NC State Building Codes Amendments - Effective 1/1/2016

(adopted September 2014 through June 2015)

(Note: some amendments may indicate earlier effective dates)

The North Carolina Codes are available at www.iccsafe.org/NCDOI for purchase online. Soft-bound copies are available for walk-in purchase only at the following location.

NC Department of Insurance, 322 Chapanoke Road, Suite 200, Raleigh, NC 27603 919-661-5880 x 240 (call for availability)

The following pages represent a summary of the Building Code Council adopted amendments that have been approved by the Rules Review Commission.

2011 NC Electrical Code (based on the 2011 NEC)

2012 NC Building, Energy Conservation, Fire, Fuel Gas, Mechanical, Plumbing, Residential Codes (based on the 2009 International Codes)

2015 NC Existing Building Code (based on the 2012 IEBC)

These amendments revise, delete or add to the adopted NC Code.

2011 NC Electrical Code
230.2 (B) Special Occupancies. (140909 Item B-1)

230.2 (B) Special Occupancies. By special permission, additional services shall be permitted for ~~either~~ any of the following:
(1) Multiple-occupancy buildings where there is no available space for service equipment accessible to all occupants.
(2) A single building or other structure sufficiently large to make two or more services necessary. Buildings or other structures large enough to allow each service location to be separated by at least 50 feet (50.240 m), meet the criteria for "sufficiently large."

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

NC Register Published/Tracked

230.2 (B) Special Occupancies. By special permission, additional services shall be permitted for ~~either~~ any of the following:
(1) Multiple-occupancy buildings where there is no available space for service equipment accessible to all occupants
(2) A single building or other structure sufficiently large to make two or more services necessary
Buildings or other structures large enough to allow each service location to be separated by at least 50 feet (50.240 m), meet the criteria for "sufficiently large."
~~[(3) Multiple service locations are allowed in R-2 four story and less buildings with each service location limited to 6 disconnects and separated by at least 50 feet]~~

2011 NC Electrical Code
250.53(A)(2) Supplemental Electrode Required. (130910 Item B-4)

250.53(A)(2) Supplemental Electrode Required. A single rod, pipe, or plate electrode shall be supplemented by an additional electrode of a type specified in 250.52(A)(2) through (A)(8). The supplemental electrode shall be permitted to be bonded to one of the following:
(1) Rod, pipe, or plate electrode
(2) Grounding electrode conductor
(3) Grounded service-entrance conductor
(4) Nonflexible grounded service raceway
(5) Any grounded service enclosure
Exception No. 1: If a single rod, pipe, or plate grounding electrode has a resistance to earth of 25 ohms or less, the supplemental electrode shall not be required.
Exception No. 2: The supplemental grounding electrode shall not be required at temporary electrical service installation (saw service pole) at construction site, provided the temporary electrical service does not exceed 150 volts to ground or 100 amperes.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2011 NC Electrical Code
406.4(D)(4) Arc-Fault Circuit-Interrupter Protection. (140311 Item B-4)

406.4(D)(4) Arc-Fault Circuit-Interrupter Protection. Where a receptacle outlet is supplied by a branch circuit that requires arc-fault circuit interrupter protection as specified elsewhere in this *Code*, a replacement receptacle at this outlet shall be one of the following:
(1) A listed outlet branch circuit type arc-fault circuit interrupter receptacle
(2) A receptacle protected by a listed outlet branch circuit type arc-fault circuit interrupter type receptacle
(3) A receptacle protected by a listed combination type arc-fault circuit interrupter type circuit breaker
Exception: Non-grounding type receptacle(s).

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

680.42(B) Bonding. Bonding by metal-to-metal mounting on a common frame or base shall be permitted. The metal bands or hoops used to secure wooden staves shall not be required to be bonded as required in 680.26.
Equipotential bonding of perimeter surfaces in accordance with 680.26(B)(2) shall not be required to be provided for spas and hot tubs where all of the following conditions apply:
(1) The spa or hot tub shall be listed as a self-contained spa for aboveground use.
(2) The spa or hot tub shall not be identified as suitable only for indoor use.
(3) The installation shall be in accordance with the manufacturer's instructions and shall be located on or above grade.
(4) The top rim of the spa or hot tub shall be at least 710 mm (28 in.) above all perimeter surfaces that are within 760 mm (30 in.), measured horizontally from the spa or hot tub. The height of nonconductive external steps for entry to or exit from the self-contained spa shall not be used to reduce or increase this rim height measurement.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Administrative Code
107 Inspections. (140610 Item B-1)

[Commentary is included for clarification only and not subject to review.]

SECTION 107 INSPECTIONS

107.1 General. The inspection department shall perform the following inspections:
1. Footing inspection;
2. Under slab inspection, as appropriate;
3. Foundation inspection~~, wood-frame construction~~;
4. Rough-in inspection;
5. Building framing inspection;
6. Insulation inspection;
7. Fire protection inspection; and
8. Final inspection.

Commentary: The code enforcement official makes these inspections during certain phases of construction and is not on site at all times when construction is in progress. The code official verifies code compliance and/or code defects visible and subject to discovery during the above listed inspections and spot checks numerous similar items.

Nothing in any of Sections 107.1.1-107.1.8 requirements is intended to prevent partial inspections of the inspection types listed in Section 107.1 "General" as requested by the permit holder as allowed by the local inspection department. Cumulative partial inspections approved by the code official shall satisfy the same degree of readiness for inspection for viewing as described in Sections 107.1.1 – 107.1.8.

Not all items, such as, but not limited to, nailing of roof or other sheathing material, are always visible at framing inspection, but remain the responsibility of the permit holder to comply with the code.

Temporary electrical service poles may be inspected at any phase of construction as requested by the permit holder. Temporary utility (TU) applications deemed safe by the AHJ or as otherwise permitted by the code shall be allowed.

107.1.1 Footing inspection. Footing inspections shall be made after the trenches are excavated, all grade stakes are installed, all reinforcing steel and supports are in place and ~~appropriately~~ tied, and all necessary forms and bulkheads are in place and braced~~, and~~ before any concrete is placed.
107.1.2 Under-slab inspection. Under-slab inspections, as appropriate, shall be made after all materials and equipment to be concealed by the concrete slab are completed.
107.1.3 Foundation inspection, crawl space. Foundation and crawl space inspections shall be made after all foundation supports are installed. ~~The inspection is to check foundation supports, crawl space leveling, ground clearances and positive drainage when required.~~

Commentary: Foundation inspections are conducted to verify correct installation and proper bearing support. Poured concrete and masonry walls that have reinforcement steel should be inspected prior to concrete placement. Crawl space leveling, ground clearances, positive drainage and waterproofing/dampproofing, when required, may be inspected at future inspections prior to concealment.

107.1.4 Rough-in inspection. Rough-in inspections shall be made when all building framing and parts of the electrical, plumbing, fire protection, or heating-ventilation or cooling system that will be hidden from view in the finished building have been placed, but before any wall, ceiling finish, or building insulation is installed.

Commentary: Plumbing, mechanical, and electrical components installed underground should be considered as rough-in inspections and may be inspected at any point during construction prior to covering.

107.1.5 Building Framing Inspection. Framing inspections shall be made after the roof (excluding permanent roof coverings), wall, ceiling, and floor framing is complete with appropriate blocking, bracing, and firestopping in place. The following items shall be in place and visible for inspection:

1. Pipes;
2. Chimneys and vents;
3. Flashing for roofs and chimneys~~, and wall openings~~;
4. Insulation baffles; and
5. All lintels that are required to be bolted to the framing for support shall not be covered by any exterior or interior wall or ceiling finish material before approval. Work may continue without approval for lintels supported on masonry or concrete.

Commentary: Intent of this section is to identify a building's level of readiness and what can be visible at this stage of construction. This stage of construction is intended to review structural components. The permanent roof covering may or may not be installed prior to framing inspection.

The following items should be in place and visible for inspection: pipes, chimneys and vents, flashing, and required exterior water-resistant barriers.

107.1.6 Insulation inspection. Insulation inspection shall be made after an *approved* building framing and rough-in inspection and after the permanent roof covering is installed, with all insulation and vapor retarders in place, but before any wall or ceiling covering is applied.

Commentary: Insulation baffles that cannot be seen at this inspection, such as vaulted ceilings with concealed rafter cavities, should have baffles installed at framing inspection for verification.

It is acceptable that wall cavity insulation enclosed by an air barrier material behind tubs, showers, and fireplace units installed on exterior walls may not be observable by the code official.

107.1.7 Fire protection inspection. Fire protection inspections shall be made in all buildings where any material is used for fire protection purposes. The permit holder or his agent shall notify the inspection department after all fire protection materials are in place. Fire protection materials shall not be concealed until inspected and approved by the code enforcement official.

Commentary: Fire protection inspection is typically performed in commercial building structures and is required in addition to any special inspection as listed in Chapter 17 of the North Carolina Building Code.

107.1.8 Final inspection. Final inspections shall be made for each trade after completion of the work authorized under the technical codes.

Commentary: Each trade shall complete a final inspection giving approval to permitted work. Work required by the technical codes shall be complete before being requested. Temporary power and temporary certificate of occupancy (TCO) requests are allowed prior to final inspection.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

605.11 Solar photovoltaic power systems. Solar photovoltaic power systems shall be installed in accordance with Sections 605.11.1 through 605.11.2, the *International Building Code* and NFPA 70.

605.11.1 Access and pathways. Roof access, pathways, and spacing requirements shall be provided in accordance with Sections 605.11.1.1 through 605.11.1.3.3.
Exceptions:
1. Detached, non-habitable Group U structures including, but not limited to, parking shade structures, carports, solar trellises, and similar structures.
2. Roof access, pathways, and spacing requirements need not be provided where the fire chief has determined that rooftop operations shall not be employed.

605.11.1.1 Roof access points. Roof access points shall be located in areas that do not require the placement of ground ladders over openings such as windows or doors, and located at strong points of building construction in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires, or signs.

605.11.1.2 Solar photovoltaic systems for Group R-3 buildings. Solar photovoltaic systems for Group R-3 buildings shall comply with Sections 605.11.1.2.1 through 605.11.1.2.5.
Exception: These requirements shall not apply to one and two family dwelling and townhomes.

605.11.1.2.1 Size of solar photovoltaic array. Each photovoltaic array shall be limited to 150 feet (45 720 mm) by 150 feet (45 720 mm). Multiple arrays shall be separated by a 3-foot-wide (914 mm) clear access pathway.

605.11.1.2.2 Hip roof layouts. Panels and modules installed on Group R-3 buildings with hip roof layouts shall be located in a manner that provides a 3-foot-wide (914 mm) clear access pathway from the eave to the ridge on each roof slope where panels and modules are located. The access pathway shall be at a location on the building capable of supporting the fire fighters accessing the roof.
Exception: These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

605.11.1.2.3 Single-ridge roofs. Panels and modules installed on Group R-3 buildings with a single ridge shall be located in a manner that provides two, 3-foot-wide (914 mm) access pathways from the eave to the ridge on each roof slope where panels and modules are located.
Exception: This requirement shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

605.11.1.2.4 Roofs with hips and valleys. Panels and modules installed on Group R-3 buildings with roof hips and valleys shall not be located closer than 18 inches (457 mm) to a hip or a valley where panels/modules are to be placed on both sides of a hip or valley. Where panels are to be located on only one side of a hip or valley that is of equal length, the panels shall be permitted to be placed directly adjacent to the hip or valley.
Exception: These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

605.11.1.2.5 Allowance for smoke ventilation operations. Panels and modules installed on Group R-3 buildings shall be located not less than 3 feet (914 mm) from the ridge in order to allow for fire department smoke ventilation operations.
Exception: Panels and modules shall be permitted to be located up to the roof ridge where an alternative ventilation method *approved* by the fire chief has been provided or where the fire chief has determined vertical ventilation techniques shall not be employed.

605.11.1.3 Other than Group R-3 buildings. Access to systems for buildings, other than those containing Group R-3 occupancies, shall be provided in accordance with Sections 605.11.1.3.1 through 605.11.1.3.3.
Exception: Where it is determined by the fire code official that the roof configuration is similar to that of a Group R-3 occupancy, the residential access and ventilation requirements in Sections 605.11.1.2.1 through 605.11.1.2.5 shall be permitted to be used.

605.11.1.3.1 Access. There shall be a minimum 6 foot-wide (1829 mm) clear perimeter around the edges of the roof.

Exception: Where either axis of the building is 250 feet (76 200 mm) or less, the clear perimeter around the edges of the roof shall be permitted to be reduced to a minimum 4 foot wide (1290 mm).

605.11.1.3.2 Pathways. The solar installation shall be designed to provide designated pathways. The pathways shall meet the following requirements:
1. The pathway shall be over areas capable of supporting fire fighters accessing the roof.
2. The centerline axis pathways shall be provided in both axes of the roof. Centerline axis pathways shall run where the roof structure is capable of supporting fire fighters accessing the roof.
3. Pathways shall be a straight line not less than 4 feet (1290 mm) clear to roof standpipes or ventilation hatches.
4. Pathways shall provide not less than 4 feet (1290 mm) clear around roof access hatch with not less than one singular pathway not less than 4 feet (1290 mm) clear to a parapet or roof edge.

605.11.1.3.3 Smoke ventilation. The solar installation shall be designed to meet the following requirements:
1. Arrays shall not be greater than 150 feet (45 720 mm) by 150 feet (45 720 mm) in distance in either axis in order to create opportunities for fire department smoke ventilation operations.
2. Smoke ventilation options between array sections shall be one of the following:
    2.1 A pathway 8 feet (2438 mm) or greater in width.
    2.2 A 4-foot (1290 mm) or greater in width pathway and bordering roof skylights or gravity-operated dropout smoke and heat vents on not less than one side.
    2.3 A 4-foot (1290 mm) or greater in width pathway and bordering all sides of non-gravity-operated dropout smoke and heat vents.
    2.4 A 4-foot (1290 mm) or greater in width pathway and bordering 4-foot by 8-foot (1290 mm by 2438 mm) "venting cutouts" every 20 feet (6096 mm) on alternating sides of the pathway.

605.11.2 Ground-mounted photovoltaic arrays. Ground-mounted photovoltaic arrays shall comply with Section 605.11 and this section. Setback requirements shall not apply to ground-mounted, free-standing photovoltaic arrays. A clear, brush-free area of 10 feet (3048 mm) shall be required for ground-mounted photovoltaic arrays.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

[Note: This Rule will also be printed in the 2012 NC Fire Code, Section 605.11 Solar photovoltaic power systems.]

2012 NC Building Code
Chapter 2, Section 915, Chapter 35 Carbon Monoxide Detection. (141209 Item B-4)

[Note: Section 908.7, Carbon Monoxide Alarms has been incorporated into this Rule.]

(Add the following definition to)
SECTION 202
GENERAL DEFINITIONS

[B] PRIVATE GARAGE. A building or portion of a building in which motor vehicles used by the tenants of the building or buildings on the premises are stored or kept, without provisions for repairing or servicing such vehicles for profit.

SECTION 915
CARBON MONOXIDE DETECTION

915.1 General. Carbon monoxide detection shall be installed in new buildings in accordance with Sections 915.1.1 through 915.6.

915.1.1 Where required. Carbon monoxide detection shall be provided in Group I-1, I-2, I-4 and R occupancies and in classrooms in Group E occupancies in the locations specified in Section 915.2 where any of the conditions in Sections 915.1.2 through 915.1.6 exist.

915.1.2 Fuel-burning appliances and fuel-burning fireplaces. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms that contain a fuel-burning appliance or a fuel-burning fireplace.

915.1.3 Forced air furnaces. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms served by a fuel-burning, forced air furnace.
Exception: Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms where carbon monoxide detection is provided in the first room or area served by each main duct leaving the furnace, and the carbon monoxide alarm signals are automatically transmitted to an *approved* location.

915.1.4 Fuel-burning appliances outside of dwelling units, sleeping units and classrooms. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms located in buildings that contain fuel-burning appliances or fuel-burning fireplaces.
Exceptions:
1. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms if there are no communicating openings between the fuel-burning appliance or fuel-burning fireplace and the dwelling unit, sleeping unit or classroom.
2. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms if carbon monoxide detection is provided in one of the following locations:
2.1 In an *approved* location between the fuel-burning appliance or fuel-burning fireplace and the dwelling unit, sleeping unit or classroom; or
2.2 On the ceiling of the room containing the fuel-burning appliance or fuel-burning fireplace.

915.1.5 Private garages. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms in buildings with attached private garages.
Exceptions:
1. Carbon monoxide detection shall not be required where there are no communicating openings between the private garage and the dwelling unit, sleeping unit or classroom.
2. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms located more than one story above or below a private garage.
3. Carbon monoxide detection shall not be required where the private garage connects to the building through an open-ended corridor.
4. Where carbon monoxide detection is provided in an *approved* location between openings to a private garage and dwelling units, sleeping units or classrooms, carbon monoxide detection shall not be required in the dwelling units, sleeping units or classrooms.

915.1.6 Exempt garages. For determining compliance with Section 915.1.5, an open parking garage complying with Section 406.5 of the International Building Code or an enclosed parking garage complying with Section 406.6 of the International Building Code shall not be considered a private garage.

915.2 Locations. Where required by Section 915.1.1, carbon monoxide detection shall be installed in the locations specified in Sections 915.2.1 through 915.2.3.

915.2.1 Dwelling units. Carbon monoxide detection shall be installed in dwelling units outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning appliance is located within a bedroom or its attached bathroom, carbon monoxide detection shall be installed within the bedroom.

915.2.2 Sleeping units. Carbon monoxide detection shall be installed in sleeping units.
Exception: Carbon monoxide detection shall be allowed to be installed outside of each separate sleeping area in the immediate vicinity of the sleeping unit where the sleeping unit or its attached bathroom does not contain a fuel-burning appliance and is not served by a forced air furnace.

915.2.3 Group E occupancies. Carbon monoxide detection shall be installed in classrooms in Group E occupancies. Carbon monoxide alarm signals shall be automatically transmitted to an on-site location that is staffed by school personnel.
Exception: Carbon monoxide alarm signals shall not be required to be automatically transmitted to an on-site location that it staffed by school personnel in Group E occupancies with an occupant load of 30 or less.

915.3 Detection equipment. Carbon monoxide detection required by Sections 915.1 through 915.2.3 shall be provided by carbon monoxide alarms complying with Section 915.4 or with carbon monoxide detection systems complying with Section 915.5.

915.4 Carbon monoxide alarms. Carbon monoxide alarms shall comply with Sections 915.4.1 through 915.4.3.

915.4.1 Power source. Carbon monoxide alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than that required for overcurrent protection.
Exception: Where installed in buildings without commercial power, battery-powered carbon monoxide alarms shall be an acceptable alternative.

915.4.2 Listings. Carbon monoxide alarms shall be listed in accordance with UL 2034.

915.4.3 Combination alarms. Combination carbon monoxide/smoke alarms shall be an acceptable alternative to carbon monoxide alarms. Combination carbon monoxide/smoke alarms shall be listed in accordance with UL 2034 and UL 217.

915.5 Carbon monoxide detection systems. Carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide alarms and shall comply with Sections 915.5.1 through 915.5.3.

915.5.1 General. Carbon monoxide detection systems shall comply with NFPA 720. Carbon monoxide detectors shall be listed in accordance with UL 2075.

915.5.2 Locations. Carbon monoxide detectors shall be installed in the locations specified in Section 915.2. These locations supersede the locations specified in NFPA 720.

915.5.3 Combination detectors. Combination carbon monoxide/smoke detectors installed in carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide detectors, provided they are listed in accordance with UL 2075 and UL 268.

915.6 Maintenance. Carbon monoxide alarms and carbon monoxide detection systems shall be maintained in accordance with NFPA 720. Carbon monoxide alarms and carbon monoxide detectors that become inoperable or begin producing end-of-life signals shall be replaced.

(Revise Chapter 35 as follows)

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

[Note: This Rule will also be printed in the 2012 NC Fire Code, Section 915, 2012 NC Fuel Gas Code, Section 311.4, and 2012 NC Mechanical Code, Section 313.4, Carbon Monoxide Detection.]

2012 NC Building Code
Docks, Piers, Bulkheads and Waterway Structures. (140610 Item B-14)

Revision to Table 1004.1.1

Add footnote to the table stating the following:
Reference Section 3606.8 for occupant load of *piers* and *docks*.

Addition to Chapter 11

1109.14.3.1 Recreational boating facilities. The minimum required number of accessible berths shall be provided as per Table 1109.14.3.1.

1109.14.3.1.1 Number of boat slips not identified. Where the number of boat slips is not identified, for example, along the edge of a long side-tie dock, each 40 feet of linear dock edge, or fraction thereof, shall be counted as one boat slip.

1109.14.3.1.2 Total number of boat slips. The total number of berths in a marina facility shall include all single berths, double berths, side-tie berths, end-tie berths, open berths and covered berths, as well as berths that are components of courtesy landings, visitor *docks*, fuel *docks*, sewage pumpout *docks*, harbor master office *docks*, haul out and repair *docks*, etc.

