1952

AMENDMENTS

TO THE

WISCONSIN STATE BUILDING CODE

Effective June 1, 1952

ISSUED BY THE
INDUSTRIAL COMMISSION OF WISCONSIN

MADISON, WISCONSIN

5291

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INDUSTRIAL COMMISSION OF WISCONSIN

AMENDMENTS TO THE BUILDING CODE

The following orders 5111, 5121, 5124, 5314, 5315, 5316, 5317, 5318, 5319, 5321, 5322, 5413, 5560, 5568, 5700, 5722 and 5725 were adopted by the Industrial Commission, April 1, 1952 and became effective as a part of the Wisconsin State Building Code June 1, 1952.

WISCONSIN STATE BUILDING CODE REVISIONS

1952

Chapter 3

DEFINITIONS AND STANDARDS

Order 5111—Glass Block.

1. Use. Approved glass block may be used in non-load bearing panels in walls where ordinary glass will be permitted, unless specifically prohibited by occupancy requirements of this code.

2. Installation. Glass block panels shall not exceed 144 square feet in unsupported area, with a maximum height of 20 feet and a maximum width of 20 feet. The horizontal and vertical mortar joints between each block shall be composed of one part of Portland cement, one part of lime and 4 parts of sand, or its equivalent.

All panels over 6 feet in width shall be supported on each side by chases, not less than 1½ inches in depth, of metal or other incombustible material.

Approved continuous metal bond ties shall be provided in each horizontal mortar joint for block of nominal 12 x 12 inch size and in at least every third joint for block of smaller dimension.

Provision shall be made in all panels for expansion, using approved expansion material not less than ½ inch thick for heads and lintels and not less than ¼ inch thick for jambs.

Order 5121—Standpipes.

1. Standpipe systems are designed for two classes of service: (a) for use by fire departments or others trained in handling heavy streams from 2½ inch hose, and (b) for use by occupants of a building on incipient fires. These are referred to in these orders as Fire Department, and First Aid Standpipes, respectively. The features of each system may be combined in a single equipment, if served by an automatic water supply conforming to Order 5121–2(g) or 2(h). All threads on hose and hose connections shall be interchangeable with those of the public fire department.

2. Fire Department Standpipes.

(a) Shall be provided for all buildings exceeding 60 feet in height. Required standpipes shall be installed as construction progresses, to make them available to the fire department in the topmost floor constructed.

(b) Standpipes shall be sufficient in number so that any part of every floor area can be reached within 30 feet by a nozzle attached to 100 feet of hose connected to the standpipe. When two or more standpipes are required, they shall be cross connected at the bottom, and equipped with individual controlling valves located not higher than the first story.

(c) Standpipes shall be protected against mechanical and fire damage, with outlets in stairway enclosures; where stairways are not enclosed, outlets shall be at inside or outside of outside walls, within one foot of a fire tower, interior stairway or fire escape. Dry standpipes shall be accessible for inspection and not concealed.

(d) No required standpipe shall be less than 4 inches in diameter, and not less than 6 inches in diameter for buildings exceeding 75 feet in height. Material shall be steel or wrought iron pipe with approved fittings, designed for a working pressure of 100 pounds in excess of the static pressure due to elevation. An approved 2½ inch hose valve shall be located at each story, not over 5 feet above the floor level. An approved pressure reducing device shall be installed at hose valves where the pressure would otherwise be in excess of 50 pounds. Where a standpipe is not normally under pressure, hose valves shall be equipped with a tight fitting cap on a chain and having lugs for a spanner wrench.

(e) An approved siamese connection with a check valve in each inlet shall be installed on a 4 inch pipe connecting with each standpipe system and shall be marked "To Standpipe". The elevation of the connection shall be not over 3 feet above the sidewalk or ground

An automatic drip valve shall be installed where necessary to prevent freezing. In buildings with several standpipes, more than one siamese connection may be required.

(f) Fire department standpipes need not be equipped with attached hose.

(g) Automatic water supplies will not ordinarily be required, except as provided in Order 5121–2(h), or where judged necessary by reason of the high combustibility or potential hazard of the occupancy. When required, they shall be designed to provide not less than 40 pounds flowing pressure at the top outlet, with volume for two fire streams. Any of the following supplies will be acceptable:

1. Connection to city water works system when providing required minimum volume and pressure.

2. Gravity tank of not less than 3500 gallons capacity, elevated 50 feet above the top story.

3. Pressure tank of 5250 gallons gross capacity (3500 gallons water capacity).

4. Automatic pump or pumps, with combined effective capacity of 500 gallons per minute.

(h) An automatic water supply from an approved fire pump shall be provided in buildings over 150 feet high, or in buildings over 10,000 square feet in area per floor and requiring a standpipe. The capacity of the pump shall be not less than 500 gallons per minute for a 4 inch standpipe, 750 gallons per minute for two interconnected 4 inch or single 6 inch standpipes, and 1,000 gallons per minute for larger systems.

3. First Aid Standpipes.

(a) Shall be provided as required in Orders 5414, 5533, and 5721 of this code.

(b) Standpipes shall be sufficient in number so that any part of every floor area can be reached within 20 feet by a nozzle attached to not more than 75 feet of hose connected to a standpipe.

> Note: Standpipe outlets should be located in occupied areas, and usually at interior columns in large area buildings. Asylums and places of detention may require special arrangements. It should be possible in all cases to direct the stream into all important enclosures, such as closets, etc.

(c) No required standpipe shall be less than 2 inches in diameter, and not less than 2½ inches in diameter for buildings 5 stories or more in height. Material shall be wrought iron or steel and pipe and fittings shall be of suitable weight for the pressure used. An approved 1½ inch hose valve shall be located in each story, not more than 5 feet above the floor level; valves of the gate type shall be equipped with a suitable open drip connection. An approved pressure-reducing device shall be installed at hose valves where pressure would otherwise be over 50 pounds.

(d) Not more than 75 feet of hose shall be attached to each outlet. Hose shall be of unlined linen construction, 1½ inches in

diameter, with a ½ inch nozzle attached, and shall be located in approved cabinets or racks.

(e) Water supply shall be automatic, and be designed for 70 gallons per minute for 30 minutes with 25 pounds flowing pressure at the top outlet. Such supply may be from city connection, gravity tank, pressure tank or pump.

Note: Data on the design of standpipe systems can be found in the Standards of the National Board of Fire Underwriters for the Installation of Standpipe and Hose systems. The Industrial Commission will ordinarily approve any installation which is approved by the Underwriters.

