

UNIFORM BUILDING CODE

1935 Edition

PRELIMINARY DRAFT TO 1936 EDITION



Pacific Coast
Building Officials' Conference

580 I. W. Hellman Building
124 West Fourth Street
LOS ANGELES, CALIFORNIA

COPYRIGHT—1935

UNIFORM BUILDING CODE

1935 Edition



ADOPTED BY THE
Pacific Coast Building Officials' Conference
at the 6th Annual Meeting
October, 1927

With Revisions and Additions Approved
at the 12th Annual Meeting
August, 1934

PUBLISHED OCTOBER—1935



COPYRIGHT, 1935

by

**Pacific Coast
Building Officials' Conference**

580 I. W. Hellman Building
124 West Fourth St.
Los Angeles, California

PRICE PER COPY—\$1.00

Complete Index in Back

Dedication

The Uniform Building Code is dedicated to the development of better building construction and greater safety to the public, through the elimination of needless red tape, favoritism and local politics by uniformity in building laws; to the granting of full justice to all building materials on the fair basis of the true merits of each material; and to the development of a sound economic basis for the future growth of cities through unbiased and equitable dealing with structural design and fire hazards.

Pacific Coast Building Officials' Conference



OFFICERS 1935-1936

President.....W. A. Curtis, Stockton, California
First Vice-President.....C. S. McCormick, Tacoma, Washington
Second Vice-President....Frank H. Clough, South Pasadena, California
Managing Sec.-Treas.....David H. Merrill, Los Angeles, California

Conference Headquarters, 124 West Fourth Street,
Los Angeles, California



EXECUTIVE COMMITTEE 1935-1936

A. Haggart, Vancouver, B. C.	A. J. Hurley, Richmond, California
H. E. Plummer, Portland, Oregon	J. H. Park, Compton, California
W. C. Clubb, Eugene, Oregon	Walter Putnam,
W. T. Hedgcock, Denver, Colo.	Pasadena, California
L. Harold Anderson,	F. H. McMahon,
Palo Alto, California	Pomona, California



PAST PRESIDENTS

M. C. Woodruff,	Walter Putnam,
San Jose, California	Pasadena, California
J. J. Backus,	H. E. Plummer,
Los Angeles, California	Portland, Oregon
R. L. Proctor,	S. P. Koch, Berkeley, California
Seattle, Washington	C. D. Wailes, Jr.,
C. E. Jenkins, Alhambra, California	Long Beach, California

Preface to 1927 Edition

The Pacific Coast Building Officials' Conference takes great pride in presenting to the public the Uniform Building Code, 1927 Edition, representing several years of preparation and the final result of many preliminary drafts which have been widely studied and commented upon.

Knowledge of the lack of uniformity existing in city and state building codes was one of the reasons for the formation of the Pacific Coast Building Officials' Conference in 1922. The idea grew rather slowly until the fall of 1925. At that time the Conference took very definite steps toward dividing the coast area into three districts, northern, central and southern. These districts were organized with chairmen and during the year of 1926 district meetings were held for the purpose of publicly discussing the various problems attendant upon the formulation of the proposed Uniform Building Code. Data was gathered from every source possible, preliminary outlines prepared and the Code then developed part by part.

The final preliminary draft of this Code published in September, 1926, represented the first definite accomplishment in the way of a completed code although not then complete in all details. On the basis of this draft the Conference proceeded to get comments, criticisms and suggestions and continued through the medium of further district meetings to perfect the Code.

Even in this preliminary stage of development the Code was adopted by Sacramento, Alhambra, Fontana, Redlands, Ocean-side and San Bernardino in California and by Klamath Falls in Oregon. A number of other cities and organizations used this preliminary draft as a model for revisions of existing building codes or in preliminary code work.

Throughout the entire preparation of the Code the policy of hearing all opinions and then weighing them carefully was closely adhered to, with the result that the completed Code represents not only one individual's experiences or ideas but is in fact a broad, equitable and unbiased document for the safe regulation of building construction. Safe practices based upon minimum safe standards have been created to permit of the greatest economy. Continual research brings to light many vital points in the engineering design of buildings and structures and the Conference has endeavored to recognize all authentic information in the effort to be just in its recommended practices. No definite limit of valuation can be placed on a human life and the Code therefore provides protection not only for ordinary use of the building but for cases of emergency when such protection is imperative.

Two printed drafts of this Code have been published previously and a number of mimeographed drafts were distributed,

all in the process of development of this 1927 Edition. At each successive stage of development the Code has been subjected to critical examination by more than 60 active building officials on the Pacific Coast. Many architects, engineers and contractors have given advice from the store of information gained through years of activity in their respective fields; private and governmental research bureaus and experts have generously contributed technical data. The reports of many national committees and organizations have been incorporated in the Code because of their significance and general application, and manufacturers of building materials through the various national organizations have contributed excellent information to help in producing the Code and have generously assisted in carrying this work through to completion.

A great deal of thought was given to the logical arrangement of the details in the Code. It is divided into ten parts and these parts are further divided into chapters and sections for more ready reference. Repetition was eliminated by using direct section, chapter or part references to general details wherever those details applied to various parts of the Code.

Classification of buildings according to use or the character of the occupancy allows the application of proper safety features and construction according to the hazard inherent in a particular use or occupancy. Such details as construction, height, area, location on property, protection of openings, exits, safeguards for special hazards and separations from adjoining occupancies are found properly graded in the occupancy chapters 5 to 15, inclusive.

In order that all materials and types of construction might be treated in a thoroughly unbiased manner, a fire test basis was adopted as prepared by the American Society for Testing Materials. Materials and combinations of materials upon which authentic test data were obtainable have been tabulated in Part VIII and are applied by direct reference throughout the Code.

The Code has been criticized by some individuals and organizations because it did not serve the selfish purposes in which they were interested. The Conference has endeavored in the formulation of the Code to serve no private or selfish interest but to deal fairly with all in the effort to produce safe buildings for the greatest economy and good of the public. It is true that everyone has a different estimate of just what is best and in deciding these various issues combined in the Code it was necessary to draw upon a wide field of opinion. The result finally represented is no doubt better than any individual opinion. Wherever the Uniform Building Code can be improved it is the desire of the Conference to so improve it, for it is not and never will be perfect. Fair constructive criticism and proper guidance will make the Code better through years of use and application so that ultimately much good may result.

Appreciation is given by the Conference for the fine assistance given by many individuals and organizations in the preparation of this 1927 Edition of the Uniform Building Code. Mention should be made of the reports, research and findings of the Department of Commerce Building Code Committee, the U. S. Bureau of Standards, the Underwriters' Laboratories, Inc., the

American Society for Testing Materials, the National Board of Fire Underwriters, the American Engineering Standards Committee, the American Concrete Institute, the Joint Committee on Reinforced Concrete, U. S. Forest Products Laboratory, Bureau of Entomology of the U. S. Department of Agriculture, and the individual work of many members of these organizations, all of which has contributed to make the Code better. The Conference is deeply indebted to the many national and Pacific Coast trade associations who have supported the code development from the very beginning. To the many building inspectors, engineers, architects, and contractors who assisted, the Conference is indeed grateful. Certain members of the Conference are especially to be thanked for the excellent service rendered through many hours of ceaseless labor to make the Uniform Code possible. Special recognition is given to A. C. Horner, former and original secretary to the Conference, for his initiating the real active work which commenced the preparation of the Code and instituting fundamentals which form the basis of the Uniform Building Code.

As a recommended set of minimum safe practices for building construction the Uniform Building Code has gained international renown. In addition to having been adopted as the building ordinance of 32 cities (as of December 1, 1928), it has served as a model in framing amendments to many existing building codes.

Seven cities are now planning immediate use of the Code and two of these have already started adoption by ordinance. Such widespread use of the Uniform Building Code is recognition of its careful preparation and its equitable handling of the general problem of building regulation.

Since January, 1928, the following cities have adopted the Uniform Building Code, 1927 edition: Alhambra, Pomona, Fresno, Piedmont, San Rafael, Coronado, El Monte, Ontario, San Jose, Visalia, Fullerton, South San Francisco, Pittsburg, Claremont, Walnut Creek, Tulare, San Fernando, Livermore and Berkeley, California; Eugene and Klamath Falls, Oregon; Prescott and Tucson, Arizona. Shreveport, Louisiana, and Laguna Beach, California, had previous to this time adopted the preliminary draft published September, 1926, and the proof draft published October, 1927, respectively.

To prevent diverting the Code from its original purpose of serving the public in an honest and ethical manner, it has been copyrighted. Any city desiring to adopt the Uniform Code may do so upon proper application to the Pacific Coast Building Officials Conference, 19 Pine Avenue, Long Beach, California.

Future editions will be prepared from time to time so that the recommended practices will be kept thoroughly up-to-date. Comments or suggested improvements will be welcomed for the future consideration of the many communities participating in the Uniform Building Code movement.

J. E. M., November, 1928.

Preface to 1935 Edition

The 1935 Edition of the Uniform Building Code is a further refining and bringing up-to-date of the 1930 edition. It is the result of the very studious effort of several code changes committees appointed and starting their work at the 9th Annual Meeting of the Pacific Coast Building Official's Conference, held at Long Beach, California, in September, 1930.

One hundred forty-five cities and counties to date have adopted the Code as their building ordinance. Located in seventeen states, these cities range in population from less than 1,000 to 325,000. The majority of them adopted the Code without changes, using the method of adoption by reference. A complete list of adoption cities up to-date may be obtained from Conference headquarters upon request.

The Pacific Coast Building Officials' Conference intends to make such additions and changes each year as research, increased knowledge and new materials and types of construction may necessitate.

D. H. M., September, 1935.

Outline of Contents by Parts, Chapters and Sections

PART I—ADMINISTRATIVE.

CHAPTER 1. Title and Scope	21
SEC. 101. Title	
102. Purpose	
103. Scope	
104. Application to Existing Buildings	
(a) Major Alterations and Repairs	
(b) Changed Use	
(c) Additions	
(d) Minor Alterations and Repairs	
105. Maintenance	
CHAPTER 2. General Provisions.....	23
SEC. 201. Application for Permit	
202. Building Permits	
203. Fees	
204. Inspection and Registered Inspectors	
Special Engineering Supervision	
205. Certificate of Compliance	
206. Certificate of Occupancy	
207. Change of Occupancy	
CHAPTER 3. Enforcement	28
SEC. 301. Powers and Duties of Building	
Inspector	
302. Alternate Materials and Types of	
Construction	
303. Appeals	
304. Board of Examiners and Appeals	
305. Violations and Penalties	

PART II—DEFINITIONS.

CHAPTER 4. Definitions	32
SEC. 401. Definitions	

PART III—REQUIREMENTS BASED ON OCCUPANCY.

CHAPTER 5. Classification of All Buildings by Use or	
Occupancy and General Requirements	
for All Occupancies	37
SEC. 501. Occupancy Classified	
502. Change in Use	
503. Mixed Occupancy	
504. Location on Property	
CHAPTER 6. Requirements for Group A Buildings.....	41
SEC. 601. Group A Occupancies Defined	
602. Construction, Height and Area	
Allowable	
603. Location on Property	
604. Stairs and Exits	
605. Light and Ventilation	
606. Enclosure of Vertical Openings	

	607.	Fire Extinguishing Apparatus	
	608.	Special Hazards	
	609.	Exceptions and Deviations	
	610.	Mixed Occupancies	
CHAPTER 7.		Requirements for Group B Buildings.....	47
SEC.	701.	Group B Occupancies Defined	
	702.	Construction, Height and Area Allowable	
	703.	Location on Property	
	704.	Stairs and Exits	
	705.	Light and Ventilation	
	706.	Enclosure of Vertical Openings	
	707.	Fire Extinguishing Apparatus	
	708.	Special Hazards	
	709.	Exceptions and Deviations	
	710.	Mixed Occupancies	
CHAPTER 8.		Requirements for Group C Buildings.....	50
SEC.	801.	Group C Occupancies Defined	
	802.	Construction, Height and Area Allowable	
	803.	Location on Property	
	804.	Stairs and Exits	
	805.	Light and Ventilation	
	806.	Enclosure of Vertical Openings	
	807.	Fire Extinguishing Apparatus	
	808.	Special Hazards	
	809.	Exceptions and Deviations	
	810.	Mixed Occupancies	
CHAPTER 9.		Requirements for Group D Buildings.....	55
SEC.	901.	Group D Occupancies Defined	
	902.	Construction, Height and Area Allowable	
	903.	Location on Property	
	904.	Stairs and Exits	
	905.	Light and Ventilation	
	906.	Enclosure of Vertical Openings	
	907.	Fire Extinguishing Apparatus	
	908.	Special Hazards	
	909.	Exceptions and Deviations	
	910.	Mixed Occupancies	
CHAPTER 10.		Requirements for Group E Buildings....	58
SEC.	1001.	Group E Occupancies Defined	
	1002.	Construction, Height and Area Allowable	
	1003.	Location on Property	
	1004.	Stairs and Exits	
	1005.	Light, Ventilation and Sanitation	
	1006.	Enclosure of Vertical Openings	
	1007.	Fire Extinguishing Apparatus	
	1008.	Special Hazards	
	1009.	Exceptions and Deviations	
	1010.	Mixed Occupancies	
CHAPTER 11.		Requirements for Group F Buildings.....	62
SEC.	1101.	Group F Occupancies Defined	

1102.	Construction, Height and Area Allowable	
1103.	Location on Property	
1104.	Stairs and Exits	
1105.	Light, Ventilation and Sanitation	
1106.	Enclosure of Vertical Openings	
1107.	Fire Extinguishing Apparatus	
1108.	Special Hazards	
1109.	Exceptions and Deviations	
1110.	Mixed Occupancies	
CHAPTER 12.	Requirements for Group G Buildings.....	65
SEC. 1201.	Group G Occupancies Defined	
1202.	Construction, Height and Area Allowable	
1203.	Location on Property	
1204.	Stairs and Exits	
1205.	Light, Ventilation and Sanitation	
1206.	Enclosure of Vertical Openings	
1207.	Fire Extinguishing Apparatus	
1208.	Special Hazards	
1209.	Exceptions and Deviations	
1210.	Mixed Occupancies	
CHAPTER 13.	Requirements for Group H Buildings.....	67
SEC. 1301.	Group H Occupancies Defined	
1302.	Construction, Height and Area Allowable	
1303.	Location on Property	
1304.	Stairs and Exits	
1305.	Light, Ventilation and Sanitation	
1306.	Enclosure of Vertical Openings	
1307.	Fire Extinguishing Apparatus	
1308.	Special Hazards	
1309.	Exceptions and Deviations	
1310.	Mixed Occupancies	
CHAPTER 14.	Requirements for Group I Buildings.....	70
SEC. 1401.	Group I Occupancies Defined	
1402.	Construction, Height and Area Allowable	
1403.	Location on Property	
1404.	Stairs and Exits	
1405.	Light, Ventilation and Sanitation	
1406.	Enclosure of Vertical Openings	
1407.	Fire Extinguishing Apparatus	
1408.	Special Hazards	
1409.	Exceptions and Deviations	
1410.	Mixed Occupancies	
CHAPTER 15.	Requirements for Group J Buildings.....	72
SEC. 1501.	Group J Buildings Defined	
1502.	Construction, Height and Area Allowable	
1503.	Location on Property	
1504.	Stairs, Exits, Aisles and Seats	
1505.	Light and Ventilation	
1506.	Enclosure of Vertical Openings	
1507.	Fire Extinguishing Apparatus	

- 1508. Special Hazards
- 1509. Exceptions and Deviations
- 1510. Mixed Occupancies

PART IV—REQUIREMENTS BASED ON LOCATION IN FIRE ZONES.

- CHAPTER 16. Restrictions in Fire Zones..... 75
 - SEC. 1601. Fire Zones Defined
 - 1602. Restrictions in Fire Zone No. 1
 - 1603. Restrictions in Fire Zone No. 2
 - 1604. Restrictions in Fire Zone No. 3

PART V—REQUIREMENTS BASED ON TYPES OF CONSTRUCTION.

- CHAPTER 17. Classification of All Buildings by
Types of Construction 78
 - SEC. 1701. General
 - 1702. Classification by Types of
Construction
- CHAPTER 18. Type I Buildings (Fire-resistive)..... 79
 - SEC. 1801. Definition
 - 1802. Height Allowable
 - 1803. Area Allowable
 - 1804. Foundations
 - 1805. Exterior and Inner Court Walls
 - 1806. Partitions
 - 1807. Enclosure of Vertical Openings
 - 1808. Structural Framework
 - 1809. Fireproofing of Structural Members
 - 1810. Floor Construction
 - 1811. Roof Construction
 - 1812. Stairs
 - 1813. Doors and Windows
 - 1814. Projections from the Building
 - 1815. Penthouses and Skylights
 - 1816. Combustible Materials Regulated
- CHAPTER 19. Type II Buildings (Heavy Timber
Construction) 84
 - SEC. 1901. Definition
 - 1902. Height Allowable
 - 1903. Area Allowable
 - 1904. Foundations
 - 1905. Exterior and Inner Court Walls
 - 1906. Partitions
 - 1907. Enclosure of Vertical Openings
 - 1908. Structural Framework
 - 1909. Fireproofing of Structural Members
 - 1910. Floor Construction
 - 1911. Roof Construction
 - 1912. Stair Construction
 - 1913. Doors and Windows
 - 1914. Projections from the Building
 - 1915. Penthouses and Skylights
 - 1916. Combustible Materials Regulated

CHAPTER 20.	Type III Buildings (Ordinary Masonry)	89
SEC. 2001.	Definition	
2002.	Height Allowable	
2003.	Area Allowable	
2004.	Foundations	
2005.	Exterior and Inner Court Walls	
2006.	Partitions	
2007.	Enclosure of Vertical Openings	
2008.	Structural Framework	
2009.	Fireproofing Structural Members	
2010.	Floor Construction	
2011.	Roof Construction	
2012.	Stair Construction	
2013.	Doors and Windows	
2014.	Projections from the Building	
2015.	Penthouses and Skylights	
2016.	Combustible Materials Regulated	
CHAPTER 21.	Type IV Buildings (Metal Frame)	92
SEC. 2101.	Definition	
2102.	Height Allowable	
2103.	Area Allowable	
2104.	Foundations	
2105.	Exterior Walls	
2106.	Partitions	
2107.	Enclosure of Vertical Openings	
2108.	Structural Framework	
2109.	Fireproofing Structural Members	
2110.	Floor Construction	
2111.	Roof Construction	
2112.	Stair Construction	
2113.	Doors and Windows	
2114.	Projections from the Building	
2115.	Penthouses and Skylights	
2116.	Combustible Materials Regulated	
CHAPTER 22.	Type V Buildings (Wood Frame).....	94
SEC. 2201.	Definition	
2202.	Height Allowable	
2203.	Area Allowable	
2204.	Foundations	
2205.	Exterior Walls and Wall Coverings	
2206.	Interior Partitions	
2207.	Floor Construction	
2208.	Roof and Ceiling Construction	
2209.	Roof Covering	
2210.	Enclosure of Vertical Openings	
2211.	General	
PART VI—ENGINEERING REGULATIONS, QUALITY AND DESIGN OF THE MATERIALS OF CONSTRUCTION.		
CHAPTER 23.	Live and Dead Loads	103
SEC. 2301.	Definitions	
2302.	General	
2303.	Special Load Considerations	
2304.	Unit Live Loads	

2305.	Roof Loads	
2306.	Reduction of Live Loads	
2307.	Wind Pressure	
2308.	Live Loads and Seating Capacity Posted	
2309.	Occupancy Permits for Changed Floor Loading	
2310.	Retaining Walls and Basement Floors	
2311.	Earthquake Regulations	
CHAPTER 24.	Masonry (Quality and Design)	108
SEC. 2401.	Quality of Materials and Tests Required	
2402.	Burned Clay or Shale Brick	
2403.	Sand-Lime Brick	
2404.	Concrete Brick	
2405.	Plain Concrete	
2406.	Hollow Concrete Block or Tile	
2407.	Gypsum	
2408.	Hollow Clay Tile	
2409.	Mortars	
2410.	Allowable Working Stresses	
2411.	General Requirements	
CHAPTER 25.	Wood (Quality and Design)	117
SEC. 2501.	General	
2502.	Determination of Required Sizes	
2503.	Allowable Unit Stresses	
2504.	Allowable Unit Stresses for Columns	
2505.	Framing Details; Vertical Members	
2506.	Framing Details; Horizontal Members	
2507.	Framing Details; Stud Walls and Partitions	
2508.	Roof Framing	
2509.	Framing Details; Trusses	
2510.	Fire Stops	
2511.	Termite Provisions	
CHAPTER 26.	Reinforced Concrete (Quality and Design)	126
SEC. 2601.	Quality	
2602.	Design	
2603.	Definitions	
2604.	Materials	
2605.	Test of Materials	
2606.	Quality of Concrete	
2607.	Proportions and Consistency	
2608.	Control of Proportions	
2609.	Mixing and Placing Concrete	
2610.	Forms and Details of Construction	
2611.	Assumptions for Design	
2612.	Notations	
2613.	Working Stresses	
2614.	Flexural Computations	
2615.	Moment Coefficients: Freely Supported, Slightly Restrained	
2616.	Moment Coefficients: Fully Restrained	
2617.	Moment Coefficients: Unequal Spans, Non-uniform Loads	

- 2618. Shear and Diagonal Tension
- 2619. Bond and Anchorage
- 2620. Flat-Slab Construction
- 2621. Reinforced Concrete Columns
- 2622. Footings

CHAPTER 27. Steel and Iron (Quality and Design).....151

- SEC. 2701. Quality and Design
- 2702. Allowable Unit Stresses
- 2703. Eccentric Loads
- 2704. Beams and Girders
- 2705. Thickness of Materials
- 2706. Compression Splices
- 2707. Net Sections
- 2708. Connections
- 2709. Rivets and Bolts
- 2710. Welded Connections
- 2711. Construction Details
- 2712. Lattice
- 2713. Pins and Pin Holes
- 2714. Steel Joists
- 2715. Expansion
- 2716. Workmanship
- 2717. Painting
- 2718. Erection

PART VII—DETAILED REGULATIONS.

CHAPTER 28. Excavations, Footings and Foundations162

- SEC. 2801. Excavations
- 2802. Footings and Foundations
- 2803. Piles

CHAPTER 29. Walls and Partitions166

- SEC. 2901. General Provisions: Solid Masonry Walls
- 2902. Working Stresses
- 2903. Thickness of Exterior Walls other than Skeleton Construction
- 2904. Bonds
- 2905. Piers
- 2906. Chases and Recesses
- 2907. General Provisions: Hollow Walls
- 2908. Working Stresses
- 2909. Thickness and Height of Walls other than Skeleton Construction
- 2910. Bond
- 2911. Beam Supports
- 2912. Piers
- 2913. Chases and Recesses
- 2914. General Provisions: Reinforced Concrete Walls
- 2915. Working Stresses
- 2916. Thickness of Walls other than in Skeleton Construction

2917.	Piers	
2918.	Chases and Recesses	
2919.	Quality of Material (Stone Walls)	
2920.	Working Stresses	
2921.	Lateral Support and Thickness	
2922.	Bond	
2923.	Chases and Recesses	
2924.	Quality of Material (Veneered Walls)	
2925.	Working Stresses	
2926.	Attachment of Veneering	
2927.	Height of Veneered Walls	
2928.	Quality of Material (Faced Walls)	
2929.	Working Stresses	
2930.	Thickness	
2931.	Bond	
2932.	Fire Walls: Solid Masonry	
2933.	Hollow Fire Walls	
2934.	Fire Division Walls	
2935.	Parapet Walls	
2936.	Bearing Partitions	
2937.	Non-bearing Partitions	
2938.	Foundation Walls	
2939.	Panel and Enclosure Walls	
2940.	Anchoring of Walls	
2941.	Use of Existing Walls	
CHAPTER 30.	Enclosure of Vertical Openings	179
SEC. 3001.	Enclosures; When Required	
3002.	Stairway, Ramp and Elevator Enclosures	
3003.	Other Vertical Openings	
CHAPTER 31.	Floor Construction	180
SEC. 3101.	General	
3102.	Concrete Floors	
3103.	Steel Joisted Floors	
3104.	Mill Constructed Floors	
3105.	Wood Joisted Floors	
CHAPTER 32.	Roof Construction and Covering	182
SEC. 3201.	General	
3202.	Construction	
3203.	Design	
3204.	Roof Coverings	
3205.	Access to Roof Space	
3206.	Roof Drainage	
CHAPTER 33.	Stairs, Ramps and Smokeproof Towers	183
SEC. 3301.	General Requirements	
3302.	General Design	
3303.	Arrangement and Access	
3304.	Doors	
3305.	Railings	
3306.	Lighting	
3307.	Detailed Requirements	
3308.	Stairway Enclosures	
3309.	Stairways Required	

3310.	Ramps	
3311.	Horizontal Exits	
3312.	Signs and Lighting	
3313.	Passageways and Corridors	
3314.	Exceptions	
3315.	Smokeproof Tower	
3316.	Outside Stairways	
CHAPTER 34.	Doors, Windows and Skylights	190
SEC. 3401.	Doors and Windows	
3402.	Skylights	
CHAPTER 35.	Bays and Balconies	191
SEC. 3501.	Construction	
CHAPTER 36.	Penthouses and Roof Structures	192
SEC. 3601.	Penthouses and Roof Structures	
3602.	Towers and Spires	
CHAPTER 37.	Chimneys and Heating Apparatus.....	193
SEC. 3701.	Chimneys	
3702.	Smokestacks	
3703.	Gas Vents	
3704.	Patent Chimneys	
3705.	Smoke Pipes and Thimbles	
3706.	Fireplaces	
3707.	Warm Air Furnaces	
3708.	Low Pressure Steam Heating Plants	
3709.	Boilers	
3710.	Stoves	
3711.	Gas Ranges, Domestic Water Heaters and Hot Plates	
3712.	Gas Ranges for Restaurants and Hotels	
3713.	Oil Burners	
3714.	Other Sources of Heat	
3715.	Warm Air Ducts and Appurtenances	
3716.	Incinerators	
CHAPTER 38.	Fire Extinguishing Apparatus.....	202
SEC. 3801.	Automatic Sprinklers; Where Required	
3802.	Automatic Sprinkler Requirements	
3803.	Dry Standpipes; Where Required	
3804.	Dry Standpipe Requirements	
3805.	Wet Standpipes; Where Required	
3806.	Wet Standpipe Requirements	
3807.	Basement Pipe Inlets	
CHAPTER 39.	Stage	207
SEC. 3901.	Stage Ventilators	
3902.	Gridirons	
3903.	Rooms Accessory to Stage	
3904.	Proscenium Walls	
3905.	Stage Floors	
3906.	Platforms	
3907.	Stage Exits	
3908.	Miscellaneous	
CHAPTER 40.	Motion Picture Machine Booths.....	210
SEC. 4001.	Motion Picture Machine Booths	

CHAPTER 41. Proscenium Curtains	212
SEC. 4101. General	
4102. Materials	
4103. Design and Construction	
4104. Operating Equipment	
4105. Tests	
4106. New Designs	
PART VIII—FIRE-RESISTIVE STANDARDS FOR FIRE PROTECTION.	
CHAPTER 42. General	215
SEC. 4201. Fire-Resistive Construction Defined	
4202. Fire-Resistive Materials	
4203. Fire-Resistive Construction	
CHAPTER 43. Fire-Resistive Standards	217
SEC. 4301. Protection of Structural Parts	
4302. Fire-Resistive Walls and Partitions	
4303. Fire-Resistive Floor Construction	
4304. Fire Doors, Shutters and Windows	
4305. Roof Coverings	
PART IX—REGULATIONS FOR USE OR OCCUPANCY OF STREETS AND PROJECTIONS OVER PUBLIC PROPERTY.	
CHAPTER 44. Temporary Use of Streets During Construction	233
SEC. 4401. Temporary Use of Streets During Construction	
CHAPTER 45. Permanent Occupancy of Public Property	235
SEC. 4501. Permanent Occupancy of Public Property	
PART X—LEGISLATIVE.	
CHAPTER 46. Legislative	237
SEC. 4601. Validity	
4602. Appended Documents	
4603. Ordinances Repealed	
4604. Date Effective	
PART XI—SPECIAL ORDINANCES	
CHAPTER 47. Plastering	237
SEC. 4701 to 4721, inclusive, Plastering Provisions	
CHAPTER 48. Film Storage	238
(See Appendix)	
CHAPTER 49. Mechanical Refrigeration	238
(See Appendix)	
Appendix	239
Index	279

**PACIFIC COAST CONFERENCE
UNIFORM BUILDING CODE**

Ordinance No.

An ordinance regulating the erection, construction, enlargement, alteration, repair, moving, removal, demolition, conversion, occupancy, equipment, use, height, area, and maintenance of buildings and/or structures in the City of

.....; providing for the issuance of permits and collection of fees therefor; declaring and establishing Fire Districts; providing penalties for the violation thereof, and repealing all ordinances and/or parts of ordinances in conflict therewith.

Be it ordained by the of the

City of as follows:

A complete list of publications prepared by Pacific Coast Building Officials' Conference will be found on page 319.

k

PART I

ADMINISTRATIVE

CHAPTER 1 — TITLE AND SCOPE

Sec. 101. This Ordinance shall be known as the "Building Code," may be cited as such and will be referred to in this Ordinance as "this Code." **Title**

Sec. 102. The purpose of this Code is to provide certain minimum standards, provisions and requirements for safe and stable design, methods of construction and uses of materials in buildings and/or structures hereafter erected, constructed, enlarged, altered, repaired, moved, converted to other uses or demolished and to regulate the equipment, maintenance, use and occupancy of all buildings and/or structures. **Purpose**

The provisions of this Code shall be deemed to supplement any and all state laws of the State of..... related to buildings.

Sec. 103. New buildings and/or structures hereafter erected in the City of....., shall conform to all requirements of this Code; and all requirements in this Code, unless specifically provided, shall apply to new buildings. **Scope**

Additions, alterations, repairs and changes to the use or occupancy in all buildings shall comply with the requirements for new buildings except as otherwise provided in Section 104 of this Code.

Sec. 104. The following specified requirements shall apply to existing buildings which for any reason whatsoever do not conform to the requirements of this Code for new buildings: **Application to Existing Buildings**

(a) If alterations and/or repairs in excess of fifty (50) per cent of the value of an existing building are made to such existing building within any period of twelve months, the entire building shall be made to conform with the requirements given herein for new buildings; provided, however, that any existing building which for any reason whatsoever, requires repairs, at any one time, in excess of fifty (50) per cent of the value thereof, not deducting from such value any loss caused by fire or any other reason, shall be made to conform to the requirements of this Code or shall be entirely demolished. (See Sec. 1602 (c) for buildings located in Fire Zone No. 1.) **Major Alterations and Repairs**

(b) If the existing use or occupancy of an existing building is changed to a use or occupancy which would not be permitted in a similar building hereafter erected, the entire building shall be made to conform with the requirements given herein for new buildings; provided, however, that if the use or occupancy of **Changed Use**

Secs. 104-105

only a portion or portions of an existing building is changed and such portion or portions are segregated as specified in Section 503 of this Code then only such portion or portions of the building need be made to comply with said requirements; and provided further, that the Building Inspector is hereby given authority to approve any change in the use or occupancy of any existing building within any one Group of Occupancy as specified in Part III, even though such building is not made to fully conform to the requirements of this Code, when it is obvious that such a change in the use or occupancy of the existing building will not extend or increase any existing non-conformity or hazard of the building.

Additions

(c) Any existing building not covered by the preceding paragraphs (a) and (b) which has its floor area or its number of stories increased or its use or occupancy changed in any way from its former or existing use or occupancy shall be provided with stairways, emergency exits and fire protection facilities as specified in this Code for buildings hereafter erected for similar uses or occupancies.

Minor Alterations and Repairs

(d) Every alteration or repair to any structural part or portion of an existing building shall when deemed necessary in the opinion of the Building Inspector be made to conform to the requirements of this Code for new buildings. Minor alterations, repairs and changes not covered by the preceding paragraphs (a), (b) and (c) may be made with the same materials of which the building is constructed; provided, that not more than twenty-five (25) per cent of the roof covering of any building shall be replaced in any period of twelve (12) months unless the entire roof covering is made to conform with the requirements of this Code for new buildings.

New roofing meeting the requirements of this Code may be placed over existing roofings when the existing roofing and roof framing is such as to permit the new roofing to be properly supported and securely fastened.

Maintenance

Sec. 105. The requirements contained in this Code, covering the maintenance of buildings, shall apply to all buildings and/or structures now existing or hereafter erected. All buildings and/or structures and all parts thereof shall be maintained in a safe condition, and all devices or safeguards which are required by this Code at the erection, alteration or repair of any building shall be maintained in good working order.

This section shall not be construed as permitting the removal or non-maintenance of any existing devices or safeguards unless authorized in writing by the Building Inspector.

CHAPTER 2 — GENERAL PROVISIONS

Sec. 201. No person shall erect or construct or proceed with the erection or construction of any building or structure, nor add to, enlarge, move, improve, alter, convert, extend or demolish any building or structure, or cause the same to be done, without first obtaining a building permit therefor from the Building Inspector. **Application for Permit**

Any person desiring a building permit as required by this Code shall file with the Building Inspector an application therefor in writing on a blank form to be furnished for that purpose.

Every such application for a permit shall describe the land upon which the proposed building or work is to be done, either by lot, block and/or tract, or similar general description that will readily identify and definitely locate the proposed building or work.

Every such application shall show the use or occupancy of all parts of the building and such other reasonable information as may be required by the Building Inspector.

Copies of plans and specifications and a lot plan showing the location of the proposed building and of every existing building thereon, shall accompany every application for a permit, and shall be filed in duplicate with the Building Inspector; provided, however, that the Building Inspector may authorize the issuance of a permit without plans or specifications for small or unimportant work.

Plans shall be drawn to scale upon substantial paper or cloth and the essential parts shall be drawn to a scale of not less than one-eighth (1/8) inch to one foot.

Plans and specifications shall be of sufficient clarity to indicate the nature and character of the work proposed and to show that the law will be complied with. Computations, strain sheets, stress diagrams and other data necessary to show the correctness of the plans, shall accompany the plans and specifications when required by the Building Inspector.

Any specifications in which general expressions are used to the effect that "work shall be done in accordance with the Building Code" or "to the satisfaction of the Building Inspector" shall be deemed imperfect and incomplete and every reference to this Code shall be to the section or sub-section applicable to the material to be used or to the method of construction proposed.

All plans shall bear the name of the Architect, Structural Engineer or person responsible therefor. (See Appendix).

Sec. 202. The application, plans and specifications filed by an applicant for a permit shall be checked by the Building Inspector and if found to be in conformity with the requirements of this Code and all other laws or ordinances applicable thereto, the Building Inspector shall, upon receipt of the required fee, issue a permit therefor. **Building Permits**

When the Building Inspector issues the permit he shall endorse in writing or stamp both sets of plans and specifications "Approved." One such approved set of plans and specifications shall be retained by the Building Inspector as a public record,

Secs. 202-204

and one such approved set of plans and specifications shall be returned to the applicant, which set shall be kept on such building or work at all times during which the work authorized thereby is in progress and shall be open to inspection by public officials. Such approved plans and specifications shall not be changed, modified or altered without authorization from the Building Inspector, and all work shall be done in accordance with the approved plans.

Fees

Sec. 203. Any person desiring a building permit shall, at the time of filing an application therefor, as provided in Sec.

201 of this Code, pay to the.....a fee as required in this Section. (See Appendix.)

For a total valuation of \$50.00 or less no fee.

For a total valuation from \$50.00 to \$1,001 a \$2.00 fee; and an additional fee of \$2.00 for each additional \$1000 or fraction thereof of total valuation to and including \$15,000; and an additional fee of \$1.00 for each additional \$1000 or fraction thereof of total valuation to and including \$50,000; and an additional fee of 50c for each additional \$1000 or fraction thereof of total valuation exceeding \$50,000.

The City of....., the County of.....,

the State of....., and the United States of America, shall be exempt from the paying of any fee for any building permit.

Where work for which a permit is required by this Code is started or proceeded with prior to obtaining said permit, the fees above specified shall be doubled, but the payment of such double fee shall not relieve any persons from fully complying with the requirements of this Code in the execution of the work nor from any other penalties prescribed herein.

The Building Inspector shall keep a permanent, accurate account of all fees collected and received under this Code and give the name of the persons upon whose account the same were paid, the date and amount thereof, together with the location of the building or premises to which they relate.

Inspection
and
Registered
Inspectors

Sec. 204. The Building Inspector shall inspect or cause to be inspected at various intervals during the erection, construction, enlarging, alteration, repairing, moving, demolition, conversion, occupancy and underpinning all buildings and/or structures referred to in this Code and located in the City of

.....and a final inspection shall be made of every building and/or structure hereafter erected prior to the issuance of the Certificate of Occupancy as specified in Sec. 206.

No building construction, alteration, repair or demolition requiring a building permit shall be commenced until the permit holder or his agent shall have posted the building permit card in a conspicuous place on the front premises and in such position as to permit the Building Inspector to conveniently make the required entries thereon respecting inspection of the work. This permit card shall be maintained in such position by the permit holder until the Certificate of Occupancy has been issued by the Building Inspector.

Sec. 204

The Building Inspector upon notification from the permit holder or his agent shall make the following inspections of Type V buildings and shall either approve that portion of the construction as completed or shall notify the permit holder or his agent wherein the same fails to comply with the law.

Foundation Inspection: To be made after trenches are excavated and the necessary forms erected and when all materials for the foundation are delivered on the job.

Frame Inspection: To be made after the roof, all framing, fire-blocking and bracing is in place and all pipes, chimneys and vents are complete.

Stucco Inspection: To be made after all lathing and backing is in place and all plastering and stucco materials are delivered on the job, but before any stucco is applied.

Final Inspection: To be made after building is completed and is ready for occupancy.

No work shall be done on any part of the building and/or structure beyond the point indicated in each successive inspection without first obtaining the written approval of the Building Inspector. Such written approval shall be given only after an inspection shall have been made of each successive step in the construction as indicated by each of the above four inspections. (See Appendix).

No reinforcing steel or structural framework of any part of any building or structure shall be covered or concealed in any manner whatsoever without first obtaining the approval of the Building Inspector.

In all buildings where plaster is used for fire protection purposes the permit holder or his agent shall notify the Building Inspector after all lathing and backing is in place and all plastering materials are delivered on the job and no plaster shall be applied until the approval of the Building Inspector has been received.

Any person engaged in the erection or causing the erection of a building and/or structure, except Type V Buildings and/or structures, where the estimated cost exceeds \$20,000 shall employ a "registered inspector" properly qualified as specified in this section or shall cause his employment by the architect, structural engineer or designer of such structure; provided, that the Building Inspector may authorize the proposed construction without requiring a "registered inspector" when in his estimation such special supervision is not necessary. The Building Inspector may designate any building and/or structure as requiring a "registered inspector" when deemed necessary or where there is a complicated design or where new materials or methods of construction are intended to be used.

The "registered inspector" shall be approved by, registered with, deputized by and assigned to a particular building or structure by the Building Inspector. Such "registered inspector" shall be thoroughly qualified by knowledge and experience in the design and construction of the structure to which he is assigned by the Building Inspector and he shall be thoroughly familiar with the requirements of this Code applying to that building or structure and of their practical application. The Building Inspector may authorize one such "registered inspector" to supervise the construction of a limited number of build-

**Special
Engineering
Supervision**

Secs. 204-205

ings and/or structures provided that his service shall extend over all the important details of framing, erection and assembly and that he is able to render full engineering inspection service on each building and/or structure under his supervision and control.

Before commencing his duties the "registered inspector" shall obtain a certificate of registration from the Building Inspector for which he shall pay the sum of one dollar (\$1.00), and he shall deposit with the Building Inspector a surety bond in the sum of five thousand dollars (\$5000) conditioned upon the faithful and efficient performance of his duties, said bond to

be made payable to the City of..... and to be furnished for the term of one year. The "registered inspector" shall remain constantly upon the work during the process of construction and his duties shall terminate only when a Certificate of Compliance is issued by the Building Inspector in approval and acceptance of the work on which he may be engaged as specified in Section 205.

Each such "registered inspector" shall carefully inspect all materials entering into the construction of the structure and be responsible for obtaining full information regarding the strength of materials where new or untried materials are intended for any use involving structural safety. He shall report in writing, upon the special forms furnished by the Building Department, the true details regarding the progress of the work, the condition of same, deviation, defects, delays, general character of materials, working situations, weather conditions and all and any influencing factors that effect in any manner the structural safety and strength of the building. He shall be held directly responsible for the enforcement of this Code wherever same is applicable to the structure upon which he is engaged. He shall notify the Building Inspector of any attempt to cover, conceal, patch or repair any defect in materials or workmanship before such materials have been examined by the Building Inspector or his duly authorized representative. He shall be held directly responsible for the infraction of any ruling of the Building Inspector and shall have the authority to compel the removal of defective materials or to suspend or stop work pending the rulings of the Building Inspector. He shall not be engaged in any other labor on the project upon which he is employed.

**Certificate
of
Compliance**

Sec. 205. The duties of the "registered inspector" shall terminate only when a Certificate of Compliance has been issued by the Building Inspector. Such Certificate of Compliance shall bear a statement signed by the "registered inspector" stating that the work upon the building or structure to which he has been assigned has been completed in a satisfactory manner and that the regulations of this Code affecting the structural features of such building or structure have been fully complied with. If there have been any infractions of this ordinance they shall be noted in this statement. The Building Inspector shall approve such Certificate of Compliance filed by the "registered inspector" if after inspection the structural features of such building or structure are found to be in accordance with the provisions of this Code. Each Certificate of Compliance shall

Secs. 205-207

bear the legal description of the property upon which such building or structure is located and an identifying description of the building. A duplicate of each Certificate of Compliance shall be kept on file permanently in the office of the Building Inspector.

Sec. 206. No building shall be occupied in any part thereof unless or until a Certificate of Occupancy has been issued by the Building Inspector. The Building Inspector shall, after an application therefor has been filed by the owner or his agent, issue a Certificate of Occupancy for such building, if after inspection it is found that such building complied with the provisions of this Code and all other requirements of law or ordinance applicable thereto. Such Certificate of Occupancy shall show the use to which the structure may be put and the maximum allowable floor loads for each floor thereof. A temporary Certificate of Occupancy may be issued by the Building Inspector for the temporary use of a portion of a building prior to the completion and occupancy of the entire building.

**Certificate
of
Occupancy**

Sec. 207. The use or occupancy of any building shall not be changed until a Certificate of Occupancy permitting the new use or occupancy is issued by the Building Inspector when the new occupancy is such as to require alterations or repairs of the building, as specified in this Code. No such Certificate of Occupancy shall be issued unless the building shall comply with the requirements of this Code as specified in Section 104.

**Change of
Occupancy**

Sec. 301

CHAPTER 3—ENFORCEMENT

**Powers and
Duties of
Building
Inspector**

Sec. 301. The office of Building Inspector is hereby created and the Building Inspector is hereby authorized and directed to enforce all of the provisions of this Code and for such purpose he shall have the powers of a police officer.

The Building Inspector or his authorized representative may enter any building or premises for the purpose of inspection or to prevent violation of this Code, upon presentation of the proper credentials.

Whenever any building work is being done contrary to the provisions of this Code, or is being done in an unsafe or dangerous manner, the Building Inspector may order the work stopped by notice in writing served on any persons engaged in the doing or causing such work to be done, and any such person shall forthwith stop such work until authorized by the Building Inspector to recommence and proceed with the work.

Whenever any building or portion thereof is being used or occupied contrary to the provisions of this Code the Building Inspector shall order such use or occupancy discontinued and the building or portion thereof vacated by notice served on any person using or causing such use or occupancy to be continued and such person shall vacate such building or portion thereof within ten days after receipt of such notice, or make the building or portion thereof comply with the requirements of this Code; provided, however, that in the event of an emergency the following paragraph shall apply.

Any building or portion thereof, including buildings and/or structures in process of erection, if found to be dangerous to persons or property, or unsafe for the purpose for which it is being used, or in danger from fire due to defects in construction, or dangerous for use because of insufficient means of egress in case of fire, or which violates the provisions of this Code due to the removal, decay, deterioration or the falling off of any thing, appliance, device or requirement originally required by this Code, or which has become damaged by the elements or fire to an extent of fifty (50) percent of its value, may be condemned by the Building Inspector. The Building Inspector may order portions of the structural frame of a building or structure to be exposed for inspection when in his opinion they are in an unsafe condition. In any of the aforesaid cases the Building Inspector shall serve notice in writing on the owner, reputed owner or person in charge of such a building or premises, setting forth what must be done to make such building safe. The person receiving such notice shall commence within forty-eight hours thereafter to make the changes, repairs or alterations set out in such notice and diligently proceed with such work or demolish the building. No such building shall be occupied or used for any purpose after the Building Inspector serves written notice of its unsafe or dangerous condition until the instructions of the Building Inspector have been complied with.

If, at the expiration of the time as set forth in the first notice, the instructions, as stated, have not been complied with, a second notice shall be served personally upon the owner, his agent, or the person in possession, charge or control of such

Secs. 301-302

building or structure or part thereof, stating therein such precautionary measures as may be necessary or advisable to place such building or structure or part thereof in a safe condition. Should the necessary changes not be made within thirty days after the service of such second notice the City Council may order the owner or agent of the building prosecuted as a violator of the provisions of this Code and/or may order the building inspector to proceed with the work specified in such notice. A statement of the cost of such work shall be transmitted to the City Council, who shall cause the same to be paid and levied as a lien against the property. Proper service of either such notices shall be personal service upon the owner

of record, if he shall be within the City of.....

If he is not in the City of..... such service may be had upon any person accustomed to collect rents on the

property in question who may be in the City of....., and in the absence of such a person, upon the tenant of the premises. In the event such premises are vacant, and the owner

is not in the City of....., such service will be completed when the notice is sent by registered mail to the last known address of the said owner. Whenever the owner, agent or tenant is a corporation, service may be upon the President, Vice-President, Secretary or Treasurer, or in the absence of any of these, the local representatives of such corporation.

Sec. 302. The provisions of this Code are not intended to prevent the use of types of construction or materials offered as an alternate for the types of construction or materials required by this Code, but such alternate types of construction or materials to be given consideration shall be offered for approval as specified in this chapter.

Alternate Materials and Types of Construction

Corresponding materials or types of construction referred to in the Code, the use of which is the same as is intended for the new material or construction, and approved, shall be considered as standards of quality and strength if no specifications are provided.

Any person desiring to use types of construction or materials not specifically mentioned in this Code shall file with the Building Inspector authentic proof in support of claims that may be made regarding the sufficiency of such types of construction and materials and request approval and permission for their use.

The Building Inspector may approve such alternate types of construction or materials and/or may recommend an amendment to this Code in order to make permissible the use of same. If the evidence and proof are not sufficient, in the opinion of the Building Inspector, to justify approval or recommendation for an amendment, the applicant may refer the entire matter to the Board of Examiners and Appeals as specified in Section 303.

Sec. 303. Any person whose application for a building permit for the use of an alternate material or type of construction has been refused by the Building Inspector or who may consider

Appeals

Secs. 302-305

that the provisions of this Code do not cover the point raised or that any particular provision would cause a manifest injury to be done may appeal to the Board of Examiners and Appeals by serving written notice on the Building Inspector in which it shall be stated that the applicant desiring to use the alternate materials or types of construction shall guarantee payment of all expenses for necessary tests made or ordered by the Board of Examiners and Appeals. Such notice shall be at once transmitted to the Board which Board shall arrange for a hearing on the particular point raised.

Such written notice shall be accompanied with the sum of ten dollars (\$10.00) payable to the..... If the appeal be denied such fee shall be retained by the City of, otherwise the fee shall be returned to the appellant.

**Board of
Examiners
and Appeals**

Sec. 304. In order to determine the suitability of alternate materials and construction and to provide for reasonable interpretations of the provisions of this Code, there shall be and is hereby created a Board of Examiners and Appeals, consisting of five (5) members, who are qualified by experience and training to pass on matters pertaining to building construction. One member shall be a practicing architect, one a competent builder, one a lawyer and two structural engineers, each of whom shall have had at least ten years' experience as an architect, builder, lawyer or structural engineer. The Building Inspector shall be an ex-officio member and shall act as Secretary to the Board. The Board of Examiners and Appeals shall be appointed by

.....and shall hold office at.....pleasure. The Board shall adopt reasonable rules and regulations for conducting its investigations and shall render all decisions and findings in writing to the Building Inspector with a duplicate copy to the appellant and may recommend to the City Council such new legislation as is consistent therewith.

The Board of Examiners and Appeals may interpret the provisions of the Code to cover a special case, if it appears that the provisions of the Code do not definitely cover the point raised or that a manifest injustice might be done, provided that every such decision shall be by unanimous vote of the Board of Examiners and Appeals. Decisions as to the use of alternate materials and/or types of construction shall be by majority vote and if not permitted by this Code shall become effective only when authorized by an amendment to this Code.

**Violations
and
Penalties**

Sec. 305. It shall be unlawful for any person, firm or corporation to erect, construct, enlarge, alter, repair, move, remove, demolish, convert, equip, use or occupy or maintain any building and/or structure or any portion of any building and/or structure in the City of....., contrary to or in violation of any provision of this Code or to cause, permit or suffer the same to be done.

Any person, firm or corporation violating any of the provisions of this Code shall be deemed guilty of a misdemeanor and each such person shall be deemed guilty of a separate of-

Sec. 305

fense for each and every day or portion thereof during which any violation of any of the provisions of this Code is committed, continued or permitted, and upon the conviction of any such violation such person shall be punishable by a fine of not more than , or by imprisonment in the jail for not more than..... or by both such fine and imprisonment.