Table 1109.14.3.1
Minimum Required
Number of Accessible Berths

Total Number of Boat Slips	Minimum Number
1 to 25	1
26 to 50	2
51 to 100	3
101 to 150	4
151 to 300	5
301 to 400	6
401 to 500	7
501 to 600	8
601 to 700	9
701 to 800	10
810 to 900	11
901 to 1000	12
1001 and over	12, plus 1 for each 100 or fraction thereof over 1000

The effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Building Code
Docks, Piers, Bulkheads and Waterway Structures. (140610 Item B-14)

Revision to Chapter 18

1810.3.2.4.1 Preservative treatment. Timber deep foundation elements used to support permanent structures shall be treated in accordance with this section unless it is established that the tops of the untreated timber elements will be below the lowest ground-water level assumed to exist during the life of the structure. Preservative and minimum final retention shall be in accordance with AWPA U1 (Commodity Specification E, Use Category 4C) for round timber elements and AWPA U1 (Commodity Specification A, Use Category 4B) for sawn timber elements. Preservative-treated timber elements shall be subject to a quality control program administered by an *approved agency*. Element cutoffs shall be treated in accordance with AWPA M4. For preservative treatment of piles in marine and underwater environments, see Chapter 36.

The effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

(Add a definition in Chapter 2)
[BS] CROSS-LAMINATED TIMBER. A prefabricated engineered wood product consisting of not less than three layers of solid-sawn lumber or *structural composite lumber* where the adjacent layers are cross oriented and bonded with structural adhesive to form a solid wood element.

(Revise as follows)
602.4 Type IV. Type IV construction (Heavy Timber, HT) is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid or laminated wood without concealed spaces. The details of Type IV construction shall comply with the provisions of this section and Section 2304.10. ~~*Fire-retardant-treated wood* framing~~ Exterior walls complying with Section ~~2303.2~~ 602.4.1 or 602.4.2 shall be ~~permitted within exterior wall assemblies with a 2-hour rating or less~~ permitted. Minimum solid-sawn nominal dimensions are required for structures built using Type IV construction (HT). For glued-laminated members, the equivalent net finished width and depths corresponding to the minimum nominal width and depths of solid-sawn lumber are required as specified in Table 602.4. *Cross-laminated timber* (CLT) dimensions used in this section are actual dimensions.

602.4.1 Fire-retardant-treated wood in exterior wall. Fire-retardant wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies with a 2-hour rating or less.

602.4.2 Cross-laminated timber in exterior walls. Cross-laminated timber complying with Section 2303.1.4 shall be permitted within exterior wall assemblies with a 2-hour rating or less, provided the exterior surface of the cross-laminated timber is protected by one of the following:
1. Fire-retardant-treated wood sheathing complying with Section 2303.2 and not less than 15/32 inch (12 mm) thick;
2. Gypsum board not less than ½ inch (12.7 mm) thick; or
3. A noncombustible material

~~**602.4.1**~~ **602.4.3 Columns.** *(no change, only renumbering)*

~~**602.4.2**~~ **602.4.4 Floor framing.** *(no change, only renumbering)*

~~**602.4.3**~~ **602.4.5 Roof framing.** *(no change, only renumbering)*

~~**602.4.4**~~ **602.4.6 Floors.** *(no change, only renumbering)*

602.4.6.1 Cross-laminated timber floors. Cross-laminated timber shall be not less than 4 inches (102 mm) in thickness. Cross-laminated timber shall be continuous from support to support and mechanically fastened to one another. Cross-laminated timber shall be permitted to be connected to walls without a shrinkage gap providing swelling or shrinking is considered in the design. Corbelling of masonry walls under the floor shall be permitted to be used.

~~**602.4.5**~~ **602.4.7 Roofs.** Roofs shall be without concealed spaces and wood roof decks shall be sawn or glued-laminated, splined or tongue-and-groove plank, not less than 2 inches (51 mm) nominal in thickness~~,~~; 11/8-inch-thick (32 mm) wood structural panel (exterior glue)~~,~~; ~~or of~~ planks not less than 3 inches (76 mm) nominal in width, set on edge close together and laid as required for floors~~.~~; or cross-laminated timber. Other types of decking shall be permitted to be used if providing equivalent *fire resistance* and structural properties.

Cross-laminated timber roofs shall be not less than 3 inches (76 mm) nominal in thickness and shall be continuous from support to support and mechanically fastened to one another.

~~**602.4.6**~~ **602.4.8 Partitions and walls.** Partitions and walls shall comply with Section 602.4.8.1 or 602.4.8.2.

602.4.8.1 Interior walls and partitions. Interior walls and ~~Partitions~~ partitions shall be of solid wood construction formed by not less than two layers of 1-inch (25 mm) matched boards or laminated construction 4 inches (102 mm) thick, or of 1-hour fire-resistance-rated construction.

602.4.8.2 Exterior walls. Exterior walls shall be one of the following:

1. Noncombustible materials
2. Not less than 6 inches (152 mm) in thickness and constructed of one of the following:
2.1 Fire-retardant-treated wood in accordance with Section 2303.2 and complying with Section 602.4.1.
2.2 Cross-laminated timber complying with Section 602.4.2.

~~602.4.7~~ 602.4.9 Exterior structural members. *(no change, only renumbering)*

2302.1 Definitions.

(Insert as follows)
CROSS-LAMINATED TIMBER. A prefabricated engineered wood product consisting of not less than three layers of solid-sawn lumber or *structural composite lumber* where the adjacent layers are cross oriented and bonded with structural adhesive to form a solid wood element.

(Revise as follows)
2303.1.4 Structural glued cross-laminated timber. Cross-laminated timbers shall be manufactured and identified in accordance with ANSI/APA PRG 320.

~~2303.1.4~~ 2303.1.5 Wood structural panels. *(no change, only renumbering)*

(Renumber subsequent sections accordingly)

(Add to Chapter 35 under APA)
ANSI/APA PRG 320-2012 Standard for Performance-rated Cross Laminated Timber……2303.1.4

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Building Code
Chapter 34 Existing Structures. (140610 Item B-6)

Delete Chapter 34, Existing Building And Structures, from the 2012 NC Building Code.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

Additions to Chapter 35

AASHTO M288-06 Geotextile Specification for Highway Applications

ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures

ACI 440.2R-08 Guide to the Design and Construction of Externally Bonded *FRP* Systems for Strengthening Concrete Structures

ACI 440.3R-12 Guide Test Methods for Fiber Reinforced Polymer (*FRP*) Composites for Reinforcing or Strengthening Concrete and Masonry Structures

ASTM C581-03 Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service

ASTM C666-03 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

ASTM D256-10 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

ASTM D570-98 Standard Test Method for Water Absorption of Plastics

ASTM D578-05 Standard Specification for Glass Fiber Strands

ASTM D618-13 Practice for Conditioning Plastics for Testing

ASTM D638-10 Test Method for Tensile Properties of Plastics

ASTM D648-07 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

ASTM D696-08 Test Method for Coefficient of Linear Thermal Expansion of Plastics between -30^0C and 30^0C with a Vitreous Silica Dilatometer

ASTM D790-10 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM D883-12 Terminology Relating to Plastics

ASTM D907-12a Standard Terminology of Adhesives

ASTM D953-10 Standard Test Method for Bearing Strength of Plastics

ASTM D1435-13 Practice for Outdoor Weathering of Plastics

ASTM D2343-09 Standard Test Method for Tensile Properties of Glass Fiber Strands, Yarns, and Rovings Used in Reinforced Plastics

ASTM D2344-13 Standard Test Method for Short Beam Strength of Polymer Matrix Composite Materials and Their Laminates

ASTM D2583-13a Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

ASTM D3878-07 Standard Terminology of High-modulus Reinforcing Fibers and Their Composites

ASTM D3917-12 Standard Specification for Dimensional Tolerance of Thermosetting Glass-reinforced Plastic Pultruded Shapes

ASTM D4065-12 Standard Practice for Plastics: Dynamic Mechanical Properties: Determination and Report of Procedures

ASTM D4385-13 Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products

ASTM D4216-13 Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products

ASTM D4226-11 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly(Vinyl Chloride) (CPVC) Building Products Compounds

ASTM D5379-12 Standard Test Method for Shear Properties of Composite Materials by the V-Notch Beam Method

ASTM D6641-09 Standard Test Method for Determining the Compressive Properties of Polymer Matrix Composite Laminates Using a Combined Loading Compression (CLC) Test Fixture

ASTM D7136-12 Standard Test Method for Measuring the Damage Resistance of a Fiber-reinforced Polymer Matrix Composite to a Drop-weight Impact Event

ASTM D7290-06 Standard Practice for Evaluating Material Property Characteristic Values for Polymeric Composites for Civil Engineering Applications

ASTM D7332-09 Standard Test Method for Measuring the Fastener Pull-through Resistance of a Fiber-reinforced Matrix Composite

ASTM G154-12a Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

The effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

Replacement of Chapter 36
(Note: The following is to be considered underlined in its entirety.)
Commentary is included for clarification only and not subject to review.

CHAPTER 36 DOCKS, PIERS, BULKHEADS AND WATERWAY STRUCTURES

SECTION 3601 GENERAL AND SCOPE

3601.1 General. The intent of this chapter is to provide minimum standards for the design, construction and maintenance of *docks, piers, bulkheads,* and waterway structures. The guidelines in this chapter address minimum standards for foundations, design forces, structural integrity, material selection and utilization and construction techniques.

Commentary: *The design of docks, piers, bulkheads and waterway structures is essential for the protection of life and property without causing adverse effects to the shoreline. These structures by their very nature result in some modification of physical environment and therefore require minimum design standards.*

3601.2 Scope. The following structures shall be designed in accordance with the requirements of this chapter:

1. *Docks, piers, gangways,* and *catwalks,* other than residential and farm *docks* and *piers* exempted from this chapter in the exceptions below, shall be designed by a registered design professional.

2. All *bulkheads* having an exposed height greater than 5 feet or with a superimposed load shall be designed by a registered design professional and require special inspection. Special inspection shall be waived for *bulkheads* of any height constructed from property line to property line of one- or two- family dwellings and including attachment to neighboring *bulkheads.*

Commentary: *Chapters 17 and 18 require special inspection on retaining walls exceeding 5 feet in height due to failures associated with construction related deficiencies. Bulkheads are also prone to the same sort of construction deficiencies; therefore, special inspection is required for bulkheads greater than 5 feet, including common bulkheads for multi-family residential projects or subdivisions where the bulkhead services multiple single family residences. The exception is a bulkhead servicing the property of one single family residence.*

3. Oceanfront retaining walls, *bulkheads* and other types of retaining walls used by the public on the coastline of the ocean or adjacent inlets shall be designed by a registered design professional.

4. Marine terminal or port facilities for berthing, mooring, docking and servicing ships, barges, or tug boats that handle cargo of all types, including bulks, containers, liquids, fuels, and people, which shall be designed by a registered design professional in accordance with accepted industry standards.

Commentary: *Wharves and piers for cargo handling facilities typically require consideration of loadings unique to each individual facility. As a result, these facilities must be designed by a registered design professional who works with the owner in the preliminary phases of the project to develop design criteria tailored to the owner's needs. Support structures, such as warehouses, office buildings, and cranes supported on these structures, are required to comply with the provisions of this code. For more information on cargo wharves and docks, the reader is referred to the Department of Defense UFC 4-152-01 Design: Piers and Wharves, UFC 4-152-07 Design: Small Craft Berthing Facilities, and the Port of Long Beach Wharf Design Criteria.*

5. Groins not exempted below, jetties, breakwaters, oceanfront seawalls, and oceanfront revetments shall be designed by a registered design professional in accordance with accepted industry standards.

Commentary: *These structures typically require consideration of loadings unique to each individual facility. As a result, these structures must be designed by a registered design professional who works with the owner in the preliminary phases of the project to develop design criteria tailored to the owner's needs. For more information, refer to documents such as The Coastal Engineering Manual by the U. S. Army Corps of Engineers.*

Exceptions*:* The following structures are exempt from the requirements of this chapter:

1. Sill structures combined with marsh plantings and certain groins in accordance with the Department of Environmental and Natural Resources general permit requirements.

2. Oceanfront and inlet sandbag revetments in accordance with the Department of Environmental and Natural Resources general permit requirements.

3. Revetments constructed on single family residential property having a height no greater than 10 feet and slope greater than 1.5 horizontal: 1.0 vertical and in accordance with the Department of Environmental and Natural Resources general permit requirements.

4. Farm structures not on public waters.

Commentary: *Farm structures should be limited solely for use by the farmer, his family, and his employees.*

5. *Piers* and *docks* associated with one- or two- family dwellings meeting the exceptions of the *NC Residential Code*.

SECTION 3602 DEFINITIONS

ADDITIVES. Substances added to a polymer resin or vinyl chloride material to aid in processing the material.

BOAT SLIP. A berthing place for one or two watercraft where the watercraft can be securely moored to cleats, piling, or other devices while the boats are in the water. Boat slips are commonly configured as "side-ties" or as single or double loaded "U" shaped berths.

BULKHEAD. A vertical wall structure designed to retain shoreline material and prevent erosion due to wave activity.

CATWALK. A narrow footway platform extending alongside a structure.

DESIGN WAVE. A design wave that is potentially most damaging to an economically feasible structure, or wave for which a structure is designed.

DOCK. A structure extending alongshore or out from the shore into a body of water, usually accommodating multiple boat slips, to which boats may be moored in order to load or unload people or cargo.

EXTRUSION. Manufacturing process whereby a material is pushed through a die to form a shape of constant cross section. Vinyl Chloride sheet piling is generally manufactured using an extrusion process.

FETCH. Open water exposure over which waves are generated.

FIBER. One or more glass, carbon, or aramid filaments in the form of a continuous strand or roving in an *FRP* material.

FIBER ARCHITECTURE. Construction of a composite material from layers with different types and orientations of fibrous material.

FIBER ORIENTATION. Fiber orientation is the alignment of the longitudinal axis of a fiber in an *FRP* material with respect to the stated reference axis.

FIBER REINFORCED POLYMER (*FRP*). A composite material which consists of a polymer resin based matrix reinforced with fibers of glass, carbon, aramid, or hybrid combinations of these fiber types.

FIBER VOLUME FRACTION. The volume of reinforcement fiber in a cured composite divided by the volume of the composite section.

FILLER. Substance added to the matrix of a *FRP* material intended to alter its engineering properties, performance, or cost.

GANGWAY. A footway bridge extending from the *dock, pier, bulkhead,* or shore, usually to a floating structure.

GLASS TRANSITION TEMPERATURE (T_g). Temperature at which the polymer matrix of an *FRP* material changes from a glassy state to a rubbery state.

KING PILE. The primary structural member that supports horizontal panels to form a vertical wall sometimes used in *bulkhead* or groin construction.

LAMINA. A layer of fibers and resin in an *FRP* material.

MATERIAL LONGITUDINAL DIRECTION. Direction in an *FRP* material parallel to the direction of pultrusion (pulling) during the manufacture of a plate or structural shape.

MATERIAL TRANSVERSE DIRECTION. Direction in an *FRP* material orthogonal to the longitudinal direction.

MATRIX. Continuous constituent of an *FRP* material surrounding the reinforcing fibers and consisting of a polymer resin with any fillers and additives.

PIER. An elevated deck structure, usually pile supported, extending out into the water from the shore.

PILE. A timber, concrete, metal, or composite member embedded into the ground to support or brace a structure. "Piles" or "piling" are plural forms of "pile."

PRIVATE WATERFRONT STRUCTURES. A *dock, pier, bulkhead,* or associated structure not open to the general public and with no more than ten total boat slips and no more than ten owners.

PUBLIC WATERFRONT STRUCTURES. A *dock, pier, bulkhead,* or associated structure located on *multi-family* residential property (greater than ten *dwelling units*), public property or commercial property.

PULTRUSION. Manufacturing process whereby a material is pulled through a die to form a shape of constant cross section. *FRP* plates and structural shapes are generally manufactured using a pultrusion process.

RESIN. An organic polymer possessing indefinite and often high molecular weight and a softening or melting range that exhibits a tendency to flow when subjected to stress.

REVETMENT. A sloping structure usually constructed of stone or concrete and placed on a shoreline to protect it against erosion by wave and current action.

ROVING. In an *FRP* material, a roving is a large number of continuous parallel filaments or a group of untwisted parallel strands.

SHEET PILE. A pile with a generally slender flat cross section to be embedded into the ground or seabed and meshed or interlocked with like members to form a diaphragm, wall, or *bulkhead*.

SYMMETRIC COMPOSITE. A symmetric composite is a composite material in which the sequence of lamina below the laminate mid-plane is a mirror image to those above the laminate mid-plane.

SECTION 3603 PERMITS AND APPROVALS

3603.1 General. In addition to a building permit, permits may be required from federal, state, or county agencies such as the United States Army Corps of Engineers or the North Carolina Department of Environmental and Natural Resources. In cases of structures to be built on lakes operated by an electric utility for the generation of power, a permit from the operating utility may also be required.

SECTION 3604 MINIMUM DESIGN LOADS

3604.1 General. Every structure shall be of sufficient strength to support the imposed dead, live, snow, wind, impact, and seismic loads without exceeding the prescribed stresses for the various materials described elsewhere in this code. Adequate consideration shall be made for forces imposed by earth, water, docking, and mooring.

3604.2 Dead loads. The weight of the component parts of a structure shall be used in the design when it will influence the strength of the structural elements. All utilities, permanent furniture, dock boxes, and mooring hardware should be considered as dead load.

3604.3 Live loads. Design live loads shall be the greatest load that will likely be imposed on the structure, including superimposed loads on retained material that exert horizontal loads on the structure. Where vehicles are allowed, actual weight of vehicles and wheel loads as specified in the latest edition of Standard Specifications for Highway Bridges of the American Association of State Highway and Transportation Officials or obtained from the vehicle manufacturer shall be used. The design load shall be posted at the *dock* or *pier* approach where vehicles are allowed. Minimum live loads are:

1. Fixed *piers, docks, catwalks* - Private waterfront *piers*: 40 psf or 300 pounds concentrated load on any area 2 foot square. Public waterfront *piers*: Design loads shall be the greatest combinations of loads exerted on the structure but not less than 60 psf.

2. Floating *docks* - Private waterfront *docks*: 20 psf, public waterfront *docks*: 30 psf, or 300 pounds concentrated load on any area 2 feet square. Under dead and live load, all floating *docks* shall have a minimum of 3 inches freeboard from the top of the flotation device, other than low freeboard watercraft (e.g. kayak) launching facilities. All floating *docks* subject to this chapter shall have not more than 5 degrees tilt from the horizontal under uniform live loading on one-half of the dock width or under concentrated load of 400 pounds applied within 12 inches of any side.

3. *Gangways* - *Gangways* shall be designed for a live load of for 100 psf. Flotation for *gangway* landing shall be designed for 50 psf, live load.

4. *Bulkheads, revetments* - Design loads shall be the greatest combinations of loads exerted on the structure. Consideration shall be given to horizontal loads exerted by superimposed loads on the retained earth and by inclined

surface slopes. Superimposed loads shall be considered when exceeding 50 psf and located within a horizontal distance of three times the height of the *bulkhead* from the face of the *bulkhead*.

3604.4 Snow Loads. Design snow loads shall be as prescribed in Chapter 16.

3604.5 Wind loads. Design wind loads shall be as prescribed in Chapter 16 without moored vessels. In wind regions with a design wind speed greater than 90 mph, the design wind speed shall be no less than 90 mph (3 second gust). This gust wind speed shall be adjusted for duration and height (not restricted to 15 feet minimum) for wind pressures applied to vessels moored at the facility in accordance with Chapter 16.

Commentary: *During hurricanes, the intent is that vessels be removed from the water or sailed out to sea away from the storm, hence the reduced design wind speed for moored vessels. A design wind speed of 90 mph (3 second gust) is consistent with a thunderstorm.*

3604.6 Impact loads. Design impact loads shall be as prescribed in Chapter 16 but not less than 1.25 times the kinetic energy exerted by a striking vessel or vehicle.

3604.7 Seismic Loads. Design seismic loads shall be as prescribed in Chapter 16. Seismic loads are not applicable for any structure exempted from design by a registered design professional.

3604.8 Water loads. Hydrostatic and hydrodynamic loadings shall be considered as follows:

3604.8.1 Hydrostatic Pressures. Hydrostatic pressures shall be considered in conjunction with the equivalent fluid pressure of soil and any surcharge acting on the structure. For *bulkheads,* hydrostatic pressures shall be estimated based on maximum difference between retained and offshore water surface elevations.

3604.8.2 Current Loads. Current loads for structures and vessels shall be determined from records on current velocity using accepted engineering practice.

3604.8.3 Anchorage for Uplift. Sufficient anchorage against uplift between all components, except elements specifically designed to break away, shall be provided. Resisting forces shall be not less than 1.5 times the applied uplift force.

3604.8.4 Wave Forces. Wave forces shall be determined from wave records where available. Where no wave records are available, the design wave shall be determined from probable wind speed, direction, fetch, and water depth that will yield a critical wave. Forces shall then be calculated using accepted engineering practice.

3604.8.5 Forces due to Passing Vessels. All *piers* and floating *docks* shall be designed for water loading generated by wind and passing vessels. Adjacent to federal designated channels, water loading shall be based on commercial and recreational vessels with minimum passing speeds of 10 and 20 knots, respectively.

3604.9 Earth loads. Lateral earth pressures shall be determined by considering the specific soil properties and applying earth pressure theories generally accepted for soil mechanics in engineering practice. A geotechnical investigation or other adequate consideration shall be given by the registered design professional for the effect of probable varying levels of retained water, tide, and flood water. Pressures exerted by the earth shall be checked for dry, moist, and saturated conditions as applicable.

3604.10 Erosion. The effects of reasonably predictable erosion, propeller wash-induced scour, and wave-induced scour shall be given ample consideration.