Order 5124—Fire Alarm Systems.

Interior fire alarm systems required under Orders 5416, 5619 and 5722 shall be designed and constructed in conformity with the following requirements:

All such alarm systems shall consist of operating stations on each floor of the building, including the basement, with bells, horns, or other approved sounding devices which are effective throughout the building. The system shall be so arranged that the operation of any one station will actuate all alarm devices connected to the system except in the case of a presignal system. Fire alarms shall be readily distinguishable from any other signaling devices used in the building. A system designed for fire alarm and paging service may be used if the design is such that fire alarm signals will have precedence over all others.

Every fire alarm system shall be electrically operated except as provided in Order 5619 and shall be operated on closed circuit current under constant electrical supervision, so arranged that upon a circuit opening and remaining open, or in case of a ground or short circuit in the ungrounded conductor, audible trouble signals will be given instantly.

In buildings more than 3 stories in height, coded fire alarm systems shall be provided, and the systems shall be so arranged that the code transmitted shall indicate the location and the story of the structure in which the signal originated.

Exception: In apartment buildings less than 6 stories in height and having less than 5 000 square feet area per floor, non-coded, electrically supervised, continuous ringing fire alarm systems will be accepted.

Operating stations shall be prominently located in an accessible position at all required exit doors and required exit stairways. Operating stations shall be of an approved type and shall be conspicuously identified. All such operating stations shall be of a type, which after being operated, will indicate that an alarm has been sent therefrom until reset by an authorized means. (Operating stations having a "Break Glass" panel will be acceptable. On coded systems having a device to permanently record the transmission of an alarm, "Open

Door" type stations may be used.) The fire alarm operating stations shall be mounted approximately 5 feet above the finished floor as measured from the floor to the center of the box.

All such alarm systems shall be tested at least once a week and a record of such tests shall be kept.

Existing fire alarm systems that are effective in operation will be accepted if approved by the Industrial Commission.

Note: The following sections are taken from the Wisconsin State Electrical Code Order 13–7294.

The energy for operation of fire alarm systems shall be taken from sources suited to the design of the system. Primary batteries shall not be used.

A 3 wire 110–220 volt service will be accepted for supervised systems, providing the operating current is secured from one ungrounded conductor and the neutral or grounded conductor and the current for operation of trouble signal or signals is secured from the other ungrounded conductor and the neutral or grounded conductor.

Electrical wiring in connection with fire alarm systems shall be installed in rigid metal conduit, flexible metal conduit, electrical metallic tubing or surface metal raceway. Armored cable (metal) may be used where it can be fished in hollow spaces of walls or partitions in apartments or rooming houses not over 3 stories in height. Where the wiring is subject to excessive moisture or severe mechanical injury, rigid metal conduit shall be used. The smallest size conductor to be used in any fire alarm system in a building over 3 stories in height shall be #14 AWG or #16 AWG for buildings not over 3 stories in height. The wires shall be provided with insulation suitable for use on circuits not exceeding 600 volts. Fire alarm systems shall be connected to the line side of the service switch or to the emergency bus, where available, through an approved fire alarm cut-out or equivalent.

Chapter 5

STRUCTURAL REQUIREMENTS

SECTION 3. CONCRETE CONSTRUCTION

Order 5314—Concrete Materials.

1. Portland Cement. Portland cement shall conform to the "Standard Specifications for Portland Cement" (A.S.T.M. Serial Designation: C–150–49).

2. Concrete Aggregates. Concrete aggregates, except lightweight aggregates, shall conform to the "Standard Specifications for Concrete Aggregates" (A.S.T.M. Designation C–33–49) including the method of sampling and testing.

Lightweight aggregates for concrete shall conform to the "Standard Specifications for Lightweight Aggregates for Concrete" (A.S.T.M. Designation C–130–42) including the methods of sampling and testing.

The maximum size of the aggregate shall not be larger than one-fifth of the narrowest dimension between sides of the forms of the member for which the concrete is to be used nor larger than three-fourths of the minimum clear spacing between reinforcing bars.

3. Water. Water used in mixing concrete shall be clean, and free from injurious amounts of oil, acid, alkali, organic matter, or other harmful substances.

4. (a) Metal Reinforcement. Metal reinforcement shall conform to the requirements of the "Standard Specifications for Billet-Steel Bars for Concrete Reinforcement" (A.S.T.M. Serial Designation: A15–50T) or for "Rail Steel Bars for Concrete Reinforcement" (A.S.T.M. Serial Designation: A16–50T) or for "Welded Steel Wire Fabric for Concrete Reinforcement" (A.S.T.M. Serial Designation A–185–37).

(b) Deformed Bars. Deformed reinforcing bars shall conform to the "Standard Specifications for Minimum Requirements for the Deformations of Deformed Steel Bars for Concrete Reinforcement" (A.S.T.M. Serial Designation: A–305–50T). Bars not conforming to these specifications shall be classed as plain bars.

Wire mesh with welded intersections not further apart than 6 inches in the direction of the principal reinforcement and with cross wires not smaller than No. 10 W and M gauge may be rated as deformed bars.

5. Placing Metal Reinforcement. Metal reinforcement shall be accurately placed and adequately secured in position by concrete or metal chairs or spacers. The minimum clear distance between parallel bars, except in columns, shall be equal to the nominal diameter of the bars. In no case shall the clear distance between bars be less than one inch, nor less than one and one-third the maximum size of the coarse aggregate. Where reinforcement in beams or girders is placed in two or more layers, the clear distance between layers shall not be less than one inch and the bars in the upper layers shall be placed directly above those in the bottom layer.

6. Storage of Materials. Cement and aggregates shall be stored in such a manner as to prevent deterioration or the intrusion of foreign matter. Any material which has deteriorated or which has been damaged shall be removed completely from the premises.

Order 5315—Concrete Proportions, Mixing and Strength.

1. Proportions. The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate or excess free water to collect on the surface.

The methods of measuring concrete materials shall be such that the proportions can be controlled accurately and checked easily at any time during the work. Wherever practicable, such measurement shall be by weight rather than by volume.

2. Mixing. The concrete shall be mixed until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. In machine mixing, only batchmixers shall be used. Each batch shall be mixed not less than one minute after all the materials are in the mixer and must be discharged completely before the mixer is recharged. Machine mixers shall have a peripheral speed of approximately 200 feet per minute.

Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in the "Standard Specifications for Ready-mixed Concrete" (A.S.T.M. Serial Designation C94–48).

