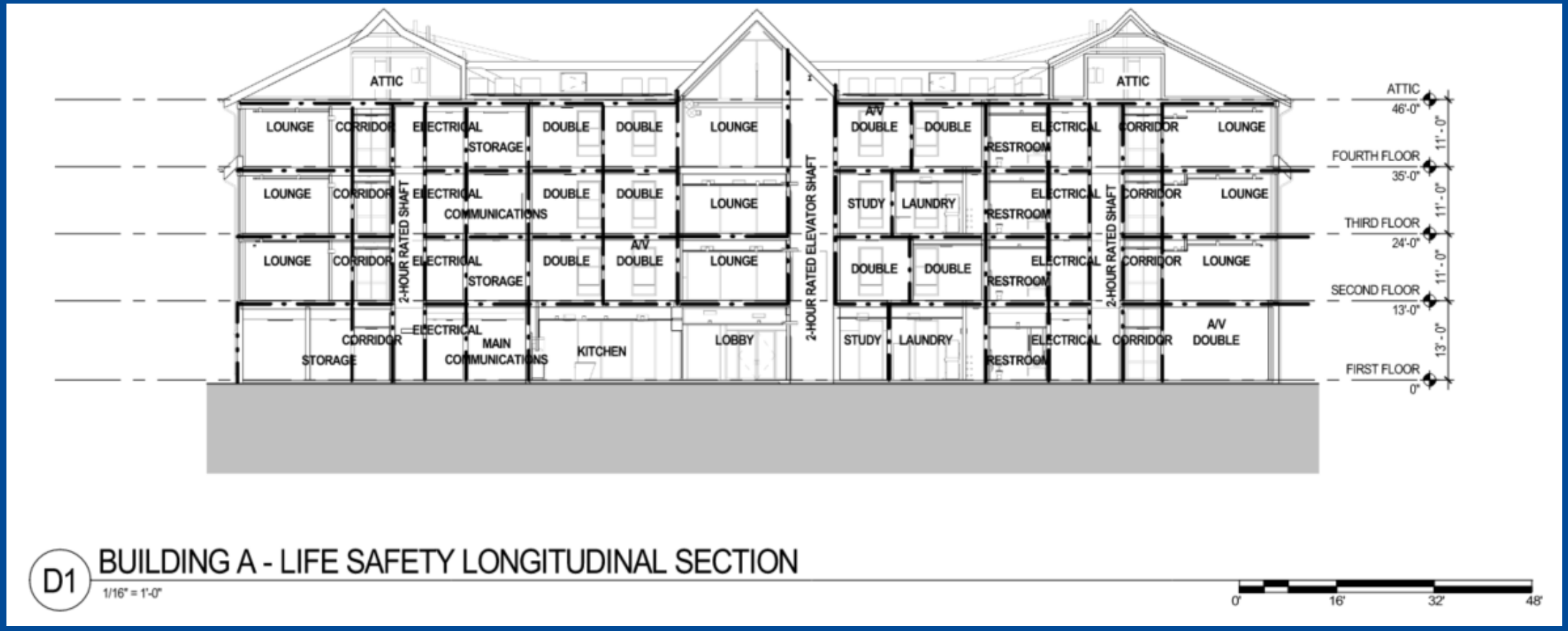
Load Factor

- 5.00 SF
- 15.00 SF
- 60.00 SF
- 100.00 SF
- 200.00 SF
- 300.00 SF

AREA/OCCUPANCY SCHEDULE - LEVEL 01

Room Type	Area Function	Area	Load Factor	Occupant Load	Fixed Occupant Load
LEVEL 01_CAFE 814' - 6"					
EVENT DINING	A-2	1957.38 SF	15.00 SF	130.5	
KITCHEN	A-2	2457.42 SF	200.00 SF	12.3	
MAIN DINING	A-2	3610.13 SF	15.00 SF	240.7	
SCULLERY	A-2	279.56 SF	200.00 SF	1.4	
SERVERY	A-2	611.86 SF	5.00 SF	122.4	
SHOP	A-3	749.84 SF	60.00 SF	12.5	
FIRST AID	B	242.81 SF	100.00 SF	2.4	
GREEN RM	B	125.28 SF	100.00 SF	1.3	
MOTHERS RM	B	99.66 SF	100.00 SF	1	
OFFICE	B	460.46 SF	100.00 SF	4.6	
IT	S-1	65.14 SF	300.00 SF	0.2	
STOR	S-1	228.89 SF	300.00 SF	0.8	
STOR	S-1	326.98 SF	300.00 SF	1.1	
STOR	S-1	392.89 SF	300.00 SF	1.3	
STOR	S-1	217.99 SF	300.00 SF	0.7	
STOR	S-1	227.01 SF	300.00 SF	0.8	
STOR	S-1	33.36 SF	300.00 SF	0.1	
STOR	S-1	137.55 SF	300.00 SF	0.5	
STOR	S-1	94.45 SF	300.00 SF	0.3	
JAN	U	44.21 SF	300.00 SF	0.1	
Grand total: 20				534.9	0

Life Safety Section



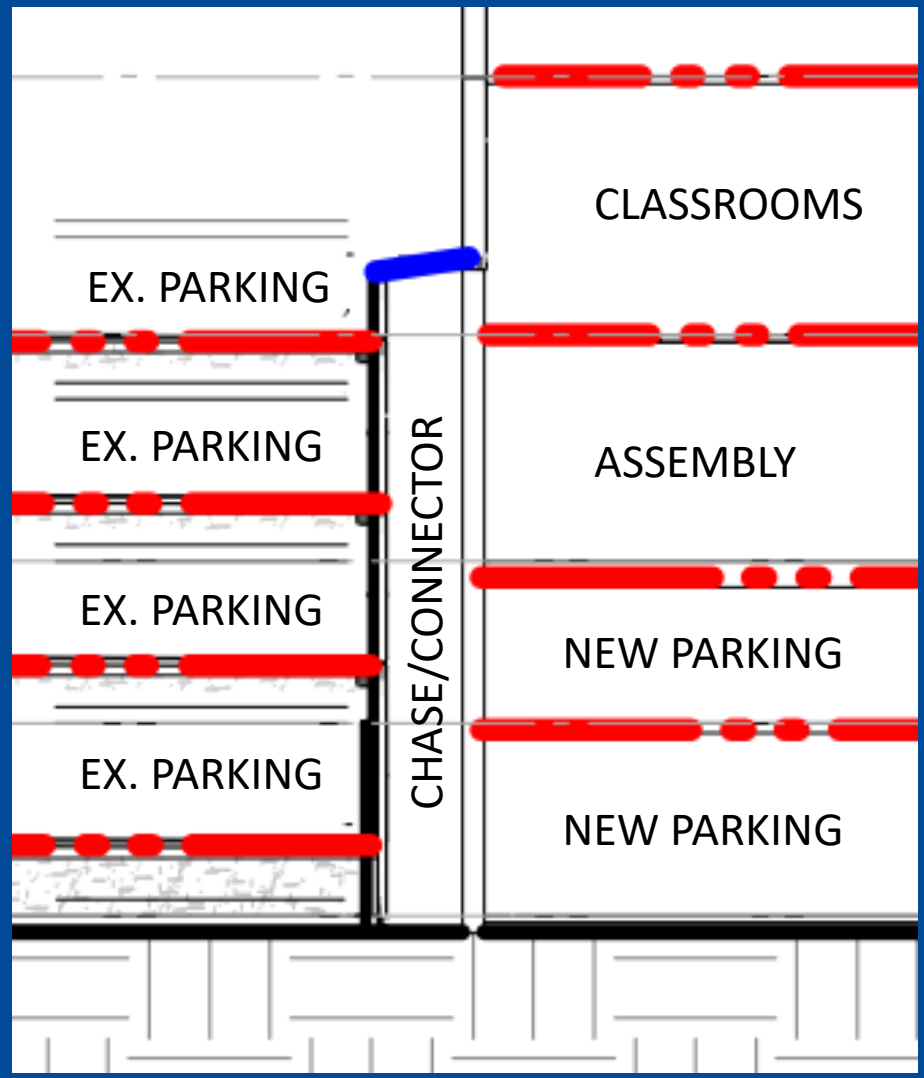
Common Project Code issues…

- The following slides illustrate just a few of the types of construction concerns we see and building code issues we help identify and resolve…

Complexity & Simplification

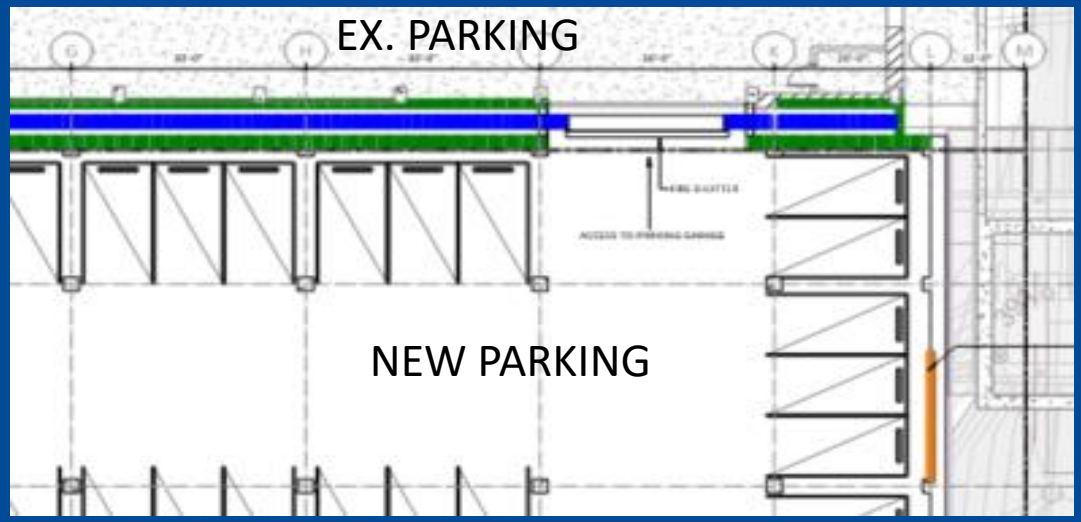
- Sometimes it is possible to re-think a problem and look at it from a different perspective and achieve a better simpler solution.

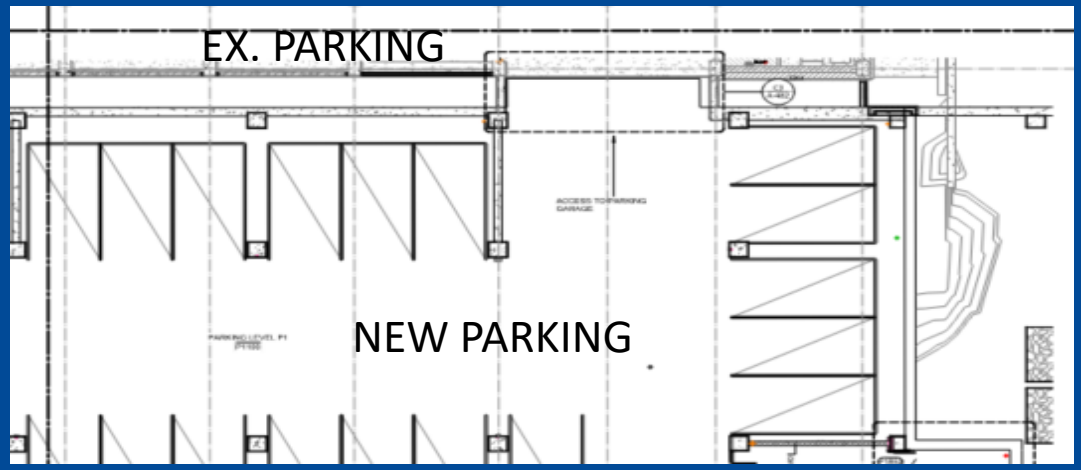
- A change from separated Mixed Use to non-separated mixed use had a major impact on this project!