The issuance or granting of a permit or approval of plans and/or specifications shall not be deemed or construed to be a permit for, or an approval of, any violation of any of the provisions of this Code. No permit presuming to give authority to violate or cancel the provisions of this code shall be valid, except insofar as the work or use which it authorizes is lawful.

The issuance of a permit upon plans and specifications shall not prevent the Building Inspector from thereafter requiring the correction of errors in said plans and specifications or from preventing building operations being carried on thereunder when in violation of this Code or of any other ordinance of the City of.....

Every permit issued by the Building Inspector under the provisions of this Code shall expire by limitation and become null and void, if the building or work authorized by such permit is not commenced within sixty days from the date of such permit, or if the building or work authorized by such permit is suspended or abandoned at any time after the work is commenced for a period of sixty days. Before such work can be recommenced a new permit shall be first obtained so to do, and the fee therefor shall be one-half the amount required for a new permit.

Sec. 401

PART II.
DEFINITIONS
CHAPTER 4

Definitions Sec. 401. For the purpose of this Code, certain terms, phrases and words and their derivatives shall be construed as set out in this section. Words used in the singular include the plural and the plural the singular. Words used in the masculine gender include the feminine, and the feminine the masculine. Wherever a section, chapter or part is referred to in this Code by number it shall be understood to refer to a section, chapter or part of this Code.

“ALLEY” Any public space, public park or thoroughfare less than sixteen (16) feet but not less than ten (10) feet in width which has been deeded to the public for public use.

“ALTERATION” Alter or alteration means any change, addition or modification in construction or occupancy.

“APARTMENT HOUSE” is any building, or portion thereof, which is designed, built, rented, leased, let or hired out to be occupied, or which is occupied as the home or residence of three or more families living independently of each other and doing their own cooking in the said building, and shall include flats and apartments.

“APARTMENT” is a room or suite of rooms which is occupied or which is intended or designed to be occupied by one family for living and sleeping purposes.

“APPROVED” as to materials and types of construction, refers to approval by the Building Inspector as the result of investigation and tests conducted by him, or by reason of accepted principles or tests by national authorities, technical or scientific organizations.

“AREA” (See “Floor Area”).

“ATTIC” or “ATTIC STORY” is any story situated wholly or partly in the roof, so designated, arranged or built as to be used for business, storage or habitation.

“BALCONY” is that portion of the seating space of an assembly room which is raised four (4) feet or more above the level of the main floor.

“BASEMENT” is that portion of a building between floor and ceiling, which is partly below and partly above grade (as defined in this Section), but so located that the vertical distance from grade to the floor below is less than the vertical distance from grade to ceiling. (See “Story”).

“BAY WINDOW” is a rectangular, curved or polygonal window, supported on a foundation extending beyond the main wall of the building.

“BUILDING” is any structure built for the support, shelter and enclosure of persons, animals, chattels or movable property of any kind; and when separated by an “Absolute Fire Separation” each portion of such building so separated shall be deemed a separate building.

Sec.401

"BUILDING INSPECTOR" - the Chief Building Inspector or any regularly authorized deputy.

"CAST STONE" shall be understood to mean a building stone manufactured from cement concrete, pre-cast and used as trim, veneer and/or facing on or in buildings and other structures.

"CELLAR" is that portion of a building between floor and ceiling which is wholly or partly below grade (as defined in this Section) and so located that the vertical distance from grade to the floor below is equal to or greater than the vertical distance from grade to ceiling. (See "Story").

"COURT" is an open, unoccupied space, bounded on two or more sides by the walls of the building. An inner court is a court entirely within the exterior walls of a building. All other courts are outer courts. (See Appendix).

"DEAD LOAD" in a building includes the weight of the walls, permanent partitions, framing, floors, roofs and all other permanent, stationary construction forming a part of the building.

"DWELLING" is any building or any portion thereof, which is not an "Apartment House" or a "Hotel" as defined in this Code, which contains one or more "Apartments" or "Guest Rooms", used, intended or designed to be used, built, rented, leased, let or hired out to be occupied, or which are occupied for living purposes.

"EXISTING BUILDING" is a building already erected or one for which a legal permit has been issued prior to the adoption of this Code.

"FACED WALL" is a wall in which the masonry facing and backing are so bonded as to exert a common action under load.

"FAMILY" is one person living alone or a group of two or more persons living together, whether related to each other by birth or not.

"FLOOR AREA" is the area included within exterior walls or within exterior walls and fire walls of a building exclusive of vent shafts and courts.

"FRONT OF LOT" means the front boundary line of lot bordering on the street, and in the case of a corner lot may be either frontage.

"FOOTING" or "FOUNDATION" is the spreading course at the base or bottom of a foundation wall, column or pier.

"GALLERY" is that portion of the seating space of an assembly room having a seating capacity of more than ten (10) and located above a balcony.

"GARAGE" is a building or portion thereof in which a motor vehicle containing gasoline, distillate or other volatile, inflammable liquid in its tank, is stored, repaired, or kept.

"PRIVATE GARAGE" is a building, or a portion of a building, in which motor vehicles used by the tenants of the building or buildings on the premises are stored or kept. (See Section 1509.)

"GRADE" when used in connection with lumber, means the division of sawn lumber into quality classes with respect to its physical and mechanical properties as defined in published lumber manufacturers' standard grading rules.

Sec. 401

"GRADE" (1) For buildings adjoining one street only, the elevation of the sidewalk at the center of that wall adjoining the street.

(2) For buildings adjoining more than one street, the average of the elevations of the sidewalk at centers of all walls adjoining streets.

(3) For buildings having no wall adjoining the street, the average level of the ground (finished surface) adjacent to the exterior walls of the building. All walls approximately parallel to and not more than five (5) feet from a street line are to be considered as adjoining a street.

"GUEST" means any person hiring and occupying a room for living and sleeping purposes.

"GUEST ROOM" means a room in a building occupied, or intended and designed to be occupied, let or hired out to "Guests".

"HEIGHT OF BUILDING" is the vertical distance from the "Grade" to the highest point of the coping of a flat roof or to the deck line of a mansard roof or to the average height of the highest gable of a pitch or hip roof.

"HOTEL" is any building containing six or more rooms intended or designed to be used, or which are used, rented or hired out to be occupied, or which are occupied for sleeping purposes by guests.

"LINTEL" is the beam or girder placed over an opening in a wall, and which supports the wall construction above.

"LIVE LOADS" are all imposed, fixed or transient loads other than "Dead Loads."

"MASONRY" is that form of construction composed of stone, brick, concrete, gypsum, hollow clay tile, concrete blocks or tile, or other similar building units or materials or a combination of these materials laid up unit by unit and set in mortar. For the purpose of this Code plain monolithic concrete shall be considered as Masonry. (See Section 2405.)

"SOLID MASONRY" means masonry built without hollow spaces.

"MEZZANINE" or "MEZZANINE FLOOR" is an intermediate floor placed in any story or room. When the total area of any such "Mezzanine Floor" exceeds thirty-three and one-third (33-1/3) percent of the total floor area in that room or story in which said "Mezzanine Floor" occurs, it shall be considered as constituting an additional "Story". The clear height above or below a "Mezzanine Floor" construction shall be not less than seven (7) feet.

"OCCUPANCY" as used in this Code pertains to and is the purpose for which a building is used or intended to be used. Change of occupancy is not intended to include change of tenants or proprietors.

"ORIEL WINDOW" is a window that projects from the main line of an enclosing wall of a building and is carried on brackets or corbels.

"PERSON" means a natural person, his heirs, executors, administrators or assigns, and also includes a firm, partnership or corporation, its or their successors or assigns, or the agent of any of the aforesaid.

Sec. 401

"REPAIR" means the reconstruction or renewal of any part of an existing building for the purpose of its maintenance. The word "Repair" or "Repairs" shall not apply to any change of construction.

"SEATING CAPACITY" The seating capacity of a theatre, auditorium, or any room or place of public assemblage in which seats are not fixed shall be determined on the basis of seven (7) square feet of floor, balcony and/or gallery area per person, and in the case of fixed seats such as pews or benches the seating capacity shall be based on one person to each eighteen (18) inches of pew or bench length.

Exceptions:

(1) The capacity of dance floors or the playing areas of gymnasiums when such areas or floors are not to be used for general assembly purposes shall be determined on the basis of fifteen (15) square feet of floor area per person.

(2) The capacity of school class rooms, individual rooms in public libraries and museums, when two thousand (2000) square feet or less in floor area, shall be determined on the basis of twenty (20) square feet of floor area per person.

"SHAFT" means a vertical opening through a building for elevators, dumb waiter, light, ventilation or similar purposes.

"SHALL" as used in this Code, is mandatory.

"STAGE" is a raised platform in an assembly room which is cut off from the audience section by a proscenium wall and where the wing space is over three (3) feet beyond the proscenium opening on one or both sides and/or where there is more than three (3) feet of open space above the proscenium opening.

"STORY" means that portion of a building included between the upper surface of any floor and the upper surface of the floor next above, except that the topmost story shall be that portion of a building included between the upper surface of the topmost floor and the ceiling or roof above. If the finished floor level directly above a basement or cellar is more than six (6) feet above grade such basement or cellar shall be considered a story.

"STREET" is any thoroughfare or public park not less than sixteen (16) feet in width which has been dedicated or deeded to the public for public use.

"STRUCTURE" is that which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner.

"THEATRE" is a building or part thereof which contains an assembly hall, having a stage which may be equipped with curtains and/or permanent stage scenery or mechanical equipment adaptable to the showing of plays, operas, moving pictures, performances, spectacles and similar forms of entertainment.

"VALUE" of a building shall be the estimated cost to replace the building in kind.

"VENEER" is the outer facing of brick, stone, concrete or tile attached to an enclosing wall for the purpose of providing

Sec. 401

ornamentation, protection or insulation but not counted as adding strength to the wall.

"WALLS".

"BEARING WALL" is a wall which supports any load other than its own weight.

"CURTAIN WALL" is a non-bearing wall between columns or piers which is not supported by girders or beams.

"ENCLOSURE WALL" is an exterior, non-bearing wall in skeleton construction, anchored to columns, piers or floors, but not necessarily built between columns or piers.

"FIRE DIVISION WALL" is a wall of masonry or reinforced concrete which subdivides a building to restrict the spread of fire, but is not necessarily continuous through all stories nor extended through the roof.

"FIRE WALL" is a wall of masonry or reinforced concrete which subdivides a building to prevent the spread of fire by starting at the foundation and extending continuously through all stories to and above the roof.

"INTERIOR WALL" is a wall entirely surrounded by the exterior walls of the building.

"NON-BEARING WALL" is a wall which supports no load other than its own weight.

"PANEL WALL" is a non-bearing wall in skeleton construction built between columns or piers and wholly supported at each story.

"PARAPET WALL" is that part of any wall entirely above the roof line.

"PARTY WALL" is a wall used or adapted for joint service between two buildings.

"RETAINING WALL" is any wall used to resist the lateral displacement of any material.

"YARD" is an open, unoccupied space, other than a court, unobstructed from the ground to the sky, except where specifically provided by this Code, and on the lot on which a building is situated.

PART III. REQUIREMENTS BASED ON OCCUPANCY

CHAPTER 5 — CLASSIFICATION OF ALL BUILDINGS BY USE OR OCCUPANCY AND GENERAL RE- QUIREMENTS FOR ALL OCCUPANCIES

Sec. 501. Every building, whether existing or hereafter erected, shall for the purpose of this Code be classified by the Building Inspector according to its use or the character of its occupancy, as a building of Group A, B, C, D, E, F, G, H, I or J, as defined in Chapters 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15 respectively. (See Chart in Section 503.)

**Occupancy
Classified**

Any occupancy not mentioned specifically or about which there is any question shall be classified by the Building Inspector and included in the Group which its use most nearly resembles based on the existing or proposed life and fire hazard.

The Types of Construction referred to in Chapters 6 to 15 inclusive, are:

Type I —Fire-Resistive Construction,

Type II —Heavy Timber Construction,

Type III—Ordinary Masonry Construction,

Type IV—Metal Frame Construction,

Type V —Wood Frame Construction,

and are defined in Chapters 18, 19, 20, 21 and 22 respectively.

Sec. 502. No change shall be made in the character of occupancy or use of any building which would place the building in a different Group of occupancy, unless such building is made to comply with the requirements of this Code for that Group.

**Change
in Use**

EXCEPTIONS

The character of the occupancy of existing buildings may, subject to the approval of the Building Inspector, be changed and occupied for purposes in other Groups without conforming to all the requirements of the Code for those Groups, provided the new or proposed use is less hazardous, based on life and fire risk, than the existing use.

No change in the character of occupancy of a building shall be made without a Certificate of Occupancy, as required in Section 207 of this Code.

Buildings in existence at the time of the passage of this Code, may have their existing use or occupancy continued, if such use or occupancy was legal at the time of the passage of this Code, provided such continued use is not dangerous to life.

Sec. 503. (a) When the occupancy of a building is such that different portions of the building are placed in different occupancy Groups, a "Fire Separation" as specified in this Section shall be provided so that each Group is entirely segregated. Such "Fire Separation" shall provide either a complete vertical or horizontal separation, or a combination of both. Each portion of a building so segregated shall be considered, for the purpose of this Code, to be a separate building and as such shall conform to the specific requirements applying to that use

**Mixed
Occupancy**

Secs. 503-504

or occupancy; provided, however, that "Fire Separations" shall not affect or alter the requirement for fire walls when and where required because of area as specified in Part III, except when such "Fire Separation" provides the necessary complete vertical separation as specified in Section 2932.

(b) "Fire Separations may be vertical and/or horizontal, depending upon the locations of the portions of the building to be segregated and shall consist of a system of walls, partitions and/or floors of materials and construction so arranged as to provide, during the period specified, a complete, secure and continuous fire-break between the buildings or portions thereof as required. "Fire Separations" are, for the purpose of this Code, classified as "Absolute", "Special" and "Ordinary" and shall be not less than as specified in the following paragraphs.

(1) An "Absolute Fire Separation" shall provide an effective resistance to the passage of fire for not less than four hours as specified in Chapters 42 and 43. No openings shall be allowed through an "Absolute Fire Separation."

(2) A "Special Fire Separation" shall provide an effective resistance to the passage of fire for not less than three hours as specified in Chapters 42 and 43, except that all openings in walls forming such separation shall be protected on each side thereof by self-closing one hour fire-resistive doors as specified in Section 4304 (a). Such doors shall be kept normally closed. The total width of all openings in any vertical "Special Fire Separation" shall not exceed in any one story twenty-five (25) percent of the length of the wall in that story and no single opening shall have an area greater than one hundred twenty (120) square feet.

Enclosure walls of vertical or horizontal enclosures passing through a "Special Fire Separation" shall be of not less than two hour fire-resistive construction as specified in Section 4302.

(3) An "Ordinary Fire Separation" shall provide an effective resistance to the passage of fire for not less than one hour as specified in Chapters 42 and 43. Openings in "Ordinary Fire Separations" shall be protected by self-closing metal clad doors, as provided in Section 4304 and such doors shall be kept normally closed.

(c) "Fire Separations" shall be provided between the various Groups and Divisions of occupancies as specified in the tabulation which follows, except that in no case need the separation be more fire-resistive than the exterior walls of the building in which the separation occurs; provided, however, that where any fire separation is required the minimum shall be a one-hour "Fire Separation."

Location
on
Property

Sec. 504. The location of all buildings and the protection of certain openings shall conform to the requirements of the Occupancy Group in which such building is classified in this Code according to the use or character of the occupancy; provided, that exterior walls which form an angle of seventy-

Sec. 504

five (75) degrees or more with the adjacent property line may have openings therein which are protected by not less than one-hour fire-resistive construction as specified in Section 4304.

The specific requirements given in Sections 603, 703, 803, 903, 1003, 1103, 1203, 1303, 1403, and 1503, regulating the construction of exterior walls and the protection of openings therein with respect to adjacent property lines, shall apply to buildings erected on the same property, but with reference to an imaginary property line located between such buildings and parallel to the face of either building.

"FIRE SEPARATIONS" REQUIRED FOR MIXED OCCUPANCY

OCCUPANCY			GROUPS AND DIVISIONS OF OCCUPANCY																							
Chapter Reference	Group	DIVISION*	A			B		C	D		E			F			G			H		I	J			
			1	2	3	1	2	1	1	2	1	2	3	1	2	3	1	2	3	1	2	1	1	2	3	
6	A	1—Major theatres (stage depth back of proscenium wall more than 5 feet).....	N	N	N	N	N	N	S	S	A	A	A	S	A	A	A	S	O	S	S	O	A	N	N	
		2—Moving Picture theatres (seating 1000 or more).....	N	N	N	N	N	N	S	S	A	A	A	S	A	A	A	S	O	S	S	O	A	N	N	
		3—Places of public assemblage (other than theatres or moving picture theatres) having a seating capacity of 3500 or more in any one room.....	N	N	N	N	S	S	A	A	A	S	A	A	A	S	O	O	O	O	A	N	N	N		
7	B	1—Theatres and moving picture theatres (stage depth back of proscenium wall 5 feet or less).....	N	N	N	S	S	A	A	A	S	A	A	S	O	S	S	O	A	N	N	N				
		2—Same as Group A, Division 3, but having a seating capacity of 500 to 3500 in any one room.....	N	N	S	S	A	A	A	S	A	A	A	S	O	N	N	O	A	N	N	N				
8	C	1—Same as Group A, Division 3, but having a seating capacity in any one room of less than 500.....	N	O	O	A	S	A	O	O	O	O	O	N	N	N	N	A	N	N	N					
9	D	1—Jails, prisons, reformatories, asylums, similar buildings.....	N	O	A	S	A	S	O	O	A	O	O	O	O	O	S	N	N	N						
		2—Hospitals, sanitariums, orphanages, nurseries and similar buildings (accommodating more than 6 patients).....	N	A	S	A	O	S	S	A	O	O	O	O	S	N	N									
10	E	1—Public garages, paint or petroleum products storage, dry cleaning.....	S	S	A	S	S	S	S	S	O	S	S	S	S	O	O	S								
		2—Planing mills, box factories, woodworking and mattress factories.....	N	O	S	N	N	S	N	N	A	A	O	O	N	S										
		3—Storage of hay and highly inflammable or explosive materials.....	N	S	S	S	S	S	O	A	A	S	S	S	S											
11	F	1—Wholesale and retail stores, office buildings, restaurants, undertaking parlors, printing plants, municipal police and fire stations.....	N	N	N	O	N	N	O	O	N	O	N	O	N	O	N	O								
		2—Factories and workshops using materials not highly inflammable or explosive.....	N	N	O	N	N	O	O	O	N	O	N	O	N	O										
		3—Storage and sales rooms for combustible goods.....	N	O	N	N	O	O	N	O	N	O	N	O	N	O										
12	G	1—Ice plants, power plants, pumping plants, cold storage, creameries.....	N	N	O	S	S	O	N	N	O	N	N	O	N	N	O	N	N							
		2—Factories and workshops using incombustible or non-explosive materials.....	N	N	O	O	N	N	N	N	N	N	N	N	N	N	N									
		3—Storage and sales rooms of incombustible or non-explosive goods.....	N	O	O	N	N	N	N	N	N	N	N	N	N	N										
13	H	1—Hotels, apartment houses, dormitories, lodging houses.....	N	N	N	O	N	O	N	O	N	O	N	O	N	O	N	O								
		2—Convents, monasteries, old peoples' homes (accommodating 10 or more).....	N	N	N	O	N	O	N	O	N	O	N	O	N	O										
14	I	1—Dwellings.....	N	O	N	O	N	O	N	O	N	O	N	O	N	O	N	O								
15	J	1—Private garages.....	N	N	O	N	O	N	O	N	O	N	O	N	O	N	O	N	O							
		2—Accessory buildings and structures such as sheds, fences over 6 feet high, water tanks, towers.....	N	N	O	N	O	N	O	N	O	N	O	N	O	N	O	N	O							
		3—Stadiums, reviewing stands, amusement park structures.....	N	N	O	N	O	N	O	N	O	N	O	N	O	N	O	N	O							

Legend: A—Absolute Separation. S—Special Separation. O—Ordinary Separation. N—No separation required.

Note: *Refer to Chapters 6 to 15 inclusive for more complete listing of occupancies and definitions.

†Provided that any two garages, two paint or petroleum products storage spaces, two dry cleaning plants, may occur in the same building without any separation being required.

‡Provided that an "Ordinary Separation" shall be permitted between public garages and dwellings.

§Provided that in Type I buildings, no separation shall be required.

¶Provided that three-fourths (¾) of an inch of metal lath and plaster on the garage side and a self-closing, tight-fitting one and three-eighths (1⅜) inch solid slab wood door shall be permitted where the private garage space will accommodate not more than four (4) automobiles.

Secs. 601-604

CHAPTER 6 — REQUIREMENTS FOR GROUP A BUILDINGS

Sec. 601. Each Group A occupancy shall be considered as a separate building and the Group shall include: **Group A Occupancies Defined**

Division 1: All theatres, motion picture theatres, auditoriums, schools, churches, lodges, clubs, museums, dance halls, armories, libraries, gymnasiums, passenger stations, administration buildings of city, county or state and similar buildings having a permanent stage and seating capacity of one thousand (1000) or more.

Division 2: The same as Division 1 except, not having a permanent stage and having a seating capacity of thirty-five hundred (3500) or more.

Sec. 602. (a) General. Buildings or parts of buildings classed in Group A because of use or occupancy shall be of Type I Construction and shall not be limited as to location in fire zone, seating capacity, height or floor area. **Construction, Height and Area Allowable**

(b) Special Construction. Stages and platforms as defined in Section 401 shall be of Type I construction, except as specified in Section 3904.

The slope of the main floor of the auditorium shall not exceed one (1) in five (5). Ramps steeper than one (1) in eight (8) shall have non-slip floor surfaces.

Sec. 603. All Group A buildings shall front directly upon at least one public street not less than twenty (20) feet in width in which front shall be located the main entrance and exit of such building. The main floor of every Group A occupancy shall be located at or near the ground floor level. **Location on Property**

All exterior walls or parts of walls, except on street fronts, of Group A buildings which are less than five (5) feet from adjacent property lines shall have no openings therein. All openings in exterior walls, except on street fronts, which are less than ten (10) feet from adjacent property lines shall be protected by doors or windows of one-hour fire-resistive construction as specified in Section 4304. See Section 504 for regulating adjacent buildings on the same property.

Sec. 604. (a) Main Entrance and Exits. In every Group A building there shall be not less than one (1) exit on each of three sides of the auditorium. Each of these exits shall be not less than five feet (5'-0") in width and shall open directly upon a street or into an open exit court which shall be directly connected to a street as specified in paragraph (b) of this Section. **Stairs and Exits**

One such exit on a street front which shall serve as the main entrance shall be proportioned on the basis of two (2) feet of width for each one hundred (100) persons or major fraction thereof to and including one thousand (1000) persons, with an additional one (1) foot per hundred persons for each additional one hundred (100) persons or major fraction thereof to and including two thousand (2000) persons and an additional six (6) inches for each additional one hundred (100) persons or major fraction thereof, all based upon the total

Sec. 604

seating capacity of the building served by such entrance and/or exit.

At the main entrance of each Group A building there shall be a foyer having an area of one (1) square foot to each seat in such building having access to such foyer. The required width of the foyer at any point shall be the combined width of the aisles, passageways and stairways at that point but need not exceed the required width of the entrance. The foyer shall be at the same level as the back of the auditorium and all changes in elevation between the foyer and the public street adjacent thereto shall be by ramps with a slope of not more than one (1) in ten (10).

The foyer if not abutting directly upon a public street shall communicate thereto by a straight and unobstructed corridor or passageway equal in width to that required for the main entrance which shall be used only as an exit or entrance; provided, however, that not to exceed ten (10) per cent of such required width may be used for the placing of a ticket booth.

(b) Exit Courts. Along each side and long enough to accommodate all side exits of the auditorium not fronting directly upon a street (not including that side bounded by the stage) shall be an open court, or a passageway of Type I construction, not less than five (5) feet in width when the total seating capacity is one thousand (1000) or less, and such width shall be increased by one (1) foot for each additional five hundred (500) persons or major fraction thereof. These are required widths and shall not be reduced in any way.

The courts shall extend full width to a street or shall be connected to the street by a passageway of the same required width, with a height of not less than seven (7) feet and such passageway shall not exceed a length of fifty (50) feet. The court or passageway shall meet the street level and all changes in elevation shall be by ramps with a slope of not more than one (1) in eight (8).

All doors opening into such open courts or passageways of Type I construction shall be arranged so as not to decrease the clear width of the court when open.

(c) Main Floor Auditorium Exits. There shall be provided at the rear of the auditorium leading into the foyer, exits which shall not be less in width than the full width of the aisle or aisles leading thereto. Additional exits, located on each side of and not less than one-half the length of the auditorium from the foyer, shall be provided on the main floor of each Group A building. These exits shall be proportioned on the basis of not less than twenty-two (22) inches of combined width to each one hundred fifty (150) seats or major fraction thereof on the main floor of the auditorium, and this exit width shall be equally divided to each side of the auditorium. All such exits shall open directly upon a street or exit court or may be connected thereto by corridors having a width not less than the exit opening into same. There shall be no openings in such corridors other than the exit openings, and the exit doors shall be hung so as not to decrease the required width. Egress from the main floor of the auditorium to the street shall be

Sec. 604

by means of ramps having a slope of not more than one (1) in eight (8), except as specified in part (a) of this Section.

Where fixed seats are not provided the exits shall be proportioned on the seating capacity as defined in Section 401 and shall be evenly distributed and so arranged that the distance between adjacent exits shall not exceed one hundred (100) feet measured along the wall.

(d) Balcony and Gallery Exits. For balconies or galleries having a seating capacity of over fifty (50) exits shall be provided from each side of each balcony or gallery, leading directly to a street or exit court. These exits shall have a combined width of not less than twenty-two (22) inches for every seventy-five (75) seats or major fraction thereof in such balcony or gallery and such exits shall be equally divided to each side. No exit shall be less than three feet and six inches (3'-6") in width and shall be served by stairs or ramps completely enclosed and constructed as specified in Chapter 33. Balconies or galleries having a seating capacity of fifty (50) or less shall be provided with not less than two means of egress at least one of which shall lead directly to a street or court. These exits shall be not less than three feet six inches (3'-6") in width. All such exits shall be located as far apart as is practicable and all combined exits shall continue the full combined width to the street. No stair exit shall be continued to or communicate with a basement.

Exits leading to the foyer shall have a combined width of not less than twenty-two (22) inches for each one hundred fifty (150) seats or major fraction thereof in such balcony or gallery. No such exit shall be less than three feet six inches (3'-6") in width.

Where fixed seats are not provided the exits shall be proportioned on the seating capacity as defined in Section 401.

Hand rails shall be provided for stairs as specified in Section 3305.

Stairs emptying into exit courts shall meet the court floor at not less than the stair width from the near side of any main floor exit opening into such exit court.

(e) Stage exits. For size and location of stage exits see Section 3910.

(f) Aisles. Aisles on the main floor shall be located so that there are not more than six (6) seats between any seat and an aisle. Every aisle shall be not less than three (3) feet wide if having seats on only one side and not less than three feet six inches (3'-6") wide if having seats on both sides. Such minimum width shall be measured at the end farthest from the foyer and shall be increased by one and one-half (1½) inches for each five (5) feet in length toward the foyer. There shall be no steps or obstructions of any kind in any aisles, and aisles may have a slope of not more than one (1) in five (5). Ramps steeper than one (1) in eight (8) shall have non-slip floor surfaces.

Aisles in balconies or galleries shall be located so that there are not more than six (6) seats between any seat and an aisle.

Sec. 604

Aisles in balconies and galleries shall have the same minimum width as for aisles on the first floor and shall have the same ratio of increase in width with the exception that the increase shall be in the direction of exit travel. There shall be provided in all balconies or galleries having more than twenty (20) rows of seats a cross aisle not less than four (4) feet wide from the back of one chair to the edge of the seat when down in the next row. Such cross aisle shall lead directly to an entrance or to an emergency exit.

Risers shall be not more than seven and one-half (7½) inches and shall be the full width of the aisle and no tread shall be less than ten (10) inches. When the slope of the aisle is not more than one (1) in five (5) it shall be ramped. All aisles shall lead directly to exits.

The floor between rows of seats shall be on the same level as the aisles where they intersect.

(g) Seats. Seats shall be spaced not less than thirty-three (33) inches back to back.

All seats in buildings of Divisions 1 of Group A on the main floor and in balconies and galleries shall be fastened securely to the floor and shall be not less than eighteen (18) inches in minimum width.

(h) Boxes. Boxes may be served by stairs not less than three (3) feet in width with a rise and tread as required for main stair exits. Boxes accommodating more than twenty-five (25) persons shall be considered as balconies. Seats in boxes need not be fastened to the floor.

(i) Doors and Gates. All exit and entrance doors or gates shall swing in the direction of exit travel and if provided with latches such latches shall be of self-releasing type, such as panic bolts or similar devices, which will permit the door to open when pressed against. All doors shall be installed so as not to decrease the required width of any opening, passage-way or corridor in any manner whatsoever. No single door shall be more than three feet and six inches (3'-6") in width and every exit door on the exterior of such building shall be of not less than one-hour fire resistance as specified in Section 4304 except at the main entrance and exit. Doors opening from within the building into a stair or ramp enclosure may be metal-clad doors as specified in Section 4304.

(j) Exit Lights. All exits shall be marked with illuminated signs bearing the word "EXIT" in letters at least five (5) inches high. Each sign shall be provided with two (2) separate electric light globes each on separate circuits, one circuit being separate from any other circuit in the building. All exit signs shall be illuminated during any time the building is occupied.

(k) Smokeproof Tower. Where there is more than one balcony or gallery all balconies or galleries above the first shall be served by not less than one smokeproof tower located on each side of such balcony or gallery and constructed as specified in Chapter 33.

Secs. 604-608

(1) General. No persons or obstructions of any kind, either permanent or movable shall be placed in any aisle, exit, foyer, passageway, foyer or corridor and all dimensions given shall refer to the clear width. This shall be construed as prohibiting radiators, chairs, stools, stands, slot machines, easels and similar objects from being placed in any exit, foyer, aisle, passageway or corridor. No furniture or fixtures of any kind shall be placed in the foyer in such a manner as to diminish its required width.

No bars shall be placed upon any window or any other opening in any Group A building except on the windows of a private office.

All doors shall have a clear height of not less than six feet and eight inches (6'-8").

Sec. 605. All portions of Group A buildings customarily used by human beings and all dressing rooms shall be provided with light and ventilation by means of windows and/or skylights with an area not less than one-eighth (1/8) of the total floor area, or shall be provided with artificial light and a mechanically operated ventilating system. The mechanically operated ventilating system shall supply at least thirty (30) cubic feet of pure air per minute for each occupant thereof in all portions of the building and such system shall be kept continuously in operation during such time as the building is occupied. If the velocity of the air at the register exceeds ten (10) feet per second the register must be placed more than eight (8) feet above the floor directly beneath.

Lights in all parts of the building customarily used by human beings shall be on a separate circuit from that of the stage and shall be controlled from the box office. Lights in corridors, exit courts and exit passageways shall be protected by a wire cage.

All registers or vents supplying air back stage shall be equipped with automatic closing devices with fusible links.

Sec. 606. Main stair or ramp exits from the first or lower balcony or gallery need not be enclosed but all other stair exits shall be enclosed as specified in Chapter 30. There shall be no openings into stair or ramp enclosures except necessary entrance and exit doors. All emergency stair or ramp enclosures shall lead directly to a public street or alley or exit court.

All elevator shafts, vent shafts and other vertical openings shall be enclosed as specified under Types of Construction.

Openings through stage floors shall be equipped with tight fitting trap doors of wood not less than two (2) inches thick.

Sec. 607. Group A buildings shall be equipped with automatic sprinklers as provided in Chapter 38.

Wet and dry standpipes shall be provided as specified in Chapter 38.

Stages shall be equipped with automatic ventilators as provided in Section 3901.

Sec. 608. Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Motion picture machine booths shall conform to the requirements of Chapter 40.

**Light and
Ventilation**

**Enclosure
of
Vertical
Openings**

**Fire Extinguishing
Apparatus**

**Special
Hazards**

Secs. 608-610

No inflammable liquids shall be placed, stored or used in a Group A building.

Any gas service to the stage portion of the building shall be separated from any other service to the building and each gas service shall be provided with a shut-off valve at a convenient and conspicuous place outside the building and adequately marked.

Every boiler room or room containing a heating plant which burns liquid or solid fuel shall be separated from the rest of the building with a "Special Fire Separation" as specified in Sec. 503.

Every boiler room or room containing a heating plant which burns gas as fuel shall be separated from the rest of the building with not less than an "Ordinary Fire Separation" as specified in Section 503.

**Exceptions
and
Deviations**

Sec. 609. Gymnasiums and similar buildings may have running tracks constructed of wood or unprotected steel or iron.

Note: Existing buildings not complying with the requirements of this chapter may be classed as Group A buildings and so used if the requirements of Sections 602, 604, 607, 608 and 609 are fully complied with and not less than a "Special Fire Separation" as specified in Section 503 is provided as a separation between the Group A occupancy and all other adjacent occupancies.

**Mixed
Occupancies**

Sec. 610. Separation of Group A occupancies from all other occupancies shall be provided as specified in Section 503.

CHAPTER 7 — REQUIREMENTS FOR GROUP B BUILDINGS

Sec. 701. Each Group B occupancy shall be considered as a separate building and the Group shall include: **Group B Occupancies Defined**

Division 1: All theatres, motion picture theatres, auditoriums, schools, churches, lodges, clubs, museums, dance halls, armories, libraries, gymnasiums, passenger stations, administration buildings of city, county or state and similar buildings having a permanent stage and a seating capacity of three hundred (300) or more but less than one thousand (1000).

Division 2: The same as Division 1, except, not having a permanent stage and having a seating capacity of seven hundred and fifty (750) or more but less than thirty-five hundred (3500).

Sec. 702. (a) General. Buildings or parts of buildings classed in Group B because of use or the character of the occupancy shall conform to the following specific requirements: **Construction, Height and Area Allowable**

Type of Construction Permissible	Height Limit (Ft.)	Maximum Total Seating Capacity in Any One Room	Floor Area Permissible (Sq. Ft.)
Type I	No limit	3500	No limit
Type II	75	1000*	No limit
Type III	55	750*	15,000

* Seating capacity may be increased, except for Division 1 Group B occupancies, not to exceed fifty (50) per cent when no balconies or galleries are constructed as a part of such building and when the auditorium floor is located at or near ground floor level, in which case all exits shall be at street level or shall meet street level by means of ramps.

(b) Special construction. Stages and platforms as defined in Section 401, shall be constructed as provided in Chapter 39.

Platforms which are used in lieu of stages shall be included in the floor area of the assembly room when determining the seating capacity, as defined in Section 401.

Sec. 703. All Group B buildings shall front directly upon at least one public street not less than twenty (20) feet in width, in which front shall be located the main entrance and exit of such building, or such building may be connected to the street by an entrance passageway as specified in Section 704. The main floor of each Group B occupancy shall be located at or near the ground floor level, provided that occupancies in Division 2 of Group B buildings having a total seating capacity of not more than fifteen hundred (1500) may be located above the ground floor or in the first basement, and stairs may be used as a means of ingress and egress. **Location on Property**

All exterior walls or parts of walls, except on street fronts, of Group B buildings which are less than five (5) feet from adjacent property lines shall have no openings therein. All openings in exterior walls, except on street fronts, which are less than ten (10) feet from adjacent property lines shall be protected by doors or windows of one-hour fire-resistive con-

Secs. 704-709

struction as specified in Section 4304. See Section 504 for regulating adjacent buildings on the same property.

**Stairs
and
Exits**

Sec. 704. Requirements for stairs and exits shall be the same as for Group A buildings as specified in Section 604 with the following exceptions:—

(1) A foyer shall not be required.

(2) No balcony or gallery shall be allowed except in buildings of Type I construction.

**Light and
Ventilation**

Sec. 705. All portions of Group B buildings customarily used by human beings and all dressing rooms shall be provided with light and ventilation, either natural or artificial, as specified in Section 605.

**Enclosure
of Vertical
Openings**

Sec. 706. All vertical openings such as elevator shafts, stairs, ramps and vent shafts shall be enclosed as specified in Chapter 30, provided, however, that stair or ramp exits serving only a Group B occupancy on the second floor of a building need not be enclosed. There shall be no openings into stair or ramp enclosures except necessary entrance and exit doors.

**Fire Extinguishing
Apparatus**

Sec. 707. Automatic sprinklers, standpipes and basement pipe inlets shall be installed as and when specified in Chapter 38.

**Special
Hazards**

Sec. 708. Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Motion picture machine booths shall conform to the requirements of Chapter 40.

No inflammable liquids shall be placed, stored or used in a Group B building.

Any gas service to a Group B building shall be provided with an outside shut-off conspicuously marked.

Exterior openings in a boiler room or room containing central heating equipment, if located below openings in another story or if less than ten (10) feet from other doors or windows of the same building, shall be provided with one-hour fire resistive protection as specified in Section 4304.

Every boiler room or room containing a heating plant which burns liquid or solid fuel shall be separated from the rest of the building with a "Special Fire Separation" as specified in Section 503. Every boiler room or room containing a heating plant which burns gas as fuel shall be separated from the rest of the building with not less than an "Ordinary Fire Separation" as specified in Section 503.

**Exceptions
and
Deviations**

Sec. 709. Gymnasiums and similar buildings may have running tracks constructed of wood or unprotected steel or iron.

All partitions and floors in Group B buildings and all bearing partitions and floors below a Group B occupancy when such occupancy is placed or is to be placed above the first floor of a building or structure shall be of not less than one-hour fire-resistive construction as specified in Chapter 43.

Secs. 709-710

Type IV and V Construction shall not be permitted for use of Group B occupancies.

Sec. 710. Separation of Group B occupancies from any other occupancies shall be provided as specified in Section 503.

**Mixed
Occupancies**

Secs. 801-802

CHAPTER 8

REQUIREMENTS FOR GROUP C BUILDINGS

Group C
Occupancies
Defined

Sec. 801. Each Group C occupancy shall be considered as a separate building and the Group shall include:—

Division 1: All theatres, motion picture theatres, auditoriums, schools, churches, lodges, clubs, museums, dance halls, armories, libraries, gymnasiums, passenger stations, administration buildings of city, county or state and similar buildings having a permanent stage and each having a seating capacity of less than three hundred (300).

Division 2: The same as Division 1, except, not having a permanent stage but having a seating capacity of fifty (50), or more but less than seven hundred and fifty (750).

Division 3: The same as Division 1, except, not having a permanent stage but having a seating capacity of less than fifty (50).

Construction,
Height and
Area
Allowable

Sec. 802. (a) General. Buildings or parts of buildings classed in Group C because of use or the character of the occupancy shall be of Types I, II, III, IV or V Construction and the maximum height and floor areas shall not exceed those specified in the following table.

Maximum Allowable Floor Areas as Determined by Height of Building, Street Frontage and Type of Construction

Types of Construction	Maximum Height for Corresponding Areas		Maximum Floor Areas (Sq. Ft.)			
			Building Fronting on			Increase for Complete Sprinkling*
	Feet	Stories	1 street	2 streets	3 or more streets	
Type I	NO RESTRICTIONS					
Type II	75 ft.	7 stories	12,000	15,000	18,000	100 %
	55 ft.	5 stories	15,000	18,000	20,000	
	65 ft.	1 story	20,000	25,000	30,000	
Type III	55 ft.	5 stories	12,000	15,000	18,000	100 %
	35 ft.	1 story	18,000	22,000	26,000	
Type IV	no restriction	1 story	15,000	18,000	21,000	100 %
Type V	35 ft.	2 stories	6,000	7,000	8,000	100 %
	30 ft.	1 story	8,500	9,500	10,500	

Note:—*Increase shall not be permitted unless the area is entirely protected by an automatic sprinkler installation as specified in Chapter 38.

Sec. 802

A side or rear yard which is forty (40) feet or more in width to the adjacent property line or to another building, and which is a clear access to a street, may be considered a street for the purpose of determining the allowable area of a school building.

In buildings having rooms with floor areas of over thirty thousand (30,000) square feet, tight draft stops shall be installed to prevent a free current of air under the roof. These draft stops in trussed roofs shall extend from the roof down to the bottom chord of the truss, and shall divide the under-roof or attic area into sections not to exceed twenty thousand (20,000) square feet in area.

(b) Special Construction. All public and private school buildings more than two stories in height shall be of Type I construction.

Stages and platforms as defined in Section 401 shall be constructed as provided in Chapter 39.

(c) Buildings of Type IV construction one or two stories in height, having areas not exceeding 50% over those shown in the table for one-story buildings may be allowed for Group C occupancy provided the following restrictions are adhered to in addition to those set up in Chapter 21.

1. Exterior walls and court walls shall be not less than two-hour fire-resistive construction.

2. The structural framework shall be protected with one-hour fireproofing.

All ducts, pipe sleeves and vents shall be fire-proofed between ceiling and floor or roof where they cut through the ceiling space.

3. Floors shall be as required for Type I or II construction or may be of continuous steel deck type, providing the underside over usable space is protected with not less than the equivalent of metal lath with three-quarters ($\frac{3}{4}$) inch of Portland cement or gypsum plaster, and the top surface protected with a fire retardant surface equivalent to three-quarters ($\frac{3}{4}$) inch of hardwood flooring on sleepers over two (2) layers of twelve (12) pound asbestos paper. One-quarter ($\frac{1}{4}$) inch linoleum cemented over three-quarters ($\frac{3}{4}$) inch pine floor will be considered equivalent to three-quarters ($\frac{3}{4}$) inch of hardwood.

4. Mezzanine floors shall be as required for other floors in the building.

Division 1 occupancy shall not be located above the ground floor except in buildings of Type I or II construction.

(d) The allowable floor area for one-story Type V buildings may be increased 50% provided one-hour fire-resistive construction is used throughout. The allowable floor area for two-story Type V buildings may be increased 50%, provided the construction up to and including the first floor is of Type I construction.

Division 2 shall not be located above the first floor except

Secs. 802-804

in buildings of not less than one-hour fire-resistive construction throughout.

(e) No balcony shall be allowed in a Type V building.

(f) Stairs and corridors in Group C occupancies shall be of not less than one-hour fire-resistive construction.

**Location
on
Property**

Sec. 803. All Group C buildings shall front directly upon at least one public street not less than twenty (20) feet in width, in which front shall be located the main entrance and exit of such building, or such building may be connected to such street by an entrance passageway as specified in Section 804.

All exterior walls or parts of walls, except on street fronts, of Group C buildings which are less than three (3) feet from adjacent property lines shall be of masonry or reinforced concrete. Walls which are three (3) feet or more but less than ten (10) feet from adjacent property lines except street fronts, shall be of not less than two-hour fire-resistive construction. All openings in exterior walls, except on street fronts, which are less than ten (10) feet to adjacent property lines, shall be protected by doors or windows of one-hour fire-resistive construction as specified in Section 4304. When openings are placed closer than three (3) feet to property lines other than street fronts, the sum of the widths of such openings shall constitute not more than twenty-five (25) per cent of the total length of the walls affected. See Section 504 for regulating adjacent buildings on the same property.

**Stairs
and
Exits**

Sec. 804. Requirements for stairs and exits shall be the same as for Group A buildings as specified in Section 604 with the following exceptions:—

- (1) A foyer shall not be required.
- (2) Seats shall not be required to be fixed.
- (3) Divisions 2 and 3 when located above the first floor may be served by stairs in place of ramps.
- (4) No balcony or gallery shall be allowed unless the balcony or gallery and all exits therefrom are of incombustible construction.
- (5) In Division 3 all required exits may be located on one side of the room provided that in no case shall any part of a room be more than thirty-five (35) feet from an exit.
- (6) Except as required in Section 803, the provisions requiring fire-protected doors given in Section 604 (i) shall not apply.
- (7) For classroom portion of school buildings, and similar small assembly rooms the aggregate width of exit stairs in any story shall be on the basis of whole units of twenty-two (22) inches each. The required number of units shall be determined by dividing the greatest number of people on any one floor above the stairs in question by one hundred (100) and no stairs shall be decreased in width toward the building exit. Each floor shall have not less than two exit stairs. For other requirements see Chapter 33.

The clear width of hallways in school buildings shall be measured in whole twenty-two (22) inch units and shall have

Secs. 804-808

a width of one more than the number of units obtained by dividing the total number of people in all rooms opening into such hallway by one hundred (100), provided that such hallway shall have a minimum clear width of four feet six inches (4'-6") and the required clear width shall not be diminished by any furniture, fixtures or locker or room doors when such doors are fully open. There shall be no dead end in exit hallways more than ten (10) beyond the stairway or exit. Where an auditorium exits into a hallway that serves as an egress from other rooms of a school, the hallway between the auditorium and the exit to the exterior need only provide for the occupants of either the auditorium or the classrooms which ever requires the greater width. The minimum width of exit doors at either end of a hallway to a yard or passage shall be eighteen (18) inches less than the required width of the hallway.

Single class rooms and other similar small assembly rooms shall have not less than two (2) exit doors three (3) feet wide or one (1) door five (5) feet wide and there shall be not less than two (2) means of exit available from each door.

(8) Any room in a school basement used by students shall have at least one (1) exit leading directly to the outside of the building and this exit shall be not less in width than one-half ($\frac{1}{2}$) the total required width of all room exits for the basement.

(9) Exit lights need not be installed over classroom exits.

(10) All stairs and ramps serving as entrances or exits for any Group C occupancy shall not be less than the width required for the doors serving such stairs and shall be designed and constructed as specified in Chapter 33; provided, that when such Group C occupancy is located on the second floor of a two-story building or when leading to and serving such occupancy only, such stairs or ramps need not be enclosed when stairs lead directly to the outer air or are connected thereto by direct passages with unpierced walls and ceilings.

All emergency stairs and ramps shall lead directly to a public street or alley or to a court or space not less than five (5) feet in clear width connected directly to a street or alley.

Sec. 805. All portions of Group C buildings customarily used by human beings shall be provided with light and ventilation, either natural or artificial, as specified in Section 605.

Sec. 806. All vertical openings such as elevator shafts, stair wells and vent shafts which permit the passage of fire or smoke through more than one floor shall be enclosed as specified in Chapter 30.

Sec. 807. Automatic sprinklers, standpipes and basement pipe inlets shall be installed as and when specified in Chapter 38.

Sec. 808. Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Motion picture machine booths shall conform to the requirements of Chapter 40.

**Light and
Ventilation**

**Enclosure
of
Vertical
Openings**

**Fire Extinguishing
Apparatus**

**Special
Hazards**

Secs. 808-810

Where the basement and first floor of a Type V building is required to be of Type I construction the first floor shall be unpierced for human access. No usable space or basement shall be allowed in a two-story Type V building unless such space or basement is surrounded by four-hour fire-resistive construction.

Exterior openings in a boiler room or room containing central heating equipment, if located below openings in another story or if less than ten (10) feet from other doors or windows of the same building, shall be provided with one-hour fire-resistive protection as specified in Section 4304.

Every boiler room or room containing a heating plant which burns liquid or solid fuel shall be separated from the rest of the building with a "Special Fire Separation" as specified in Section 503. Every boiler room or room containing a heating plant which burns gas as fuel shall be separated from the rest of the building with not less than an "Ordinary Fire Separation" as specified in Section 503.

No inflammable liquids shall be placed, stored or used in any Group C buildings except in small quantities as necessary in laboratories, and such liquids shall be kept in tight or sealed containers when not in actual use.

**Exceptions
and
Deviations**

Sec. 809. Gymnasiums and similar buildings may have running tracks constructed of wood or unprotected steel or iron.

All walls, partitions and floors of Group C buildings when more than one story in height and all walls, bearing partitions and floors below a Group C occupancy when such occupancy is placed or is to be placed above the first floor of a building or structure shall be of not less than one-hour fire-resistive construction as specified in Chapter 43.

Roof trusses, roof girders and beams twenty-five (25) feet or more above the nearest floor or balcony need not be fire-proofed.

Rooms in school buildings having a seating capacity of more than three hundred (300) shall not be located above the first story above grade except in buildings of Type I construction.

No school class room used for kindergarten, first or second grade pupils shall be located above the first story above grade in any building of less than Type I construction.

An arcade connecting buildings and used exclusively as a passage way, need not be considered as an adjacent building for the provisions of this Chapter, provided the walls of the buildings adjoining the arcade are finished with the same construction as required for the exterior walls of the building and with no communicating openings between the arcade and the building, except a door, and provided the arcade is of not less than one-hour fire-resistive construction or entirely of incombustible materials.

**Mixed
Occupancies**

Sec. 810. Separation of Group C occupancies from any other occupancies shall be provided as specified in Section 503.

Secs. 901-902

CHAPTER 9 — REQUIREMENTS FOR GROUP D BUILDINGS

Sec. 901. Each Group D occupancy shall be considered as a separate building and the Group shall include: **Group D Occupancies Defined**

Division 1: Jails, prisons, reformatories, houses of correction, asylums for the insane or feeble-minded, and similar buildings.

Division 2: Hospitals, sanitariums, orphanages, nurseries and similar buildings (accommodating more than six.)

Sec. 902. (a) Buildings or parts of buildings classified in Group D because of use or the character of the occupancy shall be of Type I, II, III, IV or V Construction, and the maximum height and floor areas shall not exceed those specified in the following table. **Construction, Height and Area Allowable**

Maximum Allowable Floor Areas as Determined by Height of Building, Street Frontage and Type of Construction

Types of Construction	Maximum Height for Corresponding Areas		Maximum Floor Areas (Sq. Ft.)			
			Building Fronting on			Increase for Complete Sprinkling*
	Feet	Stories	1 street	2 streets	3 or more streets	
Type I	NO RESTRICTIONS					
Type II	55 ft.	5 stories	15,000	18,000	20,000	100 %
	65 ft.	1 story	20,000	25,000	30,000	
Type III	35 ft.	3 stories	10,000	12,500	15,000	100 %
	35 ft.	1 story	15,000	20,000	25,000	
Type IV	35 ft.	1 story	15,000	20,000	25,000	100 %
Type V	20 ft.	1 story	5,000	6,000	7,000	100 %

Note:— *Increase shall not be permitted unless the area is entirely protected by an automatic sprinkler installation as specified in Chapter 38.