3. Strength. For the design of reinforced concrete structures, the value of f'_c used for determining the working stresses as stipulated in Order 5322–3 shall be based on the specified minimum 28-day compressive strength of the concrete, or on the specified minimum compressive strength at the earlier age at which the concrete may be expected to receive its full load. All plans, submitted for approval or used on the job, shall show clearly the assumed strength of concrete at the specified age for which all parts of the structure were designed.

All concrete exposed to the action of the weather shall have a water-content of not to exceed 6 gallons per sack of cement.

When average aggregates are to be used and no preliminary tests are to be made, the water-content to be used for various desired strengths of concrete shall be as indicated in the following table:

Water-Content, U. S. Gallons per 94 lb. Sack of Cement	7½	6¾	6
Assumed Compressive Strength at 28 Days, lb. per sq. in.	2000	2500	3000

In computing the water-content, surface water carried by the aggregates must be included. Water-content other than shown in the above table may be used, provided that the strength-quality of the concrete proposed for use in the structure shall be established by tests made in advance of the start of the work, using suitable consistencies and in accordance with the "Standard Method of Making Compression Tests of Concrete" (A.S.T.M. Serial Designation: C39–49).

A curve representing the relation between the water-content and the average 28-day compressive strength or earlier strength at which the concrete is to receive its full working load, shall be established for a range of values including all the compressive strengths indicated on the plans.

The curve shall be established by at least 3 points, each point representing average values from at least 4 test specimens. The

maximum allowable water-content for the concrete for the structure shall be as determined from this curve and shall correspond to a strength which is fifteen per cent greater than that indicated on the plans. No substitutions shall be made in the materials used on the work without additional tests in accordance herewith to show that the quality of the concrete is satisfactory.

4. Curing and Protection Against Cold Weather. In all concrete structures, concrete made with normal Portland cement shall be maintained in a moist condition for at least the first 7 days after placing, and high-early-strength concrete shall be so maintained for at least the first 3 days.

Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing weather. No frozen materials or materials containing ice shall be used.

All concrete materials and all reinforcement, forms, fillers, and ground with which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40 degrees Fahrenheit, all concrete when placed in the forms shall have a temperature of between 60 and 90 degrees Fahrenheit and shall be maintained at a temperature of not less than 50 degrees Fahrenheit for at least 72 hours for normal concrete or 24 hours for high-early-strength concrete, or for as much more time as is necessary to insure proper rate of curing of the concrete. The housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

5. Forms and Shoring for Concrete Structures. Forms shall be substantially constructed to carry dead and live loads and impact imposed during pouring operations. Forms shall conform to the shape, lines, and dimensions of the members as called for on the plans, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain position and shape.

Forms shall be removed in such manner as to insure the complete safety of the structure. Where the structure as a whole is supported on shores, the removable floor forms, beam and girder sides, column and similar vertical forms may be removed after 24 hours, provided the concrete is sufficiently hard not to be injured thereby. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support safely their weight and the load thereon. The results of suitable control tests may be used as evidence that the concrete has attained such sufficient strength.

Order 5316—Flexure of Beams, Frames, and Slabs.

1. Condition of Design. All members of frames or continuous construction shall be designed to resist at all sections the maximum moments and shears produced by dead load, live load and wind load, as determined by some one of the approximate methods of elastic

frame analysis. Any reasonable assumptions may be adopted as to relative stiffness of columns and floor members. The assumptions made should be consistent throughout the analysis. The following will serve as a guide to satisfactory design.

The stiffness, K, of a member is defined as EI divided by l or h. The modulus of elasticity for concrete shall be assumed as 1000 f'_c, and that for steel as 30,000,000 lbs. per sq. in. In the analysis of continuous frames, center to center distances, l and h, shall be used in the determination of moments.

In computing the value of I of slabs, beams, girders, and columns, the reinforcement may be neglected. In T-shaped sections allowance shall be made for the effect of the flange. The additional width of haunched floor members near supports may be neglected in computing moments, but may be considered to resist moment and shear. The additional depth of haunched floor members may be considered as resisting moment only when a complete analysis is made taking into account the variation in depth. Otherwise the minimum depth should be used to find moment and to resist the resulting moment. However, in any case, the actual depth may be assumed to resist shear.

Moments at faces of supports may be used for design of beams and girders. Solid or ribbed slabs with clear spans of not more than 10 feet that are built integrally with their supports may be designed as continuous slabs on knife edge supports with spans equal to the clear spans of the slab and the width of beams otherwise neglected. The span length of members that are not built integrally with their supports shall be the clear span plus the depth of the beam or slab but shall not exceed the distance between centers of supports.

The clear distance between lateral supports of a beam shall not exceed thirty-two times the least width of compression flange.

2. Requirements for T-Beams. In T-beam construction, the slab and beam shall be built integrally or otherwise effectively bonded together. The effective flange width to be used in the design of symmetrical T-beams shall not exceed one-fourth of the span length of the beam, and its overhanging width on either side of the web shall not exceed eight times the thickness of the slab nor one-half the clear distance to the next beam.

For beams having a flange on one side only, the effective overhanging flange width shall not exceed one-twelfth of the span length of the beam, nor six times the thickness of the slab, nor one-half the clear distance to the next beam.

Where the principal reinforcement in a slab which is considered as the flange of a T-beam (not a joist in concrete joist floors) is parallel to the beam, transverse reinforcement shall be provided in the top of the slab. This reinforcement shall be designed to carry the load on the portion of the slab assumed as the flange of the T-beam. The spacing of the bars shall not exceed five times the thickness of the flange, nor in any case eighteen inches.

Provision shall be made for the compressive stress at the support in continuous T-beam construction, care being taken that the provisions relating to the spacing of bars, and the placing of concrete shall be fully met.

The overhanging portion of the flange of the beam shall not be considered as effective in computing the shear and diagonal tension resistance of T-beams.

Isolated beams in which the T-form is used only for the purpose of providing additional compression area, shall have a flange thickness not less than one-half the width of the web and a total flange width not more than four times the web thickness.

3. Compression Steel in Flexural Members. Compression steel in beams, girders, or slabs shall be anchored by ties or stirrups not less than ¼ inch in diameter spaced not farther apart than 16 bar diameters, or 48 tie diameters. Such stirrups or ties shall be used throughout the distance where the compression steel is required.

4. Concrete Joist Floor Construction. Concrete joist floor construction consists of concrete joists and slabs placed monolithically with or without burned clay or concrete tile fillers. The joists shall not be farther apart than thirty inches face to face. The joists shall be not less than four inches wide, nor of a depth more than three times the width.