Complexity & Simplification

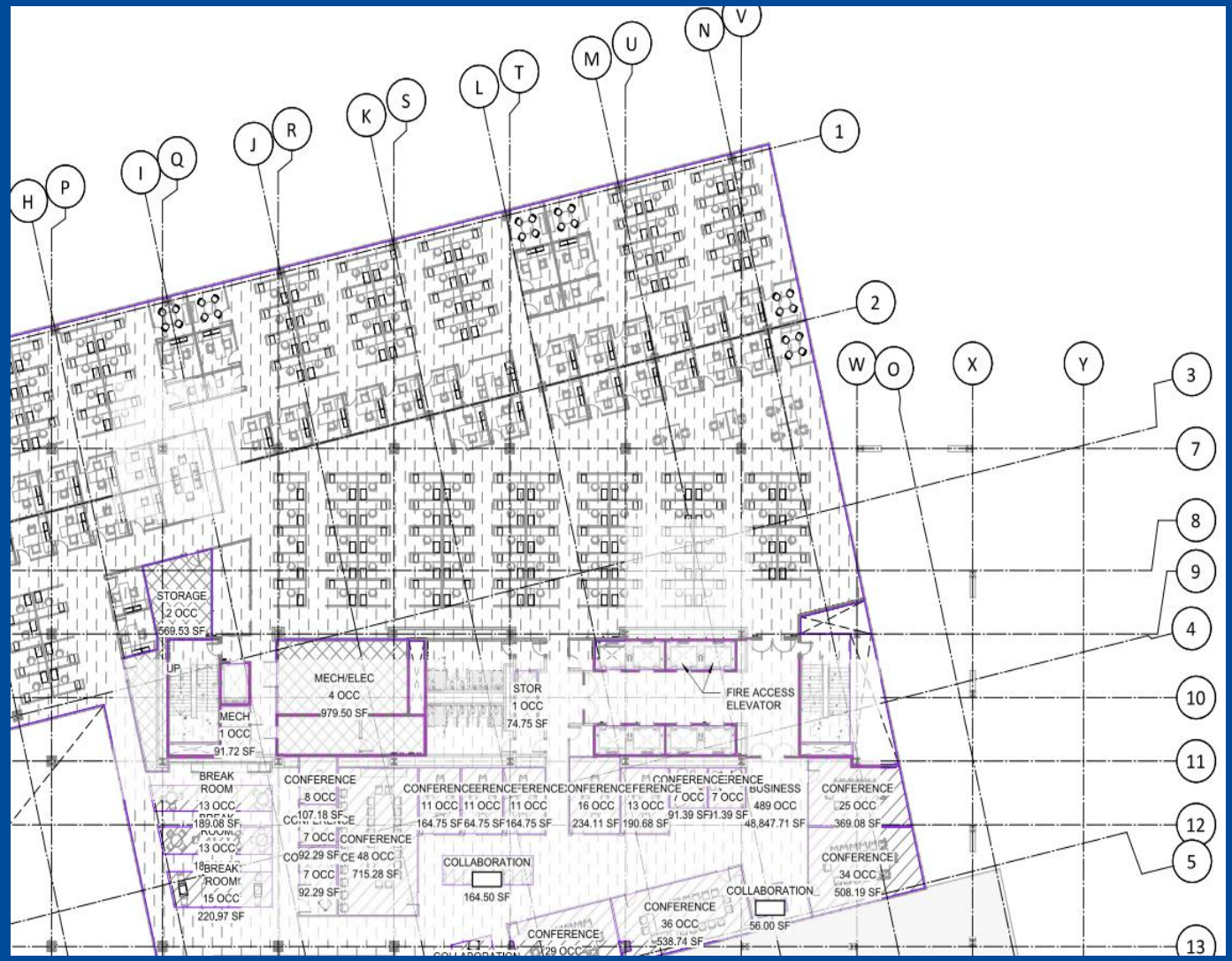
- By the architect's decision to change from separated mixed use to non-separated mixed use, a fire wall and many fire rated assemblies were eliminated. Of course, this was not a simple change, but it made both the construction and plan review so much simpler and faster for all involved!





Complexity upon Complexity

- In today's world almost all projects are complex! This is an example of a project that includes multiple high rises, mixed uses, a complex site and complex geometries rotated upon each other. While interesting in concept, as much simplification as possible, especially early in a project is highly recommended!



Complexity & Apparent Contradiction

- Two critical 2018 NC State Building Code Sections:

1020.6 Corridor continuity.

Fire-resistance-rated corridors shall be continuous from the point of entry to an *exit*, and shall not be interrupted by intervening rooms. Where the path of egress travel within a *fire-resistance-rated corridor* to the exit includes travel along unenclosed *exit access stairways* or *ramps*, the *fire-resistance rating* shall be continuous for the length of the *stairway* or *ramp* and for the length of the connecting *corridor* on the adjacent floor leading to the *exit*.

Exceptions:

1. Foyers, lobbies or reception rooms constructed as required for *corridors* shall not be construed as intervening rooms.
2. Enclosed elevator lobbies as permitted by Item 1 of Section 1016.2 shall not be construed as intervening rooms.
3. A toilet room, as defined by the *North Carolina Plumbing Code*, that meets all of the following requirements may be included as part of the rated corridor enclosure:
   - 3.1. The toilet room, shall be separated from the remainder of the building by fire-resistantrated construction meeting the same requirements as the corridor construction;
   - 3.2. No other rooms open off of the toilet room;
   - 3.3. No gas or electric appliances other than electric point-of-use water heaters and hand dryers are located in the toilet room; and
   - 3.4. The toilet room is not used for any other purpose.

1016.2 Egress through intervening spaces.

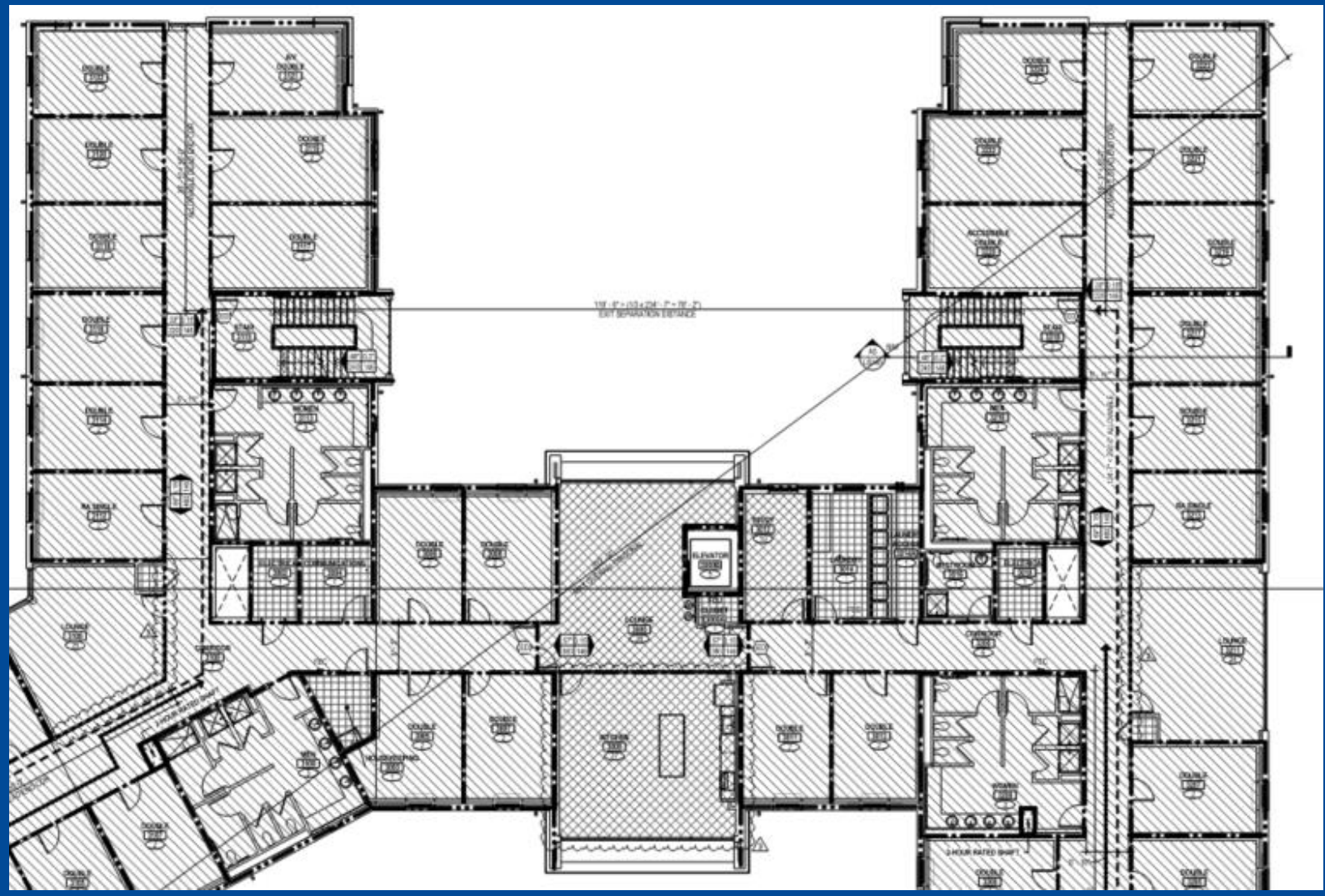
Egress through intervening spaces shall comply with this section.

1. *Exit access* through an enclosed elevator lobby is permitted. Access to not less than one of the required *exits* shall be provided without travel through the enclosed elevator lobbies required by Section 3006. Where the path of exit access travel passes through an enclosed elevator lobby, the level of protection required for the enclosed elevator lobby is not required to be extended to the *exit* unless direct access to an *exit* is required by other sections of this code.
2. Egress from a room or space shall not pass through adjoining or intervening rooms or areas, except where such adjoining rooms or areas and the area served are accessory to one or the other, are not a Group H occupancy and provide a discernible path of egress travel to an *exit*.

   Exception: *Means of egress* are not prohibited through adjoining or intervening rooms or spaces in a Group H, S or F occupancy where the adjoining or intervening rooms or spaces are the same or a lesser hazard occupancy group.
3. An *exit access* shall not pass through a room that can be locked to prevent egress.
4. *Means of egress* from *dwelling units* or sleeping areas shall not lead through other sleeping areas, toilet rooms or bathrooms.
5. Egress shall not pass through kitchens, storage rooms, closets or spaces used for similar purposes.

Complexity & Apparent Contradiction

- The solution for this dormitory was to:
  - Allow one exit to pass through an elevator lobby and the other exit to be fully continuous.
  - Provide multiple doors to achieve exit passage where at least one door swings with the flow of travel.
  - Isolate the center kitchen area from the exit path with a fire rated barrier.



Complexity & Apparent Contradiction

- The 2015 International Building Code Commentary:

- Diagrams that clarify this apparent Code Contradiction and create certain design opportunities as shown in many dormitory designs.

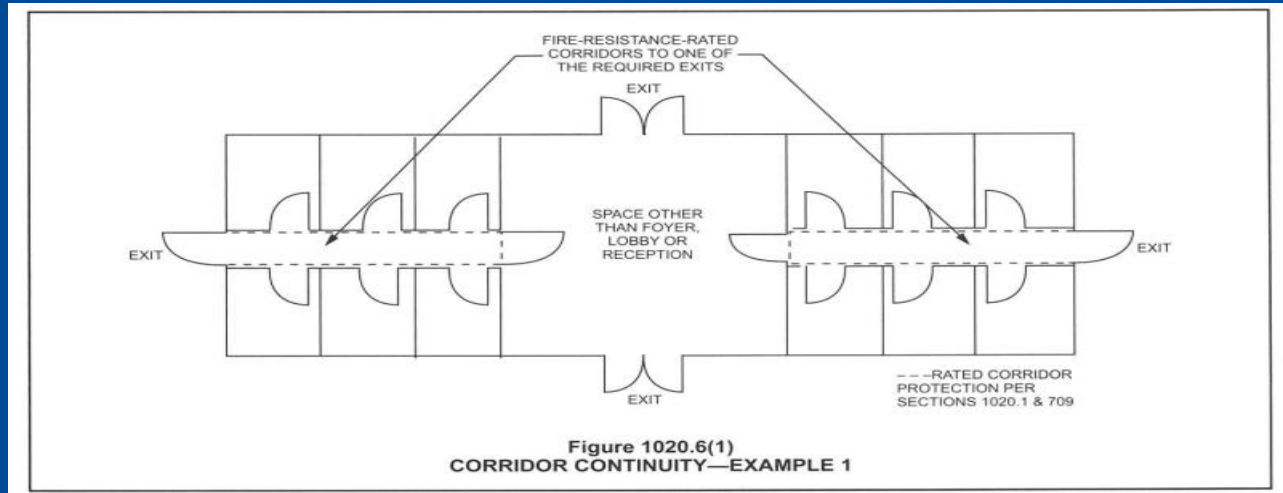


Figure 1020.6(1)
CORRIDOR CONTINUITY—EXAMPLE 1

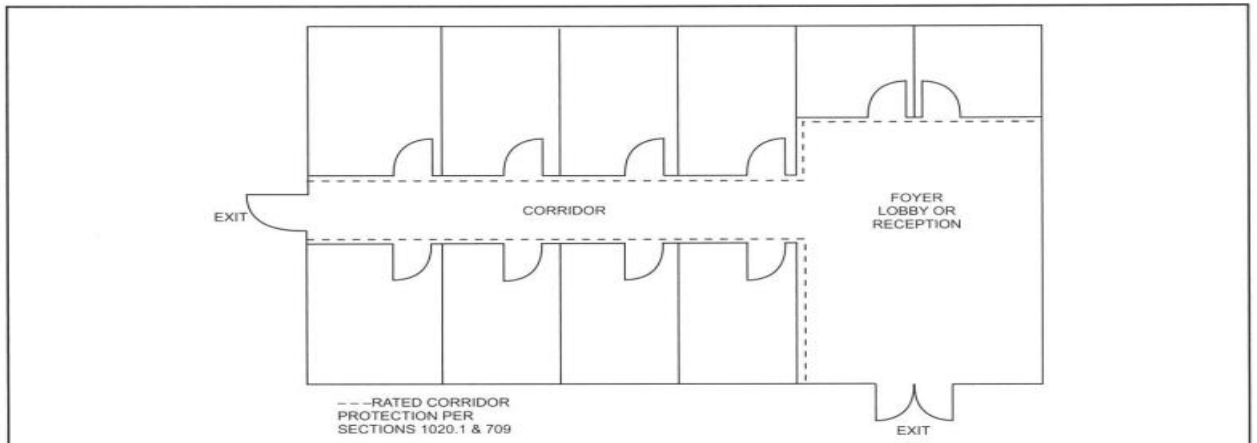


Figure 1020.6(2)
CORRIDOR CONTINUITY—EXAMPLE 2

NC DOA
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State Construction Office

