The Residential Code of New York State

Instructor:

**CHAPTER XXX III**

Sub Chapter A

1220 Residential Code
1221 Building Code
1222 Plumbing Code
1223 Mechanical Code
1224 Fuel Code
1225 Fire Code
1226 Property Maint.

**Introduction and Overview**

So...What is the RC?

“A comprehensive, stand alone residential construction code, that establishes minimum regulations for the construction of one and two-family dwellings and town homes using prescriptive provisions”

**Introduction and Overview**

When should the RC be used?

- New Construction of:
  - One and two-family dwellings
  - Multiple single family dwellings (townhouses)
    - Under 3 stories in height
    - Providing separate means of egress from each dwelling unit

**Introduction and Overview**

The Residential Code should also be used to provide minimum requirements for:

- Additions
- Alterations
- Movement
- Repairs
- Replacement of equipment
- Demolition or Removal
Lesson 1:
Introduction

**What is in the RC?**
The RC includes prescriptive provisions for:
- Conventional Light Frame Construction
  - Wood
- Light-Gage Steel Construction
  - Metal studs, joists and rafters
- Masonry Construction
  - Block
- Concrete Construction
  - Poured in-place

**The Big Picture**
- Course 9A
  - Permits and legal avenue to do our jobs
  - Building Code, State Laws and Regulations
- Course 9B
  - Fire Safe Design
- Course 9C
  - Inspections of existing buildings
  - Fire Code and Property Maintenance Code
- Course 9D
  - Basic construction principles
  - Energy Code, Fuel Gas, Mechanical, Plumbing Code, Systems

**The Big Picture (continued)**
- This course (9E) will address Residential Structures using a prescriptive format
  - Residential Code
- Course 9F will cover General Building Construction
  - Building Code and Fire Code

**Course Materials**
- Student Workbook
  - Note taking
  - Supplemental information in the appendix
- Single Family Plans
  - Yours to keep – BUT DON’T use them to build
- Plan Review Checklist
  - 2 sets in the back of the workbook

**Course format**
- We will follow a 4 step process
  1. The instructor will cover code sections through lecture
  2. Using a plan review sheet and a set of plans the class will do a plan review covering the code sections from the lecture
  3. The class and the instructor will perform virtual inspections through slides
  4. The class will take a final exam

**Are there any Questions or concerns at this point?**
Lesson 2: Overview

THE RESIDENTIAL CODE OF NEW YORK STATE

Lesson 2

Table of Contents

Provides us with a layout of the book broken down by

Part 1: Part III
- Chapter 1: Chapter 3
- Section 1: Section R311

Let's take a look at the Table of Contents

Organization

Part I Administration
- Chapter 1: General requirements
- Part II Definitions
- Part III Building Planning and Construction
  - Chapters 3 through 10
- Part IV Energy Conservation
  - Chapter 11
- Part V Mechanical
  - Chapters 12 through 23

Part VI Fuel Gas
- Chapter 24

Part VII Plumbing
- Chapters 25 through 32

Part VIII Electrical
- Chapters 33 through 42

Part IX Referenced Standards
- Chapter 43

Part X Appendices
- A through K

Index

The “Division” of the RC

Chapter 3
- Performance requirements
- Sets criteria for use of prescriptive chapters

Chapters 4 through 42
- Prescriptive (specification) construction requirements
- All the “How to…” information

PLANS

DRAWINGS and SPECIFICATIONS

DRAWINGS are QUANTITATIVE
(How many)

SPECIFICATIONS are QUALITATIVE
(What type)

Together these documents
DESCRIBE
a structure or building
Lesson 2: Overview

The Project

Cover Sheet

Plan view

The Plans

Cover Sheet

Avalon – Garage Left

Avalon – Garage Right

The Plans

Plot Plan

Sheet S-1

Locates the building on the property
Locates the
- Water line
- Septic line
- Site utilities
Provides setback information

The Plans

Site Location

Subdivision Map

- Provides a reference drawing to help locate the building site
- Shows properties that surround the building site and their relationship to it

The Plans

Topographic Information

Contour Lines
Lesson 2: Overview

The Plans

Foundation Plan  A-1
Dimensioning Systems

First Floor Plan  A3.02L
Window schedule
Door schedule
General notes
Fireplace sizes

Second Floor Plan  A3.03L

Section
A representation of an object as it would appear if cut by an imaginary plane, showing the internal structure.

A representation of a building, or portion thereof, drawn as if it were cut vertically to show the interior.

Cutting Plane Detail
CUT PLANE
BS-B/A3.04
LOCATION (pg. #)
VIEW ANGLE
Lesson 2:  
Overview

**The Plans**  
Building Sections  A3.04L

**The Plans**  
Elevation Views  A3.05 and A3.06

1. A drawing showing the vertical elements of a building, either exterior or interior, as a direct projection to a vertical projection plane.
2. The vertical distance above or below some established reference level.

**The Plans**  
Floor Framing Plans  A-7 and A-8

Optional window master bedroom

**The Plans**  
Floor Framing Plans  A-7 and A-8

Engineered Lumber
- TJI joist
- Microlam

**The Plans**  
Roof Framing Plans  A3.09L

WHAT?
NO 2X12’S?
Lesson 2: Overview

The Plans

**Electrical Details**
Sheet E-1

**Systems**
Basic systems were covered in Course 42
- Plumbing
- Heating
- Electrical
- Fuel Gas
We will check for compliance with a plan review and verify through inspections

**Plan Review Sheet**

A plan review sheet should be used to conduct a plan review
A good plan review sheet will lead you to important code sections that should not be overlooked
A plan review sheet should never be used in place of the RC book
A plan review should never be considered to be all inclusive

**Plan Review Sheet**

PHASE 3
The Sommerville Bldg.
20 Swan St., Menands, NY

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Lesson 2: Overview

**Plan Review Sheet**

For ease in identifying sections of the code needed for a particular plan review, the review sheet has been broken into 6 parts:

- Form 1 Master
- Form 2 Foundations
- Form 3W Wood frame construction
- Form 3S Steel frame construction
- Form 3M Masonry or Concrete construction
- Form 4 Roof construction

**Form 1**

Fill out with info from application

Top row based on local conditions

Bottom row to verify information on the plans

Check off forms used for review

---

**Lesson 2 Conclusion**

You have now seen the tools we have to work with:

- The Residential Code
- The plans for a single family residence
- The plan review sheet

In the next lesson...
We will start to put these items and YOU to work.
Lesson 3: Building Planning

The RESIDENTIAL CODE of NEW YORK STATE

Lesson 3
Chapter 3 Building Planning

R101.2 Scope
The Residential Code shall apply to:
- Detached One-and two-family dwellings and Multiple single-family dwellings (townhouses)
  - Not more than 3 stories in height
  - Separate means of egress
  - Accessory structures

R101.2 Scope

What is a Townhouse?

1 2 3 4 5 6

Would this work? See definition…

Townhouse

NO!

R102 Applicability
General Rules

- Most restrictive requirement ALWAYS applies
- In a conflict, most “Specific” code requirements rule
- In a conflict between the Code and a Standard, the Code rules

R102.8
Existing Structures

- Legal occupancy permitted to continue, with exceptions
- Additions, alterations, repairs comply with Code
- Code NOT applicable to existing portions of the structure unless specifically stated
Lesson 3: 
Building Planning

RC
It's NOT in there!!

What You Won't Find in the RC:

- Construction type
- Maximum building area
  - 3 story maximum height
    - If >3 stories, the Building Code applies
  - Prescriptive Chapters MAY limit
    - Height and/or size
- Habitable space location limitations

RC
CHAPTER 3 BUILDING PLANNING
Sections R301 through R324

Part III Building Planning and Construction

Topic 1: Structural Design Criteria
Topic 2: Minimum Requirements for
  - Habitability
  - Fire Safety
  - Fire Protection

RC
Chapter 3 - Building Planning

Topic 1
“Design Criteria”
Sets conditions for use of the
  PRESCRIPTIVE Chapters

RC
Prescriptive

- The intent of this code is to allow the
design and construction of a structure
using proven and recognized methods
and materials.

- If all the elements of the light frame
construction comply with the code, no
additional engineering is required!

RC
R301.1 Design

- All buildings and structures must be designed
to safely support all loads
  - Dead load
  - Live load
  - Roof, Flood, Snow, Wind and Seismic loads
- Loads must be transferred …
Lesson 3:
Building Planning

**TABLE R301.2(1)**

The code enforcement official will complete based on local conditions

<table>
<thead>
<tr>
<th>CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GROUND SNOW LOAD</strong></td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
</tbody>
</table>

**Student Research**
- This building will be located in GLENS FALLS (Warren County – southern most part)
- Use the FOOTNOTES to complete the first line of the Table

***Informational Note***
Prescriptive Tables for Rafters are based on Ground Snow Load – adjustment for roof conditions are built in!

**RC SNOW MAP**

Footnote i: Adjust ground snow load at locations above 1000 feet elevation

**Section R301.2.1**
- Wind Limitations
  - Buildings shall be limited by wind speed as defined in Table R301.2(1)
  - Basic wind speed shall be determined by Figure B301.2(4)

**R301.2.1.4 - Exposure Categories**
- Exposure “A”
  - Large city center. Not typical of Residential Code building
- Exposure “B” (This is presumed unless site meets another category)
  - Urban/suburban, low-rise construction, fairly dense
- Exposure “C”
  - Suburban/rural with some topological differences
  - Hurricane prone regions
- Exposure “D”
  - Flat, unobstructed areas with wind flowing over water (Municipalities on Lake Ontario or Lake Erie)
Lesson 3: Building Planning

High Wind and Hurricane Prone areas

- R301.2.1.1 Design Criteria
  - Building design MUST comply with 1 of 5 listed methods:
    - AFPA, SBCC, ASCE-7, Cold-formed steel, Concrete
  - R301.2.1.2 Internal Pressure
    - Protect Openings … OR … Design as a Partially Enclosed Building
    - Exception for Wood Structural Panels

Seismic Design Category

What did you learn in Course 9D?