When burned clay or concrete tile fillers, of material having a unit compressive strength at least equal to that of the designed strength of the concrete in the joists are used, and the fillers are so placed that the joints in alternate rows are staggered, the vertical shells of the fillers in contact with the joists may be included in the calculations involving shear or negative bending moment. No other portion of the fillers may be included in the design calculations.

The concrete slab over the fillers shall be not less than one and one-half inches in thickness, nor less in thickness than one-twelfth of the clear distance between joists.

Where removable forms or fillers are used, the thickness of the concrete slab shall not be less than one-twelfth of the clear distance between joists and in no case less than two inches. Such slab shall be reinforced at right angles to the joists with a minimum of .049 sq. in. of reinforcing steel per foot of width, and in slabs on which the prescribed live load does not exceed fifty lbs. per sq. ft., no additional reinforcement shall be required.

When the finish used as a wearing surface is placed monolithically with the structural slab in buildings of the warehouse or industrial class, the thickness of the concrete over the fillers shall be one-half inch greater than the thickness used for design purposes.

Where the slab contains conduits or pipes, the thickness shall not be less than one-half inch plus the total over-all depth of such conduits or pipes at any point. Such conduits or pipes shall be so located as not to impair the strength of the construction.

5. Flat Slabs and Two-Way Slabs with Supports on Four Sides. Structures of these types shall be designed in accordance with the provisions of the 1940 Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, or the building regulations for reinforced concrete of the American Concrete Institute (A.C.I. 318–51).

Order 5317—Shear and Diagonal Tension.

1. General. Due to the composite character of reinforced concrete beams, the action of reinforcement in resisting diagonal tension is not susceptible of exact analysis. Hence, the design of web reinforcement is based on empirical or modified rational methods which have been developed from tests and the observation of existing structures.

Vertical stirrups, bent-up longitudinal bars or both, add greatly to the resistance to shear or diagonal tension. This is especially true if adequate bond resistance is provided, either in the form of low bond stress or effective anchorage of the reinforcement. The importance of bond resistance is such that high working stresses are permitted only when all of the reinforcement is anchored properly. Therefore, the requirements of Order 5318 on Bond and Anchorage are intimately related to the provisions of this order.

2. Unit Shearing Stress. The shearing unit stress used as a measure of diagonal tension shall be computed by the formula $v = \frac{V}{bjd}$. For beams of I or T section, the width of the concrete web or stem shall be used.

In concrete joist floor construction where burned clay or concrete tile are used, the shells of the tile in contact with the joists may be used in computing the shearing stress provided that the net compressive strength of the shells of tile equals that of the concrete in the joists and provided that the joints in alternate rows of tile are staggered.

3. Use of Web Reinforcement. Where the shearing unit stress in a beam or joist exceeds 0.03 f'_c, web reinforcement shall be provided at all sections for the shear in excess of this amount.

Web reinforcement may consist of vertical or inclined stirrups or bent-up longitudinal reinforcement or a combination thereof. Bars inclined at an angle less than 15 degrees with the axis of the beam shall not be considered as web reinforcement.

Stirrups or bent-up longitudinal bars to be considered effective as web reinforcement shall be anchored at both ends in accordance with the requirements of Order 5318–4.

4. Spacing of Web Reinforcement. Where web reinforcement is required, it shall be so spaced that every 45 degree line (representing a potential crack) extending from the mid-depth of the beam to the longitudinal tension bars shall be crossed by at least one line of web reinforcement. If a shearing unit stress in excess of 0.06 f'_c is used, every such line shall be crossed by at least two such lines of web reinforcement.

Order 5318—Bond and Anchorage.

1. Unit Bond Stress. In flexural members in which the tensile reinforcement is parallel to the compression face, the bond stress at any cross section shall be computed by the formula $u = \frac{V}{\sum o\, jd}$. In beams of variable depth to which this formula does not apply, special provision must be made for the end anchorage of all tensile reinforcement.

2. Anchorage for Longitudinal Steel and Web Reinforcement. Tensile negative reinforcement in any span of a continuous, restrained or cantilever beam, or in any member of a rigid frame shall be adequately anchored by bond, hooks or mechanical anchors in or through the supporting member. Within any such span, every reinforcing bar, whether required for positive or negative reinforcement, shall be extended at least 12 diameters beyond the point at which it is no longer needed to resist stress. The maximum tension in any bar must be developed by bond on a sufficient straight or bent embedment or by other anchorage. If preferred, the bar may be bent across the web at an angle of not less than 15 degrees with the longitudinal portion of the bar and made continuous with the reinforcement which resists moment of opposite sign.

Of the positive reinforcement in continuous beams not less than one-fourth of the area shall extend along the same face of the beam into the support a distance of 6 inches.

In simple beams, or at the freely supported end of continuous beams, at least one-third the required positive reinforcement shall extend along the same face of the beam into the support a distance of 6 inches.

Plain bars in tension shall terminate in standard hooks except that hooks shall not be required on the positive reinforcement at interior supports of continuous members.

Single separate bars used as web reinforcement shall be anchored at each end by one of the following methods:

(a) By welding to longitudinal reinforcement.
(b) By hooking tightly around the longitudinal reinforcement through 180 degrees.
(c) The extreme ends of bars forming simple U or multiple stirrups shall be anchored as specified in (a) or (b) or shall be bent through an angle of 90 degrees tightly around a longitudinal reinforcing bar not less in diameter than the stirrup bar and shall project beyond the bend at least 12 diameters of the stirrup bar.
(d) In all cases, web reinforcement shall be carried as close to the compression surface of the beam as fire and rust protection regulations and the proximity of other steel will permit.

Order 5319—Columns.

1. Limiting Dimensions. The following sections apply to a short column, for which the unsupported height is not greater than 10 times the least lateral dimension. When the unsupported height exceeds this value, the design shall be modified as shown in Order 5319–4. The unsupported height may be defined as the distance from the bottom of a slab, column capital, or beam to the top of the floor below. Principal columns in buildings shall have a minimum diameter or thickness of 10 inches. Posts, bearing walls, piers, or mullions that are not continuous from story to story shall have a minimum diameter or thickness of 6 inches.

2. Spiral Columns. The maximum allowable axial load on columns reinforced with longitudinal bars and closely spaced spirals enclosing a circular core shall be as follows:

$$P = A_c\,(0.225\,f'_c + f_s p_s)$$

Wherein

A_c = The gross area of the column.
f'_c = Compressive strength of the concrete.
f_s = Nominal allowable stress in vertical column reinforcement to be taken at 40 per cent of the minimum specification value of the yield point; namely, for rail or hard grade steel —20,000#; for intermediate grade steel—16,000#
p_s = Ratio of the effective cross sectional area of vertical reinforcement to the gross area A_c. The ratio p_s shall not be less than 0.01 nor more than 0.08.