3604.11 Water Levels. The ability to accommodate dead, live, wind, current, and wave loadings for the range of water levels (from low water to base flood level) anticipated at the site shall be given consideration. For public and private

floating *docks*, guide piling systems shall be capable of accommodating water levels extending a minimum of 2 feet above base flood elevation plus the freeboard of the dock structure.

SECTION 3605 MATERIALS

3605.1 General. The quality of materials and fasteners used for load-supporting purposes shall conform to *acceptable engineering practice.*

Commentary: *Marine environments are quite hostile to many materials. Fresh water facilitates corrosion of metals, and salt water further accelerates corrosion. While conventional concrete cover affords some protection to reinforcing steel, wet service in all marine environments and chloride penetration in salt water environments can break down the passive protection afforded by concrete cover. Wood is subject to attack by decay, insects, and, in salt water, by marine borers. Due to the hostile environments in marine applications, durability of materials is as important a consideration in the selection of materials as strength.*

3605.2 Piling and Foundations. Materials used for piling and repairing piling shall comply with applicable provisions of Chapter 18 and the material requirements of Sections 3605.3 through 3605.7.

3605.2.1 Helical Anchors. Helical anchors shall be hot dip galvanized. A representative number of helical anchors subjected to tensile loading shall be load tested in accordance with ASTM D 3689 to two times their design load capacity. Load testing of anchors in tension shall include creep testing of a representative number of the anchors. Helical anchors shall be designed and installed as determined by a registered design professional.

Commentary: *The design should consider the risk of varying soils at the site with specific concern for deposits of marine clays susceptible to creep. In sedimentary regions and areas created with fill from dredged deposits, pockets of such clays can exist and lack of long term testing at that specific location could result in creep of the anchor.*

3605.3 Wood. Wood shall be pressure treated with a preservative recommended by the American Wood Preservers' Association for the specific application. Wood species, preservative treatment, minimum lumber size, and lumber grade shall be in accordance with Table 3605.3. Handrails, guardrails, wallcaps, and decking may be constructed of naturally durable species where located above the normal high water mark.

3605.3.1 Wood Connections. All steel bolts, rods, and other hardware shall be hot-dipped galvanized or protected with an equivalent system. All bolts, rods and other metal materials shall be no smaller than 5/8 inch in diameter. Beams, girders, or pile caps shall be attached to the piling with a minimum of two 5/8-inch hot-dip galvanized steel bolts per beam member through bolted at each piling connection. Piling shall not be notched so that the cross-section is reduced below 50 percent. Threaded fasteners shall not be tightened directly against wood surfaces but used only in conjunction with standard ogee or flat washers. Cold formed metal connectors shall not be used in wet applications or applications subject to wetting and drying cycles. Mooring hardware, including cleats, and pile guides shall be through bolted using sizes recommended by the manufacturer.

Table 3605.3: SPECIFICATIONS FOR SOUTHERN PINE[2] LUMBER IN FRESH AND SALT WATER SERVICE

Location	Component	AWPA Use Category[1,4]		Dimensions	Lumber Grade		Moisture Content at Treatment
		Saltwater	Freshwater		Saltwater	Freshwater	
Above Normal High Water	Decking[3]	3B	3B	5/4 “ 2” Nominal Min.	Premium No. 2	Premium No. 2	Surfaced Dry 19%
	Guardrails	3B	3B	2” Nominal Min.	No. 2	No. 2	Surfaced Dry 19%
	Wallcaps	3B	3B	2” Nominal Min.	No. 2	No. 2	Surfaced Dry 19%
	Walers	3B	3B	4x6 Nominal	No. 2	No. 2	KD 20% or less or Dry 23%
	Cross Bracing	3B	3B	2” to 4” Nominal	No. 2	No. 2	Surfaced Dry 19%
Splash Zone	Split Pile Caps	4B	4B	2” to 4” Nominal	No. 2	No. 2	Surfaced Dry 19%
	Stringers	4B	4B	2” Nominal	No. 2	No. 2	Surfaced Dry 19%
Below Normal High Water	Sheet Piles	5B	4C	2” to 4” Nominal	Marine No. 1[7]	No. 2	Surfaced Dry 19%
	Walers	5B	4C	4x6 Nominal	Marine No. 1[7]	No. 2	KD 20% or less or Dry 23%
	Cross Bracing	5B	4C	2” to 4” Nominal	Marine No. 1[7]	No. 2	Surfaced Dry 19%
	Rectangular Timber Piles	Not Allowed[6]	4C	6x6 Nominal	Not Allowed[6]	No. 2	KD 20% or less or Dry 23%
	Round Timber Piles	5B[6]	4C	ASTM D25	ASTM D25	ASTM D25	KD 25% or Less
Engineered Lumber	Glulam Timber	5B	4B	4” Nominal Min.	Note 5	Note 5	12% Average
	Parallel Strand Lumber	5B	4B	3½” Minimum 26	1.8E or Better	1.8E or Better	Per Manufacturer’s Specifications

Footnotes:

1. Lumber shall be pressure treated with preservative treatment in accordance with AWPA U1.

2. At the discretion of the Building Official, lumber species other than Southern Pine may be approved when span tables for wet use conditions are submitted, and the lumber is treated for comparable service life to the treatment specifications required by Table 3605.1.

3. Wood composite decking, treated or untreated, shall provide equivalent service life to the treated decking specified in Table 3605.1.

4. All notches, holes, and field cuts shall be field treated in accordance with AWPA M4.

5. Glulam grade shall be specified as a layup combination or stress class in accordance with the National Design Specification or the manufacturer's published data. Layup combinations shall consist of species and grades capable of the treatment retentions equivalent to the AWPA use categories specified in Table 3605.1.

6. Commercial pile wraps may be used to extend the life expectancy of timber piles exposed to marine borers.

7. AWPA requirements for Marine No. 1 specify that no heartwood be exposed on any face prior to preservative treatment.

Commentary: *Table 3605.3 specifies the minimum lumber grades and preservative pressure treatment required for Southern Pine lumber to survive in various marine environments providing a reasonable service life. Southern Pine is the most prevalent species treated in North Carolina. Other species are acceptable when treated in accordance with appropriate AWPA standards and designed accounting for wet use. Treatment is specified in accordance with the use condition categories set forth in AWPA U1. Fresh water applications and salt water applications above normal high water require protection from decay and insects. Salt water applications below normal high water require additional protection from marine borers, teredoes and limnoria. In treating wood against marine borers sapwood is required on exposed faces of the pile. For round piles it is reasonably easy to procure a wood member with no heartwood exposed; however, for square or rectangular piles it is much more expensive to saw the pile in a manner that leaves no heartwood exposed on any face of the pile.*

3605.4 Concrete. Concrete components shall comply with applicable provisions of Chapter 19 and ACI 318. Minimum concrete strength, air entrainment, maximum chloride content, and maximum water cement ratio shall be determined from ACI 318 on the basis of required structural strength, required resistance to freeze-thaw exposure, required abrasion resistance, and required resistance to water penetration and salt water intrusion. Minimum concrete cover shall be increased and reinforcing steel spacing shall be decreased in accordance with ACI 350, to reduce crack size. All steel embedments, other than reinforcing steel, shall be stainless, hot dip galvanized, or coated for corrosion protection. Field welds and abrasions of coatings on embeds shall be touch coated in the field.

Commentary: *In marine environments durability requirements dictate material selection and concrete mix designs. ACI 318 specifies maximum water cement ratios for concrete mixes to limit permeability of the concrete. Concrete strength specified by the designer should be consistent with the water cement ratio required. Higher concrete strengths than needed for strength considerations may be required to achieve the required water cement ratio. Controlling cracking of the concrete limits potential pathways of water and chloride ions to the reinforcing steel, thereby reducing corrosion potential.*

3605.5 Structural Steel. Steel components shall comply with applicable provisions of Chapter 22 and AISC 360. All structural steel members, fasteners, and fittings shall be protected from corrosion by coating or cathodic protection for the specific exposure. Steel *bulkhead* components and dock components shall be hot dip galvanized or coated to achieve the corrosion protection required for the degree of exposure of corrosive elements. Field welds and abrasions to coatings shall be touch coated after erection or installation is completed. Cold formed metal joists, girders, columns, and studs shall not be used in applications where the members are constantly wet or subject to wetting and drying cycles.

Commentary: *Cold formed metal structural members have very little reserve capacity when subjected to a corrosive environment.*

3605.6 Aluminum. Aluminum *bulkhead* sheets or aluminum *bulkhead* or *dock* components shall be of proper alloy to resist corrosive elements in the adjacent water and soil. *Bulkhead* components and hardware shall be aluminum or stainless steel. Aluminum shall be galvanically and physically isolated from concrete and galvanically isolated from steel. Connection hardware and fasteners for aluminum components may be stainless steel or galvanized steel if isolated from aluminum structural elements.

Commentary: *Aluminum in contact with concrete may react with the concrete producing deleterious effects on the concrete. Aluminum in direct contact with steel precipitates a galvanic reaction resulting in accelerated corrosion of the steel.*

3605.7 Plastics and Composites. *Bulkheads*, structural shapes, plates, and guardrail systems manufactured from vinyl chloride based materials or fiber reinforced polymer (*FRP*) materials shall be designed to comply with manufacturer's published load tables or manufacturer's published mechanical properties subject to the requirements for specific materials in Sections 3605.7.1, 3605.7.2, and 3605.7.3. Plastic and composite members shall contain additives to inhibit ultra violet radiation degradation or shall be protected from ultra violet radiation by an *approved* coating.

3605.7.1 Sheet Piling Manufactured from Vinyl Chloride Based Materials. Vinyl chloride materials for sheet piling shall be specified and tested for conformance in accordance with ASTM D4216, including weathering tests in accordance with ASTM D1435. Mechanical properties shall be established in accordance with the tests specified in Table 3605.7.1. Design values of the tabulated properties shall conform to the limiting values specified in the table. The manufacturer of the sheet piling shall produce a certificate of analysis from a third party testing agency

certifying the vinyl chloride material from which the sheet piling is manufactured conforms to the physical properties specified. The third party testing agency shall be accredited in accordance with ISO 17025 to conduct the specified tests. Testing programs shall address changes in material sources and composition over time, and test data shall accurately represent the properties of the product produced at any given time.

Commentary: *Language of 3605.7.1 and its subsections is based on a 2005 Army Corps of Engineers document entitled "INTERIM REPORT, General Design Guide: PVC Sheet Pile." This document appears to be the most current available on the topic.*

The report explains specification of materials using the cell method of categorizing mechanical properties and conformance testing in accordance with ASTM D4216.

According to the report, manufacturers of PVC sheet piling use primarily recycled materials. Variability of recycled materials affects mechanical properties and durability of the product. For this reason, ongoing testing of the materials used in manufacturing the sheet piling by a qualified third party testing agency is of the utmost importance.

3605.7.1.1 Deflection of Vinyl Chloride Based Sheet Piling. Deflection of vinyl sheet pile *bulkheads* shall not exceed the lesser of 1/60 times the height from the mud line to the top of the wall or 2 inches. Effects of in-service temperatures exceeding 80^0F on modulus of elasticity shall be considered in deflection calculations and selection of materials.

Commentary: *Vinyl chloride based materials have a very low modulus of elasticity. Consequently, large deflections can occur in bulkheads that normally would have sufficient strength to withstand applied loads. Large deflections affect both stability of the bulkhead, especially in the presence of transient superimposed loads, and appearance. Therefore, deflections need to be limited. The elastic modulus of vinyl chloride based materials decreases at a rate of approximately 202 psi/^{0}F with increase in temperature. Consequently, high summertime temperatures and resulting increased surface temperatures can significantly affect deflection of the bulkhead.*

3605.7.1.2 Service Stresses for Vinyl Chloride Based Sheet Piling. Service load stresses in the vinyl sheet piling shall not exceed 3200 psi.

Commentary: *Regardless of design method, ASD or LRFD, the USACE report recommends limiting service load stresses to 3200 psi in order to limit creep deformations.*

3605.7.1.3 Ultra Violet Light Stabilization. Vinyl chloride based materials shall be compounded with stabilizing agents. Addition of stabilizers during the extrusion process is prohibited.

Commentary: *Adding stabilizers during the extrusion process does not adequately stabilize the material against UV deterioration. Stabilizer must be added when the product is compounded.*

3605.7.1.4 Impact Resistance of Vinyl Materials. Vinyl sheet pile *bulkheads* shall have sufficient impact resistance, determined in accordance with ASTM D256 and ASTM D4226, to resist impact from vessels traveling at mooring speeds, resist wave impact when installed in high velocity flood zones (V-Zones on Flood Insurance Rate Maps), and to resist impact from debris likely to collide with the *bulkhead* at flood stage or in areas subject to storm surge.

3605.7.1.5 Fire, Smoke, and Toxicity. Vinyl materials shall be tested for the in-service thickness in accordance with ASTM D635 with a resulting burning rate of 2 ½ inches per minute or less.

Table 3605.7.1: LIMITATIONS ON MECHANICAL PROPERTIES FOR VINYL CHLORIDE BASED SHEET PILING		
Mechanical Property	**Test Protocol**	**Limitations on Property**
Notch Impact Resistance	ASTM D256	2.0 ft-lb./in minimum
Drop Dart Impact Resistance, Procedure A	ASTM D4226	1.0 in-lb./mil minimum
Drop Dart Impact Resistance, Procedure B	ASTM D4226	2.0 in-lb./mil minimum
Tensile Strength	ASTM D638	6500 psi minimum
Modulus of Elasticity in Tension	ASTM D638	377,000 psi minimum
Deflection Temperature under 264 psi	ASTM D648	158 psi minimum
Linear Coefficient of Expansion	ASTM D696	$4.4x10^{-5}$ in/in/^{0}F maximum

3605.7.2 Pultruded Fiber Reinforced Polymer (*FRP*) Sheet Piling, Shapes and Plates. Mechanical properties for *FRP* structural components shall be established in accordance with the tests specified in Table 3605.7.2. Each manufacturer shall publish the characteristic values for the product in accordance with ASTM D7290. The manufacturer of the *FRP* shall produce a certificate of analysis certifying the *FRP* material and constituent materials from which the *FRP* components are manufactured conform to the physical properties specified. Testing programs shall address changes in material sources and composition over time, and test data shall accurately represent the properties of the product produced at any given time. Manufactured components shall be inspected in the plant in accordance with ASTM D3917 for dimensional tolerances and according to ASTM D4385 for visual defects. Inspection reports shall be provided.

***Commentary**: Section 3605.7.2 is based on the ASCE "Prestandard for Load and Resistance Factor Design of Pultruded Fiber Reinforced Polymer Structures." This document has not yet been published as a national standard. Excerpts from the ASCE document necessary to establish consistent material behavior have been reproduced in this code. Methods for proportioning members are left to the designer with reference to manufacturer's published data.*

Table 3605.7.2: LIMITATIONS ON PHYSICAL AND MECHANICAL PROPERTIES FOR FIBER REINFORCED POLYMER COMPONENTS[1]		
Property	**ASTM Test Method**	**Minimum Number of Tests**
Barcol Hardness	D2583	5
Glass Transition Temperature T_g	D4065	5
Coefficient of Thermal Expansion	D696	5
Moisture Equilibrium Content	D570	5
Longitudinal Tensile Strength	D638	10
Transverse Tensile Strength	D638	10
Longitudinal Tensile Modulus	D638	10
Transverse Tensile Modulus	D638	10
Longitudinal Compressive Strength	D6641	10
Transverse Compressive Strength	D6641	10
Longitudinal Compressive Modulus	D6641	10
Transverse Compressive Modulus	D6641	10
Longitudinal Flexural Strength	D790	10
Transverse Flexural Strength	D790	10
Longitudinal Flexural Modulus	D790	10
Transverse Flexural Modulus	D790	10

In-Plane Shear Strength	D5379	10
In-Plane Shear Modulus	D5379	10
Inter-laminar Shear Strength	D2344	10
Longitudinal Pin Bearing Strength	D953[2]	10
Transverse Pin Bearing Strength	D953[2]	10
Pull Through Strength per Fastener t = 3/8” t = ½” t = ¾”	D7332, Proc. B	10

Footnotes:

1. Property requirements for shapes apply to sheet piles.

2. Tests shall be conducted for material thicknesses, t, tabulated and bolt sizes from 3/8 inch to 1 inch in diameter. No more than 1/3 of the bolt shank within the thickness of the connection material may be threaded. Bolts shall be installed snug tight.

3605.7.2.1 Maximum Service Temperature. Service temperature of *FRP* structural components shall not exceed T_g-40^{0}F, where T_g is the glass transition temperature determined in accordance with ASTM D4065.

3605.7.2.2 *FRP* Constituent Materials. Fibers and matrix constituents shall comply with the following requirements:

3605.7.2.2.1 Fiber Type. Fibers shall be glass, carbon, aramid, or hybrid combinations of these fiber types. Glass fibers shall conform to ASTM D578.

3605.7.2.2.2 Fiber Architecture and Content. The fiber architecture of any pultruded element comprising the cross section of a pultruded *FRP* structural member shall be symmetrical and balanced. Each pultruded *FRP* structural element shall contain a minimum total fiber volume fraction of 30%.

3605.7.2.2.3 Fiber Orientations. Each element of a pultruded *FRP* structural member shall have fibers oriented in a minimum of two directions separated by a minimum of 30 degrees. In the direction of the longitudinal axis of the member the percentage of continuous fiber in each pultruded element shall be a minimum of 30% of the total fiber reinforcement by volume for shapes and a minimum of 25% of the total fiber reinforcement by volume for plates. When multiple elements share a common edge in the direction of pultrusion, at least 50% of the non-roving reinforcement in the element having the largest percentage of non-roving reinforcement shall extend through the junction connecting the elements.

3605.7.2.2.4 Minimum Fiber Tensile Strength. Determined in accordance with ASTM D7290, the characteristic value of the tensile strength of the fiber strands, yarns, and rovings shall be at least 290,000 psi. Tensile tests shall be conducted in accordance with ASTM D2343.

3605.7.2.2.5 Resin. A commercial grade thermoset resin shall be used for fabricating pultruded *FRP* structural members.

3605.7.2.2.6 Other Constituent Materials. Additives to the resin system that influence processing or curing, such as fillers, promoter, accelerators, inhibitors, UV resistant agent, and pigments shall be compatible with the fiber and resin system.

3605.7.2.3 Durability and Environmental Effects. Materials for *FRP* structural components shall be selected, designed, and manufactured to tolerate long term environmental effects anticipated during the service life of the structure.

3605.7.2.3.1 Factors Considered in Material Selection. The following factors shall be considered in selecting *FRP* materials for marine structures:

a. Performance criteria for the structure;
b. Intended service life of the structure;
c. Expected environmental conditions, including likelihood of exposure to alkalis or organic solvents;
d. Protective measures; and
e. Feasibility of maintenance and repair during service.

3605.7.2.3.2 Adjustment of Material Properties to Account for Environmental Effects. Unless the glass transition temperature determined in accordance with ASTM D4065 and the tensile strength of the composite in the longitudinal and transverse directions determined in accordance with ASTM D638 can be shown to retain at least 85% of their characteristic values after conditioning in the environments listed below, the nominal strength and stiffness shall be reduced for design purposes in accordance with test data produced from testing simulating the anticipated environment. Materials that cannot retain at least 15% of their characteristic values after conditioning the listed environments are prohibited in structural

applications. Design tensile strength shall be reduced in accordance with material specific tests when in-service temperatures exceed of 90^0F. Condition test samples as follows:
a. Water: Samples shall be immersed in distilled water having a temperature of 100 ± 3^0F and tested after 1,000 hours of exposure.

b. Alternating Ultraviolet Light and Condensing Humidity: Samples shall be exposed according to Cycle No. 1 (0.89 W/m^2/mm, 8 hours UV at 60^0C, 4 hours condensation at 50^0C) using UVA-340 lamps in an apparatus meeting the requirements of ASTM G154. Samples shall be tested within two hours after removal from the apparatus.

Commentary: *Many FRP materials lose strength and stiffness as a result of environmental exposure. Adjustment of characteristic mechanical properties used in design is necessary to account for effects of exposure. Otherwise, the material may fail prematurely. Exposure to alkalis and freeze thaw may also adversely affect the performance of FRP materials. However, at this time, there are no ASTM protocols specifically for testing FRP materials in these environments. The designer should take these conditions into account when proportioning the structures and specifying FRP materials.*

3605.7.2.4 Impact Resistance of FRP Materials. *FRP* sheet pile *bulkheads* shall have sufficient impact resistance, determined in accordance with ASTM D7136, for the intended application.

3605.7.2.5 Deflection of FRP Sheet Piling. Deflection of vinyl sheet pile *bulkheads* shall not exceed the lesser of 1/60 times the height from the mud line to the top of the wall or 2 inches. Effects of in-service temperatures in excess of 90^0F on modulus of elasticity shall be considered in deflection calculations.

Commentary: *FRP materials have a relatively low modulus of elasticity. Consequently, large deflections can occur in bulkheads that normally would have sufficient strength to withstand applied loads. Large deflections affect both stability of the bulkhead, especially in the presence of transient superimposed loads, and appearance. Therefore, deflections need to be limited.*

3605.7.2.6 Fire, Smoke, and Toxicity. *FRP* materials shall be tested for the in-service thickness in accordance with ASTM D635 with a resulting burning rate of 2 ½ inches per minute or less.