Civil/Structural Design Review

Common Design Missteps

Md Aviquzzaman, PE

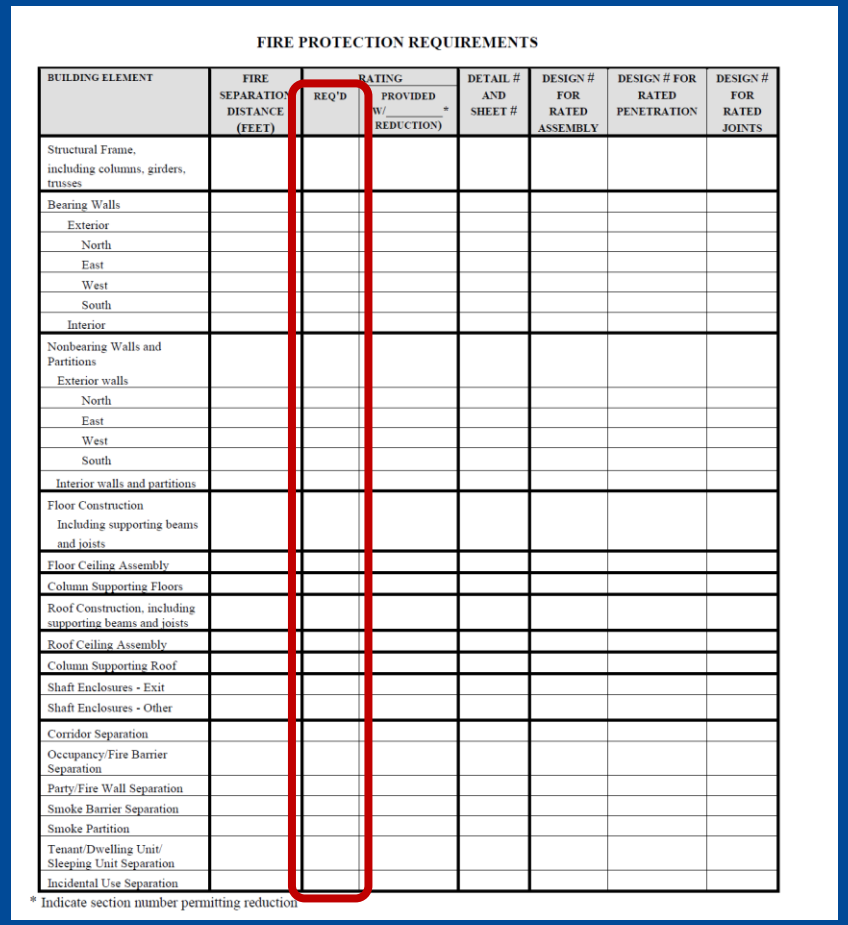
Introduction:

- Fire protection for Structural Supports
- Floodplain Development Permits
- Eccentricity
- Delegated Design

Fire protection for Structural Supports

Fire protection for Structural Supports

- Architects determine the fire requirements for structural members in the Appendix B
- What falls on structural engineer's shoulder?
- Deep Understanding of the UL (Underwriters Laboratories) standards



FIRE PROTECTION REQUIREMENTS

BUILDING ELEMENT	FIRE SEPARATION DISTANCE (FEET)	RATING REQ'D	RATING PROVIDED W/_____* REDUCTION)	DETAIL # AND SHEET #	DESIGN # FOR RATED ASSEMBLY	DESIGN # FOR RATED PENETRATION	DESIGN # FOR RATED JOINTS
Structural Frame, including columns, girders, trusses							
Bearing Walls							
Exterior							
North							
East							
West							
South							
Interior							
Nonbearing Walls and Partitions Exterior walls							
North							
East							
West							
South							
Interior walls and partitions							
Floor Construction Including supporting beams and joists							
Floor Ceiling Assembly							
Column Supporting Floors							
Roof Construction, including supporting beams and joists							
Roof Ceiling Assembly							
Column Supporting Roof							
Shaft Enclosures - Exit							
Shaft Enclosures - Other							
Corridor Separation							
Occupancy/Fire Barrier Separation							
Party/Fire Wall Separation							
Smoke Barrier Separation							
Smoke Partition							
Tenant/Dwelling Unit/ Sleeping Unit Separation							
Incidental Use Separation							

* Indicate section number permitting reduction

Fire Protection of Structural Steel

- The structural Engineer of Record must review and understand the requirements of the third-party listings.
- Third-party listings will help avoid gaps and omissions in the overall building design ; like limiting beam spacings and deck gauge
- UL listing indicating that deck spans are limited for “unrestrained assembly ratings”.

The Unrestrained Assembly Rating s equal to the Unrestrained Beam Rating for a max of 3 Hr. and is limited to the following units and limitations:

(a) 1-1/2 in. deep, 24 or 36 in. wide, 22 MSG or thicker fluted with clear spans not more than 7 ft 8 in.

(b) 1-1/2 in. deep, 24 or 36 in. wide, 20 MSG or thicker fluted with clear spans not more than 8 ft 8 in.

(c) 1-1/2 in. deep, 24 or 36 in. wide, 16 MSG or thicker fluted and 18/18 MSG or thicker cellular with clear spans not more than 9 ft 11 in.

(d) 3 in. deep, 36 in. wide, 18 MSG or thicker fluted and 24 in. wide, 20/18 MSG or thicker cellular with clear spans not more than 13 ft 2 in.

Fire Protection of Structural Steel

- Part 703.2.3 of the NCBC: Fire-resistance-rated assemblies tested under ASTM E119 or UL 263 shall not be considered to be retrained unless evidence satisfactory to the building official is furnished by the registered design professional showing that the construction qualifies for a restrained classification in accordance with ASTM E119 or UL 263. Restrained construction shall be identified on the construction documents.
- Include the "restrained" or "unrestrained" language in Section 078100 (Applied Fireproofing) of the project specification to avoid confusion and construction disputes
- Unrestrained assemblies require greater applied fireproofing thicknesses than restrained

Fire Protection of Structural Steel

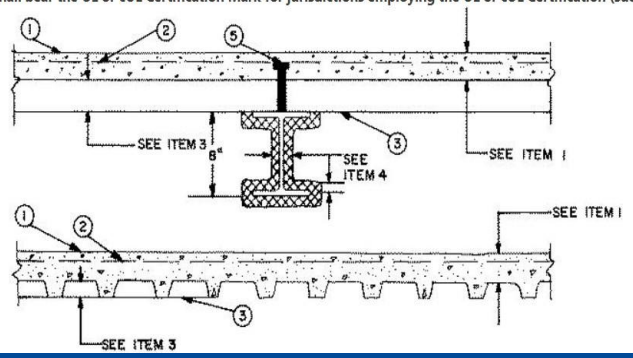
Design No. D916

December 16, 2021

Restrained Assembly Ratings — 3/4, 1, 1-1/2, 2 or 3 Hr.
(See Items 1, 6, 7, 8 and 11)
Unrestrained Assembly Rating — 0 Hr. (See Items 3, 4 and 4A)
Unrestrained Beam Ratings — 1, 1-1/2, 2 and 3 Hr.
(See Items 4, 4A, 7 and 11)

This design was evaluated using a load design method other than the Limit States Design Method (e.g., Working Stress Design Method). For jurisdictions employing the Limit States Design Method, such as Canada, a load restriction factor shall be used — See Guide BXUV or BXUV7

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



- An example of UL listing for a composite floor assembly
- The circled note indicates the design was evaluated using a load design method other than limit states design

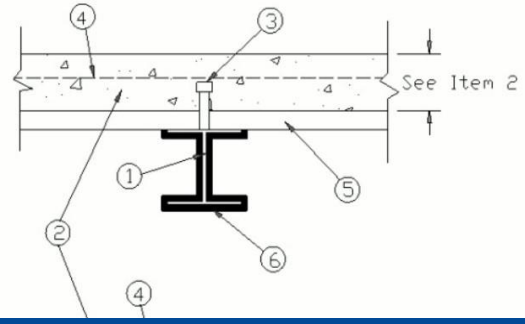
Design No. D982

October 21, 2016

Restrained Assembly Rating - 2 Hr.
Unrestrained Assembly Rating - 2 Hr.
Unrestrained Beam Rating - 1 Hr.

Loading Determined by Allowable Stress Design Method or Load and Resistance Factor Design Method published by the American Institute of Steel Construction, or in accordance with the relevant Limit State Design provisions of Part 4 of the National Building Code of Canada

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



- Another example UL listing
- The circled note indicates that loading was determined by allowable stress design method or load and resistance factor design method

- Differing testing conditions affect the steel design in certain situations.

Fire Protection of Structural Steel

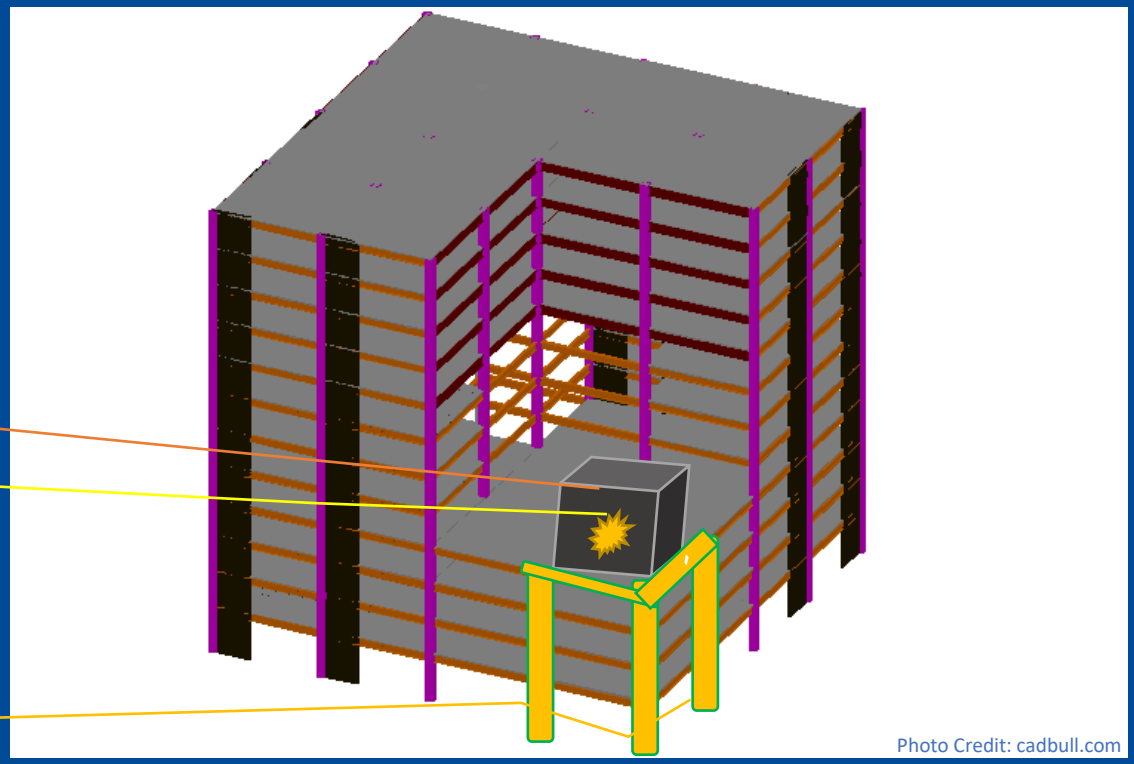
- AISC, AISI and UL conducted a collaborative study several years ago where restrained and unrestrained assemblies, historically tested using working stress methods, where reevaluated using limit states procedures, or in other words, AISC's LRFD and post-2005 ASD.
- Beams evaluated using ASD & LRFD can endure higher loads than those originally assumed by the UL tests.
- In order to ensure performance in harmony with the original listing, it was determined that the load capacity of certain beams must be reduced

Fire Protection of Structural Steel

- Load restriction factors for steel beams need not be applied to any UL Design that is based upon strength calculated using the 2005 or 2010 AISC *Specification*.
- Load restriction factors for steel beams need not be applied to any other UL Design if an unrestrained beam rating is used.
- Load restriction factors for steel beams need not be applied to any other UL Design if a 1-hour restrained beam rating is used.
- When using a UL Design for which none of the foregoing conditions applies, a load restriction factor of 0.9 is applicable for both composite design and non-composite design in U.S. practice.