In buildings having rooms with floor areas of over thirty thousand (30,000) square feet, tight draft stops shall be installed to prevent a free current of air under the roof. These draft stops in trussed roofs shall extend from the roof down to the bottom chord of the truss and shall divide the under-roof or attic area into sections not to exceed twenty thousand (20,000) square feet in area.

(b) Special Construction. All Division 1 buildings of Group D shall be of Type I construction throughout; and all

Secs. 902-908

Division 2 buildings more than one story in height shall have all floors and partitions of not less than one-hour fire-resistive construction as specified in Chapter 43.

**Location
on
Property**

Sec. 903. All exterior walls or parts of walls, except on street fronts, of Group D buildings which are less than five (5) feet from adjacent property lines shall have no openings therein and shall be of masonry or reinforced concrete. All openings in exterior walls, except on street fronts, which are less than ten (10) feet from adjacent property lines shall be protected by doors or windows of one-hour fire-resistive construction as specified in Section 4304. See Section 504 for regulating adjacent buildings on the same property.

**Stairs
and
Exits**

Sec. 904. Not less than two exits shall be provided from each floor in every group D building regardless of the height or area of the building, and additional exits shall be provided as specified in Chapter 33.

In hospitals or sanitariums, ramps with a slope of not more than one (1) in six (6) shall be installed instead of stairways or in addition thereto to serve all portions of the building where bed-ridden patients are or may be placed. These ramps shall land at the first or ground floor level at points giving the most direct access practicable to the outer air.

Except in places of detention, exit doors shall not be fastened against exit by any device except self-releasing latches, panic bolts or similar devices which can readily be opened from the inside at all times without the use of keys or any special knowledge or effort.

Smokeproof towers shall be provided as specified in Chapter 33.

**Light and
Ventilation**

Sec. 905. All portions of Group D buildings customarily used by human beings shall be provided with light and ventilation by means of windows and/or skylights with an area equal to one-eighth ($\frac{1}{8}$) of the total floor area, or shall be provided with artificial light and a mechanically operated ventilating system. The mechanically driven ventilating system shall supply at least thirty (30) cubic feet of pure air per minute for each occupant thereof in all portions of the building and such system shall be kept continuously in operation during such time as the building is occupied.

**Enclosure
of Vertical
Openings**

Sec. 906. All elevator shafts, vent shafts and other vertical openings shall be enclosed as specified under Types of Construction.

**Fire Extinguishing
Apparatus**

Sec. 907. Automatic sprinklers, standpipes and basement pipe inlets shall be installed as and when specified in Chapter 38.

**Special
Hazards**

Sec. 908. Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Motion picture machine booths shall conform to the require-

Secs. 908-910

ments of Chapter 40.

No storage of volatile inflammable liquids shall be allowed in Group D buildings and the handling of such liquids shall not be permitted in any Group D buildings in quantities of more than one gallon unless such handling complies with the suggested ordinance Regulating the Use, Handling, Storage and Sale of Flammable Liquids and the Products Thereof, adopted by the National Fire Protection Association, May, 1926.

Any gas service to a Group D building shall be provided with an outside shut-off conspicuously marked.

Every boiler room or room containing a heating plant which burns liquid or solid fuel shall be separated from the rest of the building with a "Special Fire Separation" as specified in Section 503. Every boiler room or room containing a heating plant which burns gas as fuel shall be separated from the rest of the building by not less than an "Ordinary Fire Separation" as specified in Section 503.

Sec. 909. No requirements of this Chapter shall be so construed as to prohibit the construction of cell blocks in jails or prevent the use of any locks or safety devices in buildings where it is necessary to forcibly restrain the inmates.

**Exceptions
and
Deviations**

Sec. 910. Separation of Group D occupancies from any other occupancies shall be provided as specified in Section 503.

**Mixed
Occupancies**

Secs. 1001-1002

CHAPTER 10 — REQUIREMENTS FOR
GROUP E BUILDINGS**Group E
Occupancies
Defined**

Sec. 1001. Each Group E occupancy shall be considered as a separate building and the Group shall include all industrial or commercial buildings in which the nature of the occupancy creates a serious fire or life hazard, such as:

Division 1: Public garages, paint or petroleum storage, dry cleaning plants, gasoline service stations, paint shops.

Division 2: Planing mills, box factories, woodworking and mattress factories.

Division 3: Storage of hazardous and highly inflammable or explosive materials and/or liquids.

Note:—Inflammable liquids shall be deemed to be those with a flash point below 190 degrees Fahrenheit as determined by the closed cup tester.

**Construction,
Height
and Area
Allowable**

Sec. 1002. (a) General. Buildings or parts of buildings classed in Group E because of use or the character of the occupancy shall be of Type I, II, III, IV or V Construction and the maximum height and floor areas shall not exceed those specified in the following table.

**Maximum Allowable Floor Areas as Determined by Height
of Building, Street Frontage and Type of Construction**

Types of Construction	Maximum Height for Corresponding Areas		Maximum Floor Areas (Sq. Ft.)			
			Building Fronting on			Increase for Complete Sprinkling*
	Feet	Stories	1 street	2 streets	3 or more streets	
Type I	NO RESTRICTIONS					
Type II	75 ft.	7 stories	8,000	10,000	12,000	100 %
	55 ft.	5 stories	10,000	12,000	15,000	
	65 ft.	1 story	18,000	22,000	26,000	
Type III	55 ft.	5 stories	8,000	10,000	12,000	100 %
	40 ft.	1 story	12,000	15,000	18,000	
Type IV	45 ft.	1 story	10,000	12,000	15,000	100 %
Type V	30 ft.	1 story	8,000	9,000	10,000	100 %

Note:—*Increase shall not be permitted unless the area is entirely protected by an automatic sprinkler installation as specified in Chapter 38.

Secs. 1002-1005

In buildings having rooms with floor areas of over thirty thousand (30,000) square feet, tight draft stops shall be installed to prevent a free current of air under the roof. These draft stops in trussed roofs shall extend from the roof down to the bottom chord of the truss, and shall divide the under-roof or attic space into sections not to exceed twenty thousand (20,000) square feet in area.

Sec. 1003. All exterior walls or parts of walls, except on street fronts, of Group E buildings which are less than five (5) feet from adjacent property lines shall have no openings therein and shall be of masonry or reinforced concrete. All openings in exterior walls, except on street fronts, which are less than ten (10) feet from adjacent property lines shall be protected by doors or windows of one-hour fire-resistive construction as specified in Section 4304. See Section 504 for regulating adjacent buildings on the same property.

**Location
on
Property**

Sec. 1004. All Group E buildings shall have not less than two means of egress from each story including basements or cellars unless such basements or cellars are used for heating apparatus only, in which latter case only one exit shall be required.

**Stairs and
Exits**

All stairs and exits shall comply with the requirements specified in Chapter 33.

Smokeproof towers shall be installed as and when specified in Chapter 33.

Where ramps are used for the transfer of automobiles from one floor to another such ramps shall meet the ground floor level at a point not less than twenty (20) feet from the exit from such building.

Sec. 1005. All portions of Group E buildings customarily used by human beings shall be provided with light and ventilation by means of windows and/or skylights with an area equal to one-eighth ($\frac{1}{8}$) of the total floor area or shall be provided with artificial light and mechanically operated ventilating system. The mechanically driven ventilating system shall supply at least thirty (30) cubic feet of pure air per minute for each occupant thereof in all portions of the building and such system shall be kept continuously in operation during such time as the building is occupied.

**Light, Venti-
lation and
Sanitation**

In all buildings used for the storing or handling of automobiles operated under their own power and in all buildings where inflammable liquids are used exhaust ventilation shall be provided sufficient to produce one complete change of air every fifteen minutes. Such exhaust ventilation shall be taken from a point at or near the floor level.

All buildings where more than four persons are employed shall be provided with at least one toilet. All buildings and

Secs. 1005-1009

each subdivision thereof where both sexes are employed shall be provided with access to at least two toilets either located in such building or conveniently located in a building adjacent thereto.

Enclosure
of
Vertical
Openings

Sec. 1006. All elevator shafts, vent shafts and other vertical openings shall be enclosed as specified under Types of Construction.

Doors which are part of an automobile ramp enclosure may be kept normally open but shall be equipped with fusible links and so arranged as to be self-closing when released.

Fire Extinguishing
Apparatus

Sec. 1007. Automatic sprinklers, standpipes and basement pipe inlets shall be installed as and when specified in Chapter 38.

Special
Hazards

Sec. 1008. Chimneys and heating apparatus shall conform to the requirements of Chapter 37. In any room in which volatile inflammable liquids are used or stored no device generating a glow or flame capable of igniting gasoline vapor shall be installed or used within twenty-four (24) inches of the floor.

The use, handling, storage and sale of gasoline, fuel oil and other inflammable liquids shall not be permitted in any Group E building unless such use, handling, storage and sale complies with the "Suggested Fire Prevention Ordinance, Edition of 1930, recommended by the National Board of Fire Underwriters."

Dry cleaning plants in which combustible solvents are used or stored shall be of Type I construction and shall not exceed one (1) story in height. All partitions shall be of four-hour fire-resistive construction, except for the necessary openings for the vent ducts, piping and shafting. All openings in exterior walls, except wall vents, shall be protected with one-hour fire-resistive doors or windows. Wall vents having an area of not less than sixteen (16) square inches each, shall be placed in the exterior walls near the floor line, not less than six (6) feet apart horizontally. Each building shall be provided with a power driven fan exhaust system of ventilation which shall be arranged and operated so as to produce a complete change of air in each room every three (3) minutes.

Each machine in dry cleaning establishments which uses a volatile inflammable liquid shall have an adequate steam line directly connected to it, so arranged as to have the steam automatically released to the inside of such machine should an explosion occur in the machine.

Laws of the State of regulating the construction and maintenance of dry cleaning plants or other buildings containing any occupancy or special hazard covered by this Chapter, shall be deemed to be a part of this Code and such buildings shall conform to the provisions of such state laws.

Exceptions
and
Deviations

Sec. 1009. Public garages shall not be of Type V construction, shall not be of Type III construction when more than two (2) stories in height, and shall be not over six hundred

Secs. 1009-1010

(600) square feet in area or twenty-five (25) feet in height when of Type IV construction.

All public garage floors shall be of incombustible materials and if not placed directly on the ground shall conform to the requirements for floors of Type I Construction, or the floors may be of Type II Construction properly protected with incombustible materials against saturation by oil and grease.

Gasoline filling stations of Type V construction shall have incombustible exterior wall covering.

Division 3 buildings of Group E more than five (5) stories in height shall have all floors of not less than three-hour fire-resistive construction as specified in Section 4303.

Sec. 1010. Separation of Group E occupancies from all other occupancies shall be provided as specified in Section 503.

**Mixed
Occupancies**

Secs. 1101-1102

CHAPTER 11 — REQUIREMENTS FOR GROUP F BUILDINGS

Group F Occupancies Defined

Sec. 1101. Each Group F occupancy shall be considered as a separate building and the Group shall include all moderately hazardous industrial and commercial occupancies, such as:

Division 1: Wholesale and retail stores, office buildings, restaurants, undertaking parlors, printing plants, municipal police and fire stations.

Division 2: Factories and workshops using materials not highly inflammable or combustible.

Division 3: Storage and sales rooms for combustible goods.

Construction, Height and Area Allowable

Sec. 1102. Buildings or parts of buildings classed in Group F because of use or the character of the occupancy shall be of Types I, II, III, IV or V Construction and the maximum height and floor areas shall not exceed those specified in the following table.

Maximum Allowable Floor Areas as Determined by Height of Building, Street Frontage and Type of Construction

Types of Construction	Maximum Height for Corresponding Areas		Maximum Floor Areas (Sq. Ft.)			
	Building Fronting on					Increase for Complete Sprinkling*
	Feet	Stories	1 street	2 streets	3 or more streets	
Type I	NO RESTRICTIONS					
Type II	75 ft.	7 stories	12,000	15,000	18,000	100 %
	55 ft.	5 stories	15,000	18,000	20,000	
	65 ft.	1 story	20,000	25,000	30,000	
Type III	55 ft.	5 stories	12,000	15,000	18,000	100 %
	40 ft.	1 story	18,000	22,500	25,000	
Type IV	no restrictions	1 story	20,000	25,000	30,000	100 %
Type V	38 ft.	3 stories	5,000	6,000	7,000	100 %
	20 ft.	1 story	10,000	12,000	14,000	

Note:—*Increase shall not be permitted unless the area is entirely protected by an automatic sprinkler installation as specified in Chapter 38.

In buildings having rooms with floor areas over thirty thousand (30,000) square feet, tight draft stops shall be installed to prevent a free current of air under the roof. These draft stops in trussed roofs shall extend from the roof down to the bottom chord of the truss and divide the under-roof or attic

Secs. 1102-1109

space into sections not to exceed twenty thousand (20,000) square feet in area.

Sec. 1103. All exterior walls or parts of walls, except on street fronts, of Group F buildings which are less than four (4) feet from adjacent property lines shall be of masonry or reinforced concrete. All openings in exterior walls, except on street fronts, which are less than eight (8) feet from adjacent property lines shall be protected by doors or windows of one-hour fire-resistive construction as specified in Section 4304. When openings are placed closer than three (3) feet to property lines other than street fronts, the sum of the widths of such openings shall constitute not more than twenty-five (25) per cent of the total length of the walls affected. See Section 504 for regulating adjacent buildings on the same property.

Location on Property

Sec. 1104. Stairs and exits shall be provided as specified in Chapter 33.

Stairs and Exits

Smokeproof towers shall be provided as and when specified in Chapter 33.

Sec. 1105. All portions of Group F buildings customarily used by human beings shall be provided with light and ventilation by means of windows and/or skylights with an area not less than one-eighth (1/8) of the total floor area or shall be provided with artificial light and a mechanically operated ventilating system. In no case shall less than four changes of air per hour be provided.

Light, Ventilation and Sanitation

Every building or portion thereof where more than four persons are employed shall be provided with at least one toilet. Every building and each subdivision thereof where both sexes are employed shall be provided with access to at least two toilets either located in such building or conveniently located in a building adjacent thereto.

Sec. 1106. All elevator shafts, vent shafts and other vertical openings shall be enclosed as specified under Types of Construction.

Enclosure of Vertical Openings

Sec. 1107. In any room in which volatile inflammable liquids are used or stored no device generating a glow or flame capable of igniting gasoline vapor shall be installed or used within twenty-four (24) inches of the floor.

Fire Extinguishing Apparatus

Sec. 1108. Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Special Hazards

No storage of volatile inflammable liquids shall be allowed in Group F buildings and the handling and use of gasoline, fuel oil and other inflammable liquids shall not be permitted in any Group F building unless such use and handling complies with the Suggested Fire Prevention Ordinance, Edition of 1930, recommended by the National Board of Fire Underwriters.

Sec. 1109. Roof covering on Type V buildings may be of galvanized iron or sheet metal laid directly on the wood roof framing without solid sheathing.

Exceptions and Deviations

Secs. 1109-1110

Division 3 buildings of Group F more than six (6) stories in height shall have all floors of not less than three-hour fire-resistive construction as specified in Section 4303.

Mixed Occupancies **Sec. 1110.** Separation of Group F occupancies from all other occupancies shall be provided as specified in Section 503.

Secs. 1201-1202

CHAPTER 12

REQUIREMENTS FOR GROUP G BUILDINGS

Sec. 1201. Each Group G occupancy shall be considered as a separate building and the Group shall include non-hazardous industrial and commercial occupancies which create a low fire and life hazard, such as:

Group G Occupancies Defined

Division 1: Ice plants, power plants, pumping plants, cold storage, creameries.

Division 2: Factories and workshops using incombustible and/or non-explosive materials.

Division 3: Storage and sales rooms of incombustible and/or non-explosive materials.

Sec. 1202. Buildings or parts of buildings classed in Group G because of use or the character of the occupancy shall be of Types I, II, III, IV or V Construction and the maximum height and floor areas shall not exceed those specified in the following table.

Construction, Height and Area Allowable

Maximum Allowable Floor Areas as Determined by Height of Building, Street Frontage and Type of Construction

Types of Construction	Maximum Height for Corresponding Areas		Maximum Floor Areas (Sq. Ft.)			
			Building Fronting on			Increase for Complete Sprinkling*
	Feet	Stories	1 street	2 streets	3 or more streets	
Type I	NO RESTRICTIONS					100 %
Type II	75 ft.	7 stories	15,000	18,000	20,000	
	55 ft.	5 stories	20,000	25,000	30,000	
	65 ft.	1 story	UNRESTRICTED			
Type III	55 ft.	5 stories	12,000	15,000	18,000	100 %
	40 ft.	1 story	20,000	25,000	30,000	
Type IV	no restriction	1 story	25,000	30,000	35,000	100 %
Type V	38 ft.	3 stories	10,000	12,500	15,000	100 %
	20 ft.	1 story	12,000	15,000	18,000	

Note:—*Increase shall not be permitted unless the area is entirely protected by an automatic sprinkler installation as specified in Chapter 38.

In buildings having rooms with floor areas of over thirty thousand (30,000) square feet, tight draft stops shall be in-

Secs. 1202-1210

stalled to prevent a free current of air under the roof. These draft stops in trussed roofs shall extend from the room down to the bottom chord of the truss and shall divide the under-roof or attic area into sections not to exceed twenty thousand (20,000) square feet in area.

Location on Property

Sec. 1203. All exterior walls or parts of walls, except on street fronts, of Group G buildings which are less than three (3) feet from adjacent property lines shall be of not less than one-hour fire-resistive construction as specified in Section 4302. When openings are placed closer than three (3) feet to property lines other than street fronts, the sum of the widths of such openings shall constitute not more than twenty-five (25) per cent of the total length of the walls affected. See Section 504 for regulating adjacent buildings on the same property.

Stairs and Exits

Sec. 1204. Stairs and exits shall be provided as specified in Chapter 33.

Smokeproof towers shall be provided as and when required in Chapter 33.

Light, Ventilation and Sanitation

Sec. 1205. All portions of Group G buildings customarily used by human beings shall be provided with light and ventilation.

Every building or portion thereof where more than four persons are employed shall be provided with at least one toilet. Every building and each subdivision thereof where both sexes are employed shall be provided with access to at least two toilets either located in such building or conveniently located in a building adjacent thereto.

Enclosure of Vertical Openings

Sec. 1206. Except as specified in Chapter 33, vertical openings are not required to be enclosed.

Fire Extinguishing Apparatus

Sec. 1207. Automatic sprinklers, standpipes and basement pipe inlets shall be installed as and when specified in Chapter 33.

Special Hazards

Sec. 1208. Chimneys and heating apparatus shall conform to the requirements of Chapter 37. In any room in which volatile inflammable liquids are used or stored, no device generating a glow or flame capable of igniting gasoline vapor shall be installed or used within twenty-four (24) inches of the floor.

The storage, use and handling of gasoline, fuel oil and other inflammable liquids shall not be permitted in any Group G building unless such storage and handling complies with the Suggested Fire Prevention Ordinance, Edition of 1930, recommended by the National Board of Fire Underwriters.

Exceptions and Deviations

Sec. 1209. Roof covering on Type V buildings may be of galvanized iron or sheet metal laid directly on the wood roof framing without solid sheathing. Fireproofing of the under side of all roof framing of Group G buildings may be omitted in all Types of Construction.

Mixed Occupancies

Sec. 1210. Separation of Group G occupancies from all other occupancies shall be provided as specified in Section 503.

Secs. 1301-1303

CHAPTER 13

REQUIREMENTS FOR GROUP H BUILDINGS

Sec. 1301. Each Group H occupancy shall be considered as a separate building and the Group shall include:

**Group H
Occupancies
Defined**

Division 1: Hotels, apartment houses, dormitories, lodging houses.

Division 2: Convents, monasteries, old people's homes (accommodating ten or more persons).

Sec. 1302. Buildings or parts of buildings classed in Group H because of use or the character of the occupancy shall be of Types I, II, III, IV or V Construction and the maximum height and floor areas shall not exceed those specified in the following table.

**Construction,
Height
and Area
Allowable**

Maximum Allowable Floor Areas as Determined by Height of Building, Street Frontage and Type of Construction

Types of Construction	Maximum Height for Corresponding Areas		Maximum Floor Areas (Sq. Ft.)			
			Building Fronting on			Increase for Complete Sprink- ling*
	Feet	Stories	1 street	2 streets	3 or more streets	
Type I	NO RESTRICTIONS					
Type II	75 ft.	7 stories	12,000	15,000	18,000	100 %
	55 ft.	5 stories	15,000	18,000	20,000	
	65 ft.	1 story	20,000	25,000	30,000	
Type III	55 ft.	5 stories	12,000	15,000	18,000	100 %
	40 ft.	1 story	18,000	20,000	22,500	
Type IV	45 ft.	1 story	15,000	18,000	22,500	100 %
Type V	38 ft.	3 stories	6,000	7,000	8,000	100 %
	20 ft.	1 story	8,000	9,000	10,000	

Note:—*Increase shall not be permitted unless the area is entirely protected by an automatic sprinkler installation as specified in Chapter 38.

Sec. 1303. All exterior walls or parts of walls, except on street fronts, of Group H buildings which are less than three (3) feet from adjacent property lines shall be of not less than one-hour fire-resistive construction as specified in Section 4302.

**Location
on
Property**

Secs. 1303-1308

All openings in exterior walls, except on street fronts, which are less than five (5) feet from adjacent property lines shall be protected by doors or windows of one-hour fire-resistive construction as specified in Section 4304. When openings are placed closer than three (3) feet to property lines other than street fronts, the sum of the widths of such openings shall constitute not more than twenty-five (25) per cent of the total length of the walls affected. See Section 504 for regulating adjacent buildings on the same property.

Location of Group H buildings on the property shall meet the requirements of the.....Housing Act of the.....of..... (See Appendix.)

Stairs and Exits

Sec. 1304. Stairs and exits shall be provided as specified in Chapter 33.

Smokeproof towers shall be provided as and when specified in Chapter 33.

All stairs and exits in Group H buildings shall open directly upon a street or alley or upon a yard or court not less than four (4) feet in width directly connected to a street or alley by means of a passageway not less in width than the stairway opening into such passageway and not less than seven (7) feet in height.

Light, Ventilation and Sanitation

Sec. 1305. All rooms of Group H buildings used for eating, living and/or sleeping purposes shall be provided with light and ventilation by means of windows with an area not less than one-eighth ($\frac{1}{8}$) of the total floor area of such room or rooms.

Every building shall be provided with at least one toilet. Every building and each subdivision thereof where both sexes are accommodated shall be provided with at least two toilets located in such building and one such toilet shall be conspicuously marked "For Women" and the other conspicuously marked "For Men." Not less than one toilet shall be provided for each fifteen (15) persons or major fraction thereof that such building is designed to accommodate.

Light, ventilation and sanitation shall be provided as specified by the.....Housing Act of the.....of.....

Enclosure of Vertical Openings

Sec. 1306. All elevator shafts, vent shafts, stairways and other vertical openings shall be enclosed as specified under Types of Construction, except stairways in buildings two (2) stories in height.

Fire Extinguishing Apparatus

Sec. 1307. Automatic sprinklers, standpipes and basement pipe inlets shall be installed as and when specified in Chapter 38.

Special Hazards

Sec. 1308. Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Every boiler room or room containing a central heating plant using solid or liquid fuel shall be separated from the rest of the building by a "Special Fire Separation" as specified in Section 503; except, that in buildings of Type V Construction an "Ordinary Fire Separation" may be used.

Secs. 1308-1310

The storage and handling of gasoline, fuel oil and other inflammable liquids shall not be permitted in any Group H building unless such storage and handling complies with the suggested ordinance Regulating the Use, Handling, Storage and Sale of Flammable Liquids and the Products Thereof, adopted by the National Fire Protection Association, May, 1926. All doors leading into rooms in which volatile inflammable liquids are used or kept shall be of one-hour fire-resistive construction as specified in Section 4304 and shall be kept normally closed.

Sec. 1309. Furnaces may be used without a "Fire Separation" in buildings not more than two (2) stories in height.

Sec. 1310. Separations between Group H occupancies and Mixed all other occupancies shall be provided as specified in Section Occupancies 503.

Secs. 1401-1408

CHAPTER 14 — REQUIREMENTS FOR GROUP I BUILDINGS

Group I Occupancies Defined **Sec. 1401.** Each Group I occupancy shall be considered as a separate building and the Group shall include any buildings or parts of buildings used as dwellings.

Construction, Height and Area Allowable **Sec. 1402.** Buildings or parts of buildings classed in Group I because of use or the character of the occupancy shall be of Types I, II, III, IV or V Construction. The floor areas of Types I and II shall be unlimited, the floor area of Types III and IV shall be limited to ten thousand (10,000) square feet, and the floor area of Type V shall be limited to seventy-five hundred (7500) square feet.

Location on Property **Sec. 1403.** All exterior walls or parts of walls (including windows or doors), except on street fronts, of Group I buildings which are less than three (3) feet from adjacent property lines shall be of not less than one-hour fire-resistive construction as specified in Section 4302. When openings are placed closer than three (3) feet to property lines other than street fronts, the sum of the widths of such openings shall constitute not more than twenty-five (25) per cent of the total length of the walls affected. See Section 504 for regulating adjacent buildings on the same property.

Stairs and Exits **Sec. 1404.** Stairs and exits shall be provided as and when specified in Chapter 33.

Light, Ventilation and Sanitation **Sec. 1405.** All rooms of Group I buildings used for eating, living and/or sleeping purposes shall be provided with light and ventilation by means of windows with an area not less than one-eighth ($\frac{1}{8}$) of the total floor area of such room or rooms.

Light, ventilation and sanitation shall be provided as specified by the.....Housing Act of the.....
of

Enclosure of Vertical Openings **Sec. 1406.** Stairs in Group I buildings need not be enclosed. Dumb-waiter shafts, clothes chutes and other similar vertical openings shall be protected as specified in Section 8003.

Fire Extinguishing Apparatus **Sec. 1407.** Fire extinguishing apparatus when installed shall conform to the requirements of Chapter 38.

Special Hazards **Sec. 1408.** Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Inflammable liquids shall not be stored or used in Group I buildings in quantities in excess of one (1) gallon and all such

Secs. 1408-1410

inflammable liquids shall be kept in tight or sealed containers when not in actual use.

Sec. 1409. Dwellings constructed on the roof of multiple storied buildings shall be considered as an additional story in so far as the construction, location, exposure, stairs, exits and fire extinguishing apparatus is concerned. **Exceptions and Deviations**

Sec. 1410. Separation of Group I occupancies from all other occupancies shall be provided as specified in Section 503. **Mixed Occupancies**

Secs. 1501-1504

CHAPTER 15 — REQUIREMENTS FOR GROUP J BUILDINGS

**Group J
Buildings
Defined**

Sec. 1501. Each Group J building or occupancy shall be considered as a separate building and the Group shall include:

Division 1: Private garages.

Division 2: Accessory buildings and structures such as sheds, fences over six (6) feet high, water tanks, towers.

Division 3: Stadiums, reviewing stands and amusement park structures.

**Construction,
Height
and Area
Allowable**

Sec. 1502. Buildings or parts of buildings classed in Group J because of use or the character of the occupancy shall be of Types I, II, III, IV or V Construction as regulated by the requirements of Chapter 16. The floor area of Types I and II construction shall not be limited, the floor area of Types III and IV shall be limited to ten thousand (10,000) square feet and buildings of Type V construction shall not exceed one thousand (1000) square feet in area and/or two (2) stories in height, except that such restriction of Type V construction shall not apply to stadiums, reviewing stands or amusement park structures of the open skeleton-framed type.

Reviewing stands and amusement park structures shall be designed and constructed in a substantial manner so as to fully withstand all impact loads in addition to the static loads specified in Chapter 23. (See appendix.)

**Location
on
Property**

Sec. 1503. All exterior walls or parts of walls, (including windows or doors), except on street fronts, of Group J buildings which are less than three (3) feet from adjacent property lines shall be of not less than one-hour fire-resistive construction as specified in Section 4302. See Section 504 for regulating adjacent buildings on the same property.

**Stairs, Exits,
Aisles and
Seats**

Sec. 1504. (a) Stairs and exits for amusement park devices shall be provided as specified in Chapter 33 except that stairs and ramps in buildings not exceeding two stories in height need not be enclosed.

(b) Stairs, exits, aisles and seating for stadiums and reviewing stands shall be as follows:

1. Stairs. All stairs shall have a rise of not more than seven and one-half ($7\frac{1}{2}$) inches and a tread of not less than ten (10) inches not including the nosing.

2. Exits. There shall be provided one exit not less than seven (7) feet wide for each two thousand (2000) persons or major fraction thereof which the stadium or reviewing stand is designed to seat. Such exits shall be spaced not more than seventy-five (75) feet apart. Passageways serving such

Secs. 1504-1509

exits shall be not less than seven (7) feet in clear height nor less than seven (7) feet in clear width.

3. Aisles. Aisles not less than three feet six inches (3' 6") in width shall be provided so that there are not more than twenty (20) seats between any seat and an aisle.

4. Seats. Where seats are not spaced or marked off in any stadium or reviewing stand, a distance of eighteen (18) inches along any bench or platform shall constitute one seat in computing the required aisles, stairs and exits. Seats shall be spaced not less than twenty-six (26) inches back to back and where backs are provided for the seats they shall be spaced thirty (30) inches back to back.

Where the space under the stadium or reviewing stand is used for any purpose whatsoever, exits passing through this space shall be separated therefrom by walls, floors and ceilings of not less than one-hour fire-resistive construction.

Sec. 1505. Private garages which are constructed in conjunction with any Group H or I buildings and which have openings into such buildings shall be equipped with fixed louvered or screened openings or exhaust ventilation with exhaust openings located within six (6) inches of the floor. The clear area of the louvered openings or of the openings into the exhaust ducts shall be not less than sixty (60) square inches per car stored in such private garage. Under no circumstances shall a private garage have any opening into a living or sleeping room.

Light and Ventilation

Amusement park structures which have enclosed spaces open to and used by the public shall be provided with light and ventilation, either natural or artificial, sufficient for safe and healthful conditions.

Sec. 1506. Elevator shafts, vent shafts, stair-wells and similar vertical openings shall be enclosed as specified in Chapter 30 when extending through three or more stories.

Enclosure of Vertical Openings

Sec. 1507. Fire extinguishing apparatus shall be installed as and when specified in Chapter 38.

Fire Extinguishing Apparatus

Where more than three automobiles are stored in any private garage there shall be installed not less than one two-and-one-half (2½) gallon chemical extinguisher to each five cars or major fraction thereof.

Sec. 1508. Chimneys and heating apparatus shall conform to the requirements of Chapter 37.

Special Hazards

Inflammable liquids shall not be stored, handled or used in Group J buildings unless such storage or handling shall comply with the Suggested Fire Prevention Ordinance, Edition of 1930, recommended by the National Board of Fire Underwriters.

Sec. 1509. When storage space, termed by this Code a private garage, is designed and provided in any building for the storage of more than ten (10) automobiles, such storage space shall be deemed to be a public garage.

Exceptions and Deviations

Amusement park structures into which the public is ad-

Secs. 1509-1510

mitted, other than those of the open frame type of construction, when more than one story or two hundred (200) square feet in area shall have the exterior walls, bearing partitions and floors of not less than one-hour fire-resistive construction as specified in Chapter 43.

**Mixed
Occupancies**

Sec. 1510. Separation of Group J occupancies from any other occupancies shall be provided as specified in Section 503 and in Section 1509.

PART IV. REQUIREMENTS BASED ON LOCATION IN FIRE ZONES

CHAPTER 16—RESTRICTIONS IN FIRE ZONES

Sec. 1601. For the purpose of this Code, the entire City of is hereby declared to be and is hereby established a Fire District and said Fire District shall be known and designated as Fire Zones One, Two and Three, and shall include such territory or portions of said city as outlined in an ordinance of said City, entitled, "An Ordinance Creating and Establishing Fire Zones in the City of....." Wherever such ordinance creating and establishing fire zones, reference is made to any fire zone, it shall be construed to mean one of the three fire zones designated and referred to in this Chapter. (See Appendix.)

**Fire
Zones
Defined**

Sec. 1602. (a) No building or structure of Type V Construction shall be erected or constructed in or moved into Fire Zone No. 1.

**Restrictions
in Fire Zone
No. 1**

(b) No building or structure of Type IV Construction having an area greater than four hundred (400) square feet shall be erected or constructed in or moved into Fire Zone No. 1.

(c) Any building or structure in Fire Zone No. 1 which is enlarged, altered, raised or built upon to an extent exceeding an expenditure of twenty (20) per cent of the value of such building, shall be made to completely comply with the requirements of a new building in such fire zone.

(d) Any building or structure moved into Fire Zone No. 1 shall comply with all the requirements for new buildings in Fire Zone No. 1.

(e) No building of Type IV Construction in excess of four hundred (400) square feet in area nor any building of Type V Construction already erected in Fire Zone No. 1 shall hereafter be altered, raised, enlarged, added to or moved, except as follows:

(1) Such building may be entirely demolished.

(2) Such building may be moved entirely outside the limits of Fire Zone No. 1.

(3) Changes, alterations and repairs to the interior of such building or to the front facing a public street may be made, provided such changes shall not increase in the opinion of the Building Inspector, the fire hazard of such building.

(4) Roofs of such buildings may be covered only with a "Fire-Retardant" roof as specified in Section 4305.

(f) Temporary buildings such as reviewing stands and other miscellaneous structures conforming to the requirements of this Code, and sheds, canopies or fences used for the pro-

Secs. 1602-1603

tection of the public around and in conjunction with construction work may be erected in Fire Zone No. 1 by special permit from the Building Inspector for a limited period of time and such structures shall be completely removed upon the expiration of the time limit in such permit.

(g) All doors, windows and other openings in exterior walls of all buildings erected in Fire Zone No. 1 shall be protected by doors or windows of one-hour fire-resistive construction as specified in Section 4304.

Exceptions: The provisions of paragraph (g) shall not apply to doors, windows or other openings which face directly upon and are not within fifty (50) feet of the opposite side of a public street or other public place, this distance to be measured at right angles to the plane of the wall in which such openings occur.

The provisions of paragraph (g) shall not apply to openings twenty (20) feet or more from buildings on the same property, or twenty (20) feet or more from adjacent property lines other than street fronts, as regulated by the first exceptions; nor shall such provisions apply to openings in courts which are at least twenty (20) feet in their least dimension. For the purpose of this paragraph the adjacent property line may be considered as the opposite side of adjoining alleys, streets or other public places if such exist.

(h) All buildings of Type III construction erected in Fire Zone No. 1 shall have all partitions and floors of not less than one-hour fire-resistive construction as specified in Chapter 43.

(i) No Group E buildings except public garages or gasoline filling stations shall be constructed or erected in Fire Zone No. 1 and no existing buildings shall be used or occupied in any manner whatsoever by Group E occupancies except as public garages or gasoline filling stations.

(j) A building or structure, which is or may be located partly in one Fire Zone and partly in another, shall be considered to be in the most highly restricted Fire Zone when more than one-third of its total floor area is located in such Zone.

Restrictions in Fire Zone No. 2

Sec.1603. (a) Buildings of Type V Construction erected or constructed in Fire Zone No. 2 shall have all exterior walls of not less than one-hour fire-resistive construction as specified in Section 4302; provided, that when such exterior walls are less than three (3) feet from adjacent property lines or less than six (6) feet from buildings on the same property the exterior walls shall be of masonry or reinforced concrete and in both cases the roofs of such buildings shall be covered with a "Fire Retardant" roofing as specified in Section 4305.

(b) No building of Type IV Construction having an area greater than one thousand (1000) square feet shall be erected or constructed in Fire Zone No. 2.

(c) Any building in Fire Zone No. 2 which is enlarged, altered, raised or built upon to an extent exceeding an expenditure of fifty (50) per cent of the value of such building shall be made to comply with the requirements of a new building in such fire zone.

(d) Any building or structure moved into Fire Zone No. 2

Secs. 1603-1604

shall comply with all the requirements for new buildings in Fire Zone No. 2.

(e) No building of Type IV Construction in excess of one thousand (1000) square feet in area, nor any building of Type V Construction, except as noted in paragraph (a) of this Section, already erected in Fire Zone No. 2 shall hereafter be altered, raised, enlarged, added to or moved except as follows:

- (1) Such building may be entirely demolished.
- (2) Such building may be moved entirely outside the limits of Fire Zone No. 2.
- (3) Such building may be made to conform to the provisions of paragraph (a) of this Section.
- (4) Changes, alterations and repairs to the interior of such building or to the front facing a public street may be made provided such changes do not increase the fire hazard of such building.
- (5), Roofs of such buildings may be covered only with a "Fire-Retardant" roof as specified in Section 4305.

(f) Temporary buildings such as reviewing stands and other miscellaneous structures conforming to the requirements of this Code, and sheds, canopies or fences used for the protection of the public around and in conjunction with construction work may be erected in Fire Zone No. 2 by special permit from the Building Inspector for a limited period of time and such structures shall be completely removed upon the expiration of the time limit in such permit.

(g) No group E buildings except public garages or gasoline filling stations shall be constructed or erected in Fire Zone No. 2 and no existing buildings shall be used or occupied in any manner whatsoever by Group E occupancies except as public garages or gasoline filling stations.

(h) A building which is partly in Fire Zone No. 2 and partly in Fire Zone No. 3 shall conform to all the restrictions of Fire Zone No. 2 if more than one-third of the area of the building is in Fire Zone No. 2.

Sec. 1604. Any building complying with the requirements specified in this Code may be erected or moved into or within Fire Zone No. 3.

**Restrictions
in Fire Zone
No. 3**

PART V.

REQUIREMENTS BASED ON TYPES
OF CONSTRUCTIONCHAPTER 17 — CLASSIFICATION OF ALL BUILDINGS
BY TYPES OF CONSTRUCTION

General

Sec. 1701. The requirements of Part V are the minimum requirements for the various Types of Construction. In order that a building may be classed in any specific Type of Construction, it is necessary that all of the requirements for that Type of Construction be complied with.

No building or portion thereof shall be required to conform to the details of a Type of Construction higher than that Type which meets the minimum requirements based on Occupancy (Part III) or Location in Fire Zone (Part IV) even though certain features of such building actually conform to a higher Type of Construction.

The various Types of Construction herein specified represent varying degrees of public safety and resistance to fire. Where specific materials, types of construction or fire-resistive protection are required, such requirements shall be the minimum requirements and any materials, types of construction or fire-resistive protection which will afford equal or greater public safety or resistance to fire, as specified in this Code, may be used.

Any system or method of construction to be used shall admit of a rational analysis in accordance with well established principles of mechanics.

Classifica-
tion by
Types of
Construction

Sec. 1702. All buildings for the purpose of this Code shall be divided into the following Types of Construction based upon their resistance to fire, and for the purpose of this Code Type I shall be deemed to be the most fire-resistive and Type V the least fire-resistive Type of Construction.

Type I — FIRE-RESISTIVE Construction.

Type II — HEAVY TIMBER Construction.

Type III — ORDINARY MASONRY Construction.

Type IV — METAL FRAME Construction.

Type V — WOOD FRAME Construction.

When two or more types of construction occur in the same building and are not separated by an "Absolute Fire Separation" as specified in Section 503, the entire building shall be classed in the least fire-resistive type of construction and such building shall be subject to the restrictions of such type. Any building erected prior to the passage of this Code, which by its construction cannot be definitely classified as Type I, II, III, IV or V as defined herein, shall for the purpose of this Code be deemed to belong to the least fire-resistive class of the two types to which it most nearly conforms.

CHAPTER 18 — TYPE I BUILDINGS (Fire-Resistive)

Sec. 1801. "Type I" or "Type I Buildings". The structural frame of Type I buildings shall be of structural steel or iron which shall be fireproofed, or shall be of reinforced concrete. The foundation, exterior walls, inner court walls and walls enclosing vertical openings, shall be of masonry or reinforced concrete. The roof construction and floors shall be of fire-resistive materials. Exterior doors and windows, except as specified in Section 1813 shall be of fire-resistive construction. (Note: Fire-resistive materials and fire-resistive construction have a specific meaning in this Code, as specified in Chapters 42 and 43.)

Definition

Sec. 1802. The height of Type I buildings shall not be limited. (See Appendix.)

Height Allowable

Sec. 1803. The floor area of Type I buildings shall not be limited.

Area Allowable

Sec. 1804. Foundation walls and footings shall be of solid masonry as specified in Chapter 29 or of reinforced concrete as specified in Chapters 26 and 29, and shall be designed as specified in Sections 2306 and 2802.

Foundations

Sec. 1805. All exterior walls, fire walls and fire division walls shall be of masonry or reinforced concrete as specified in Chapter 29 and shall be of not less than four-hour fire-resistive construction as specified in Section 4302.

Exterior and Inner Court Walls

Inner court walls shall be of masonry or reinforced concrete of not less than three-hour fire-resistive construction as specified in Section 4302.

Walls fronting on streets having a width of at least fifty (50) feet in Fire Zone No. 1, or thirty (30) feet in Fire Zones No. 2 and 3, may be of incombustible construction with all structural members fire-proofed as required in Section 1809.

Sec. 1806. Interior partitions shall be constructed of incombustible materials and shall be of not less than one-hour fire-resistive construction as specified in Section 4302.

Partitions

Exceptions: Partitions dividing portions of stores, offices or similar places occupied by one tenant only may be constructed of wood panels or similar light construction up to three-fourths (3/4) the height of the room in which placed; when more than three-fourths (3/4) the height of the room, such partitions shall have not less than the upper one-fourth (1/4) of the partition constructed of glass set in sash.

Sec. 1807. Enclosures for elevator shafts, vent shafts, stair wells and other vertical openings, when required because of Occupancy in Part III shall be of two-hour fire-resistive construction and all openings therein shall be protected by fire-resistive doors or windows as specified in Chapters 30 and 43.

Enclosure of Vertical Openings

A parapet wall or hand rail at least thirty (30) inches in height above the roof shall be provided around all open shaft enclosures extending through the roof.

Structural Framework

Sec. 1808. Structural framework shall be of structural steel

Secs. 1808-1809

or iron as specified in Chapter 27 or shall be of reinforced concrete as specified in Chapter 26.

The structural frame shall be considered as the columns, and all girders, beams, trusses or spandrels having rigid connections to the columns. The members of floor or roof panels which have no connection to the columns, shall be considered secondary members. The structural frame and secondary members shall be designed and constructed to carry all dead, live and other loads to which they may be subjected both during erection and after completion of the structure. Unless otherwise provided for in the structural frame the floor and roof panel construction shall be designed and constructed to carry the horizontal forces to such parts of the structural frame as are designed to carry the horizontal forces to the foundations.

The entire structural frame and each member which is a part of such frame shall be so designed and constructed that the stresses may be satisfactorily determined by a rational analysis in accordance with well established principles of mechanics and sound engineering practice.

**Fireproof-
ing of
Structural
Members**

Sec. 1809. (a) All structural steel or iron members, not including forms or structural members for elevators and elevator enclosures, shall be thoroughly fire-proofed with not less than four-hour fire-resistive protection for columns, beams and girders and three-hour fire-resistive protection for floors, for all buildings more than eight (8) stories or eighty-five (85) feet in height; and with three-hour fire-resistive protection for columns, beams and girders and two-hour fire-resistive protection for floors for all buildings which are eight (8) stories or eighty-five (85) feet or less in height; and all such fire-resistive protection shall be as specified in Chapter 43.

Exceptions: (1) The thickness of the fireproofing on the outer edge of lugs or brackets on columns may be reduced to not less than one (1) inch.

(2) The masonry over window openings may be supported by a steel plate, angle or similar member which is not fireproofed on the under side, provided the member is supported at proper intervals from a structural beam or girder which is fireproofed on all sides. For openings in masonry bearing walls not exceeding four (4) feet in width, an angle or similar member supported by masonry and not fireproofed on the under side may be used.

(3) Where every part of the structural steel framework of the roof of a Group A, B or C building is not less than twenty-five (25) feet above any floor or balcony, fireproofing of all members of the roof construction may be omitted.

(4) Where every part of the structural steel framework of the roof of a Group A, B or C building is more than eighteen (18) feet and less than twenty-five (25) feet above any floor or balcony the roof construction shall be protected by a suspended ceiling of not less than one-hour fire-resistive construction as specified in Chapter 43, and such ceiling shall be not less than six (6) inches distant from any part of such roof construction.

(b) All reinforced concrete columns, beams and girders

Secs. 1809-1813

shall be thoroughly fireproofed with four-hour fire-resistive protection and all floors, joists and slabs shall be thoroughly fireproofed with not less than three-hour fire-resistive protection for all buildings more than eight (8) stories or eighty-five (85) feet in height; and all reinforced concrete columns, beams and girders shall be thoroughly fireproofed with not less than three-hour fire-resistive protection and all floors, joists and slabs shall be thoroughly fireproofed with not less than two-hour fire-resistive protection for all buildings which are eight (8) stories or eighty-five (85) feet or less in height; and all such fire-resistive protection shall be as specified in Chapter 43.

Sec. 1810. Floors shall be constructed of reinforced concrete, brick or hollow tile arches, reinforced gypsum or may be composite floors of those materials in combination with structural steel or iron or reinforced concrete or such floor panel construction shall consist of any floor system providing not less than two-hour fire-resistive construction as specified in Section 4303 for buildings which are eight (8) stories or eighty-five (85) feet or less in height and providing not less than three-hour fire-resistive construction as specified in Section 4303 for all buildings more than eight (8) stories or eighty-five (85) feet in height.

Floor Construction

The type of floor construction used shall provide means to keep the beams and girders from spreading, either by installing ties or bridging, with no laterally unsupported length of joists being permitted to exceed eight (8) feet except as otherwise provided in Sections 3102 and 3103. The floor and roof panel construction shall be so designed and constructed as to transfer horizontal forces to such parts of the structural frame as are designed to carry the horizontal forces to the foundations.

Where wood sleepers are used for laying wood floors the space between the floor slab and the underside of the wood flooring shall be filled with incombustible material in such a manner that there will be no open spaces under the flooring which will exceed one hundred (100) square feet in area and such space shall be filled solidly under all partitions so that there is no communication under the flooring between adjoining rooms.

Sec. 1811. Roofs shall be constructed of any materials or combination of materials as allowed for floors in Section 1810.

Roof Construction

Roof Covering shall be a "Fire-Retardant" roofing as specified in Section 4305.

Any drainage fill placed on a roof deck of any building shall be an incombustible material and such fill shall be considered as a part of the dead load in designing the roof framing.

Sec. 1812. Stairs and stair platforms shall be constructed of reinforced concrete, iron or steel with treads and risers of concrete, iron or steel. Brick, marble, tile or other hard incombustible materials may be used for the finish of such treads and risers.

Stairs

All stairs shall be designed and constructed as specified in Chapter 33 and as specified under Occupancy in Part III.

Doors and Windows

Sec. 1813. (a) Doors, windows and other openings in the

Secs. 1813-1816

exterior walls shall be protected by one-hour fire-resistive construction as specified in Section 4304.

Exceptions: (1) The provisions of this Section shall not apply to doors, windows and other openings which face directly upon, and are not within fifty (50) feet in Fire Zone No. 1 or are not within thirty (30) feet in Fire Zones No. 2, and 3, of the opposite side of a public street or other public place, this distance to be measured at right angles to the plane of the wall in which such openings occur.

(2) The provisions of paragraph (a) of this Section shall not apply to openings in an outer court twenty (20) feet or more in width parallel to and facing upon a street or public place, provided such openings are not within twenty (20) feet of an adjacent property line.

**Projections
from the
Building**

Sec. 1814. Bays, oriels and similar projections shall be constructed of incombustible materials with walls, floors and roofs as specified in this Chapter and as specified in Chapter 35.

Porches and exterior balconies shall be constructed of incombustible materials but structural steel or iron members need not be fireproofed; provided, that loading platforms for warehouses, freight depots and similar buildings may be of heavy timber construction with wood floors not less than one and five-eighths (1 5/8) inches thick. Such wood construction shall not be carried through the exterior walls of any Type I building.

Cornices, marquises and similar appendages which are a part of a Type I building shall be constructed of substantial incombustible materials and as specified in Chapter 45.

**Penthouses
and Sky-
lights**

Sec. 1815. Penthouses and other roof structures shall be constructed of masonry or reinforced concrete, and all doors, windows and other openings therein shall be protected by one-hour fire-resistive construction or shall have one-hour fire-resistive windows as specified in Chapters 36 and 43.

Skylights shall be constructed of one-hour fire-resistive materials as specified in Chapter 43 and in Section 3402.

**Combustible
Materials
Regulated**

Sec. 1816. Wood or unprotected steel or iron shall be permitted in the following places:

(1) Mezzanine floors may be of wood or unprotected steel provided that there shall be not more than two such mezzanines in any room of any building and provided, further, that no such mezzanine floor or floors shall cover more than thirty-three and one-third (33 1/3) per cent of the area in the room where located. Such mezzanine floors constructed in Fire Zone No. 1 shall be of heavy timber construction as specified for floor construction in Type II buildings.

(2) Show window frames and aprons, also show cases and other appurtenances on the first floors of stores or other similar buildings may be of wood with or without unprotected steel or iron.

.. Sec. 1816

(3) Trim, picture molds, chair rails, wainscoting, baseboards, hand rails, show window backing, temporary partitions, floors, and sleepers may be of wood. Wood doors may be used except in stair, elevator or other shaft enclosures or where specifically prohibited under Occupancy in Part III.