The minimum number of vertical bars shall be six, and the minimum diameter of bar shall be ⅝ inch. Spirals shall be at least ¼ inch in diameter and shall not be spaced less than 1½ inches nor more than 3 inches apart.

Spiral Reinforcement. The ratio of spiral reinforcement p' shall not be less than the value given by the following formula:

$$p' = 0.45\left(\frac{A_g}{A_c} - 1\right)\frac{f'_c}{f'_s}$$

Wherein

p' = Ratio of volume of spiral reinforcement to the volume of the concrete core (out to out of spirals)
f'_s = Useful limit stress of spiral reinforcement to be taken as 40,000# per sq. in. for hot rolled rods of intermediate grade, 50,000# per sq. in. for rods of hard grade, and 60,000# per sq. in. for cold drawn wire.

3. Tied Columns. The maximum allowable axial load on columns reinforced with longitudinal bars and separate lateral ties shall be 80 per cent of that given by the formula for spirally reinforced columns.

The minimum number of vertical bars shall be four, and the minimum diameter of bar shall be ⅝ inch. Lateral ties shall be at least ¼ inch in diameter and shall be spaced apart not over 16 bar diameters, 48 tie diameters, or the least dimension of the column. When there are more than 4 vertical bars, additional ties shall be provided so that every longitudinal bar is held firmly in its designed position.

4. Long Columns. The maximum allowable load P' on an axially loaded reinforced concrete column having a height, h, greater than 10 times its least lateral dimension, d, is given by the formula:

$$P' = P\left[1.3 - .03\frac{h}{d}\right]$$

in which P = the allowable axial load on a normal short column.

5. Bending Moments in Columns. Columns in building frames shall be designed to resist the maximum moments and shears produced by dead load, live load, and wind load, as determined by some approximate method of elastic frame analysis. Assumptions as to relative rigidity of columns and floor members shall be consistent throughout and agree with the methods used in the analysis of floor members. Recognized methods of analysis shall be followed in calculating the stresses due to combined axial load and bending. The gross area of both spiral and tied columns may be used in these computations.

Where lapped splices in the column verticals are used, the minimum amount of lap shall be as follows:

(a) For deformed bars with concrete having a strength of 3000# per sq. in. or above, 20 diameters of bar of intermediate or hard grade steel. For bars of higher yield point, the amount of lap shall be increased one diameter for each 1000# per sq. in. by which the allowable stress exceeds 20,000# per sq. in. When the concrete strengths are less than 3000# per sq. in., the amount of lap shall be one-third greater than the values given above.

(b) For plain bars, the minimum amount of lap shall be twice that specified for deformed bars.

(c) Welded splices or other positive connections may be used instead of lapped splices. Welded splices shall preferably be used in cases where the bar diameter exceeds 1¼ inches. An approved welded splice shall be defined as one in which the bars are butted and welded and that will develop in tension at least the yield point stress of the reinforcing steel used.

Order 5320—Plain and Reinforced Concrete Walls and Piers.

1. Definitions. Plain concrete shall be defined as that which is reinforced with less than 0.0025 times the cross sectional area of the wall, either vertically or horizontally.

2. Thickness. The thickness of walls built of concrete having a 28-day compressive strength of 2000# per sq. in. or better may be 20 per cent less than that of other forms of masonry walls.

Exterior basement walls of either plain or reinforced concrete shall be not less than 8 inches thick.

3. Working Stresses. The allowable working stresses in reinforced concrete bearing walls with minimum reinforcement specified above shall be 0.25 f'_c for walls having a ratio of height to thickness of 10 or less, and shall be reduced proportionately to 0.15 f'_c for walls having a ratio of height to thickness of 25. When the reinforcement

in bearing walls is designed, placed, tied, and anchored in position as for tied columns, the allowable working stresses for tied columns may be used. The length of wall to be considered effective for each concentrated load shall not exceed the width of the bearing plus four times the wall thickness nor shall it exceed the center to center distance between loads.

4. Non-Bearing Walls. Non-bearing panel and enclosure walls of reinforced concrete shall have a thickness of not less than 5 inches and not less than one-thirtieth the distance between the supporting or enclosing members.

Order 5321—Footings.

1. Bending Moment. The external moment on any section shall be determined by passing through the section a vertical plane which extends completely across the footing, and computing the moment of the forces acting over the entire area of the footing on one side of said plane.

The greatest bending moment to be used in the design of an isolated footing shall be the moment computed in the manner just described at sections located as follows:

(a) At the face of the column, pedestal or wall, for footings supporting a concrete column, pedestal or wall.

(b) Halfway between the middle and the edge of the wall, for footings under masonry walls.

(c) Halfway between the face of the column or pedestal and the edge of the metallic base, for footings under metallic bases.

The width resisting compression at any section shall be assumed as the entire width of the top of the footing at the section under consideration.

In one-way reinforced footings, the total tensile reinforcement at any section shall provide a moment of resistance at least equal to the bending moment and the reinforcement thus determined shall be distributed uniformly across the full width of the section.

In two-way reinforced footings, the total tensile reinforcement at any section shall provide a moment of resistance at least equal to 85 per cent of the bending moment.

In two-way square footings, the reinforcement extending in each direction shall be distributed uniformly across the full width of the footing.

In two-way rectangular footings, the reinforcement in the long direction shall be distributed uniformly across the full width of the footing. In the case of the reinforcement in the short direction, that portion determined by the following formula shall be uniformly distributed across a band-width (B) centered with respect to the center line of the column or pedestal and having a width equal to the length of the short side of the footing. The remainder of the reinforcement shall be uniformly distributed in the outer portions of the footing.

$$\frac{\text{Reinforcement in band-width (B)}}{\text{Total reinforcement in short dimension}} = \frac{2}{(S+1)}$$

In this formula, "S" is the ratio of the long side to the short side of the footing.

2. Anchorage of Bars in Footing Slabs. Plain bars in footing slabs shall be anchored by means of standard hooks. The outer faces of these hooks and the ends of deformed bars shall not be less than 3 inches nor more than 6 inches from the face of the footing.