Fire protection for Structural Supports

- Part 707.5 of the NCBC state that fire barrier walls shall be supported by construction having an equivalent fire-resistance rating
- For Example: If a fire rated mechanical room or assembly is on third floor and architects specified 2-hr fire rated enclosure that means, all steel framing (beams, girders, and columns) directly supporting the room must achieve a 2-hour rating for their entire length
- The plans must define the extents of protection. There are times when this information is best shown on the structural drawings.



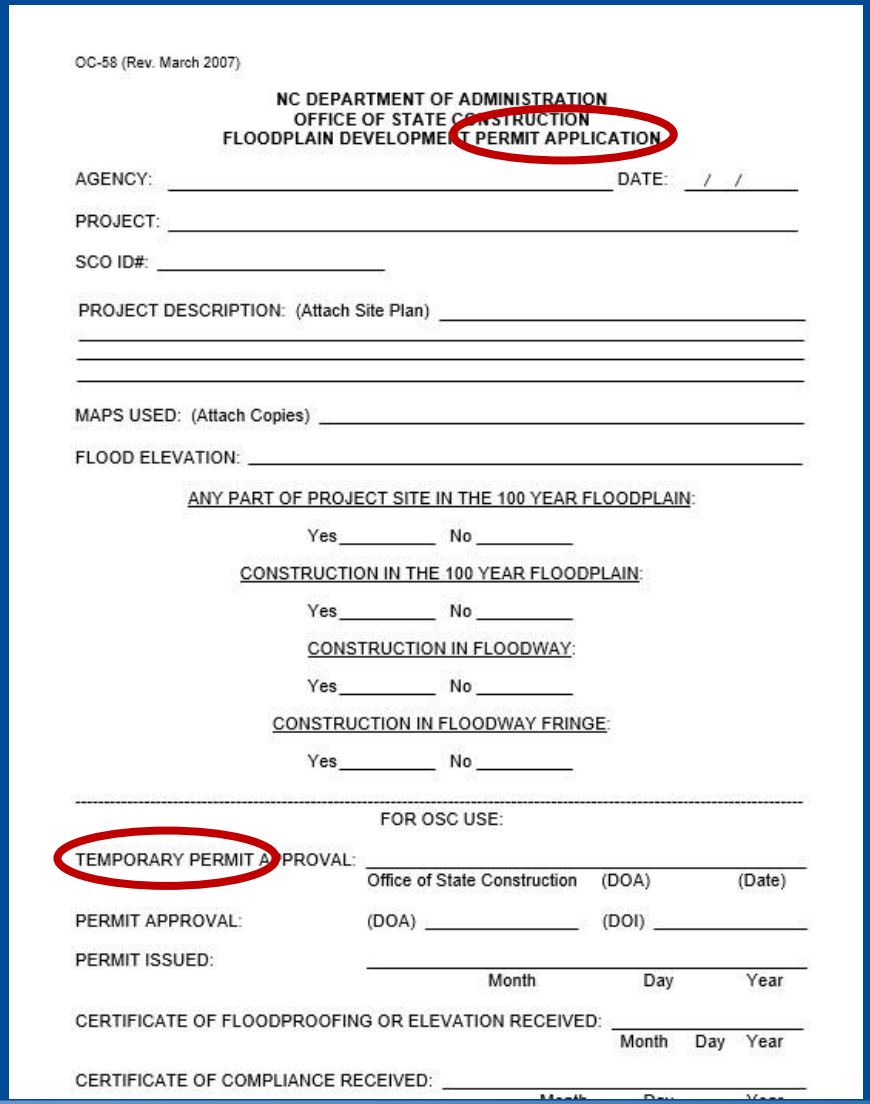
Floodplain Development Permits

- Executive Order 123 identifies the State Construction Office as the AHJ for Floodplain permitting
- Permitting Instructions found at https://ncadmin.nc.gov/businesses/construction/forms-documents
- Two types of flood permits:
  - Temporary flood plain permit
  - Final flood plain permit

2022 State Construction Conference

Floodplain Development Permits

- The Temporary Permit allows the project to go to bid but construction of the project should not begin until the Floodplain Development Permit Application is fully approved.
- Hard copies or electronic submittals accepted



OC-58 (Rev. March 2007)

NC DEPARTMENT OF ADMINISTRATION
OFFICE OF STATE CONSTRUCTION
FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

AGENCY: _____ DATE: / /

PROJECT: _____

SCO ID#: _____

PROJECT DESCRIPTION: (Attach Site Plan) _____

MAPS USED: (Attach Copies) _____

FLOOD ELEVATION: _____

ANY PART OF PROJECT SITE IN THE 100 YEAR FLOODPLAIN:

Yes_____ No_____

CONSTRUCTION IN THE 100 YEAR FLOODPLAIN:

Yes_____ No_____

CONSTRUCTION IN FLOODWAY:

Yes_____ No_____

CONSTRUCTION IN FLOODWAY FRINGE:

Yes_____ No_____

FOR OSC USE:

TEMPORARY PERMIT APPROVAL: _____
Office of State Construction (DOA) (Date)

PERMIT APPROVAL: (DOA) _____ (DOI) _____

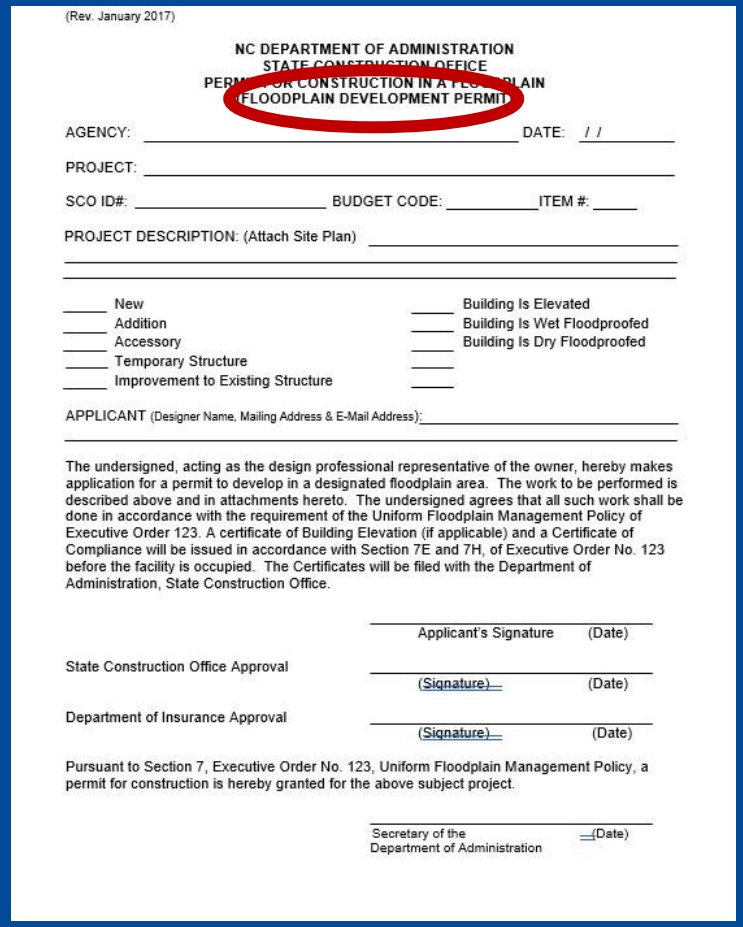
PERMIT ISSUED: _____
Month Day Year

CERTIFICATE OF FLOODPROOFING OR ELEVATION RECEIVED: _____
Month Day Year

CERTIFICATE OF COMPLIANCE RECEIVED: _____

Floodplain Development Permits

- Floodplain Development Permit Form
- Should be submitted with CD
- Supporting Documents
  - Flood Insurance Rate Map (FIRM)
  - Site Plan showing extents of floodplain and note declaring involvement
  - Pertinent drawings and calculations



(Rev. January 2017)

NC DEPARTMENT OF ADMINISTRATION
STATE CONSTRUCTION OFFICE
PERMIT FOR CONSTRUCTION IN A FLOODPLAIN
(FLOODPLAIN DEVELOPMENT PERMIT)

AGENCY: _____ DATE: / /

PROJECT: _____

SCO ID#: _____ BUDGET CODE: _____ ITEM #: _____

PROJECT DESCRIPTION: (Attach Site Plan) _____

_____ New
_____ Addition
_____ Accessory
_____ Temporary Structure
_____ Improvement to Existing Structure

_____ Building Is Elevated
_____ Building Is Wet Floodproofed
_____ Building Is Dry Floodproofed
_____
_____

APPLICANT (Designer Name, Mailing Address & E-Mail Address): _____

The undersigned, acting as the design professional representative of the owner, hereby makes application for a permit to develop in a designated floodplain area. The work to be performed is described above and in attachments hereto. The undersigned agrees that all such work shall be done in accordance with the requirement of the Uniform Floodplain Management Policy of Executive Order 123. A certificate of Building Elevation (if applicable) and a Certificate of Compliance will be issued in accordance with Section 7E and 7H, of Executive Order No. 123 before the facility is occupied. The Certificates will be filed with the Department of Administration, State Construction Office.

_____
Applicant's Signature (Date)

State Construction Office Approval
_____
(Signature) (Date)

Department of Insurance Approval
_____
(Signature) (Date)

Pursuant to Section 7, Executive Order No. 123, Uniform Floodplain Management Policy, a permit for construction is hereby granted for the above subject project.

_____
Secretary of the Department of Administration (Date)

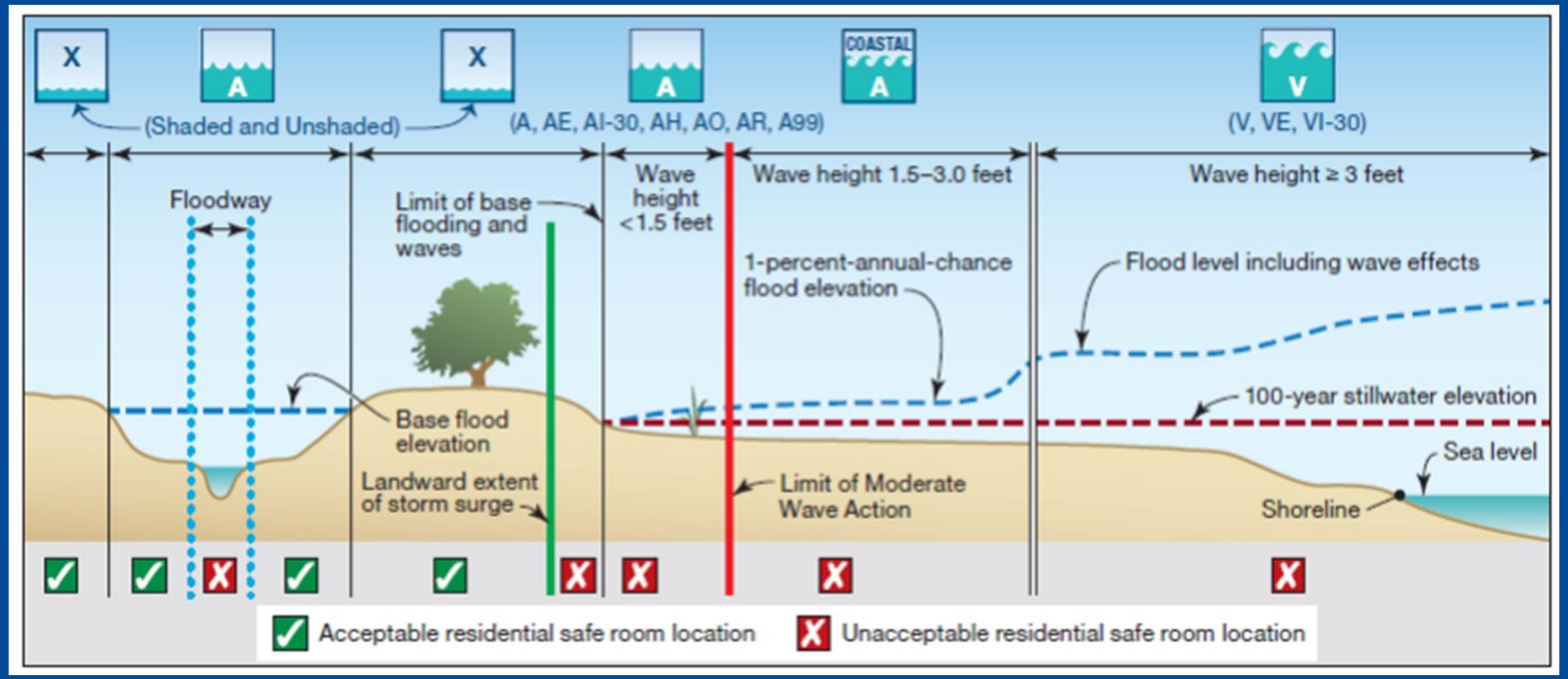
Floodplain Development Permits

- Considerations not covered by EO123:
  - ASCE24-14 Flood Design Class 4 – BFE +2ft or DFE, or 500-year flood elevation, whichever is higher.
  - Non-encroachment Zones – Portion of the floodplain where development may be prohibited due to its effects on the conveyance of discharge.
    - 44 CFR 60.3(c)(10) – "Required until a regulatory floodway is designated, that non new construction, substantial improvements, or other development shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