Commentary: *Criteria are consistent with provisions for CC2 plastics in Section 2606.4. ASTM D4216 references D635 for burning characteristics of vinyl materials, and allusion is made to similar requirements in the ASCE Prestandard for FRP.*

3605.7.3 Carbon Fiber Reinforced Polymer Repair Products. Carbon Fiber Reinforced plate and wrap used for flexural and shear reinforcement of existing concrete structures shall be designed in accordance with the design procedures specified in ACI 440.2R. Mechanical properties of Carbon Fiber Reinforced plate and wrap shall be established in accordance with the tests specified in ACI 440.3R.

3605.8 Masonry. Masonry used in *bulkheads* and *dock* work shall comply with Chapter 21.

SECTION 3606 CONSTRUCTION OF PIERS, DOCKS, CATWALKS, GANGWAYS, AND FLOATING DOCKS

3606.1 Fixed piers. Fixed *piers* shall be constructed in accordance with Sections 3606.1.1 through 3606.1.4.

3606.1.1 Required depth of piles. Fixed *piers* shall be supported by pilings with tip penetrations dependent on the soil conditions and the total applied load. *Piers* support by shallow piling, legs or columns with point bearing on rock shall have provisions to resist horizontal forces and overturning, as well as

flotation uplift. *Piles* shall be installed in accordance with the requirements of Chapter 18 and inspected in accordance with the requirements of Chapter 17.

3606.1.2 Structural steel and concrete members. Structural steel members shall be designed in accordance with AISC 360, Chapter 22 of this code, and the material requirements of this chapter. Concrete members shall be designed in accordance with ACI 318, Chapter 19 of this code, and the materials requirements of this chapter.

3606.1.3 Size of wood piles. *Piles* shall be sized in accordance with the American Wood Council National Design Specification. In no case shall round timber piles be less than 7 inches in diameter at the butt and have a minimum tip diameter of less than 5 ½ inches. Rectangular timber piles shall not be less than nominal 6 inches x 6 inches.

3606.1.4 Bracing of wood piles. Where required by design, bracing shall be sized to limit stresses in the *piles* from lateral loads in accordance with the American Wood Council National Design Specification to prevent buckling.

3606.1.5 Wood girder and joist spans. Maximum spans for *pier pile* caps or girders and joists or stringers shall be determined in accordance with the American Wood Council National Design Specification considering the member to be subject to wet use.

3606.1.6 Connections. Connections between *piling* or legs to *pile* caps, stringers, beams, bracing and deck shall have sufficient capacity to safely support all applied loads and provide transfer of load to adjoining members.

3606.1.7 Gangways. On coastal waterways, the maximum slope permitted shall be 3:1 at 0.0 mean low water or above and 2½:1 below 0.0 mean low water. On lakes and other inland waters, the maximum slope shall be 3:1 not less than 90% of the time and 2½:1 not more than 10% of the time.

3606.2 Flotation units. Flotation units shall be foam-filled encapsulated floats or polystyrene billets securely wrapped with Class I woven geotextile fabric in accordance with AASHTO M288. The use of metal barrels not specifically designed for use as flotation devices and unwrapped polystyrene billets are prohibited.

3606.3 Electrical service. All electrical service to marine structures shall be in accordance with the *North Carolina Electrical Code*.

3606.4 Fire protection. All fire protection for marine structures shall be in accordance with applicable provisions of the *North Carolina Fire Prevention Code.*

3606.5 Fuel docks. Fuel *docks* and other marine facilities handling flammable liquids shall comply with the *Flammable and Combustible Liquids Code*, NFPA 30 and the *North Carolina Fire Code*. All fuel installations shall be designed to prevent fuel spillage from entering the water. The fuel *docks* or floats shall be isolated to the extent that fire or explosion would have minimal opportunity to spread to or from the fuel *dock* to the berths. Storage tanks for public facilities shall be located a minimum distance of 50 feet from the dispenser with a shutoff valve at the tank.

Commentary: *Other standards typically referenced for fueling facilities are:*
NFPA 30A–Automotive and Marine Service Station Code

NFPA 70–National Electrical Code, Article 555, Marinas and Boatyards
NFPA 302–Pleasure and Commercial Motor Craft
NFPA 303–Marinas and Boatyards
PEI RP1000-09 –Recommended Practices for the Installation of Marina Fueling Systems

3606.6 Guardrails. For walkways, access *piers*, steps, or ramps, guardrails or other safety provisions shall be provided along the edges where the vertical drop to the lesser of the mean low water level, normal low water level (sounds), normal pool (lakes and rivers), or mud line exceeds 6 feet. Edges having a primary function other than walks or access ways, such as docking frontage and swimming access shall not require guardrails. Guardrails shall be designed in accordance with Chapter 16 for balconies. Guardrails shall be a minimum of 42 inches high and shall prevent the passage of a 21 inch sphere except where required otherwise by Chapter 11. Edge protection shall be provided as required by other rules.

Commentary: *Chapter 36 requirements for guardrails are a compromise intended to address as many general cases as possible. In marine applications, guardrails or deletion of rails may be determined on a case by case basis due to the diversity of activities taking place on the waterfront. In many cases, function and view are important factors in the design of a barrier system. A case in point is an urban waterfront where small to medium sized vessels are docking along a pedestrian promenade. The solution was a minimal barrier system that would allow for function and view while alerting pedestrians that there is a hazard and channeling them away from the hazard. As a compromise, the committee attempted to incorporate these concepts into the draft code provisions. The 21 inch sphere limitation is based from minimum OSHA standards. For a vertical drop less than 6 feet, the intent of omitting guardrails considers that the drop is over water or above a soft substrate. Consideration for guardrails should be made when hazardous conditions exist.*

Exception: For private waterfront *piers* and *docks*, guardrails or other safety provisions shall be provided along the edges where the vertical drop to the lesser of the mean low water level, normal low water level (sounds), normal pool (lakes and rivers), or mud line exceeds 8 feet. Guardrails shall be a minimum of 36 inches high and shall prevent the passage of a 21 inch sphere. Edge protection shall be provided as required by other rules.

3606.7 Accessibility. *Piers, docks, catwalks, gangways,* and floating *docks* shall comply with Chapter 11 and ANSI/ICC A117.1 for accessibility.

Commentary: *Compliance with the NC Building Code does not necessarily ensure compliance with the Federal law, The Americans with Disabilities Act. The designer and the owner should investigate Federal requirements. Refer to Chapter 11 for requirements regarding the number and distribution of accessible berths. The provisions of ANSI A117.1 note the maximum running and cross slopes of the floating dock along the accessible route cannot exceed 1:20 and 1:48, respectively, under static loading (no wave loading). Therefore, the maximum cross slope should be checked with any combination of dead load, uniform dock surface live load and dock surface concentrated load as prescribed in Section 3604.3.2.For maximum running slope on a floating dock, the same loadings must be checked including where the gangway lands on the floating dock at the ends of fingers. ANSI A117.1 provides exceptions to the requirements for maximum running slope, maximum rise and changes in level for gangways serving an accessible route based on the number of boat slips at the facility. The height and location of utilities and attached utility structures must be considered based on the provisions of ANSI A117.1.*

3606.8 Egress. *Piers* and *docks* shall be provided with means of egress in accordance with Sections 3606.8.1 through 3606.8.4.

3606.8.1 Occupant Load. Occupant load for *piers* and *docks* shall be calculated as follows:

3606.8.1.1 Piers and Boardwalks. Occupant load for piers and boardwalks intended for recreational fishing shall be calculated based on 3 linear feet of rail per person on the perimeter plus 50 square feet per person on a net area with a perimeter 3 feet inside the rail. Occupant load for *piers* and boardwalks intended for other uses shall be in accordance with Chapter 10.

Commentary: *Occupants on fishing piers tend to be concentrated around the perimeter of the pier. Depending on the event, occupants on piers intended for assembly purposes can be densely packed over the entire area of the pier.*

3606.8.1.2 Public Waterfront Docks. Occupant load for *docks* constructed at public marinas intended for mooring of private pleasure craft shall be calculated based on 30 square feet of net dock area per person.

3606.8.1.3 Private Waterfront Docks. Occupant load for private waterfront *docks* shall be calculated based on 20 square feet per person.

Commentary: *Private waterfront docks are likely locations for parties, weddings, and other gatherings. The stated occupant load reflects this probability.*

3606.8.2 Piers. *Piers* intended for recreational fishing, assembly, or educational purposes with travel distance to exit discharge exceeding 600 feet and greater than 15 feet above mean low water shall have emergency access ladders at 300 feet intervals and at the end of the *pier*. The *pier* shall be constructed of noncombustible material with the exception that the floor decking may be heavy timber.

Commentary: *Emergency access ladders facilitate rescue by watercraft. Noncombustible construction is intended to limit the spread of fire. Heavy timber decking, while combustible, burns more slowly than dimension lumber and offers the designer some advantages in regards to energy absorption from wave forces and durability. Heavy timber decking is defined as solid sawn decking 3 inches nominal in thickness.*

3606.8.3 Public Waterfront Docks. Public waterfront *docks* intended for mooring of private pleasure craft with travel distance to exit discharge in excess of 600 feet shall have a second means of egress or a means of rescue from the water. Construction for these *docks* shall be noncombustible, with the exception that wood walers may be embedded in the dock edges for attachment of mooring hardware.

Commentary: *Boat owners may be able to cast off and move away from the dock. Guests may not have this option. Means of rescue by water can be designated harbor patrol, life rafts, or life preservers. Noncombustible construction is intended to slow the spread of fire.*

3606.8.4 Buildings Constructed on Piers and Docks. Buildings constructed on public waterfront *piers* and *docks* shall comply with the requirements of all applicable provisions of the North Carolina State Building Code.

SECTION 3607 CONSTRUCTION: BULKHEADS AND REVETMENTS

3607.1 Bulkheads. *Bulkheads* shall be constructed in accordance with Sections 3607.1.1 through 3607.1.5.

3607.1.1 General. *Bulkheads* shall be constructed in a manner to be effective against erosion and provide for bank stabilization. The *bulkhead* system may consist of any of the following or combinations thereof: braced sheet pile walls with tie backs, king piles, and horizontal panels, gravity walls, cantilever and counterfort retaining walls. *Bulkhead* walls shall be constructed to prevent passage of fine material (See ASTM D 2487) through joints or cracks from the fill side to the stream side.

3607.1.2 Systems. Local site conditions and performance of *bulkheads* in service shall govern in selection of a system. The potential for erosion and scour at the mud line shall also be investigated, and

compensating features shall be reflected in the construction. *Bulkheads* shall be terminated by either tying into adjoining structures or by extending the *bulkhead* line a minimum of 10 feet in a landward direction at an angle of not less than 45 degrees to the shoreline in order to protect against end erosion or flanking by wave action. No structure shall be terminated without regard for end anchorage and stabilization.

3607.1.3 Guardrails. Where designated public walkways, steps, or ramps run adjacent to *bulkheads* within 6 feet, guardrails or other safety provisions shall be provided along the top of the wall where the vertical drop to the lesser of the mean low water level, normal low water level (sounds), normal pool (lakes and rivers), or mud line exceeds 6 feet. Guardrails shall be designed in accordance with Chapter 16 for balcony guardrails. Guardrails shall be 42 inches high and shall prevent the passage of a 21 inch sphere except where required otherwise by Chapter 11. Edge protection shall be provided as required by other rules.

Commentary: *Chapter 36 requirements for guardrails are a compromise intended to address as many general cases as possible. In marine applications, guardrails or deletion of rails may be determined on a case by case basis due to the diversity of activities taking place on the waterfront. In many cases, function and view are important factors in the design of a barrier system. A case in point is an urban waterfront where small to medium sized vessels are docking along a pedestrian promenade. The solution was a minimal barrier system that would allow for function and view while alerting pedestrians that there is a hazard and channeling them away from the hazard. As a compromise, the committee attempted to incorporate these concepts into the code provisions. The 21 inch sphere limitation is based from minimum OSHA standards. For a vertical drop less than 6 feet, the intent of omitting guardrails considers that the drop is over water or above a soft substrate. Consideration for guardrails should be made when hazardous conditions exist.*

Exception: For private waterfront *bulkheads* with designated walkways within 6 feet, guardrails or other safety provisions shall be provided along the edges where the vertical drop to the lesser of the mean low water level , normal low water level (sounds), normal pool (lakes and rivers), or mud line exceeds 8 feet. Guardrails shall be a minimum of 36 inches high and shall prevent the passage of a 21 inch sphere. A wall cap 30 inches or less in width shall not be considered a designated walkway unless it is connected to a walkway. Edge protection shall be provided as required by other rules.

3607.1.4 Wood Construction. For wood grades, member sizes, preservative treatment, and protection of metal fasteners and fittings, see Section 3605.3.

3607.1.5 Bulkheads of Materials Other than Wood. Vinyl, fiber reinforced polymer, aluminum, concrete, and steel *bulkheads* shall be constructed in a manner to ensure performance. Connections shall be designed to resist the full applied load. For materials and corrosion protection reference Sections 3605.4 through 3605.7.

3607.2 Revetments. Revetments shall be constructed in accordance with Sections 3607.2.1 through 3607.2.2

3607.2.1 Rigid revetments. Rigid revetments shall be founded on a firm foundation to prevent undermining and progressive instability. Provisions shall be made to provide for toe protection to compensate for known or anticipated scour. Additional protection may be needed in active areas and may consist of sheet piling along the toe or stone rip rap. A pattern of weep holes shall be provided in the face to relieve hydrostatic pressure behind the wall. Joints shall be sealed or provided with a properly designed filter to prevent loss of fines from the protected slope.

3607.2.2 Flexible revetments. Adequate provisions shall be made to prevent migration of fine materials through the structure. The face shall not be steeper than one unit horizontal to one unit vertical. Flatter slopes may be needed for stability depending on the construction materials and site conditions. The face may consist of armor stone, rip rap, or individual interlocking concrete units or poured concrete. Toe protection provisions shall be provided as discussed for the rigid type and the top of slope shall be detailed to prevent erosions under the revetment from surface water runoff. Flexible revetments shall be provided with a filter layer designed to prevent loss of fines from the protected slope and to relieve hydrostatic pressure behind the face.

Commentary: *Flexible revetments include geo-textile construction such as sandbags and other geo-textile structures.*

The effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR b,l	SKYLIGHTb U-FACTOR	GLAZED FENESTRATION SHGC b,e,m	CEILING R-VALUE k	WOOD FRAME WALL R-VALUE e	MASS WALL R-VALUE i	FLOOR R-VALUE	BASEMENT WALL R-VALUE c	SLAB R-VALUE & DEPTH d	CRAWL SPACE WALL R-VALUE c
3	0.35	0.65	0.30	30	13	5/10	19	10/13[f]	0	5/13
4	0.35	0.60	0.30	38 or 30 cont. [j]	15, 13+2.5[h]	5/10	19	10/13	10	10/13
5	0.35	0.60	NR	38 or 30 cont. [j]	19, 13+5, or 15+3[eh]	13/17	30 [g]	10/13	10	10/13

l. In addition to the exemption in Section 402.3.3, a maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

m. In addition to the exemption in Section 402.3.3, a maximum of two glazed fenestration product assemblies having a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

TABLE 402.1.3
EQUIVALENT U-FACTORS[a]

CLIMATE ZONE	FENESTRATION U-FACTOR e	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR d	CRAWL SPACE WALL U-FACTOR c
3	0.35	0.65	0.035	0.082	0.141	0.047	0.059	0.136
4	0.35	0.60	0.030	0.077	0.141	0.047	0.059	0.065
5	0.35	0.60	0.030	0.061	0.082	0.033	0.059	0.065

e. A maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 and a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty. When applying this note and using the REScheck "UA Trade-off" compliance method to allow continued use of the software, the applicable fenestration products shall be modeled as meeting the U-factor of 0.35 and the SHGC of 0.30, as applicable, but the fenestration products actual U-factor and actual SHGC shall be noted in the comments section of the software for documentation of application of this note to the applicable products. Compliance for these substitute products shall be verified compared to the allowed substituted maximum U-value requirement and maximum SHGC requirement, as applicable.

402.3.5 Thermally isolated conditioned sunroom U-factor and SHGC. The maximum fenestration U-factor shall be 0.40 and the maximum skylight *U*-factor shall be 0.75. Sunrooms with cooling systems shall have a maximum fenestration SHGC of 0.40 for all glazing.

New windows and doors separating the sunroom from conditioned space shall meet the building thermal envelope requirements. Sunroom additions shall maintain thermal isolation; and shall be served by a separate heating or cooling system, or be thermostatically controlled as a separate zone of the existing system.

Exception: A maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 and, when cooling is provided, a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

402.5 Maximum fenestration *U*-factor and SHGC (Mandatory Requirements). The area-weighted average maximum fenestration *U*-factor permitted using trade-offs from Section 402.1.4 shall be 0.40. Maximum skylight *U*-factors shall be 0.65 in zones 4 and 5 and 0.60 in zone 3. The area-weighted average maximum fenestration SHGC permitted using trade-offs from Section 405 in Zones 3 and 4 shall be 0.40.
Exception: A maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 and a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Energy Conservation Code
402.5 Maximum Fenestration U-Factor and SHGC. (140610 Item B-2)

402.5 Maximum fenestration *U*-factor and SHGC (Mandatory Requirements). The area-weighted average maximum fenestration *U*-factor permitted using trade-offs from Section 402.1.4 shall be 0.40. Maximum skylight *U*-factors shall be 0.65 in zones 4 and 5 and 0.60 in zone 3. The area-weighted average maximum fenestration SHGC permitted using trade-offs from Section 405 in zones 3 ~~and 4~~ shall be ~~0.40~~ 0.50.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Energy Conservation Code
TABLE 405.5.2(1) Air exchange rate. (140909 Item B-2)

TABLE 405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS
(Air exchange rate and Mechanical ventilation components only)

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	~~Specific leakage area (SLA)d = 0.00028 or 5 ACH50.~~ 5 ACH50 The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than continuous operation at 0.01 x CFA + 7.5 (N_{br} + 1) where: CFA = conditioned floor area N_{br} = number of bedrooms Energy recovery shall not be assumed for mechanical ventilation.	For residences that are not tested, the same as the standard reference design. For tested residences, the measured air exchange rate. [e] The mechanical ventilation rate shall be in addition to the air leakage rate and shall be as proposed. [f]
Mechanical ventilation	None, except where mechanical ventilation is specified by the proposed design, in which case: Annual vent fan energy use: kWh/yr = 0.03942 x CFA + 29.565 X (N_{br} + 1) where: CFA = conditioned floor area N_{br} = number of bedrooms	As proposed

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Energy Conservation Code
TABLE 502.1.2 Building Envelope. (141209 Item B-2)

TABLE 502.1.2
BUILDING ENVELOPE REQUIREMENTS OPAQUE ELEMENT, MAXIMUM U-FACTORS

Climate Zone	3		4		5	
	All Other	Group R	All Other	Group R	All Other	Group R
Roofs						
Insulation entirely above deck	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032
Metal buildings (with R-5 thermal blocks[a])	U-0.041	U-0.041	U-0.035	U-0.035	U-0.035	U-0.035
Attic and other	U-0.027	U-0.041	U-0.021	U-0.021	U-0.021	U-0.021
Walls, Above Grade						
Mass	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.060
Metal Building	U-0.072	U-0.050	U-0.060	U-0.050	U-0.050	U-0.050
Metal framed	U-0.064	U-0.064	~~U-0.055~~ U-0.064	~~U-0.049~~ U-0.064	~~U-0.049~~ U-0.064	~~U-0.043~~ U-0.055
Wood framed and other	U-0.064	~~U-0.051~~ U-0.064	~~U-0.051~~ U-0.064	~~U-0.045~~ U-0.064	~~U-0.045~~ U-0.064	~~U-0.041~~ U-0.051
Walls, Below Grade						
Below-grade wall[a]	C-0.119	C-0.119	C-0.119	C-0.092	C-0.119	C-0.092
Floors						
Mass	U-0.064	U-0.064	U-0.057	U-0.051	U-0.057	U-0.051
Joist/Framing	U-0.033	U-0.033	U-0.027	U-0.027	U-0.027	U-0.027
Slab-on-Grade Floors						
Unheated slabs	F-0.730	F-0.540	F-0.520	F-0.520	F-0.520	F-0.510
Heated slabs	F-0.860	F-0.860	F-0.688	F-0.688	F-0.688	F-0.688

a. When heated slabs are placed below-grade, below grade walls must meet the *F*-factor requirements for perimeter insulation according to the heated slab-on-grade construction.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Existing Building Code
403.6.1, 404.6, 603.2, 703.3, 1203.3 Smoke Alarms. (141209 Item B-10)

(Add Section to Chapter 4)
403.6.1 Smoke alarms in one- and two-family dwellings and townhouses. Detached one- and two-family dwellings and townhouses shall be provided with smoke alarms installed in accordance with Section 804.4.1.
404.6 Smoke alarms. Smoke alarms shall be provided and installed in accordance with Section 804.4.

(Add Section to Chapter 6)
603.2 Smoke alarms. Smoke alarms shall be provided and installed in accordance with Section 804.4.

(Add Section to Chapter 7)
703.2 Smoke alarms. Smoke alarms shall be provided and installed in accordance with Section 804.4.