3. Shear and Bond. The critical section for shear to be used as a measure of diagonal tension shall be assumed as a vertical section obtained by passing a series of vertical planes through the footing, each of which is parallel to a corresponding face of the column, pedestal, or wall and located a distance therefrom equal to the effective depth for footings on soil, and one-half the effective depth for footings on piles.

Each face of the critical section as defined above shall be considered as resisting an external shear equal to the load on an area bounded by said face of the critical section for shear, two diagonal lines drawn from the column or pedestal corners and making 45 degree angles with the principal axes of the footing, and that portion of the corresponding edge or edges of the footing intercepted between the two diagonals.

Critical sections for bond shall be assumed at the same planes as those prescribed for bending moment; also at all other vertical planes where changes of section or of reinforcement occur.

Computations for shear to be used as a measure of bond shall be based on the same section and loading as prescribed for bending moment.

The total tensile reinforcement at any section shall provide a bond resistance at least equal to the bond requirement as computed from the following percentages of the external shear at the section:

(a) In one-way reinforced footings, 100 per cent.
(b) In two-way reinforced footings, 85 per cent.

In computing the external shear on any section through a footing supported on piles, the entire reaction from any pile whose center is located 6 inches or more outside the section shall be assumed as producing shear on the section; the reaction from any pile whose center is located 6 inches or more inside the section shall be assumed as producing no shear on the section. For intermediate positions of the pile center, the portion of the pile reaction to be assumed as producing shear on the section shall be based on straightline interpolation between full value at 6 inches outside the section and zero value at 6 inches inside the section.

4. Transfer of Stress at Base of Column. The stress in the longitudinal reinforcement of a column or pedestal shall be transferred to its supporting pedestal or footing either by extending the longitudinal bars into the supporting member, or by dowels.

In case the transfer of stress in the reinforcement is accomplished by extension of the longitudinal bars, they shall extend into the

supporting member the distance required to transfer to the concrete, by allowable bond stress, their full working value.

In cases where dowels are used, their total sectional area shall be not less than the sectional area of the longitudinal reinforcement in the member from which the stress is being transferred. In no case shall the number of dowels per member be less than 4 and the diameter of the dowels shall not exceed the diameter of the column bars by more than one-eighth inch.

Dowels shall extend up into the column or pedestal a distance at least equal to that required for lap of longitudinal column bars and down into the supporting pedestal or footing the distance required to transfer to the concrete, by allowable bond stress, the full working value of the dowel.

The compressive stress in the concrete at the base of a column or pedestal shall be considered as being transferred by bearing to the top of the supporting pedestal or footing. The unit compressive stress on the loaded area shall not exceed the bearing stress allowable for the quality of concrete in the supporting member as limited by the ratio of the loaded area to the supporting area.

In sloped or stepped footings, the supporting area for bearing may be taken as the top horizontal surface of the footing, or assumed as the area of the lower base of the largest frustum of a pyramid or cone contained wholly within the footing and having for its upper base the area actually loaded, and having side slopes of one vertical to two horizontal.

5. Pedestals and Footings (Plain Concrete). The allowable compressive unit stress on the gross area of a concentrically loaded pedestal shall not exceed 0.25 f'_c. Where this stress is exceeded, reinforcement shall be provided and the member designed as a reinforced concrete column.

The depth and width of a pedestal or footing of plain concrete shall be such that the tension in the concrete shall not exceed .03 f'_c and the average shearing stress shall not exceed .02 f'_c taken on sections as prescribed heretofore for reinforced concrete footings.

6. Footings Supporting Round Columns. In computing the stresses in footings which support a round or octagonal concrete column or pedestal, the "face" of the column or pedestal shall be taken as the side of a square having an area equal to the area enclosed within the perimeter of the column or pedestal.

7. Minimum Edge-Thickness. In reinforced concrete footings, the thickness above the reinforcement at the edge shall be not less than 6 inches for footings on soil, nor less than 12 inches for footings on piles.

In plain concrete footings, the thickness at the edge shall be not less than 8 inches for footings on soil, nor less than 14 inches above the tops of the piles for footings on piles.

Order 5322—Allowable Working Stresses.

1. Concrete Strength. The strength of concrete is fixed by the water content as described in Order 5315–3. Reinforced concrete used under this code shall have a compressive strength of at least 2000# per sq. in. and no credit shall be given for strengths in excess of 3000# per sq. in. unless approved in writing by the Industrial Commission.

2. Modular Ratio. The modular ratio, n, shall be assumed equal to $n = \frac{30{,}000}{f'_c}$

3. Allowable Unit Stresses in Concrete.

Description		Allowable unit stresses				
		For any strength of concrete in accordance with Order 5315–2 $n = \frac{30{,}000}{f'_c}$	Maximum value psi	For strength of concrete shown below		
				f'_c=2000 psi n=15	f'_c=2500 psi n=12	f'_c=3000 psi n=10
Flexure: f_c						
Extreme fiber stress in compression	f_c	$0.45f'_c$	-------	900	1125	1350
Extreme fiber stress in tension in plain concrete footings	f_c	$0.03f'_c$	-------	60	75	90
Shear: v (as a measure of diagonal tension)						
Beams with no web reinforcement	v_c	$0.03f'_c$	-------	60	75	90
Beams with properly designed web reinforcement	v	$0.12f'_c$	-------	240	300	360
Flat slabs at distance d from edge of column capital or drop panel	v_c	$0.03f'_c$	-------	60	75	90
Footings	v_c	$0.03f'_c$	75	60	75	75
Bond: u						
Deformed bars						
Top bars	------	$0.07f'_c$	245	140	175	210
In 2-way footings (except top bars)	------	$0.08f'_c$	280	160	200	240
All others	------	$0.10f'_c$	350	200	250	300
Plain bars (must be hooked)						
Top bars	------	$0.03f'_c$	105	60	75	90
In 2-way footings (except top bars)	------	$0.036f'_c$	126	72	90	108
All others	------	$0.045f'_c$	158	90	113	135
Bearing: f_c						
Walls, Piers, Pilasters and Pedestals						
On full area	f_c	$0.25f'_c$	-------	500	625	750
On ⅓ area or less	f_c	$0.375f'_c$	-------	750	938	1125
Columns: See Order 5319						

4. Allowable Unit Stresses in Reinforcement.

Tension in Longitudinal Steel and Web Reinforcement:

Structural grade steel rods ---------- $f_s = 18{,}000$

Intermediate grade and hard grade steel rods (Billet steel, rail steel or axle steel) ---------- $f_s = 20{,}000$

Compression in Column Verticals:

Intermediate grade steel rods ---------- $f_s = 16{,}000$

Hard grade steel rods (Billet steel, rail steel or axle steel) ---------- $f_s = 20{,}000$

Note: The symbols and notation used in the above formulas are defined as follows:

f'_c—ultimate compressive strength of concrete at age of 28 days.

f_c—compressive unit stress in extreme fibre of concrete in flexure or axial compression in concrete in columns.

v_c—unit shearing stress in concrete.

u—bond stress per unit area of surface of bar.

f_s—tensile unit stress in reinforcement.