You will provide the information on table R301.2(1) to establish the minimum acceptable structural requirements

<table>
<thead>
<tr>
<th>GROUND SNOW LOAD</th>
<th>WIND Speed (mph)</th>
<th>SEISMIC DESIGN CATEGORY</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

R301.2.2 - Seismic Provisions

ONLY applies to Seismic Design Categories C and D
- NY has several C and D category areas!
- Detached one- and two-family in category C are EXEMPT
- Additional seismic requirements found in prescriptive construction chapters…

Table R301.2(1)

<table>
<thead>
<tr>
<th>SUBJECT TO DAMAGE FROM</th>
<th>Weathering a</th>
<th>Frost line depth b</th>
<th>Termite c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weathering</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| NYS is entirely in the severe zone
| Concrete requirements |
| Frost line depth       |              |                    |           |
| Based on local conditions
| Chapter 4 Footing and foundations |

“Termite”
- Protection and prevention
- Based on figure R301.2(6) (Termite)
Or known local conditions
Lesson 3:
Building Planning

**R320 Protection Against Termites**

Infestation probability
- Figure 301.2(6)
- Control to be provided by:
  - Chemical soil treatment
  - Termite baiting system
  - AWPA complying pressure treated wood
    - Field cut ends, notches, and drilled holes require re-treatment in field
  - Naturally termite-resistant woods
  - Plastic or metal physical barriers (shields)
  - Or any combination of the methods above

**Table R301.2(1)**

<table>
<thead>
<tr>
<th>ICE SHIELD UNDERLAYMENT REQUIRED</th>
<th>FLOOD HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice Shield Underlayment</td>
<td></td>
</tr>
<tr>
<td>Must be provided on all roof eaves in N.Y.S. to a distance of 24” inside the exterior wall of the building line</td>
<td></td>
</tr>
<tr>
<td>Flood Hazards</td>
<td></td>
</tr>
<tr>
<td>Based on FIRM maps</td>
<td></td>
</tr>
<tr>
<td>Design Flood elevation PLUS Freeboard of 2’</td>
<td></td>
</tr>
</tbody>
</table>

**R324 Flood-Resistant Construction**

Requirements for areas prone to flooding
- Protection of equipment and systems
- Elevation of living spaces
- Foundation design and construction

**As-built elevation certification**
- 324.1.9
- Licensed surveyor or design professional

“A” or “V” Zone requirement compliance
- R324.2 Flood Hazard Areas (A Zones)
- R324.3 Coastal High Hazard Areas (V Zones)
  - Certification by design professional required

**R319 Protection Against Decay**

- Construction in areas subject to decay
  - See Figure 301.2(7)
- Approved species/grade of lumber
  - AWPA pressure preservative treated or decay-resistant heartwoods
- Required if contact with, or proximity to
  - Ground, Concrete or Masonry
- Fasteners
  - Hot-dipped galvanized steel, stainless steel, silicon bronze or copper

**Chapter 3 - Building Planning**

Topic 2

Requirements for:
- Habitability
- Fire Safety and Protection

What is Habitable Space?
Fire Safety and Protection
- Exterior walls
  - Table R302.1
  - Does not apply in walls that are perpendicular
  - Projections limited to 12” into space where openings are prohibited
- Exceptions
  - Sheds and playhouse if Permit is Not Required
  - Detached Garage allowed within 2’

Table R302.1

<table>
<thead>
<tr>
<th>EXTERIOR WALL ELEMENT</th>
<th>MINIMUM FIRE- RESISTANCE RATING</th>
<th>MINIMUM FIRE SEPARATION DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walls</td>
<td>(Fire-resistance rated) 1 hour with exposure from both sides</td>
<td>0 feet</td>
</tr>
<tr>
<td></td>
<td>Not fire-resistance rated 0 hours</td>
<td>5 feet</td>
</tr>
<tr>
<td>Projections</td>
<td>(Fire-resistance rated) 1 hour on the underside</td>
<td>4 feet</td>
</tr>
<tr>
<td></td>
<td>Not fire-resistance rated 0 hours</td>
<td>5 feet</td>
</tr>
<tr>
<td>Openings</td>
<td>Not allowed N/A</td>
<td>&lt; 3 feet</td>
</tr>
<tr>
<td></td>
<td>25% Maximum of Wall Area 0 hours</td>
<td>3 feet</td>
</tr>
<tr>
<td></td>
<td>Unlimited 0 hours</td>
<td>5 feet</td>
</tr>
<tr>
<td>Penetrations</td>
<td>All Comply with Section R317.3</td>
<td>&lt; 5 feet</td>
</tr>
<tr>
<td></td>
<td>None required 5 feet</td>
<td></td>
</tr>
</tbody>
</table>

R302 Exterior Wall Location

Fire Safety and Protection
- Location on lot
  - 1 hr rating if < than 5’ fire separation distance
  - Openings not permitted, (some exceptions)

R303 Habitability
- Light and Ventilation - R303
  - Natural light
    - Minimum glazing area = 8% of the floor area
  - Natural ventilation
    - Minimum openable area = 4% of the floor area
  - Allowance to “borrow” from adjacent rooms

Natural Light and Ventilation
- Natural Light
  - Calculate total surface area of all glazing in the room
- Natural Ventilation
  - Calculate the total area of all doors, windows and louvers in the room that open to outside air

Borrowed Light and Ventilation
1. Calculate total floor area for both rooms
2. Windows in living room must equal 8% of total floor area
3. Openable windows in living room must equal 4% of total floor area
4. Opening criteria in R303.2 Adjoining rooms
Lesson 3: Building Planning

Step #1:
- Find this window chart in the appendix of your workbook
- 2 pages:
  - Vent Units
  - Fixed and Transom

Light and Ventilation Example
Bedroom #2
- 168 SF
- Req’d light is 8%
- Req’d ventilation 4%
- Window is “E”
  - From the Window Schedule
  - PTD 2953-2
  - 2 units

Using the Pella Window information

Plan Review

Types of Safety Glass
Tempered
Lesson 3: Building Planning

Types of Safety Glass

Laminated Safety Glass

Strengthened Glass

Heat Strengthened Glass

Chemically Strengthened Glass

Hazardous Locations RCNY

Identifying Safety Glazing

Fire Safety and Protection

Garages and Carports

- No openings to sleeping rooms
- Door assembly must be ¾ hour rated
  - Self closing
- Duct work in garage area must be
  - Min 26 gage steel
  - Have NO openings in garage area

Fire Safety and Protection

Garages and Carports

- Separation must be provided
  - Vertically
  - Horizontally
- Separation must have a ¾ hour fire-resistance rating
  - Or meet the requirements of the exception
Lesson 3: Building Planning

R310 Escape/Rescue Openings

Fire Safety and Protection
- Emergency Escape and Rescue Openings
  - Required from:
    - Basements with habitable space
    - Every sleeping room

R310 Escape/Rescue Openings

Minimum Dimensions
- Minimum openable area 5.7sq.ft.
  (see exception)
- Minimum opening height 24"
- Minimum opening width 20"
- Maximum sill height of 44"
- Must be openable without keys or tools

R310 Escape/Rescue Openings

Window Wells
- Permanent ladder or steps if deeper than 44"
- Minimum width of 36"
- Minimum 36" horizontal projection
- Minimum net area 9 SF
- Maximum 44" sill height

R310 Escape/Rescue Openings

R311 Means of Egress

Fire Safety and Protection
- Hallway width 3'-0" minimum
- Doors
  - One swinging exit door from dwelling to exterior
    - Minimum of 3'0" width, 6'8" height
  - Operable without key, tool or special knowledge

R311 Means of Egress

- Space under stairs
- Stairways
  - Headroom
  - Riser height
  - Tread width
    - plus nosing
  - Riser height

R312 Guards

- Required when:
  - 30" or greater elevation change
  - Open side of stairs exceeding 30"
- Guard opening limitations:
  - Balustrade can't allow passage of a 4" sphere
  - Tread opening can't allow passage of a 6" sphere

R312 Guards

No passage of 4" sphere
30" or more

4 3/8" allowed here

No passage of 6" sphere
Lesson 3: Building Planning

For more Stair Construction Details …

- www.stairways.org

RC  

R313.1 Smoke Alarms  

Fire Safety and Protection

- Single and multiple-station smoke alarms shall be installed in
  - Each sleeping room
  - Outside each separate sleeping area
  - In each additional story
- Power source
  - Hard wired and battery back up

RC  

R313.4 CO Alarms  

Fire Safety and Protection

- Required Locations
  - Any story having a sleeping area
  - Any story with a CO source
  - Normally hardwired and interconnected

RC  

R313.5 Sprinkler Systems  

Fire Safety and Protection

- Three story above a basement
- NFPA 13D sprinkler system

RC  

Fire Safety and Protection

- Dwelling Unit Separation – R317
  - Must have minimum 1 hour rating (exception)
  - Must be structurally independent
  - All supporting structural elements must have same rating
- Must be provided in
  - Two-Family Dwelling
  - Townhouse Separations

RC  

Lesson 3 Summary

- Chapters 1, 2 and 3
  - Administration, Definitions, Building Planning
  - Performance requirements
- Next lessons Chapters 4 through 10
  - Prescriptive Construction Requirements
  - Specific to building components and systems
Lesson 4: Foundations

Chapter 4  Foundations

**Section R401**

- **R401.1 Application**
  - Use this chapter to design and construct
  - Foundations
  - Foundation spaces
  - Wood foundations use
  - AF&PA Permanent Wood Foundation Design Specification
  - See exceptions