2022 State Construction Conference

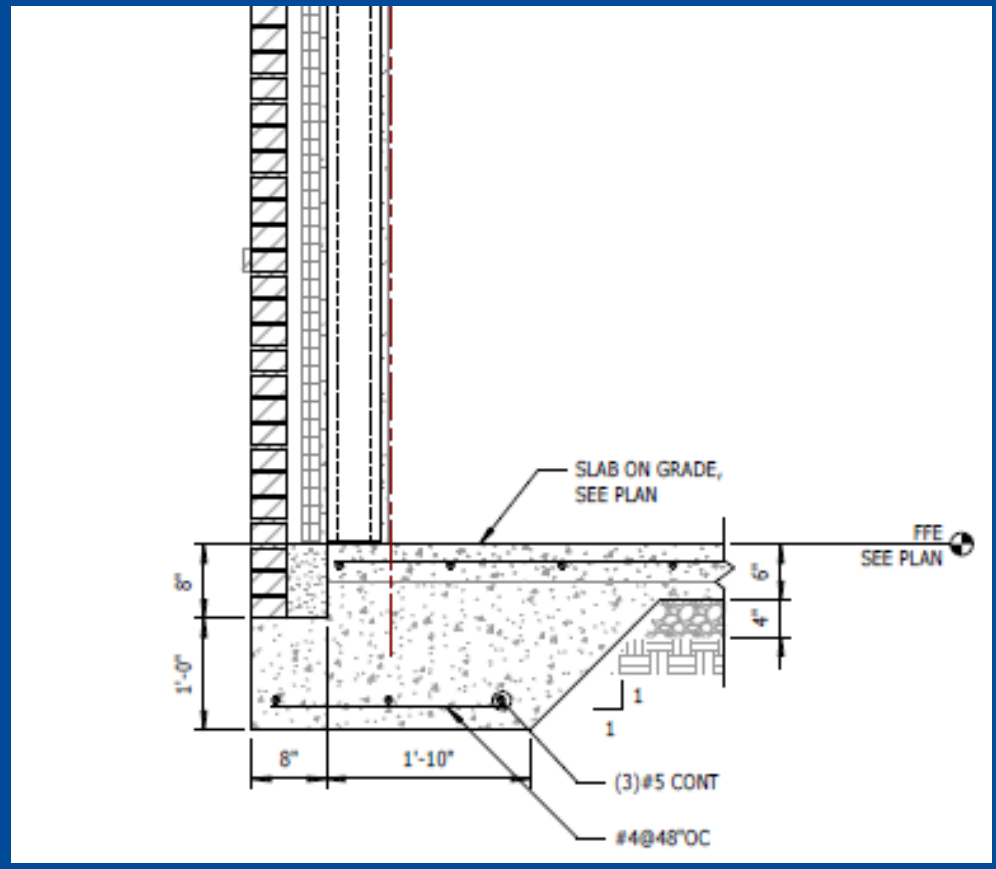
Floodplain Development Permits

- Considerations not covered by EO123:
  - LiMWA – Limit of Moderate Wave Action: IBC and ASCE24 require specific structural checks in Coastal A Zones.



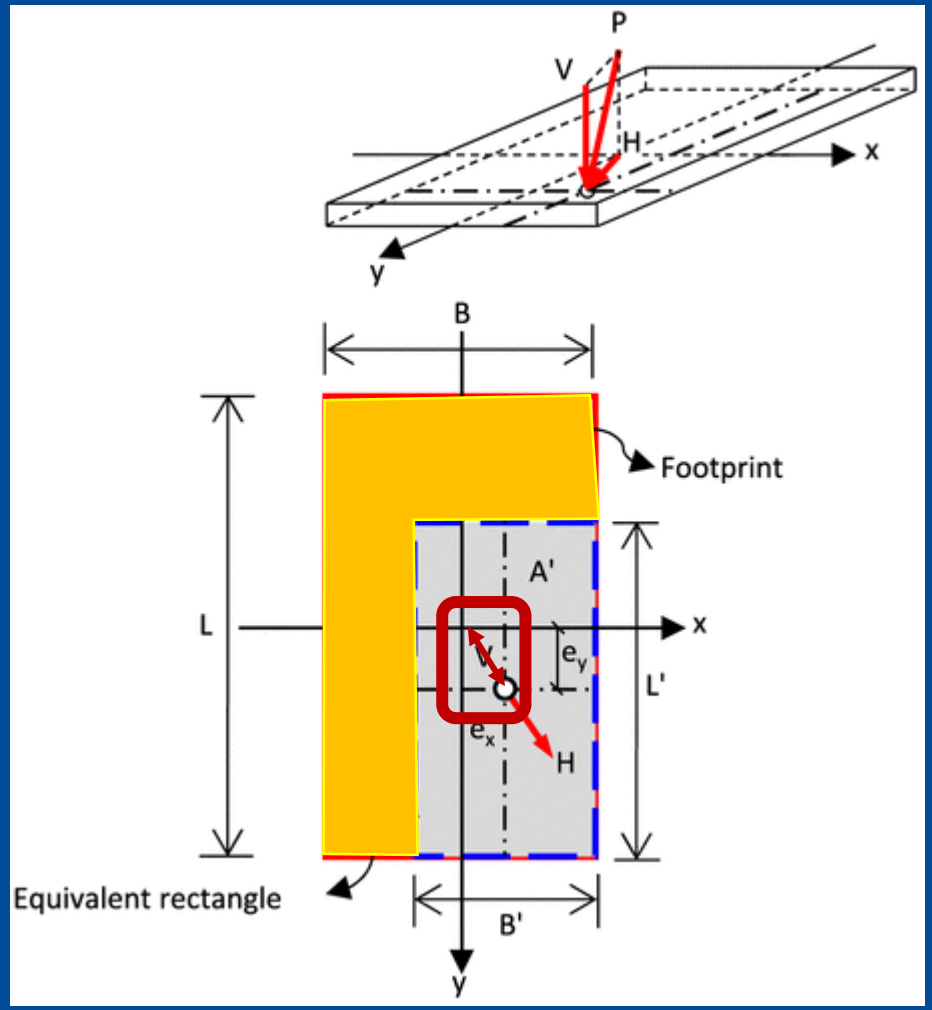
Eccentricity

- Eccentricity on foundation – Specially for PEMB
  - Usually footing design doesn't consider eccentricity in the calculation



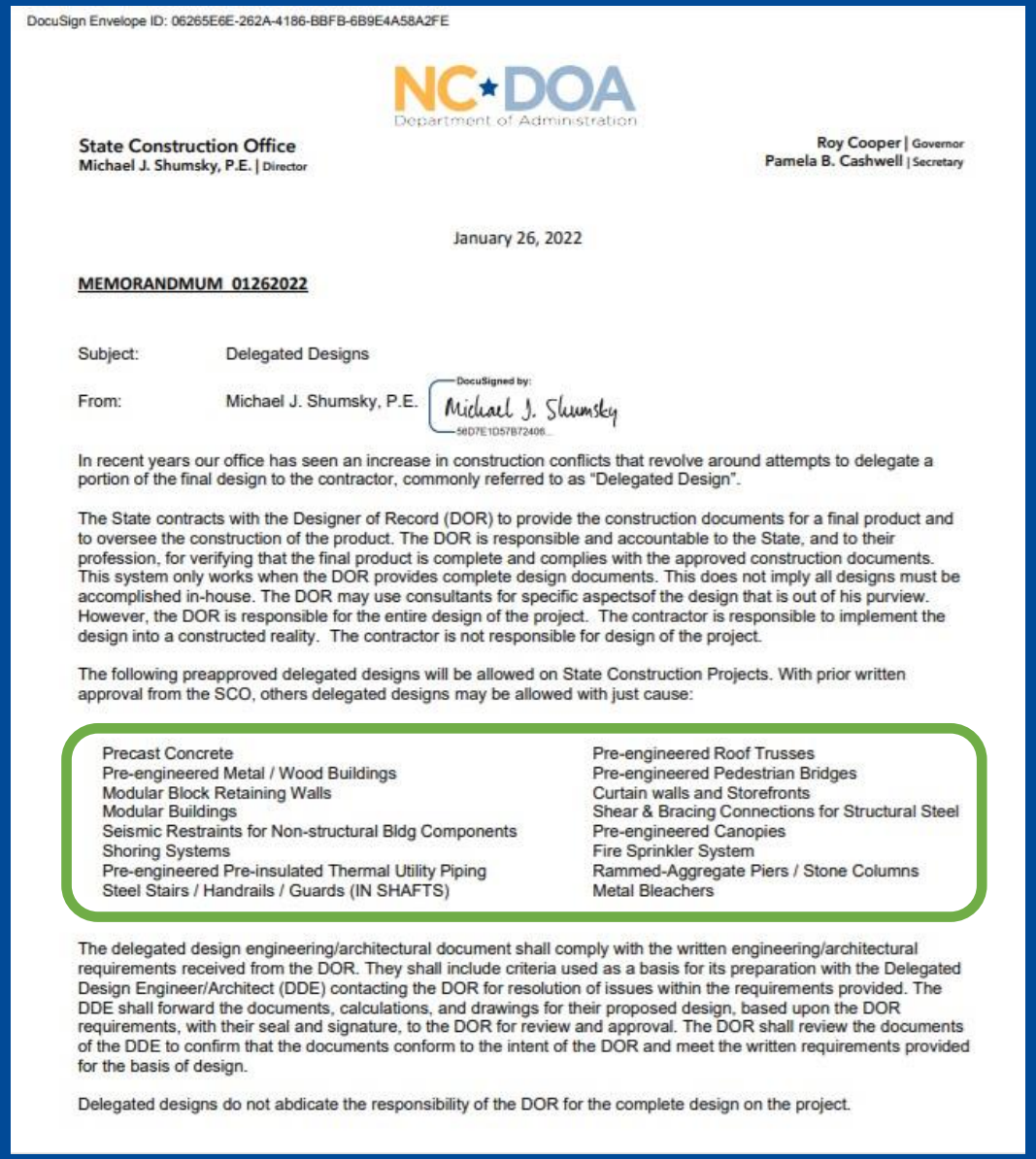
Eccentricity

- In PEMB the foundation and superstructure are designed separately, sometimes what causes significant eccentricity on footing
- As a result, partial settlement and cracks in the foundation walls occur



Delegated Design

- Memorandum 01262022 is available on the SCO website.
- List of delegated systems which can be delegated without question.
- Other systems are acceptable upon approval.
- Delegated design is not a complete delegation of responsibility.
- Shoring systems can be delegated, the EOR must define the need.



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NC DOA
Department of Administration

State Construction Office
Michael J. Shumsky, P.E. | Director

Roy Cooper | Governor
Pamela B. Cashwell | Secretary

January 26, 2022

MEMORANDMUM 01262022

Subject: Delegated Designs

From: Michael J. Shumsky, P.E.

DocuSigned by:
Michael J. Shumsky
56D7E1D57B7240...

In recent years our office has seen an increase in construction conflicts that revolve around attempts to delegate a portion of the final design to the contractor, commonly referred to as "Delegated Design".

The State contracts with the Designer of Record (DOR) to provide the construction documents for a final product and to oversee the construction of the product. The DOR is responsible and accountable to the State, and to their profession, for verifying that the final product is complete and complies with the approved construction documents. This system only works when the DOR provides complete design documents. This does not imply all designs must be accomplished in-house. The DOR may use consultants for specific aspectsof the design that is out of his purview. However, the DOR is responsible for the entire design of the project. The contractor is responsible to implement the design into a constructed reality. The contractor is not responsible for design of the project.

The following preapproved delegated designs will be allowed on State Construction Projects. With prior written approval from the SCO, others delegated designs may be allowed with just cause:

Precast Concrete	Pre-engineered Roof Trusses
Pre-engineered Metal / Wood Buildings	Pre-engineered Pedestrian Bridges
Modular Block Retaining Walls	Curtain walls and Storefronts
Modular Buildings	Shear & Bracing Connections for Structural Steel
Seismic Restraints for Non-structural Bldg Components	Pre-engineered Canopies
Shoring Systems	Fire Sprinkler System
Pre-engineered Pre-insulated Thermal Utility Piping	Rammed-Aggregate Piers / Stone Columns
Steel Stairs / Handrails / Guards (IN SHAFTS)	Metal Bleachers

The delegated design engineering/architectural document shall comply with the written engineering/architectural requirements received from the DOR. They shall include criteria used as a basis for its preparation with the Delegated Design Engineer/Architect (DDE) contacting the DOR for resolution of issues within the requirements provided. The DDE shall forward the documents, calculations, and drawings for their proposed design, based upon the DOR requirements, with their seal and signature, to the DOR for review and approval. The DOR shall review the documents of the DDE to confirm that the documents conform to the intent of the DOR and meet the written requirements provided for the basis of design.