Chapter 6

FACTORIES, OFFICE AND MERCANTILE BUILDINGS

Order 5413—Isolation of Hazards.

All heating boilers and furnaces, power boilers, fuel rooms, storage vaults for paints, oils, and similar combustibles and other similar hazards in a building shall be isolated from the rest of the building by at least a two-hour fire-resistive enclosure as specified in Orders 5105 and 5106; except that in buildings not more than 2 stories in height and having a floor area of not more than 3000 square feet per floor, a one-hour fire-resistive enclosure as specified in Orders 5105 and 5106, or better, shall be provided.

All openings shall be protected with self-closing fire-resistive doors as specified in Order 5109.

Space heaters, suspended furnaces, and direct-fired unit heaters, fired with various fuels, may be used without an enclosure where approved by the Industrial Commission. Where suspended furnaces and direct fired unit heaters are used without an enclosure, all such units shall be located at least 8 feet above the floor.

Order 5416—Fire Alarm.

A fire alarm system complying with Order 5124 shall be provided in every factory or workshop where more than 10 persons are employed above the second story except buildings which are provided with a complete automatic sprinkler system and except fire-resistive buildings whose contents are practically incombustible.

Chapter 7

THEATERS AND ASSEMBLY HALLS

Order 5560—Flame Resistance.

All tents used for assembly purposes or in which animals are stabled and all other tents used by the public in places of outdoor assembly shall be effectively flame-proofed. The owner shall furnish a certificate or a test report by a recognized testing engineer or laboratory as evidence that such tents have the required flame resistance.

Order 5568—Outdoor Theaters.

1. Definition and Scope. For the purpose of this code, an outdoor theater is a place of outdoor assembly used for the showing of plays, operas, motion pictures and similar forms of entertainment in which the audience views the performance from self-propelled vehicles parked within the theater enclosure. The requirements of this order shall apply to outdoor theaters now in existence and to outdoor theaters hereafter constructed, except as provided in paragraph 5.

2. Entrances and Exits. All entrances and exits for outdoor theaters shall comply with the regulations of the State Highway Commission for driveways from property abutting state highways and the following additional requirements:

(a) Not more than one entrance shall be provided for each access road but each such entrance may be divided into 2 roadways and channelized to properly provide for vehicles turning right or left from the highway.

(b) That portion of an entrance or exit lying within the highway right-of-way shall comply with the regulations of the authority in charge of the maintenance of the highway or in the event this authority has no regulation, it shall comply with regulations prescribed by the State Highway Commission.

(c) Not more than one exit shall be provided for each access highway but such exit may be suitably channelized to provide for right and left turns to the highway, and not more than one traffic lane shall be permitted for each traffic lane on the highway available to vehicles leaving the theater.

3. Vehicle Storage.

(a) Sufficient area shall be provided between the highway and the ticket booth to provide storage space for vehicles equal to not less than 10 per cent of the theater capacity. In all cases, sufficient storage space shall be provided so the vehicles will not back up on the traveled way of the highway. Storage area shall be calculated on the basis of 162 square feet per vehicle.

(b) A hold-over storage area having sufficient capacity to accommodate not less than 15 per cent of the theater capacity shall be provided between the ticket booth and the ramp area.

4. Tower Construction. The tower supporting the motion picture screen shall be designed to resist a horizontal wind pressure of not less than 30 pounds for every square foot of exposed surface.

5. Location of Tower. The screen shall be so oriented that the picture is not visible from any major highway. This requirement does not apply to towers erected prior to January 1, 1952.

6. Concession and Motion Picture Machine Booth. The motion picture booth and equipment shall comply in all respects with the requirements of Orders 5540–5549, inclusive, of this code.

Concession buildings in connection with outdoor theaters shall comply with the requirements of Chapter 6 of this code.

7. Sanitary Equipment. Separate toilet rooms shall be provided for males and females in connection with all outdoor theaters as required by Order 5532. Toilet rooms and equipment shall comply in all respects with the requirements of Orders 5250–5264 of this code.

In determining the number of fixtures required for toilet rooms in connection with outdoor theaters, the capacity of the theater is established by allowing 2¼ persons for each vehicle accommodated, exclusive of vehicles parked in the waiting or hold-over area.

Where the public toilet rooms are so located that the patrons must cross the ramp area in order to reach the toilet rooms, a suitable approach or passageway leading thereto shall be maintained. Such passageways shall be properly lighted and they shall be kept free from obstructions.

8. Ramps and Speaker Equipment.

(a) Ramps shall be spaced not less than 38 feet apart. The ramps shall be so designed that any vehicle can move from its parked position to the exit driveway without being required to back up.

All ramps, parking areas, entrance and exit driveways shall be properly surfaced with a gravel surfacing or better, adequate to withstand the weight of the vehicles accommodated.

(b) An individual speaker shall be provided for each vehicle accommodated in the ramp area. All speakers shall be equipped with sufficient cord to permit the speaker to be placed inside the vehicle.

Where additional seating space is provided in the theater enclosure for patrons using public transportation facilities, the speaker arrangement shall be such that the sound will be confined to the immediate seating area and not broadcast beyond the theater enclosure.

There shall not be less than 18 feet distance between speaker posts, measured parallel to the ramps, except in seated areas for patrons using public transportation. All electrical wiring and electrical equipment shall be installed in accordance with the provisions of the Wisconsin State Electrical Code. Each speaker post shall be wired with wire approved for underground use laid in trenches not less than 12 inches in depth.

9. Lighting. All entrance and exit driveways shall be adequately lighted and properly marked to avoid congestion and confusion and

shall remain lighted throughout the performance and until the audience has left the area.

10. Speed Limit. In every outdoor theater, notices of a permanent character shall be prominently displayed designating the maximum speed limit permitted for cars driven within the area. Parking lights shall be used when cars are moving in the theater enclosure.

11. Running of Engines. At each performance, an instructive trailer shall be shown on the screen informing the patrons of the danger of carbon monoxide poisoning when the engine is running and stating that when it becomes necessary to run the engine, the windows of the vehicle should be opened at least one inch.