(Add Section to Chapter 12)
1203.13 Smoke alarms. Smoke alarms shall be provided and installed in accordance with Section 804.4.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Existing Building Code
Ch. 2, Section 403.7, 703.2, 1203.13, 1401.2.6, Ch. 47 Carbon Monoxide Detection. (141209 Item B-9)

(Add the following definition to Section 202)
[B] PRIVATE GARAGE. A building or portion of a building in which motor vehicles used by the tenants of the building or buildings on the premises are stored or kept, without provisions for repairing or servicing such vehicles for profit.

(Add Section to Chapter 4)
403.7 Carbon monoxide detection.

403.7.1 General. Carbon monoxide detection shall be installed in accordance with Sections 403.7.1 through 403.7.6. For one- and two-family dwellings and townhouses, carbon monoxide alarms shall be installed in accordance with Section 403.7.7.

403.7.1.1 Where required. Carbon monoxide detection shall be provided in Group I-1, I-2, I-4 and R occupancies and in classrooms in Group E occupancies in the locations specified in Section 403.7.2 where any of the conditions in Sections 403.7.1.2 through 403.7.1.6 exist.
403.7.1.2 Fuel-burning appliances and fuel-burning fireplaces. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms that contain a fuel-burning appliance or a fuel-burning fireplace.
403.7.1.3 Forced air furnaces. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms served by a fuel-burning, forced air furnace.
Exception: Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms where carbon monoxide detection is provided in the first room or area served by each main duct leaving the furnace, and the carbon monoxide alarm signals are automatically transmitted to an *approved* location.
403.7.1.4 Fuel-burning appliances outside of dwelling units, sleeping units and classrooms. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms located in buildings that contain fuel-burning appliances or fuel-burning fireplaces.
Exceptions:
1. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms if there are no communicating openings between the fuel-burning appliance or fuel-burning fireplace and the dwelling unit, sleeping unit or classroom.
2. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms if carbon monoxide detection is provided in one of the following locations:
2.1. In an *approved* location between the fuel-burning appliance or fuel-burning fireplace and the dwelling unit, sleeping unit or classroom; or
2.2. On the ceiling of the room containing the fuel-burning appliance or fuel-burning fireplace.
403.7.1.5 Private garages. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms in buildings with attached private garages.
Exceptions:
1. Carbon monoxide detection shall not be required where there are no communicating openings between the private garage and the dwelling unit, sleeping unit or classroom.
2. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms located more than one story above or below a private garage.
3. Carbon monoxide detection shall not be required where the private garage connects to the building through an open-ended corridor.
4. Where carbon monoxide detection is provided in an *approved* location between openings to a private garage and dwelling units, sleeping units or classrooms, carbon monoxide detection shall not be required in the dwelling units, sleeping units or classrooms.
403.7.1.6 Exempt garages. For determining compliance with Section 403.7.1.5, an open parking garage complying with Section 406.5 of the International Building Code or an enclosed parking garage complying with Section 406.6 of the International Building Code shall not be considered a private garage.

403.7.2 Locations. Where required by Section 403.7.1.1, carbon monoxide detection shall be installed in the locations specified in Sections 403.7.2.1 through 403.7.2.3.

403.7.2.1 Dwelling units. Carbon monoxide detection shall be installed in dwelling units outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning appliance is located within a bedroom or its attached bathroom, carbon monoxide detection shall be installed within the bedroom.
403.7.2.2 Sleeping units. Carbon monoxide detection shall be installed in sleeping units.
Exception: Carbon monoxide detection shall be allowed to be installed outside of each separate sleeping area in the immediate vicinity of the sleeping unit where the sleeping unit or its attached bathroom does not contain a fuel-burning appliance and is not served by a forced air furnace.
403.7.2.3 Group E occupancies. Carbon monoxide detection shall be installed in classrooms in Group E occupancies. Carbon monoxide alarm signals shall be automatically transmitted to an on-site location that is staffed by school personnel.
Exception: Carbon monoxide alarm signals shall not be required to be automatically transmitted to an on-site location that is staffed by school personnel in Group E occupancies with an occupant load of 30 or less.

403.7.3 Detection equipment. Carbon monoxide detection required by Sections 403.7.1 through 403.7.2.3 shall be provided by carbon monoxide alarms complying with Section 403.7.4 or with carbon monoxide detection systems complying with Section 403.7.5.

403.7.4 Carbon monoxide alarms. Carbon monoxide alarms shall comply with Sections 403.7.4.1 through 403.7.4.3.

403.7.4.1 Power source. Carbon monoxide alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than that required for overcurrent protection.
Exception: Where installed in buildings without commercial power, battery-powered carbon monoxide alarms shall be an acceptable alternative.
403.7.4.2 Listings. Carbon monoxide alarms shall be listed in accordance with UL 2034.
403.7.4.3 Combination alarms. Combination carbon monoxide/smoke alarms shall be an acceptable alternative to carbon monoxide alarms. Combination carbon monoxide/smoke alarms shall be listed in accordance with UL 2034 and UL 217.

403.7.5 Carbon monoxide detection systems. Carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide alarms and shall comply with Sections 403.7.5.1 through 403.7.5.3.

403.7.5.1 General. Carbon monoxide detection systems shall comply with NFPA 720. Carbon monoxide detectors shall be listed in accordance with UL 2075.
403.7.5.2 Locations. Carbon monoxide detectors shall be installed in the locations specified in Section 403.7.2. These locations supersede the locations specified in NFPA 720.
403.7.5.3 Combination detectors. Combination carbon monoxide/smoke detectors installed in carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide detectors, provided they are listed in accordance with UL 2075 and UL 268.

403.7.6 Maintenance. Carbon monoxide alarms and carbon monoxide detection systems shall be maintained in accordance with NFPA 720. Carbon monoxide alarms and carbon monoxide detectors that become inoperable or begin producing end-of-life signals shall be replaced.

403.7.7 Carbon monoxide alarms for one- and two-family dwellings and townhouses. Where interior work requiring a permit occurs, or where one or more sleeping rooms are added or created or where fuel fired appliances or fireplaces are added or replaced, carbon monoxide alarms shall be provided in accordance with Section 403.7.7.1
Exception: Work involving the exterior surfaces of dwellings, such as replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, or the installation of a fuel-fire appliance that cannot introduce carbon monoxide to the interior of the dwelling.

403.7.7.1 Where required. One- and two-family dwellings and townhouses within which fuel fired appliances or fireplaces are installed or that have attached garages shall be provided with an *approved* carbon monoxide alarm installed outside each separate sleeping area in the immediate vicinity of the bedrooms(s) as directed by the alarm manufacturer.
403.7.7.2 Alarm requirements. The required carbon monoxide alarms shall be audible in all bedrooms over background noise levels with all intervening doors closed. Single station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions. Battery powered, plug-in or hard wired alarms are acceptable for use.

(Add Section to Chapter 4)
404.7. Carbon monoxide detection. Carbon monoxide detection shall be installed in accordance with Section 403.7.

(Add Section to Chapter 6
603.3. Carbon monoxide detection. Carbon monoxide detection shall be installed in accordance with Section 403.7.

(Add Section to Chapter 7)
703.3. Carbon monoxide detection. Carbon monoxide detection shall be installed in accordance with Section 403.7.

(Delete/Add Section to Chapter 8)
~~**804.4.2 Carbon monoxide alarms for detached one- and two-family dwellings and townhouses.**~~
~~Detached one- and two- family dwellings and townhouses requiring a permit for interior work or the replacement or addition of a fuel-fired appliance shall be provided with an *approved* carbon monoxide alarm installed outside of each separate sleeping area in the immediate vicinity of the bedroom(s).~~
~~**804.4.2.1 Alarm requirements.** The required carbon monoxide alarms shall be audible in all bedrooms over background noise levels with all intervening doors closed. Single station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions. Battery powered, plug-in or hard-wired alarms are acceptable for use.~~
804.4.2. Carbon monoxide detection. Carbon monoxide detection shall be installed in accordance with Section 403.7.

(Add Section to Chapter 12)
1203.14. Carbon monoxide detection. Carbon monoxide detection shall be installed in accordance with Section 403.7.

(Add Section to Chapter 14)
1401.2.6 Carbon monoxide detection. Group R occupancies and classrooms in Group E occupancies shall be provided with carbon monoxide detection in accordance with Section 403.7.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2015 NC Existing Building Code
505.1 Level 3 Alteration. (140610 Item B-3)

505.1 Scope. Level 3 Alteration (Reconstruction) ~~apply~~ applies where the work area exceeds 50 percent of the aggregate area of the building in any 12 month period.
Exception: Alterations limited to displays or showrooms in Group M Occupancies.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2015 NC Existing Building Code
805.2 Means of Egress. (140610 Item B-4)

805.2 General. The means of egress shall comply with the requirements of this section.
Exceptions:
1. Where the work area and the means of egress serving it complies with NFPA 101.
2. Means of egress conforming to the requirements of the building code under which the building was constructed shall be considered compliant means of egress if, in the opinion of the code official, they do not constitute a distinct hazard of life.
3. In one and two family dwellings, stairways not required for egress are permitted to be as narrow as 26 inches.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2015 NC Existing Building Code
805.6 Dead End Corridors. (140610 Item B-5)

805.6 Dead-end corridors. Dead-end corridors in any work area shall not exceed 35 feet.
Exceptions:
1. Where dead-end corridors of greater length are permitted by the *International Building Code*.
2. In other than Group A and H occupancies, the maximum length of an existing dead-end corridor shall be 50 feet in buildings equipped throughout with an automatic fire alarm system installed in accordance with the *International Building Code*.
3. In other than Group A and H occupancies, the maximum length of an existing dead-end corridor shall be 70 feet in buildings equipped throughout with an automatic sprinkler system installed in accordance with the *International Building Code*.
~~4. In other than Group A and H occupancies, the maximum length of a newly constructed, or extended dead-end corridor shall not exceed 50 feet on floors equipped with an automatic sprinkler system installed in accordance with the International Building Code.~~

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

SECTION 106
INSPECTIONS

In order to preserve and protect public health and safety and to satisfy the requirements of General Statute 153A-364 and General Statute 160A-424, political subdivisions assuming inspection duties, as set out in General Statute 153A-351 and General Statute 160A-411, shall have a periodic inspection schedule for the purpose of identifying activities and conditions in buildings, structures and premises that pose dangers of fire, explosion or related hazards. Such inspection schedule shall be *approved* by the local governing body and shall be submitted to the Office of State Fire Marshal of the Department of Insurance. In no case shall inspections be conducted less frequently than described in the schedule below:

Once every year
Hazardous, institutional, high-rise assembly except those noted below, and Residential except one- and two family dwellings and only interior common areas of dwelling units of multi-family occupancies.
New and existing lodging establishments, including hotels, motels, and tourist homes that provide accommodations for seven or more continuous days (extended-stay establishments), bed and breakfast inns and bed and breakfast homes as defined in G.S. 130A-247 for the installation and maintenance of carbon monoxide alarms and detectors in accordance with G.S. 143-138(b2).

Once every two years
Industrial and educational (except public schools).

Once every three years
Assembly occupancies with an occupant load less than 100, business, mercantile, storage, churches, synagogues, and miscellaneous Group U occupancies.

Frequency rates for inspections of occupancies as mandated by the North Carolina General Statutes shall supersede this schedule. Nothing in this section is intended to prevent a jurisdiction from conducting more frequent inspections than the schedule listed above or the schedule filed with the Office of State Fire Marshal of the Department of Insurance.

On unattended or vacant structures, the fire code official shall affix a letter on the premises in a conspicuous place at or near the entrance to such premises requesting an inspection in accordance with this section. This order of notice shall be mailed by registered or certified mail with return receipt requested, to the last known address of the owner, occupant or both. If the owner, occupant or both shall fail to respond to said notice within 10 calendar days, these actions by the fire code official shall be deemed to constitute an inspection in accordance with this section.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Fire Code
310.9 Hookah or water pipe use. (140909 Item B-5)

310.9 Hookah or water pipe use. The use of hookahs or similar devices within buildings shall comply with all of the following:

1. An *approved* ventilation system is required.
    1.1 The room or building shall comply with the *North Carolina Mechanical Code* Section 403.3 for a smoking lounge.
    1.2 Carbon monoxide accumulation shall be controlled in accordance with the *North Carolina Mechanical Code* Section 502.
2. Coals shall be transported from the preparation area in an *approved* noncombustible container.
3. Hookah pipes shall be located and positioned in such a manner as to prevent overturning.
4. Disposal, use, or handling of ashes and coals shall comply with Sections 305.1 and 305.2.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

NC Register Published/Tracked

CHAPTER 2
DEFINITIONS

~~**[SMOKING LOUNGE.** An enclosed facility in any building or room within a building closed in by a roof and four walls with appropriate openings for ingress and egress, used for the purpose of smoking.]~~

~~**[SMOKING.** Shall include any of the following: (1) the combustion of any cigar, cigarette, pipe, or any similar article, using any form of tobacco or other combustible substance in any form, or (2) the holding or carrying of a lighted cigar, cigarette, pipe or any other lighted smoking device, or (3) emitting or exhaling the smoke directly from a cigar, cigarette, pipe, hookah pipe or any other lighted smoking device.]~~

~~**[310.9 Smoking Lounges shall comply with all of the following:**~~
~~1. Adequate ventilation is required to prevent the accumulation of carbon monoxide. Locations shall comply with the North Carolina Mechanical Code Table 403.3.~~
~~2. A mechanical exhaust hood system shall be installed in preparation areas used for the lighting of coals, charcoal or other cooking mediums.~~
~~3. A 2-A: 20-B:C type fire extinguisher shall be installed adjacent to the area where coals are prepared.~~
~~4. Coals shall not be lit with portable type flaming devices or torches.~~
~~5. Coals removed from the preparation area shall be placed in a ceramic, metal, or other non-combustible container. All devices used to transfer coals to the hookah pipe shall be of non-combustible material. Hookah pipes shall not be moved with burning coal or other lit material in place.~~
~~6. Hookah pipes shall be securely fastened in place to prevent overturning.~~
~~7. Used coals shall not be discarded in such a manner that could cause ignition of combustible materials. Used coals shall be removed and placed into a sealed metal or ceramic container with a lid.~~
~~8. All combustible decorative materials shall be flame resistant, this includes; curtains, tablecloths, upholstery, and materials hung from the ceiling and walls.]~~

2012 NC Fire Code
319 Rooftop Gardens and Landscaped Roofs. (140610 Item B-15)

SECTION 319 ROOFTOP GARDENS AND LANDSCAPED ROOFS

319.1 General. Rooftop gardens and landscaped roofs shall be installed and maintained in accordance with Sections 319.2 through 319.5 and Sections 1505.0 and 1507.16 of the *International Building Code.*

319.2 Rooftop garden or landscaped roof size. Rooftop garden or landscaped roof areas shall not exceed 15,625 square feet (1,450 m2) in size for any single area with a maximum dimension of 125 feet (39 m) in length or width. A minimum 6-foot-wide (1.8 m) clearance consisting of a Class A-rated roof system complying with ASTM E 108 or UL 790 shall be provided between adjacent rooftop gardens or landscaped roof areas.

319.3 Rooftop structure and equipment clearance. For all vegetated roofing systems abutting combustible vertical surfaces, a Class A-rated roof system complying with ASTM E 108 or UL 790 shall be achieved for a minimum 6-foot-wide (1.8 m) continuous border placed around rooftop structures and all rooftop equipment including, but not limited to, mechanical and machine rooms, penthouses, skylights, roof vents, solar panels, antenna supports, and building service equipment.

319.4 Vegetation. Vegetation shall be maintained in accordance with Sections 319.4.1 and 319.4.2.

319.4.1 Irrigation. Supplemental irrigation shall be provided to maintain levels of hydration necessary to keep green roof plants alive and to keep dry foliage to a minimum.

319.4.2 Dead foliage. Excess biomass, such as overgrown vegetation, leaves, and other dead and decaying material, shall be removed at regular intervals not less than two times per year.

319.4.3 Maintenance plan. The *fire code official* is authorized to require a maintenance plan for vegetation placed on roofs due to the size of a roof garden, materials used, or when a fire hazard exists to the building or exposures due to the lack of maintenance.

319.5 Maintenance equipment. Fueled equipment stored on roofs and used for the care and maintenance of vegetation on roofs shall be stored in accordance with Section 313.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Fire Code
320 Group E in churches, private schools and public schools. (140311 Item B-12)

320 Group E in churches, private schools and public schools. Rooms used for first grade children and younger shall be located on the *level of exit discharge*. Rooms used for second grade children shall not be located more than one *story* above the *level of exit discharge*.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

[Note: This Rule is currently printed in the 2012 NC Building Code, Section 427.3]

2012 NC Fire Code
509.1.1 Utility Identification. (140610 Item B-16)

509.1.1 Utility identification. Gas shutoff valves, electric meters, service switches, and other utility equipment shall be clearly and legibly marked to identify the unit or space that it serves. Identification shall be made in a manner that is visible and shall be maintained.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

605.11 Solar photovoltaic power systems. Solar photovoltaic power systems shall be installed in accordance with Sections 605.11.1 through 605.11.2, the *International Building Code* and NFPA 70.

605.11.1 Access and pathways. Roof access, pathways, and spacing requirements shall be provided in accordance with Sections 605.11.1.1 through 605.11.1.3.3.
Exceptions:
1. Detached, non-habitable Group U structures including, but not limited to, parking shade structures, carports, solar trellises, and similar structures.
2. Roof access, pathways, and spacing requirements need not be provided where the fire chief has determined that rooftop operations shall not be employed.

605.11.1.1 Roof access points. Roof access points shall be located in areas that do not require the placement of ground ladders over openings such as windows or doors, and located at strong points of building construction in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires, or signs.

605.11.1.2 Solar photovoltaic systems for Group R-3 buildings. Solar photovoltaic systems for Group R-3 buildings shall comply with Sections 605.11.1.2.1 through 605.11.1.2.5.
Exception: These requirements shall not apply to one and two family dwelling and townhomes.

605.11.1.2.1 Size of solar photovoltaic array. Each photovoltaic array shall be limited to 150 feet (45 720 mm) by 150 feet (45 720 mm). Multiple arrays shall be separated by a 3-foot-wide (914 mm) clear access pathway.

605.11.1.2.2 Hip roof layouts. Panels and modules installed on Group R-3 buildings with hip roof layouts shall be located in a manner that provides a 3-foot-wide (914 mm) clear access pathway from the eave to the ridge on each roof slope where panels and modules are located. The access pathway shall be at a location on the building capable of supporting the fire fighters accessing the roof.
Exception: These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

605.11.1.2.3 Single-ridge roofs. Panels and modules installed on Group R-3 buildings with a single ridge shall be located in a manner that provides two, 3-foot-wide (914 mm) access pathways from the eave to the ridge on each roof slope where panels and modules are located.
Exception: This requirement shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

605.11.1.2.4 Roofs with hips and valleys. Panels and modules installed on Group R-3 buildings with roof hips and valleys shall not be located closer than 18 inches (457 mm) to a hip or a valley where panels/modules are to be placed on both sides of a hip or valley. Where panels are to be located on only one side of a hip or valley that is of equal length, the panels shall be permitted to be placed directly adjacent to the hip or valley.
Exception: These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (2:12) or less.

605.11.1.2.5 Allowance for smoke ventilation operations. Panels and modules installed on Group R-3 buildings shall be located not less than 3 feet (914 mm) from the ridge in order to allow for fire department smoke ventilation operations.
Exception: Panels and modules shall be permitted to be located up to the roof ridge where an alternative ventilation method *approved* by the fire chief has been provided or where the fire chief has determined vertical ventilation techniques shall not be employed.

605.11.1.3 Other than Group R-3 buildings. Access to systems for buildings, other than those containing Group R-3 occupancies, shall be provided in accordance with Sections 605.11.1.3.1 through 605.11.1.3.3.
Exception: Where it is determined by the fire code official that the roof configuration is similar to that of a Group R-3 occupancy, the residential access and ventilation requirements in Sections 605.11.1.2.1 through 605.11.1.2.5 shall be permitted to be used.

605.11.1.3.1 Access. There shall be a minimum 6 foot-wide (1829 mm) clear perimeter around the edges of the roof.
Exception: Where either axis of the building is 250 feet (76 200 mm) or less, the clear perimeter around the edges of the roof shall be permitted to be reduced to a minimum 4 foot wide (1290 mm).

605.11.1.3.2 Pathways. The solar installation shall be designed to provide designated pathways. The pathways shall meet the following requirements:
1. The pathway shall be over areas capable of supporting fire fighters accessing the roof.
2. The centerline axis pathways shall be provided in both axes of the roof. Centerline axis pathways shall run where the roof structure is capable of supporting fire fighters accessing the roof.
3. Pathways shall be a straight line not less than 4 feet (1290 mm) clear to roof standpipes or ventilation hatches.
4. Pathways shall provide not less than 4 feet (1290 mm) clear around roof access hatch with not less than one singular pathway not less than 4 feet (1290 mm) clear to a parapet or roof edge.

605.11.1.3.3 Smoke ventilation. The solar installation shall be designed to meet the following requirements:
1. Arrays shall not be greater than 150 feet (45 720 mm) by 150 feet (45 720 mm) in distance in either axis in order to create opportunities for fire department smoke ventilation operations.
2. Smoke ventilation options between array sections shall be one of the following:
    2.1 A pathway 8 feet (2438 mm) or greater in width.
    2.2 A 4-foot (1290 mm) or greater in width pathway and bordering roof skylights or gravity-operated dropout smoke and heat vents on not less than one side.
    2.3 A 4-foot (1290 mm) or greater in width pathway and bordering all sides of non-gravity-operated dropout smoke and heat vents.
    2.4 A 4-foot (1290 mm) or greater in width pathway and bordering 4-foot by 8-foot (1290 mm by 2438 mm) "venting cutouts" every 20 feet (6096 mm) on alternating sides of the pathway.