- **R401.2 Requirements**
  - Must carry all loads
  - Transmit loads
  - Be supported by proper soils

**R401.3 Drainage**

- **Surface Drainage**
  - to storm sewer
  - approved collection point
  - Final grade shall pitch at least 6” within the first 10’ of foundation

- **R401.4 Soil tests shall be required**
  - If soil conditions are unknown
  - If soils are known to be of poor quality

**In lieu of a full geotechnical evaluation the load bearing values in table R401.4.1 shall be assumed**

**Table R405.1**

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
<th>Classification</th>
<th>Ability</th>
<th>Permeability</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Gravelly sand, gravel and sand, both or either</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>SP</td>
<td>Sandy gravelly sand, gravelly sand, and sand</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>SW</td>
<td>Silty sand, sandy loam, and loam</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>SM</td>
<td>Silty sand</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>OC</td>
<td>Organic clay</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>SC</td>
<td>Sandy clay</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
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<tr>
<td>CL</td>
<td>Clays</td>
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<td>Moderate</td>
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<td>CO</td>
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<td>CS19</td>
<td>Clayey silts</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>CS20</td>
<td>Clayey silts</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>CS21</td>
<td>Clayey silts</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>CS22</td>
<td>Clayey silts</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
</tbody>
</table>

**R402. Materials**

- **R402.1 Wood Foundations**
- **R402.1.1 Fasteners**
- **R402.1.2 Wood treatment**
- **R402.2 Concrete**
  - Compressive strength
  - Air entrainment
  - See Table R402.2

4 - 1
Lesson 4: Foundations

### Table R402.2 Minimum Specified Compressive Strength of Concrete

<table>
<thead>
<tr>
<th>Type or Location of Concrete Construction</th>
<th>Minimum Specified Compressive Strength ( F'c )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basement walls, foundations and other concrete not exposed to the weather</td>
<td>2,500 psi</td>
</tr>
<tr>
<td>Basement slabs and interior slabs on grade, except garage floor slabs</td>
<td>2,500 psi</td>
</tr>
<tr>
<td>Basement walls, foundation walls, exterior walls and other vertical concrete work exposed to the weather</td>
<td>3,000 psi</td>
</tr>
<tr>
<td>Porches, carport slabs and steps exposed to the weather, and garage floor slabs</td>
<td>3,500 psi</td>
</tr>
</tbody>
</table>

### R403.1.1 Minimum Footing Size

- **Spread footings**
  - Minimum 6" thick
  - Width \( W \)
    - Table R403.1
  - Projection \( P \)
    - Minimum 2"
    - Max. thickness of footing
  - Pier footing size
    - Based on tributary loads

- **Width \( W \) shall be determined by**

### Table R403.1 Minimum Width of Concrete or Masonry Footings (inches)

<table>
<thead>
<tr>
<th>Load-Bearing Value of Soil (psf)</th>
<th>1,500</th>
<th>2,000</th>
<th>3,000</th>
<th>4,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional light-frame construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-story</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>2-story</td>
<td>15</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>3-story</td>
<td>21</td>
<td>17</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>4&quot; brick veneer over light frame or 8&quot; hollow concrete masonry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-story</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>2-story</td>
<td>21</td>
<td>17</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>3-story</td>
<td>32</td>
<td>24</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>8&quot; solid or fully grouted masonry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-story</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>2-story</td>
<td>21</td>
<td>17</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>3-story</td>
<td>42</td>
<td>32</td>
<td>21</td>
<td>12</td>
</tr>
</tbody>
</table>

### R403.1.3 Seismic Reinforcing

- Concrete footing in Seismic Design Categories D₀, D₁ and D₂
  - Shall have reinforcement
  - Reinforcement shall be min of 3" from bottom of footing
Lesson 4: Foundations

R403.1.4 Minimum Depth

- Below frost line in Table R301.2(1)
  - 12" min. below undisturbed ground
- Minimum depth exceptions:
  - Frost-protected footings in R403.3
  - ASCE 32 (Frost Protected Shallow Foundation)
  - Footings/Foundations on solid rock

<table>
<thead>
<tr>
<th>Weathering *</th>
<th>Frost line Depth *</th>
<th>Termite *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Insert Frost Depth here

Exceptions:
- Free standing accessory structures...
- 600 SF or less, LIGHT-FRAMED CONSTRUCTION
- 400 SF or less, of OTHER THAN LIGHT-FRAMED
- Decks adjoining but ...

More Footing Details

- 403.1.5 Slope
  - Top of footings must be level
  - Bottom surfaces no greater than 1 to 10 slope
- 403.1.6 Foundation anchorage
  - Anchor bolt spacing
  - Size, depth
  - Other fasteners

Footings on or adjacent to slopes

R403.1.7.1 Building clearance from ascending slopes
R403.1.7.2 Footing setback from descending slopes
R403.1.7.3 Foundation elevation
R403.1.7.4 Alternative setback and clearances

Foundations in Expansive Soils

“Foundations and floor slabs for buildings located on expansive soils shall be designed in accordance with section 1805.8 of the Building Code of New York State”

R404.1 Foundation Walls

- R404.1 Concrete and Masonry Foundations:
  - R404.1.1 Masonry
  - R404.1.2 Concrete
- Typical acceptable wall designs from:
  - R404.1.1 Tables in Code
  - OR listed ACI, NCMA, ASCE or TMS Standards
- Engineered design required when:
  - Hydrostatic pressure from ground water
  - Unbalanced backfill against unsupported walls
Lesson 4: Foundations

**R404.1.1 Foundation Tables**

- **Use the appropriate table…**
  - Table R404.1.1(1) Plain Masonry
  - Table R404.1.1(2) 8" Reinforced Masonry
  - Table R404.1.1(3) 10" Reinforced Masonry
  - Table R404.1.1(4) 12" Reinforced Masonry
  - Table R404.1.1(5) Concrete Foundation Walls

**Terminology (Footnote)**

- “Unbalanced backfill”
  - The height difference between exterior and interior ground levels
  - Measured from exterior finish grade to top of interior floor/ground level

**Backfill requirements**

404.1.6

Top of finished foundation must be
- 4" above finish grade for brick veneer
- 6" above grade for all other finishes

404.1.7

Backfill shall only be placed against walls when
- The wall has achieved proper strength and has been anchored to the floor above
- Has been braced to prevent damage

**R405 Foundation Drainage**

- Requires footing drains
  - with an exception

**R406 Waterproofing/Dampproofing**

- Damp proofing for all foundation walls
  - Parging with bituminous coating
  - Waterproofing for high water table areas
  - Membrane protection

**R407 Columns**

- Wood columns
  - Protected from decay
- Steel columns
  - Protected against corrosion
- Structural requirements
  - Shall be restrained to prevent movement
  - 4"x4" wood
  - 3" standard pipe

**R408 Under floor space**

- Crawl space requirements
  - Must be ventilated
  - See 408.2 for sizing
  - Must have access
  - Minimum 18"x24"
  - Shall be flood resistant
FLOORS

Chapter 5 covers 4 types of floor systems
- Wood floor framing
- Wood floors on the ground
- Steel floor framing
- Concrete slabs on the ground

Design and construction of ALL floors
Including attics with mechanical/plumbing equipment
Must comply with appropriate section

Because they are the most common types used in NYS we will concentrate on
- Wood floor systems
- Concrete slabs on grade

R501.2 - Loads
Accommodate loads in accordance with R301

<table>
<thead>
<tr>
<th>USE</th>
<th>LIVE LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attics with limited storage**</td>
<td>20</td>
</tr>
<tr>
<td>Attics without storage*</td>
<td>10</td>
</tr>
<tr>
<td>Decks*</td>
<td>40</td>
</tr>
<tr>
<td>Exterior balconies</td>
<td>60</td>
</tr>
<tr>
<td>Fire escapes</td>
<td>40</td>
</tr>
<tr>
<td>Guardrails and handrails*</td>
<td>200</td>
</tr>
<tr>
<td>Guardrails in-fill components*</td>
<td>50</td>
</tr>
<tr>
<td>Passenger vehicle garages*</td>
<td>50</td>
</tr>
<tr>
<td>Rooms other than sleeping rooms**</td>
<td>40</td>
</tr>
<tr>
<td>Sleeping rooms</td>
<td>30</td>
</tr>
<tr>
<td>Stairs</td>
<td>40</td>
</tr>
</tbody>
</table>

R502 Wood Floor Framing

Identification
All dimensional lumber must have
- The grade mark of a grading or inspection agency
Or
- An approved certificate of inspection in compliance with DOC PS 20

EXCEPTION: Rough sawn lumber

Grade Mark examples
Lesson 5:
Floors

**Rough Sawn Lumber**

*Exception:*
- Rough Sawn Lumber will be allowed for use in construction in one of two ways:
  1. If sold directly to consumer or builder
  2. If the lumber comes with a letter from the sawyer stating the lumber is equal to #2 grade lumber

**Treated Lumber**

Identification
Treated dimensional lumber must also bear a grade stamp and quality mark.