Chapter 9

APARTMENT BUILDINGS, HOTELS AND PLACES OF DETENTION

Order 5700—Scope.

The requirements of this chapter shall apply to all apartment buildings, row houses, rooming houses, hotels, dormitories, convents, monasteries, hospitals, children's homes, homes for the aged and infirm, nursing homes, convalescent hospitals, convalescent homes, asylums, mental hospitals, jails, and other places of abode or detention, except as provided in Order 5725–2.

By *place of abode* is meant a building or part of a building, such as apartment building, row house, rooming house, hotel, dormitory, convent, hospital, as follows:

(1) Occupied as a residence of 3 or more families living independently or occupied by 2 such families and used also for business purposes, or

(2) Occupied for sleeping or lodging purposes by 3 or more persons not members of the same family.

By *place of detention* is meant a building or part of a building used as a place of abode and wherein persons are forcibly confined, such as asylums, mental hospitals, and jails.

> Note: The attorney general has ruled that all persons committed to an insane asylum by court order come within the meaning of the words "forcibly confined". Also that the words "forcibly confined" apply to all persons confined without their consent.

Order 5707—Number, Location and Type of Exits.

There shall be at least 2 exits accessible from each room or apartment by means of stairways, ramps or horizontal exits. The number and location of such exits shall be such that in case any exit or

passageway is blocked at any point, some other exit will still be accessible through public passageways from every room or apartment, except that in fire-resistive buildings a total area of not more than 1200 square feet may be placed between an exit and the end of the building, and except in 2 story buildings where there are not more than 2 apartments on the second floor, one exit may be through the adjoining apartment provided a connecting door containing a glass panel is provided in the partition separating the 2 apartments. The lock or locks on such doors shall be of a type which can be unlocked from either side without the use of a key.

Exits shall be distributed so that the entrance to each room or apartment will be not more than 50 feet distant from an exit, measuring along public passageways, if in a building of non-fire-resistive construction, or 75 feet in a fire-resistive building.

At least one-half of the required exits, in buildings of more than one story, shall be stairways as specified in Order 5116. The remaining exits shall be either stairways, or horizontal exits; or fire escapes may be used as exits from floors which are not more than 40 feet above grade if they are placed against blank walls. Every building which accommodates more than one family, or 8 persons, above the second story shall have at least 2 stairways.

Apartment buildings 3 stories or less in height whose floors and supporting members are of not less than two-hour fire-resistive construction, as specified in Order 5106, and which have a plan so arranged that not more than 2 occupancies on any floor make use of a common stairway, may be constructed with one common stairway as a single exit, provided the walls between occupancies and those enclosing the stairway are of two-hour fire-resistive construction as specified in Order 5105. In this case, the stairways must be of not less than two-hour fire-resistive construction, must lead directly to the outside and have all interior openings protected by approved fire-resistive doors as specified in Order 5109.

Where a jail or other place of detention wherein persons are forcibly confined is located on the upper floors of a court house or office building, at least one of the exits from the jail shall be a separate smokeproof stair tower leading directly from the jail section to the outside at street grade. This stairway shall serve only the jail area and there shall be no doors opening into it from the office or court house section of the building.

Order 5720—Isolation of Fire Hazards.

1. All boiler and furnace rooms, including fuel rooms and breeching, all laundries, drying rooms, carpenter shops, paint shops, and other hazardous work rooms and storage rooms in all buildings accommodating transients, and in hospitals, asylums and other places of detention, shall be enclosed with a four-hour fire-resistive enclosure as specified in Orders 5105 and 5106. All openings shall be protected by self-closing fire-resistive doors as specified in Order 5109.

2. In all other buildings under this classification, such rooms shall be enclosed with a two-hour fire-resistive enclosure as provided in Orders 5105 and 5106, or better, except as otherwise provided in this order.

3. In apartment buildings not more than 2 stories in height, such rooms shall be enclosed with a one-hour fire-resistive enclosure as specified in Orders 5105 and 5106, or better, except as provided in paragraph 5 of this order.

4. In one story buildings having a floor area of not more than 3,000 square feet and two-story buildings having a floor area of not more than 1,500 square feet per floor which are used for business purposes and also accommodate not more than two families, such rooms shall be enclosed with a one-hour fire-resistive enclosure, as specified in Orders 5105 and 5106, or better.

5. The enclosure for the heating plant may be omitted in apartment buildings not more than 2 stories in height and having not more than 2 apartments on a floor and in rooming houses not more than 2 stories in height and having not more than 8 living or sleeping rooms on a floor, provided no part of the building is used for business purposes and all interior basement stairways are enclosed with a one-hour fire-resistive enclosure as specified in Orders 5105 and 5106, or better. See Order 5725 for exception for row house installations.

Exception: Gas fired space heaters may be used in private apartments and in guest rooms in motels or tourist courts without an enclosure if approved by the Industrial Commission.

Order 5722—Fire Alarm.

Every building which accommodates more than 20 persons except hospitals and places of detention shall be provided with a fire alarm system complying with Order 5124.

Every hospital which accommodates 20 or more persons shall be provided with a fire alarm system complying with Order 5124 except that chimes or other approved sounding devices shall be used when within hearing distance of the patients. Visual attention compelling devices may be used in hospitals where approved by the Industrial Commission.

A presignal fire alarm system may be installed in hospitals or hotels where not less than 4 employees are on duty at all times to respond to fire alarms.

This order applies to buildings now in existence and to buildings hereafter constructed.

Note: Where presignal systems are installed, it is recommended that the fire department be called immediately after the pre-alarm signal is received.

Order 5725—Row House.

1. Definition. A row house is a place of abode not more than 2 stories in height, arranged to accommodate 3 or more attached row dwelling units in which each dwelling unit is separated from the

adjoining unit by an unpierced vertical occupancy separation of not less than one-hour fire-resistive construction, extending from the basement or lowest floor to the under side of the roof boards.

2. Requirements.

(a) Each dwelling unit shall have separate entrances and exits leading directly to the outside.

(b) Heating ducts may be installed in the space between studs in the occupancy separation wall provided all such ducts are covered with ¼ inch corrugated asbestos or the equivalent protection. Heating ducts shall not be installed back to back in the occupancy separation wall.

(c) Where each living unit has a separate heating system, the requirements of Order 5720 and 5722 need not be complied with.

(d) Each living unit shall have access to the attic from the inside by means of an opening not less than 20 x 30 inches located above the stair landing on the second floor, but the other provisions of Order 5723 need not be complied with.