(4) Roofs may be sheathed by wood planks of two and one-half (2 1/2) inch nominal thickness when such sheathing is more than thirty (30) feet distant from any floor, balcony or gallery and when such plank sheathing is protected on the underside by a ceiling of not less than one-hour fire-resistive construction as specified in Section 4301.

Secs. 1901-1905

CHAPTER 19 — TYPE II BUILDINGS

(Heavy Timber Construction)

Definition	Sec. 1901. "Type II" or "Type II Buildings". The structural frame shall be of structural steel or iron which shall be fire-proofed, of reinforced concrete, of masonry or of heavy timbers, provided, that in buildings not exceeding one story and sixty-five (65) feet in height the structural steel or iron may have the fire-proofing omitted. Foundations and exterior walls shall be of masonry or reinforced concrete. Inner court walls shall be of masonry or reinforced concrete of not less than one-hour fire-resistive construction, or of protected solid wood. Roof construction shall be of wood, or incombustible materials. Floors and non-bearing partitions shall be of wood or incombustible materials.
Height Allowable	Sec. 1902. Type II buildings shall not exceed a height of seventy-five (75) feet in which height there shall be not more than seven (7) stories; provided, that the height of a building erected on sloping ground may be not to exceed seventy-five (75) feet plus a vertical distance equal to the vertical change in slope along the length of any side of such building but in no case shall such height exceed eighty-five (85) feet above the adjacent finished ground level; provided, further, that no one-story building shall exceed a height of sixty-five (65) feet. Towers, spires and steeples erected as a part of the building and not used for habitation or storage may extend not to exceed twenty (20) feet above such height limit.
Area Allowable	Sec. 1903. The floor area of a Type II building shall be limited according to Occupancy as specified in Part III of this Code.
Foundations	Sec. 1904. Foundation walls and footings shall be of solid masonry as specified in Chapter 29 or of reinforced concrete as specified in Chapters 26 and 29, and shall be designed as specified in Sections 2306 and 2802.
Exterior and Inner Court Walls	Sec. 1905. All exterior walls, fire walls and fire division walls shall be of masonry or reinforced concrete as specified in Chapter 29 and shall be of not less than four-hour fire-resistive construction as specified in Section 4302. All walls within five (5) feet of adjacent property lines (excepting property lines abutting a street or an alley) and all walls within ten (10) feet of other buildings on the same property shall be provided with a parapet wall at least thirty (30) inches high above the roof at all points, provided that parapet walls need not be constructed on buildings twenty (20) feet or less in height or where the roof slopes more than twenty (20) degrees from the horizontal back from the exterior wall of such building. Walls fronting on streets having a width of at least fifty (50) feet in Fire Zone No. 1, or thirty (30) feet in Fire Zones N. 2 and 3, may be of incombustible construction with all structural members fire-proofed as required in Sec. 1909. Inner court walls shall be constructed the same as exterior walls or shall be of not less than four-inch solid wood laminated construction protected on the weather side thereof by incombustible fire-resistive materials as provided in Section 4202.

Secs. 1906-1909

Sec. 1906. Interior partitions shall be of one-hour fire-resistive construction as specified in Section 4302 or may be of solid wood construction formed of two layers of one-inch nominal matched boards or of two-inch nominal tongued and grooved wood planking or of solid wood laminated construction not less than three and five-eighths (3 5/8) inches thick.

Partitions

Where wood partitions abutt or adjoin masonry walls they shall be tied as specified in Section 2507.

Temporary partitions as specified in Section 1806 may be used.

Sec. 1907. Enclosures for elevator shafts, vent shafts, stair wells and other vertical openings shall be of two-hour fire-resistive construction as specified in Chapters 30 and 43; provided, that in buildings not more than three (3) stories in height which are completely sprinkled as specified in Chapter 38 such enclosure walls may be of any construction permitted for interior partitions.

Enclosure of Vertical Openings

A parapet wall or hand rail at least thirty (30) inches in height above the roof shall be provided around all open shaft enclosures extending through the roof.

Sec. 1908. The structural frame shall be of reinforced concrete, as provided in Chapter 26, structural steel as provided in Chapter 27, or of solid wood construction as specified in Chapter 25.

Structural Framework

All wood columns in such structural frame shall be directly superimposed, one above the other, (no girders or bolsters between columns) and shall be provided with steel or cast iron caps or pintles which shall be self-releasing wherever any horizontal members are framed into such columns. No wood column shall be less than eight (8) inches nominal in its least dimension and no beam, girder or joist shall be less than six (6) inches nominal in its least dimension nor less than forty-eight (48) square inches nominal in cross-sectional area. In no case shall masonry or reinforced concrete be supported on wood construction, except tile or concrete floor finishes not more than three (3) inches in thickness.

Sec. 1909. (a) All structural steel or iron members (not including frames and structural members for elevators and elevator enclosures) shall be thoroughly fireproofed. Such fireproofing shall be of three-hour fire-resistive protection for columns, and two-hour fire-resistive protection for beams, girders and floor systems, and all fireproofing shall be determined as specified in Chapter 43; provided, that such fireproofing may be omitted when the building does not exceed a height of one story and sixty-five (65) feet.

Fireproofing of Structural Members

Exceptions: (1) The thickness of the fireproofing on the outer edge of lugs or brackets on columns may be reduced to not less than one (1) inch.

(2) The masonry over window openings may be supported by a steel plate, angle or similar member which is not fireproofed on the under side, provided the member is supported at proper intervals from a structural beam or

Secs. 1909-1911

girder which is fireproofed on all sides. For openings in masonry bearing walls not exceeding four (4) feet in width, an angle or similar member supported by masonry and not fireproofed on the under side may be used.

(3) Where the structural steel framework of the roof of a Group A, B or C building is not less than twenty-five (25) feet above any floor or balcony, fireproofing of all members of the roof construction may be omitted.

(4) Where the structural steel framework of the roof of a Group A, B or C building is more than eighteen (18) feet and less than twenty-five (25) feet above any floor or balcony the roof construction shall be protected by a suspended ceiling of not less than two-hour fire-resistive construction as specified in Chapter 43, and such ceiling shall be not less than six (6) inches distant from any part of such roof construction.

(b) Wood structural members shall not be required to be fireproofed.

(c) All reinforced concrete columns shall be thoroughly fireproofed with not less than three-hour fire-resistive protection and all joists, beams, girders and slabs shall be thoroughly fireproofed with not less than two-hour fire-resistive protection outside of all steel reinforcing as specified in Section 4301.

**Floor
Construc-
tion**

Sec. 1910. Floor construction shall be as specified for Type I buildings or shall be of one of the types noted below:

(1) Floor construction shall be of tongued and grooved or splined lumber not less than three (3) inches nominal in thickness with a top layer of flooring of one (1) inch nominal in thickness laid thereon.

(2) Construction of solid lumber placed on edge and securely spiked together to make a floor not less than four (4) inches nominal in thickness.

If such floor is six (6) inches nominal or more in thickness the lumber shall be air seasoned or kiln dried.

A space of one-half (1/2) inch shall be required between all floor construction and the wall which it adjoins, to allow for swelling in case the floor becomes wet. This space shall be properly covered by a molding so arranged that it will not interfere with the swelling and shrinking movements of the flooring.

Wood joists, beams and girders supported by masonry walls shall be anchored thereto as specified in Section 2506.

The timbers and planking shall be self-releasing at end support on walls and no planking or timber shall extend through or across any fire, party or division walls.

**Roof Con-
struction**

Sec. 1911. Roof construction shall be as specified for floor construction in Section 1910 except that the minimum allowable thickness shall be two and one-half (2 1/2) inches nominal, the timbers and planking shall be self-releasing at end support on walls and no planking or timber shall extend across or through fire, party or division walls. Wood joists, beams, girders and rafters supported by masonry walls shall be anchored thereto as provided in Section 2508.

Secs. 1911-1916

Roof covering shall be a "Fire-Retardant" roofing as specified in Section 4305 and shall be required over all combustible roof construction.

Sec. 1912. Stair construction may be of wood in buildings not exceeding three (3) stories in height.

**Stair
Construc-
tion**

In buildings four (4) or more stories in height all stairs and stair construction shall be as required for Type I buildings.

All stairs and exits shall be designed and constructed as specified in Chapter 33 and as specified under Occupancy in Part III.

Sec. 1913. (a) Doors, windows and other openings in the exterior walls shall be protected by one-hour fire-resistive construction as specified in Section 4304.

**Doors
and
Windows**

Exceptions: (1) The provisions of this Section shall not apply to doors, windows and other openings which face directly upon, and are not within fifty (50) feet in Fire Zone No. 1 or are not within thirty (30) feet in Fire Zones No. 2, 3 and 4, of the opposite side of a public street or other public place, this distance to be measured at right angles to the plane of the wall in which such openings occur.

(2) The provisions of paragraph (a) shall not apply to openings in an outer court twenty (20) feet or more in width parallel to and facing upon a street or public place, provided such openings are not within twenty (20) feet of an adjacent property line.

Sec. 1914. Bays, oriels and similar projections shall be constructed of incombustible materials with walls, floors and roof as specified in this Chapter and in Chapter 35.

**Projections
from the
Building**

Porches and exterior balconies shall be constructed of incombustible materials but structural steel or iron members need not be fireproofed; provided, that loading platforms for warehouses, freight depots and other similar buildings may be of heavy timber construction with wood floors not less than one and five-eighths (1 5/8) inches thick. Such wood construction shall not be carried through the exterior walls of any Type II building.

Cornices, marquises and similar appendages which are a part of a Type II building shall be constructed of substantial incombustible materials and as specified in Chapter 45.

Sec. 1915. Penthouses shall be as required for Type I construction or shall be constructed with two-hour fire-resistive construction as specified in Chapters 36 and 43.

**Penthouses
and Sky-
lights**

Skylights shall be of one-hour fire-resistive construction as specified in Chapters 34 and 43.

Sec. 1916. No wood lath or wood furring shall be allowed in any building of Type II Construction, but unprotected steel or iron or wood will be allowed in the following places:

**Combustible
Materials
Regulated**

(1) Mezzanine floors may be of wood or unprotected steel, provided that there shall be not more than two such mezzanines in any room of any building, and provided, further, that no

Sec. 1916

such mezzanine floor or floors shall cover more than thirty-three and one-third ($33 \frac{1}{3}$) per cent of the area in the room where located.

(2) Show window frames and aprons, also show cases and other appurtenances on the first floors of stores and other similar buildings may be of wood, with or without unprotected steel or iron.

(3) Trim, hand rails, show window backing and temporary partitions as specified in Section 1906, picture molds, chair rails and wainscoting or baseboards may be of wood. Wood doors may be used, except in stair, elevator and other shaft enclosures, or where specifically prohibited under Occupancy in Part III.

CHAPTER 20—TYPE III BUILDINGS (Ordinary Masonry)

Sec. 2001. "Type III" or "Type III Buildings." The interior load bearing construction may be masonry or reinforced concrete walls or a structural frame of steel, reinforced concrete or wood. Foundations and exterior walls shall be of masonry or reinforced concrete. Partitions, floors and roof framing may be of wood.

Definition

Sec. 2002. Type III buildings shall not exceed a height of fifty-five (55) feet in which height there shall be not more than five (5) stories; provided, that the height of a building erected on sloping ground may be fifty-five (55) feet plus a vertical distance equal to the vertical change in slope along and in the length of any side of such building but in no case shall such height exceed sixty-five (65) feet above the adjacent finished ground level; and provided, further, that towers, spires and steeples erected as a part of such building and not used for habitation or storage may extend not to exceed fifteen (15) feet above such height limit.

Height Allowable

Sec. 2003. The floor area of Type III buildings shall be limited according to Occupancy as specified in Part III.

Area Allowable

Sec. 2004. Foundation walls and footings shall be of solid masonry as specified in Chapter 29 or of reinforced concrete as specified in Chapters 26 and 29, and shall be designed as specified in Sections 2306 and 2802.

Foundations

Sec. 2005. All exterior walls, fire walls and fire division walls shall be of masonry or reinforced concrete as specified in Chapter 29 and shall be of not less than four-hour fire-resistive construction as specified in Section 4302.

Exterior and Inner Court Walls

Inner court walls and all other walls not forming the exterior walls of the building may be constructed as required for Type I or Type II buildings, or shall be of not less than one-hour fire-resistive construction as specified in Chapter 43.

All walls within five (5) feet of adjacent property lines (except property lines abutting a street or alley) and all walls within ten (10) feet of other buildings on the same property shall be provided with parapet walls at least thirty (30) inches high above the roof at all points; provided, that parapet walls need not be constructed on buildings twenty (20) feet or less in height or where the roof slopes more than twenty (20) degrees from the horizontal back from the exterior wall of such building.

Exceptions:

Walls fronting on streets having a width of at least fifty (50) feet in Fire Zone No. 1 or thirty (30) feet in Fire Zones No. 2 and 3, may be of incombustible construction with all structural members fire-proofed with not less than one-hour fire-resistive protection. Such wall assemblies shall have at least a one-hour fire-resistive rating except when the space between the roof and a plastered ceiling is less than three (3) feet, the part of the wall covering this space need not be plastered on the inside.

Secs. 2006-2011

Partitions

Sec. 2006. Partitions of wood shall be constructed as required in Chapter 25. In buildings of four (4) stories or more in height all partitions shall be of one-hour fire-resistive construction as specified in Section 4302. Bearing partitions, when constructed of wood, shall not support more than two (2) stories and a roof.

Exceptions: Partitions dividing portions of stores, offices or similar places occupied by one tenant only may be constructed of wood panels or similar light construction up to three-fourths ($3/4$) of the height of the room in which placed; when more than three-fourths ($3/4$) the height of the room, such partitions shall have not less than the upper one-fourth ($1/4$) of the partition constructed of glass set in sash.

Enclosure of Vertical Openings

Sec. 2007. Enclosures for elevator shafts, vent shafts, stair wells and other vertical openings when required because of Occupancy in Part III shall be of one-hour fire-resistive construction as specified in Chapters 30 and 43.

A parapet wall or hand rail at least thirty (30) inches in height above the roof shall be provided around all open shaft enclosures extending through the roof.

Structural Framework

Sec. 2008. Structural framework shall be of steel, iron, reinforced concrete, masonry or wood and shall be designed and erected as specified in Chapter 26 for reinforced concrete, Chapter 27 for steel and iron, Chapters 22 and 25 for wood and Chapters 24 and 29 for masonry.

Fireproofing Structural Members

Sec. 2009. Fireproofing of steel, iron or wood structural members may be omitted unless otherwise provided because of Location as in Part IV or Occupancy as in Part III, or as specified in Section 2010.

Exception:

Except on steel, other than exterior lintels supporting masonry in which case the members shall be protected with not less than one-hour fire-resistive protection.

Floor Construction

Sec. 2010. Floors may be constructed of reinforced concrete as specified in Chapter 26, of masonry as specified in Chapter 24, of wood as specified in Chapter 25, or of steel or iron as specified in Chapter 27.

In buildings of four (4) stories or more in height the lower side of all metal or wood floor or roof construction shall be entirely protected by a ceiling of one-hour fire-resistive construction as specified in Chapter 43.

In all buildings having a cellar or basement, except Group I buildings, the under side of the first floor construction when of metal or wood shall be protected by a ceiling of one hour fire-resistive construction as specified in Chapter 43.

Wood joists, beams and/or girders supported by masonry walls shall be anchored thereto as specified in Section 2506.

Roof Construction

Sec. 2011. Roof construction shall be of any Type of Construction permitted for floors except in buildings four (4) stories

Secs. 2011-2016

or more in height as specified in Section 2010 and except where otherwise required because of Occupancy in Part III.

Wood rafters, joists, purlins, beams and girders supported by masonry walls shall be anchored thereto as specified in Section 2508.

Attic or roof spaces shall be divided into areas not exceeding twenty-five hundred (2500) square feet as specified in Section 2510.

Roof covering shall be a "Fire-Retardant" roofing as specified in Section 4305.

Sec. 2012. Stairs may be of steel, iron, reinforced concrete, masonry or wood and shall be designed and constructed as specified in Chapter 33, and as specified under Occupancy in Part III. **Stair Construction**

Sec. 2013. Doors, windows and other openings in exterior walls may be of wood or of plain glass and wood sash unless otherwise specified under Occupancy in Part III or Location in Part IV. **Doors and Windows**

Sec. 2014. Bays, oriels and similar projections shall be constructed of incombustible materials with walls, floors and roof as specified in this Chapter and in Chapter 35. **Projections from the Building**

Porches and exterior balconies shall be constructed of incombustible materials but structural steel or iron members need not be fireproofed; provided that loading platforms for warehouses, freight depots and similar buildings may be of heavy timber construction with wood floors not less than one and five-eighths (1 5/8) inches thick. Such wood construction shall not be carried through the exterior walls of any Type III building.

Cornices, marquises and similar appendages which are a part of a Type III building shall be constructed of substantial incombustible materials and as specified in Chapter 45.

Sec. 2015. Penthouses and other roof structures shall be of not less than one-hour fire-resistive construction as specified in Chapters 36 and 43. **Penthouses and Skylights**

Skylights shall be of not less than one-hour fire-resistive construction as specified in Chapters 34 and 43.

Sec. 2016. Wood shall be permitted in a building of Type III Construction except where specifically prohibited as specified under Occupancy in Part III or Location in Part IV. **Combustible Materials Regulated**

No enclosed air space in any vertical wood framing shall have a dimension greater than seven (7) feet.

Combustible insulating materials may be placed in the partition, floor or roof framing but shall in no way interfere with the fire blocking or fire separations required by this Code.

Secs. 2101-2111

CHAPTER 21 — TYPE IV BUILDINGS

(Metal Frame)

Definition	Sec. 2101. "Type IV" or "Type IV Buildings." The structural framework shall be of steel, iron, masonry or reinforced concrete and the exterior walls and roof shall be of metal or other incombustible materials. Foundations shall be of masonry or reinforced concrete. Partitions and floor construction shall be as specified in this Chapter.
Height Allowable	Sec. 2102. Type IV buildings shall not exceed a height of forty-five (45) feet, except as provided in Sections 802, 1102 and 1202. There shall be not more than one (1) story and a mezzanine floor in the height of a Type IV building, except as provided in Section 802. The height of a Type IV building erected on sloping ground, if limited to forty-five (45) feet, may be forty-five (45) feet plus a vertical distance equal to the vertical change of slope along and in the length of any side of such building; but at no point shall such height exceed fifty-five (55) feet above the adjacent finished ground level. Towers, spires and steeples erected as part of the building and not used for habitation or storage may extend not to exceed ten (10) feet above such height limit.
Area Allowable	Sec. 2103. The floor area of a Type IV building shall be limited as specified under Occupancy in Part III and Location in Part IV.
Foundations	Sec. 2104. Foundation walls and footings shall be of masonry as specified in Chapter 29 or of reinforced concrete as specified in Chapters 26 and 29, and shall be designed as specified in Sections 2306 and 2802.
Exterior Walls	Sec. 2105. Exterior walls shall be of galvanized iron or other non-corrodible metal of not less than twenty-six (26) gauge or shall be of incombustible materials.
Partitions	Sec. 2106. Interior partitions shall be of metal or other incombustible materials.
Enclosure of Vertical Openings	Sec. 2107. No restrictions.
Structural Framework	Sec. 2108. The structural framework shall be of steel or iron as specified in Chapter 27, or masonry as specified in Chapters 24 and 29 or of reinforced concrete as specified in Chapter 26.
Fireproofing Structural Members	Sec. 2109. Fireproofing of structural members shall not be required.
Floor Construction	Sec. 2110. The floors shall be of any type of construction permitted in Type III buildings or may be of wood blocks or of any incombustible material.
Roof Construction	Sec. 2111. Roof construction shall be entirely of metal or other incombustible materials provided that wood purlins not

Secs. 2111-2116

less than four (4) inches nominal in least dimension may be used to support metal roof covering.

Roof covering shall be of a non-corrodible metal or may be a "Fire-Retardant" roofing as specified in Section 4305.

Sec. 2112. Stairs shall be of steel, iron, reinforced concrete, masonry or wood and shall comply with the requirements of Chapter 33. **Stair Construction**

Sec. 2113. Openings in exterior walls shall be protected by doors, windows or shutters of metal or of metal frame, metal sash and wire glass; provided that such protection may be omitted when such openings are sixteen (16) feet or more from the opposite side of any street, alley or public place, from an adjoining building or from adjacent property lines. **Doors and Windows**

Sec. 2114. Porches, cornices, marquees, canopies and all other similar projections from the building shall be of metal or incombustible materials, except that a loading platform may be constructed of wood. **Projections from the Building**

Sec. 2115. Penthouses and other roof structures shall be constructed entirely of incombustible materials except that roofs of such structures may be constructed as specified in Section 2111. **Penthouses and Skylights**

Skylights shall be of one-hour fire-resistive construction as specified in Chapters 34 and 43.

Sec. 2116. The inner side of walls and under side of roof shall not be ceiled with wood or wood lath and plaster but may be ceiled with any incombustible material. **Combustible Materials Regulated**

Secs. 2201-2204

CHAPTER 22 — TYPE V BUILDINGS
(Wood Frame)

Definition Sec. 2201. "Type V" or "Type V Buildings". Enclosing walls, interior walls, partitions, floors and roofs shall be of wood or of wood in combination with other materials except where prohibited as specified under Occupancy in Part III. Any buildings which cannot be classed as a Type I, II, III or IV building shall be considered to be of Type V.

Height Allowable Sec. 2202. Type V buildings shall not exceed a height of thirty-five (35) feet in which height there shall be not more than three (3) stories; provided, that the height of a building erected on sloping ground may be thirty-five (35) feet plus a vertical distance equal to the vertical change in slope along and in the length of any side of such building but in no case shall such height exceed forty-five (45) feet above the adjacent finished ground level; provided, further, that spires, towers or steeples erected as a part of such building and not used for habitation or storage may extend not to exceed ten (10) feet above such height limit.

Area Allowable Sec. 2203. The maximum floor area allowable for a Type V building shall in no case exceed that specified under Occupancy in Part III or Location in Part IV.

Foundations Sec. 2204. All exterior walls of Type V buildings shall be supported on continuous masonry or reinforced concrete walls or footings and shall be of sufficient size to safely support the loads imposed as determined from the character of the soil. Masonry foundation walls shall extend at least six (6) inches above the finished grade adjacent to the exterior wall at all points. Mudsills shall be bolted to the foundation with not less than one-half ($\frac{1}{2}$) inch bolts, embedded at least seven (7) inches into the masonry and spaced not more than six (6) feet apart.

(See appendix for table of footing dimensions for Type V building.)

Exceptions: (1) For Type V buildings (except Group I buildings) of post and girder construction continuous walls or footings shall not be required.

(2) A one (1) story building, except a Group I building which does not exceed four hundred (400) square feet in area, may be constructed without a masonry or reinforced concrete foundation, providing such building is placed on an all-heart redwood, cedar or cypress, or on a creosoted wood mudsill.

Foundations for all buildings where the surface of the ground slopes more than one (1) foot in ten (10) feet shall be level or shall be stepped so that both top and bottom of such foundation shall be level.

Foundation walls used as retaining walls and all retaining walls shall be not less than eight (8) inches in thickness when five (5) feet or less in height. Such walls when more than five (5) feet in height shall be not less than eight (8) inches in thickness at the top and shall be increased one (1) inch in thickness for every additional foot in height.

Secs. 2204-2205

Foundations of Type V buildings may be of piles, constructed as provided in Chapter 28.

Screened openings through foundation walls or exterior walls shall be provided for cross ventilation under the first floor on the basis of two (2) square feet for each twenty-five (25) lineal feet or major fraction thereof of exterior wall, except that such openings need not be placed in the front of such building. The screen for covering such openings shall have a maximum of one-half ($\frac{1}{2}$) inch mesh and shall be galvanized. (See Appendix.)

Sec. 2205. Exterior walls of all Type V buildings having a floor area of four hundred (400) square feet or more shall be constructed with studding not less than two inches by four inches (2"x 4") spaced not more than sixteen (16) inches on centers, or such walls may be constructed of not less than four inch by four inch (4"x 4") posts spaced not more than five (5) feet on centers or of larger members designed as specified in Chapter 25, or may be of post and beam framing with plank sheathing not less than one and one-half ($1\frac{1}{2}$) inches thick or may be of laminated construction not less than four (4) inches nominal in thickness with the structural assembly properly designed to support all loads.

Exterior Walls and Wall Coverings

Buildings three (3) stories in height shall have the first story studs not less than two inches by six inches (2"x 6") spaced not more than sixteen (16) inches on centers.

Where studs continue through more than one (1) story, joists shall be nailed securely to the studs and shall be supported upon a one inch by three inch (1"x 3") ribbon notched into the studs and securely nailed thereto. Where stories are framed separately, each tier of studding shall have top and bottom plates and the top plates shall be doubled and lapped at all corners and intersections. Laps in separate pieces of the top plate shall be staggered not less than two (2) feet.

All exterior walls and partitions shall be thoroughly and effectively angle braced.

Maximum allowable height of two inch by four inch (2"x 4") stud framing shall be fourteen (14) feet and of two inch by six inch (2"x 6") stud framing shall be twenty (20) feet unless the wall is supported laterally by adequate framing in a horizontal direction, perpendicular to the direction of the stud wall.

All walls shall be effectively fire stopped at the floor and ceiling and at the spring of cove in a coved ceiling. Fire stops shall also be placed between the floor and the ceiling in such a manner that there shall be no concealed air spaces with a dimension greater than seven (7) feet. Fire stopping shall consist of not less than two (2) inch material and shall be the full thickness of the stud wall. Where stories are not framed separately, fire stopping shall be placed behind the ribbon at the ceiling line and at the top of joists at the floor line. Such fire stopping shall be two (2) inches thick and the full width of the stud.

All openings four (4) feet wide or less shall be provided with

Sec. 2205

double headers not less than two (2) inches thick placed on edge, and such headers shall have two (2) inch solid bearing to the floor or bottom plate. All openings more than four (4) feet wide shall be trussed or provided with lintels which shall have not less than two (2) inch solid bearing to the floor or bottom plate. (See Section 2507, paragraph (g).)

Underpinning shall be not less in size than the studding of the story above; provided, that all underpinning exceeding four (4) feet in height shall be not less in size than the studding required for an additional story. All such underpinning shall be effectively braced.

The space under the first floor joists of all Type V buildings (except such space as is occupied by a basement or cellar) shall be provided with a sufficient number of ventilating openings to insure ample ventilation and such openings shall be covered with wire mesh with openings in such mesh not greater than one-half (1/2) inch in any dimension. Such ventilating openings shall be proportioned on the basis of two (2) square feet for each twenty-five (25) lineal feet or major fraction thereof of exterior wall; except, that such openings need not be placed in the front of such building.

An all-heart redwood, cedar or cypress, or a creosoted wood mudsill not less than two (2) inches thick and not less in width than the wall framing supported thereon shall be placed under all walls or partitions that rest on masonry or reinforced concrete foundations.

All Type V buildings three (3) stories in height shall have the exterior walls thoroughly covered with a solid sheathing of wood not less than five-eighths (5/8) of an inch thick, or approved fiber-board not less than seven-sixteenths (7/16) of an inch thick or approved incombustible sheathing not less than one-half (1/2) an inch thick.

All exterior walls shall be covered on the outside with weatherboarding, shingles, stucco, masonry veneer or galvanized metal as specified in this section or by other similar approved materials, provided that one story buildings having a total floor area of not more than four hundred (400) square feet may have exterior walls of vertical one (1) inch boards and battens without studs.

The minimum requirements for wall coverings for Type V buildings are as specified in parts (a), (b), (c), (d), and (e) of this Section.

(a) Weatherboarding. Studs shall be covered on the outside face with one layer of two-ply waterproofed building paper applied and tacked shingle fashion with joints horizontal. Horizontal joints of the paper shall be lapped at least two (2) inches and perpendicular joints at least six (6) inches. Weatherboarding, when in place, shall have an average thickness of not less than five-eighths (5/8) of an inch and a minimum thickness of not less than three-eighths (3/8) of an inch. Such weatherboarding shall be placed over the paper and shall be securely nailed to the studding with not less than two nails to each stud in each piece of such weatherboard-

Sec. 2205

ing. Horizontal joints in the weatherboarding shall be tongued and grooved or ship-lapped joints, or such weatherboarding shall be laid shingle fashion and lapped not less than one-half ($\frac{1}{2}$) inch. Building paper may be omitted where the interior face of the studs is not covered or where there is no human occupancy. Siding patterns known as rustic, drop siding or shiplap shall have an average thickness in place of not less than nineteen thirty-seconds ($\frac{19}{32}$) of an inch and a minimum thickness of not less than three-eighths ($\frac{3}{8}$) of an inch. Bevel siding shall have a minimum thickness measured at the butt section of not less than twenty-one thirty-seconds ($\frac{21}{32}$) of an inch and a tip thickness of not less than one-quarter ($\frac{1}{4}$) inch. Siding of lesser dimensions may be used provided the outside face of the studs is first sheathed solid with boards not less than five-eighths ($\frac{5}{8}$) of an inch in thickness.

(b) Shingles or Shakes. Shingles or shakes may be used for the exterior wall covering when applied as follows: The outside face of the studs shall be first sheathed with board of uniform thickness not less than twenty-five thirty-seconds ($\frac{25}{32}$) of an inch thick and such sheathing shall be securely nailed to the studding with not less than two (2) eight (8) penny common nails to each stud in each piece of sheathing eight (8) inches or less in width and not less than three (3) such nails when such sheathing boards exceed eight (8) inches in width. In all cases, except where the building is not intended for human occupancy or where the interior face of the studs is not covered, a substantial water-proofed building paper shall be applied directly over the outer face of the sheathing in the same manner as specified in Sub-sec. (a) of this Section. Shingles or shakes shall be nailed securely to the wall sheathing with at least two nails in each piece.

(c) Stucco. Stucco may be applied with or without sheathing or similar backing.

In all cases except in back plastered construction a substantial waterproofed paper or asphalt saturated felt weighing not less than fourteen (14) pounds per one hundred (100) square feet or any substantial waterproofed paper which successfully passes a sixty (60) pound Mullen test shall be applied weather-board fashion directly over the studs or sheathing. Horizontal joints shall be lapped not less than two (2) inches and vertical joints not less than six (6) inches. Where sheathing or similar backing is not used a sixteen (16) W. & M. gauge wire stretched taut horizontally across the stud frame at not more than eight (8) inch centers shall be securely fastened in place before the paper or felt is applied; provided, that where such paper or felt is fastened to the metal reinforcing in such a manner as not to affect the waterproof qualities of such paper or felt the wire need not be installed. Skeleton sheathing shall be of boards not less than four (4) inches wide, spaced not to exceed four (4) inches apart.

In all cases a metal reinforcement shall be used of either expanded metal or wire fabric as follows:

1. Expanded metal cut from sheets not less than twenty

Sec. 2205

(20) U. S. gauge in thickness with mesh not less than three-fourths ($\frac{3}{4}$) inch in least dimension, nor more than four (4) inches in greatest dimension and not exceeding six (6) square inches in area; the fabric shall weigh not less than one and eight-tenths (1.8) pounds per square yard.

2. Wire fabric composed of wires not smaller than shown in the following table and with no openings or mesh therein less than three-fourths ($\frac{3}{4}$) inch nor greater than two (2) inches. The minimum allowable gauge of the wire for the various meshes shall be as follows:

For openings not exceeding 1 inch—18 W. & M. Gauge.
For openings not exceeding 2 inches—16 W. & M. gauge.

3. Expanded metal lath weighing not less than three (3) pounds per square yard.

4. Electrically welded wire of sixteen (16) W. & M. gauge with openings not exceeding two (2) inches in greatest dimension and not exceeding four (4) square inches in area.

Metal reinforcing shall be securely fixed in place using a furring device that will positively fur the metal reinforcing at least one-fourth ($\frac{1}{4}$) inch from the studs, sheathing or other backing. No form of strips or metal rods shall be used for furring which will serve to weaken the stucco. Metal reinforcing shall be secured with not less than four penny (4d) nails driven to at least three-fourths ($\frac{3}{4}$) inch penetration in the studs or sheathing. Nails and furring devices shall be not more than six (6) inches apart vertically. Horizontal and vertical joints of the metal reinforcing shall be lapped at least one full mesh. All horizontal joints between studding shall have not less than one tie with number eighteen (No. 18) annealed tie wire except when building is sheathed and all vertical joints shall be made at the studs when attached directly thereto.

Stucco shall consist of three (3) coats: (1) First or scratch coat, (2) Second or brown coat, (3) Finish coat. The total thickness of the three coats shall be not less than seven-eighths ($\frac{7}{8}$) of an inch thick at every point. No one coat of stucco shall be less than one-fourth ($\frac{1}{4}$) inch thick, except the finish coat, which shall be not less than one-eighth ($\frac{1}{8}$) inch in thickness at any point.

The stucco shall be of Portland cement and sand as specified in Chapter 26, with an addition of not more than ten (10) per cent of hydrated lime or similar material based on volume of cement in either the scratch coat or brown coat and with not more than thirty-three and one-third ($33\frac{1}{3}$) per cent of hydrated lime or similar material based on volume of cement in the finish coat.

The first or scratch coat of stucco shall be shoved thoroughly through the metal reinforcing until all space between the metal and the backing is filled solidly and such coat shall be kept thoroughly moist during the first twenty-four (24) hours after being applied. The brown coat shall be kept thoroughly moist during the first twenty-four (24) hours after being applied and at least seven (7) days shall elapse between the application of the brown coat, except when an approved high-

Secs. 2205-2207

early-strength cement is used, at least 48 hours shall lapse between the application of the scratch coat and brown coat.

The above requirements shall not apply to stucco placed on masonry backing. Before applying stucco on any masonry backing such backing shall be thoroughly washed and cleaned.

Gunitite, as defined in Chapter 26, shall be applied in not less than two (2) coats, and shall be reinforced as specified for "Stucco" in this Section. Gunitite shall be not less than three-fourths ($\frac{3}{4}$) of an inch in thickness on one or two story buildings and not less than one (1) inch in thickness on three story buildings.

(d) **Masonry Veneer.** In all cases before applying masonry veneer a substantial waterproofed paper or asphalt saturated felt weighing not less than fourteen (14) pounds per one hundred (100) square feet shall be applied weatherboard fashion directly over the studs, sheathing or backing as specified for "Stucco" under part (c) of this Section, except that no wire need be stretched back of such paper.

Masonry veneer shall not be less than two (2) inches if only one story or less in height and not less than three and three-quarters ($3\frac{3}{4}$) inches thick for heights more than one story. The masonry shall be bonded to the studs by means of corrugated galvanized iron twenty-four (24) gauge strips or twenty penny (20d) nails, in both cases not more than sixteen (16) inches apart horizontally and twelve (12) inches apart vertically. Such veneer shall not be permitted above two (2) stories, except for gables. The veneer shall be supported directly on the foundation.

(e) **Galvanized Iron.** Galvanized iron not less than twenty-eight (28) gauge may be used on stud walls without sheathing. Walls shall be effectively braced and nailing strips shall be placed in such manner as to permit the metal to be nailed at vertical intervals of not more than four (4) feet. (For complete plastering provisions, see appendix, refer to Chapter 47.)

Sec. 2206. All interior partitions shall be constructed, framed and fire stopped as required for exterior walls as specified in Section 2205, except that interior non-bearing partitions may have a single top plate, and except that where non-bearing partitions are approximately parallel and not more than four (4) feet apart, two inch by three inch (2"x 3") studs sixteen (16) inches on centers, may be used.

**Interior
Partitions**

Sec. 2207. Girders supporting first floor joists in residence buildings shall be not less than four inches by four inches (4"x 4") for spans of five (5) feet or less, or not less than four inches by six inches (4"x 6") (placed on edge) for spans not more than seven (7) feet.

**Floor
Construction**

The following table gives the maximum allowable spans for floor joists for Douglas fir (Oregon pine) using a Common Structural Joist and Plank grade, surfaced four sides to

Sec. 2207

American Lumber Standard sizes and based on a live load of forty (40) pounds per square foot uniformly distributed live load.

Size of Joists (Inches)	Spacing of Joists, Center to Center (Inches)	Maximum Allowable Span	
		(Feet and Inches) Plastered Ceiling Below	Without Plastered Ceiling Below
2 x 6	12	10- 0	12- 0
	16	9- 1	10- 0
	24	8- 0	8- 7
2 x 8	12	13- 0	15- 11
	16	12- 1	13-11
	24	10- 8	11- 5
2 x 10	12	16- 8	19-11
	16	15- 3	17- 4
	24	13- 5	14- 5
2 x 12	12	20- 1	23-11
	16	18- 5	20-11
	24	16- 2	17- 5
2 x 14	12	23- 5	27- 8
	16	21- 5	24- 4
	24	18-11	20- 3
3 x 6	12	11- 8	15- 0
	16	10- 8	13- 1
	24	9- 4	10-10
3 x 8	12	15- 4	19- 8
	16	14- 0	17- 4
	24	12- 4	14- 4
3 x 10	12	19- 3	24- 7
	16	17- 8	21- 8
	24	15- 7	18- 0
3 x 12	12	23- 1	29- 4
	16	21- 3	25-11
	24	18- 9	21- 8
3 x 14	12	26-11	30- 0
	16	24-10	30- 0
	24	22- 1	25- 2

Joists of other grades, other woods and other sizes may be used, in which case they shall not be stressed to exceed the maximum allowable fiber stress as specified in Chapter 25.

Floor joists shall have a clearance of not less than eighteen (18) inches between the bottom of the joists and the surface of the ground underneath. (See Appendix—Section 2511.)

Joists under bearing partitions shall be installed as specified in Section 2506-(j). All joists, beams and girders shall be framed away at least two (2) inches from all flues and chimneys and at least four (4) inches from the back of any fireplace. All wood floor joists having a span of more than eight (8) feet shall have bridging as specified in Section 2506-(k).

Secs. 2207-2208

Solid blocking not less than two (2) inches in thickness and the full depth of the joists shall be provided in the following places; over all girders except when not ceiled on the under side of joists, bearing walls, bearing partitions and around all stairways or other vertical openings. Such solid blocking shall serve as the required bridging specified in Section 2506-(k).

Trimmers and header joists more than four (4) feet long shall be doubled. Header joists over six (6) feet long and tail joists over twelve (12) feet long shall be hung in stirrups or metal joist hangers. Header beams shall be placed not closer than eighteen (18) inches from the face of a chimney. All spaces between chimneys and wood joists or beams shall be filled with loose incombustible materials placed in an incombustible support, or a metal collar connected to the chimney and fastened to the joists, beams or flooring to form an effective fire stop.

All joists shall have a minimum bearing of two (2) inches except when supported on a ribbon board and nailed securely to the adjoining stud.

Cutting of wood girders, beams or joists shall be limited to that permitted in Section 2506-(m).

Sec. 2208. The following table gives the maximum allowable spans for ceiling joists and roof rafters of Douglas fir (Oregon pine) using a Common Structural Joist and Plank grade, surfaced four sides to American Lumber Standards sizes.

**Roof and
Ceiling
Construction**

Size of Joists (Inches)	Spacing of Joists, Center to Center (Inches)	Maximum Allowable Span	
		(Feet and Inches) For Ceiling Joists	For Roof Rafters
2 x 4	12	11- 0	10- 4
	16	10- 0	9- 0
	24	8-11	7- 5
	32	7-10	6- 0
2 x 6	12	16- 7	15- 8
	16	15- 4	13- 9
	24	13- 8	11- 5
	32	12- 0	10- 0
2 x 8	12	21- 8	20- 8
	16	20- 2	18- 2
	24	18- 0	15- 1
	32	15-10	12- 0
2 x 10	12	26-10	25- 9
	16	25- 0	22- 9
	24	22- 6	18-10
	32	19- 6	14- 6

Joists or rafters of other grades, other woods and other sizes may be used, in which case they shall not be stressed to

Secs. 2208-2211

exceed the maximum allowable fiber stress as specified in Chapter 25.

The allowable span of roof rafters shall be measured from plate to ridge, except that where rafters are braced to ceiling joists and a complete truss is formed, to the satisfaction of the Building Inspector, the span shall be considered as the distance between intersecting points of trussing, when the allowable stresses are not exceeded.

Roof framing and trussing shall be thoroughly and effectively angle braced. Roof joists when supported on a ribbon board shall be well nailed to the stud.

Roof spaces shall be subdivided by a tightly fitted partition of matched wood or approved incombustible materials extending from the ceiling to the roof sheathing, so located as to subdivide this space into areas not exceeding twenty-five hundred (2500) square feet. All openings in such partitions shall have self-closing doors or equally effective devices to provide effective resistance to the passage of flames and gases.

**Roof
Covering**

Sec. 2209. Roof covering shall be a "Fire Retardant" roofing, except that for Groups H, I and J buildings an ordinary roofing may be used as specified in Section 4305. Wherever a composition roofing is used, the roof construction shall be solidly sheathed with wood, sheathing to be not less than twenty-five thirty-seconds (25/32) of an inch thick.

**Enclosure
of Vertical
Openings**

Sec. 2210. Enclosure walls for elevator shafts, vent shafts, stair wells and similar vertical openings through a building shall be of not less than one-hour fire-resistive construction as specified in Chapters 30 and 43 and where required under Occupancy in Part III, except that chutes and dumb-waiter shafts with a cross sectional area of not more than four (4) square feet may be lined with not less than one-fourth (1/4) inch asbestos covered with not less than twenty-six (26) gauge sheet metal with all joints in such sheet metal lock-lapped. All openings into any such vertical enclosures shall be protected by metal or metal-clad doors with either metal or metal-clad jams, casings or frames.

General

Sec. 2211. Other parts of Type V buildings may be constructed of wood or shall be constructed of approved combustible or incombustible materials, and all such wood construction shall be as specified in Chapter 25. The carrying capacity of all members shall be calculated by the accepted principles of mechanics. The actual dimensions of timbers shall be used and not the nominal sizes in computations for stress and determination of size.

Combustible insulating materials may be placed in partitions, floor or roof framing but shall in no way interfere with the fire blocking or fire separations required by this Code.

PART VI.

ENGINEERING REGULATIONS, QUALITY AND DESIGN OF THE MATERIALS OF CONSTRUCTION

CHAPTER 23 — LIVE AND DEAD LOADS

Sec. 2301. Dead Load. The dead load of a building shall include the weight of the walls, permanent partitions, framing, floors, roofs and all other permanent stationary construction entering into and becoming a part of a building. (See appendix for weights of construction materials.)

Definitions

Live Load. The live load includes all loads except dead loads.

Sec. 2302. (a) Loads. Buildings and all parts thereof shall be of sufficient strength to support the estimated or actual imposed dead and live loads in addition to their own proper dead load, without exceeding the stresses noted elsewhere in this Code, provided that no building or part thereof shall be designed for live loads less than those specified in the following sections. Impact shall be considered in the design of any structure where impact loads occur. (See appendix for impact considerations.)

General

(b) Design. Any system or method of construction to be used shall admit of a rational analysis in accordance with well established principles of mechanics.

Sec. 2303. (a) Provision shall be made in designing office floors for load of two thousand (2000) pounds placed upon any space two and one-half (2½) feet square wherever this load upon an otherwise unloaded floor would produce stresses greater than those caused by a uniformly distributed load of fifty (50) pounds per square foot.

Special
Load Con-
siderations

(b) Corridors in dwellings shall be designed for not less than forty (40) pounds per square foot.

(c) In designing floors to be used for industrial or commercial purposes the actual live load caused by the use to which the building or part of the building is to be put, shall be used in the design of such building or part thereof, and special provision shall be made for machine or apparatus loads when such machine or apparatus would cause a greater load than specified for such use in Section 2304.

(d) Floors in office buildings and in other buildings subject to shifting of partitions without reference to arrangement of floor beams or girders shall be designed to support in addition to other loads a single partition of the type used in the building placed in any position.

(e) Public garages and commercial or industrial buildings in which loaded trucks are placed, used or stored shall have the

Secs. 2303-2305

floor systems designed to support a concentrated rear wheel load of a loaded truck placed in any possible position.

Unit
Live
Loads

Sec. 2304. The following unit loads shall be taken as the minimum live loads in pounds per square foot to be used in the design of buildings for the occupancies listed, and loads at least equal shall be assumed for uses not listed in this Section but which create or accommodate similar loadings.

Apartments	40
Armories	150
Auditoriums—Fixed Seats.....	50
Movable Seats	100
Balconies and Galleries—Fixed Seats.....	50
Movable Seats	100
Dance Halls.....	100
Drill Rooms.....	100
Dwellings	40
Exterior Balconies.....	100
Fire Escapes.....	100
Garages	100
Gymnasiums	100
Hospitals—Wards and Rooms.....	40
Corridors and Public Rooms.....	100
Hotels—Guest Rooms and Corridors.....	40
Public Rooms	100
Corridors (Public).....	100
Libraries—Reading Rooms	60
Corridors	100
Stack Rooms.....	125
Loft Building	100
Manufacturing—Light	75
Heavy	125
Marquise	60
Offices	50
Printing Plants—Press Rooms.....	150
Composing and Linotype Rooms.....	100
Public Rooms	100
Rest Rooms	50
Reviewing Stands and Bleachers.....	100
Roof Loads.....	(See Section 2305)
Schools—Class Rooms	40
Corridors	100
Sidewalks—800 lbs. Concentrated or.....	250
Skating Rinks	100
Stairways	100
Storage—Light	125
Heavy (Load to be determined from pro-	
posed use or occupancy, but never less	
than	250
Stores—Retail (Light Merchandise).....	75
Wholesale (Light Merchandise).....	100

Roof
Loads

Sec. 2305. Roofs having a rise of four (4) inches or less per foot of horizontal projection shall be designed for a vertical live load of thirty (30) pounds per square foot of horizontal projection applied to any or all slopes. Roofs with a rise of

Secs. 2305-2306

more than four (4) inches, and not more than (12) inches per foot shall be designed for a vertical live load of twenty-five (25) pounds per square foot on the horizontal projection thereof. If the rise exceeds twelve (12) inches per foot no vertical load need be assumed but a wind force of twenty (20) pounds per square foot of such surface acting normal to the roof surface (on one slope at a time) shall be provided for.

Sec. 2306. The following reductions in assumed live loads shall be permitted in designing of columns, piers, walls, foundations, trusses and girders.

Reduction
of Live
Loads

(1) No reduction of the assumed live load shall be allowed in the design of any slabs, joists or beams.

(2) A reduction of the total live load used in the design of girders based on a certain tributary floor area shall be permitted as noted in the following schedule. This reduction shall not be carried into the columns nor shall such reduction be used in design of buildings to be used or occupied as warehouses or for storage purposes.

Reduction Allowed	Tributary Floor Area
5%	100 sq. ft.
10%	200 sq. ft.
15%	300 sq. ft. or more

(3) For determining the total live loads carried by columns the following reductions shall be permitted, the reductions being based on the assumed live loads applied to the entire tributary floor area:

Allowable Reductions for Warehouses and
Storage Buildings

Carrying the roof.....	0 per cent
Carrying 1 floor and roof.....	0 per cent
Carrying 2 floors and roof.....	5 per cent
Carrying 3 floors and roof.....	10 per cent
Carrying 4 floors and roof.....	15 per cent
Carrying 5 or more floors and roof.....	20 per cent

Live Load Reductions for Manufacturing Buildings,
Stores and Garages

Carrying the roof.....	0 per cent
Carrying 1 floor and roof.....	0 per cent
Carrying 2 floors and roof.....	10 per cent
Carrying 3 floors and roof.....	20 per cent
Carrying 4 or more floors and roof.....	30 per cent

Allowable Live Load Reductions for All
Other Buildings

Carrying the roof.....	0 per cent
Carrying 1 floor and roof.....	0 per cent
Carrying 2 floors and roof.....	10 per cent
Carrying 3 floors and roof.....	20 per cent
Carrying 4 floors and roof.....	30 per cent
Carrying 5 floors and roof.....	40 per cent
Carrying 6 floors and roof.....	45 per cent
Carrying 7 or more floors and roof.....	50 per cent

Secs. 2306-2308

(4) The base area of the footings of all buildings shall be designed in the following manner: The area of the footing which has the largest percentage of live load to total load shall be determined by dividing the total load by the allowable soil load. From the area thus obtained the dead load soil pressure of such footing is determined and the areas of all other footings of the building shall be determined on the basis of their respective dead loads only and such dead load soil pressure. In no case shall the load per square foot under any portion of any footing, due to the combined dead, live, wind and/or any other loads, exceed the safe sustaining power of the soil upon which the footing rests. The total reduced live load occurring in the column immediately above the footing shall be the live load used in the above computation.

Wind
Pressure

Sec. 2307. For purposes of design the wind pressure upon all vertical plane surfaces of all buildings and structures, shall be taken at not less than ten (10) pounds per square foot for those portions of the building less than forty (40) feet above ground and at not less than twenty (20) pounds per square foot for those portions more than forty (40) feet above ground.

The wind pressure upon sprinkler tanks, sky signs, or other similar exposed structures and their supports shall be taken as not less than thirty (30) pounds per square foot of the gross area of the plane surface, acting in any direction. In calculating the wind pressure on circular tanks, towers or stacks this pressure shall be assumed to act on six-tenths (6/10) of the projected area.

Where it shall appear that a building or structure will be exposed to the full force of the wind throughout its entire height and width, the pressure upon all vertical surfaces thus exposed shall be taken at not less than twenty (20) pounds per square foot.

The overturning moment resulting from the above calculations shall in no case exceed fifty (50) per cent of the dead load resisting moment.

For combined stresses due to wind and other loads the allowable unit stresses may be increased thirty-three and one-third (33 $\frac{1}{3}$) per cent in excess of the values given in Chapters 24, 25, 26, and 27. For members carrying wind stresses only the allowable unit stresses may be increased thirty-three and one-third (33 $\frac{1}{3}$) per cent. In no case shall the section be less than required if the wind stress be neglected.