**Wood Floor Framing**

IDENTIFICATION: The grade mark must also be visible on all...
- End jointed lumber
- Prefabricated wood I joists
  - Must comply with the appropriate regulating standards

**Wood Floor Framing**

Must be Designed, Constructed and Inspected to...
- Requirements of Chapter 5
- Figure R502.2
- R319 Protection against decay
- R320 Protection against termites

**Wood Floor Framing**

502.1.6 Structural log members.
- Stress graded ... OR
- Certificate of Inspection as to species and grade

**Figure 502.2**
502.2.1 DECKS

- Deck live loads must be as shown in Table 301.5
  - Where decks are designed with a cantilever, the uplift forces must be equal to the loads

<table>
<thead>
<tr>
<th>USE</th>
<th>LIVE LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attics with limited storage</td>
<td>20</td>
</tr>
<tr>
<td>Attics without storage</td>
<td>10</td>
</tr>
<tr>
<td>Decks</td>
<td>40</td>
</tr>
<tr>
<td>Exterior balconies</td>
<td>60</td>
</tr>
<tr>
<td>Fire escapes</td>
<td>40</td>
</tr>
<tr>
<td>Guardrails and handrails</td>
<td>200</td>
</tr>
</tbody>
</table>

502.2.2 DECKS

Where supported by attachment to an exterior wall decks

- Shall be positively anchored (bolts)
- Shall be designed for vertical loads
- Shall be designed for lateral loads

If connections can’t be inspected, deck must be self supporting

Allowable Joist Spans

- Tables R502.3.1(1) and (2)
  - Allowable Spans for Common Species
- Table R502.3.1(1) for 30 psf Live load
  - Sleeping and attic areas
- Table R502.3.1(2) for 40 psf Live load
  - Other floor areas

Floor Joist Span Examples

- Given: Sleeping area
  - Appropriate table?
    - Table R502.3.1(1)
  - 2 x 6, Spruce-pine-fir, grade #2 at 16” o.c.
  - Allowable Span?

R502.3.3 Floor Cantilevers

- Cantilevers shall not exceed the nominal depth of the joist
- The ratio of back spans to cantilever must be at least 3 to 1
Lesson 5:
Floors

R502.3.3 Floor Cantilevers

- In limited application, up to a 70 lb ground snow load.
- Single story cantilevers may also be constructed using Table R502.3.3(1)
- Exterior Balcony uses Table R502.3.3(2)

- All others will require engineer certification

R502.4 Joists Under Bearing Partitions

- If framed for pipe or duct passage must be solid blocked 4’ o.c.

- Joists under bearing partitions must be sized to support loads

R502.5 Allowable Girder Spans

Girders constructed of dimensional lumber shall not exceed values in tables

- R502.5(1)
  - Girder and header spans for exterior bearing walls
- R502.5(2) (left out is a typo)
  - Girder and header spans for interior bearing walls

R502.6 Bearing Requirements

- Joists, beams, girders

- 1.5” bearing on wood or metal

- 3” bearing on masonry or concrete

Other options: 1 x 4 ribbon strip or hangers

| TABLE R502.3(1) Girder Spans and Header Spans for Exterior Bearing Walls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 28 | 36 | 20 | 28 | 36 | 20 | 28 | 36 | 20 | 28 | 36 |
| 30 | 50 | 70 | 30 | 50 | 70 | 30 | 50 | 70 | 30 | 50 | 70 |
| 40 | 60 | 80 | 40 | 60 | 80 | 40 | 60 | 80 | 40 | 60 | 80 |
Lesson 5: Floors

502.6.1 Floor systems
- Framing shall lap a minimum of 3"
- Shall be nailed with minimum of 3-10d nails
  OR
- Must be provided with a wood or metal splice

502.6.2 Joist Framing
Framing into wood girders
- Approved framing anchors
  OR
- Nail in place and support on 2" x 2" (nominal) ledger

502.8 DRILLING AND NOTCHING
- Structural floor framing using sawn lumber can only be cut, notched, or drilled in accordance with figure 502.8
- Structural floor framing using engineered systems
  - Glue lams
  - I-joists
  - Trusses
  Can only be cut, notched, or bored if such altering is specifically considered in the design of the member

Fig. 502.8 Cutting, Notching and Drilling

R502.10 Framing of Openings
Header joists 4 feet or less need not be doubled

R502.10 Framing of Openings
Header joists
- Over 4' must be doubled
- Over 6' require approved hangers
Tail joist
- Over 12' need a hanger or ledger at header
Lesson 5: Floors

R502.11 Wood Trusses

- Must be
  - Engineered designed and must have all certification documentation
  - Temporarily braced during construction
  - Permanently braced per specifications

- Must NOT be
  - Site altered in any way without approval of a design professional
  - Installed if damaged without approval of a design professional

R502.12 Draftstopping

- Must be provided if concealed spaces exceed 1000 sq. ft. (interconnected)

Typical ways to produce this scenario:
- Suspended ceiling under floor framing
- Using open web trusses to frame floor

Draftstopping must be constructed using an approved material as described in the code.

R503.2.1 Wood Structural Panels

- All Wood Structural Panels (Plywood) must be identified by a grade stamp

R503 Floor Sheathing

Wood structural panels use Tables R503.2.1.1(1) and R503.2.1.1(2)

<table>
<thead>
<tr>
<th>Span Rating</th>
<th>Min. Nominal Thickness</th>
<th>Allowable Live Load (PSF)</th>
<th>Maximum Span (inches)</th>
<th>Maximum Span Load (PSF, at maximum span)</th>
<th>Sufficient Span Load (PSF, at maximum span)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/0</td>
<td>5/16</td>
<td>12</td>
<td>12</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>16/0</td>
<td>5/16</td>
<td>16</td>
<td>16</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>20/0</td>
<td>5/16</td>
<td>20</td>
<td>20</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>24/0</td>
<td>3/8</td>
<td>24</td>
<td>24</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>24/16</td>
<td>7/16</td>
<td>24</td>
<td>24</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>32/16</td>
<td>15/32, 1/2</td>
<td>32</td>
<td>28</td>
<td>40</td>
<td>30</td>
</tr>
</tbody>
</table>

R506 Concrete Floors (On Ground)

- 3.5” minimum slab thickness
- IF “expansive” soil - R403.1.8 (Comply with Building Code Section 1805.8)
- Compressive strength - R402.2
- 2,500 psi
- 4” base course if slab is below grade
- Vapor retarder between slab and base

R506 Concrete Floors (On Ground)

- 506.2.4 Reinforcement support.
  ...from the center to upper one third of the slab for the duration of the concrete placement.
Lesson 5: Floors

First Floor Framing
Reading the Plans

- NON-Prescriptive framing
- Engineered Lumber
  - Follow manufacturer’s instructions
- TJI TrusJoist floor and ceiling joists
- Microllam LVL beams and girders

Materials - Joists
Locator
Joist identifier for location

Materials - Girders
Joist Locator
Connection Detail
MicroLam

Symbol Legend

Location
Beam label
Bearing required
Lesson 5: Floors

First Floor Framing

Reading the Plans

Level Notes

Scale

Loading

Flooring

Spacing

First Floor Framing

Manufacturer’s Specs

- TJI/Pro 120TS Span Table

Improved Performance System

L/480 Live Load Deflection

- Detail A2

First Floor Framing

Manufacturer’s Specs

- Detail B1

TJI Cantilever Details

Manufacturer allows load bearing cantilevers up to 2’
Non load bearing cantilevers up to 4’
See 3 details for load bearing cantilevers
Builders Guide

- Check on job site for proper handling of materials
- Be sure all bracing both temporary and permanent are installed properly

Holes in TJI Joists
To check compliance on our building you must use the TJI hole chart

Note:
- Closer to bearing point smaller hole allowed
- Mid span larger holes allowed
- No cutting or drilling top or bottom cord

First Floor Framing

Plan Review Exercise

- Use plan pages A-7 and A-8
- Complete all applicable sections of Item #1 of plan review form #3W
Lesson 6: Wall Construction

Chapter 6

Wall Construction

- Comply with appropriate section
  - R602 Wood Wall Framing
  - R603 Steel Wall Framing

Figure R602.3(1)
Depicts code provisions for wood frame systems

Figure R602.3(2)
Provides additional framing details for wood frame construction

Fasteners
- Tables R602.3(1) through R602.3(4)
  - Fastener Schedule for Structural Members
  - Examples:
    - Using table (1) find these examples
    - Top or sole plate to stud, end nail
      - 2-16d (3 1/2” x 0.135”) fasteners.
    - Built-up header, two pieces with 1/2” spacer
      - 16d (3 1/2” x 0.135”) fasteners at 16” o.c. along each edge

Table 602.3.1 Fastener Schedule
Using the Correct Fasteners

Table R602.3(1) identifies common nails for fastening sheathing materials to framing

Be sure the fasteners used on the job site are
- Common nails
- Equal or better
Residential Code

Lesson 6: Wall Construction

R602.3.1 Stud Spacing

Table R602.3.1(5) provides the prescriptive requirements for stud spacing in bearing walls up to 10' in height.

### Stud Spacing in Bearing Walls up to 10' in Height

<table>
<thead>
<tr>
<th>Size</th>
<th>Stud Spacing</th>
<th>Minimum Total Stud Size</th>
<th>Maximum Total Stud Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
<tr>
<td>2'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
<tr>
<td>3'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
<tr>
<td>4'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
<tr>
<td>5'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
<tr>
<td>6'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
<tr>
<td>7'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
<tr>
<td>8'</td>
<td>24 24 24</td>
<td>24 24 24</td>
<td>24 24 24</td>
</tr>
</tbody>
</table>

Bearing stud walls over 10' in height:
- Conform with Table R602.3.1

R602.4 Interior Load-bearing Walls

Interior load-bearing walls shall be:
- Constructed
- Framed
- Fireblocked

As specified for exterior walls.

R602.6 Drilling and Notching Studs

**Fig. 602.6(1)**

Exception:

Drilling and notching of top plates:

**Fig. 602.6.1**

If top plate of a bearing wall is notched or cut by more than 50% (as for the installation of piping or ductwork), strapping must be installed as shown above.

R602.7 Headers

Headers in load bearing walls must comply with Tables R502.5(1) and (2).