Delegated designs do not abdicate the responsibility of the DOR for the complete design on the project.

2022 State Construction Conference

NC DOA
Department of Administration
State Construction Office

Mechanical, Energy, and Fire Protection Design Review

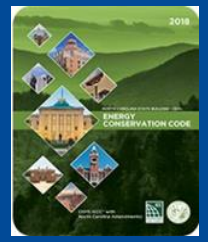
Common Design Missteps

Tom Galdi, PE

Paths to Energy Code Compliance

- 2018 NCECC

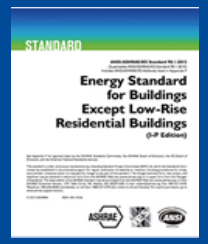
  (C401.2 p. 2,3)



-Prescriptive
-Mandatory Reqts and Model per C407

- ASHRAE 90.1-2013

  (C401.2 p. 1)



-Prescriptive
-ECB Method
-Appendix G

- Comcheck

  (401.2 other)

-ASHRAE 90.1-2016 or ICC 2015

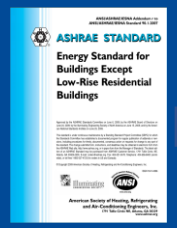
G.S. 143-135.37 Sustainable Energy Efficient Bldgs

- 30% Less Energy than ASHRAE 90.1-2004 Baseline.

- Amended for ‘Net Savings Required’ as determined by The Department.

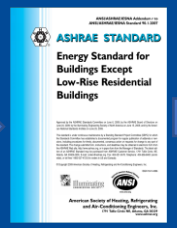
ASHRAE

2004



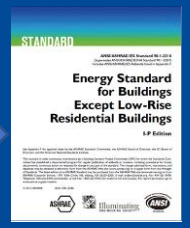
4.5%

2007



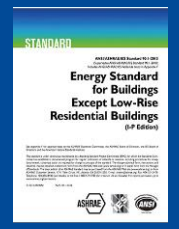
18.2%

2010



7.6%

2013

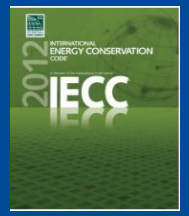


27.8% less than 2004

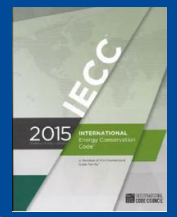
ICC

2009

2012

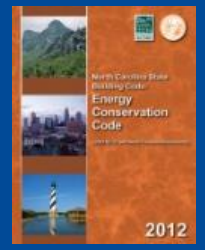


2015

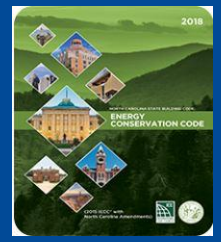


NC

2012



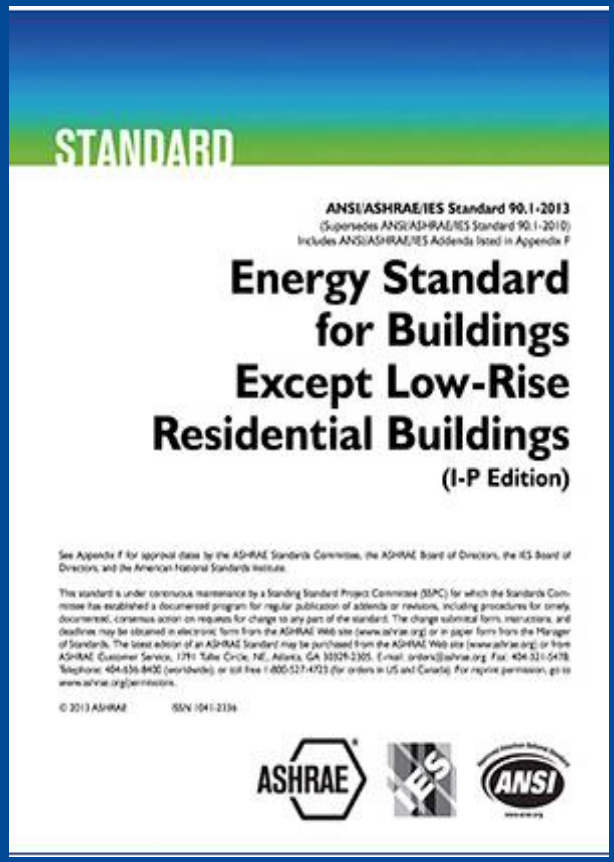
2018



Where Are We With This?

Sustainable Bldgs Expectation

- Use ASHRAE 90.1-2013 as a compliance path.
  - ❖If performance path is used (Appendix G or ECB), submit compliance forms from the User's manual that demonstrates compliance and where proposed design does not meet prescriptive requirements.



Fire Damper Access

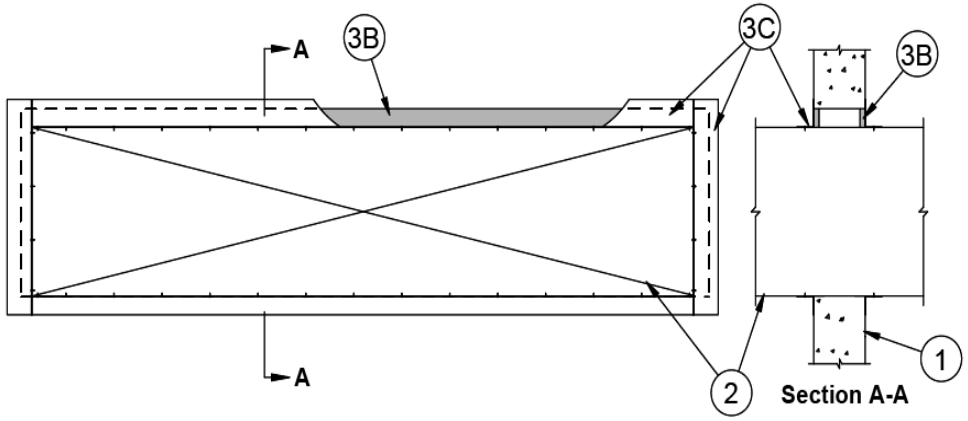
"Approved Means of Access Large enough to permit inspection and maintenance"

Current ICC Wording

[BF] 607.4.1 Access. CDP

Fire and smoke dampers shall be provided with an *approved* means of access that is large enough to permit inspection and maintenance of the damper and its operating parts. Dampers equipped with fusible links, internal operators or both shall be provided with an access door that is not less than 12 inches (305 mm) square or provided with a removable duct section.

From 2021 ICC



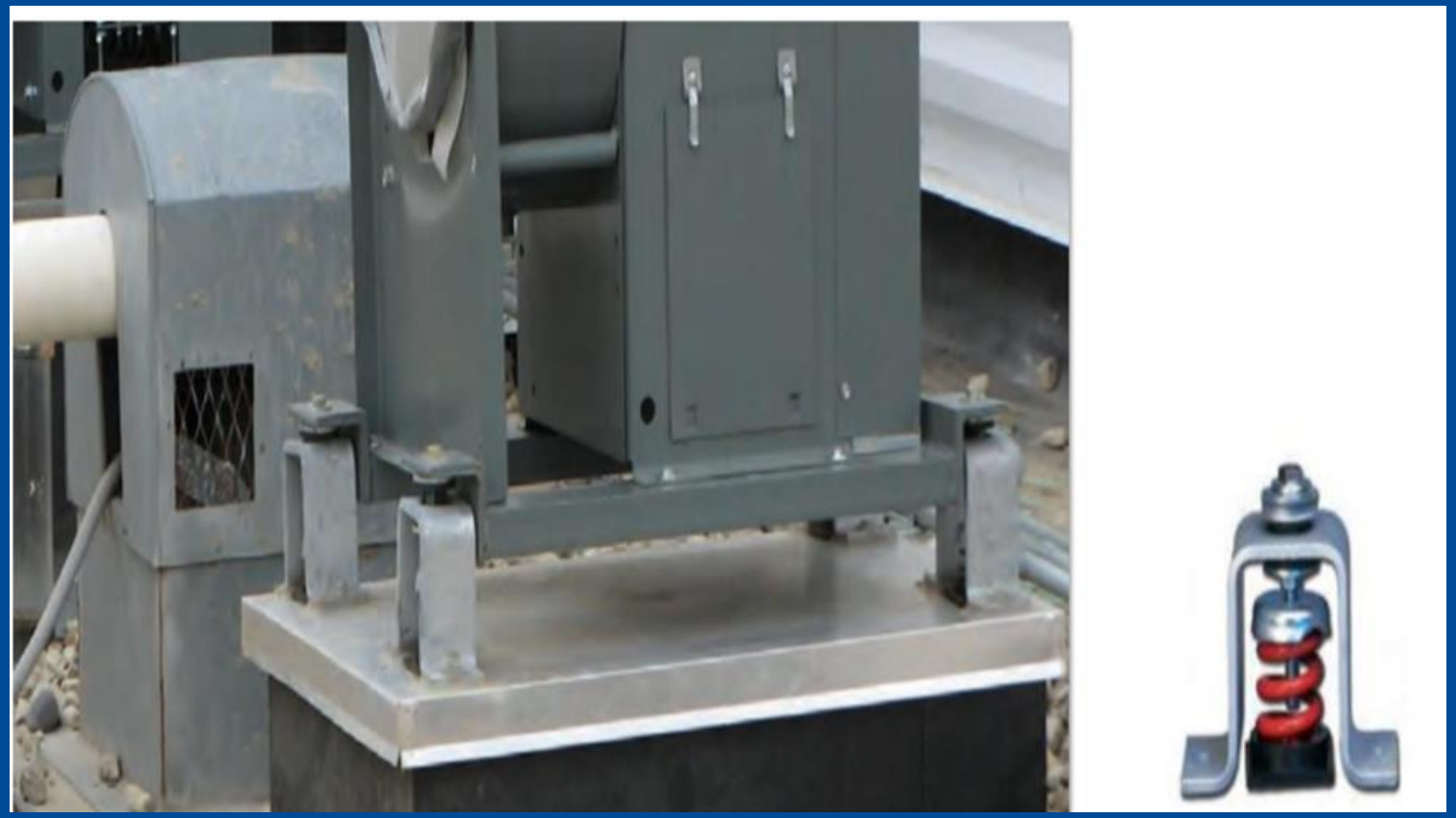
System No. W-J-7007
F Rating — 2 Hr
T Rating — 1/2 Hr

1. **Wall Assembly** — Min 6 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks*** Max area of opening is 73.67 sq ft with max dimension of 104 in.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.
2. **Steel Duct** — Nom 100 in. by 100 in. (or smaller) No. 24 gauge (or heavier) galv steel duct to be installed either concentrically or eccentrically within the firestop system. The space between the steel duct and periphery or opening shall be min 0 in. (point contact) to max 2 in. Steel duct to be rigidly supported on both sides of the wall assembly.
3. **Firestop System** — The firestop system shall consist of the following:
   A. **Packing Material** — (Optional, Not Shown) — Polyethylene backer rod, mineral wool batt insulation or fiberglass batt insulation friction fitted into annular space of opening. Packing material to be recessed from both surfaces of wall as required thickness of fill material.
   B. **Fill, Void or Cavity Material*** — **Sealant** — Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between steel duct and concrete wall, a min 1/4 in. diam bead of fill material shall be applied at the concrete/steel duct interface on both surfaces of wall assembly.
      SPECIFIED TECHNOLOGIES INC — SpecSeal 100, 101, 102, 105, 120 or 129 Sealant
   C. **Steel Retaining Angles** — Min No. 16 gauge galv steel angles sized to lap steel duct a min of 2 in. and lap wall surfaces a min 1 in. Angles attached to steel duct on both sides of wall with min No. 10 by 1/2 in. long steel sheet metal screws spaced a max of 1 in. from each end of steel duct and spaced a max 6 in. OC.

*Bearing the UL Classification Mark

Can exempt FD's in many situations in sprinklered bldgs. Use appropriate penetration detail.

Seismic for MEP and FP



SEISMIC DESIGN CATEGORY

- SDC
  - ‘A’ – Seismic Restraints Not Required
  - ‘B’ – Seismic Restraints Not Required
  - ‘C’ – Seismic Design Needed for Systems/Equipment Importance Factor > 1
  - ‘D’ – Seismic Design Needed

SDC "C"

- Importance Factor = 1.0 – Exempt from seismic design package
- Importance Factor = 1.5 – Seismic design package required
  - Sprinkler systems
  - Systems and Equipment with hazardous materials
  - Systems in critical facilities (Hospitals, Emergency Response Operations etc.)

Delegated Design

- Obtain the services of an engineer licensed in the state of North Carolina to design seismic restraint systems and methods of anchorage to building structure. This shall include preparation of a quality assurance plan that includes special inspections per 1705.12 of the NC Building Code.

❖ Delegated Designs do not abdicate D.O.R. of overall responsibility

Sprinkler Systems

Sprinkler System Design in NC is delegated to the Fire Sprinkler Contractor. This work is still under the Designer of Record who is expected to verify installation per approved design drawings.