Live
Loads
and
Seating
Capacity
Posted

Sec. 2308. The live loads for which each floor or part thereof of a commercial or industrial building is or has been designed, shall have such designed live loads conspicuously posted by the owner in that part of each story in which they apply using durable metal signs, and it shall be unlawful to remove or deface such notices. The occupant of the building shall be responsible for keeping the actual load below the allowable limits.

The maximum seating capacity shall be conspicuously posted by the owner of the building by means of durable metal signs placed in each assembly room, auditorium or room used for a similar purpose where fixed seats are not installed, and it shall

Secs. 2308-2311

be unlawful to remove or deface such notice or to permit more than this legal number of persons within such space.

Sec. 2309. Plans for other than residential buildings filed with the Building Inspector with applications for permits shall show on each drawing the live loads per square foot of area covered, for which the building is designed, and occupancy permits for buildings hereafter erected shall not be issued until the floor load signs, required by Section 2308, have been installed. No changes in the occupancy of a building now existing or hereafter erected shall be made until a revised occupancy permit has been issued by the Building Inspector certifying that the floors are suitable for the loads characteristic of the proposed occupancy. (See Sections 206 and 207.)

**Occupancy
Permits
for
Changed
Floor
Loading**

Sec. 2310. When earth or water, or earth and water cause or may cause a pressure on any building or structure, such total pressure created shall be calculated in accordance with the best accepted engineering practice, and such calculations and design shall take into account any possible surcharge due to moving or fixed loads.

**Retaining
Walls and
Basement
Floors**

Sec. 2311. (See Appendix).

**Earthquake
Regulations**

CHAPTER 24 — MASONRY

(Quality and Design)

**Quality
of
Materials
and Tests
Required**

Sec. 2401. The quality and design of materials used in the construction of masonry buildings or of the masonry portions of any building shall conform to the minimum standards as specified in this Chapter.

The following materials when used with mortar, and plain concrete and gypsum shall be classed as masonry and wherever used in any building shall conform to the minimum requirements specified in this Chapter.

- | | |
|--|-------------------------------|
| (a) Brick (clay, sand-lime or concrete). | (c) Concrete (block or tile). |
| (b) Concrete (plain concrete). | (d) Gypsum (see note (a)). |
| | (e) Hollow tile (clay). |
| | (f) Stone. |

The Building Inspector may require structural and fire-resistive materials to be subjected to tests to determine their quality whenever there is reason to believe the materials used do not come up to the requirements of this Code and may require any tests to be repeated if there is any reason to believe that the material is no longer up to the specifications on which the approval was based.

Tests of materials shall be made in accordance with the Standard Specifications of the American Society for Testing Materials as such standard specifications are noted in this Chapter.

"Brick" as used in this Code shall mean a structural unit of burned clay or shale, sand-lime or concrete, formed while plastic into rectangular prism usually solid and about eight by three and three-quarters by two and one-quarter ($8 \times 3\frac{3}{4} \times 2\frac{1}{4}$) inches in size, and shall be of the quality specified in Sections 2402, 2403 and 2404.

Note (a). This applies only to gypsum used in floor or roof construction, non-bearing walls or partitions, fireproofing or similar uses where not exposed to the weather.

**Burned Clay
or Shale
Brick**

Sec. 2402. Brick as used in this Code shall mean a structural unit of burned clay or shale formed while plastic into a rectangular prism, usually solid and about eight inches by three and three-fourth inches by two and one-fourth inches ($8" \times 3\frac{3}{4}" \times 2\frac{1}{4}"$) in size.

Brick of burned clay or shale shall have an average compressive strength when tested flatwise of not less than twelve hundred fifty (1250) pounds per square inch, taken on five (5) representative specimens and not less than one thousand (1000) pounds per square inch on any individual specimen. The average modulus of rupture of brick tested flatwise shall be not less than three hundred (300) pounds per square inch, taken on five (5) representative specimens and not less than two hundred (200) pounds per square inch on any individual specimen. Tests shall be made in accordance with the Standard Methods of Testing Brick, A.S.T.M. Designation C67-31 of the American Society

Secs. 2402-2406

for Testing Materials. All brick shall conform to the Standard Specifications for Building Brick, A.S.T.M. Designation C62-30 of the American Society for Testing Materials.

Sec. 2403. Sand-lime brick shall have an average compressive strength when tested flatwise of not less than twelve hundred fifty (1250) pounds per square inch, taken on five (5) representative specimens, and not less than one thousand (1000) pounds per square inch on any individual specimen. The average modulus of rupture of brick tested flatwise shall be not less than three hundred (300) pounds per square inch, taken on five (5) representative specimens, and not less than two hundred (200) pounds per square inch on any individual specimen.

Sand-Lime Brick

Tests shall be made in accordance with the Standard Methods of Testing Brick, A. S. T. M. Designation C67-30 of the American Society for Testing Materials.

Sand-lime brick shall conform to the Standard Specifications for Sand-Lime Building Brick, A. S. T. M. Designation C73-30 of the American Society for Testing Materials.

Sec. 2404. Concrete brick shall have an average compressive strength when tested flatwise of not less than twelve hundred fifty (1250) pounds per square inch, taken on five (5) representative specimens, and not less than one thousand (1000) pounds per square inch on any individual specimen. The average modulus of rupture of brick tested flatwise shall be not less than three hundred (300) pounds per square inch, taken on five (5) representative specimens, and not less than two hundred (200) pounds per square inch on any individual specimen.

Concrete Brick

Tests shall be made in accordance with the Standard Methods of Testing Brick, A. S. T. M. Designation C67-30 of the American Society for Testing Materials.

Concrete brick shall conform to the Tentative Specifications for Concrete Building Brick, A. S. T. M. Designation C55-33T of the American Society for Testing Materials.

Sec. 2405. Monolithic concrete construction containing less than two-tenths (2/10) of one (1) per cent of reinforcement shall be classed as plain concrete. Plain concrete in walls and piers shall have a strength of not less than fifteen hundred (1500) pounds per square inch as specified in Section 2606, and such concrete shall be governed by the requirements specified in Chapter 26.

Plain Concrete

Cement, fine aggregate and coarse aggregate shall conform to the requirements specified in Chapter 26.

Sec. 2406. All hollow concrete block or tile used for exterior party, fire or division walls shall be as specified in this Section.

Hollow Concrete Block or Tile

The average compressive strength of five units at the time

Secs. 2406-2407

of delivery to the site shall be not less than the following:

Minimum Face Shell Thickness Inches	Average Compressive Strength in Pounds per Square Inch Gross Cross Sectional Area as Laid in the Wall	Minimum Compressive Strength Permitted on any Test Unit in Pounds per Square Inch Gross Cross Sectional Area
1½ or over	700	600
Under 1½ and over ¾	1000	800

Concrete masonry units which will be exposed to the soil or weather in the finished work (without brick, stucco or other suitable protective covering approved by the Building Inspector) shall not absorb more than fifteen (15) pounds of water per cubic foot of concrete actually contained. Units which will be suitably protected from the soil or weather in the finished work need not conform to the absorption requirement of this paragraph.

All hollow concrete units shall meet the requirements of the Tentative Specifications and Tests for Load-bearing Concrete Units, A.S.T.M. Designation C90-31T of the American Society for Testing Materials.

Special concrete block or tile, in addition to meeting the requirements in this Section, shall comply with the Underwriters' Laboratories' Standard for Hollow Concrete Building Units, dated September 26, 1930, and shall have a compressive strength of not less than one thousand (1000) pounds per square inch of gross area as laid in the wall.

Underwriters' Laboratories' certificated hollow concrete building units may be considered as Special Units.

Gypsum

Sec. 2407. Gypsum as used in this Section means a product containing not less than sixty-four and one-half (64½) per cent by weight of calcium sulphate combined with water.

Neat Gypsum, gypsum fiber concrete or gypsum coarse aggregate concrete used in floor and roof construction of either the reinforced gypsum suspension system or reinforced gypsum in which the gypsum acts structurally shall develop the following minimum ultimate compressive strength in pounds per square inch when dried to constant weight.

- (a) Neat gypsum (as used in pre-cast tile).....1800
- (b) Gypsum fiber concrete containing not more than three (3) per cent by weight of wood chips, excelsior or fiber.....1000
- (c) Gypsum fiber concrete containing not more than twelve and one-half (12½) per cent by weight of wood chips, excelsior or fiber 500

Secs. 2407-2408

Gypsum coarse aggregate concrete of the following volumetric mixes:

- (d) One and one half ($1\frac{1}{2}$) parts gypsum cement;
one (1) part sand; three (3) parts cinders 500
- (e) One and one-half ($1\frac{1}{2}$) parts gypsum cement;
one (1) part sand; three (3) parts slag 800
- (f) One and one-half ($1\frac{1}{2}$) parts gypsum cement;
one (1) part sand; three (3) parts gravel 800
- (g) One and one-half ($1\frac{1}{2}$) parts gypsum cement;
one (1) part sand; three (3) parts stone 800

Note: "Compressive tests shall be made on" cylinders six (6) inches in diameter and twelve (12) inches long. The average compressive strength shall be not less than noted above and no one specimen shall test less than seventy-five (75) per cent of the average of the lot tested and not less than five (5) samples from the lot shall be tested to determine the average.

Gypsum tile or block used for partitions, walls, furring and enclosures may contain, intimately, mixed, not more than fifteen (15) per cent by weight of binding material consisting of wood chips, excelsior or fiber.

Gypsum partition tile or block shall be equal in quality to that specified in the Standard Specifications for Gypsum Partition Tile or Block, A. S. T. M. Designation C52-33, of the American Society for Testing Materials.

The chemical and physical properties of the gypsum and calcined gypsum shall be equal to that specified in the Standard specifications for Gypsum and Calcined Gypsum, A. S. T. M. Designation C22-25 and C23-30 respectively, of the American Society for Testing Materials.

Sec. 2408. All hollow burned clay wall tile used for exterior, party, fire or division walls shall be load-bearing tile and shall be well burned units of clay or shale of a quality at least equal to one of the two grades noted below.

**Hollow
Clay
Tile**

Grade	Absorption Limits per cent		Compressive Strength Based on Gross Area in lbs. per sq. in.*			
			End Construction		Side Construction	
	Mean of 5 tests	Individual Maximum	Mean of 5 Tests	Individual Minimum	Mean of 5 Tests	Individual Minimum
A	16 or less	19	1400 or more	1000	700 or more	500
B	25 or less	28	1000 or more	700	500 or more	350

*Gross area shall be taken as the total area enclosed by the outside dimensions of the unit taken in a direction perpendicular to that in which the load is carried.

All hollow burned-clay load-bearing wall tile shall meet the requirements of the Tentative Specifications and Tests for Hollow Burned-Clay Load-Bearing Wall Tile, A. S. T. M. Designation C34-33T of the American Society for Testing Materials.

(a) All cast stone shall be branded with a permanent identification mark of the manufacturer which shall be registered with the Building Inspector.

Secs. 2408-2409

The average compressive strength of cast stone taken on four (4) representative samples at the age of twenty-eight (28) days or when delivered on the job shall not be less than five thousand (5000) pounds per square inch with an individual minimum of forty-five hundred (4500) pounds per square inch, and the average absorption of such samples shall be not more than seven (7) per cent of their dry weight with an individual maximum of eight (8) per cent.

Test samples shall consist of two by two (2x2) inch cylinders or two (2) inch cubes, cut from the stone as delivered on the job or from the regular stock in the yard, and shall be taken in such a manner that they are composed of approximately one-half of the facing and one-half of the backing material and so that they can be tested in the position in which the cast stone will be laid in the masonry. Tests of cast stone specimens shall be made in accordance with the Tentative Specifications for Cast Stone, Serial Designation P-3-A-29T of the American Concrete Institute.

Mortars

Sec. 2409. All cements and limes used in mortars shall conform to the requirements of the Standard Specifications of these materials issued by the American Society for Testing Materials, having A. S. T. M. Designation as listed below:

Quicklime for Structural Purposes C5-26.

Hydrated Lime for Structural Purposes C6-31.

Specifications and Tests for Portland Cement C9-30.

All mortar used in unit masonry construction shall be either lime-cement mortar or cement mortar. For isolated piers, footings and exterior foundation walls, and for all unit masonry below the grade where subjected to wet conditions, only cement mortar shall be used.

(a) Lime-cement mortar shall be composed of one (1) part lime putty or hydrated lime, one (1) part Portland cement and six (6) parts of sand by volume.

(b) Cement mortar shall be composed of one (1) part of cement and three (3) parts of sand by volume with an allowable addition of lime putty or hydrated lime of not to exceed fifteen (15) per cent by volume of the cement content.

(c) Mortar composed of cement, lime putty or hydrated lime and sand and having proportions intermediate to those specified in paragraphs (a) and (b) may be used in place of lime-cement mortar, provided the ratio, by volume, of the sand and cementitious material does not exceed three (3) to one (1). The allowable working stress for such mortar shall be determined by the following formula:

$$P_1 = P_i + \frac{(C-L)}{(C+L)} (P_c - P_i)$$

P_1 = Maximum allowable unit working stress for the mortar used.

P_i = Maximum allowable unit working stress for Lime-Cement mortar.

C = Number of parts (by volume) of cement in mortar used.

L = Number of parts (by volume) of lime in mortar used.

P_c = Maximum allowable unit working stress for cement mortar.

Secs. 2409-2410

The proportions shall be based strictly according to the volume of the constituent parts.

Sec. 2410. (a) The maximum allowable working compressive stresses in brick masonry due to combined live, dead and other loads, shall not exceed the limits for the respective compressive strengths of the individual units listed in the following table:

**Allowable
Working
Stresses**

Minimum Average Compressive Strength of Units	Maximum Unit Working Stresses (pounds per square inch) Using various mortars		
	Lime Mortar	Lime Cement	Cement Mortar
4500	110	300	400
2500	100	250	300
1250	90	150	175

The above stresses are based on good workmanship with full mortar beds and full mortar joints and shall be allowed only with such construction.

The maximum allowable compressive stresses in hollow walls of brick due to combined live and dead loads, shall not exceed the stresses given in the above table, based upon the effective net cross sectional area of the wall.

(b) Concrete — plain. The maximum allowable working stresses in masonry of plain concrete shall be the following percentages of the ultimate strength of the concrete in compression as determined by the requirements of Chapter 26:

Compression $0.20f'_c$

Shear and diagonal tension..... $0.04f'_c$

where f'_c represents the ultimate compressive strength.

(c) Concrete Block or Tile. The maximum allowable compressive stresses, due to combined live and dead loads, in masonry of concrete block or tile, complying in all respects with Section 2406, shall not exceed eighty (80) pounds per square inch of gross cross-sectional area when laid in cement mortar or seventy (70) pounds per square inch of gross cross-sectional area when laid in lime-cement mortar.

(d) Gypsum. Gypsum suspension systems, poured-in place or pre-cast, shall not be less than three (3) inches in thickness, and shall be of such character as to be readily calculable by other loads, with a factor of safety of not less than four (4), and shall be of such character as to be readily calculable by the use of accepted engineering formulas, in which the stress in

Sec. 2410

the suspension wires or cables shall be determined by the formula:

$$T = \frac{WL}{8d} \sqrt{L^2 + 16d^2}$$

NOTE:

T equals maximum tension in wires or cables in pounds per foot width of slab.

W equals load in pounds per square foot.

L equals clear span in feet between supports.

d equals deflection or "dip" of wires or cables in feet at center of span.

The wires or cables used shall be cold-drawn steel in which the allowable working stress shall not exceed twenty thousand (20,000) pounds per square inch.

When pre-cast or poured-in-place slabs or tiles or reinforced gypsum in which the gypsum acts structurally, are used, they shall be designed to carry the total dead, live and other loads in

Sec. 2410

accordance with the formulae for reinforced concrete construction as provided in Chapter 26.

The following working stresses expressed in pounds per square inch shall not be exceeded:

	NEAT GYPSUM	GYPSUM FIBER CONCRETE with not more than 3 per cent of wood chips, excelsior or fiber	GYPSUM FIBER CONCRETE with not more than 12½ per cent of wood chips, excelsior or fiber	GYPSUM COARSE AGGREGATE CONCRETE
Extreme fiber stress in compression in flexure	350	220	125	125
Direct compression or bearing	200	165	100	100
Bond between gypsum and reinforcing	40	30	30	30
Shearing Stress	30	25	20	20
Modulus of elasticity in lbs. per square inch	1,000,000	600,000	200,000	200,000
Ratio of modulus of elasticity of steel to that of gypsum (n).	30	50	150	150

(e) Load-bearing Clay Tile. The maximum allowable compressive stresses, due to combined live and dead loads, in masonry of load-bearing clay tile which complies in all respects to Section 2408, shall not exceed eighty (80) pounds per square inch of the gross cross-sectional area when laid in cement mor-

Secs. 2410-2411

tar or seventy (70) pounds per square inch of the gross cross-sectional area when laid in lime-cement mortar.

(f) Stone. The maximum allowable compressive stresses in rubble stonework, due to combined live and dead loads, shall not exceed one hundred and forty (140) pounds per square inch when laid in Portland cement mortar, nor one hundred (100) pounds per square inch in lime-cement mortar.

The maximum allowable compressive stress in ashlar masonry due to combined live and dead loads shall not exceed the following limits:

Unit	Maximum Unit Working Stresses (pounds per square inch) laid in	
	Lime Cement Mortar	Portland Cement Mortar
Granite.....	640	800
Limestone.....	400	500
Marble	400	500
Sandstone.....	320	400

General

Requirements shall be fully analyzed and allowances made for them in design. Sec. 2411. The effects of eccentric loads and lateral forces. Concentrated loads shall be distributed so as not to exceed the allowable working stresses as specified in Section 2410 by more than twenty-five (25) per cent.

CHAPTER 25 — WOOD (Quality and Design)

Sec. 2501. The quality and design of all wood except finish and millwork, used in the construction of all buildings shall conform to the requirements of this Chapter. **General**

All members shall be so framed, anchored, tied and braced together as to develop the maximum strength and rigidity necessary for the purpose for which they are used. No member shall be stressed in excess of the strength of its details and connections.

Workmanship in fabrication, preparation, and installation of material shall conform throughout to good engineering practice.

American Lumber Standards as set forth in "Simplified Practice Recommendations, R16-29" of the United States Department of Commerce, effective July 1, 1929, is hereby declared to be the basis for the determination of minimum acceptable sizes, for the assignment of allowable working stresses and quality of structural lumber for the purposes of this Code. Manufacturers association grades conforming to these provisions shall be accepted as complying with the requirements of this Code.

Sec. 2502. All wood structural members shall be of sufficient size and strength to carry their imposed loads safely and without exceeding the allowable working stresses as specified in Sections 2503 and 2504. **Determination of Required Sizes**

In computations to determine the required size of timber members the net cross sectional area or actual size shall be used and not the nominal size. Sizes required by this Code shall be deemed to refer to the nominal or commercial description of size unless stated in fractional minimums. American lumber standards dressed sizes shall be accepted as conforming to nominal or commercial descriptions of sizes.

Sec. 2503. Allowable unit working stresses for lumber shall be determined on the basis of the quality (Grade) of lumber used. **Allowable Unit Stresses**

For the purpose of assigning Allowable Unit Working Stresses three general classes of lumber shall be recognized as follows:

- (a) "STRUCTURAL LUMBER"
- (b) "YARD LUMBER"
- (c) OTHER LUMBER

(a) STRUCTURAL LUMBER is (1) lumber manufactured and graded in accordance with any of the lumber association Structural Grades conforming to the American Lumber Standards, or (2) lumber graded under the Structural Grade Examples of the American Lumber Standards (Part IV—Simplified Practice Recommendations R16-29) and in either case adequately identified.

Each piece of Structural Lumber shall be grade-marked and shall bear the trade-mark of the lumber association under whose rules the lumber is graded; provided, however, that the Building Inspector may accept a lumber manufacturer's Association Certificate of Grade in lieu of such grade—and trade-marks.

Sec. 2503

The allowable unit working stresses for each Grade of such lumber shall be as given in Table I of this Section.

(b) YARD LUMBER is (1) lumber manufactured and graded in accordance with the rules of a lumber association for "Yard Lumber," or (2) lumber graded in accordance with the basic Grade Classifications and with the Size Standards for "Yard Lumber" in American Lumber Standards. (Part III—Simplified Practice Recommendations R16-29.)

YARD LUMBER shall be used for load-bearing purposes only after working stresses for the Grades used shall have been assigned by the Building Inspector. Such working stresses shall be assigned when evidence is furnished, to the satisfaction of the Building Inspector, as to the Grade of the lumber. Such evidence may be either (1) grade-marks on the lumber when accompanied by an Association trade-mark or (2) a lumber Association Certificate of Grade, or (3) in the absence of such identification, the Building Inspector may determine the Grade of the lumber by visual inspection.

The allowable unit working stresses for any Grade of YARD LUMBER shall be assigned by the Building Inspector as follows:

He shall determine the maximum defects, present or permitted, in the lumber to be used. This determination may be made by inspecting the lumber or by referring to the Grading Rules of the lumber association under which the lumber was graded.

He shall compare the effect of defects found or permitted in the Grade of lumber to be used, with the effect of defects permitted in the Grade Example for "Common" Structural Material as set forth in American Lumber Standards. (Part IV—Simplified Practice Recommendations R16-29.)

On the basis of such comparison he shall estimate the ratio of strength of lumber used to strength of lumber graded under the Grade Example for "Common" Structural Material.

This ratio shall be applied to the values in Table II for the same species of lumber, and working stresses shall be assigned proportionately.

(c) OTHER LUMBER is—All lumber which does not, for any reason, qualify as a Grade of "Structural Lumber" or "Yard Lumber" as defined hereinbefore.

OTHER LUMBER shall be used for load-bearing purposes only when approved by the Building Inspector.

The allowable unit working stresses for such lumber shall be assigned by the Building Inspector as follows:

He shall inspect such lumber and determine the maximum defects in any pieces thereof.

He shall compare the effect of the defects found with the effect of the defects permitted in the Grade Example for "Common" Structural Material as set forth in American Lumber Standards.

On the basis of such comparison he shall estimate the ratio of strength of lumber used to strength of lumber graded under the Grade Example for "Common" Structural Material.

TABLE I
Allowable Unit Stresses for "STRUCTURAL LUMBER"
All Sizes, Dry Locations

Species of Timber	Grade	Allowable Stress in Pounds per square inch.					
		Extreme Fiber in Bending		Maximum Horizontal Shear	Compression		Modulus of Elasticity
		Joists and Plank sizes 4" and less in thickness	Beam and Stringer Sizes 5" and thicker		Parallel to grain Short Columns	Perpen- dicular to Grain	
Douglas fir, Coast Region West Coast Lumbermen's Association*	Dense Structural.....	1800	1800	105	1300	380	1,600,000
	Structural	1600	1600	90	1200	345	1,600,000
	Common Structural	1200	1400	84	1100	325	1,600,000
Douglas fir, Calif. Coast Region. West- ern Pine Association*	Common Structural	1200	1200	72	880	325	1,600,000
Douglas fir, Inland Empire region. West- ern Pine Association*	Select Structural.....	1800	1800	120	1466	380	1,600,000
	Structural	1600	1600	85	1175	335	1,500,000
	Common Structural	1200	1200	80	1050	315	1,500,000
Fir, white. Western Pine Association*	Select Structural.....	1100	1100	70	700	300	1,100,000
	Common Structural	880	880	56	560	300	1,100,000
Larch. Western Pine Association*	Select Structural.....	1800	1800	133	1466	380	1,300,000
	Structural	1600	1600	100	1200	345	1,300,000
	Common Structural	1200	1200	90	1100	325	1,300,000
Pine, Ponder- osa and Sugar. Western Pine Association*	Select Structural.....	900	900	85	750	250	1,000,000
	Common Structural	720	720	68	600	250	1,000,000
Redwood. Calif. Redwood Association*	Prime Structural.....	1707	1494	82	1245	267	1,200,000
	Select Structural.....	1280	1322	70	1100	267	1,200,000
	Heart Structural.....	1024	1150	56	1000	267	1,200,000

*Lumber Manufacturers Association under whose Grading Rules the species of wood indicated is graded in the Region shown.

Secs. 2503-2504

TABLE II

**Basis for Determining Allowable Unit Working Stresses —
For "Yard Lumber" and "Other Lumber"**

(From Recommendations of United States Forest Products
Laboratory for Lumber Conforming to the Grade Example
of "COMMON" STRUCTURAL MATERIAL in American
Lumber Standards.)

Always Dry Locations					
SPECIES	Allowable Stress in Pounds per sq. in.			Horizontal Shear	Modulus of Elasticity
	Extreme Fiber in Bending	Compression			
		Parallel to Grain Short Columns*	Perpendicular to Grain		
Cedar					
Western Red	720	560	200	64	1,000,000
Cedar					
Port Orford	880	720	250	72	1,200,000
Douglas Fir					
(Coast Region) ..	1200	880	325	72	1,600,000
Douglas Fir					
(Rocky Mt. Reg.) ..	880	640	275	68	1,200,000
Fir: Golden, Noble, Silver, White ..	880	560	300	56	1,100,000
Hemlock					
West Coast	1040	720	300	60	1,400,000
Larch	960	880	325	80	1,300,000
Pine: Idaho White, Lodgepole, Sugar, Ponderosa, Calif. White, & Western Yellow ..	720	600	250	68	1,000,000
Redwood	960	800	250	56	1,200,000
Spruce					
Engelmann	600	480	175	56	800,000
Spruce: Sitka	880	640	250	68	1,200,000

*For Posts and Timbers 6"x16" and larger and with unsupported length not greater than 10 times least dimension.

Allow-
able Unit
Stresses
for
Columns

Sec. 2504. (a) The unit working stresses in compression with grain for columns whose ratio of unsupported length to least dimension does not exceed ten (10) (short columns) shall be not greater than that given in Section 2503.

(b) For columns the ratio of whose unsupported length to least dimension is greater than ten (10) (intermediate columns) the following formula shall be used until the reduction

Sec. 2504

in allowable stress equals one-third the stress for short columns:

$$\frac{P}{A} = S \left[1 - \frac{1}{3} \left(\frac{l}{Kd} \right)^4 \right]$$

where P = Total load in pounds
 A = Area in square inches
 P — = Unit compressive stress
 A — = Safe stress in compression with grain for short columns
 l = Unsupported length in inches
 d = Least dimension in inches
 E = Modulus of elasticity
 K = The $\frac{l}{d}$ at the point of tangency of the parabolic and Euler curves, at which $\frac{P}{A} = \frac{2}{3} S$.
 The value of K for any species and grade is

$$K = \frac{\pi}{2} \sqrt{\frac{E}{6S}}$$

NOTE: For "Structural" Lumber the value of "S" to be used is the value given in Table I of Section 2503 for "Compression Parallel to Grain" for the respective Grades and Species.

For "Yard Lumber" and "Other Lumber" the value of "S" to be used shall be assigned by the Building Inspector in the same manner as provided in Sections 2503 (b) or 2503 (c).

- (c) For columns the ratio of whose unsupported length to least dimension ($\frac{l}{d}$) is greater than "K" (long columns) the Euler formula below shall be used.

$$\frac{P}{A} = \frac{\pi^2 E}{36 \left(\frac{l}{d} \right)^2}$$

- (d) Columns shall be limited in slenderness to $\frac{l}{d} = 50$.

Secs. 2505-2506

Framing
Details;
Vertical
Members

Sec. 2505. (a) Wood columns and posts shall be squared at the ends; shall be provided with metal base plates and dowels; shall be supported in basements by footings projecting at least two (2) inches above the finished floor; shall be superimposed on approved metal appliances where continuing through more than one story; shall not rest directly or indirectly on any floor beams, except in cases where there is no column below.

(b) Wood bolsters may be used to support a single floor or the roof beams only.

(c) Preservatives shall be applied to column ends where necessary to protect against possible dampness.

(d) Wood columns in basements when built in solid partitions shall be open on at least two (2) sides.

(e) Wood posts, except for minor structures and as piles, shall not be used as foundations below ground.

Framing
Details;
Horizontal
Members

Sec. 2506. (a) Girders and beams where entering or resting on masonry walls shall have a bearing of at least four (4) inches with the under surface protected by a piece of asphalt saturated felt or paper or a metal bearing plate, or such end may be dipped or painted with creosote, except when not ceiled on the under side of joists.

Where members meet at columns they shall be fitted around or butted up close and held in place by metal strips unless the post caps provide sufficient anchorage.

(b) Built-up timbers shall have members bolted tightly together.

(c) Joists and rafter ends may be supported by a two-inch by four inch (2"x4") wood strip or cleat spiked or bolted to the girder.

(d) Wood members entering masonry party or fire walls shall be separated from the opposite side of the wall and from beams entering the opposite side of the wall by four (4) inch masonry. The ends of the joists, beams and/or girders shall be fire-cut to a bevel of not less than three (3) inches in their depth.

(e) Where girders and beams enter masonry they shall be provided with wall plates, boxes or anchors of an approved self-releasing type so arranged as to leave an air space of not less than one (1) inch at sides of member. Rigid boxes shall be provided in concrete walls. The ends of girders shall not be sealed in; provided, that where ends of timbers are well treated with creosote or other approved preservative they may be sealed in.

(f) Anchors for each tier of joists shall be provided where they enter masonry walls and also when they are parallel to masonry walls. Such anchors shall be not less than three-fourths (3/4) inch round iron anchors not less than thirty-six (36) inches long fitted with a three-fourths inch by ten-inch (3/4"x10") pin at the wall end, and with a two (2) inch hook at the inner end, and shall be spaced not more than six (6) feet apart. The hooks shall be inserted into a three-fourths (3/4) inch hole in the joists, two (2) inches up from the bottom when anchors are placed at the ends of joists. The pin at the opposite end shall be placed vertically in the wall four (4) inches from the opposite face, and embedded solidly in masonry and mortar. Such anchors shall in all cases occur on the oppo-

Secs. 2506-2507

site end of the same run of joists and ends of joists shall be lapped and spiked so as to form a continuous tie across the building. Anchors shall be placed across the top of the joists that run parallel to the wall, with the hook inserted into a three-fourths ($\frac{3}{4}$) inch hole in a two-inch by four-inch (2"x4") header fitted between the joists with similar headers continuous to the wall, parallel with the anchors. Pin ends shall be installed as herein provided for anchors at the ends of joists.

(g) The minimum permissible thickness of joists, rafters and studs shall be one and five-eighths (1 $\frac{5}{8}$) inches.

(h) Floor joists shall be supported by girders, bearing partitions or exterior walls. Where entering exterior stud walls, the joists shall be supported by a ribbon let into the studs if no plate is provided. Joists shall be well nailed to the supporting studs. Studs shall be doubled under the ends of doubled joists.

(i) Header joists over six (6) feet long and tail joists over twelve (12) feet long shall be hung in approved stirrup irons or joist hangers.

(j) Joists under bearing partitions and running parallel thereto shall be doubled and well spiked or separated by solid bridging not more than sixteen (16) inches on centers to permit the passage of pipes.

(k) Wood cross bridging shall be placed between joists if the span is over eight (8) feet. The distance between bridging or between bridging and bearing shall not exceed eight (8) feet. Wood cross bridging in dwellings may be three (3) inches in cross sectional area, but in other buildings shall not be less than six (6) inches.

Metal cross bridging of equal or greater strength may be used in place of the wood cross bridging.

(l) Solid two (2) inch bridging shall be placed between floor joists over all supports. Solid bridging shall be placed between joists at the edge of flooring when the attic space is only partially covered.

(m) Cutting of wood girders, beams or joists shall be limited to cuts and bore holes not deeper than one-fifth ($\frac{1}{5}$) the beam depth below its top located not further from the beam end than three (3) times the beam depth. Cuts in excess of above or bore holes with a diameter more than two (2) inches are not permitted without special provisions for framing the beams approved by the Building Inspector.

Sec. 2507. (a) Stud partitions shall be provided with soles or plates with dimensions not less than the studs where the partition studs do not rest on walls, girder beams, or do not pass through the floor to the top plate at the partition below.

(b) In bearing partitions the top plate shall be doubled and lapped at each intersection. Joints in the upper and lower members of the top plate shall be staggered not less than two (2) feet.

(c) Studs in bearing partitions and walls shall not be less than two inches by four inches (2"x4") in size. Where a bearing partition supports more than the weight of the roof and one floor the studs shall be not less than two inches by six inches (2"x6") or three inches by four inches (3"x4") except that underpinning may be of the same size as the studs immediately

**Framing
Details;
Stud
Walls and
Partitions**

Secs. 2507-2509

above when such underpinning is not more than four (4) feet in height.

(d) Where studs pass through from floor to floor they shall be fire-stopped at point of passage through floors.

(e) Angles at corners where stud walls or partitions meet shall be framed solid so no lath can extend from one room to another. All exterior and main cross stud partitions shall be effectively and thoroughly angle braced.

(f) Stud partitions containing plumbing, heating or other pipes shall be so framed and the joists underneath so spaced as to give proper clearance for the piping. Where a partition containing such piping runs parallel to the floor joists, the joists underneath such partitions shall be doubled and spaced to permit the passage of such pipes and shall be bridged with solid bridging. Where plumbing, heating or other pipes are placed in or partly in a partition necessitating the cutting of the soles or plates, a metal tie not less than one-eighth ($\frac{1}{8}$) inch thick and one and one-half ($1\frac{1}{2}$) inches wide shall be fastened to the plate across and to each side of the opening with not less than four (4) sixteen-penny (16-d.) nails.

(g) Openings in stud partitions and walls shall be framed around with double studs at each side and double headers across the top resting on the short stud at each end. The double header shall be placed on edge and shall be trussed above for all openings over four (4) feet in width or where more than two (2) studs are cut away.

(h) Wood lath, furring or framing shall be placed not less than two (2) inches from any chimney and not less than four (4) inches from the back of any fireplace.

(i) Where wood partitions and masonry walls join, one-half ($\frac{1}{2}$) inch bolts ten (10) inches long with two inch by five inch by one-fourth ($2'' \times 5'' \times \frac{1}{4}''$) inch iron plate washers shall be built into the masonry wall opposite each line of fire blocking and near the top, top plate or ribbon in each partition. The projecting end of the bolt shall pierce the partition and be securely fastened thereto.

Roof
Framing

Sec. 2508. (a) Valley rafters shall be not less than one and five-eighths by five and one-half inches ($1-5/8'' \times 5-1/2''$) in size. Roof sheathing shall have a minimum thickness of twenty-five thirty-seconds ($25/32$) of an inch.

(b) Flashings shall be placed around all openings in and extensions of mechanical appliances or equipment through the roof.

(c) Anchors for joists and rafters shall be provided where they enter masonry walls and also where they are parallel to masonry walls as specified for joists in Section 2506 (f).

Framing
Details;
Trusses

Sec. 2509. (a) Wood trusses and truss framing shall have all joints accurately cut and fitted together so that each bearing is true and drawn tight to the full bearing. All such trusses shall be properly secured in place by lateral bracing.

(b) Washers of sufficient size to distribute the loads properly shall be used in connection with rods or metal members. Before a truss is loaded, the tension rods shall be well tightened.

Secs. 2509-2511

(c) Timber trusses shall be securely anchored to the wall at points of bearing.

Sec. 2510. (a) Fire stops shall be provided at all intersections of interior and exterior walls with floors, ceilings and roof in such a manner as to effectively cut off communication by fire through hollow concealed spaces and prevent both vertical and horizontal drafts.

Fire Stops

(b) Furred walls shall have fire stopping placed immediately above and below the junction of any floor construction with the walls or shall be fire-stopped the full depth of the joist.

(c) All stud walls or partitions shall have a continuous row of bridging or fire stopping which shall form a complete and effective separation in the entire width of partition at that point, placed in such a manner that there shall be no concealed air spaces greater than seven (7) feet in any dimension. Fire stops shall be the full width of the studding and sufficiently stiff to act as lateral bracing for the individual studs.

(d) Stair stringers shall be fire-stopped at least once in the middle portion of each run, and shall be fire-stopped by a header beam at the top and bottom, so as to effectively prevent the passage of fire. Full width fire blocking shall be placed between studs along and in line with the run of stairs adjoining such partitions.

(e) When sliding doors are pocketed in partitions, such pockets shall be completely fire-stopped at end, sides, top and bottom.

(f) All spaces between chimneys and wood framing shall be solidly filled with refuse mortar, loose cinders or other incombustible material placed in incombustible supports.

(g) All fire-stopping as required in this Section shall be not less than two (2) inches in thickness and not less in width than the enclosed space within the partition except as provided in paragraph (f) hereof for chimneys.

(h) All attic spaces or spaces between ceilings and the underside of roofs shall be divided into horizontal areas of not more than twenty-five hundred (2500) square feet with tight one-inch (1") partitions of matched wood or of approved incombustible materials. All openings through these partitions shall be protected by self-closing doors of the same thickness and materials as the partition.

Sec. 2511. Termite provisions. (See Appendix Sec. 2511.)

Termite Provisions

Secs. 2601-2603

CHAPTER 26 — REINFORCED CONCRETE QUALITY AND DESIGN

Quality	Sec. 2601. The quality of the materials used in reinforced concrete and the quality of reinforced concrete shall conform to the physical and chemical properties as specified in Section 2604.
Design	Sec. 2602. The design of reinforced concrete shall conform to the rules and principles specified in this Chapter.
Definitions	Sec. 2603. The following definitions give the meaning of certain terms as used in this Chapter. Anchorage—The embedment in concrete of a portion of a reinforcement bar, either straight or with hooks, designed to prevent pulling out or slipping of the bar when subjected to stress. (The anchorage of tension reinforcement in beams includes only the embedded length beyond a point of contraflexure or of zero moment.) Column—An upright compression member, the length of which exceeds three times its least lateral dimension. (See Pedestal.) Column Capital—An enlargement of the upper end of a reinforced concrete column designed and built to act as a unit with the column and flat-slab. Concrete—A mixture of Portland cement, fine aggregate, coarse aggregate and water. Deformed Bar—(See Section 2604-d.) Effective Area of Reinforcement—The area obtained by multiplying the right cross-sectional area of the metal reinforcement by the cosine of the angle between its direction and that for which the effectiveness of the reinforcement is to be determined. Flat Slab—(See Section 2620.) Gunite—A mixture of Portland cement and fine aggregate, mixed dry, passed through a cement gun, or other similar device, hydrated at the nozzle and deposited under pressure in its place of final repose, and shall be considered as concrete for particulars of design as specified in Chapter 26. Laitance—Extremely fine material of little or no hardness which may collect on the surface of freshly deposited concrete or mortar, resulting from the use of excess mixing water and usually recognized by its relatively light color. Mortar—A mixture of Portland cement, fine aggregate and water. Negative Reinforcement—Reinforcement so placed as to take tensile stress due to negative bending moment. Panel Length—The distance in either direction between centers of two columns of a panel, other than a diagonal direction. Pedestal—An upright compression member whose height does not exceed three times its least lateral dimension. Plain Concrete—(See Section 2405.) Portland Cement—The product obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials, with no additions subsequent to calcination excepting water and calcined or uncalcined gypsum. Positive Reinforcement—Reinforcement so placed as to take tensile stress due to positive bending moment.

Ratio of Reinforcement—The ratio of the effective area of the reinforcement cut by a section of a beam or slab to the effective area of the concrete cut by that section.

Reinforced Concrete—Concrete in which metal is embedded in such a manner that the two materials act together in resisting forces.

Sec. 2604. (a) Portland cement shall conform to the Standard Specifications and Tests for Portland Cement, (A. S. T. M. Designation C9-30) or the Tentative Standard Specifications and Tests for High Early Strengths Portland Cement, (A. S. T. M. Designation C-74-30T) of the American Society for Testing Materials.

Materials

(b) Concrete aggregates shall consist of natural sands, gravels, crushed rock, air-cooled blast-furnace slag, burnt shale, burnt clay, or other inert materials having clean, strong, durable, uncoated particles and shall meet the approval of the Building Inspector. Aggregates containing soft, friable, thin, flaky, elongated or laminated particles totaling more than three (3) per cent by weight, or containing shale in excess of one and one-half ($1\frac{1}{2}$) per cent, or silt and crusher dust finer than the No. 100 Standard sieve in excess of two (2) per cent shall not be used. These percentages shall be used on the weight of the combined aggregate as used in the concrete. When all three groups of these injurious materials are present in the aggregate, the combined amounts shall not exceed five (5) per cent by weight, of the combined aggregate. Aggregates shall not contain strong alkali, or organic material which gives a color darker than the standard color when tested in accordance with the Standard Method of Tests for Organic Impurities in Sands for Concrete, A.S.T.M. Designation C-40-27 of the American Society for Testing Materials.

The maximum size of the aggregate shall not be larger than one-fifth ($1/5$) of the narrowest dimension between forms of the member for which the concrete is to be used nor larger than three-fourths ($3/4$) of the minimum clear spacing between reinforcing bars, or between bars and forms. Maximum size of aggregate is defined as the clear space between the sides of the smallest square opening through which ninety-five (95) per cent by weight, of the material can be passed.

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

(d) Metal reinforcement shall conform to the requirements of the Standard Specifications (A. S. T. M. Designation A15-14) for Billet-Steel Concrete Reinforcement Bars of structural, intermediate or hard grade or Standard Specifications (A. S. T. M. Designation A16-14) for Rail-Steel Concrete Reinforcement Bars, Standard Specifications of the American Society for Testing Materials, or Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement (A. S. T. M. Designation A82-27); provided, that hard grade billet-steel bars larger than three-fourths ($3/4$) inch in diameter shall not be used where bending would be required; and provided, further, that the requirement in the above mentioned specifications for machining of deformed bars shall be eliminated.

Secs. 2604-2606

Deformed bars, to receive that rating which permits the use of higher bond stresses than allowed for plain bars, shall show a bond strength twenty-five (25) per cent greater than that shown by plain bars of equivalent cross-sectional area.

(e) Storage of cement and aggregates shall be in a manner to prevent deterioration or the intrusion of foreign matter. Any material which has been damaged shall be immediately and completely removed from the work.

Test of Materials

Sec. 2605. On concrete or reinforced concrete work the Building Inspector shall have the right to require the owner or his agent to make tests of the concrete from time to time to determine whether the materials and methods in use are such as to produce concrete or reinforced concrete of the quality specified and used in the design of the building or structure. The tests shall be made when ordered by the Building Inspector by the owner or his authorized representative and no responsibility for the expense of these tests shall attach to the Building Department. All such tests shall be made by competent persons approved by the Building Inspector and copies of the results shall be kept on file in the office of the Building Inspector for a period of not less than two years after the acceptance of the structure. Specimens for such tests shall be taken at the place where the concrete is being deposited and shall be taken, cured and tested in accordance with the Standard Method of Making and Storing Specimens of Concrete in the Field, A. S. T. M. Designation C31-27 of the American Society for Testing Materials.

Quality of Concrete

Sec. 2606. Provisions for the design of structures embodied in this Chapter are based on the presumption of concrete of certain strength. To produce concrete of the required strength, the proportion of the mixing water to the cement shall be accurately controlled except that the ratios of water to cement suggested in this Section shall not apply to gunite.

The strengths of concrete indicated in the following table are the minimum ultimate strengths that may be expected of Portland cement concrete when using the tabulated ratios of water to cement and when the concrete is cured and tested as specified in Section 2605, but in all cases the strength used in the design shall be the ultimate measure and determining factor. Water or moisture contained in the aggregates must be included in determining the ratio of water to cement.

Approximate Proportions of Mixing Water to Cement	
Strengths (Lbs. per sq. in.)	Water-Cement Ratio (U. S. Gal. of Water per cu. ft. of Cement)
1,500	8¼
2,000	7½
2,500	6¾
3,000	6

(See Appendix)

All structural drawings and plans submitted for approval shall show the proposed strength of concrete to be used and the water-cement ratio assumed to produce that strength, but the concrete produced and used shall develop a strength in twenty-eight (28) days not less than that shown on the plans as assumed in the design.

Secs. 2607-2609

Sec. 2607. The proportions of aggregates to cement for concrete of any water-cement ratio shall be such as to produce concrete that will work readily into the corners and angles of the form and around the reinforcement without excessive puddling or spading and without permitting free water to collect on the surface. The combined aggregates shall be of such composition of sizes that when separated by the No. 4 standard sieve, the weight retained on the sieve shall not be less than one-half ($\frac{1}{2}$) nor more than two-thirds ($\frac{2}{3}$) of the total, nor shall the amount of coarse material be such as to produce harshness in placing or honeycombing in the structure. When forms are removed, the faces and corners of the members shall be smooth and sound throughout.

**Proportions
and
Consistency**

Admixtures of lime or finely pulverized inert materials may be added but not in excess of six (6) per cent by volume of the cement used.

Sec. 2608. The methods of measuring concrete materials shall be such that the proportion of water to cement can be accurately controlled during the progress of the work and easily checked at any time by the Building Inspector or his authorized representative. A tolerance of one-fourth ($\frac{1}{4}$) gallon of water per sack of cement in any batch of concrete will be allowed provided that the average for any ten (10) consecutive batches does not show a water content greater than that shown in the table and on plans as specified in Section 2606.

**Control of
Proportions**

The method of delivering the aggregates to the work and of storing and handling shall be such that the moisture content of the aggregates as they come to the mixer shall not be subject to frequent or unnecessary changes.

Sec. 2609. (a) 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 batch mixers shall be used. Each batch shall be mixed not less than one minute after all the materials are in the mixer and must be completely discharged before the mixer is recharged. Machine mixers shall have a peripheral speed of approximately two hundred (200) feet per minute.

**Mixing and
Placing
Concrete**

(b) Cleaning Forms and Equipment. Before concrete is placed all equipment for mixing and transporting the concrete shall be cleaned, all debris shall be removed from the spaces to be occupied by the concrete, forms shall be thoroughly wetted (except in freezing weather) or oiled, and masonry that will be in contact with concrete shall be well drenched (except in freezing weather). Reinforcement shall be thoroughly cleaned and secured in position. Concrete shall not be placed until the forms and re-inforcement have been inspected and approved by the "Building Inspector."

(c) Removal of Water From Excavations. Water shall be removed from excavations before concrete is deposited, unless otherwise directed by the Building Inspector. Any flow of water into an excavation shall be diverted through proper side drains to a sump, or be removed by other approved methods which will avoid washing the freshly deposited concrete. Water

Secs. 2609-2610

vent pipes and drains shall be filled by grouting or otherwise, after the concrete has thoroughly hardened.

(d) **Transporting Concrete.** Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which shall prevent the separation or loss of the ingredients. It shall be deposited as nearly as practicable in its final position to avoid rehandling or flowing. Under no circumstances shall concrete that has attained its initial set be used.

(e) **Placing.** Concrete shall be thoroughly compacted with suitable tools. When necessary, openings shall be provided in the forms to permit the placing of concrete in such a manner as to avoid accumulations of hardened concrete on the forms or reinforcing bars. The concrete shall be thoroughly worked around the reinforcement.

(f) **Curing.** Exposed surfaces of concrete shall be kept moist for a period of at least seven (7) days after being deposited.

(g) **Depositing in Cold Weather.** When depositing concrete at freezing or near freezing temperatures, the concrete shall be maintained at a temperature of at least fifty (50) deg. F., but not more than one hundred twenty (120) deg. F. The concrete shall be maintained at a temperature of not less than fifty (50) deg. F. for not less than seventy-two (72) hours after placing. When necessary, concrete materials shall be heated before mixing. Dependence shall not be placed on salt or other chemicals for the prevention of freezing.

(h) **Bonding Fresh and Hardened Concrete.** Before new concrete is deposited on or against concrete which has set, the forms shall be re-tightened, the surface of the set concrete shall be roughened, cleaned of foreign matter and laitance and thoroughly wetted but not saturated. The cleaned and wetted surfaces of the hardened concrete, including vertical and inclined surfaces, shall first be slushed with a coating of 1:2 cement mortar against which the new concrete shall be placed before the mortar has attained its initial set.

Forms and Details of Construction

Sec. 2610. (a) **Design of Forms.** Forms shall conform to the shape, lines and dimensions of the member as called for on the plans and shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain position and shape. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

Forms shall be so designed, braced and aligned as to keep the finished columns of the building plumb with not more than an error of 1 to 1,000 in the height of the exterior columns or of columns adjacent to elevators.

Temporary openings shall be provided at the base of column and wall forms, and at other points where necessary, to facilitate cleaning and inspection.

(b) **Removal of Forms.** Forms shall not be disturbed until the concrete has hardened sufficiently to permit their removal

Sec. 2610

with safety. Shoring shall not be removed until the member has acquired sufficient strength to support safely its own weight and the load upon it. Members subject to additional loads during construction shall be adequately shored to support both the member and construction loads in a manner that will protect the member from damage.

The Building Inspector may require forms to remain in place for a specified time.

(c) **Cleaning and Bending Reinforcements.** Metal reinforcement before being placed shall be thoroughly cleaned of loose mill and rust scale and of other coatings that will destroy or reduce the bond. Reinforcement shall be carefully formed to the dimensions indicated on the plans. Cold bends shall be made around a pin having a diameter of not less than four times the least dimension of the bar.

Metal reinforcement shall not be bent, straightened or handled in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of reinforcement will be permitted only when approved by the Building Inspector.

(d) **Placing Reinforcement.** Metal reinforcement shall be accurately placed and secured and shall be supported by chairs, spacers, or hangers. The minimum clear distance between parallel bars shall be one and one-half ($1\frac{1}{2}$) times the diameter for round bars or one and one-half ($1\frac{1}{2}$) times the diagonal for square bars. The minimum clear distance between bars and forms shall be the diameter of round bars and the diagonal of square bars. If the ends of bars are anchored as specified in Section 2619, the clear spacing may be made equal to the diameter of round bars or to the diagonal of square bars, but in no case shall the spacing between bars be less than one (1) inch, nor less than one and one-third ($1\frac{1}{3}$) times the maximum size of the coarse aggregate. Bars shall be embedded a distance from any face of any member not less than the minimum distance as specified in Section 4301. The main longitudinal slab steel shall be spaced not more than two and one-half ($2\frac{1}{2}$) times the slab thickness, and not less than one-tenth ($1/10$) of one (1) per cent of transverse steel shall be provided.