**REMEMBER?**
R602.8 Fireblocking Requirements

- Concealed stud spaces
  - Ceiling and floor levels
  - Horizontally at 10' intervals

- Connection between wall cavity and soffit areas

- Drop ceiling locations

- Connection between wall cavity and soffit areas

- Drop ceiling locations

- At cove or trayed ceiling locations

- At openings around tubs to close off connections between floors

- At the top and bottom of stair stringers

- At openings around pipes, ducts, vents at ceiling and floor levels

NONCOMMESTIBLE FIREBLOCKING

Noncombustible fireblocking must be provided at ceiling and floor levels around chimneys and flues

R602.8.1 Materials

- Acceptable firestopping materials include
  - Solid 2" blocking (nominal)
  - Two layers of 1" solid blocking
  - ¾" plywood or particle board
  - Fiber glass or mineral wool
    - Must be secured in place
    - Must completely fill the cavity for a dimension of 16"
Definitions: Review from 9D

- Braced Walls Lines
  - "A series of braced wall panels constructed in accordance with R602.10 for wood ... or R603.7, R301.1.1 for steel ... to resist racking ..."
- Braced Wall Panel
  - "A section of braced wall line constructed in accordance with R602.10 for wood ... or R603.7 or R301.1.1 for steel, which extends the full height of the wall."

R602.10 Wall Bracing

- Requirements and location
  - Table R602.10.1
  - Panels must begin within 12’6” of the end of wall
  - In line, or offset no more than 4’

R602.10.1 Braced Wall Lines

- Meet one of 8 designs in section R602.10.3
- Seismic category and location in structure will govern which design may be used
- Length of panels must comply with R602.10.4
  - Generally 48”

Resisting Lateral Loads
Chapter 6 Walls: Prescriptive Application

<table>
<thead>
<tr>
<th>Seismic Design Category or Wind Speed</th>
<th>Categories A and B (S_d ≤ 0.35g and S_d ≤ 0.33g) or 100 mph and less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>Type of Wall **</td>
</tr>
<tr>
<td>Top story of first story</td>
<td>Methods 2, 3, 4, 5, 6, 7 and 8 in R602.10 and at floors of less than 100 mph</td>
</tr>
<tr>
<td>First story of first story</td>
<td>Methods 2, 3, 4, 5, 6, 7 and 8 in R602.10 and at floors of less than 100 mph</td>
</tr>
<tr>
<td>First story of second story</td>
<td>Methods 2, 3, 4, 5, 6, 7 and 8 in R602.10 and at floors of less than 100 mph</td>
</tr>
<tr>
<td>First story of third story</td>
<td>Methods 2, 3, 4, 5, 6, 7 and 8 in R602.10 and at floors of less than 100 mph</td>
</tr>
</tbody>
</table>
Lesson 6: Wall Construction

Resisting Lateral Loads
Chapter 6 Walls: Prescriptive Application

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>TYPE OF BRACE</th>
<th>AMOUNT OF BRACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>One story</td>
<td>1, 2, 3, 4, 5, 6, 7 or 8</td>
<td>Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 16% of braced wall line for Methods 2 through 8.</td>
</tr>
<tr>
<td>Top of two or three story</td>
<td>1, 2, 3, 4, 5, 6, 7 or 8</td>
<td>Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 16% of braced wall line for Method 3 or 25% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.</td>
</tr>
<tr>
<td>First story of two story</td>
<td>1, 2, 3, 4, 5, 6, 7 or 8</td>
<td>Located in accordance with Section R602.10 and at least every 25 feet on center but not less than 25% of braced wall line for Method 3 or 35% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.</td>
</tr>
<tr>
<td>Second story of three story</td>
<td>1, 2, 3, 4, 5, 6, 7 or 8</td>
<td></td>
</tr>
<tr>
<td>First story of three story</td>
<td>1, 2, 3, 4, 5, 6, 7 or 8</td>
<td></td>
</tr>
</tbody>
</table>

8 Methods for Braced Panels
1. 1 x 4 diagonal brace
2. Wood boards, diagonally
3. Wood structural panels
4. Fiberboard sheathing panels
5. Gypsum, sheathing or wallboard
6. Particle board sheathing panels
7. Portland cement plaster
8. Hardboard panel siding

Resisting Lateral Loads
Chapter 6 Walls: Prescriptive Application

R602.10.5 Appendix pg. 11
Continuous Structural Panel Sheathing

- Another approach to bracing wall lines
  - Use structural panels
  - Entire wall must be sheathed
  - Length (width) of braced panel may be REDUCED to as little as 24”

Normal Bracing Method

- Normal PANEL WIDTH is 48”

Panels are required near each end, and in Seismic Category “C” the wall could require 16% to 60% braced panels
Lesson 6: Wall Construction

R602.10.5 Continuous Structural Panel Sheathing

... braced wall panel lengths (width) shall be in accordance with...

<table>
<thead>
<tr>
<th>TABLE R602.10.5 Length Requirements for Braced Wall Panels in a Continuously Sheathed Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINIMUM LENGTH OF</td>
</tr>
<tr>
<td>BRACED WALL PANEL</td>
</tr>
<tr>
<td>(inches)</td>
</tr>
<tr>
<td>8-foot wall</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>32</td>
</tr>
<tr>
<td>24</td>
</tr>
</tbody>
</table>

First Benefit!

R602.10.5 Continuous Structural Panel Sheathing

- Reduction in the AMOUNT (total length) of braced panels is allowed
  - Based on Table R602.10.1, Method 3
  - Multiply the required % x 0.9
  - Next to 85% height opening
  - Multiply the required % x 0.8
  - Next to 67% height opening

Second Benefit!

R602.10.5 Continuous Structural Panel Sheathing

- Reductions allowed for CONTINUOUS SHEATHING

<table>
<thead>
<tr>
<th>Glens Falls: SDC “C”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max opening is 67% of wall height (window)</td>
</tr>
<tr>
<td>One story or top story</td>
</tr>
</tbody>
</table>

Example: Appendix pg. 12

- Length of braced wall line is 50'.
- This is a one story house.
- Wall height is 8'.
- This wall contains a door, but no full height opening.

This was a couple slides back!
Lesson 6: Wall Construction

Example: Step 1

- Determine Required % of Bracing
  - Table 602.10.1
  - Max. opening height

When maximum opening in braced wall line is a door - 85% of wall height

One story house

Normally 16%, reduced by a factor of .8 = 14.4%

Example: Step 2

- Evaluate each panel to determine if the panel qualifies
  - Based on TABLE 602.10.5

Example: Step 2

- Evaluate each panel to determine if the panel qualifies
  - Based on TABLE 602.10.5

Example: Step 2

- Evaluate each panel to determine if the panel qualifies
  - Based on TABLE 602.10.5

Example: Step 2

- Evaluate each panel to determine if the panel qualifies
  - Based on TABLE 602.10.5

PANEL 1: Required to be 32” - Qualifies

PANEL 2: Required to be 32” because of the DOOR opening - Does NOT Qualify

PANEL 3: Required to be 24” - Qualifies

PANEL 4: Required to be 24” - Qualifies
Lesson 6: Wall Construction

Example: Step 3

- NEEDED
  - 50' wall requires 14.4% braced = 7.2'

- As shown 34" + 24" + 24" = 82"
  - 82" = 6'-10"

- Required is 14.4% - This example FAILS

Example: Step 4

- From Table 602.10.1, Ensure panels are spaced no more than 25' on center and are located near each end of the braced wall line

602.10.6 Alternate Bracing Methods

602.10.6.1 Alternate braced wall panels

- Allowed as a replacement for a 4' panel

<table>
<thead>
<tr>
<th>SEISMIC CATEGORY AND WINDSPEED</th>
<th>TIE-DOWN FORCE (lb)</th>
<th>HEIGHT OF BRACED WALL PANEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sheathed Width</td>
<td>8 ft.</td>
</tr>
<tr>
<td>SDC A, B, and C, Windspeed &lt; 110 mph</td>
<td>R602.10.6.1, Item 1</td>
<td>1800</td>
</tr>
<tr>
<td></td>
<td>R602.10.6.1, Item 2</td>
<td>3000</td>
</tr>
<tr>
<td>SDC D0, D1, and D2, Windspeed &lt; 110 mph</td>
<td>R602.10.6.1, Item 1</td>
<td>1800</td>
</tr>
<tr>
<td></td>
<td>R602.10.6.1, Item 2</td>
<td>3000</td>
</tr>
</tbody>
</table>

R604 Wood structural panels

- Must have identification and grade stamp

- Meet spans shown in Table R602.3(3)

- Attached to framing as indicated in Table R602.3(1)

OTHER MATERIALS

- Chapter 6 also covers the requirements for constructing walls using other materials such as
  - Steel
  - Masonry
  - Insulated concrete form

- If the plans indicate use of one of these other materials follow the requirements found in the appropriate section
LESSON 7
CHAPTER 7
WALL COVERINGS

NEW YORK STATE RESIDENTIAL CODE

Wall coverings
- All wall coverings
  - Interior
  - Exterior
  Shall comply with this chapter

R702 Interior Coverings
- Shall be installed to tables
  - R702.1(1) Thickness of Plaster
  - R702.1(2) Gypsum Plaster Proportions
  - R702.1(3) Portland Cement Plaster
  - R702.3.5 Min. Thickness of Gypsum Board

R702.3 Gypsum Board (Interior)
- Because it is the most widely used material we will concentrate on Gypsum Board
- All gypsum Board materials and accessories must comply with the ASTM requirements shown in section R702.3.1

R702.3.2 Wood Framing
- Framing supporting gypsum board shall be
  - Minimum 2" thick (nominal) in the least dimension
  - Minimum 1” furring strip installed over solid backing or studs 24” o.c. maximum

R702.3.5 Application
- Gypsum board must be installed to tables
  - R702.3.5 Interior
  - R602.3(1) Exterior
  to assure proper size, spacing, fastening and orientation to supporting structures
Lesson 7: Wall Covering