605.11.2 Ground-mounted photovoltaic arrays. Ground-mounted photovoltaic arrays shall comply with Section 605.11 and this section. Setback requirements shall not apply to ground-mounted, free-standing photovoltaic arrays. A clear, brush-free area of 10 feet (3048 mm) shall be required for ground-mounted photovoltaic arrays.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

[Note: This Rule will also be printed in the 2012 NC Building Code, Section 605.11 Solar photovoltaic power systems.]

[Note: Section 908.7, Carbon Monoxide Alarms has been incorporated into this Rule.]

(Add the following definition to)
SECTION 202
GENERAL DEFINITIONS

[B] PRIVATE GARAGE. A building or portion of a building in which motor vehicles used by the tenants of the building or buildings on the premises are stored or kept, without provisions for repairing or servicing such vehicles for profit.

SECTION 915
CARBON MONOXIDE DETECTION

915.1 General. Carbon monoxide detection shall be installed in new buildings in accordance with Sections 915.1.1 through 915.6.

915.1.1 Where required. Carbon monoxide detection shall be provided in Group I-1, I-2, I-4 and R occupancies and in classrooms in Group E occupancies in the locations specified in Section 915.2 where any of the conditions in Sections 915.1.2 through 915.1.6 exist.

915.1.2 Fuel-burning appliances and fuel-burning fireplaces. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms that contain a fuel-burning appliance or a fuel-burning fireplace.

915.1.3 Forced air furnaces. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms served by a fuel-burning, forced air furnace.
Exception: Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms where carbon monoxide detection is provided in the first room or area served by each main duct leaving the furnace, and the carbon monoxide alarm signals are automatically transmitted to an *approved* location.

915.1.4 Fuel-burning appliances outside of dwelling units, sleeping units and classrooms. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms located in buildings that contain fuel-burning appliances or fuel-burning fireplaces.
Exceptions:
1. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms if there are no communicating openings between the fuel-burning appliance or fuel-burning fireplace and the dwelling unit, sleeping unit or classroom.
2. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms if carbon monoxide detection is provided in one of the following locations:
2.1 In an *approved* location between the fuel-burning appliance or fuel-burning fireplace and the dwelling unit, sleeping unit or classroom; or
2.2 On the ceiling of the room containing the fuel-burning appliance or fuel-burning fireplace.

915.1.5 Private garages. Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms in buildings with attached private garages.
Exceptions:
1. Carbon monoxide detection shall not be required where there are no communicating openings between the private garage and the dwelling unit, sleeping unit or classroom.
2. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms located more than one story above or below a private garage.
3. Carbon monoxide detection shall not be required where the private garage connects to the building through an open-ended corridor.

4. Where carbon monoxide detection is provided in an *approved* location between openings to a private garage and dwelling units, sleeping units or classrooms, carbon monoxide detection shall not be required in the dwelling units, sleeping units or classrooms.

915.1.6 Exempt garages. For determining compliance with Section 915.1.5, an open parking garage complying with Section 406.5 of the International Building Code or an enclosed parking garage complying with Section 406.6 of the International Building Code shall not be considered a private garage.

915.2 Locations. Where required by Section 915.1.1, carbon monoxide detection shall be installed in the locations specified in Sections 915.2.1 through 915.2.3.

915.2.1 Dwelling units. Carbon monoxide detection shall be installed in dwelling units outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning appliance is located within a bedroom or its attached bathroom, carbon monoxide detection shall be installed within the bedroom.

915.2.2 Sleeping units. Carbon monoxide detection shall be installed in sleeping units.
Exception: Carbon monoxide detection shall be allowed to be installed outside of each separate sleeping area in the immediate vicinity of the sleeping unit where the sleeping unit or its attached bathroom does not contain a fuel-burning appliance and is not served by a forced air furnace.

915.2.3 Group E occupancies. Carbon monoxide detection shall be installed in classrooms in Group E occupancies. Carbon monoxide alarm signals shall be automatically transmitted to an on-site location that is staffed by school personnel.
Exception: Carbon monoxide alarm signals shall not be required to be automatically transmitted to an on-site location that it staffed by school personnel in Group E occupancies with an occupant load of 30 or less.

915.3 Detection equipment. Carbon monoxide detection required by Sections 915.1 through 915.2.3 shall be provided by carbon monoxide alarms complying with Section 915.4 or with carbon monoxide detection systems complying with Section 915.5.

915.4 Carbon monoxide alarms. Carbon monoxide alarms shall comply with Sections 915.4.1 through 915.4.3.

915.4.1 Power source. Carbon monoxide alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than that required for overcurrent protection.
Exception: Where installed in buildings without commercial power, battery-powered carbon monoxide alarms shall be an acceptable alternative.

915.4.2 Listings. Carbon monoxide alarms shall be listed in accordance with UL 2034.

915.4.3 Combination alarms. Combination carbon monoxide/smoke alarms shall be an acceptable alternative to carbon monoxide alarms. Combination carbon monoxide/smoke alarms shall be listed in accordance with UL 2034 and UL 217.

915.5 Carbon monoxide detection systems. Carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide alarms and shall comply with Sections 915.5.1 through 915.5.3.

915.5.1 General. Carbon monoxide detection systems shall comply with NFPA 720. Carbon monoxide detectors shall be listed in accordance with UL 2075.

915.5.2 Locations. Carbon monoxide detectors shall be installed in the locations specified in Section 915.2. These locations supersede the locations specified in NFPA 720.

915.5.3 Combination detectors. Combination carbon monoxide/smoke detectors installed in carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide detectors, provided they are listed in accordance with UL 2075 and UL 268.

915.6 Maintenance. Carbon monoxide alarms and carbon monoxide detection systems shall be maintained in accordance with NFPA 720. Carbon monoxide alarms and carbon monoxide detectors that become inoperable or begin producing end-of-life signals shall be replaced.

(Revise Chapter 47 as follows)
NFPA 720 – ~~09~~ 12

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

[Note: This Rule will also be printed in the 2012 NC Building Code, Section 915, 2012 NC Fuel Gas Code, Section 311.4, and 2012 NC Mechanical Code, Section 313.4, Carbon Monoxide Detection.]

2012 NC Fire Code
1208.2 Automatic Sprinkler System Exceptions. (140610 Item B-17)

1208.2 Automatic sprinkler system. An *automatic sprinkler system* shall be installed in accordance with Section 903.3.1.1 throughout dry cleaning plants containing Type II, Type III-A or Type III-B dry cleaning systems.

Exceptions:

1. An *automatic sprinkler system* shall not be required in Type III-A dry cleaning plants where the aggregate quantity of Class III-A solvent in dry cleaning machines and storage does not exceed 330 gallons (1250 L) and dry cleaning machines are equipped with a feature that will accomplish any one of the following:

1.1. Prevent oxygen concentrations from reaching 8 percent or more by volume.

1.2. Keep the temperature of the solvent at least 30°F (16.7°C) below the flash point.

1.3. Maintain the solvent vapor concentration at a level lower than 25 percent of the lower explosive limit (LEL).

1.4. Utilize equipment *approved* for use in Class I, Division 2 hazardous locations in accordance with NFPA 70.

1.5. Utilize an integrated dry-chemical, clean agent or water-mist automatic fire-extinguishing system designed in accordance with Chapter 9.

2. An *automatic sprinkler system* shall not be required in Type III-B dry cleaning plants where the aggregate quantity of Class III-B solvent in dry cleaning machines and storage does not exceed 3,300 gallons (12 490 L).

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

Delete existing Chapter 17 text and replace with the following:

CHAPTER 17 FUMIGATION AND INSECTICIDAL

FOGGINGSECTION 1701 GENERAL

1701.1 Scope. Fumigation and insecticidal fogging operations within buildings, structures and spaces shall comply with this chapter.

1701.2 Permits. Permits shall be required as set forth in Section 105.6.

SECTION 1702 DEFINITIONS

1702.1 Definitions. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

FUMIGANT. A substance which by itself or in combination with any other substance emits or liberates a gas, fume or vapor utilized for the destruction or control of insects, fungi, vermin, germs, rats or other pests, and shall be distinguished from insecticides and disinfectants which are essentially effective in the solid or liquid phases. Examples are methyl bromide, ethylene dibromide, hydrogen cyanide, carbon disulfide and sulfuryl fluoride.

FUMIGATION. The utilization within an enclosed space of a fumigant in concentrations that are hazardous or acutely toxic to humans.

INSECTICIDAL FOGGING. The utilization of insecticidal liquids passed through fog-generating units where, by means of pressure and turbulence, with or without the application of heat, such liquids are transformed and discharged in the form of fog or mist blown into an area to be treated.

SECTION 1703 FIRE SAFETY REQUIREMENTS

1703.1 General. Buildings, structures and spaces in which fumigation and insecticidal fogging operations are conducted shall comply with the fire protection and safety requirements of Sections 1703.2 through 1703.7.

1703.2 Sources of ignition. Fires, open flames and similar sources of ignition shall be eliminated from the space under fumigation or insecticidal fogging. Heating, where needed, shall be of an *approved* type.

1703.2.1 Electricity. Electricity in any part of the building, structure or space where operation of switches or electrical devices, equipment or systems could serve as a source of ignition shall be shut off.

Exception: Circulating fans that have been specifically designed for utilization in hazardous atmospheres and installed in accordance with NFPA 70.

1703.2.2 Electronic devices. Electronic devices, including portable equipment and cellular phones, shall be shut off. Telephone lines shall be disconnected from telephones.

1703.2.3 Duration. Sources of ignition shall be shut off during the fumigation activity and remain shut off until the ventilation required in Section 1703.6 is completed.

1703.3 Notification. The *fire code official* and fire chief shall be notified in writing not less than 48 hours before the building, structure or space is to be closed in connection with the utilization of any toxic or flammable fumigant. Notification shall give the location of the enclosed space to be fumigated or fogged,

the occupancy, the fumigants or insecticides to be utilized, the person or persons responsible for the operation, and the date and time at which the operation will begin. Written notice of any fumigation or insecticidal fogging operation shall be given to all affected occupants of the building, structure or space in which such operations are to be conducted with sufficient advance notice to allow the occupants to evacuate the building, structure or space. Such notice shall inform the occupants as to the purposes, anticipated duration and hazards associated with the fumigation or insecticidal fogging operation.

1703.3.1 Warning signs. *Approved* warning signs indicating the danger, type of chemical involved and necessary precautions shall be posted on all doors and entrances to the affected building, structure or space and upon all gangplanks and ladders from the deck, pier or land to a ship. Such notices shall be printed in red ink on a white background. Letters in the headlines shall be not less than 2 inches (51 mm) in height and shall state the date and time of the operation, the name and address of the person, the name of the operator in charge, and a warning stating that the affected building, structure or space shall be vacated not less than 1 hour before the operation begins and shall not be reentered until the danger signs have been removed by the proper authorities.

1703.3.2 Breathing apparatus. Persons engaged in the business of fumigation or insecticidal fogging shall maintain and have available *approved* protective breathing apparatus.

1703.3.3 Watch personnel. During the period fumigation is in progress, except where fumigation is conducted in a gas-tight vault or tank, a responsible watchperson shall remain on duty at the entrance or entrances to the enclosed fumigated space until after the fumigation is completed and the building, structure or space is properly ventilated and safe for occupancy. Sufficient watchers shall be provided to prevent persons from entering the enclosed space under fumigation without being observed.

1703.3.4 Evacuation during fumigation. Occupants of the building, structure or space to be fumigated, except the personnel conducting the fumigation, shall be evacuated from such building, structure or space prior to commencing fumigation operations.

1703.3.5 Evacuation during insecticidal fogging operations. Occupants in the building, structure or space to be fogged, except the personnel conducting the insecticidal fogging operations, shall be evacuated from such building, structure or space prior to commencing fogging operations.

1703.4 Insecticidal fogging liquids. Insecticidal fogging liquids with a *flash point* below I00°F (38°C) shall not be utilized.

1703.5 Sealing of buildings, structures and spaces. Paper and other similar materials that do not meet the flame propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701 shall not be used to wrap or cover a building, structure or space in excess of that required for the sealing of cracks, casements and similar openings.

1703.5.1 Maintenance of openings. All openings to the building, structure or space to be fumigated or fogged shall be kept securely closed during such operation.

1703.6 Venting and cleanup. At the end of the exposure period, fumigators shall safely and properly ventilate the premises and contents; properly dispose of fumigant containers, residues, debris and other materials used for such fumigation; and clear obstructions from gas-fired appliance vents.

1703.7 Flammable fumigants restricted. The use of carbon disulfide and hydrogen cyanide shall be restricted to agricultural fumigation.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Fire Code
Docks, Piers, Bulkheads and Waterway Structures. (140610 Item B-14)

4504.1 General. *Piers*, marinas, and wharves with facilities for mooring or servicing five or more vessels, and marine motor fuel-dispensing facilities shall be equipped with fire protection equipment in accordance with Sections 4504.2 through 4504.6.
Exception: Private Waterfront Structures

Section 202 General Definitions

[B] PRIVATE WATERFRONT STRUCTURES. A *dock, pier, bulkhead,* or associated structure not open to the general public and with no more than ten total boat slips and no more than ten owners.

[B] PUBLIC WATERFRONT STRUCTURES. A *dock*, *pier*, *bulkhead*, or associated structure located on *multi-family* residential property (greater than ten *dwelling units*), public property or commercial property.

The effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

NFPA National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

Standard Reference Number	Title	Referenced in code section number
10- ~~07~~ 13	Portable Fire Extinguishers	***No Change to Section numbers***
11-~~05~~ 10	Low-, Medium- and High-expansion foam	
12-~~05~~ 11	Carbon Dioxide Extinguishing Systems	
12A-~~04~~ 09	Halon 1301 Fire Extinguishing Systems	
13-~~07~~ 13	Installation of Sprinkler Systems	
13D-~~07~~ 13	Installation of Sprinkler Systems in One-and-Two family dwellings and Manufactured Homes	
13R-~~07~~ 13	Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height.	
14-~~07~~ 13	Installation of Standpipe and Hose Systems	
15-~~07~~ 12	Water Spray Fixed Systems for Fire Protection	
16-~~07~~ 11	Installation of Foam-water Sprinkler and Foam-water Spray Systems	
17-~~02~~ 13	Dry Chemical Extinguishing Systems	
17A-~~02~~ 13	Wet Chemical Extinguishing Systems	
20-~~07~~ 13	Installation of Stationary Pumps for Fire Protection	
22-~~03~~ 13	Water Tanks for Private Fire Protection	
24-~~07~~ 13	Installation of Private Fire Service Mains and Their Appurtenances	
25-~~08~~ 14	Inspection Testing and Maintenance of Water-based Fire Protection Systems	
30-~~08~~ 12	Flammable and Combustible Liquids Code	
30A-~~08~~ 12	Code for Motor Fuel-dispensing Facilities and Repair Garages	
30B-~~07~~ 11	Manufacture and Storage of Aerosol Products	
31-~~06~~ 11	Installation of Oil-burning Equipment	
32-~~07~~ 11	Dry Cleaning Plants	
33-~~07~~ 11	Spray Application Using Flammable or Combustible Materials	
34-~~07~~ 11	Dipping and Coating Processes Using Flammable or Combustible Liquids	
35-~~05~~ 11	Manufacture of Organic Coatings	
40-~~07~~ 11	Storage and Handling of Cellulose Nitrate Film	
51 -~~07~~ 13	Design and Installation of Oxygen-fuel Gas Systems for Welding, Cutting and Allied Processes	
51A-~~06~~ 12	Acetylene Cylinder Charging Plants	
52-~~06~~ 13	Vehicular Fuel System Code	
55-~~05~~ 13	Standard for the Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers Cylinders and Tanks	
58-~~08~~ 14	Liquefied Petroleum Gas Code	
59A-~~06~~ 13	Production, Storage and Handling of Liquefied Natural Gas (LNG)	
61-~~08~~ 13	Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities	
69-~~08~~ 14	Explosion Prevention Systems	
70-~~08~~ 14	National Electrical Code	
72-~~07~~ 13	National Fire Alarm and Signaling Code	
80-~~07~~ 13	Fire Doors and Other Opening Protectives	
85-~~07~~ 11	Boiler and Combustion System Hazards Code	
86-~~07~~ 11	Ovens and Furnaces	
92B-~~05~~ 12	Smoke Management Systems in Malls, Atria and Large Spaces	
99-~~05~~ 12	Health Care Facilities	
101-~~06~~ 12	Life Safety Code	

105-~~07~~ 10	Installation of Smoke Door Assemblies and Other Opening Protectives
110 -~~05~~ 10	Emergency and Standby Power Systems
111-~~05~~ 10	Stored Electrical Energy Emergency and Standby Power Systems
120-~~04~~ 10	Coal Preparation Plants
160-~~06~~ 11	Flame Effects Before an Audience
170-~~06~~ 12	Standard for Fire Safety and Emergency Symbols
211-~~06~~ 13	Chimneys, Fireplaces, Vents and Solid Fuel-burning Appliances
241-~~04~~ 13	Safeguarding Construction, Alteration and Demolition Operations
253-~~06~~ 11	Standard Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
260-~~03~~ 13	Method of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture
261-~~03~~ 13	Method of Test for Determining Resistance of Mock-up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes
265-~~07~~ 11	Method of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Wall Coverings in Full Height Panels and Walls
286-~~06~~ 11	Standard Method of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
303-~~06~~ 11	Fire Protection Standard for Marinas and Boatyards
385-~~07~~ 12	Tank Vehicles for Flammable and Combustible Liquids
407-~~07~~ 12	Aircraft Fuel Servicing
409-~~04~~ 11	Aircraft Hangars
430-04	Storage of Liquid and Solid Oxidizers
484-~~06~~ 12	Combustible Metals
490-02	Storage of Ammonium Nitrate
495-~~06~~ 13	Explosive Materials Code
498-~~06~~ 13	Safe Havens and Interchange Lots for Vehicles Transporting Explosives
505-~~06~~ 13	Powered Industrial Trucks, Including Type Designations, Areas of Use, Maintenance and Operation
654-~~06~~ 13	Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids
655-~~07~~ 12	Prevention of Sulfur Fires and Explosions
664-~~07~~ 12	Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
701-~~04~~ 10	Methods of Fire Tests for Flame- propagation of Textiles and Films
703-~~06~~ 12	Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Materials
704-~~07~~ 12	Identification of the Hazards of Materials for Emergency Response
750-~~06~~ 10	Water Mist Fire Protection Systems
1122-~~08~~ 13	Model Rocketry
1123-~~10~~ 14	Fireworks Display
1124-~~06~~ 13	Manufacture, Transportation, Storage and Retail Sale of Fireworks and Pyrotechnic Articles
1125-~~07~~ 12	Manufacture of Model Rocket and High Power Rocket Motors
1126-~~10~~ 11	Use of Pyrotechnics Before a Proximate Audience
1127-~~08~~ 13	High Power Rocketry
1142-~~07~~ 12	Water Supply for Suburban and Rural Fire Fighting
2001-~~08~~ 12	Clean Agent Fire Extinguishing Systems

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Fuel Gas Code
310.1.1, Chapter 8 CSST. (141209 Item B-11)

310.1.1 CSST. Corrugated stainless steel tubing (CSST) gas *piping* systems shall be bonded to the electrical service grounding electrode system ~~at the point where the gas service enters the building~~. The bonding jumper shall be not smaller than 6 AWG copper wire or equivalent.
CSST with an arc-resistant jacket listed by an *approved* agency for installation without the direct bonding, as prescribed in this section, shall be installed in accordance with Section 310.1 and the manufacturer's installation instructions.

(Chapter 8, Revise the Standard Name and Date)
~~ANSI LC 1-97 Interior Gas Piping Systems Using Corrugated Stainless Steel Tubing with Addenda LC1a-1999 and LC1b-2001~~
ANSI LC 1-2014/CSA 6.26b Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Plumbing Code
417.4 Shower compartments. (140311 Item B-8)

417.4 Shower compartments. Shower compartments shall conform to Table 417.4 and shall have approved shower pan material or the equivalent thereof as determined by the plumbing official. The pan shall turn up on three sides at least 2 inches (51 mm) above the finished curb level. The remaining side shall wrap over the curb. Shower drains shall be constructed with a clamping device so that the pan may be securely fastened to the shower drain thereby making a watertight joint. Shower drains shall have an approved weephole device system to ensure constant drainage of water from the shower pan to the sanitary drainage system. There shall be a watertight joint between the shower and drain and trap. Shower receptacle waste outlets shall be not less than 2 inches (51 mm) and shall have a removable strainer.