(e) **Splices and Offsets in Reinforcement.** In slabs, beams and girders, splices of reinforcement shall not be made at points of maximum stress without the approval of the Building Inspector. Splices, where permitted, shall provide sufficient lap to transfer the stress between bars by bond and shear. In such splices the bars shall be spaced at the minimum distance specified in paragraph (d) of this Section.

Where changes in the cross-section of a compression member occur, the longitudinal bars shall be sloped for the full length of the member or offset in a region where lateral support is afforded. Where offset, the slope of the inclined portion from the axis of the member shall not be more than 1 in 6.

(f) **Protective Covering of Concrete.** At the under side of footings metal reinforcement shall have a minimum covering of three (3) inches of concrete.

Secs. 2610-2611

In fire-resistive construction, metal reinforcement shall be protected as specified in Section 4301.

Exposed reinforcement bars intended for bonding with future extensions shall be protected from corrosion.

(g) **Construction Joints.** Joints not indicated on the plans shall be so made and located as to least impair the strength of the completed structure. Where a joint is to be made, any excess water and laitance shall be removed from the surface after concrete is deposited. Before depositing of concrete is resumed the hardened surface shall be treated as specified in paragraph (h) of Section 2609.

At least one (1) hour must elapse after concrete is deposited in the columns or walls before depositing in beams, girders, or slabs supported thereon. Haunches and column capitals shall be considered as part of, and to act continuous with, the floor.

Construction joints in floors shall be located near the middle spans of slabs, beams or girders, unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. Provision shall be made for shear by use of reinforcement, inclined in both directions across the joint.

Pipes, conduits, or other openings shall not be allowed in concrete columns, and shall not be allowed in other reinforced concrete structural units unless special provision is made for the additional stress caused in the concrete and steel by the presence of the openings. No allowance shall be made for the strength of the pipe or conduits.

Assumptions for Design Sec. 2611. The design of reinforced concrete members shall be based on the following assumptions:

(a) Calculations shall be made with reference to working stresses and safe loads;

(b) A plane section before bending remains plane after bending, shearing distortions being neglected;

(c) The modulus of elasticity of concrete in compression is constant within the limits of working stresses, and the distribution of compressive stress in beams is rectilinear;

(d) The moduli of elasticity of concrete in computations for the position of the neutral axis, for the resisting moment of beams and for compression of concrete in columns, are as follows:

Moduli of Elasticity	Compressive Strength of Concrete at 28 days
(1) 1/15 that of steel	1,500 to 2,200 lbs. per sq. in.
(2) 1/12 that of steel	2,200 to 2,900 lbs. per sq. in.
(3) 1/10 that of steel	2,900 or more lbs. per sq. in.

(e) In calculating the moment of resistance of reinforced concrete beams and slabs the tensile resistance of the concrete is neglected;

(f) The bond between the concrete and the metal reinforcement remains unbroken throughout the range of working stresses. Under compression the two materials are therefore stressed in proportion to their moduli of elasticity;

(g) Initial stress in the reinforcement due to contraction or expansion of the concrete is neglected except in the design of reinforced concrete columns.

Sec. 2612

Sec. 2612. The symbols and notations used in this Chapter are defined as follows:

Notation

- a =width of face of column or pedestal;
- α =angle between inclined web bars and axis of beam;
- A =total net area of column, footing, or pedestal, exclusive of fireproofing;
- A' =loaded area of pedestal, pier or footing;
- $A_c=A (1-p)$ net area of concrete core of column (core area minus reinforcement);
- A'_c =net area of concrete in columns with lateral ties (total column area minus area of reinforcement);
- A_s =effective cross-sectional area of metal reinforcement in tension in beams or compression in columns; and the effective cross-sectional area of metal reinforcement which crosses any of the principal design sections of a flat-slab and which meets the requirements of paragraph (d) of section 2620;
- A_v =total area of web reinforcement in tension within a distance of s (s_1, s_2, s_3 , etc.) or the total area of all bars bent up in any one point;
- b =width of rectangular beam or width of flange of T-beam;
- b_1 =dimension of the dropped panel of a flat-slab in the direction parallel to l_1 ;
- c =base diameter of the largest right circular cone which lies entirely within the column (including the capital) whose vertex angle is 90 deg. and whose base is one and one-half ($1\frac{1}{2}$) inches below the bottom of the slab or the bottom of the dropped panel, (in flat-slab formulae);
- c =projection of footing from face of column (in footing formulae);
- d =depth from compression surface of beam or slab to center of longitudinal tension reinforcement;
- d' =depth from compression surface of a beam or slab to center of compression reinforcement;
- E_c =modulus of elasticity of concrete in compression;
- E_s =modulus of elasticity of steel=30,000,000 lb. per sq. in.;
- f_c =compressive unit stress in extreme fiber of concrete;
- f'_c =ultimate compressive strength of concrete at age of twenty-eight (28) days, determined by tests made in accordance with Section 2605;
- f_r =compressive unit stress in metal core;
- f_s =tensile unit stress in longitudinal reinforcement;
- f_v =tensile unit stress in web reinforcement;
- F =total tension in a bar;
- F' =total tensile stress in a bar developed in the length " y ", (see paragraph (c) of Section 2619);
- h =unsupported length of column (see paragraph (b) Section 2621);
- I =moment of inertia of a section about the neutral axis for bending;

Sec. 2612

- j =ratio of lever arm of resisting couple to depth d ;
 k =ratio of depth of neutral axis to depth d ;
 l =span length of beam or slab (see paragraph (b) Section 2614);
 l =span length of flat-slab, center to center of columns, in the direction in which moments are considered;
 $l_{\perp}$ =span length of flat-slab, center to center of columns, perpendicular to the direction in which moments are considered;
 M =bending moment or moment of resistance in general;
 M_o =sum of positive and negative bending moments in either direction, at the principal design sections of a panel of a flat-slab;
 $n=E_s/E_c$ ratio of modulus of elasticity of steel to that of concrete;
 Σ_o =sum of perimeters of bars in one set;
 p =ratio of effective area of tension reinforcement to effective area of concrete in beams= A_s/bd ; and the ratio of effective area of longitudinal reinforcement to the area of the concrete core in columns;
 P =total safe axial load on column whose h/R is less than 40;
 P' =total safe axial load on long column;
 r_a =permissible working stress in concrete over the loaded area of a pedestal, pier or footing;
 R =ratio of positive or negative moment in two column strips or one middle strip of a flat slab, to M_o (in flat-slab formulae);
 R =least radius of gyration of a section;
 s =spacing of web members, measured at the mid-depth of the beam and in the direction of the longitudinal axis of the beam;
 t =thickness of flange of T-beam;
 t_1 =thickness of flat-slab without dropped panels or thickness of a dropped panel;
 t_2 =thickness of flat-slab with dropped panels at points away from the dropped panel;
 u =bond stress per unit of area of surface of bar;
 v =shearing unit stress;
 V =total shear;
 w =uniformly distributed load per unit of length of beam or slab;
 w =upward reaction per unit of area of base of footing (in footing formulae);
 w' =uniformly distributed dead and live load per unit of area of a floor or roof;
 W =total dead and live load uniformly distributed over a single panel area;
 x =length of bar added for anchorage, including the hook, if any;
 y =distance from the point at which the tension is computed to the point of beginning of anchorage;

Sec. 2613

**Working
Stresses**

Sec. 2613. As specified in Section 2606, the structural drawings and plans shall show the ultimate strength of concrete for which the several parts of the structures were designed. The working stresses for the design of buildings or structures shall be based on the ultimate strength indicated on the drawings as specified in Section 2606 and shall be in the ratios specified in this Chapter. The ultimate strength (f'_c) shall be the average strength attained at twenty-eight (28) days, based on six by twelve inch (6"x12") or eight by sixteen inch (8"x16") cylinders made, cured and tested in accordance with the Standard Methods of Making and Storing Specimens of Concrete in the Field (A. S. T. M. Designation C31-27) and Standard Methods of Making Compression Tests of Concrete (A. S. T. M. Designation C39-27) of the American Society for Testing Materials. Guniting test cylinders shall be made in a manner that will permit the blast of air to firmly compact the materials and provide proper escapement of the air to eliminate possible back pressure, and such cylinders shall be cured and tested as specified above.

Working stresses in concrete and reinforcement are summarized as follows:

MAXIMUM ALLOWABLE STRESSES**CONCRETE: (a) Compression**

1. Columns: varies (See Paragraphs (c) and (d) Section 2621)
2. Long Columns: (See paragraph (h) Section 2621)
3. Piers and Pedestals..... $0.25f'_c$
4. Extreme Fibre, positive bending..... $0.40f'_c$
5. Extreme Fibre, negative bending..... $0.45f'_c$
- (b) **Shear:** (1) *Beams without special anchorage of longitudinal reinforcement.*
6. No web reinforcement..... $0.02f'_c$
7. Stirrups and/or bent-up bars..... $0.06f'_c$
- (2) *Beams with special anchorage of longitudinal reinforcement.*
8. No web reinforcement..... $0.03f'_c$
9. Stirrups and/or bent-up bars..... $0.12f'_c$

NOTE: Web reinforcement in beams where the shear exceeds $0.06f'_c$ shall be subject to the approval of the Building Inspector and in no case shall the maximum unit shearing stress exceed 240 lbs. per sq. in.

(3) Flat-slabs.

10. At distance d from edge of column cap or dropped panel $0.03f'_c$
- (4) **Footings.**
11. Same as 6.
12. Same as 8.
- (c) **Bond:** (1) *Plain Bars.*
13. Beams and slabs, and one-way footings..... $0.04f'_c$

Secs. 2613-2614

14. Two-way footings $0.03f'_c$
(2) *Deformed Bars.*
15. Beams and slabs, and one-way footings..... $0.05f'_c$
16. Two-way footings $0.0375f'_c$
- STEEL:**
- (a) *Tension.*
17. Billet-steel bars:
Structural grade 16,000 lbs. per sq. in.
Intermediate grade 18,000 " " " "
Hard grade (where permitted) 20,000 " " " "
18. Rail-steel bars 20,000 " " " "
- (b) *Compression.*
19. Ordinary reinforcing bars..... nf_c
20. Structural steel core of composite
column 16,000 lbs. per sq. in.
(See paragraph (f) of Section 2621 for reduced stresses)
21. Structural steel column..... 16,000 lbs. per sq. in.
(See paragraph (g) of Section 2621 for reduced stresses)
22. Composite cast-iron column..... 10,000 lbs. per sq. in.
(See paragraph (f) of Section 2621 for reduced stresses)
23. Cold drawn steel wire..... 20,000 lbs. per sq. in.

Flexural**Computations**

Sec. 2614. (a) Formulas for Flexure. Computations of flexural resistance of reinforced concrete beams and slabs shall be based on the assumptions of Section 2611. The customary formulas or their equivalent shall be used.

(b) Span Length. The span length of freely supported beams and slabs shall be the clear span plus the depth of beam or slab but shall not exceed the distance between centers of the supports.

The span length for continuous or restrained beams built to act integrally with supports shall be the clear distance between faces of supports. For continuous or restrained beams having brackets built to act integrally with both beam and support and of a width not less than the width of the beam and making an angle of 45 deg. or more with the horizontal, the span may be measured from the section where the combined depth of the beam and bracket is at least one-third ($\frac{1}{3}$) more than the depth of the beam. No portion of such a bracket shall be considered as adding to the effective depth of the beam. Maximum negative moments are to be considered as existing at the ends of the span, as defined above.

In rectangular slabs reinforced in both directions the distribution of load shall be assumed to be inversely as the cubes of the spans.

(c) Unsupported Length of Beams. The distance between lateral supports of the compression area of a beam shall not exceed twenty-four (24) times the least width of compression flange.

(d) Requirements for T-Beams. In T-beam construction the slab shall be built integral with the beam. The effective flange width to be used in the design of symmetrical T-beams shall not exceed one-fourth ($\frac{1}{4}$) of the span length of the beam, and its overhanging width on either side of the web shall not exceed eight (8) times the thickness of the slab, and

Secs. 2614-2616

never more than one-half ($\frac{1}{2}$) the clear distance to the next beam.

For beams having a flange on one side only, the effective flange width to be used in design shall not exceed one-tenth ($\frac{1}{10}$) of the span length of the beam, and its overhanging width from the face of the web shall not exceed six (6) times the thickness of the slab, and never more than one-half ($\frac{1}{2}$) the clear distance to the next beam.

Where the principal slab reinforcement is parallel to the beam, transverse reinforcement, not less in amount than three-tenths (0.3) per cent of the sectional area of the slab, shall be provided in the top of the slab and shall extend across the beam and into the slab not less than two-thirds ($\frac{2}{3}$) of the width of the effective flange overhang. The spacing of the bars shall not exceed eighteen (18) inches.

Provision shall be made for the compressive stress at the support in continuous T-beam construction.

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 purpose of providing additional compression area shall have a flange thickness not less than one-half ($\frac{1}{2}$) the width of the web and a total symmetrical flange width not more than four (4) times the web thickness.

Sec. 2615. Beams and slabs of equal spans freely supported or built to act integrally with beams, girders or other slightly restraining support, or beams and slabs built into masonry walls in a manner which develops only partial end restraint, and carrying uniformly distributed loads, shall be designed for the following moments at critical sections:

Moment Coefficients:
Freely Supported, Slightly Restrained

- (a) Beams and slabs of one span,
Maximum positive moment near center,
 $M = wl^2/8$ (1)
- (b) Beams and slabs continuous for two spans only,
(1) Maximum positive moment near center,
 $M = wl^2/10$ (2)
(2) Negative moment over interior support,
 $M = wl^2/8$ (3)
- (c) Beams and slabs continuous for more than two spans,
(1) Maximum positive moment near center and negative moment at support of interior spans,
 $M = wl^2/12$ (4)
(2) Maximum positive moment near centers of end spans and negative moment at first interior support,
 $M = wl^2/10$ (5)
- (d) Negative moment at end supports for cases (a),
(b) and (c) of this Section.
 $M = \text{not less than } wl^2/16$ (6)

Moment Coefficients:
Fully Restrained

Sec. 2616. Beams and slabs of equal span built to act integrally with columns, walls, or other restraining supports and assumed to carry uniformly distributed loads, shall be designed,

Secs. 2616-2618

except as provided in Section 2615, for the following moments at critical sections:

- (a) Interior spans,
 - (1) Negative moment at interior supports except the first,
 $M = w\ell^2/12$ (7)
 - (2) Maximum positive moment near centers of interior spans,
 $M = w\ell^2/16$ (8)
- (b) End spans of continuous beams and slabs, and beams and slabs of one span in which l/l is less than twice the sum of the values of l/h for the exterior columns above and below which are built into beams;
 - (1) Maximum positive moment near center of span and negative moment at first interior supports,
 $M = w\ell^2/12$ (9)
 - (2) Negative moment at exterior supports,
 $M = w\ell^2/12$ (10)
- (c) End spans of continuous beams, and beams of one span, in which l/l is equal to or greater than twice the sum of the values of l/h for the exterior columns above and below which are built into the beams:
 - (1) Maximum positive moment near center of span and negative moment at first interior support,
 $M = w\ell^2/10$ (11)
 - (2) Negative moment at exterior support,
 $M = w\ell^2/16$ (12)

In this section " I " represents the moment of inertia which for these calculations shall be computed on the assumption that the member is homogeneous, neglecting the reinforcement but including that part of the concrete section outside of the reinforcement which is ordinarily considered as fireproofing.

**Moment Coefficients:
Unequal
Spans, Non-uniform Loads**

Sec. 2617. Continuous beams or slabs with unequal spans or with other than uniformly distributed loading, whether freely supported or restrained, shall be designed for the actual moments under the conditions of loading and restraint.

Provision shall be made where necessary for negative moment near the center of short spans which are adjacent to long spans, and for the negative moment at the end supports, if restrained.

**Shear and
Diagonal
Tension**

Sec. 2618. (a) The shearing unit stress, v , in reinforced concrete slabs, joists, beams and girders shall be computed by Formula 14 on the minimum width of rectangular beams and on the minimum web thickness in L or T-beams.

$$v = V/bjd \text{ (14)}$$

(b) Types of web reinforcement may consist of vertical or inclined stirrups or web reinforcing bars forming an angle of 30 deg. or more with the axis of the beam, or longitudinal bars bent up at an angle of 15 deg. or more with the axis of the

Sec. 2618

beam, and shall be anchored at both ends as specified in paragraph (e) of Section 2619.

(c) Spacing of stirrups or bent-up bars shall not exceed the values given by Formula 15, where the shearing stress is not greater than $0.06f'_c$.

$$s = \frac{45d}{a+10} \dots \dots \dots (15)$$

Bent-up bars and stirrups shall be considered effective in reinforcing the web only within the area between two vertical planes distant $s/2$ in either direction from the point where the bent-up bar crosses the mid-depth of the beam.

Where the shearing stress is greater than $0.06f'_c$, the distance s shall be not greater than two-thirds ($2/3$) of the values given by Formula 15.

(d) Maximum shearing unit stresses computed by Formula 14, in beams where the longitudinal reinforcement is without special anchorage, shall not exceed the value given by Formula 16 and in no case shall it exceed $0.06f'_c$.

$$v = 0.02f'_c + \frac{f_v A_v}{bs} (\sin \alpha + \cos \alpha) \dots \dots \dots (16)$$

In beams in which the longitudinal reinforcement is anchored as specified in paragraph (e) of Section 2619, the shearing unit stress shall not exceed the value given by Formula 16 when $0.03f'_c$ is substituted for $0.02f'_c$, and in no case shall it exceed 240 lbs. per sq. in.

Where the entire web reinforcement consists of longitudinal bars bent up in a single plane the allowance for the quantity, $\frac{f_v A_v}{bs} (\sin \alpha + \cos \alpha)$ in Formula 16, shall not exceed 75.

(e) Combined web reinforcement shall be assumed to have a total shearing resistance of the sum of the shearing resistances computed of the various types separately, the shearing resistance of the concrete being included only once.

(f) Shearing unit stresses in flat-slabs, computed by Formula 14 (in which d shall be taken as $t_c - 1\frac{1}{2}$) on a vertical section which lies at a distance $t_c - 1\frac{1}{2}$ from the edge of the column capital and parallel with it, shall not exceed $0.02f'_c$ multiplied by the following factor: 1 plus the ratio which the cross-sectional area of the negative reinforcement in the width of strip directly above the column capital bears to the cross-sectional area of the negative reinforcement in the full width of two column strips. At least twenty-five (25) per cent of the total cross-sectional area of the negative reinforcement in two column strips must be within the width of strip directly above the column capital.

In no case shall the unit shearing stress exceed $0.03f'_c$.

The shearing unit stress, computed by Formula 14 (in which d shall be taken as $t_c - 1\frac{1}{2}$) on a vertical section which lies at a distance of $t_c - 1\frac{1}{2}$ from the edge of the dropped panel and parallel with it, shall not exceed $0.03f'_c$. At least fifty (50)

Secs. 2618-2619

per cent of the cross-sectional area of the negative reinforcement in two column strips must be within the width of strip directly above the dropped panel.

(g) Shear and diagonal tension in footings shall be taken as not less than that computed by Formula 14, and at the critical section shall not exceed $0.02f'_c$ for footings with straight bars nor $0.03f'_c$ for footings in which the bars are anchored at both ends by adequate hooks as specified in paragraph (e) of Section 2619.

The critical section for diagonal tension in footings on soil shall be computed on a vertical section through the perimeter of the lower base of a frustum of a cone or pyramid which has a base angle of 45 deg., and which has for its top the base of the column or pedestal and for its lower base the plane at the centroid of longitudinal reinforcement.

The critical section for diagonal tension in footings on piles shall be computed on a vertical section at the inner edge of the first row of piles entirely outside a section midway between the face of the column or pedestal and the section defined for soil footings, but in no case outside of that section. For piles not arranged in rows, the critical section shall be taken midway between the face of the column and the section defined for soil footings.

Bond and Anchorage

Sec. 2619. (a) Bond stresses in beams where bar reinforcement is used to resist tensile stresses developed by beam action shall be taken as not less than that computed by Formula 17.

$$u = V / \sum_o j d \dots\dots\dots (17)$$

For continuous or restrained members, the critical section for bond for the positive reinforcement shall be assumed to be at the point of inflection; that for the negative reinforcement shall be assumed to be at the face of the support, and at the point of inflection. For simple beams or at the outer ends of freely supported end spans of continuous beams, the critical section for bond shall be assumed to be at the face of the support.

Bent-up longitudinal bars, which, at the critical section, are within a distance $d/3$ from horizontal reinforcement under consideration may be included with the straight bars in computing $\sum_o$.

(b) Permissible bond stress where ordinary anchorage as described in paragraph (d) of this Section is provided, shall not exceed the values specified in Section 2613.

(c) Permissible bond stress where special anchorage is provided, as described in paragraph (e) of this Section, shall not exceed two and one-half ($2\frac{1}{2}$) times that specified in paragraph (b) of this Section. A sufficient additional length of bar shall be added beyond the theoretical point of zero moment to provide for the development of the excess in bond stress of that specified in paragraph (b) of this Section. The length x to be added for this purpose is expressed by Formula 18.

$$xu \sum_o = F - F' \dots\dots\dots (18)$$

The point of beginning of anchorage shall be taken at the

Sec. 2619

edge of support for freely supported beams and at the point of inflection for fixed or continuous beams. Anchorage of negative reinforcing shall be toward the center of the beams from this point.

The length of bar added for anchorage may be either straight or bent. The radius of bend shall be not less than four (4) bar diameters.

(d) Ordinary anchorage in continuous, restrained or cantilever beams shall be the length of anchorage of the tensile negative reinforcement beyond the face of the support and shall provide for the full maximum tension by Formula 18. Such anchorage shall provide a length of bar not less than the depth of the beam. In the case of end supports which have a width less than three-fourths of the depth of the beam, the bars shall be bent down toward the support a distance not less than the effective depth of the beam. The portion of the bar so bent down shall be as near to the end of the beam as protective covering permits. In continuous or restrained beams, negative reinforcement shall be carried to or beyond the point of inflection. Not less than one-fourth of the area of the positive reinforcement shall extend into the support to provide an embedment of ten (10) or more bar diameters.

In simple beams or at the outer ends of freely supported end spans of continuous beams at least one-fourth of the area of the tensile reinforcement shall extend along the tension side of the beam and beyond the face of the support to provide an embedment of ten (10) or more bar diameters.

(e) Special anchorage in addition to that required in paragraph (d) of this Section shall be provided as specified in this paragraph where increased shearing stresses are used as provided in paragraphs (c), (d), (f) and (g) of Section 2618, or where increased bond stresses are used as provided in paragraph (c) of this Section.

(1) In continuous and restrained beams, anchorage beyond points of inflection of at least one-third the area of the negative reinforcement and beyond the face of the support of at least one-third the area of the positive reinforcement, shall be provided to develop one-third of the maximum working stress in tension. The anchorage length x shall be computed by Formula 18, with bond stresses not greater than those specified in paragraph (b) of this section.

(2) At the edges of footings, anchorage for all the bars for one-third the maximum working stress in tension shall be provided within a region where the tension in the concrete, computed as an unreinforced beam, does not exceed 40 lbs. per sq. in. In any case the reinforcement bars shall extend to within four (4) inches of the edge of the footing but not closer than three (3) inches as specified in paragraph (f) of Section 2610.

(3) In simple beams or at the outer ends of freely supported end spans of continuous beams, at least one-half of the tensile reinforcements shall extend along the tension side of the beam to provide an anchorage beyond the face

Secs. 2619-2620

of the support for one-third of the maximum working stress in tension.

(f) Anchorage of web reinforcement at both ends shall be by providing continuity with longitudinal reinforcement, bending around the longitudinal bar or by means of a semi-circular hook which has a radius not less than four (4) times the diameter of the web bar.

Stirrup anchorage shall be so provided in the compression and tension regions of a beam as to permit the development of safe working tensile stress in the stirrup at a point $0.3d$ from either face.

The end anchorage of a web member not in bearing on the longitudinal reinforcement shall be such as to engage an amount of concrete sufficient to prevent the bar from pulling out. In all cases the stirrups shall be carried as close to the upper and lower surfaces as fireproofing requirements permit.

Flat-Slab Construction

Sec. 2620. (a) Limitations. Flat-slab construction shall refer to concrete slabs having reinforcement bars extending in two or four directions, without beams or girders to carry the load to supporting members and with a ratio of length to width of panel not greater than 1.33. The moment coefficients, moment distribution and slab thicknesses specified herein are for slabs which have three or more rows of panels in each direction, and in which the panels are approximately uniform in size. Slabs with paneled ceiling or with depressed paneling in the floor shall be considered as coming under the requirements herein given, provided the depth of the thicker portion of the slab does not exceed 1.5 times the depth of the remainder of the slab.

(b) Panel Strips and Principal Design Section. A flat-slab panel shall be considered as consisting of strips as follows:

A middle strip one-half panel in width, symmetrical with respect to the panel center line and extending through the panel in the direction in which moments are being considered;

Two Column strips, each one-quarter panel in width, occupying the two (2) quarter-panel areas outside of the middle strip.

When considering moments in the direction of the width of the panel, the panel is similarly divided by strips, the width of which are respectively one-half and one-fourth of the length of the panel.

The principal design sections are located as follows:

Sections for Negative Moment shall be taken along the edges of the panel; that is, along the lines joining the column centers. For the column strips, the section shall follow the center line between the columns to the edge of the column capital and then around the circumference of the column capital for one-quarter ($\frac{1}{4}$) circumference.

Sections for Positive Moment shall be taken on the center line of the panel, crossing the strips for which moments are being considered.

(c) Moments in Interior Panels. Flat-slabs in which the ratio of reinforcement, p , for negative moment in the column strip is not greater than 0.01, the numerical sum of the positive and negative moments in the direction of either side of a rectangular panel shall be not less than that given by Formula 19.

$$M=0.09 Wl (1-2c/3l)^2 \dots \dots \dots (19)$$

(d) Moments in Principal Design Sections. The moments in the principal design sections shall be those given in the accompanying table of moments, except as follows:

(1) The sum of the maximum negative moments in the two column strips may be greater or less than the values given in the table of moments by not more than $0.03M_o$.

(2) The maximum negative and the maximum positive moments in the middle strip and the sum of the maximum positive moments in the two column strips may be greater or less than the values given in the table of moments by not more than $0.01M_o$.

BENDING MOMENTS TO BE USED IN DESIGN OF FLAT SLABS

For Interior Panels Fully Continuous

Strip	Flat-Slabs without Dropped Panels		Flat-Slabs with Dropped Panels	
	Negative	Positive	Negative	Positive
Slabs with 2-way Reinforcement				
Column strip	0.23 M_o	0.11 M_o	0.25 M_o	0.10 M_o
2-Column strips	0.46 M_o	0.22 M_o	0.50 M_o	0.20 M_o
Middle strip	0.16 M_o	0.16 M_o	0.15 M_o	0.15 M_o
Slabs with 4-way Reinforcement				
Column strip	0.25 M_o	0.10 M_o	0.27 M_o	0.095 M_o
2-Column strips	0.50 M_o	0.20 M_o	0.54 M_o	0.190 M_o
Middle strip	0.10 M_o	0.20 M_o	0.08 M_o	0.190 M_o

(e) Lateral Dimensions of Dropped Panels. The dropped panel shall have a length or diameter in each direction parallel to a side of the panel of not less than one-third the panel length in that direction.

(f) Thickness of Slabs and Dropped Panels. The total thickness of the slab through the dropped panel, t_d in inches, or of the slab if a dropped panel is not used, shall be not less than the value given by Formula 20.

$$t_d=0.038 (1-1.44 c/l) l \sqrt{Rw' l/b_1+1\frac{1}{2}} \dots \dots \dots (20)$$

Note: The values of R in the above formula are the coefficients of M_o in the preceding table in this Section.

For slabs with dropped panels the total thickness in inches at points beyond the dropped panel shall be not less than

$$t_d=0.02 l \sqrt{w' +1} \dots \dots \dots (21)$$

The dropped panel shall have a thickness of t_d not greater than $1.5t_d$.

Sec. 2620

In determining minimum thickness by Formulas 20 and 21, the value of l shall be the panel length center to center of the columns, on the long side of panel and the value of l shall be the panel width, center to center of the columns.

The slab thickness t_1 or t_2 shall in no case be less than $l/32$ for floor slabs, and not less than $l/40$ for roof slabs.

(g) Wall and Other Irregular Panels. In wall panels and other panels in which the slab is not continuous with an adjacent panel, the maximum negative moment at the edge of the panel opposite to the discontinuous edge and the maximum positive moment at the center of this panel shall be increased fifteen (15) per cent in the column strip perpendicular to the wall or discontinuous edge and thirty (30) per cent in the middle strip perpendicular to the wall or discontinuous edge. Such increase refers to the moments for interior panels as specified in paragraph (d) of this Section.

In these strips the bars used for positive moments perpendicular to the discontinuous edge shall extend to the edge of the panel at which the slab is discontinuous.

At the wall or discontinuous edge the negative moment in the column strip shall be taken as not less than ninety (90) per cent and in the middle strip as not less than sixty-five (65) per cent of the corresponding moments for a normal interior panel as given in the table in paragraph (d) of this Section.

(h) Panels with Marginal Beams. A marginal beam which has a depth greater than the thickness of the dropped panel into which it frames, shall be designed to carry, in addition to the load superimposed directly upon it, a uniformly distributed load equal to at least one-fourth of the total live and dead load for which the adjacent panel or panels are designed. Slabs supported by marginal beams on opposite edges shall be designed as freely supported slabs for the entire load.

Column strips adjacent to and parallel with marginal beams having a depth less than the thickness of the dropped panel, shall be designed to resist the moment specified for a column strip in the table of moments. Column strips adjacent to and parallel with marginal beams having a depth less than the thickness of the dropped panel, shall be designed to resist a moment at least one-half as great as that specified for a column strip in the table of moments.

In wall columns where brackets are used in place of capitals, the value of c in the direction in which the bracket extends shall be taken as twice the distance from the center of the column to a point one and one-half ($1\frac{1}{2}$) inches back from the edge of the bracket and averaged with the value of c for an interior column capital in the computation for moments in Formula 19. The value of c for column strips parallel and adjacent to marginal beams shall be taken as equal to the width of the wall column if no bracket is used in this direction.

(i) Flat-Slabs on Bearing Walls. Where there is a beam or a bearing wall at the center line of columns in the interior portion of a continuous flat slab, the negative moment at the beam or wall line in the middle strip perpendicular to the beam

Secs. 2620-2621

or wall shall be taken as thirty (30) per cent greater than the negative moment specified in the table of moments in paragraph (d) of this Section for a middle strip. The column strip adjacent to and lying on either side of the beam or wall shall be designed to resist moments at least one-half of those specified in the table of moments for a column strip.

(j) Points of Inflection. In the middle strip the point of inflection for the slabs without dropped panels shall be assumed at a line $0.30 l$ distant from the center of the span, and for slabs with dropped panels $0.25 l$ distant from the center of the span.

In the column strip the point of inflection for slabs without dropped panels shall be at a line $0.30 (l-c)$ distant from the center of the panel and $0.25 (l-c)$ for slabs with dropped panels.

(k) Effective Reinforcement. The reinforcement which crosses any section and which fulfills the requirements given in paragraph (l) of this Section may be considered as effective in resisting the moment at the section. The sectional area of a bar multiplied by the cosine of the angle between the direction of the axis of the bar and any other direction may be considered effective as reinforcement in that direction.

(l) Arrangement of Reinforcement. The reinforcement shall be securely fastened in place. All bars in rectangular or diagonal directions shall be carried to points at least twenty (20) diameters beyond the point of inflection on each side of a section of critical, positive, or negative moment. Lapped splices shall not be permitted at or near regions of maximum stress except as described in paragraph (e) of Section 2610. At least four-tenths (0.4) of all bars in each direction shall be of such length and shall be so placed as to provide reinforcement at two sections of critical negative moment and at the intermediate section of critical positive moment. Not less than one-third of the bars used for positive reinforcement in the column strip shall extend into the dropped panel at least twenty (20) diameters of the bar, or in case no dropped panel is used, shall extend to within one-eighth ($\frac{1}{8}$) of the span length from the center line of the column or the support.

(m) Special Panel Arrangement. For structures having a width of less than three rows of panels, or in which irregular or special panels are used, an analysis shall be made of the moments developed in both slabs and columns.

Sec. 2621. (a) Limiting Dimensions. Reinforced concrete columns shall be not longer than forty (40) times the least radius of gyration, unless designed as long columns as specified in paragraph (h) of this Section. Principal columns shall have a minimum gross diameter of not less than twelve (12) inches.

(b) Unsupported Length and Radius of Gyration of Columns. The unsupported length of reinforced concrete columns shall be:

(1) In flat-slab construction the clear distance between

**Reinforced
Concrete
Columns**

Sec. 2621

the floor and under side of the capital or dropped panel above;

(2) In beam-and-slab construction, the clear distance between the floor and the under side of the shallowest beam framing into the column at the next higher floor level;

(3) In floor construction with beams in one direction only, the clear distance between floor slabs;

(4) In columns supported laterally by struts or beams only, the clear distance between consecutive pairs (or groups) of struts or beams, provided that to be considered an adequate support, two such struts or beams shall meet the column at approximately the same level and the angle between the two planes formed by the axis of the column and the axis of each strut respectively is not less than seventy-five (75) deg. nor more than one hundred five (105) deg.

When haunches are used at the junction of beams or struts with columns, the clear distance between supports may be considered as reduced by two-thirds of the depth of the haunch.

The radius of gyration of a column shall be computed from the concrete area of the core and the transformed section of the longitudinal steel area. That is, the actual area of the steel multiplied by n , this being assumed to be distributed uniformly around the periphery of the core.

(c) Design of Spiral Columns. The safe axial load on columns reinforced with longitudinal bars and closely spaced spirals enclosing a circular core, shall be not greater than that determined by Formula 22.

$$P = A [1 + (n-1)p] [300 + (0.10 + 4p)f'_c] \dots \dots \dots (22)$$

The longitudinal reinforcement shall consist of at least six bars of minimum diameter of one-half ($\frac{1}{2}$) inch, and the total effective cross-sectional area shall be not less than one (1) per cent nor more than six (6) per cent of that of the core.

The spiral reinforcement shall be not less than one-fourth ($\frac{1}{4}$) the volume of the longitudinal reinforcement. It shall consist of evenly spaced continuous spirals held firmly in place and true to line by at least three vertical spacer bars. The spacing of the spirals shall be not greater than one-sixth ($\frac{1}{6}$) of the diameter of the core and in no case more than three (3) inches.

Reinforcement shall be protected by a covering of concrete, cast monolithic with the core, of a thickness not less than that specified in Section 4301.

(d) Design of Columns with Lateral Ties. The safe axial load on columns reinforced with longitudinal bars and separate lateral ties shall be not greater than that determined by Formula 23.

$$P = (A'_c + A_s n) f_c \dots \dots \dots (23)$$

f_c shall not exceed $0.20f'_c$.

The amount of longitudinal reinforcement shall be not less than five-tenths (0.5) per cent nor shall the amount considered in the calculations be more than two (2) per cent of the total

Sec. 2621

area of the column. The longitudinal reinforcement shall consist of not less than four bars of minimum diameter of one-half ($\frac{1}{2}$) inch and shall be protected by a covering of concrete, cast monolithic with the column, of a thickness not less than that specified in Section 4301.

Lateral ties shall be at least one-quarter ($\frac{1}{4}$) inch in diameter, spaced not more than eight (8) inches apart and the points of successive ties shall be placed in rotation around the column.

(e) Bending in Columns. The bending moments in interior and exterior columns shall be determined on the basis of loading conditions and end restraint and shall be provided for in the design.

In flat-slab construction, a bending moment at all interior columns equal to $W_1l/40$ shall be assumed to cover all ordinary cases of unequal loading in floors and roofs. In this formula W_1 =the total live load on one panel and l =the span, center to center of columns, lengthwise to the panels. Known eccentric loads and uneven spacing of columns shall be provided for in the design. Resistance to these bending moments shall be provided in the columns immediately above and below in direct proportion to the values of their ratios of I/h (See Section 2616 and paragraph (b) of this Section). In columns supporting roofs the moment shall be resisted by the column below.

Wall columns in flat-slab construction shall be designed to resist bending in the same manner as interior columns except that the total live and dead load in the panel shall be used instead of the live load only when computing the moment. Any counter moment due to the weight of the structure that projects beyond the column center line may be deducted from the moment computed as just described.

The limiting unit stresses due to the combined axial load and bending shall be determined as follows:

(1) With Spiral Reinforcement—The compressive unit stress at the extreme fibre on the concrete within the core area under combined axial load and bending shall not exceed the value given by the expression $300 + (0.10 + 4p)f'_c$.

(2) With Lateral Ties—Additional longitudinal reinforcement may be used if required to provide for the bending stresses, and the compressive unit stress at the extreme fibre on the concrete under combined axial load and bending may be increased to $0.30f'_c$. The column section, however, shall be not less than that required by the provisions of paragraph (d) of this Section where axial load alone is considered. The total amount of reinforcement considered in the computations for combined stress shall be not more than four (4) per cent of the total area of the column.

(f) Composite Columns. The safe load on composite columns in which a structural steel or cast-iron column is thoroughly encased in a circumferentially reinforced concrete core shall be based on a unit stress of $0.25f'_c$ on the area within the spiral core plus the unit compressive stress on the steel or

Secs. 2621-2622

cast-iron core as determined by Formulae 24 and 25 respectively.

$$f_r = \frac{18,000}{1 + \frac{h^2}{18,000R^2}} \dots\dots\dots (24)$$

but shall not exceed 16,000 lbs. per sq. in.

$$f_r = 12,000 - 60 h/R \dots\dots\dots (25)$$

but shall not exceed 10,000 lbs. per sq. in.
The diameter of the cast-iron section shall not exceed one-half of the diameter of the core within the spiral. The spiral reinforcement shall be not less than five-tenths (0.5) per cent of the volume of the core within the spiral and shall conform in quality, spacing and other requirements to the provisions for spirals in paragraph (c) of this Section.

Ample section of concrete and continuity of reinforcement shall be provided at the junction with beams or girders. The area of the concrete between the spiral and the metal core shall be not less than that required to carry the total floor load of the story above on the basis of a stress in the concrete of $0.35f'_c$ unless special brackets are arranged on the metal core to receive directly the beam or slab load.

(g) Structural Steel Columns. The safe load on a structural steel column of a section which fully encases an area of concrete and which is protected by an outside shell of concrete at least three (3) inches thick, shall be computed in the same manner as for composite columns in paragraph (f) of Section 2621, allowing $0.25f'_c$ on the area of the concrete enclosed by the steel section. The outside shell shall be reinforced by wire mesh weighing not less than two-tenths (0.2) lbs. per sq. ft. or by ties or spirals of equal weight, and with a spacing of not more than six (6) inches between strands or hoops. Special brackets shall be used to receive the entire floor load at each story. The safe load in steel columns calculated by Formula 24 shall not exceed 16,000 lbs. per sq. in.

(h) Long Columns. The permissible working load on the core in axially loaded columns which have a length greater than forty (40) times the least radius of gyration of the column core ($40R$) shall be not greater than that determined by Formula 26.

$$P' = P (1.33 - h/120 R) \dots\dots\dots (26)$$

Footings

Sec. 2622. (a) General. The size of footings shall be determined as provided in Section 2306-(4). The requirements for flexure, shear and bond of Sections 2614 to 2619, inclusive, shall govern the design of footings, except as hereinafter provided.

(b) Loads. Footings resting directly on soil or on piles shall be proportioned as to area or number of piles on the basis of the total column load plus the weight of the footing itself. For computations of moments and shears, an upward reaction per unit area or per pile shall be based on the total column load (not including the weight of the footing itself) divided by the area or by the number of piles.

(c) Sloped or Stepped Footings. Footings in which the

Sec. 2622

thickness has been determined by the requirements for shear as specified in paragraph (g) of Section 2618 may be sloped or stepped between the critical section and the edge of the footing; provided, that the shear on no section outside the critical section exceeds the value specified; and provided further, that the thickness of the footing above the reinforcement at the edge shall be not less than six (6) inches for footings on soil, nor less than twelve (12) inches for footings on piles. Sloped or stepped footings shall be cast as a unit.

(d) Bending in Footings. The critical section for bending in a concrete footing which supports a concrete column or pedestal shall be considered to be at the face of the column or pedestal. Where steel or cast-iron column bases are used, the moment in the footing shall be computed at the middle and at the edge of the base. The load shall be considered as uniformly distributed over the column or pedestal base.

The bending moment at the critical section in a square footing supporting a concentric square column shall be computed from the load on the trapezoid bounded by one face of the column, the corresponding outside edge of the footing, and the portions of the two diagonals. The load on the two corner triangles of this trapezoid shall be considered as applied at a distance from the face equal to six-tenths of the projection of the footing from the face of the column. The load on the rectangular portion of the trapezoid shall be considered as applied at its center of gravity. The bending moment is expressed by Formula 27.

$$M = w/2(a + 1.2c)^2 \dots \dots \dots (27)$$

For a round or octagonal column, the distance a shall be taken as equal to the side of a square of an area equal to the area enclosed within the perimeter of the column.

The sectional area of reinforcement shall be distributed uniformly across the footing unless the width is greater than the diameter of the column or pedestal plus twice the effective depth of the footing, in which case the width over which the reinforcement is spread may be increased to include one-half the remaining width of footing. Additional reinforcement with a spacing double that within the effective belt shall be placed outside of the width specified, but such reinforcement shall not be considered as effective in resisting the calculated bending moment.

The extreme fibre stress in the concrete and steel shall be kept within the limits specified in Section 2613.

(e) Footings Other than Square. A rectangular or irregularly shaped footing shall be computed by dividing it into rectangles or trapezoids tributary to the sides of the column, using the distance to the center of gravity of the area as the moment arm of the upward forces. Outstanding portions of combined footings shall be treated in the same manner. Other portions of combined footings shall be designed as beams or slabs.

(f) Shearing and Bond Stresses. See paragraph (g) of

Sec. 2622

Section 2618 and paragraphs (a) and (e) of Section 2619.

(g) Transfer of Stress at Base of Column. The compressive stress in longitudinal reinforcement at the base of a column shall be transferred to the pedestal or footing by either dowels or distributing bases. When dowels are used they shall be of the same size and number as the reinforcing bars in the columns. The dowels shall extend into the column and into the pedestal or footing not less than fifty (50) diameters for plain bars or forty (40) diameters for deformed bars.

When metal distributing bases are used, they shall have sufficient area and thickness to transmit safely the load from the longitudinal reinforcement in compression and bending. The permissible compressive unit stress on top of the pedestal or footing directly under the column shall be not greater than that determined by Formula 28.

$$r_a = 0.25f'_c \sqrt{A/A'} \dots\dots\dots (28)$$

In sloped or stepped footings A may be taken as the area of the top horizontal surface of the footing or 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 loaded area A' , and having side slopes of one (1) vertical to two (2) horizontal.

(h) Pedestals without Reinforcement. The allowable compressive unit stress on the gross area of a concentrically loaded pedestal or on the minimum area of a pedestal footing shall not exceed $0.25f'_c$ unless reinforcement is provided and the member designed as a reinforced concrete column.

The depth of a pedestal or pedestal footing shall be not greater than three times its least width and the projection on any side from the face of the supported member shall be not greater than one-half the depth. The depth of a pedestal whose sides are sloped or stepped shall not exceed three times the least width or diameter of the section midway between the top and bottom. A pedestal footing supported directly on piles shall have a mat of reinforcing bars having a cross-sectional area of not less than two-tenths (0.2) sq. in. per foot in each direction, placed three (3) inches above the top of the piles.

CHAPTER 27—STEEL AND IRON

(Quality and Design)

Sec. 2701. The quality and design of all structural steel and iron used in buildings shall conform to the requirements specified in this Chapter. **Quality and Design**

Structural steel shall be of such quality as to conform to Standard Specifications for Structural Steel for Buildings, A. S. T. M. Designation A9-33, of the American Society for Testing Materials.

Cast steel used in buildings and/or structures shall be of such quality as to conform with the Standard Specifications for Steel Castings, A. S. T. M. Designation A27-24, of the American Society for Testing Materials.

Cast iron used in buildings and/or structures shall be of such quality as to conform with the Tentative Specifications for Gray Iron Castings, A. S. T. M. Designation A48-32T, of the American Society for Testing Materials.

All structural steel shall be tested in accordance with the above specifications when deemed necessary by the Building Inspector and copies of such tests shall be filed in the office of the Building Inspector. No structural steel shall be used in any building or structure which does not comply with the above requirements or for which no test results have been filed with the Building Inspector. All steel tests shall be made by competent testing laboratories and at the expense of the owner.

The computations and design shall be properly made so that the unit working stresses specified in this Chapter are not exceeded. The structure and its details shall possess the requisite strength and rigidity for proper stability and the design of every structural frame shall be such as to admit of a rational analysis according to well established principles of mechanics and sound engineering practice.

All structural steel sections shall be straight and true and any section so damaged as to affect its proper carrying capacity shall not be used in the construction of any building.

Sec. 2702. All parts of the structure shall be so proportioned that the sum of the maximum static stresses in pounds per square inch shall not exceed those specified in this Section. **Allowable Unit Stresses**

(a) Tension:	
Rolled Steel, on net section.....	18,000
Cast Steel, on net section.....	16,000
Cast Iron, on net section.....	(Not allowed)
(b) Compression, on short lengths or where lateral deflection is prevented:	
Rolled Steel	18,000
Cast Steel	16,000
Cast Iron	10,000

On gross section of structural steel columns:

$$P = \frac{18,000}{1 + \frac{F}{18,000}}$$

with a maximum of.....15,000

Sec. 2702

For main compression members, the ratio l/r shall not exceed one hundred and twenty (120) and for bracing, struts and similar members two hundred (200) .

On gross section of steel pipe columns, with square or fixed ends;

$$P=11,000-35 \ l/r$$

with a minimum gross diameter of five (5) inches.

On cast iron columns, with square or fixed ends;

$$P=9,000-40 \ l/r$$

with a minimum gross diameter of six (6) inches and with the ratio l/r never in excess of seventy (70) .

In the foregoing formulae P equals the maximum unit working stress in pounds per square inch; l equals the unsupported length of the column or compression member in inches; and r equals the least radius of gyration of the column or compression member.

(c) Bending. On extreme fibers of rolled shapes, and built-up sections, net section, if lateral deflection is prevented, 18,000. When the unsupported length L exceeds fifteen (15) times b , the width of the compression flange, the stress in pounds per square inch in the latter shall not exceed F in the following formula:

$$F = \frac{20,000}{1 + \frac{L^2}{2,000b^2}}$$

The laterally unsupported length of beams and girders shall in no case exceed forty (40) times b the width of the compression flange.

Girders, beams, lintels and similar members may be laterally braced by joists, tie rods or similar members anchored thereto so as to laterally stay such members in both directions. Two or more cast iron or steel separators rigidly joining such members together shall be considered as lateral support if the length of flanges between separators does not exceed 40 b .

On extreme fibers of pins, when the forces are assumed as acting at the center of gravity of the pieces.....27,000

(d) Shearing. On pins	13,500
On power-driven rivets.....	13,500
On turned bolts in reamed holes with a clearance of not more than one- fiftieth (1/50) of an inch.....	13,500
On hand-driven rivets.....	10,000
On unfinished bolts.....	10,000

On the gross area of the webs of beams and girders, where h , the height between flanges in inches, is not more than sixty (60) times t , the thickness of the web in inches.....12,000
On the gross area of the webs of beams and girders if the web is not stiffened where h , the height between flanges in inches, is more than sixty (60) times t , the thickness of the web, the maximum shear per square inch, S/A shall not exceed

Secs. 2702-2703

$$1 + \frac{18,000}{7,200t^2}$$

in which S is the total shear, and A is gross area of web in square inches.

	Double Shear	Single Shear
(e) Bearing.		
On pins	30,000	24,000
On power-driven rivets	30,000	24,000
On turned bolts in reamed holes....	30,000	24,000
On hand-driven rivets	20,000	16,000
On unfinished bolts	20,000	16,000
On ends of web stiffeners.....	See Section 2704 (e)	

(f) Combined Stresses: For combined stresses due to wind and other loads, the permissible working stress may be increased thirty-three and one-third (33-1/3) per cent, provided the section thus found is not less than that required by the dead and live loads alone.

Members subject to both direct and bending stresses shall be so proportioned that the greatest combined stresses shall not exceed the allowed limits.

All members and their connections which are subject to stresses of both tension and compression due to the action of live loads shall be designed to sustain the stress giving the largest section, with fifty (50) per cent of the smaller stress added to it. If the reversal of stress is due to the action of wind, the member shall be designed for the stress giving the largest section and the connections proportioned for the largest stress.

(g) Members Carrying Wind Only. For members carrying wind stresses only, the permissible working stresses may be increased thirty-three and one-third (33-1/3) per cent.

(h) The load in pounds per linear inch on expansion rollers shall not exceed six hundred (600) times the diameter of the roller in inches.

Sec. 2703. (a) Every member and combination of members shall be designed to provide for any stress due to an eccentric load or force, whenever the increase in stress due to eccentric load or force exceeds ten (10) per cent of the stress due to a direct load or force on the member or members; but a member framed directly to a central web of another member shall not be considered an eccentric load or force in case the resultant of the load or force acts parallel with the said central web.