**TABLE R702.3.5**
APPLICATION OF GYPSUM BOARD

<table>
<thead>
<tr>
<th>Application</th>
<th>1/2&quot; Combined</th>
<th>5/8&quot; Combined</th>
<th>3/4&quot; Combined</th>
<th>7/8&quot; Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch Hastings</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Ch Hastings</td>
<td>16</td>
<td>17</td>
<td>18</td>
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<td>19</td>
</tr>
<tr>
<td>Ch Hastings</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
</tbody>
</table>

**R702.3.6 Fastening**

- When using screws to attach gypsum to wood framing screws must be
  - Type W
  - Type S
  - Must penetrate the framing member a minimum of 5/8"

R703 Exterior Coverings

- Exterior wall must protect the structure with a weather resistant envelope
  - Includes flashing (R703.8)
  - Water resistant barrier
  - Means of draining to the exterior
  - Condensation protection (Energy chapter)
- Use Table R703.4 for exterior finishes and fastening

Water Resistive Barriers

- "water-resistive barrier"
- "weather-resistant barrier"

WATER-RESISTIVE BARRIER (WRB)

- A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

Water Resistive Barriers

- Defined as minimum water vapor permeance of 300ng/ Pa s m²
- Examples:
  - #15 Felt Paper (or better)
  - Grade D Building Paper
  - Tested House Wraps
  - Insulating Sheathing???
Lesson 7: Wall Covering

Types of Flexible Sheet Barriers
- Asphalt saturated organic felt
- Asphalt saturated kraft paper
- Polymer sheets (polyolefin fibers or extruded polyethylene films)

Other Types of WRBs
- Board products (i.e., foam core board)
- Liquid or trowel applied products

Water Resistive Barriers
- Water resistive barriers, combined with proper flashing, are intended to block liquid water from entering wall assembly.
- Objective is to channel liquid water and drain to the exterior.

Water Resistive Barriers
- Wall assemblies do not have to be designed to drain accumulated water to the exterior of the veneer if:
  - They have been designed to resist wind-driven rain.
  - Have been tested and found to comply with ASTM E311 under prescribed conditions.
- Masonry & concrete walls are also exempt.

Flashing
- EXPANDED REQUIREMENT
  - Flashing shall be installed in shingle fashion
  - Flashing shall be installed at exterior window and door openings
  - Shall extend to the surface of exterior wall finishes or to the water-resistive barrier for subsequent drainage from the exterior wall envelope

R703.4 Attachment
- Exterior wall coverings must be attached as shown in table R703.4
  - OR With
    - Aluminum
    - Stainless steel
    - Zinc-coated
    - Or other corrosive resistive fasteners
Lesson 7:
Wall Covering

**Summary**
- Interior and Exterior sheathing must be installed as shown in Chapter 7
- Regulates:
  - Thickness of material
  - Spacing of supporting structure
  - Fasteners to be used
LESSON 8
CHAPTER 8
ROOF–CEILING CONSTRUCTION

Chapter 8
Consists of 8 sections
- R801 General
- R802 Wood Roof Framing
- R803 Roof Sheathing
- R804 Steel Roof Framing
- R805 Ceiling Finishes
- R806 Roof Ventilation
- R807 Attic Access
- R808 Insulation Clearance

R802.3 Framing Details
- Valley and Hip Rafters
  - Supported at the ridge by a brace that transfers the load to a bearing partition
  - Roof pitch < 3/12
  - Structural members supporting rafters and joists
    - To be designed as beams

R802.3.1 Connections
- Ceiling joists and rafters must be nailed together according to Table R802.5.1(9)
- Ceiling joist shall be nailed to the top plate in accordance with Table 602.3(1)
Lesson 8: Roof Ceiling Construction

R802.3.1 Connections

Ceiling joists parallel to rafters must be:
- continuous (one piece)
or
- secured over partitions and at rafters to provide a building tie

Ceiling joists not parallel to rafters must have:
- 1 x 4 Collar ties for wind uplift installed in upper third, not more than 4' O.C.
- 2 x 4 Rafter ties at bottom of opposing rafters

R802.3.2 Ceiling Joists

Minimum lap 3" or butted over bearing partitions or beams and toe nailed

Ceiling joists used to resist rafter thrust must be fastened according to Table R602.3.(1)

R802.4 Ceiling Joist Spans

Allowable spans for common species are found on tables ...
- R802.4(1) 10 psf LIVE load
  - Attic, no storage
- R802.4(2) 20 psf LIVE load
  - Attic, limited storage

AF&PA has Span Tables for other grades, species and loading conditions

R802.5 Rafter Spans

- Allowable rafter spans for common species are found in Tables R802.5.1(1) through R802.5.1(8)

- For other grades, species, or loading conditions use the AF&PA Span Tables and ASCE 7

R802.5.1 Purlins

Purlins are used to reduce the span of rafters

Purlins must be:
- Same size as the rafters
- Continuous
- Supported by 2" x 4" braces
  - Set on bearing wall
  - Minimum 45 degrees
  - Maximum spacing 4'
  - 8' maximum length
Lesson 8:
Roof Ceiling Construction

R802.6 Bearing
- Minimum bearing of rafters and ceiling joists must be:
  - Not less than 1½" on wood or steel
  - Not less than 3" on masonry or concrete

R802.7 Cutting and Notching
- Notches shall not:
  - Exceed one-sixth of the depth of the member
  - Be longer than one-third of the depth of the member
  - Be located in the middle one-third of the span
  - Exceed one-fourth the depth of member if notched at the end of members
  - The tension side of members shall not be notched except at the ends

R802.7 Cutting and Notching
Holes
- Diameters shall not exceed one-third the depth of member
- Shall not be closer than 2" from the top or bottom of member
- Shall not be closer than 2" to any other hole in the member, or to any notch in member

R802.7 Cutting and Notching
Engineered Wood Products
- Cuts, notches and holes ... are prohibited except where:
  - Permitted by the manufacturer's
  - Considered in the design by a registered design professional

  Translation:
  Engineered wood products can only be altered within the guidelines of the manufacturers specifications

R802.8 Lateral support
“Rafters and ceiling joists having a depth-to-thickness ratio exceeding 5 to 1 (nominal dimension) shall be provided with lateral support at points of bearing to prevent rotation”

Translation
Members larger than a 2x10 must be blocked at the bearing points

R802.8.1 Bridging
“Rafters and ceiling joists having a depth-to-thickness ratio exceeding 6 to 1 (nominal) shall be laterally supported by ...”
- Solid blocking
- Diagonal bridging (wood or metal)
- Continuous 1"x3" wood strip
- Fastened across rafters or ceiling joists at no more than 8’ intervals

Translation
Members larger than 2x12 must have bridging every 8 feet
Lesson 8: Roof Ceiling Construction

**R802.9 Framing of Openings**

Openings in roof framing must be framed using headers and trimmer joists. The requirements are very similar to those we covered for floors.

**R802.10 Wood Trusses**

- Truss Design Drawings
  - Provided with the trusses
  - Provided to the local CEO prior to installation
  - Must include minimum information specified in section R802.10.1

**R802.10.2 Truss Design**

- Wood Trusses must be designed using accepted engineering practice
- Truss design drawings shall be prepared by a design professional (and bear a seal and signature)
- The design and construction of all metal plate connected trusses shall comply with ANSI/TPI 1

**Example Truss lay-out**

Identifies truss location

**R802.10.3 Truss Bracing**

- Trusses must be braced to prevent rotation and to provide lateral stability as indicated in:
  - Construction Documents
  - Truss Design Drawings
  - BCSI 1-03

**Example**

Truss design drawings provided to the local CEO prior to installation.
R802.11 Roof Tie Down

- Subject to UPLIFT pressures of 20 lbs or greater … determined as follows:
  - Table R301.2(2) Components and Cladding
    - 100 SF and Zone 1
  - Table R301.2(3) Height and Exposure Category
  - Applies to Rafters and Trusses

FIGURE R301.2(8)

- Simplified wind design
- Not used or needed for Main Wind-force Resisting System
- RCNY is Prescriptive for most construction

TABLE R301.2(2)

Component and Cladding Loads
Mean roof height of 30 feet in Exposure Category B

<table>
<thead>
<tr>
<th>Effective Area</th>
<th>Basic Wind Speed</th>
<th>Wind Pressure Positive or Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZONE shown in Fig. 301.2(8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof assembly based on pitch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall construction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE R301.2(3)

Height and Exposure Adjustments
Multiply value from Table R301.2(2) by factor from this Table

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

Our Project Building

- Given:
  - Located in a 90 MPH Wind Zone
  - Steep Roof pitch
    - 9/12 and 12/12
  - 12.1 uplift pressure
    - Adjust for Roof Height (use 25')

Adjusted uplift is less than 20 lbs, hurricane straps NOT required
Lesson 8: Roof Ceiling Construction

R802.10.5
Truss to Wall Connection

- Install per the Manufacturer’s specifications
- Connection to resist uplift force as specified in the truss design drawings

3) Provide mechanical connections (by others) of truss to bearing plate capable of withstanding 417 lb. uplift at joint 1 and 514 lb. uplift at joint 7.