Exceptions:

1. Shower compartments with prefabricated receptors conforming to the standards listed in Table 417.4.
2. Where load-bearing, bonded, waterproof membranes meeting ANSI A118.10 are used, integrated bonding flange drains shall be approved. Clamping devices and weepholes are not required where shower drains include an integrated bonding flange. Manufacturer's installation instructions shall be followed to achieve a watertight seal between the bonded waterproof membrane and the integrated bonding flange drain. Integrated bonding flange drains shall conform to ASME A112.6.3, ASME A112.18.2/CSA B125.2, or CSA B79.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Plumbing Code
417.5.2.6 Liquid-type, trowel-applied, load-bearing, bonded waterproof materials. (140909 Item B-4)

417.5.2.6 Liquid-type, trowel-applied, load-bearing, bonded waterproof materials. Liquid-type, trowel-applied, load-bearing, bonded waterproof materials shall meet the requirements of ANSI A118.10 and shall be applied in accordance with the manufacturer's instructions.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Plumbing Code
706.4 Heel- or side-inlet quarter bends. (140610 Item B-8)

706.4 Heel- or side-inlet quarter bends. ~~Heel inlet quarter bends shall be an acceptable means of connection, except where the quarter bend serves a water closet. A low heel inlet shall not be used as a wet vented connection. Side inlet quarter bends shall be an acceptable means of connection for drainage, wet venting and *stack* venting arrangements.~~ Deleted.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Plumbing Code
715.1 Sewage Backflow. (141209 Item B-5)

715.1 Sewage backflow. ~~Where the flood level rims of plumbing fixtures are~~ Where plumbing fixtures are installed on a floor with a finished floor elevation below the elevation of the manhole cover of the next upstream manhole in the *public sewer*, such fixtures shall be protected by a backwater valve installed in the *building drain*, *branch* of the *building drain* or horizontal *branch* serving such fixtures. ~~Plumbing fixtures having flood level rims above the~~ Plumbing fixtures installed on a floor with a finished floor elevation above the elevation of the manhole cover of the next upstream manhole in the *public sewer* shall not discharge through a backwater valve.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Residential Code
Screen Enclosure. (140610 Item B-21)

Revise Sections 202, 301.2.1, 301.2.1.2, 612.5 and 703.4 per attachment.

The effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

R202 DEFINITIONS

SCREEN ENCLOSURE. A building or part thereof, in whole or in part self-supporting, and having walls of insect screening with or without removable vinyl or acrylic wind break panels 10 mil or less with a Class A Flame Spread, and a roof.

R301.2.1 Wind limitations. Buildings and portions thereof shall be limited by wind speed, as defined in Table R301.2 (1) and construction methods in accordance with this code. Basic wind speeds shall be determined from Figure R301.2 (4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where loads for curtain walls exterior windows, skylights, garage doors and exterior doors are not otherwise specified, the loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for curtain walls, exterior windows, skylights, garage doors and exterior doors.

Exception: Openings for exterior balconies, decks, or porches under roofs enclosed with screen or removable vinyl or acrylic wind break panels shall be exempt from the loads listed in Table R301.2(2) and the height and exposure factors listed in Table R301.2(3). Vinyl and acrylic glazed panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall state "Removable panel SHALL be removed when wind speeds exceed 65 mph (34 m/s)." Decals shall be placed such that the decal is visible when the panel is installed.

TABLE R301.2(2)
COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (psf)[a,b,c,d,e.f]

(No change to table values)

NOTES:

a. The effective wind area shall be equal to the span length multiplied by an effective width. This width shall be permitted to be not ~~be~~ less than one-third the span length. For cladding fasteners, the effective wind area shall not be greater than the area that is tributary to an individual fastener.

b. For effective areas between those given above, the load may be interpolated; otherwise, use the load associated with the lower effective area.

c. Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table R301.2(3).

d. See Figure R301.2(7) for location of zones.

e. Plus and minus signs signify pressures acting toward and away from the building surfaces.

f. Openings for exterior balconies, decks, or porches under roofs enclosed with screen or removable vinyl or acrylic wind break panels shall be exempt from the loads listed in Table R301.2(2) and the height and exposure factors listed in Table R301.2(3). Vinyl and acrylic glazed panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall state "Removable panel SHALL be removed when wind speeds exceed 65 mph (34 m/s)." Decals shall be placed such that the decal is visible when the panel is installed.

R301.2.1.2 Protection of openings. Windows in buildings located in windborne debris regions shall have glazed openings protected from windborne debris. Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E 1996 and ASTM E 1886 referenced therein. Garage door glazed opening protection for windborne debris shall meet the requirements of an approved impact resisting standard or ANSI/DASMA 115.

Exceptions:

1. Wood structural panels with a minimum thickness of 7/16 inch (11 mm) and a maximum span of 8 feet (2438 mm) shall be permitted for opening protection in one - and two-story buildings. Panels shall be precut so that they can be attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage method so that they can be secured

with the attachment hardware provided. Attachments shall be designed to resist the component and cladding loads determined in accordance with either Table R301.2 (2) or ASCE 7, with the permanent corrosion resistant attachment hardware provided. Attachment in accordance with Table R301.2.1.2 is permitted for buildings with a mean roof height of 33 feet (10 058 mm) or less where wind speeds do not exceed 130 miles per hour (58 m/s).

2. Openings for exterior balconies, decks, or porches under roofs enclosed with screen or removable vinyl or acrylic wind break panels shall not be required to be protected provided the spaces are separated from the building interior by a wall and all openings in the wall separating the unit from the balcony, deck or porch are protected in accordance with this section. Vinyl and acrylic glazed panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall state "Removable panel SHALL be removed when wind speeds exceed 65 mph (34 m/s)." Decals shall be placed such that the decal is visible when the panel is installed.

R612.5 Performance. Exterior windows and doors shall be designed to resist the design wind loads specified in Table R301.2(2)adjusted for height and exposure per Table R301.2(3).

Exception: Openings for exterior balconies, decks, or porches under roofs enclosed with screen or removable vinyl or acrylic wind break panels shall be exempt from the loads listed in Table R301.2(2) and the height and exposure factors listed in Table R301.2(3). Vinyl and acrylic glazed panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall state "Removable panel SHALL be removed when wind speeds exceed 65 mph (34 m/s)." Decals shall be placed such that the decal is visible when the panel is installed.

R703.4 Attachments. Unless specified otherwise, all wall coverings shall be securely fastened in accordance with Table R703.4 or with other approved aluminum, stainless steel, zinc-coated or other approved corrosion-resistive fasteners. Where the basic wind speed per FigureR301.2(4) is 110 miles per hour(49 m/s) or higher, the attachment of wall coverings shall be designed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

Exception: Openings for exterior balconies, decks, or porches under roofs enclosed with screen or removable vinyl or acrylic wind break panels shall be exempt from the loads listed in Table R301.2(2) and the height and exposure factors listed in Table R301.2(3). Vinyl and acrylic glazed panels shall be removable. Removable panels shall be identified as removable by a decal. The identification decal shall state "Removable panel SHALL be removed when wind speeds exceed 65 mph (34 m/s)." Decals shall be placed such that the decal is visible when the panel is installed.

2012 NC Residential Code
R311.7.1 Width. (140909 Item B-8)

R311.7.1 Width. Stairways shall not be less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. Handrails shall not project more than 4.5 inches (114 mm) on either side of the stairway and the minimum clear width of the stairway at and below the handrail height, including treads and landings, shall not be less than 31½ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are provided on both sides.
Exceptions:
1. The width of spiral stairways shall be in accordance with Section R311.7.9.1.
2. Stairways not required for egress may be as narrow as 26 inches.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Residential Code
Ch. 2, R502.1.6, R502.8.2, R602.1.3, R802.1.5, Ch. 44 Cross-Laminated Timber. (141209 Item B-1)

(*Add a definition in Chapter 2)*
CROSS-LAMINATED TIMBER. A prefabricated engineered wood product consisting of not less than three layers of solid-sawn lumber or *structural composite lumber* where the adjacent layers are cross oriented and bonded with structural adhesive to form a solid wood element.

(*Revise as follows)*
R502.1.6 Cross-laminated timber. Cross-laminated timber shall be manufactured and identified as required by ANSI/APA PRG 320.

(*Revise as follows)*
R502.8.2 Engineered wood products. Cuts, notches and holes bored in trusses, structural glue-laminated members, cross-laminated timber members or I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a *registered design professional*.

(Revise as follows)
R602.1.3 Cross-laminated timber. Cross-laminated timber shall be manufactured and identified as required by ANSI/APA PRG 320.

~~**R602.1.3**~~ **R602.1.4 Structural log members.** *(no change, only renumbering)*

(*Revise as follows)*
R802.1.5 Cross-laminated timber. Cross-laminated timber shall be manufactured and identified as required by ANSI/APA PRG 320.

~~**R802.1.5**~~ **R802.1.6 Structural log members.** *(no change, only renumbering)*

(Revise as follows)
R802.7.2 Engineered wood products. Cuts, notches and holes bored in trusses, structural composite lumber, structural glue-laminated, cross-laminated timber members or I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a *registered design professional*.

(Add to Chapter 44 under APA)
ANSI/APA PRG 320-2012 Standard for Performance-rated Cross Laminated Timber ……R502.1.6, R602.1.3, R802.1.5

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

TABLE N1102.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENTa

CLIMATE ZONE	FENESTRATION U-FACTOR b,l	SKYLIGHTb U-FACTOR	GLAZED FENESTRATION SHGC b,e,m	CEILING R-VALUE k	WOOD FRAME WALL R-VALUE e	MASS WALL R-VALUE i	FLOOR R-VALUE	BASEMENTc WALL R-VALUE	SLABd R-VALUE & DEPTH	CRAWL SPACE WALL R-VALUE c
3	0.35	0.65	0.30	30	13	5/10	19	10/13f	0	5/13
4	0.35	0.60	0.30	38 or 30 cont. j	15, 13+2.5h	5/10	19	10/13	10	10/13
5	0.35	0.60	NR	38 or 30 cont. j	19, 13+5, or 15+3eh	13/17	30g	10/13	10	10/13

l. In addition to the exemption in Section N1102.3.3, a maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

m. In addition to the exemption in Section N1102.3.3, a maximum of two glazed fenestration product assemblies having a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

TABLE N1102.1.2
EQUIVALENT U-FACTORSa

CLIMATE ZONE	FENESTRATION U-FACTOR e	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR d	CRAWL SPACE WALL U-FACTOR c
3	0.35	0.65	0.035	0.082	0.141	0.047	0.059	0.136
4	0.35	0.60	0.030	0.077	0.141	0.047	0.059	0.065
5	0.35	0.60	0.030	0.061	0.082	0.033	0.059	0.065

e. A maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 and a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty. When applying this note and using the REScheck "UA Trade-off" compliance method to allow continued use of the software, the applicable fenestration products shall be modeled as meeting the U-factor of 0.35 and the SHGC of 0.30, as applicable, but the fenestration products actual U-factor and actual SHGC shall be noted in the comments section of the software for documentation of application of this note to the applicable products. Compliance for these substitute products shall be verified compared to the allowed substituted maximum U-value requirement and maximum SHGC requirement, as applicable.

N1102.3.5 Thermally isolated conditioned sunroom *U*-factor and SHGC. The maximum fenestration *U*-factor shall be 0.40 and the maximum skylight *U*-factor shall be 0.75. Sunrooms with cooling systems shall have a maximum fenestration SHGC of 0.40 for all glazing.

New windows and doors separating the sunroom from conditioned space shall meet the building thermal envelope requirements. Sunroom additions shall maintain thermal isolation; and shall be served by a separate heating or cooling system, or be thermostatically controlled as a separate zone of the existing system.

Exception: A maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 and, when cooling is provided, a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

N1102.5 Maximum fenestration *U*-factor and SHGC. The area-weighted average maximum fenestration *U*-factor permitted using trade-offs from Section 1102.1.3 shall be 0.40. Maximum skylight *U*-factors shall be 0.65 in zones 4 and 5 and 0.60 in zone 3.
Exception: A maximum of two glazed fenestration product assemblies having a U-factor no greater than 0.55 and a SHGC no greater than 0.70 shall be permitted to be substituted for minimum code compliant fenestration product assemblies without penalty.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Residential Code
AM106 and AM111 Tables – southern pine spans. (140610 Item B-11)

Section AM106: ***Delete partial reprint of Table R502.3.1(2) without substitution. (Only the partial reprints in Appendix M are deleted.)***

Figure AM111: ***Delete partial reprint of Table R502.5(1) without substitution. (Only the partial reprints in Appendix M are deleted.)***

The effective date of this Rule is May 1, 2015.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Residential Code
AM111 Figure – note concerning guards. (140610 Item B-10)

Revisions to note concerning guards in FIGURE AM111

Guards at a Minimum 36" required per R312.1 with 30" drop and opening limits per R312.2 & R312.3 ~~(4" on vertical pickets, 6" on horizontal and ornamental guardrails)~~, top rail and post to support 200 lbs with infill to meet 50 lbs per Table R301.5 and footnotes.

The delayed effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Residential Code
N-1 and N-2 Tables – wood and flitch plate beams. (140610 Item B-12)

Appendix N: ***Delete Tables N-1 and N-2 and substitute attached tables.***

The effective date of this Rule is May 1, 2015.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

TABLE N-1
WOOD BEAMS AND GIRDERS ALLOWABLE LOADS IN POUNDS PER LINEAR FOOT [1, 2, 3, 4]

2X8 (1 ½" X 7 ¼")						
Span L [6] (feet)	Spruce-Pine-Fir [5]			Southern Pine		
	2 ply	3 ply	4 ply	2 ply	3 ply	4 ply
3	1305	1956	2610	1692	2538	3383
4	979	1468	1958	1013	1519	2026
5	736	1104	1472	648	972	1296
6	511	767	1022	450	675	900
7	375	563	751	331	496	661
8	287	431	575	253	380	506
9	227	341	454	200	300	400
10	184	276	368	162	243	324
12	114	172	228	113	169	225
14	72	108	144	72	108	144
2X10 (1 ½" X 9 ¼")						
Span L [6] (feet)	Spruce-Pine-Fir [5]			Southern Pine		
	2 ply	3 ply	4 ply	2 ply	3 ply	4 ply
3	1665	2498	3330	2158	3238	4317
4	1249	1873	2498	1426	2139	2852
5	999	1499	1998	913	1369	1825
6	763	1144	1525	634	951	1268
7	560	840	1120	466	698	931
8	429	643	858	357	535	713
9	339	508	678	282	423	563
10	275	412	549	228	342	456
12	191	286	381	158	238	317
14	140	210	280	116	175	233
2X12 (1 ½" X 11 ¼")						
Span L [6] (feet)	Spruce-Pine-Fir [5]			Southern Pine		
	2 ply	3 ply	4 ply	2 ply	3 ply	4 ply
3	2025	3038	4050	2625	3938	5250
4	1519	2278	3038	1969	2953	3938
5	1215	1823	2430	1266	1898	2531
6	1013	1519	2025	879	1318	1756
7	753	1130	1507	646	969	1291
8	577	856	1154	494	742	989
9	456	684	911	391	586	781
10	369	554	738	316	475	633
12	256	385	513	220	330	439
14	188	283	377	161	242	323

Table N-1 Notes:
1. Lumber grade is #2 intended for an in-service moisture content of 19% or less.
2. Deflection is limited to L/360.
3. Load duration factor used in calculations is 1.0.
4. Bearing and lateral support for the member shall be provided. Support for the member ends shall provide a continuous load path from the bearing to the foundation.
5. Values tabulated are for Spruce-Pine-Fir, not Spruce-Pine-Fir (South). Values tabulated for Southern Pine are based on design values published by the American Wood Council in an addendum to NDS dated March 2013.
6. Span L, is clear span. Effective span for bending and deflection is clear span plus 3 inches.

TABLE N-2
FLITCH PLATE BEAM ALLOWABLE LOADS
In Pounds Per Linear Foot [1,2,3, 4,5]

(2) 2x6 with Plate Indicated					
Span L [6] (feet)	**Plate Size / (Beam Weight per Foot)**				
	¼"x5" Plate (8 lb./ft.)	**⅜"x5" Plate (10 lb./ft.)**	**½"x5" Plate (13 lb./ft.)**	**⅝"x5" Plate (15 lb./ft.)**	**¾"x5" Plate (17 lb./ft.)**
6'-0"	643	825	1006	1188	1370
7'-0"	473	606	739	873	1006
8'-0"	362	464	566	668	771
9'-0"	272	348	425	502	579
10'-0"	198	254	310	366	422
11'-0"	149	191	233	275	317
12'-0"	115	147	179	212	244

(2) 2x8 with Plate Indicated					
Span L [6] (feet)	**Plate Size / (Beam Weight per Foot)**				
	¼"x7" Plate (11 lb./ft.)	**⅜"x7" Plate (14 lb./ft.)**	**½"x7" Plate (17 lb./ft.)**	**⅝"x7" Plate (20 lb./ft.)**	**¾"x7" Plate (23 lb./ft.)**
6'-0"	1150	1499	1849	2199	2549
7'-0"	845	1102	1359	1615	1872
8'-0"	647	843	1040	1237	1434
9'-0"	511	666	822	977	1133
10'-0"	414	540	666	792	917
11'-0"	342	446	550	654	758
12'-0"	287	375	462	550	637
13'-0"	230	300	369	439	509
14'-0"	184	240	296	352	408
15'-0"	150	195	240	286	331
16'-0"	123	161	198	236	273

(2) 2x10 with Plate Indicated					
Span L [6] (feet)	**Plate Size / (Beam Weight per Foot)**				
	¼"x9" Plate (14 lb./ft.)	**⅜"x9" Plate (18 lb./ft.)**	**½"x9" Plate (22 lb./ft.)**	**⅝"x9" Plate (26 lb./ft.)**	**¾"x9" Plate (30 lb./ft.)**
6'-0"	1642	2145	2649	3153	3657
7'-0"	1206	1576	1946	2317	2687
8'-0"	923	1207	1490	1774	2057
9'-0"	730	954	1177	1401	1625
10'-0"	591	772	954	1135	1317
11'-0"	488	638	788	938	1088
12'-0"	410	536	662	788	914
13'-0"	350	457	564	672	779
14'-0"	302	394	487	579	672
15'-0"	263	343	424	504	585
16'-0"	231	302	373	443	514
17'-0"	204	267	330	393	456
18'-0"	182	238	294	350	406
19'-0"	155	203	250	298	345
20'-0"	133	174	214	255	296

(2) 2x12 with Plate Indicated					
Span L [6] (feet)	Plate Size / (Beam Weight per Foot)				
	¼"x11" Plate (18 lb./ft.)	3/8"x11" Plate (22 lb./ft.)	½"x11" Plate (27 lb./ft.)	5/8"x11" Plate (32 lb./ft.)	¾"x11" Plate (36 lb./ft.)
6'-0"	2297	3006	3715	4425	5134
7'-0"	1688	2209	2730	3251	3772
8'-0"	1292	1691	2090	2489	2888
9'-0"	1021	1336	1651	1966	2282
10'-0"	827	1082	1338	1593	1848
11'-0"	683	894	1105	1316	1527
12'-0"	574	752	929	1106	1283
13'-0"	489	640	791	943	1094
14'-0"	422	552	682	813	943
15'-0"	367	481	594	708	821
16'-0"	323	423	522	622	722
17'-0"	286	374	463	551	639
18'-0"	255	334	413	492	570
19'-0"	229	300	371	441	512
20'-0"	207	271	334	398	462
21'-0"	188	245	303	361	419
22'-0"	171	224	276	329	382
23'-0"	156	205	253	301	349
24'-0"	140	183	226	269	312

Table N-2 Notes:

1. Lumber species and grade is #2 Southern Pine intended for an in-service moisture content of 19% or less. Design values used were published by the American Wood Council in an addendum to NDS dated March 2013. For Spruce-Pine-Fir lumber using the tabulated flitch plate allowable loads will be slightly conservative.
2. Tabulated values are based on ASTM A36 structural steel plate.
3. Deflection is limited to L/360.
4. Load duration factor used in calculations is 1.0.
5. Bearing and lateral support for the member shall be provided. Support for the member ends shall provide a continuous load path from the bearing to the foundation.
6. Span L, is center to center of supports. Wood side plates and steel flitch plates shall be continuous throughout the span.

2012 NC Residential Code
N-1 and N-2 Tables – wood and flitch plate examples. (140610 Item B-13)

Appendix N Example at the top of Page 918: *Change as follows*

By using Table N-1, the required beam is 4 @ 2x12 ~~SYP or~~ SPF

OR

By using Table N-2, the required minimum flitch beam is 2 @ 2x8 with ~~1/2"~~ 5/8" x 7" steel plate bolted with 1/2" bolts spaced at 2' o.c.

Appendix N Example at the bottom of Page 918: *Change as follows*

By using Table N-1, the required beam is ~~3~~ 4 @ 2x12 Southern Pine or 4 @ 2x12 Spruce-pine-fir

OR

By using Table N-2, the required minimum flitch is 2 @ 2x8 with ~~3/8"~~ 1/2" x 7" steel plate bolted with 1/2" bolts spaced at 2' o.c.

The effective date of this Rule is May 1, 2015.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

2012 NC Residential Code
Docks, Piers, Bulkheads and Waterway Structures. (140610 Item B-14)

NC Residential Code: ***Revisions attached.***

Commentary is included for clarification only and not subject to review.

The effective date of this Rule is January 1, 2016.
The Statutory authority for Rule-making is G. S. 143-136; 143-138.

Revision to NC RESIDENTIAL Code

Revisions to Section R101.2

R101.2 Scope. The provisions of the *North Carolina Residential Code for One- and Two-family Dwellings* shall apply to the construction, *alteration*, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and townhouses not more than three stories above *grade plane* in height with a separate means of egress and their *accessory buildings* and *structures.*

Exception: Live/work units complying with the requirements of Section 419 of the *North Carolina Building Code* shall be permitted to be built as one- and two-family *dwellings* or townhouses. Fire suppression required by Section 419.5 of the *North Carolina Building Code* when constructed under the *North Carolina Residential Code for One- and Two-family Dwellings* shall conform to Section 903.3.1.3 of the *International Building Code*.