Sprinkler Seismic Bracing Issues

- Frequent Installation Findings:
  - Missing flexible couplings at locations required by NFPA 13.
  - Annular space missing around pipes at locations prescribed by NFPA 13.
  - Brace locations do not match shop drawings.
  - Brace angle does not match shop drawings.
  - Hanger retaining straps not installed.
  - Number of crimps on cable system not per manufacture specifications.

Standpipes to be Flow Tested

250 GPM per Outlet

100 psig

Witness by SCO and DOR

Automatic Standpipe (high rise) - can't use pumper truck

Manual Standpipe – supply can be portable pump or pumper truck.

NC DOA
Department of Administration
State Construction Office

Electrical Design Review

Common Design Missteps

Joshua Sartin, PE and Isaac Loydpierson, PE

Emergency Lighting

- Normal Power
  - **NCSBC 1008.2** – The means of egress serving a room or space shall be illuminated at all times that the room or space is occupied
  - **NCSBC 1008.2.1** – "The means of egress illumination shall not be less than 1 footcandle (11 lux) at the walking surface."

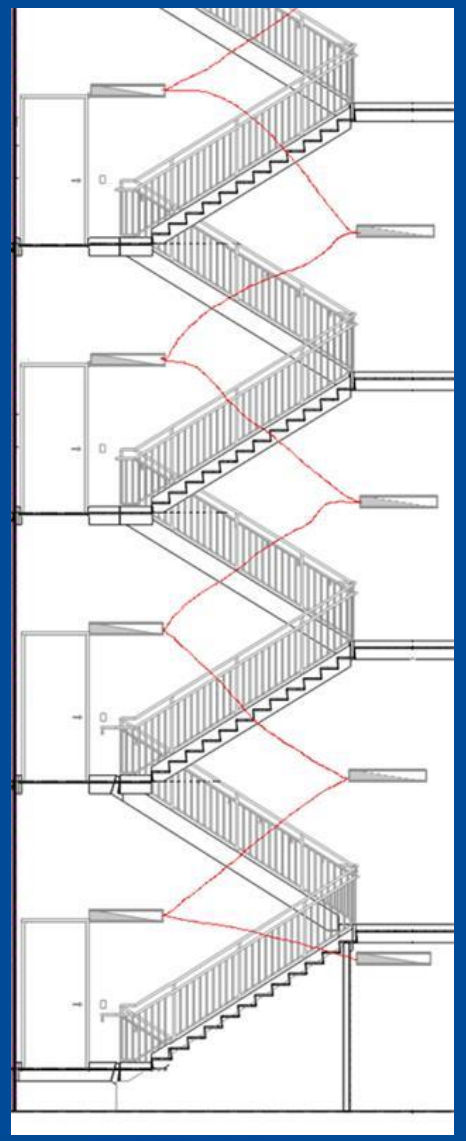
- **NCSBC 1008.3.1, 1008.3.2, 1008.3.3** requires Emergency Illumination in the listed areas regardless if the space is unoccupied. Automatic lighting controls shall not prevent emergency power from illuminating fixtures.

Emergency Lighting

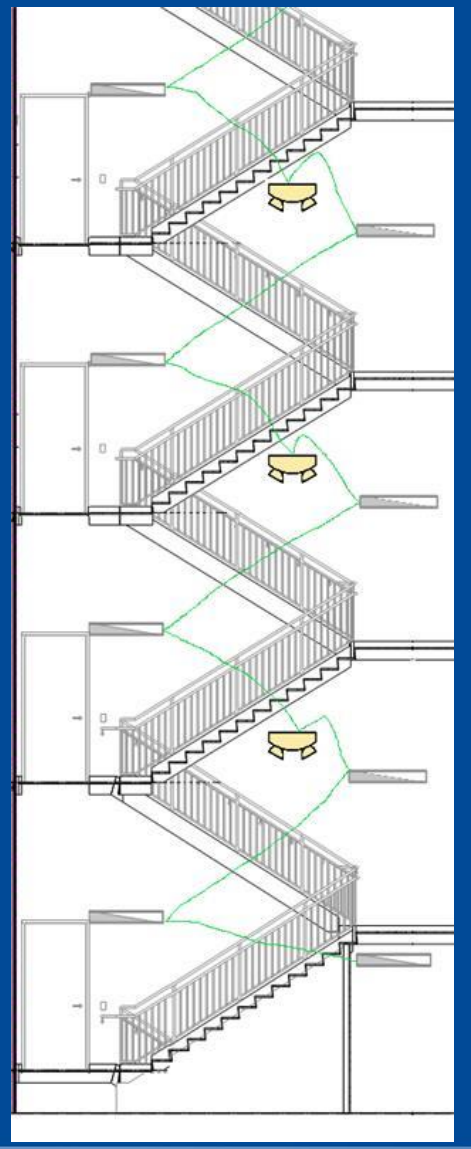
- **NEC 700.16(B)** – Failure of any illumination source cannot leave an area in complete darkness.
- **NEC 700.17** – No single branch circuit failure shall leave an area in complete darkness.

*Not all acceptable solutions are shown

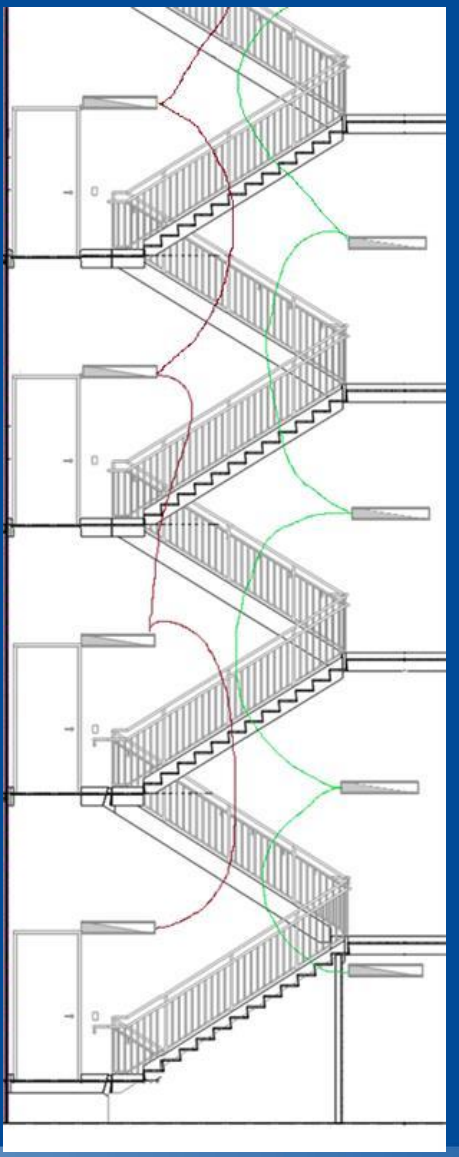
Unacceptable (Single Circuit)



Acceptable (integral Batteries)



Acceptable (Multiple Circuits)



Panel Labeling

- **NEC 408.4(A)** – The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others.

Unacceptable

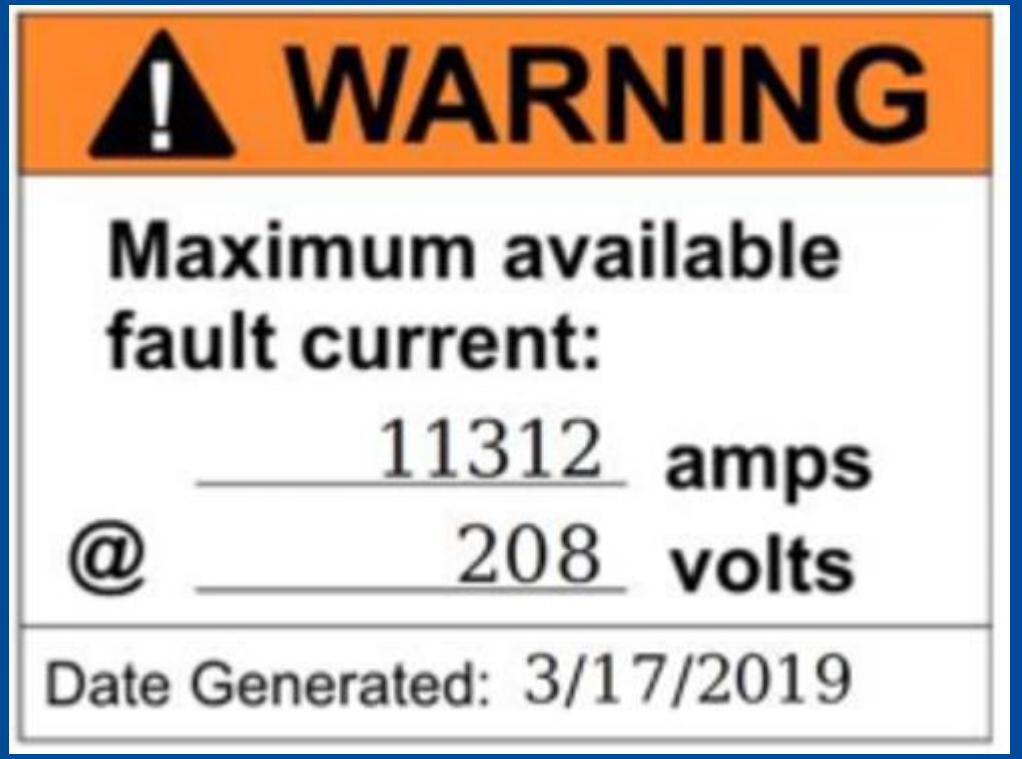
CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	CIRCUIT BREAKER			PHASE		
				NOTE	FUNCTION	TRIP	A	B	C
1	L	0.25	FLUSH VALVE			20	0.25		
3	L	0.77	LIGHTS (FIRST FLOOR NORTH)			20		0.77	
5	L	0.55	LIGHTS (FIRST FLOOR SOUTH)			20			0.55
7	L	0.17	LIGHTS (MECH PLATFORM)			20	0.35		
9	L	0.48	DISC-GWH			20		0.53	
11	O		SPARE			20			0.00
13	O		SPARE			20	0.00		
15	O		SPARE			20		0.00	
17	R	0.54	RECEPTACLES			20			0.54
19	R	0.54	RECEPTACLES			20	0.54		
21	R	0.54	RECEPTACLES			20		0.54	
23	R	0.72	RECEPTACLES			20			0.72
25	R	0.90	RECEPTACLES			20	0.90		
27	R	0.18	RECEPTACLES			20		0.18	
29	R	0.18	RECEPTACLES			20			0.18
31	R	0.18	RECEPTACLES			20	0.18		
33	R	0.36	RECEPTACLES			20		0.36	
35	O		SPACE						0.00
37	O		SPACE				0.00		
39	O		SPACE					0.00	
41	O		SPACE						0.00
	O						0.00		

Acceptable

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB
1	L		LTS - 5103, 5104, 5109, 5110		EXISTING			20
3	L		LTS - 5102, 5105, 5106, 5109		EXISTING			20
5	L		LTS - 5111, 5112, 5113		EXISTING			20
7	L		LTS - 587, 588, 592-594, 598		EXISTING			20
9	L		LTS - 583-586, 589, 590		EXISTING			20
11	L		LTS - 568, 571, 580-582		EXISTING			20
13	L		LTS - 564, 566, 567, 570		EXISTING			20
15	L		LTS - 559, 560, 562, 563, 565		EXISTING			20
17	L		LTS - 554, 556-558, 561		EXISTING			20
19	L		LTS - 549, 550, 552, 553, 555		EXISTING			20
21	L		LTS - 542		EXISTING			20
23	L		LTS - 538, 539		EXISTING			20
25	L		LTS - 528, 529, 534, 535		EXISTING			20
27	L		LTS - 537, 540, 541		EXISTING			20
29	L		LTS - 532, 536, 537		EXISTING			20
31	O		SPARE		EXISTING			20

Panel Labeling

- Require Available Fault Current to be field marked on
  - All switchgear, switchboards, and panelboards (**NEC 408.6**)
  - Service equipment (**NEC 110.24**)
  - Elevator control panels (**NEC 620.54(D)(2)**)
  - Motor control centers (**NEC 430.99**)
  - Industrial machinery (**NEC 670.5**)
  - Automatic transfer switches (**NEC 700.5(E), 701.5(D), 702.5 (C)**)