Summary

- We have now covered
  - Lessons
    - 5 Floors
    - 6 Walls
    - 7 Wall Coverings
    - 8 Roof Framing
- We have also looked at some of the typical areas to check during a framing inspection
Lesson 9: Roof Assemblies

LESSON 9
Chapter 9
Roof Assemblies

7 Sections
- R901 General
- R902 Roof Classification
- R903 Weather Protection
- R904 Materials
- R905 Requirements for Roof Coverings
- R906 Roof Insulation
- R907 Reroofing

R905 Sub-Sections
Each material has a section
- R905.2 Asphalt shingles
- R905.3 Clay/Concrete tile
- R905.4 Metal roof shingles
- R905.5 Mineral surface roll roofing
- R905.6 Slate shingles
- R905.7 Wood shingles
- R905.8 Wood shakes

ETC. through 905.15

R905.2 Asphalt Shingles
Shingles composed of organic felt or glass felt with granular mineral coating
- 3-tab
- Architectural
- Interlocking shingles

• R905.2 Asphalt Shingles. The installation of asphalt shingles shall comply with this section.

R905.2.1 Sheathing Requirements
- Shingles shall be fastened to solidly sheathed decks
  - R803 Provides the details for sheathing
    - Lumber sheathing
    - Spaced lumber sheathing
    - Structural panels
  - R803.2.3 Sheathing Fasteners

R905.2.2 Slope
- Roof Slope limits the use and installation of roof materials
  - Asphalt shingles
    - Slopes 2:12 or greater
  - Underlayment
    - Slopes 2:12 to 4:12 (Double layer)
Lesson 9: Roof Assemblies

R905.2 Asphalt Shingles

R905.2.5 Fasteners

- Galvanized Steel, Stainless Steel, Aluminum, or Copper nails
- Min. 12 gage shank
- 3/8" diameter head
- Penetrate into sheathing ¾" minimum
- ASTM F 1667

R905.2.6 Attachment

Asphalt shingles shall be installed to manufacturers specs...

- Minimum of four fasteners per strip shingle
- Minimum of two fasteners per individual shingle

Special methods required for wind speeds over 110 mph (Modified ASTM classification)

Manufacturer's Specifications

R905.2.7 Underlayment

- Roof slopes 2:12 to 4:12 underlayment shall be two layers
  - 19” starter strip at eave
  - Over-lap starter with a 36” strip
  - Over-lap successive strips 19”
  - Fastened sufficient to hold in place
- Roof slopes 4:12 and greater shall be one layer
  - Full width sheet starting at eave
  - Successive layers overlapped 2”

Low Slope Underlayment

R905.2.7.1 Ice Protection

- Areas where there has been a history of ice forming along the eaves
- Table R301.2(1) criteria designates Ice Barrier shall be provided

This includes all of New York State
Lesson 9: Roof Assemblies

**Ice Shield**

2 LAYERS OF UNDERLAYMENT CEMENTED TOGETHER OR WATERPROOFING MEMBRANE

**Ice Barrier Installation**

What's wrong with this Picture?

**Ice Dam**

Proper Installation

**R905.2 Asphalt Shingles**

*R905.2.8.2 Valleys*

Valley linings shall be installed to manufacturer's specifications before shingles are installed

This section allows open or closed valley installations as follows

**Open Valley Flashing**

Shall comply with Table R905.2.8.2
Lesson 9:
Roof Assemblies

Open Valley Flashing

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>THICKNESS</th>
<th>GAGE</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>0.0215</td>
<td>16 oz</td>
<td>0.297 lb/sq ft</td>
</tr>
<tr>
<td>Lead-cored copper</td>
<td>0.0171</td>
<td>16 oz</td>
<td>0.274 lb/sq ft</td>
</tr>
<tr>
<td>High-cold copper</td>
<td>0.0183</td>
<td>15 oz</td>
<td>0.284 lb/sq ft</td>
</tr>
<tr>
<td>Lead-cored high-yield copper</td>
<td>0.0168</td>
<td>15 oz</td>
<td>0.274 lb/sq ft</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.024</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>0.0159</td>
<td>20 oz</td>
<td>—</td>
</tr>
</tbody>
</table>

If exposed corrosion-resistant metal materials are used as valley linings, they are regulated by this table.

Closed Valley Flashing

Shall comply with ASTM D 6380 Class S Type III, Class M Type II, or ASTM D 3909.

R905.2 Asphalt Shingles

R905.2.8.3 Crickets and Saddles
- Required on the ridge side of all penetrations over 30" wide.

R905.2.8.4 Sidewall Flashing
- Flashing at vertical side walls shall use the step flashing method.

R905.2 Asphalt Shingles

R905.2.8.5 Other Flashing
- Soil stacks
- Vent pipes
- Chimney

Section 907 Reroofing

907.1
- re-covering or replacing of an existing roof covering shall comply with the requirements of Appendix J Section AJ 502.4.
Appendix J Section AJ 502.4
Recover vs. Replace

New roof coverings shall not be installed over existing roof coverings if...
1. Existing roof or roof covering is
   - Water Soaked
   - Deteriorated
   - Has inadequate base
2. Existing roof covering is
   - Wood shake, slate, clay, cement or asbestos cement tile
3. Existing roof has two or more layers of
   - Any roof covering material
4. Asphalt shingles in severe hail exposure area

AJ 502.4.5 Reinstallation of Materials

Reinstallation of Slate, Clay or Cement Tile shall be permitted except for
- Broken, cracked, damaged materials
- Existing Flashing if rusted, damaged, or deteriorated

Aggregate surface material shall not be reinstalled

Summary

- Roofing must provide weather-resistant protection for the structure
- This chapter recognizes 14 different types of roofing materials
- Proper installation methods outlined in this chapter and in the manufacturer’s specifications must be followed
- Reroofing is also regulated by this chapter
Lesson 10: Chimneys and Fireplaces

Chapter 10

Chapter 10

Regulates Chimneys and Fireplaces
- Masonry fireplaces, chimneys and heaters
- Prescriptive Requirements
- Factory built fireplaces and chimneys
- Require Listing and Labeling
- But that’s not all, it also contains ...
  - Requirements for exterior air supply

R1001 Masonry Fireplaces
- Constructed to requirements of chapters 3 and 4
- Footing
  - Solid masonry or concrete
  - Minimum 12” thick
  - Minimum 6” wider than exterior of chimney
  - Located below frost line
  - Seismically reinforced
Lesson 10:
Chimneys and Fireplaces

R1002 Masonry Heaters

- R1002.2 Installation
  - Masonry heaters shall be installed to one of the following:
    - ASTM E 1602, or
    - Listed and Label, follow manufacturer’s instructions

R1003 Masonry Chimneys

- R1003.2 Footings and Foundations
  - Solid masonry or concrete
  - Minimum 12” thick
  - Minimum 6” wider than exterior of chimney
  - Located below frost line

R1003. Corbeling

- Must meet the requirements of this section

R1003.9 Termination

- Height of chimney
  - 2’ higher than peak or highest portion of roof within 10’ of chimney
  - 3’ higher than roof deck at the high side of the penetration point

R1003.18 Chimney Clearances

- Chimneys located in building or in exterior walls must have 2” clearance to combustibles
- Those located completely outside the building must have a 1” clearance to combustibles

R1003.20 Chimney Crickets

- Required on all chimneys over 30” in width
- Crickets to be sized in accordance with table R1001.20
Lesson 10: Chimneys and Fireplaces

R1004 Factory-Built Fireplaces

- **R1004.1 General**
  - Shall be listed and labeled
  - Installed in accordance with the listing and manufacturer’s specifications
  - Tested according to UL 127

R1004.4 Unvented Gas Log Heaters

- Shall not be installed in a Factory-built Fireplace
  - Unless the fireplace was
    - Tested
    - Listed
    - Labeled
  - In accordance with UL 127

R1005 Factory Built Chimneys

- **R1005.1 LISTING**
  - Shall be listed and labeled
  - Shall be installed according to manufacturers’ instructions

- **R1005.3 SOLID FUEL APPLIANCES**
  - Factory built chimneys shall comply with the Type HT requirements of UL 103
  - Marked “Type HT and “Residential Type and Building Heating Appliance Chimney.”

R1006 Exterior Air Supply

- **R1006.1 Exterior Air**
  - Shall be equipped with an exterior air supply
    - R1006.1.1 Factory-built Fireplaces
    - R1006.1.2 Masonry Fireplaces

- **R1006.2 Exterior Air Intake**
- **R1006.3 Clearance**
- **R1006.4 Passageway**
- **R1006.5 Outlet**

Fireplace

- The house under review has a direct-vent fireplace

Summary

- Chapter 10 regulates
  - Factory built chimneys and fireplaces
  - Masonry built chimneys and fireplaces

- Masonry units comply with
  - Table R1001.1 and Figure R1001.1

- Factory units comply with
  - Manufacturer’s listing, labeling and installation requirements and this chapter
Lesson 11: Energy Efficiency

Lesson 11
Energy Conservation
Residential Compliance

Minimum prescriptive requirements for the design and construction of energy-efficient buildings and systems...