R101.2.1 Accessory buildings. Accessory buildings with any dimension greater than 12 feet (3658mm) must meet the provisions of this code. Accessory buildings may be constructed without a masonry or concrete foundation, except in coastal high hazard or ocean hazard areas, provided all of the following conditions are met:

1. The accessory building shall not exceed 400 square feet (37m2) or one story in height;

2. The building is supported on a wood foundation of minimum 2x6 or 3x4 mudsill of approved wood in accordance with Section R317; and

3. The building is anchored to resist overturning and sliding by installing a minimum of one ground anchor at each corner of the building. The total resisting force of the anchors shall be equal to 20 psf (958 Pa) times the plan area of the building.

R101.2.2 Accessory structures. Accessory structures shall meet the provisions of this code. Accessory structures not listed below are not required to meet the provisions of this code ~~except decks, gazebos, retaining walls as required by Section R404.4, detached masonry chimneys built less than 10' from other buildings, pools or spas per appendix G, or detached carports~~.

1. Decks, See Appendix M,
2. Gazebos,
3. Retaining wall, See Section R404.4,
4. Detached masonry chimneys located less than 10 feet from other buildings or lot lines,
5. Swimming pools and spas, See Appendix G,
6. Detached carports,
7. *Docks*, *piers*, *bulkheads*, and waterways structures, See Section R324.

Exception: Portable lightweight aluminum or canvas type carports not exceeding 400 sq ft or 12' mean roof height and tree houses supported solely by a tree are exempt from the provisions of this code.

Revisions to Section R202

ACCESSORY STRUCTURE. An accessory structure is any structure not roofed over and enclosed more than 50% of its perimeter walls, located on one- and two-family dwelling sites which is incidental to that of the main building. Examples of accessory structures are fencing, decks, gazebos, arbors, retaining walls, barbecue pits, detached chimneys, tree houses (supported by tree only), playground equipment, ~~and~~ yard art, *docks, piers,* etc. ~~Accessory structures are not required to meet the provisions of this code except decks, gazebos, retaining walls as required by Section R404.4, detached masonry chimneys built less than 10' from other buildings, pools or spas per appendix G, or detached carports~~

BOAT SLIP. A berthing place for one or two watercraft where the watercraft can be securely moored to cleats, piling, or other devices while the boats are in the water. Boat slips are commonly configured as "side-ties" or as single or double loaded "U" shaped berths.

DOCK. A structure extending alongshore or out from the shore into a body of water, usually accommodating multiple boat slips, to which boats may be moored in order to load or unload people or cargo.

PIER. An elevated deck structure, usually pile supported, extending out into the water from the shore.

Addition of Section R324
(Note: The following is to be considered underlined in its entirety.)

SECTION R324
DOCKS, PIERS, BULKHEADS AND WATERWAY STRUCTURES

R324.1 General. *Docks, piers, bulkheads* and waterway structures shall be constructed in accordance with Chapter 36 of the *North Carolina Building Code.*

Exceptions: Structures complying with the following are not required to meet the provisions of this code. A permit is required to verify these limitations and a plan shall be submitted for approval that the exceptions have been met.

Commentary: *Code requirements for plumbing, mechanical, and electrical installations shall apply.*

1. Fixed piers associated with a one- or two- family dwelling meeting all of the following:

    1.1 A maximum of four boat slips for a single owner of a one- or two- family dwelling or two adjacent, riparian owners.

    1.2 A maximum height of 15 feet measured from deck to mud line at any location along the pier.

Commentary: *This limitation on pier height is intended to limit pile stresses due to lateral loads. Pile sizes and embedment should be chosen considering forces due to moving water generated by flood stage or storm surge, waves, scour, and size of vessels moored to the pier. Where piles cannot be adequately embedded to resist lateral loads and uplift, fixed piers should be anchored to a soil strata capable of resisting the uplift and lateral loads. Wave forces due to large private or commercial vessels are not considered in these limitations and should be accommodated by the owner or contractor prior to construction. See Figure 1.*

    1.3 A maximum normal pool depth of 13 feet on lakes and ponds and a maximum mean low water depth of 7 feet in other locations.

Commentary: *Limiting depth of water limits lateral loads on the piles and vessel sizes. See Figure 1.*

1.4 A maximum walkway width of 6 feet.

Commentary: *The 6 foot maximum limitation on fixed pier width is intended to limit occupant load, limit storage on the pier, and prevent vehicles from operating on the pier. This limitation is consistent with the limitations for CAMA's general permitting process. See Figure 1.*

1.5 A maximum pile spacing of 8 feet, in both directions.

Commentary: *Pile spacing is limited to spans consistent with 2x8 joists or stringers at 24 inch maximum spacing and 2x10 split girders. Recommended pile size is 6 inches x 6 inches minimum. The intent is that exempted structures be capable of supporting a live load of 40 psf, even though design by a registered engineer is not required. Lateral loads on piles are also reduced by limiting the pile spacing. Wave forces due to large private or commercial vessels are not considered in these limitations and should be accommodated by the owner or contractor prior to construction. See Figure 3.*

1.6 A maximum of 576 sq. ft. for non-walkways areas.

Commentary: *Non-walkway areas include sitting areas, staging areas for vessel embarkation and disembarkation, and platforms for swimmers or fishermen. Limiting the area of these platforms is intended to limit occupancy and the potential for overload due to storage.*

1.7 A maximum boat slip length of 40 feet.

Commentary*: The boat slip size limitation is intended to limit the size of the vessels moored to the dock, which in turn limits both occupant load on the pier and lateral loads on the pier.*

1.8 A maximum roofed area of 576 sq. ft. with an additional maximum 2 foot overhang.

Commentary: *See Figure 3.*

1.9 Constructed with no enclosed or multilevel structures.

1.10 Supports a boatlift with a maximum design capacity no greater than 16,000 pounds.

2. Floating *docks* associated with a one- or two- family dwelling meeting all of the following:

2.1 A maximum of four boat slips for a single owner of a one- or two- family dwelling or two adjacent, riparian owners.

2.2 A maximum normal pool depth of 20 feet for *docks* with guide piles on lakes and ponds and a maximum mean low water of 10 feet for *docks* with guide piles in other locations.

Commentary*: Guide piles should be long enough to prevent the dock from floating off the piles at flood stage or during a 100 year storm surge. Pile sizes should be chosen considering forces due to moving water generated by flood stage or storm surge, waves, scour, and size of vessels moored to the dock. Wave forces due to large private or commercial vessels are not considered in these limitations and should be accommodated by the owner or contractor prior to construction. See Figure 2.*

2.3 A maximum boat slip length of 40 feet.

***Commentary**: The boat slip size limitation is intended to limit the size of the vessels moored to the dock, which in turn limits both occupant load on the dock and lateral loads on the dock.*

2.4 Finger piers, crosswalks or other floating surfaces having a minimum width of 3 feet wide to a maximum of 6 feet wide, except for a single 8 foot x 16 foot section.

***Commentary:** A minimum width for walking surfaces on floating docks is specified to provide some measure of stability. Owners should be aware that this is a rule of thumb and should check with the manufacturer of the floating dock system for limits on stability for their particular system. The 6 foot maximum limitation on floating walking surfaces is intended to limit occupant load, limit storage on the doc, and prevent vehicles from operating on the dock. See Figure 2.*

2.5 When constructed with a roof the following conditions exist:

i. Basic design wind speed is 90 mph or less;

ii. Ground snow load is 15 psf or less (See Figure 4);

iii. A maximum eave height of 10 feet;

iv. A maximum roof slope of 4:12;

v. A maximum roofed area of 576 sq. ft. with an additional maximum 2 foot overhang;

vi. A minimum boat slip width of 12 feet;

vii. A minimum floating dock width of 4 feet along both sides of the boat slip;

viii. A maximum dead load of 12 psf;

ix. Floating structures supporting roof structures are balanced or anchored to reduce the possibility of tipping.

2.6 Constructed with no enclosed or multilevel structures.

2.7 Supports a boat lift with a maximum design capacity no greater than 16,000 pounds.

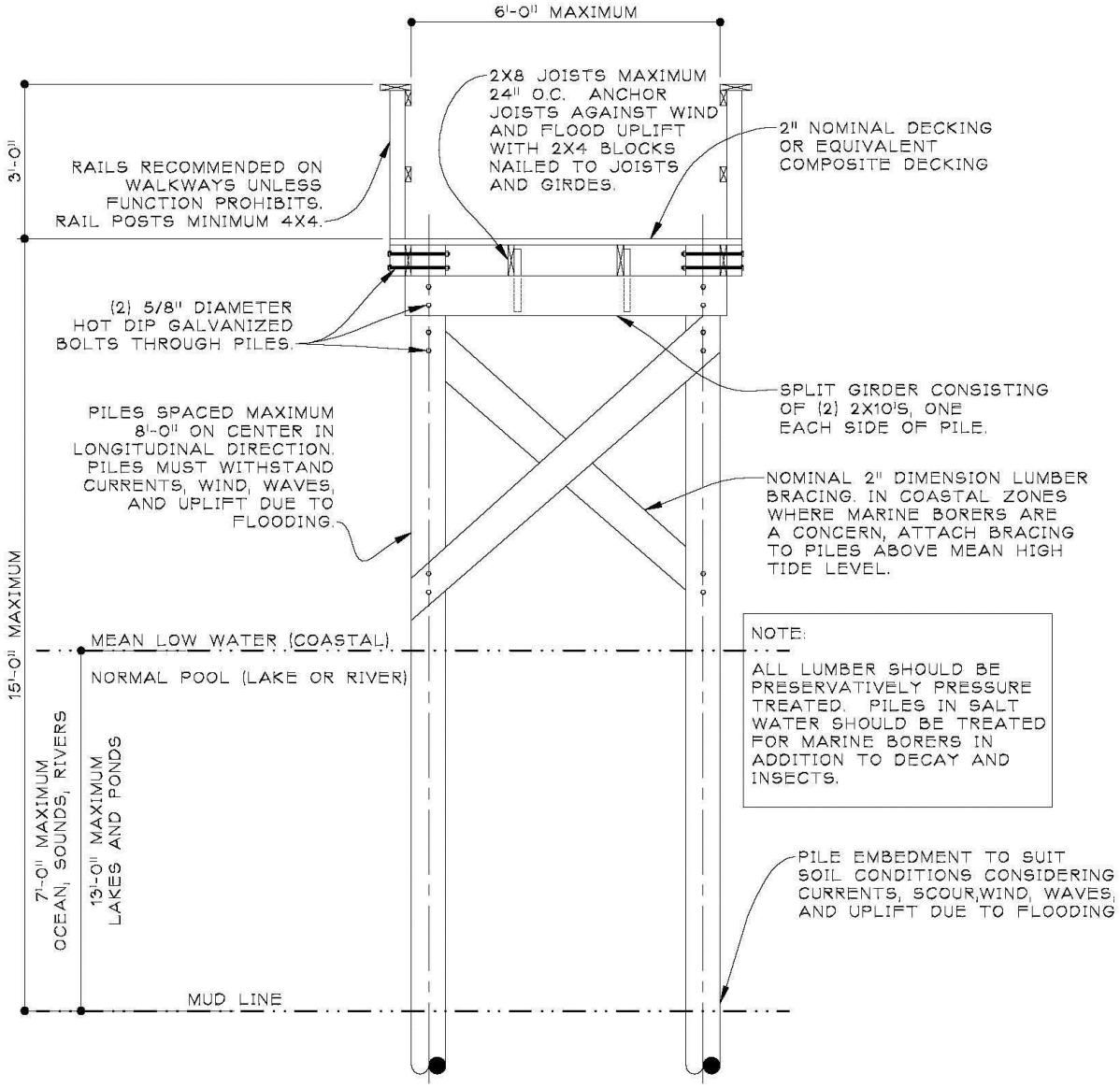


FIGURE 1: FIXED PIER WALKWAY SECTION

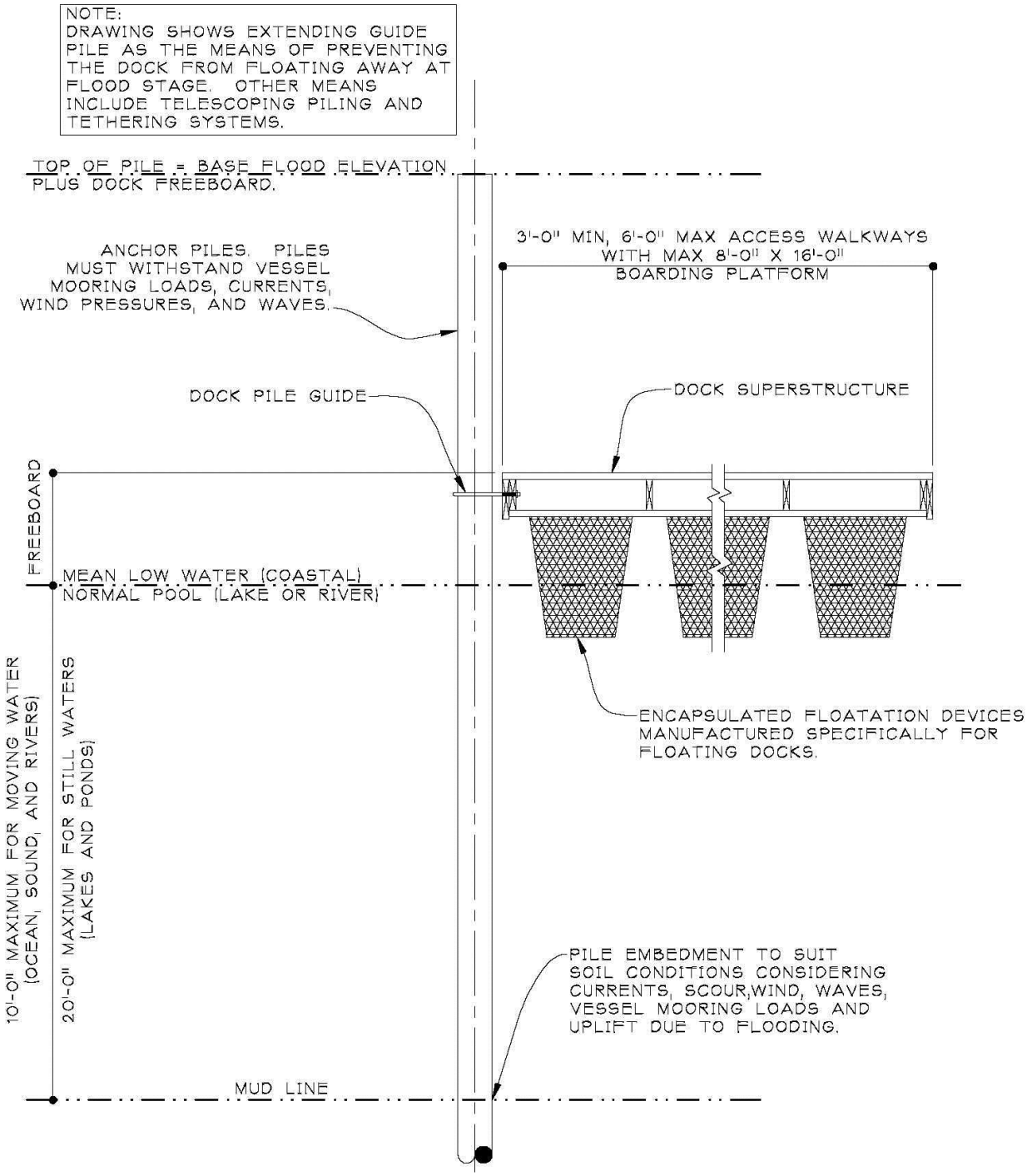


FIGURE 2: FLOATING DOCK SECTION

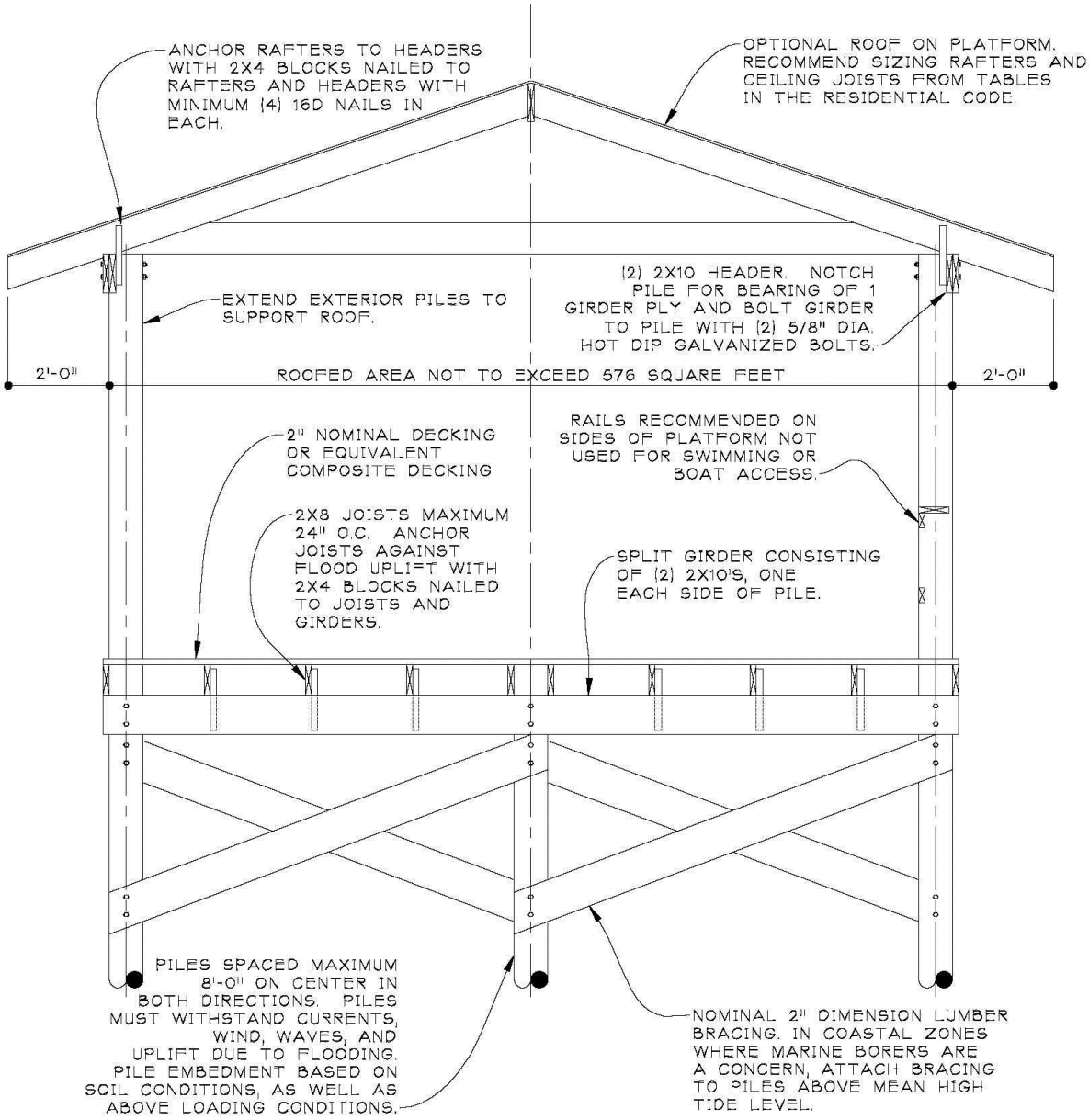
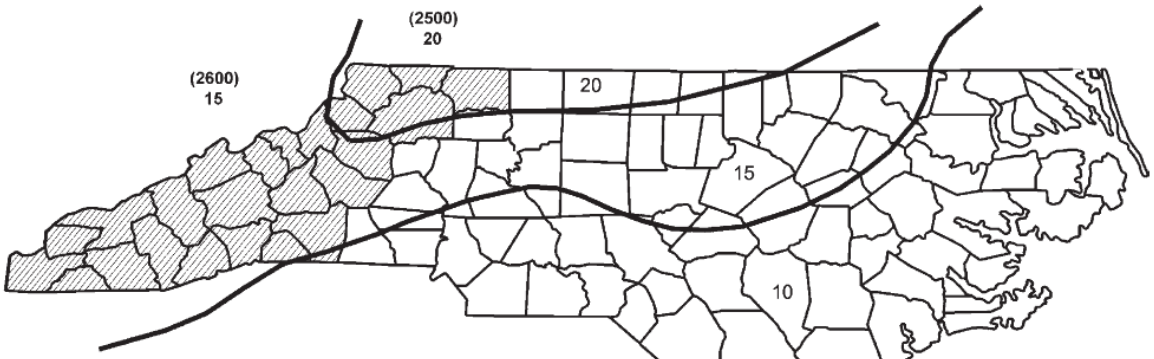


FIGURE 3: FIXED PIER PLATFORM SECTION



In CS areas, site-specific Case Studies are required to establish ground snow loads. Extreme local variations in ground snow loads in these areas preclude mapping at this scale.

Numbers in parentheses represent the upper elevation limits in feet for the ground snow load values presented below. Site-specific case studies are required to establish ground snow loads at elevations not covered.

To convert lb/sq ft to kNm^2, multiply by 0.0479.

To convert feet to meters, multiply by 0.3048.

FIGURE 4: GROUND SNOW LOADS