Eccentric Loads

(b) Where a structural member is directly connected or framed to the flange of another member by means of a web connection, the lever arm shall be taken as the distance in the direction of bending from the neutral axis to the flange connection plus one-half (1/2) inch; and in all other cases of an eccentric load or force, the lever arm shall be taken as the distance in the direction of bending from the neutral axis to the center line or center of bearing of the load or force.

(c) Where an eccentric load or force acts parallel with the axis of a compression member, the stresses due to the

Secs. 2703-2704

eccentric action may be provided for by adding to any direct load or force on the compression member an amount equal to $M. K.$ as given in the following formula, and by then designing the compression member so that the maximum unit stress therein will not exceed that specified in Section 2702.

$M. K.$ equals $A (Px/S)$;

in which formula $M. K.$ equals an equivalent concentric load or force for any given eccentric load or force; A equals the cross sectional area of the compression member; P equals the amount of the eccentric load or force in pounds; x equals the distance from the neutral axis of the compression member to the line of action of the eccentric load or force; and S equals the section modulus of the compression member in the direction of the bending.

Beams and Girders

Sec. 2704. (a) Rolled beams shall be proportioned by the moment of inertia of their net section. Plate girders with webs fully spliced for tension and compression shall be so proportioned that the unit stress on the net section does not exceed the stresses specified in Section 2702 as determined by the moment of inertia of the net section.

When two (2) or more rolled beams or channels are used to form a girder, they shall be so connected to each other as to properly distribute the loads to be carried.

(b) Built-up Girders. Plate, box and similar structural steel girders shall be proportioned by the moment of inertia of their net sections, or shall be proportioned by assuming that one-eighth (1/8) of the gross area of the web or webs act as a part of the flanges thereof, in the event that every joint in the web is spliced so as to transmit the stress therein.

(c) Plate girder webs shall have a thickness of not less than one one-hundred-sixtieth (1/160) of the unsupported distance between the flanges.

(d) Web splices shall consist of a plate on each side of the web capable of transmitting the full stress through the splice rivets.

(e) Stiffeners shall be provided on both sides of the webs of built-up girders over bearings and at points of concentrated loading. Intermediate stiffeners shall be provided on both sides of the webs wherever the thickness of the web is less than one-sixtieth (1/60) of the unsupported distance between flanges and shall not be spaced farther apart in inches than the value of S in the following formula; and shall not exceed six (6) feet in any case:

$$S = 85t \sqrt{\frac{18,000A}{V}} - 1$$

in which formula A equals the gross area of the web in inches; V equals the total vertical shear on the web; t equals the thickness of the web in inches; and S equals the clear distance between stiffeners in inches; provided, however, that stiffeners need not be provided on both sides of webs in case other adequate provision is made against buckling, torsion and for the transmission of all stresses.

Secs. 2704-2707

Stiffeners over bearings and at points of concentrated loading shall not be crimped but shall be milled and fitted for bearing against the flange angles nearest the bearing load and shall be designed to distribute the force from the reactions and concentrated loads into the web. The bearing area of the ends of stiffeners shall be taken as the outstanding portion of the leg of the stiffener, excluding any chamfered portion thereof over the fillets of flange angles, and the bearing value of such portion may be taken at not to exceed twenty-four thousand (24,000) pounds per square inch; provided, however, that where fillers are provided between stiffeners and the web, equal in thickness to the radius of the fillet plus the thickness of the flange angle, the full area of the end of the stiffener may be used, but the bearing value shall not be taken at more than eighteen thousand (18,000) pounds per square inch.

Intermediate stiffeners need not bear against flange angles, and when girders are completely encased in concrete such stiffeners may be cut off at the edge of the fillet of the flange angle.

(f) Crane runway girders and the supporting framework shall be proportioned to resist a horizontal force equal to twenty (20) per cent of the maximum wheel loads.

(g) Rivets connecting the flanges to the web at points of direct load on the flange between stiffeners shall be proportioned to carry the resultant of the longitudinal and transverse shears.

(h) The flange plates of all girders, unless stiffened, shall be limited in width so as not to extend beyond the outer line of rivets connecting them to the flange angles more than six (6) inches or twenty (20) times the thickness of the thinnest outside plate connected.

(i) Beams, channels, girders and other members acting as skewbacks for floor arches shall be of ample strength and rigidity to withstand the lateral thrusts in addition to all other loads they may sustain.

Sec. 2705. The minimum thickness of metal in structural steel shapes shall be one-fourth ($\frac{1}{4}$) inch at every point and shall not be less than one-half ($\frac{1}{2}$) inch at every point for any cast iron or cast steel member except as follows:

**Thickness
of
Materials**

Exceptions: (1) The webs of channels and I-beams, the edges of rolled steel sections, steel joists, signs, skylight bars, non-bearing walls and partitions, suspended ceilings, cornice brackets, steel studs, and similar steel shapes shall not be limited by the above thickness requirements.

Sec. 2706. The ends and abutting joints of all compression members shall be fully spliced, or where laterally supported and where no reversal of stresses is possible, may be faced to a plain surface parallel to the surfaces against which they bear and normal to the line of stress, and be spliced sufficiently to hold the connected members accurately and firmly in place.

**Compression
Splices**

Sec. 2707. In calculating tension members, the net section shall be used, and in deducting rivet holes they shall be assumed to be at least one-eighth ($\frac{1}{8}$) of an inch greater in diameter than the nominal diameter of the rivets.

**Net
Sections**

Secs. 2707-2709

Pin-connected tension members shall have the section through the pin hole at least twenty-five (25) per cent in excess of the net section of the member, and a net section back of the pin hole equal to at least seventy-five (75) per cent of that required through the pin hole.

Connections

Sec. 2708. Connections carrying calculated stresses, except for lacing, sag bars or angles, hand rails, or beam connections, shall not have less than two (2) rivets; or for field connections not less than three (3) rivets.

Members meeting at a joint shall have their lines of center of gravity meet at a point if practicable; if not, provision shall be made for any eccentricity.

The rivets at the ends of any member transmitting the stresses into that member should have their centers of gravity in the line of the center of gravity of the member; if not, provision shall be made for the effect of the resulting eccentricity. Pins may be so placed as to counteract the effect of bending due to dead load.

When a beam or girder is connected to another member in such a manner that such beam or girder acts as a continuous or fixed end beam, proper provision shall be made for the bending moments at such a connection.

Where stress is transmitted from one piece to another, through a loose filler, the number of rivets shall be properly increased; tight-fitting fillers shall be preferred.

All joints in riveted work, whether in tension or compression, shall be so spliced as to properly transmit all stresses, except as provided in Section 2706.

The minimum distance between center of the rivets and edge of plates or angles shall be one and one-half ($1\frac{1}{2}$) times the diameter of rivet.

The maximum pitch in the line of stress of compression members composed of plates and shapes shall not exceed sixteen (16) times the thinnest outside plate or shape, or twenty (20) times the thinnest enclosed plate or shape with a maximum of twelve (12) inches, and at right angles to the direction of stress the distance between lines of rivets shall not exceed thirty (30) times the thinnest plate or shape. For angles in built sections with two (2) gage lines, with rivets staggered, the maximum pitch in the line of stress in each gage line shall not exceed twenty-four (24) times the thinnest plate with a maximum of eighteen (18) inches.

Rivets and Bolts

Sec. 2709. In proportioning rivets, the nominal diameter of the rivet shall be used.

Rivets carrying calculated stresses, and whose grip exceeds five (5) diameters, shall have their number increased one (1) per cent for each additional one-tenth ($1/10$) inch in the rivet grip. Special care shall be used in heating and driving such rivets.

Rivets shall be used for the connections of main members carrying live loads which produce impact, and for connections subject to reversal of stresses.

Finished bolts in reamed holes may be used in shop or field work where it is impracticable to obtain satisfactory power-driven rivets. The finished shank shall be long enough to pro-

Secs. 2709-2711

vide full bearing, and washers used under the nuts to give full grip when turned tight.

Unfinished bolts may be used in shop or field work for connections in small structures used for shelters, and for secondary members of all structures such as purlins, girts, door and window framing, alignment bracing and secondary beams in floor.

Sec. 2710. (a) Fusion welding may be used (in place of riveting or bolting) for connecting structural steel or wrought iron parts or members to one another, but in no case shall the stresses in such joints exceed the allowable working unit stresses given in the following table:

Allowable Unit Working Stresses for Static Loads	
Tension in weld metal (butt welds).....	13,000 lbs. per sq. in.
Shear in weld metal (fillet welds).....	11,300 lbs. per sq. in.
Compression in weld metal.....	15,000 lbs. per sq. in.

Maximum fibre stresses due to bending shall not exceed the values prescribed above for tension and compression, respectively. In designing welded joints adequate provision shall be made for bending stresses due to eccentricity, if any, in the disposition or section of base metal parts.

(b) The same proportional increase in the above working stresses shall be allowed for the various given conditions as specified in parts (f) and (g) in Section 2702.

(c) The electrode wire shall conform to the American Welding Society Specifications E No. 1-A or E No. 1-B as published December, 1921, in the American Welding Society Bulletin No. 2.

All portions of the members at the point of welding shall be completely freed from rust, paint and other foreign matter by brushing the surfaces with an iron brush, by chipping or by hammering.

(d) The Building Inspector shall require the welding operator to furnish evidence of his experience and competence in structural arc welding and may require the welder to make sample butt welds. Such sample welds must show an average tensile strength of forty-five thousand (45,000) pounds per square inch with no one sample developing a tensile strength of less than forty thousand (40,000) pounds per square inch.

(e) Where electric spot or resistance welding is used the portion of the members to be welded shall be thoroughly cleaned of rust, scale or other foreign matter by pickling in a suitable acid before welding.

Sec. 2711. (a) Trusses preferably shall be riveted structures and only when there are good reasons to justify, such as where riveted field connections become unwieldy, may they be designed as pin-connected structures.

(b) All joints in riveted work, whether in tension or compression, shall be spliced as to properly transmit the stresses.

(c) Bracing shall be sufficient to safely withstand wind and other lateral forces when the building is in the process of erection as well as after completion.

(d) When two or more plates are in contact, they shall be stitch riveted with rivets not more than twelve (12) inches apart in either direction.

(e) The ends of beams, channels, girders and trusses that

**Welded
Conne-
ctions**

**Construc-
tion
Details**

Secs. 2711-2714

bear on masonry or reinforced concrete shall be so framed that the allowable stresses for masonry or reinforced concrete shall not be exceeded, and anchors of ample size and strength shall be provided thoroughly embedded in the masonry or reinforced concrete construction.

(f) The ends of all beams, channels, girders, girts, purlins and similar members, that meet on a beam, girder, truss, column or pier shall be connected to each other by a strap or through the carrying members with not less than two (2) bolts or rivets each not less than five-eighths ($\frac{5}{8}$) of an inch in diameter in the end of each connecting member.

(g) Tie rods shall be proportioned to resist their respective stresses, and holes for them shall be placed as near the spring of the arches as practicable.

Lattice

Sec. 2712 (a) Compression members of two or more pieces not connected by web or cover plates shall have their open sides provided with lattice bars or tie plates, and have tie plates as near each end as practicable, and at intermediate points where the lattice is interrupted. In main members the end tie plates shall have a length not less than the distance between the lines of rivets connecting them to the flanges, and intermediate ones not less than half this distance, and their thickness shall not be less than one-fiftieth ($1/50$) of the same distance and the rivet pitch shall not be more than four (4) diameters. The latticing of compression members shall be proportioned to resist a shearing stress at least equal to two (2) per cent of the direct stress in the member.

(b) The minimum thickness for lattice bars shall be for single lattice one-fortieth ($1/40$) and for double lattice one-sixtieth ($1/60$) of the distance between end rivets, and not less than one-fourth ($\frac{1}{4}$) inch in thickness.

(c) The inclination of all lattice bars to the axis of the member shall not be less than forty-five (45) degrees and when the distance between the rivet lines in the flanges is more than fifteen (15) inches the lattice shall be doubled.

(d) Lattice bars shall be so spaced that the ratio l/r of the flange included between their connections shall not be over three-fourths ($\frac{3}{4}$) of that of the member as a whole, where l and r are as defined in Section 2702 (b).

Pins and
Pin Holes

Sec. 2713. (a) Pins shall be long enough to insure a full bearing of all parts connected upon the turned-down body of the pin.

(b) Members packed on pins shall be held against lateral movement.

(c) Pin holes shall be reinforced by plates wherever necessary to give proper bearing. At least one plate shall be as wide as the projecting flanges will allow. Where angles are used this plate shall contain sufficient rivets to distribute their portion of the pin pressure to the full cross section of the member.

Steel
Joists

Sec. 2714. (a) Steel joists may be rolled structural steel sections, sections built up of rolled structural sections, or shapes made from strip or sheet steel securely spot-welded together so as to form a cohesive structural unit, all of which shall have the general shape or contour of an I-Beam; or such steel joist

Sec. 2714

may be of a determinate truss design built up of rolled structural steel sections effectively fusion welded together as specified in part (f) of this Section. Joists other than those consisting of a single rolled structural steel section with solid web, shall not be used in the floor construction of buildings over eight (8) stories in height.

(b) Steel joists shall be considered as secondary members of the structural steel frame. They shall be designed to carry all dead, live and other loads to which they may be subjected during the erection and after the completion of the structure. Such secondary members shall not be considered as affecting the vertical rigidity of the framework but they shall be designed and considered as carrying horizontal forces to such parts of the frame as are designed to carry these horizontal forces to the foundation.

(c) Stresses in steel joists shall not exceed those specified in Section 2702 and no joist under its calculated load shall have a deflection exceeding one three-hundred-sixtieth ($1/360$) of the span. Bridging shall be provided during the period of construction to adequately support the top chord or flange against lateral movement and such bridging shall be designed to hold each joist in a vertical plane. Permanent bridging shall be installed sufficient to laterally stay the joists and to transmit any horizontal forces in either direction perpendicular to the direction of the joists. Such bridging shall consist of solid concrete sections, structural steel shapes or plates, portal bridging, diagonal rods, or other bridging which will provide equivalent stiffness. Any row of bridging shall be capable of transferring five hundred (500) pounds from each joist to the adjoining joists. The actual spacing of the joists center to center shall be determined by their capacity to sustain the loads which they carry and the allowable load carrying capacity of the floor structure between the members.

(d) When used in buildings of Type I Construction, steel joists shall be connected to the supporting beams and/or girders by fusion welding, riveting, bolting or rigid connecting. Fusion welds shall be made on both sides of each bearing, shall be not less than one (1) inch in length measured from the starting end to the center of the finishing crater, and shall have a minimum bead of one-fourth ($\frac{1}{4}$) inch. Riveting and bolting shall comply with the requirements of Section 2709. When steel joists are supported on masonry or reinforced concrete the end bearing shall be not less than four (4) inches in length and the ends of such joists shall be provided with approved joist anchors thoroughly embedded in the supporting masonry or reinforced concrete placed at not to exceed six (6) feet center to center. Bearing plates securely welded, bolted or riveted to the joists shall be provided when required by the design of the joist. In buildings over eight (8) stories in height in which steel joisted floor construction is used, all connections between steel joists and primary members of the structure shall be approved standard connection angles and power driven rivets, or unfinished bolts as provided for light steel beams in the handbook, Steel Construction, of the American Institute of Steel Construction, Inc., dated January, 1934.

Secs. 2714-2716

(e) Strip or sheet steel used to produce strip steel joists shall in no case be less than seventy-two thousandths (0.072) of an inch in thickness. The flange width of such joists shall not exceed one-half ($\frac{1}{2}$) their depth.

(f) Trussed steel joists shall be so constructed that the lines of force of all connected members shall intersect at a point or proper allowance shall be made in the design for any resulting stress.

The joints of all trussed steel joists shall be made by connecting the members directly to one another by fusion welds or by rivets of sufficient capacity to develop the ultimate strength of the smallest connected member. When welds are used, each connection of member to member shall be made with not less than two (2) welds, and each weld shall be not less in length measured from starting end to the center of the finishing crater than twice the diameter of the smallest member connected, nor less in cross sectional area than one-fourth ($\frac{1}{4}$) of the cross sectional area of the smallest member connected. Welds shall be located symmetrically on both sides of all connected members so as to eliminate eccentricity at joints. When sections other than round bars are used, the length and cross sectional area of the welds shall be the same as those required for round bars of equivalent area.

(g) Whenever deemed necessary by the Building Inspector any welded connections or welded joints shall be tested to not less than twice the designed load by the manufacturer or user and such load shall be sustained without any signs of failure. Should any signs of failure develop the joist or joists shall be rejected and removed immediately from the premises.

Expansion

Sec. 2715. Proper provision shall be made for expansion and contraction.

Workmanship

Sec. 2716. (a) All workmanship shall be equal to the best practice in modern structural shops.

(b) Drifting to enlarge unfair holes shall not be permitted.

(c) The several pieces forming built-up sections shall be straight and fit close together; and finished members shall be free from twists, bends or open joints.

(d) Rolled sections shall not be heated in any manner which will impair their strength or quality.

(e) All steel castings shall be properly annealed.

(f) Material may be punched one-sixteenth ($\frac{1}{16}$) inch larger than the nominal diameter of the rivets, whenever the thickness of the metal is equal to or less than the diameter of the rivets, plus one-eighth ($\frac{1}{8}$) inch. When the metal is thicker than the diameter of the rivet, plus one-eighth ($\frac{1}{8}$) inch, the holes shall be drilled, or sub-punched and reamed.

(g) Rivets are to be driven hot, and wherever practicable, by power. Rivet heads shall be of hemispherical shape and uniform in size throughout the work for the same size rivet, full, neatly finished, and concentric with the holes. Rivets, after driving, shall be tight, completely filling the holes, and with heads in full contact with the surface.

(h) Compression joints depending upon contact bearing shall have the bearing surfaces truly faced after the members

Secs. 2716-2718

are riveted. All other joints shall be cut or dressed true and straight.

(i) Gas cutting may be done under the following conditions:

(1) The contractor shall be required to satisfy the Building Inspector as to his ability to produce satisfactory gas cuts.

(2) Gas cut edges shall be regular in contour.

(3) Gas cutting may be used in the preparation of base metal parts for welding, provided the edges so cut are thoroughly cleaned after cutting so as to expose clean metal.

(4) Gas cutting shall not be permitted to replace the milling of surfaces specified elsewhere in this Code.

(5) Gas cutting shall not be permitted on any member while it is carrying stress. This restriction shall not apply to detail cutting for the correction of minor fabricating errors, where the removal of metal resulting from such gas cutting would not reduce the required strength of the member that is to be cut.

(6) Gas cutting of holes in any member which has not been designed therefor shall not be permitted.

Sec. 2717. (a) Parts not in contact, but inaccessible after assembling, shall be properly protected by paint. **Painting**

(b) All steel work, except where entirely encased in concrete, shall be thoroughly cleaned and given one coat of acceptable metal protection well worked into the joints and open spaces.

(c) Machine finished surfaces shall be protected against corrosion.

(d) Cast iron columns shall not be painted until after acceptance by the Building Inspector.

Sec. 2718. (a) The frame of all steel skeleton buildings shall be carried up true and plumb, and temporary bracing shall be introduced wherever necessary to take care of all loads to which the structure may be subjected, including erection equipment, and the operation of same. Such bracing shall be left in place as long as required for safety or deemed necessary by the Building Inspector. **Erection**

(b) As erection progresses the work shall be securely bolted up to take care of all dead load, wind and erection stresses.

(c) Wherever piles of material, erection equipment, or other loads are carried during erection, proper provision shall be made to take care of the resulting stresses.

(d) No riveting or welding shall be done until the structure has been properly aligned.

(e) Rivets driven in the field shall be heated and driven with the same care as those driven in the shop.

(f) In the setting or erecting of steel work the individual pieces shall be considered plumb or level when the error does not exceed 1 to 500. For exterior columns and columns adjacent to elevator shafts of multiple story buildings the error shall not exceed 1 to 1000 of the total height of the column.

PART VII DETAILED REGULATIONS

CHAPTER 28—EXCAVATIONS, FOOTINGS AND FOUNDATIONS

Excava- tions

Sec. 2801. All excavations for buildings and excavations accessory thereto shall be protected and guarded against danger to life and property. All permanent excavations shall have retaining walls of masonry or reinforced concrete of sufficient strength to retain the embankment together with any surcharged loads. No excavation for any purpose shall extend within one (1) foot of the angle of repose or natural slope of the soil under any footing or foundation, unless such footing or foundation is first properly underpinned or protected against settlement.

Any person causing an excavation to be made on his own property, to a depth of twelve (12) feet, or less, below the grade, shall protect the excavation so that the soil of adjoining property will not cave in or settle, but shall not be liable for the expense of underpinning or extending the foundation of buildings on adjoining properties where his excavation is not in excess of twelve (12) feet in depth. Before commencing the excavation the owner shall notify in writing the owners of adjoining buildings not less than ten (10) days before such excavation is to be made that the excavation is to be made and that the adjoining buildings should be protected. The owners of the adjoining properties shall be given access to the excavation for the purpose of protecting such adjoining buildings.

Any person causing an excavation to be made exceeding twelve (12) feet in depth below the grade, shall protect the excavation so that the adjoining soil will not cave in or settle, and shall extend the foundation of any adjoining buildings below the depth of twelve (12) feet below grade at his own expense. The owner of the adjoining buildings shall extend the foundations of his building to a depth of twelve (12) feet below grade at his own expense as provided in the preceding paragraph.

Footings and Founda- tions

Sec. 2802. Footings and foundations, unless specifically provided, shall be constructed of masonry or reinforced concrete and shall in all cases extend below the frost line. Masonry units used in foundation walls and footings shall be laid up in Portland cement mortar. The base areas of all footings and foundations shall be proportioned as specified in Section 2306.

Footings shall be so designed that the allowable bearing capacity of the soil in tons per square foot as given below shall not be exceeded unless the particular soil on which the building is to be placed shows a greater bearing capacity than that specified in this Section.

Secs. 2802-2803

Rock.....	Not more than twenty per cent (20%) of the ultimate crushing strength of such rock.
Gravel or coarse sand, well cemented.....	6 tons
Dry, hard clay or coarse firm sand (hardpan).....	4 tons
Moderately dry clay or moderately dry sand and clay..	3 tons
Ordinary clay and sand.....	2 tons
Soft clay, sandy loam or silt.....	1 ton
Adobe	½ ton

Where the bearing capacity of the soil is not definitely known or is in question, the Building Inspector may require load tests or other adequate proof as to the permissible safe bearing capacity at that particular location. To determine the safe bearing capacity of soil it shall be tested by loading an area not less than two (2) square feet to not less than twice the maximum bearing capacity desired for use. Such double load shall be sustained by the soil until no additional settlement takes place for a period of not less than forty-eight (48) hours in order that such desired bearing capacity may be used. Examination of sub-soil conditions may be required when deemed necessary.

Foundations shall be built upon natural solid ground where possible. Loam or soil containing organic matter shall not be used to support buildings exceeding one story in height. Where solid natural ground does not occur at the foundation depth, such foundations shall be extended down to natural solid ground or piles shall be used, unless there is a practically level fill of good ground which has been in place a sufficient length of time to settle properly, when such fill may be used.

Sec. 2803. (a) General requirements. All piles used to support any building or part thereof shall be driven to a reasonably solid bearing in such a manner as not to impair their strength. No pile or group of piles shall be loaded eccentrically.

(b). Wood Piles. Wood piles shall be of oak, Douglas fir, Southern pine, cedar or other approved wood containing no evidences of decay. The piles shall be free from short kinks or reverse bends and shall have a uniform taper from butt to tip. A straight line drawn from the center of the butt to the tip shall lie wholly within the body of the pile. The diameter of wood piles at the point shall be not less than six (6) inches and at the butt shall be not less than ten (10) inches for piles twenty-five (25) feet or less in length, and not less than twelve (12) inches at the butt for piles more than twenty-five (25) feet in length. No piles with spiral grain which exceeds one complete turn in forty (40) feet shall be used. All wood piles and capping shall be cut off and/or placed below mean low water level or below lowest ground water level; with the exception of creosoted piles as covered in this Section.

Creosoted piles of Douglas fir or Southern pine when treated with Grade 1 creosote under pressure with the full-cell creosote treatment complying with Specification No. 41-a or No. 39-a of the American Wood Preservers Association in such a manner as to provide a final retention of not less than twelve (12)

Sec. 2803

pounds per cubic foot in Douglas fir piling and not less than fifteen (15) pounds per cubic foot in Southern pine piling may be used as follows:

1. Where the upper portion of the creosoted piling is to be exposed and available for inspection the cut-off may be above ground level or above water level.
2. Where the upper part of the creosoted piling will not be readily available for inspection the cut-off shall be below ground level but may be above ground water level provided the tops of the cut-off piles are treated with three (3) coats of hot creosote and capped with concrete so that no part of the pile will be exposed to the air.

No creosoted piling shall be used which have been so injured in handling or driving as to penetrate the creosoted shell, except in the case of bolt holes and unavoidable framing including the top cut-off, all of which shall be treated with three (3) coats of hot creosote.

The Building Inspector may require any piles which are to be used for the support of permanent structures to be inspected by an approved testing laboratory or other qualified inspector satisfactory to the Building Inspector. This inspection shall include a certificate of inspection indicating whether or not the piles, creosote and method of treatment conform to the requirements of this Code. Each pile shall be so marked or branded by the Inspector issuing the certificate of inspection as to identify the pile with respect to conformity or non-conformity to the provisions of this Code. Wood piles shall be spaced apart not less than two (2) feet, six (6) inches, center to center.

The allowable load on wood piles shall in no case exceed the values determined by the following formulae:

For piles driven by drop hammer:

$$L = 2 \text{ wh} / s + 1 \dots\dots\dots (1)$$

For piles driven by steam hammer

$$L = 2 \text{ wh} / s + 0.1 \dots\dots\dots (2)$$

Where L equals the safe load in tons, w equals the weight of the hammer in tons, h equals the height of fall or stroke of the hammer in feet, s equals the average penetration in inches under the last five (5) blows. The allowable load on a wood pile shall in no case exceed twenty-five (25) tons.

(c) Concrete piles. Concrete piles shall be of material complying with the requirements for Portland cement, fine aggregate, coarse aggregate and reinforcement as specified in Chapter 26 and steel as specified in Chapter 27. The maximum allowable working stress on any concrete pile shall not exceed twenty (20) per cent of the ultimate compressive strength of the concrete used in the piles, determined by tests as specified in Chapter 26. The maximum allowable load on any pile shall not exceed such working stress multiplied by the average cross sectional area of the pile.

Exception: When such pile is cast in a tight steel tube not less than five-sixteenths (5/16) inch thick, the allowable working stress shall be not more than twenty-five (25) per cent of the ultimate compressive strength of the concrete plus an allowable stress of not to exceed seventy-five hundred (7500) pounds per square inch for the steel tube, not includ-

Sec. 2803

ing in such latter computation the outer one-sixteenth ($1/16$) inch of the steel shell.

Concrete piles cast in place shall be made in such a manner as to insure the exclusion of any foreign matter and to secure a full sized shaft. The length of such piles shall be limited to not more than thirty (30) times the average diameter, except that when cast in steel tubes with a thickness of not less than five-sixteenths ($5/16$) inch the length of such piles shall be not greater than forty (40) times the average diameter. The diameter of concrete-filled steel tubes shall be not less than ten (10) inches and such piles shall be driven to a full bearing on rock. The diameter of other piles cast in place shall be not less than eight (8) inches at the point and shall have an average diameter of not less than eleven (11) inches.

Pre-cast concrete piles shall be sufficiently cured to attain the ultimate strength upon which their use is based, before driving. Such piles shall be reinforced and so handled as not to be fractured in any manner which will affect their durability or strength. Pre-cast concrete piles shall have a diameter at the point of not less than eight (8) inches, and an average diameter of not less than twelve (12) inches. The length of such piles when driven to rock shall be limited to twenty (20) times the average diameter and shall not exceed forty (40) times the average diameter in any other case.

The allowable load on a concrete pile when driven by a drop hammer or by a steam hammer shall not exceed the values determined by Formulas No. 1 and No. 2 respectively of this Section.

Rolled structural steel piles shall comply with the requirements for structural steel as specified in Chapter 27. The minimum thickness of metal shall be three-eighths ($3/8$) inch. The allowable load on a structural steel pile shall be determined by the formulas given in paragraph (b) of this section. In lieu of the determination of the allowable load by formula, the pile may be required to carry a test load equal to one and one-half ($1\frac{1}{2}$) times the load which the pile is to carry.

(d) The safe bearing power of any pile shall be determined by a load test whenever deemed necessary and ordered by the Building Inspector. The test pile or piles shall be loaded to twice the design load and the resultant settlement shall be measured until during a forty-eight (48) hour period no appreciable additional settlement takes place. The total settlement in inches shall not exceed one one-hundredth ($1/100$) times the test load in tons where the foundations carry a structure continuous over two or more spans nor twice this amount where the foundation carries non-continuous spans.

Secs. 2901-2903

CHAPTER 29—WALLS AND PARTITIONS

Solid Masonry Walls

General
Provis-
ions:
Solid
Masonry
Walls

Sec. 2901. Solid masonry walls shall be supported at right angles to the wall face at intervals not exceeding eighteen (18) times the wall thickness in the top story of buildings more than one story in height, or twenty (20) times the wall thickness elsewhere, except as specifically provided in Section 2903. Such lateral support may be obtained by masonry cross walls, piers or buttresses when the limiting distance is measured horizontally or by floors or roof when the limiting distance is measured vertically. Bonding and anchoring of horizontal and vertical framing members to the wall shall be provided sufficient to resist the assumed wind force acting in an outward direction. Floors and roofs shall be so constructed and anchored to such walls as to form a continuous and sufficient anchorage across the building from wall to wall. Anchoring of wood framing to masonry walls shall be as specified in Sections 2506, 2507 and 2508. Piers or buttresses relied upon for lateral support shall have sufficient strength and stability to transfer the wind force acting in either direction to the ground. When walls are dependent upon floors for their lateral support provision shall be made in the building to transfer the lateral forces resisted by all floors to the ground.

Corbels may be built into masonry walls to furnish bearing for joists or other structural parts, but such corbels shall not exceed one-fourth (1/4) the total thickness of the wall and the projection for each course in such corbel shall not exceed one-half (1/2) inch. Corbeling of walls eight (8) inches or less in thickness shall not be allowed.

Working
Stresses

Sec. 2902. The maximum allowable compressive stresses in solid masonry due to combined live, dead and other loads shall not exceed those specified in Sections 2410 and 2411.

Thickness
of Exterior
Walls
Other Than
Skeleton
Construc-
tion

Sec. 2903. (a) The thickness of solid masonry walls shall be sufficient at all points to keep the combined stresses due to live, dead and other loads for which the building is designed within the limits specified in Sections 2410 and 2411.

The minimum thickness of solid masonry exterior, bearing or party walls shall be not less in thickness than specified in the following table No. 1; provided, that in no case shall the uppermost thirty-five (35) feet of such walls be less than twelve (12) inches in thickness, and each successive thirty-five (35) feet or fraction thereof measured downward from the top shall be increased not less than four (4) inches in thickness.

Table No. 1

8th	12							
7th	12	12						
6th	12	12	12					
5th	16	12	12	12				
4th	16	16	12	12	12			
3rd	16	16	16	12	12	12		
2nd	20	16	16	16	12	12	12	
1st	20	20	20	16	16	16	12	12
Basement	20	20	20	20	16	16	16	12
Stories	8	7	6	5	4	3	2	1

Sec. 2903

Exceptions: (1) The top story exterior or bearing walls of a building not exceeding four (4) stories or fifty-five (55) feet in height, or the wall of a one-story building of Group E, F or G may be eight (8) inches; provided, that such eight (8) inch wall does not exceed twelve (12) feet unsupported height and that the roof beams or trusses are so placed or constructed as not to develop any direct thrust against the wall.

(2) Exterior walls for Group I buildings shall be as specified in part (c) of this Section.

(3) Solid masonry exterior bearing or party walls constructed as specified in part (d) of this Section may be of lesser thickness.

(b) Non-bearing walls of solid masonry shall be not less in thickness than specified in the following Table No. 2; provided, that in no case shall the uppermost fifteen (15) feet of such wall be less than eight (8) inches thick and that each successive fifty (50) feet or fraction thereof measured downward from the top shall be increased not less than four (4) inches in thickness.

Table No. 2

8th	8							
7th	12	8						
6th	12	12	8					
5th	12	12	12	8				
4th	12	12	12	12	8			
3rd	16	12	12	12	12	8		
2nd	16	16	12	12	12	12	8	
1st	16	16	16	16	12	12	8	8
Basement	20	16	16	16	16	12	12	8
Stories	8	7	6	5	4	3	2	1

Exceptions: (1) Solid masonry non-bearing walls for Group I buildings not over three (3) stories high shall be as specified in part (c) of this Section.

(c) Solid masonry walls, either bearing or non-bearing, for Group I buildings not over three (3) stories in height shall not be less in thickness than specified in Table No. 3.

Table No. 3

3rd	8		
2nd	8	8	
1st	12	8	8
Basement	12	12	8
Stories	3	2	1

(d) Where solid masonry bearing or non-bearing walls other than fire walls or fire division walls are strengthened laterally by masonry buttresses or cross walls the wall thicknesses specified in parts (a), (b) and (c) of this Section may be reduced between buttresses by one-half ($\frac{1}{2}$) the thickness added at the buttress, except that no part of such buttressed wall shall be less than eight (8) inches thick. Buttresses shall be not less than one-eighth ($\frac{1}{8}$) the clear distance between them in width and their clear distance apart shall not exceed twenty-

Secs. 2903-2906

four (24) times the reduced wall thickness. Principal girders and trusses shall rest on the buttresses.

In one-story buildings having walls not over sixteen (16) feet high to the under side of girders or trusses and pilastered as above provided for an eight (8) inch wall between pilasters, such walls may be considered as bearing walls for roof loads and parapet walls only. All materials used in solid masonry walls shall conform in all respects to the requirements for such materials in Chapters 24 and 26.

Bonds

Sec. 2904. In all solid unit masonry walls at least every sixth course on both sides of the wall shall be a header course or there shall be at least one full header in every seventy-two (72) square inches of each wall surface. In walls more than twelve (12) inches thick the inner joints of header courses shall be covered with another header course which shall break joints with the course below.

Where running bond is used, every sixth course on each face shall be bonded into the backing by using a full header course at right angles to the face behind split brick.

Piers

Sec. 2905. The unsupported height of isolated piers shall not exceed ten (10) times their least dimension. Piers of solid unit masonry shall be laid up in cement mortar.

Walls in which the openings are of such an extent as to leave relatively narrow sections exceeding ten (10) feet in height shall have such narrow sections computed and constructed as for isolated piers.

Chases and Recesses

Sec. 2906. There shall be no chases in eight (8) inch walls or within the required area of any pier, and no chase in any wall or pier shall be deeper than one-third (1/3) the wall thickness. No horizontal chase shall exceed four (4) feet in length nor shall the horizontal projection of any diagonal chase exceed four (4) feet. No vertical chase shall be closer than two (2) feet to any pilaster, cross wall, end wall or other stiffener.

Recesses for stairways or elevators may be made in walls, but in no case shall the walls at such points be less than the required thickness of walls of the fourth story above the ground floor unless reinforced by additional piers, by steel or reinforced concrete girders or steel or reinforced concrete columns and girders, securely anchored to the walls on each side of such recesses. Recesses for alcoves and similar purposes shall have not less than eight (8) inches of material at the back. Such recesses shall be not more than eight (8) feet in width and shall be arched over or spanned with lintels.

The aggregate area of recesses and chases in the wall of any one story shall not exceed one-fourth (1/4) the whole area of the face of the wall in that story.

No chases or recesses shall be permitted in fire or fire division walls that will reduce the thickness below the minimum specified in this Code.

Openings for doors and windows shall have well buttressed arches or lintels of masonry, or of metal with bearing at each end of not less than four (4) inches on the wall. On the inside of openings less than four (4) feet wide, in which the thickness

Secs. 2906-2909

of arches and lintels is less than that of the wall supported, timber may be used, which will rest at each end not more than two (2) inches on the wall and be chamfered or cut to serve as arch centers.

The maximum percentage of openings in the horizontal cross section of any wall shall not exceed fifty (50) per cent unless the wall is increased four (4) inches in thickness or such portions of the wall between openings shall be as required for piers in Section 2905.

**Walls of Hollow Tile, Concrete Block or Tile, Hollow
Walls of Brick and Hollow Monolithic Plain Concrete Walls**

Sec. 2907. Walls of hollow clay tile, of concrete block or tile, hollow walls of solid masonry units and hollow monolithic plain concrete walls shall be supported at right angles to the face at intervals not exceeding sixteen (16) times the wall thickness in top stories of buildings more than one story in height, or eighteen (18) times the wall thickness elsewhere.

**General
Provisions:
Hollow
Walls**

The general provisions relating to solid masonry walls shall apply to hollow walls as included in this Section; provided, that corbeling from hollow walls shall not be permitted except when such corbels are constructed of solid masonry or reinforced concrete.

Where air spaces are built into the wall the area of such air spaces combined with the area of the cellular space in the tile used in the construction of the wall shall not exceed forty-five (45) per cent of the gross cross-sectional area of the wall.

Masonry walls composed of a combination of solid and hollow units shall not be less in thickness than the minimum thickness required for hollow walls as provided in Section 2909.

All materials used in walls of hollow clay tile or concrete block or tile, hollow walls of solid masonry units and hollow monolithic concrete walls shall conform in all respects to the requirements for such materials in Chapters 24 and 26.

Sec. 2908. The maximum allowable compressive stresses in walls of hollow tile, concrete block or tile, hollow walls of brick or hollow monolithic plain concrete walls due to combined live, dead and other loads shall not exceed those specified in Chapters 24 and 26.

**Working
Stresses**

Sec. 2909. Walls of hollow clay tile and concrete block or tile, hollow walls of solid masonry units and hollow monolithic concrete walls shall be not less in thickness than as specified in the following Table No. 4; provided, that in no case shall the uppermost twenty-five (25) feet of such walls be less

**Thickness
and
Height of
Walls
Other Than
Skeleton
Construc-
tion**

Secs. 2909-2913

than twelve (12) inches in thickness, and each successive twenty-five (25) feet or fraction thereof measured downward from the top shall be increased not less than four (4) inches in thickness.

Table No. 4

8th	12							
7th	12	12						
6th	16	12	12					
5th	16	16	12	12				
4th	20	16	16	12	12			
3rd	20	20	16	16	12	12		
2nd	24	20	20	16	16	12	12	
1st	24	24	20	20	16	16	12	12
Basement	28	24	24	20	20	16	16	12
Stories	8	7	6	5	4	3	2	1

Except that walls of Grade A hollow clay tile or Grade A or Grade A Special hollow concrete block or tile, as specified in Sections 2406 and 2408, may be of the same thickness as solid masonry walls when not exceeding two (2) stories in height, and such walls shall be laid in cement mortar proportioned as specified in Section 2409.

One-story private garages and one-story residences may have bearing and non-bearing walls of hollow tile, concrete block or tile, hollow brick or hollow monolithic plain concrete walls six (6) inches thick.

Bond

Sec. 2910. All hollow masonry units in a wall shall have all contact surfaces solidly embedded in mortar and laid with a full bond.

Where two (2) or more hollow units are used to make up the thickness of a wall the inner and outer courses shall be bonded at vertical intervals not exceeding three (3) courses by lapping at least one (1) cell completely over a cell of the unit below.

**Beam
Supports**

Sec. 2911. Suitable provision shall be made in hollow walls or walls of hollow units at each line of floor joists or beams to shut off the spaces above from those below with incombustible material.

Except where hollow units having at least three (3) cells in each eight (8) inches of thickness are laid with cells horizontal, joists, beams or other structural members shall not be seated directly on hollow walls or walls of hollow units, but shall be supported on at least three (3) courses of brick or equivalent concrete or metal plate of sufficient thickness and size to distribute the load to the webs and shells in such a manner as not to exceed the allowable unit stress.

Piers

Sec. 2912. Hollow tile or concrete block or tile, except Grade A hollow clay tile and Special hollow concrete block or tile, shall not be used for isolated piers. Wall sections greater in height than ten (10) times their least dimension and two (2) feet or less in width shall be considered as isolated piers. Isolated piers shall be laid up in cement mortar.

**Chases
and
Recesses**

Sec. 2913. Chases and recesses in walls of hollow tile, hollow concrete block or tile, or in hollow walls of brick shall not

Secs. 2913-2916

exceed in extent those permitted for solid masonry walls under the same conditions. Chases and recesses shall not be cut in walls of the above types, but may be built in. No chases or recesses shall be permitted in fire walls that will reduce the thickness below the minimum specified in this Code.

Reinforced tile lintels over openings made by filling the cells of the hollow units with cement mortar or concrete and inserting reinforcing bars may be used. Such lintels shall be computed as reinforced concrete beams on the basis of the enclosed concrete or mortar.

Reinforced Concrete Walls

Sec. 2914. The general provisions of Chapter 26 of this Code shall apply to the design and construction of reinforced concrete walls provided that where any conflict may occur the provisions of this Article shall govern.

Reinforced concrete bearing walls shall have a thickness of not less than one twenty-fifth ($1/25$) of the unsupported height; provided, that approved buttresses, built-in columns or piers may be used in lieu of greater thicknesses.

Reinforced concrete walls shall be supported at right angles to the wall face at intervals not exceeding twenty-two (22) times the wall thickness in the top story or twenty-five (25) times the wall thickness elsewhere. Such lateral support may be obtained by masonry or reinforced concrete cross walls, piers, buttresses or built-in columns when the limiting distance is measured horizontally or by floors or roof when the limiting distance is measured vertically. Bonding and anchoring shall be provided between the wall and the supports to resist the assumed wind force acting in an outward direction. Piers, buttresses or built-in columns relied upon for lateral support shall have sufficient strength and stability to transfer the wind force acting in either direction, to the ground. When walls are dependent upon floors for their lateral support, provision shall be made in the building to transfer the lateral forces resisted by all floors, to the ground. Anchoring of interior wood framing shall be as specified in Chapter 25.

Corbeling of reinforced concrete walls for the support of beams, girders and other members shall be fully provided for in the design of the wall at that point.

Sec. 2915. The maximum allowable compressive stress in reinforced concrete walls due to combined live, dead and other loads shall not exceed $0.07 f'_c$ when the unsupported height of the wall is twenty-five (25) times the thickness, nor $0.15 f'_c$ when the unsupported height of the wall is fifteen (15) times the thickness or less with allowable stresses proportional between those limits of height.

Sec. 2916. The thickness of reinforced concrete bearing walls shall be sufficient at all points to keep the combined stresses due to dead, live and/or other loads for which the building is designed, within the limits specified in Section 2915.

The minimum thickness of reinforced concrete bearing or

**General
Provisions:
Reinforced
Concrete
Walls**

**in Skeleton
Construction**

**Working
Stresses
Thickness
of Walls
Other Than**

Secs. 2916-2919

party walls shall be not less than the thickness specified in Table No. 5.

Table No. 5

8th	8							
7th	9	8						
6th	10	9	8					
5th	11	10	9	8				
4th	12	11	10	9	8			
3rd	13	12	11	10	9	8		
2nd	14	13	12	11	10	9	8	
1st	15	14	13	12	11	10	9	8
Basement	16	15	14	13	12	11	10	8
Stories	8	7	6	5	4	3	2	1

Such reinforced concrete walls shall have not less than one-tenth (1/10) of one (1) per cent of reinforcement in each direction, horizontally and vertically and the steel shall be distributed equally to each face of the wall with a maximum bar spacing of twenty-four (24) inches in each face.

Non-bearing walls of reinforced concrete complying with all of the provisions of this Section shall be of not less thickness than that specified in the following Table No. 6.

Table No. 6

8th	6							
7th	7	6						
6th	8	7	6					
5th	9	8	7	6				
4th	10	9	8	7	6			
3rd	11	10	9	8	7	6		
2nd	12	11	10	9	8	7	6	
1st	13	12	11	10	9	8	7	6
Basement	14	13	12	11	10	9	7	7
Stories	8	7	6	5	4	3	2	1

All such reinforced concrete walls shall be laterally supported by a reinforced concrete or fire-proofed structural steel floor system when supported from one side only and may be supported by combustible floors when supported laterally from both sides.

Piers

Sec. 2917. The unsupported height of piers of reinforced concrete walls shall not exceed ten (10) times their least dimensions unless designed as reinforced concrete columns.

Walls in which the openings are of such an extent as to leave relatively narrow sections exceeding ten (10) times their least dimension in height shall be considered as piers.

Chases and
Recesses

Sec. 2918. Chases and recesses shall be as permitted in solid masonry walls in Section 2906.

Openings for doors and windows shall have reinforced concrete lintels designed as specified in Chapter 26, or fire-proofed steel lintels as specified in Chapter 27.

Quality of
Material

Stone Walls

Sec. 2919. Stone used in masonry wall construction shall

Secs. 2919-2926

be at least equal in strength to the minimum specified for plain concrete in Section 2405.

Sec. 2920. The maximum allowable compressive stresses in rubble stonework due to combined live, dead and other loads shall not exceed those specified in Sections 2410 and 2411.

**Working
Stresses**

Sec. 2921. Rubble stone walls shall be four (4) inches thicker than is required for solid brick or concrete walls of the same respective heights, but in no part less than sixteen (16) inches.

**Lateral
Support
and
Thickness**

The minimum thickness for walls or piers of ashlar masonry properly bonded shall be the same as required for solid brick walls and piers under similar conditions.

The lateral support for stone walls shall conform to the same requirements specified for solid masonry walls in Section 2901.

Sec. 2922. Bond stones extending through the wall and uniformly distributed shall be provided to the extent of not less than twenty (20) per cent of the area, and there shall be at least one bond stone for every five (5) stretchers.

Bond

Sec. 2923. Chases and recesses in stone walls shall not exceed in extent those permitted for solid masonry walls under the same conditions.

**Chases
and
Recesses**

Veneered Walls

Sec. 2924. Materials used in the veneering of masonry and reinforced concrete walls shall conform in all respects to the requirements for such materials in Chapter 24 of this Code. Stone, cellular architectural terra cotta, slab terra cotta, tile cast stone ashlar or other approved masonry materials used for veneering shall be of the thicknesses set forth as follows:

**Quality of
Material**

Stone	not less than 3 in.
Cellular architectural terra cotta	not less than 3 in.
Slab terra cotta	not less than 1½ in.
Flat tile	not less than 1 in.
Brick (Clay, concrete or sand-lime)	not less than 2 in.
Hollow tile	not less than 2 in.
Cast stone	not less than 2 in.
Other approved masonry	not less than 3 in.

In stone ashlar, each stone shall have a reasonable uniform thickness, but all stones need not necessarily be of the same thickness.

Sec. 2925. The maximum allowable compressive stress on the backing of veneered walls, due to combined live and dead loads, shall not exceed those permitted for masonry of the type which forms such backing. In no case shall the veneering be considered a part of the wall in computing the strength of bearing walls, nor shall it be considered a part of the required thickness of the wall.

**Working
Stresses**

Sec. 2926. When walls are veneered with brick, hollow tile, cellular architectural terra cotta, slab terra cotta, stone and/or

**Attachment
of
Veneering**

Secs. 2926-2931

cast stone, the veneering shall be tied into the backing either by a header for every three hundred (300) square inches of wall surface or by substantial, non-corrodible metal wall ties spaced not farther apart than one (1) foot vertically and two (2) feet horizontally. Headers shall project at least three and three-quarters (3¾) inches into the backing and anchors shall be of substantial pattern. Tile veneering not more than one (1) inch in thickness with individual units not exceeding twenty (20) inches in any one dimension and having not more than two hundred (200) square inches of superficial area and having corrugations or scorings on the back side thereof, need not be anchored in accordance with the above requirements but shall be cemented solidly to the backing with cement mortar so as to provide a continuous integral support to the backing.

**Height of
Veneered
Walls**

Sec. 2927. Veneer on masonry or reinforced concrete walls other than panel walls shall not exceed forty (40) feet in height above foundations or other definite and secure supports. Where slab terra cotta is anchored by means of substantial, non-corrosive metal ties, spaced as required in Section 2926, and grouted or cemented solidly with cement mortar to provide a continuous integral support to the masonry backing and where flat tile is anchored in accordance with the provisions of Section 2926 for tile veneer, this height limit does not apply.

Faced Walls
**Quality of
Material**

Sec. 2928. Material used in the backing and facing of faced walls shall conform in all respects to the requirements prescribed for such materials in Part VI.

Materials used for facing shall be not less than three and three-fourths (3¾) inches thick, and in no case less in thickness than one-eighth (1/8) the height of the unit, excepting that spandrel and other recessed panels, when approved, may be higher than eight (8) times their thickness, provided they are of the minimum thickness required in this paragraph.

**Working
Stresses**

Sec. 2929. The maximum allowable compressive stresses on faced walls due to combined live, dead and other loads shall not exceed those permitted for masonry of the type which forms the backing. Where bonded to the backing as provided in Section 2931, the full cross section of the facing may be considered in computing bearing strength.

**Thick-
ness**

Sec. 2930. Faced walls shall be not less in thickness than is required for masonry walls of the type which forms the backing. Where bonded to the backing as provided in Section 2931 the facing may be considered a part of the wall thickness.

Bond

Sec. 2931. Solid unit masonry facing, or cellular architectural terra cotta facing, with all voids filled solidly with masonry or concrete grout shall be bonded to wall of solid masonry or of hollow clay tile, or of concrete block or tile with at least one (1) header course in every six (6) courses, or there shall be at least one (1) full length header in every seventy-two (72) square inches of wall surface.

Secs. 2931-2934

Stone ashlar facing, or cellular architectural terra cotta facing with all voids filled solidly with masonry or concrete grout shall have at least fifteen (15) per cent of the superficial area not less than three and three-fourths ($3\frac{3}{4}$) inches thicker than the remainder of the facing to form bond units, which shall be uniformly distributed throughout the wall.