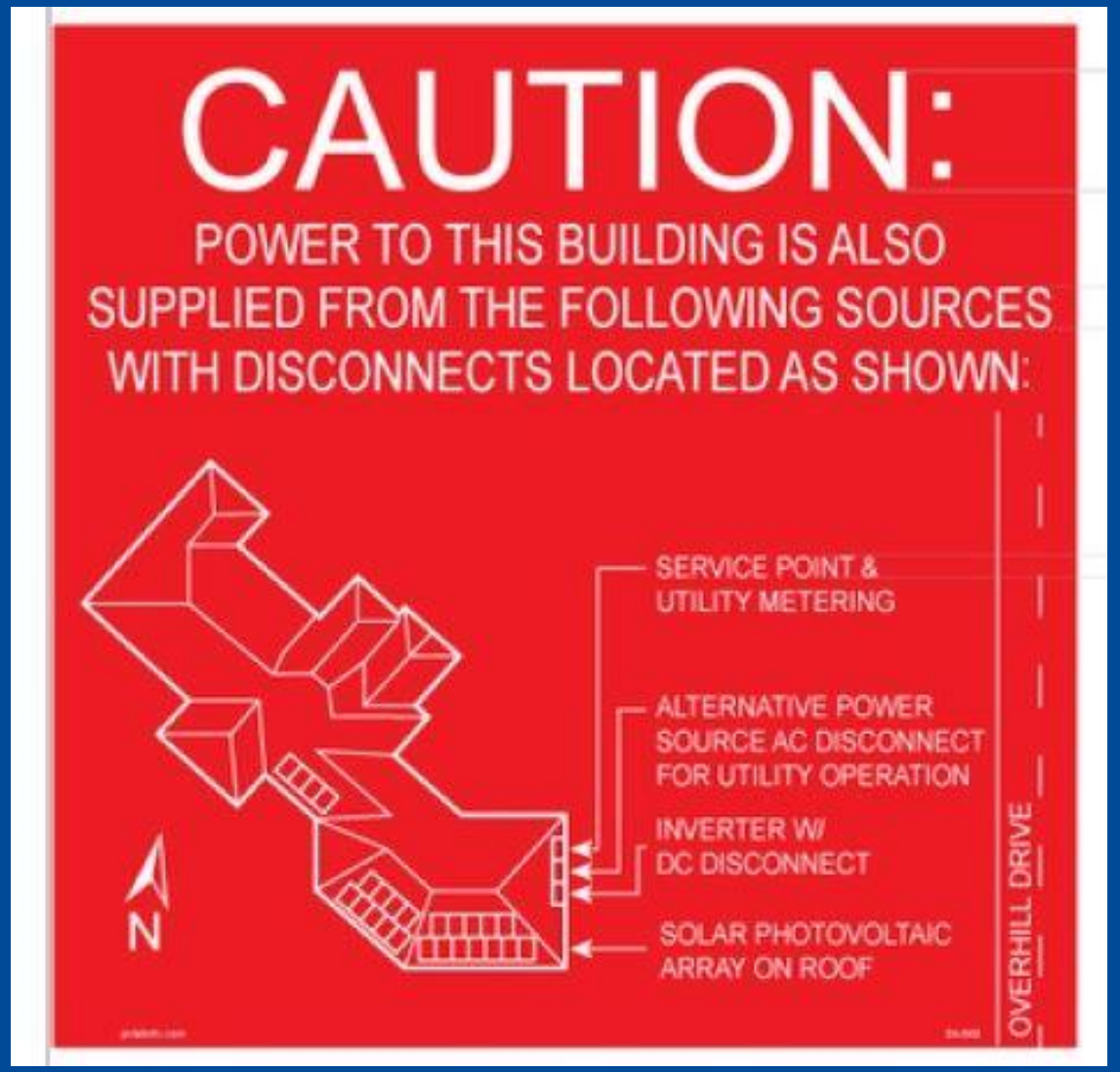


Panel Labeling

- Must include:
  - Source of supply (**NEC 408.4(B)**)
  - Panel Voltage
  - Arc flash hazard warning (**NEC 110.16(A)**)

Service Disconnect Labeling

- Multiple Service Sources
  - Identify alternative sources per **NEC 700.7(A), 701.7(A), 702.7(A)**.
  - Identify all other service locations per **NEC 230.2(E)** and **225.37**



Existing Loads

- **2019 State Construction Manual Section 507 (C)(7)(i)(3)** requires electrical drawings to show estimated load summary, connected loads, demand loads, and demand factors on DD submittals and after.
- If load is added, provide calculated or measured loads for existing and calculated load for new.
- If new breakers are added confirm physical space is available within existing panels. New breakers must match existing AIC ratings of existing panels

Existing Loads

- Unacceptable (existing loads are not included in calculation)

CKT	LOAD TYPE	LOAD KVA	DESCRIPTION	C	PH	N	G	CB	PHASE A	PHASE B	PHASE C	CB	PH	N	G	C	DESCRIPTION	LOAD KVA	LOAD TYPE	CKT
1	L		LTS - 5103, 5104, 5109, 5110		EXISTING			20	0.000			20		EXISTING			LTS - ELEVATOR LOBBY		L	2
3	L		LTS - 5102, 5105, 5106, 5109		EXISTING			20		0.000		20		EXISTING			LTS - NW CORRIDOR		L	4
5	L		LTS - 5111, 5112, 5113		EXISTING			20			0.000	20		EXISTING			LTS - NW CORRIDOR		L	6
7	L		LTS - 587, 588, 592-594, 598		EXISTING			20	0.000			20		EXISTING			LTS - E&W CENTER CORRIDOR		L	8
9	L		LTS - 583-586, 589, 590		EXISTING			20		0.000		20		EXISTING			LTS - SE CORRIDOR		L	10
11	L		LTS - 568, 571, 580-582		EXISTING			20			0.000	20		EXISTING			LTS - SE CORRIDOR		L	12
13	L		LTS - 564, 566, 567, 570		EXISTING			20	0.000			20		EXISTING			LTS - 501-503		L	14
15	L		LTS - 559, 560, 562, 563, 565		EXISTING			20		0.000		20		EXISTING			LTS - 5126-5128, 5134		L	16
17	L		LTS - 554, 556-558, 561		EXISTING			20			0.000	20		EXISTING			LTS - 5131-5133		L	18
19	L		LTS - 549, 550, 552, 553, 555		EXISTING			20	0.000			20		EXISTING			LTS - 504-508		L	20
21	L		LTS - 542		EXISTING			20		0.000		20		EXISTING			LTS - 508, 510, 511		L	22
23	L		LTS - 538, 539		EXISTING			20			0.000	20		EXISTING			LTS - 510, 512, 516, 518		L	24
25	L		LTS - 528, 529, 534, 535		EXISTING			20	0.000			20		EXISTING			LTS - 514-516		L	26
27	L		LTS - 537, 540, 541		EXISTING			20		0.000		20		EXISTING			LTS - PHONE ROOM		L	28
29	L		LTS - 532, 536, 537		EXISTING			20			0.000	20					SPARE		O	30
31	O		SPARE		EXISTING			20	0.000			20					SPARE		O	32
33	R	0.900	RECEPT - 5157, 5161A, 5161B	3/4"	10	10	10	20		0.900		20					SPARE		O	34
35	R	0.900	RECEPT - 5157C, 5161B	3/4"	10	10	10	20			0.900	20					SPARE		O	36
37	R	0.720	RECEPT - 5097C	3/4"	10	10	10	20	0.720			20					SPARE		O	38
39	R	0.720	RECEPT - 5097C	3/4"	10	10	10	20		0.720		20					SPARE		O	40
41	R	1.080	RECEPT - 5097C	3/4"	10	10	10	20			1.080	20					SPARE		O	42

208Y/120 V 3 PHASE 4 WIRE
MAINS: MCB 150 A MCB
22000 AIC SE LABEL

LOAD TOTAL:

LOAD TYPE	CONNECTED		DEMAND
(R) RECEPTACLES	4.32	100%	4.32
(M) MOTOR	0.00	100%	0.00
(H) HVAC	0.00	100%	0.00
(L) LIGHTING	0.00	125%	0.00
(O) OTHER	0.00	100%	0.00
(K) KITCHEN EQUIP	0.00	100%	0.00
TOTAL	4.32	100%	4.32

FED FROM:
MOUNT: FLUSH
NEMA: 1
MFG/MODEL: GE NHB - USE TED BREAKERS

NOTES:
1.
2.
3.
4.

PANEL TOTALS			
PHASE A	0.720	KVA	6.0 AMP
PHASE B	1.620	KVA	13.5 AMP
PHASE C	1.980	KVA	16.5 AMP

Existing Loads

- Acceptable

EXISTING PANEL HRD-9 LOAD SUMMARY

LOAD REMOVED BY THIS PROJECT:

EX. WATER HEATER WH-1: 504 VA

TOTAL LOAD REMOVED: 504 VA

LOAD ADDED BY THIS PROJECT:

(6) NEW WATER HEATERS: 6 @ 200 VA

TOTAL LOAD ADDED: 1200 VA

NET LOAD ADDED FOR THIS PROJECT: 696 VA (1.9A)

PER RECORD DRAWINGS AND FIELD INVESTIGATION, 70A/3P MCB PANEL HRD-9 CONNECTED LOAD IS 13.9A. NEW CONNECTED LOAD INCREASES TO 15.8A AT 208V/3-PHASE.

100A/3P MCB PANEL HRC FEEDS HRD, AND CONNECTED LOAD IS 30.5A. NEW CONNECTED LOAD INCREASES TO 32.4A AT 208V/3-PHASE.

REMOVAL OF TANK CIRCULATOR RCP-2 REDUCES 600A MCC4D CONNECTED LOAD BY 1.6A @ 480V/3-PHASE.

VOLTAGE: 120/240
AMPS: 100 MLO

UNIT PANEL
C, C-ACC., C-BF

1 PHASE 3 WIRE
FLUSH MOUNTED

– DESCRIPTION –	POLE	WIRE SIZE	BRK SIZE	CCT #	LOAD PER PHASE A	LOAD PER PHASE B	CCT #	BRK SIZE	WIRE SIZE	POLE	– DESCRIPTION –
SPARE	1	–	–	1	0.0/1.5		2	20	–	1	EXISTING
SPARE	1	–	–	3		0.0/1.5	4	20	–	1	EXISTING
SPARE	1	–	–	5	0.0/0.0		6	20	–	1	SPARE
SPARE	1	–	–	7		0.0/0.0	8	20	–	1	SPARE
NEW AH-5	2	12	15	9	0.2/0.0		10	20	–	1	SPARE
				11		0.2/0.7	12	20	–	1	EXISTING
SPARE	2	–	50	13	0.0/1.4		14	20	–	1	EXISTING
				15		0.0/1.4	16	20	–	1	EXISTING
SPACE	1	–	–	17	0.0/1.5		18	20	–	1	EXISTING
SPACE	1	–	–	19		0.0/1.4	20	20	–	1	EXISTING
SPACE	1	–	–	21	--/1.4		22	20	–	1	EXISTING
SPACE	1	–	–	23		--/1.5	24	20	–	1	EXISTING
					6.0	6.7					

TOTAL CONNECTED KVA: 12.7
DEMAND KVA: 6.3
PANEL RMS SYM. AMPS: 22,000
DEMAND AMPS: 29.3

* REFER TO DWELLING LOAD DEMAND CALC

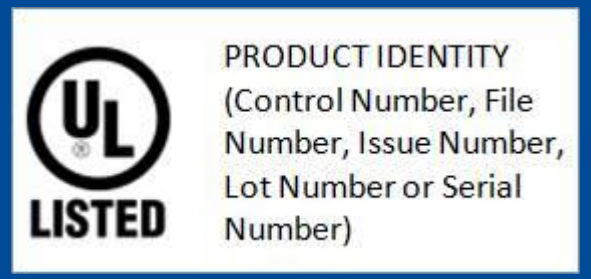
Residence Hall Smoke Detection

- SCO Fire Alarm Guidelines have been updated, reference Part 3 (9)(e).
- Any initiation device in common areas actuates the building-wide alarm.
- One initiation device in sleeping or dwelling unit shall actuate the alarm within that unit (sleeping room(s) and associated suite, pre-signal the FACP, and transmit alarm signal to supervising station to dispatch the Fire Department.
- More than one initiation device in any sleeping or dwelling unit (within the same unit or another) shall actuate the building-wide alarm.
- Low frequency sounder bases are required in all sleeping areas (**NFPA 72 18.4.5.3**).

	Actuate Building-Wide Fire Alarm Signal	Actuate Fire Alarm Signal in Suite Only	Show Fire Alarm Signal at FACP	Pre-signal Fire Alarm at FACP	Transmit Fire Alarm Signal to Supervising Station	Dispatch Fire Department Responders
Common Area Device	●		●		●	●
Single Device in Sleeping Area or Suite		●		●	●	●
Multiple Devices in Sleeping Area(s) or Suite(s)	●		●		●	●

Equipment Listing

- **NC General Statutes 66-23 thru 25** requires all electrical materials, devices, appliances, and equipment to be evaluated for safety and suitability for intended use.
- Products must be listed and labeled by an NC DOI approved third-party testing agency.
- **NEC 110.3(B)** requires using equipment in accordance with the instructions of the listing.



https://www.ncosfm.gov/codes/state-electrical-division/qualified-testing-laboratories

Referenced Standards

- NCSBC (or NCBC) – 2018 North Carolina State Building Code
- NEC – 2020 National Electric Code (NFPA 70)
- NFPA 72 – 2013 edition of NFPA 72
- SCO Fire Alarm Guidelines – 2020 State Construction Office Fire Alarm Guidelines and Policies (RV1)
- ICC – International Code Council
- AISC – American Institute of Steel Construction
- AISI – American Iron and Steel Institute

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