Section N1101 General
(MANDATORY)

- MANDATORY Provisions:
  - Section N1101, General rules and product identification
  - Specifically listed items in N1102 Building Thermal Envelope
    - Access hatches and doors
    - Common, party, and fire walls
    - Air leakage
    - Vapor retarders
  - Section N1103 Systems (Mandatory)

Section N1101 General
Same concepts as in the Energy Code

- Scope = Residential Code buildings
  - Exceptions:
    - Non-conditioned spaces
    - Solely renewable energy sources

- Exempt Buildings.
  - 1101.1.2.1 Low energy buildings
  - 1101.1.2.2 Historic buildings

Section N1101 General
Same concepts as in the Energy Code

- N1101.3.1 Additions, Alterations, Renovations and Repairs
  - Any new work to conform to new construction standards
  - The unaltered portions may remain
  - An Addition may show compliance alone or as a single building

Section N1101 General
Same concepts as in the Energy Code

- N1101.4 Compliance (options)
  - ECCCNY (Chapter 4)
  - This Chapter (same basic concept)

- Based on CLIMATE ZONES

TABLE N1101.4 Climate Zones by County

<table>
<thead>
<tr>
<th>Zone 4</th>
<th>Zone 5</th>
<th>Zone 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allegany</td>
<td>Albany</td>
<td>Bronx</td>
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<td>Montgomery</td>
<td>Cayuga</td>
<td>Kings</td>
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<td>Nassau</td>
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<td>New York</td>
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<tr>
<td>Lewis</td>
<td>Monroe</td>
<td></td>
</tr>
</tbody>
</table>

Chapter 11 Energy Efficiency
Lesson 11: Energy Efficiency

Section N1101 General
Same concepts as in the Energy Code

- N1101.4.1 Compliance
  Materials
  - Software (US DOE)
    - REScheck
    - COMcheck
    - REM/Rate and REM/Design
  - Other home energy rating (HERS) software
  - Energy modeling based on ASHRAE 90.1

Building Thermal Envelope
Meet Table N1102.1

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>U-factor</th>
<th>SHGC</th>
<th>R-value</th>
<th>Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>38</td>
</tr>
<tr>
<td>5</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>38</td>
</tr>
<tr>
<td>6</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>49</td>
</tr>
</tbody>
</table>

Building Thermal Envelope Approaches

- 1102.1.1 R-value Computation (using Tables)
  - Use all identified R-values in the assembly
  - DON'T include other components

- 1102.1.2 U-factor Alternative
  - Use value from all components of the assembly
  - Table N1102.1 provides equivalents

- 1102.1.3 Total UA Alternative
  - SUM of U-factor times assembly area

Building Thermal Envelope
N1102.2.1 Ceilings with attic spaces

- Values in Table N1102.1 for ceilings
  - May be reduced
- If insulation is not compressed at the exterior wall
  - R-38 can be reduced to R-30
  - R-49 can be reduced to R-38

Examples
“Raised Heel Construction”
N1102.2.1 Ceilings with attic space

- Reductions allowed:
  - R38 to R30
  - R49 to R38

Building Thermal Envelope
R806 Roof Ventilation

- Insulation:
  - Cathedral Ceilings
  - Vent Spacers
  - No Compression or gaps in Insulation
Lesson 11: Energy Efficiency

Building Envelope

**N1102.4.5 Recessed Lighting Fixtures**
- Recessed Lighting Fixtures
  - Sealed to limit air leakage
  - Must be IC rated
  - Gasketed or Caulked

Chapter 11 Energy Efficiency

Building Envelope

**N1102.5 Moisture Control**
- Vapor Retarder
  - Climate zones 5 and 6
  - Installed on the interior side of wall

Chapter 11 Energy Efficiency

Site Verification

- Some items must be verified by inspections
  - Insulation R Values and Installation Quality
  - Fenestration U Values, % of glazing
  - Air Sealing
  - Vapor Retarders and Ventilation
  - Equipment installation

Chapter 11 Energy Efficiency

Section N1101 General

**Same concepts as in the Energy Code**
- N1101.5 Building Thermal Envelope Insulation
- Identification of Materials and Installation
  - R-value applied to material
  - Installers certification
  - Markers for blown or sprayed insulation
  - R-value observable for inspection

Chapter 11 Energy Efficiency

Blown in Insulation

**Same concepts as in the Energy Code**
- Provide markers every 300 sq. ft. to verify depth

Chapter 11 Energy Efficiency

Section N1101 General

**Same concepts as in the Energy Code**
- N1101.7 Insulation on exterior of foundation
  - Protection to extend to 6” below grade

Chapter 11 Energy Efficiency
Lesson 11: Energy Efficiency

Section N1101 General
Same concepts as in the Energy Code

- N1101.9 Certificate posted
  - On or near electrical panel
  - Builder or Designer
  - R-values and U-factors

Example
Insulation Basement Wall
Must be protected above grade
Must extend below grade to depth indicated in 1102.2.7

Examples
Slab on Grade Insulation N1102.2.8

45° Bevel OK
绝缘可以放在内部或外部

Building Envelope N1102.4 Air Leakage (MANDATORY)

1102.4.2 Building thermal envelope. The building thermal envelope shall be durably sealed to limit infiltration.

Building Envelope N1102.4 Air Leakage (MANDATORY)

1102.4.3 Air sealing and insulation. ... shall be demonstrated to comply with one of the following options...

- N1102.4.3.1 Testing Option
- N1102.4.3.2 Visual Inspection Option
  - Thermal Bypass Inspection
Air Leakage Testing Option
- Blower Door testing
- $\text{ACH}_{50}$ better than 7

Table 1102.4.2 AIR BARRIER and INSULATION INSPECTION Component Criteria

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air barrier and thermal barrier</td>
<td>Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.</td>
</tr>
<tr>
<td></td>
<td>Breaks or joints in the air barrier are filled or repaired.</td>
</tr>
<tr>
<td></td>
<td>Air-permeable insulation is not used as a sealing material.</td>
</tr>
<tr>
<td></td>
<td>Air-permeable insulation is inside of an air barrier.</td>
</tr>
</tbody>
</table>

The Code official may require an independent inspection.

Systems N1103.1 Controls
- At least one thermostat for each system
- Programmable thermostat for each dwelling unit

Systems N1103.2 Ducts
- All ducts located in UNCONDITIONED SPACE must be insulated
  - Supply ducts in attics minimum R- 8
  - All other ducts minimum R- 6

Systems N1103.2.2 Duct Sealing
- ALL ducts, air handlers, filter boxes and building cavities used as ducts shall be sealed.
- Ducts OUTSIDE of the Building Envelope must be VERIFIED by one of the following:
  - 1103.2.2.1 Post-construction test
  - 1103.2.2.2 Rough-in test

Systems Miscellaneous details
- 1103.9 Lighting equipment
  - Minimum of 50 percent high-efficacy lamps.
Lesson 12: Systems and the Final Inspection

The Residential Code of New York State

Lesson 12
Wrapping it up
Part 1: Checking the systems
Part 2: The Final Inspection

Part 1
The Systems
- Mechanical Chapters 12-23
- Fuel gas Chapters 24
- Plumbing Chapters 25-32
- Electrical Chapters 33-42

Most of these items were covered in Course 9D so let’s review the basics

Mechanical
- Heating and Cooling Systems
- Boilers and Water Heaters
- Duct Systems
- Chimney and Vent Systems
- Exhaust Systems
  - Dryers
  - Bathrooms

R303.8 Required Heating

Every Dwelling Unit in New York State
(Winter Design Temperature for entire state is below 60°F)
Must have a heating system capable of maintaining a room temperature of at least 68°F at a point 3’ above the floor and 2’ from exterior walls in all habitable spaces

Exception: Owner-occupied one-family

Minimum Requirements
- M1303.1
  - All equipment must have a permanently affixed label which provides basic information about the unit
  - Equipment must only be installed and operated consistent with it’s listing
- M1305.1 All equipment must be installed to allow sufficient space for clearances and access for service
- M1401.3 Heating and Cooling equipment must be sized in accordance with ACCA Manual J
Lesson 12:
Systems and the Final Inspection

Fuel Gas
Review
- Chapter 24 regulates appliances that utilize LP and Natural Gas
- All equipment must be installed to the manufacturer’s specifications
- Gas piping must be sized and installed to provide sufficient gas supply to all appliances in the system
- All equipment must be properly vented

Plumbing
- Every dwelling unit must be provided with a:
  - Water closet
  - Lavatory
  - Bathtub or Shower
  - Kitchen sink
- Exception: Owner-occupied one-family

Plumbing
- All plumbing systems must be connected to an approved water supply
- Every kitchen sink, lavatory, bathtub, shower, laundry tub and washing machine hook up must have hot and cold water
- All plumbing systems must be connected to an approved sewage disposal system

Electrical
- Each dwelling unit must have its own meter
- E3502 Service must be sized based on the loads of the equipment in the dwelling
  - Minimum service size is 100 amps
- E3507 All electric circuits must be properly grounded

Electrical
- 3501.6 Service Disconnect Required
- Disconnects must be provided on all circuits
  - All circuits must be labeled

Outlets
- E3801.2 Convenience outlets must be provided:
  - On any wall area 2’ or wider
  - Within 6’ of any entrance to a room
  - A maximum of 12’ apart around the perimeter of all rooms
Lesson 12: Systems and the Final Inspection

**Electrical**

E3801.3 Kitchens must have a minimum of 2 - 20 amp circuits
E3801.4 Any counter space 12” or wider must be served by an outlet
   - Outlets along counter tops must be spaced a maximum of 4’ apart

**Electrical**

Section 3802: Ground-fault and Arc-fault Circuit-interrupter Protection

- Ground fault protection locations:
  - Bathroom Receptacles
  - Outdoor receptacles
  - Crawlspace
  - Laundry, utility, and bar sink receptacles
  - Unfinished basements
  - Kitchen receptacles
  - Bathtub and boat hoist receptacles
  - Electrically heated floors

**Electrical**

3802.11 Arc-fault circuit-interrupter protection.
   - ALL branch CIRCUITS that supply 120-volt, single-phase, …
   - 15- and 20-ampere outlets
   - Family Rooms, Dining Rooms, Living Rooms, Parlor, Libraries, Dining, Sunrooms, Recreation Rooms, Closets, Hallways and Similar

**Electrical**

3902.14 Tamper-resistant receptacles
   - General purpose receptacle distribution
   - Small appliance receptacles
   - Countertop receptacles
   - Appliance receptacle outlets
   - Bathroom
   - Outdoor outlets
   - Laundry areas
   - Basements and garages
   - HVAC outlet

**Conclusion**

- This course has taken us from learning the code, to doing a plan review, to performing the required inspections
- Although this course did not cover every topic in the Residential Code, it has given you a basic understanding of how to use the code
- Remember if you need any assistance in the future you can call your regional office or the Albany office
- Now the best part of the course…