Fire Walls, Fire Division Walls and Parapet Walls

Sec. 2932. Solid masonry and reinforced concrete fire walls shall be not less in thickness than required for exterior bearing walls of corresponding height but never less than twelve (12) inches thick except that solid masonry fire walls for Group H and I buildings, shall be not less than eight (8) inches thick for the uppermost twenty-five (25) feet of height and shall be not less than twelve (12) inches thick for the remaining lower portion. No eight (8) inch fire wall shall be broken into subsequent to building, for the insertion of structural members, and a separation of not less than four (4) inches of solid masonry shall be provided in all fire and party walls between combustible members which may enter such walls from opposite sides. Party walls which function also as fire walls shall conform to the requirements of fire walls. No chases or recesses shall be built into fire walls which will reduce the required minimum thickness.

**Fire
Walls:
Solid
Masonry**

Sec. 2933. Hollow masonry fire walls shall not be permitted as fire walls in Fire Zone No. 1 unless faced on each side thereof by not less than a four (4) inch veneer of brick work well bonded into the hollow wall construction.

**Hollow
Fire
Walls**

Fire walls of hollow clay tile, concrete block or tile shall be not less than sixteen (16) inches thick in any part, except that for Groups H and I buildings they may be not less than twelve (12) inches thick. Hollow walls of solid masonry units used as fire walls shall be not less than twelve (12) inches thick. No fire walls of the above types shall be broken into, subsequent to erection, for the insertion of structural members.

When combustible or unprotected steel building members frame into the hollow part of fire walls of thickness not greater than twelve (12) inches, they shall not project more than four (4) inches into the walls and shall be so spaced that the distance between embedded ends is not less than four (4) inches. The space above, below and between such members shall be filled solidly with burnt clay materials, mortar, concrete or equivalent fire-resistive materials, to a depth of not less than four (4) inches on all sides of the members.

All open cells in tile blocks occurring at wall ends shall be filled solid with concrete or cement mortar for at least a depth of six (6) inches, or closure tile set in the opposite direction shall be used.

Party walls which function as fire walls shall conform to the requirements of fire walls.

Sec. 2934. Fire division walls shall be not less in thickness than required for exterior bearing walls of corresponding height and materials, except in skeleton construction where they shall

**Fire
Division
Walls**

Secs. 2934-2937

Parapet
Walls

be not less than required for panel walls. Fire division walls shall have a fire-resistive rating of not less than four hours.

Sec. 2935. On all buildings, except on Group H and I buildings three (3) stories or less in height, all exterior, fire or party walls shall project above the roof as parapets; provided, that where such wall fronts on a street and where the roof construction is entirely of incombustible materials, such parapet wall may be omitted; and provided, further, that for buildings twenty (20) feet or less in height or where the adjoining roof slopes more than twenty (20) degrees from the horizontal such parapet walls may be omitted. All required parapet walls shall be not less than thirty (30) inches above the roof immediately adjacent thereto and when exceeding six (6) times their thickness in height shall be laterally supported.

All parapet walls shall have a coping of incombustible material. On Group H and I buildings not more than three (3) stories high, exterior and fire walls shall extend above combustible roofs to a height not less than twenty-four (24) inches above the roof where the pitch of the roof does not exceed three (3) inches in twelve (12) inches. Where the pitch of the roof exceeds three (3) inches in twelve (12) inches such walls may terminate at the upper side of the roof boards.

Partitions

Bearing
Partitions

Sec. 2936. All interior bearing walls, which do not extend through more than one (1) story, except fire walls, fire division walls and party walls shall be considered as bearing partitions.

Solid masonry bearing partitions shall be not less than eight (8) inches thick and those of hollow clay tile, concrete block or tile or hollow walls of brick shall be not less in thickness than one-eighteenth (1/18) of the height between floors or floor beams but never less than eight (8) inches.

Non-bearing
Partitions

Sec. 2937. Brick non-bearing partitions shall be not less than three and three-fourths (3 $\frac{3}{4}$) inches thick for a height not exceeding twelve (12) feet between floors or floor beams or roofs. Non-bearing partitions of hollow clay tile, concrete block or tile, plain concrete, hollow walls of brick or of gypsum block or other similar materials shall be built solidly against the floor and ceiling construction below and above and shall not exceed the following unsupported heights:

Thickness Exclusive of Plaster (Inches)	Maximum Unsupported Height (Feet)
2	8*
3	12
4	15
6	20
8	25

*Height or length.

Secs. 2937-2938

Solid or hollow non-bearing partitions of reinforced plaster shall have a thickness of not less than one-sixtieth ($1/60$) of the unsupported height, but never less than one and one-half ($1\frac{1}{2}$) inches for solid partitions nor have a shell thickness of less than three-fourths ($\frac{3}{4}$) of an inch for hollow partitions. Such partitions shall have vertical steel or iron channels with a depth of not less than one-half ($1/2$) the thickness of the partition, made of not less than number twenty-four (No. 24) U. S. Gauge metal and spaced not more than twenty-four (24) inches o. c.

Solid or hollow non-bearing partitions of reinforced gunite shall have a thickness of not less than one-seventieth ($1/70$) of the unsupported height but never less than one and one-half ($1\frac{1}{2}$) inches for solid partitions nor have a shell thickness of less than three-fourths ($\frac{3}{4}$) of an inch for hollow partitions. Vertical channels shall be installed in gunite partitions as specified for plaster partitions above.

Foundation Walls

Sec. 2938. Solid masonry foundation walls and those of concrete block or coursed stone shall be not less in thickness than the wall immediately above and in no case less than twelve (12) inches thick unless otherwise specified in Chapter 28, except that when the space enclosed within the foundations is not excavated they may be eight (8) inches if included within the allowable height of eight (8) inch walls and if the walls supported by such foundation are not more than eight (8) inches in thickness. When built of concrete cast in place, foundation walls shall be at least as thick as the walls supported, but in no case less than eight (8) inches. When built of rubble stone, they shall be at least sixteen (16) inches thick. Rough or random rubble without bonding or level beds shall not be used as foundations for walls exceeding thirty-five (35) feet in height nor shall coursed bonded rubble walls be used as foundations for walls exceeding seventy-five (75) feet in height.

Foundation Walls

Foundations for walls of hollow clay tile, concrete block or tile and hollow walls of brick, shall be of the same thickness, respectively, as required in the paragraph above, and shall be built of brick, stone, concrete (plain or reinforced), hollow clay tile, concrete block or tile, or as a hollow wall of brick. Tile foundation walls shall be not less than twelve (12) inches thick.

When the stresses due to earth pressure and superimposed building load exceed the maximum working stress permitted in this Code for the materials used, and the additional stresses are not otherwise provided for, the wall thickness shall be increased to bring the stresses within the required limits.

All foundation walls shall extend below the level of frost action, and shall not be constructed of gypsum.

Materials for foundation walls shall be equal in quality in all respects to those required for exterior bearing walls, except that mortar used for exterior foundation walls below grade shall be cement mortar.

Foundations built of masonry units, whether hollow or solid,

Secs. 2938-2941

shall be sealed below any woodwork with a cement wash or equally effective seal.

Panel and Enclosure Walls

Panel and
Enclosure
Walls

Sec. 2939. Panel and enclosure walls in skeleton framed buildings shall be not less than eight (8) inches thick if of solid brick, hollow clay tile, concrete block or tile, plain concrete or hollow walls of brick, nor less than one-twentieth (1/20) the distance between supporting or enclosing members. Panel and enclosure walls of reinforced concrete shall be not less than six (6) inches thick and sufficiently reinforced to resist the wind pressure specified in Section 2307 from either direction. Panel and enclosure walls of reinforced gunite shall be not less than four (4) inches thick and shall be reinforced as required for reinforced concrete walls.

Enclosure walls shall be securely fastened to the adjoining framing members.

When panel or enclosure walls are built monolithic with columns or bearing walls they may be reinforced to carry their own weight.

Miscellaneous Requirements

Anchoring
of Walls

Sec. 2940. All walls shall be securely anchored and bonded at points where they intersect and where they abutt or adjoin the frame of a skeleton framed building.

When walls are not built at the same time the perpendicular joint shall be regularly toothed with not less than four (4) inch offsets and the joint shall be provided with anchors not less than two inches by three eighths inch (2"x $\frac{3}{8}$ ") metal with ends bent up not less than two (2) inches or with cross pins to form anchorage. Such anchors shall be not less than three (3) feet long extending eighteen (18) inches in from each side of the joint and spaced not more than three (3) feet apart in the direction of the height of the wall.

Reinforcing in concrete walls shall be extended not less than twenty-four (24) inches around all corners and wall intersections.

Use of
Existing
Walls

Sec. 2941. An existing masonry wall may be used in the renewal or extension of the building providing it meets the requirements of this Code, and is structurally sound or can be made so by reasonable repairs. Existing walls which are structurally sound but which are of insufficient thickness when increased in height shall be strengthened by an addition of the same material not less than eight (8) inches in thickness laid up in Portland cement mortar, or the wall may be built out with gunite to the thickness required for a new wall of that height. Foundations and lateral supports shall be provided as required for newly constructed walls under similar conditions. All additions or linings shall be thoroughly bonded into existing masonry by toothings to assure combined action of wall and lining. Such toothings shall be distributed uniformly throughout the wall and shall aggregate in vertical cross-sectional area not less than fifteen (15) per cent of the total vertical area of the wall or lining.

CHAPTER 30

ENCLOSURE OF VERTICAL OPENINGS

Sec. 3001. Vertical openings are required to be enclosed in certain buildings depending upon the occupancy of the building, height of building or the type of construction. The vertical openings required to be enclosed are specified under Occupancy in Part III, and for stairways and ramps are specifically included in Chapter 33.

**Enclosures;
When
Required**

Sec. 3002. When stairways and/or ramps are required to be enclosed such enclosures shall also include a complete passageway not less in width at any part than the required width of such stairway or ramp and such enclosure shall extend from the lowest point to the highest point required. All doors opening into such enclosures shall be of metal or shall be metal-clad doors as specified in Section 4304, and all windows shall be of wire glass and metal frames and sash; except that when such openings face directly on a street or court and are not within ten (10) feet of an adjacent lot line such protection may be omitted. All such doors shall be self-closing and be kept normally closed.

**Stairway,
Ramp and
Elevator
Enclosures**

Walls and partitions enclosing stairways, ramps or elevators shall be of not less than two-hour fire-resistive construction as specified in Section 4302; except as specifically provided in Sections 1907 and 2007, where one-hour fire-resistive construction is specified. Enclosing walls of elevator shafts may consist of wire glass set in metal frames on the entrance side only. Elevator shafts extending through more than two (2) stories shall be equipped with an approved means of adequate ventilation to and through the main roof of the building.

Sec. 3003. All shafts, ducts, chutes and other vertical openings not covered in Section 3002 shall have enclosing walls conforming to the requirements specified under Type of Construction of the building in which they are located when they exceed nine (9) square feet in area, and all other shafts shall be lined with sheet metal having lock jointed or riveted seams and joints. Combustible material of partitions and floors through which the ducts pass shall be kept at least three (3) inches from the metal lining or be protected by not less than three-eighths (3/8) of an inch of plaster or one-fourth (1/4) of an inch of asbestos or plasterboard. Openings between any ducts and the floor construction through which they pass shall be filled with mortar or other incombustible material supported by wire baskets that prevent the passage of fire. All doors opening into such vertical shafts shall be of metal or shall be covered on the shaft side by not less than one-fourth (1/4) of an inch of asbestos and not less than twenty-six (26) gauge metal returned around all edges and well fastened to the door. Windows in such shafts shall be wire glass and metal frames and sash or such frame and sash may be of wood entirely clad with metal of not less than twenty-six (26) gauge.

**Other
Vertical
Openings**

CHAPTER 31

FLOOR CONSTRUCTION

General

Sec. 3101. Floor construction shall be of materials and construction as specified under Occupancy in Part III and under Types of Construction in Part V.

All floors shall be so framed and tied into the framework and supporting walls as to form an integral part of the whole building. Fire-resistive standards of floor construction are specified in Section 4303.

The type of floor construction used shall provide means to keep the beams and girders from spreading by installing ties or bridging.

Concrete Floors

Sec. 3102. Concrete slab floors shall be not less than two and one-half ($2\frac{1}{2}$) inches thick. Topping when poured monolithic with the slab may be included as a structural part of the slab. Sleepers for the nailing of a wood floor shall not decrease the required structural depth of the slab unless placed in the direction of span and then shall not be placed more than one-half ($\frac{1}{2}$) inch into the slab. Concrete joists shall be solidly bridged for lateral support as follows: One row of concrete bridging shall be placed in clear spans of fifteen (15) to twenty-four (24) feet; two rows of bridging shall be placed in all clear spans of twenty-four (24) feet or more. Bridging shall be reinforced continuously top and bottom with not less than one-half ($\frac{1}{2}$) inch square rod or the equivalent area in other shapes. Such bridging shall be the full depth and width of the joists.

Steel Joisted Floors

Sec. 3103. Steel joisted floors shall consist of steel joists as specified in Section 2714. When used in Type I or Type II buildings they shall have a reinforced concrete or gypsum slab not less than two and one-half ($2\frac{1}{2}$) inches thick placed on and secured to the top thereof, and a fire-resistive ceiling as specified in Section 4303 on the under side thereof, fully covering and protecting the joists; provided that when such joists are used in places where unprotected wood joists are permitted the steel joists need not be protected with fire-resistive materials as specified above. Fire-resistive ceilings as specified in Section 4303 shall, except in the case of one-hour fire-resistive construction, be designed and constructed to support a load of not less than ten (10) pounds per square foot in addition to its own weight.

The reinforced concrete or gypsum slab placed on and secured to the top of the steel joists shall be sufficiently reinforced to support all dead, live and/or other loads between joists. Joists other than those consisting of a single rolled structural steel section with solid web, shall be securely cross bridged at intervals not to exceed eight (8) feet along the joist length. The lateral unsupported length of the top chord of any steel joist shall not exceed forty (40) times the width of the compression flange.

Secs. 3104-3105

Sec. 3104. Mill constructed floors shall be not less than three (3) inches nominal spliced or tongued and grooved plank covered with one (1) inch nominal flooring laid crosswise or diagonal. Top flooring shall not extend closer than one-half (1/2) inch to walls to allow for swelling in case the floor becomes wet. Such one-half inch space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinking movements of the floor. Corbeling of masonry walls under floor planks may be used in place of such molding.

**Mill
Constructed
Floors**

If laminated floors are used, at least two laminations at the wall shall be omitted until after glazing and roofing has been completed.

Laminated floors consisting of planks not less than six (6) inches wide set on edge close together and spiked at about eighteen (18) inch intervals shall have the joints broken in such manner that no continuous line will occur across the floor and such flooring shall not be spiked to the supporting girders. Joints shall be made only at the supports and at the quarter points with no more than two-thirds (2/3) of such joints away from support. Joints between the planks of a laminated floor shall be made and kept tight.

The framing, fire cutting and anchoring of supporting timbers shall comply with the requirements of Chapter 25.

Floor timbers shall be not less than six (6) inches nominal in either cross sectional dimension.

Sec. 3105. Wood joisted floors shall be framed and constructed and anchored to supporting wood stud or masonry walls as specified in Chapter 25. Wood joisted floors need not be fire protected on the under side except where specifically required under Occupancy in Part III, Location in Part IV or Type of Construction in Part V.

**Wood
Joisted
Floors**

CHAPTER 32

ROOF CONSTRUCTION AND COVERING

General Sec. 3201. Roof covering shall be as required under Occupancy in Part III, Location in Part IV or Types of Construction in Part V. All roofs shall be so framed and tied into framework and supporting walls as to form an integral part of the whole building.

Construction Sec. 3202. The general requirements for construction of floors as specified in Chapter 31 shall apply to roofs except that in Type II buildings the roof sheathing shall be not less than two and one-half ($2\frac{1}{2}$) inches nominal in thickness and except that concrete or gypsum roof slabs shall be not less than two (2) inches in thickness.

Roof trusses shall have all joints well fitted and shall have all tension members well tightened before any load is placed on the truss. Diagonal and sway bracing shall be used to brace all roof trusses. The allowable working stresses of materials in trusses shall be as specified in Chapters 25 and 27. The minimum net section of the members after framing shall be used in determining the strength of the truss at any point.

Design Sec. 3203. The design of the roof construction shall be in accordance with engineering regulations for the materials used.

Roof Coverings Sec. 3204. Roof covering shall be required over all combustible roof construction and shall be of one of the classes specified in Section 4305 as they are specified under Occupancy in Part III, Location in Part IV and Types of Construction in Part V. (See also Sec. 104 (d)).

Access to Roof space Sec. 3205. All buildings shall have access provided to the attic space by means of a stairway or permanent ladder or a scuttle. The openings provided through the ceiling for such access into the attic space shall be not less than two feet by three feet ($2' \times 3'$) and shall be located in the hallway or corridor of all Type III and V buildings three (3) stories or more in height.

Type III or V buildings, one or two stories in height shall have scuttle holes into the attic space which are not less than eighteen (18) inches square.

Roof Drainage Sec. 3206. Roofs of all buildings shall be sloped so that they will drain to gutters and downspouts which shall be connected with conductors to carry the water down from the roof underneath the sidewalk to and through the curb. Overflows shall be installed at each low point of the roof to which the water drains.

CHAPTER 33

STAIRS, RAMPS AND SMOKEPROOF TOWERS

Sec. 3301. All exits as required for buildings in this Code shall comply with the requirements specified in this Chapter for a stairway, ramp or smokeproof tower. Wherever stairways are mentioned, ramps may be substituted when constructed as specified in Section 3310. A smokeproof tower constructed as specified in Section 3315 shall be considered as a required stairway as specified in Section 3309. Such smokeproof towers may be substituted for stairways wherever the latter are required in this Code.

General
Require-
ments

All stairways shall be constructed of materials permitted for floors as specified under Types of Construction in Part V for that type of building in which such stairways are located, except as specified in Sections 3315 and 3316. All stairways of wood construction shall be protected on the under side by not less than one-hour fire-resistive construction as specified in Chapter 43. Metal stairways entirely enclosed as specified in this Chapter shall not be required to be fireproofed as required for floors in Part V of this Code. The provisions of this Chapter shall not apply to Group I buildings except as specifically stated in Sections 3302 and 3314.

Sec. 3302. All stairways and all platforms, landings and balconies forming a part of such stairway shall be designed to sustain an assumed live load of not less than one hundred (100) pounds per square foot.

General
Design

There shall be no variation in the width of treads in any flight and the variation in heights of risers in any flight shall not exceed three-sixteenths ($3/16$) of an inch. All treads shall have a nosing of not less than one (1) inch.

The surface material of stair treads and landings shall be such as not to involve danger of slipping.

An arrangement of treads known as winders shall be permitted in Group I buildings or for monumental stairways which are not serving as a required means of exit but in no case shall any tread have a width at any point less than eight (8) inches exclusive of nosing.

Stairways and intermediate landings shall continue with no decrease in width along the direction of exit travel, except that when three or more stairways are required, one-half the required number of stairways may be combined at the second floor level with such combined width extending to the first floor level.

Sec. 3303. One-half of the required number of stairways shall be continued their full width to and through the roof by means of a penthouse in all buildings three stories or more in height; provided, that not more than one stairway shall be required to continue to and through the roof when the roof has a slope of more than six (6) inches for each twelve (12) inches of horizontal projection. In two story buildings scuttles not less than two feet by three feet (2' x 3') shall be provided to and through the roof. Stairways leading to roofs of buildings shall have signs conspicuously placed with letters not less than four (4) inches in height indicating such access at the ground floor level.

Arrange-
ment and
Access

Secs. 3303-3304

All stairways shall lead to the street directly or by means of a yard, court or fire-resistive passageway having a width at least equal to the aggregate widths of all the exits discharging into it; provided, that not to exceed one-half of the required number of stairs may terminate at the second floor level provided they lead directly to a street or alley front of the building and are provided with a balcony on the exterior of the building not less than three (3) feet wide and five (5) feet long. Such balcony shall be constructed of incombustible materials and when the floor of such balcony is located more than twelve (12) feet above the sidewalk directly below, such balcony shall be equipped with an approved counterbalanced stairway or ladder.

Where stairways discharge through the fire-resistive passageways such passageways shall be not less than seven (7) feet in clear height and with a width at least equal to the stairway or stairways served by such passageways. All openings into such passageways shall be protected by one-hour fire-resistive doors as specified in Section 4304.

All exits shall be so arranged as to make clear the direction of egress to the exterior of the building and shall be so located that they are readily accessible and visible. When not visible to all occupants, adequate signs shall be provided to indicate their location. For buildings with sleeping rooms, schools and places of detention, exits shall be so arranged that it is possible to go in either direction at any point in a corridor to an exit.

Stairways shall abutt on not more than one side of an elevator enclosure.

No portion of any building shall be more than one hundred fifty (150) feet (along the line of travel) from the nearest exit, and no corridor exit door shall be more than one hundred (100) feet (measured along the line of travel) from the nearest exit. In Group D and H buildings all doors providing egress from public hallways and all doors providing egress from the building shall open in the direction of exit travel, except sliding doors as provided in Section 3304.

Doors

Sec. 3304. Doors shall not open immediately on a flight of stairs but on a landing at least equal to the width of the door.

Doors giving access to stairways shall swing with the direction of exit travel but where swinging doors are not practicable sliding doors approved by the Building Inspector may be permitted. Vertical sliding doors and rolling shutters shall not be used. There shall be no obstructions on stairways or landings nor to the full swing of doors. Swinging doors in their swing shall not reduce the effective width of stairways or landings to less than thirty (30) inches nor when open interfere with the full use of the stairs.

All doors in exit enclosures or providing access to exterior stairways shall be self-closing and be kept normally closed and shall be of not less than one-hour fire-resistive construction as specified in Section 4304, except that doors facing a street and at street level may be of unprotected wood. All doors shall be constructed and installed in a workmanlike and tight fitting manner.

All doors used in connection with exits shall be so arranged

Secs. 3304-3308

as to be readily opened from the side from which egress is made or from both sides when the building is occupied. Locks if provided shall not require a key to operate from the inside.

Sec. 3305. All stairways shall have walls or well secured balustrades or guards on each side and handrails shall be placed on at least one side of every stairway and for stairways exceeding forty-four (44) inches in width shall have handrails placed on each side. Stairways over seven (7) feet wide shall be provided with one or more continuous intermediate handrails substantially supported and the number and position of intermediate handrails shall be such that there is not more than sixty-six (66) inches between adjacent handrails. **Railings**

Handrails and railings shall be placed thirty (30) inches above the nosing of treads and ends of handrails shall be returned to the wall.

Sec. 3306. Every stairway or other means of exit into corridors and passageways appurtenant thereto shall be provided with an adequate system of lighting, either natural or artificial. Lights in the exit signs shall be kept burning at all times that the building served by such stairways or exits is being used or occupied. **Lighting**

Sec. 3307. Stairways and landings, returns and passages serving such stairways shall be not less than forty-four (44) inches wide; except, that for dwellings and when serving mezzanines or not more than one family or one apartment in buildings not exceeding two stories in height the required width may be reduced to not less than three (3) feet. All such widths shall be clear of all obstructions; except that handrails attached to walls may project within the required width not more than three and one-half (3½) inches at each side when the stairway is forty-four (44) or more inches in width and on one side when the stairway width is less than forty-four (44) inches. If newells project above tops of rails a minimum clear width of not less than that specified in this paragraph shall be provided between the face of the newell and the face of the wall or newell opposite. **Detailed Requirements**

The rise of stairways shall be not more than seven and one-half (7½) inches and the tread exclusive of the nosing not less than ten (10) inches (maximum pitch 37 degrees,) and there shall be not more than seventeen (17) risers in any one run between landings; provided, that stairways in dwellings and stairways serving mezzanine floors may have a rise of not more than eight (8) inches and a tread exclusive of the nosing of not less than nine (9) inches.

The walls at the outer corners of landings shall be curved on a radius of at least two (2) feet, or a forty-five (45) degree splay not less than twenty (20) inches wide shall be provided to eliminate right angle corners.

Sec. 3308. All required stairways and ramps in buildings three stories or more in height, including landings and parts of floors between stairways which lie in the path of travel shall be enclosed as specified under Occupancy in Part III, under Types of Construction in Part V, and in Chapter 30; except that monumental stairways leading only from the street floor level to the second floor or basement and which do not constitute required **Stairway Enclosures**

Secs. 3308-3309

means of exit in public buildings or stores shall be exempted from the enclosure requirements.

Exit enclosures shall not be used for storage in any manner whatsoever and shall not contain any material or equipment liable to cause fire, explosion or panic.

At the top of every stairway enclosure a ventilating skylight with a horizontal area of not less than eight (8) square feet shall be installed as specified in Section 3402, or in lieu of such skylight an equivalent window opening glazed with plain glass may be provided in the penthouse walls. Fixed openings not less than five hundred (500) square inches in area shall be provided at the top of each stairway enclosure for ventilation.

Stairways
Required

Sec. 3309. The number of stairways provided for each use or occupancy shall be as required in the following tabulation for three (3) story buildings. For two (2) story buildings the allowable areas may be increased fifty (50) per cent. For buildings four (4) stories or more in height the allowable areas shall be decreased two (2) per cent per floor for each floor above the third floor to and including the eighth floor and shall be decreased one (1) per cent for each additional floor above the eighth floor; provided, that in no case shall there be less than two (2) stairways serving each floor for each building three (3) stories or more in height. Where the entire building is sprinkled in accordance with the provisions of Chapter 38 the allowable areas tabulated below may be increased thirty-three and one-third (33-1/3) per cent.

The number of required stairways for Group A, B and C buildings is specified in Chapters 6, 7 and 8, respectively.

Basic Areas for Computing Required Number of Stairways

No. of Stair- ways Re- quired	Maximum Areas for Types I and II Buildings (Sq. Ft.)				
	Group D Buildings	Group E Buildings	Group F Buildings	Group G Buildings	Group H Buildings
1	Up to 3,000	Up to 4,000	Up to 5,000	Up to 6,000	Up to 3,000
2	Up to 8,000	Up to 9,000	Up to 12,000	Up to 12,000	Up to 9,000
3	Up to 18,000	Up to 20,000	Up to 25,000	Up to 25,000	Up to 20,000
4	Up to 28,000	Up to 30,000	Up to 40,000	Up to 40,000	Up to 30,000
5	Up to 40,000	Up to 40,000	Up to 57,000	Up to 60,000	Up to 42,000
6	Up to 54,000	Up to 50,000	Up to 76,000	Up to 85,000	Up to 56,000
7	Up to 70,000	Up to 60,000	Up to 97,000	Up to 115,000	Up to 72,000
8	Up to 88,000	Up to 70,000	.....	.....	Up to 90,000
9	Up to 108,000	Up to 80,000	.....	.....	Up to 110,000
10	.....	Up to 90,000	.....	.....	.....
	Maximum Areas for Types III, IV and V Buildings (Sq. Ft.)				
	Group D Buildings	Group E Buildings	Group F Buildings	Group G Buildings	Group H Buildings
1	Up to 3,000	Up to 4,000	Up to 5,000	Up to 6,000	Up to 3,000
2	Up to 8,000	Up to 9,000	Up to 12,000	Up to 12,000	Up to 9,000
3	Up to 15,000	Up to 17,000	Up to 21,000	Up to 24,000	Up to 17,000
4	Up to 24,000	Up to 27,000	Up to 32,000	Up to 38,000	Up to 26,000
5	Up to 35,000	Up to 38,000	Up to 45,000	Up to 56,000	Up to 37,000
6	Up to 48,000	Up to 52,000	Up to 60,000	Up to 79,000	Up to 50,000
7	Up to 63,000	Up to 68,000	Up to 77,000	Up to 108,000	Up to 65,000
8	Up to 80,000	Up to 86,000	Up to 96,000	.....	Up to 82,000

Secs. 3309-3313

Exceptions: (1) Group D buildings shall be provided with not less than one (1) smokeproof tower constructed as specified in Section 3315 when such building exceeds two (2) stories in height.

(2) Group E—In automobile storage garages, where a system of ramps continuous from the ground floor to the top floor is used to transport automobiles from floor to floor, the number of stairways required shall be not less than one-half that shown in the above tabulation.

(3) Where one horizontal opening is provided, the allowable areas tabulated may be increased fifteen (15) per cent and where more than one such exit is provided, such areas may be increased not to exceed twenty-five (25) per cent.

Sec. 3310. Wherever stairways are required by this Code, ramps with a slope not greater than one (1) foot in eight (8) feet may be substituted. **Ramps**

Ramps shall comply with all the requirements for stairways as to construction, width, enclosures, landing, lighting and ventilation.

Ramps shall be surfaced with an approved non-slip material.

Handrails shall not be required where the slope of the ramp is less than one (1) foot in ten (10) feet.

Sec. 3311. A horizontal exit shall consist of one (1) or more protected openings through or around an exterior or fire wall or of one (1) or more bridges connecting two (2) buildings or parts of buildings entirely separated by fire walls. **Horizontal Exits**

Openings used in connection with horizontal exits shall be protected by one-hour fire-resistive doors as specified in Section 4304. If swinging doors are used there shall be adjacent openings with doors swinging in opposite directions, with signs on each side of the wall indicating the exit door which swings with the travel from that side.

Such doors shall be kept continuously unlocked whenever the building is occupied and be normally closed or be self-closing and equipped with fusible links.

Sec. 3312. Signs having white letters not less than five (5) inches high on a green field indicating location of exits shall be provided not only at the exit but at other points in the building wherever necessary to clearly indicate the direction of egress. Lights shall be kept burning during all times that the building is used or occupied. **Signs and Lighting**

Sec. 3313. Safe and continuous passageways, aisles, or corridors leading to exits and so arranged as to provide convenient access to exits for every occupant shall be maintained at all times on all floors and buildings. The minimum clear width of any passageway, aisle or corridor shall be three (3) feet at the narrowest point and doors swinging into such passageway shall not restrict the effective width at any point during their swing to less than the minimum width herein specified. **Passage-ways and Corridors**

Secs. 3314-3315

Exceptions

Sec. 3314. Stairways in Group I buildings, stairways serving only one apartment not above the second floor level, or stairways leading to mezzanine floors not exceeding one thousand (1000) square feet in area are exempted from the width, rise, tread and enclosure provisions in this Chapter but in no case shall such stairways have a rise of more than eight (8) inches and a tread exclusive of the nosing of less than nine (9) inches.

Smokeproof Tower

Sec. 3315. (1) Where required. A smokeproof tower consisting of a stairway with exterior access, entirely closed by masonry walls of not less than four-hour fire-resistive construction and floors and ceilings of not less than two-hour fire-resistive construction as specified in Chapter 43 and constructed as specified in this Section shall be required in every building of Group D, E, F, G and H occupancies five (5) stories or more in height. Smokeproof towers shall be installed in Group A, B and C buildings as specified in Chapters 6, 7 and 8, respectively.

(2) Construction. The stairways, landings, platforms and balconies of smokeproof towers shall be constructed as required for stairways, except that they shall be of incombustible materials throughout, except for handrails which may be of wood. The enclosure shall extend from the street level to a penthouse on the roof of the building and shall be roofed over with incombustible materials. Light and ventilation shall be provided at the top of every such enclosure as required for stairways.

Balustrades on the vestibules and balconies shall be not less than three feet and six inches (3'-6") in height. Exit lights shall be provided as required in Section 3312.

(3) Access and Egress. Access to the smokeproof tower shall be provided from each story by means of vestibules open to the outside on an exterior wall or by means of balconies overhanging an exterior wall but not subject to severe fire exposure. Every such vestibule, balcony or landing shall have an unobstructed length not less than the combined required width of exit doors opening upon such balcony or landing and shall be directly open to a street, alley or yard or to an enclosed court open at the top and not less than fifteen (15) feet in width and six hundred (600) square feet in area.

Access from the building to vestibules or balconies and to the enclosure shall be through doorways not less than thirty(30) inches wide nor less than seventy-five (75) inches in clear height. These openings shall be provided with self-closing fire doors of not less than one-hour fire-resistive construction as specified in Section 4302, swinging in the direction of exit travel; provided that clear wire glass not exceeding seven hundred and twenty (720) inches in area shall be provided in all such doors giving access to the enclosure from the balcony or vestibule. Where locks or latches are provided they shall be of an approved pressure-release type and shall be so designed as to provide access from the building at every floor and roof level.

Stairways of smokeproof towers shall provide continuous uniform egress from the roof and all stories to street grade.

Secs. 3315-3316

Egress shall be provided at the ground floor level either directly or through a passageway not less than forty-four (44) inches in clear width and eight (8) feet in clear height to a street, yard or alley not less than ten (10) feet in width. The walls of such passageway shall be of not less than four-hour fire-resistive construction and the ceiling and floor of not less than two-hour fire-resistive construction as specified in Chapter 43. The walls of any such passageway shall be unpierced throughout their entire length.

(4) Location. Every smokeproof tower required by this Code shall be located so as to furnish the best means of egress for the occupants of the building and access shall be provided thereto by means of a public room, public hall or passageway not less than thirty-six (36) inches in clear width and in no case shall access thereto be through another apartment, guest room, office or private room of any nature.

Sec. 3316. Outside stairways of the return platform or straight run type may be used as a required means of exit for buildings not exceeding five stories or fifty-five (55) feet in height but in no case shall such stairways constitute more than fifty (50) per cent of the required exit capacity. All outside stairways shall be located so as to lead directly to a street or alley or to a yard directly connected with a street or alley. **Outside Stairways**

The stairways, landings, platforms and balconies shall be constructed as specified for stairways in this Chapter, except that they shall be of incombustible materials throughout; provided that stairways serving only the second floor may be constructed of combustible material. Structural metal shall be not less than one-quarter (1/4) inch thick and shall be so framed as to permit ready access for inspection and painting. All windows and other openings adjacent to such stairways shall be provided with fixed metal covered sash and frames and wire glass or be provided with shutters or doors of one-hour fire-resistive construction as specified in Chapter 43.

No part of any such outside stairway shall be within ten (10) feet of a lot line which does not form the boundary of a street or alley.

CHAPTER 34

DOORS, WINDOWS AND SKYLIGHTS

Doors and
Windows

Sec. 3401. Fire doors where required shall be as specified in Section 4304. All such doors shall be self-closing and if not kept normally closed shall be arranged to close automatically with the fusing of an approved fusible link.

Windows required to have metal frames shall be constructed either of steel or wrought iron rolled shapes or of hollow galvanized sheet iron as specified in Section 4304.

When wire glass is required, it shall mean glass the thickness of which at the thinnest point shall not be less than one-fourth ($1/4$) of an inch and in which a wire netting is embedded. Wire glass shall be set with putty and metal stops.

Skylights

Sec. 3402. All skylights constructed with metal frames shall be substantially built with interlocking seams. All skylights, the glass of which is set at an angle of less than forty-five (45) degrees from the horizontal, if located above the first story, shall be set at least one (1) foot above the roof. The curbs on which the skylight rests shall be constructed as required for inner court walls or for masonry.

When wire glass is required for skylights the size shall not exceed seven hundred and twenty (720) square inches in area or forty-eight (48) inches in any dimension in any one panel. All glass in skylights shall be wire glass, except that skylights over vertical shafts extending through two or more stories shall be glazed with plain glass as specified in this Section; provided, that wire glass may be used if ventilation equal to not less than one-eighth ($1/8$) the cross sectional area of the shaft but never less than four (4) feet is provided at the top of such shaft.

Any glass not wire glass shall be protected above and below with a screen constructed of wire not smaller than No. 12 B. and S. gauge with a mesh not larger than one (1) inch. The screen shall be substantially supported below the glass.

Skylights installed for the use of photographers may be constructed of metal frames and plate glass without wire netting.

Ordinary glass may be used in the roofs and skylights for greenhouses, provided the height of the greenhouse at the ridge does not exceed twenty (20) feet above the grade. The use of wood in the frames of skylights will be permitted in greenhouses outside of Fire Zones No. 1 and 2, if the height of the skylight does not exceed twenty (20) feet above the grade, but in other cases metal frames and metal sash bars shall be used.

Glass used for the transmission of light, if placed in floors or sidewalks, shall be supported by metal or reinforced concrete frames, and such glass shall be not less than one-half ($1/2$) inch in thickness. Any such glass over sixteen (16) square inches in area, shall have wire mesh embedded in the same or shall be provided with a wire screen underneath as specified for skylights in this Section. All portions of the floor lights or sidewalk lights shall be of the same strength as is required by the Code for floor or sidewalk construction, except in cases where the floor is surrounded by a railing not less than three feet and six inches ($3'-6"$) in height, in which case the construction shall be calculated for not less than skylight loads.

CHAPTER 35

BAYS AND BALCONIES

Sec. 3501. Construction of walls and floors in bay and oriel windows shall conform to the construction allowed for exterior walls and floors of the Type of Construction of the building to which they are attached. The roof covering of a bay or oriel window shall conform to the requirements for roofing of the main roof of the building. Construction

All exterior balconies attached to or supported by masonry walls shall have brackets or beams constructed of wire, steel, concrete or other incombustible material. All railings for balconies or porches shall be not less than three feet and six inches (3'-6") in height above the floor of such balcony or porch. Balconies or porches shall be not less than three feet and six inches weight a live load of not less than one hundred (100) pounds per square foot. Railings of balconies shall be designed to support a horizontal thrust of not less than twenty (20) pounds per lineal foot of railing uniformly distributed along its length.

CHAPTER 36

PENTHOUSES AND ROOF STRUCTURES

**Penthouses
and Roof
Structures**

Sec. 3601. No penthouse or other projection above the roof shall exceed twenty-eight (28) feet in height above the roof when used as an enclosure for tanks or for elevators which run to the roof and in all other cases shall not extend more than twelve (12) feet in height above the roof. The aggregate area of all penthouses and other roof structures shall not exceed twenty (20) per cent of the area of the roof. No penthouse, bulkhead or any other similar projection above the roof shall be used for manufacturing, business, habitation, offices or storage, except that they shall be permitted to be used for the making of blue prints, photographic prints, for scientific observation, for summerhouses or for private dwellings.

Roof structures of Type I buildings shall be constructed with walls, floors and roof as required for the main portion of the building.

Walls of roof structures parallel to and within four (4) feet of the exterior walls of Type II or III buildings shall be constructed the same as the exterior wall of the story immediately below. Such wall shall project two (2) feet above the roof and two (2) feet beyond the sides of such roof structure, except that the side projection shall not be required when the adjoining side walls are of masonry. Walls other than those occurring within four (4) feet of an exterior wall on Type II or III buildings shall be of not less than one-hour fire-resistive construction. The restrictions of this paragraph shall not prohibit the placing of wood flagpoles or similar structures on the roof of any building.

**Towers
and
Spires**

Sec. 3602. Towers or spires when enclosed shall have exterior walls as required for the building to which they are attached. Towers not enclosed and which extend more than seventy-five (75) feet above grade shall have their framework constructed of iron, steel or reinforced concrete. No tower or spire shall occupy more than one-fourth ($1/4$) of the street frontage of any building to which it is attached and in no case shall the base area exceed sixteen hundred (1600) square feet unless conforming entirely to the Type of Construction requirements of the building to which it is attached and being limited in height as a main part of the building. If the area of the tower or spire exceeds one hundred (100) square feet at any horizontal cross section its supporting frame shall extend directly to the ground. The roof covering of spires shall be as required for the main roof of the rest of the structure.

Skeleton towers used as wireless masts and placed on the roof of any building shall be constructed entirely of incombustible materials when more than twenty-five (25) feet in height and shall be directly supported on an incombustible framework to the ground. They shall be designed to withstand a wind load from any direction as specified in Section 2307 in addition to any other loads.

CHAPTER 37

CHIMNEYS AND HEATING APPARATUS

Sec. 3701. Chimneys shall be constructed in conformance with "A Standard Ordinance for Chimney Construction" recommended by the National Board of Fire Underwriters, Third Edition, revised 1927, except as specified in this Chapter. **Chimneys**

The walls of all chimneys whether used for appliances using coal, coke, wood, gas or oil shall be built of brick, concrete, stone, hollow tile of clay or concrete or of concrete blocks; provided that a metal smokestack as specified in Section 3702 may be used.

Flue linings shall be made of fire clay or of other suitable refractory clays adapted to withstand reasonably high temperatures and flue gases and shall have a softening point not lower than nineteen hundred and ninety-four (1994) degrees Fahrenheit. Flue linings shall be not less than five-eighths (5/8) of an inch in thickness and shall be built in as the outer walls of the chimney are constructed. All joints and spaces between the masonry and lining shall be thoroughly slushed and grouted full as each course of masonry is laid. Cracked, broken or otherwise defective linings shall not be used. Flue linings shall start from a point not less than eight (8) inches below the center line of smoke pipe intakes or in the case of fireplaces from the apex of the smoke chamber and shall be continuous to a point not less than four (4) inches above the enclosing walls. Flue lining may be omitted in brick chimneys for residence buildings provided the walls of the chimneys are not less than eight (8) inches thick and that the inner course shall be of fire brick with a fire resistance equal to that required for flue linings.

The walls of brick chimneys shall be not less than three and three-fourths (3-3/4) inches thick and shall be lined except as provided above. All brick work shall be laid with full mortar joints and shall be struck smooth where exposed to the weather. No mortar lining shall be permitted.

Concrete chimneys cast in place shall be suitably reinforced vertically and horizontally. The walls shall be not less than three and three-fourths (3-3/4) inches thick and shall have a flue lining as specified in this Section; provided, that flue linings may be omitted in reinforced concrete chimneys for private dwellings when the walls of such chimneys are not less than six (6) inches thick.

Hollow blocks or building tile of clay or concrete shall not be used for the walls of an independent chimney but may be used for chimneys built in connection with exterior party walls of hollow units for buildings not exceeding three (3) stories in height. The outer eight (8) inches of such a wall may serve as the outside wall of the chimney.

Chimneys shall extend at least three (3) feet above flat roofs and not less than two (2) feet above the ridge of gable and hip roofs or the high point of mansards irrespective of the distance of the chimney from such obstruction to draft.

Chimneys shall be built upon solid masonry or reinforced concrete foundations properly proportioned to carry the weight

Secs. 3701-3702

imposed without settlement or cracking. The chimney shall carry no load except its own weight and such load shall be transmitted to the foundation in such manner as to prevent the shearing or falling off of any part of the chimney. The footing for an exterior chimney shall start below the frost line.

Flues shall be built as nearly vertical as possible and in no case at an angle greater than thirty (30) degrees from the vertical.

When any single flue has an effective area exceeding two hundred (200) square inches the wall shall be not less than eight (8) inches thick and shall have flue lining as specified in this Section, except that when flues become too large for fire clay flue lining such flues shall be lined with fire brick for a distance at least twenty-five (25) feet from the point of intake.

There shall be but one connection to a flue irrespective of whether the fuel used be coal, coke, wood or oil. Ordinary and low pressure heating devices burning solid fuels shall have a minimum effective flue area of not less than the following, and such area shall be provided by a flue having its short dimension not less than two-thirds (2/3) the long dimension.

Small special stoves and heaters.....	28 sq. inches
Stoves, ranges and room heaters	40 sq. inches
Fireplaces (at least 1/12 the fireplace opening) ..	50 sq. inches
Warm air furnaces, steam and hot water boilers ..	70 sq. inches

All flues to which large ranges, heating furnaces, boilers, automatic gas water heaters or fireplaces are to be connected shall be subjected to a smoke test before acceptance but the test shall not be made until the mortar has thoroughly seasoned. Such test shall be made by the mason contractor in the presence of the Building Inspector.

Smoke-
stacks

Sec. 3702. Steel or iron smokestacks may be used in place of brick chimneys specified in Section 3701, in which case the thickness of the metal shall be not less than one-fourth (1/4) of an inch. Such stacks when used for manufacturing, for high pressure boilers, furnaces or other similar heating or manufacturing appliances shall be lined with fire brick for a distance of not less than twenty-five (25) feet from the place where the smoke pipe enters and shall be protected on the outside up to and through the roof of the building with eight (8) inches of masonry or a metal shield which provides an eight (8) inch ventilated air space between such shield and the steel or iron stack; provided, that a metal smokestack when located inside of a vent shaft having masonry enclosing walls not less than eight (8) inches thick and having an air space between the walls and the stack on all sides may have such masonry or metal shield protection omitted when placed outside of the building. All stacks shall be properly guyed when the height of the stack exceeds fifteen times its least diameter.

Smokestacks constructed of not less than number ten (10) U. S. Gauge steel, with either welded or riveted joints, may be mounted directly upon industrial, heating and/or power boilers which are designed to support the stack load. A clearance of not less than six (6) inches shall be maintained at all times around such smokestack and any inflammable material within

Secs. 3702-3704

twelve (12) inches of such smokestack shall be protected by one-fourth ($\frac{1}{4}$) of an inch of asbestos covered by sheet metal.

Sec. 3703. Gas furnaces, gas water heaters and other gas appliances which are required to be vented, may, in lieu of the chimney required in Section 3701, be provided with a vent of unglazed fire clay or concrete tile pipe not less than one-half ($\frac{1}{2}$) inch in thickness and having a sleeve or flange not more than twenty-four (24) inches apart and at every joint in such vent pipe. Such sleeves or flanges shall project at least three-fourths ($\frac{3}{4}$) of an inch beyond the outer surface of the joint and shall securely join the sections of such vent and all points shall be well cemented. The sleeves or flanges shall be securely attached to the portions of the building or structure adjoining such vents and act as a spacer to provide an air space around such vent, or such vent may be entirely enclosed in a galvanized iron pipe with such sleeves or flanges separating the outer pipe at least one-half ($\frac{1}{2}$) inch from the clay or concrete vent. The area of any flue or vent shall be not less than the area of the largest vent connection inlet plus fifty (50) per cent of the areas of all other additional inlets, provided that no gas flue or vent shall have an area of less than twelve (12) square inches, and shall be not less than two (2) inches in any internal dimension. No vent connection inlet shall be located at the bottom or within one (1) foot of the bottom of any gas vent, and any two (2) inlets must be offset or staggered so that it will be impossible for any horizontal plane to pass through any part of both inlets.

Gas
Vents

A single galvanized or copper bearing metal vent connection exposed to view in a room throughout its entire length may be used to connect the appliance to the vent. Such metal vent connection shall be not less in diameter than the connection on the appliance and shall be maintained not less than six (6) inches distant from any combustible portion of the building or the combustible material shall be protected by not less than one-hour fire-resistive construction as specified in Chapter 43. Every portion of a vent connection shall have a rise of not less than one (1) inch to the foot from the appliance to the chimney and the length of such connection shall be no greater than the height of the vent from the point at which the vent connection enters to the top of the vent.

Every vent shall extend in as nearly a vertical direction as possible and be continuous from the gas appliance to the outside of the building and extend at least two (2) feet above any portion of the roof within fifteen (15) feet of said vent.

No vent connection connected to any gas appliance having pilot provision for automatic or remote control, shall be connected to any chimney flue which is used as a smoke flue for any stove, boiler, heater or other apparatus designed to burn wood, coal, oil or any fuel other than gas unless such pilot provision is so designed that the supply of gas to the main burners in connection therewith will be automatically shut off when combustion of gas is not taking place at the pilot.

Sec. 3704. Patent chimneys may be used, except for fireplaces, when complying with the requirements of this Section.

All patent chimneys shall be constructed with a flue lining

Patent
Chimneys

Secs. 3704-3705

enclosed in a metal outer casing which is so arranged as to provide not less than a one (1) inch air space between the flue lining and the casing. The flue lining shall be made of fire clay or suitable refractory clays adapted to withstand reasonably high temperatures and flue gases, shall have a softening point not lower than nineteen hundred and ninety-four (1994) degrees Fahrenheit and shall be not less than one (1) inch in thickness. Such chimneys shall be built up from the floor level on which they are used and in no case shall a stove pipe enter the bottom of a patent chimney nor shall such chimneys be used for fire-places.

When such chimneys are erected on the outside of a building they shall be supported by a substantial iron bracket attached to the studs or framework of the building with through-bolts. When erected on the inside of a building such patent chimneys shall be provided with a smokeproof clean-out of approved design at or near the floor. The floor on which they are placed shall be protected by not less than eight (8) inches of masonry or terra cotta set on a one-fourth (1/4) inch metal plate. Partitions enclosing patent chimneys shall have an opening opposite the clean-out on the chimney for the purpose of cleaning the flue.

All patent chimneys shall be built plumb and without bends. All joints in such chimneys shall be made with cement mortar and the bands covering the joints shall be of not less than twenty-four (24) U. S. Gauge galvanized iron. All patent chimneys shall be braced every six (6) feet in their height by not less than sixteen (16) gauge wire secured to the chimney by locks or collars and extending in at least three (3) directions.

Not more than two inlets for smoke pipes will be permitted in any patent chimney. When only one inlet is provided the flue shall be not less than six (6) inches in diameter and shall be not less than eight (8) inches in diameter where two inlets are provided.

All galvanized iron used for the casing of patent chimneys shall be of twenty-four (24) U. S. Gauge riveted together with rivets not more than three (3) inches apart or seamed and with such seams secured with rivets at the top and bottom of each section. There shall be not less than one (1) inch clearance between the chimney and the casing at all points and such casing shall be ventilated by not less than six (6) one (1) inch holes punched near the top of the chimney above the roof so as to permit the escape of hot air.

Sec. 3705. All smoke pipes shall be as short and straight as possible. Smoke pipes for furnaces, boilers or apparatus burning solid or liquid fuel shall be constructed of black iron of not less than twenty-four (24) U. S. Gauge or masonry and shall fit tightly into the chimney. Galvanized iron shall not be used.

Smoke pipes shall enter the side of chimneys through a fire clay or metal thimble or a flue-ring of masonry. The top of smoke pipe intakes shall be set not less than eighteen (18) inches below sheet metal ceilings, wood lath and plaster or exposed wood framing. Neither the intake pipe nor the thimble shall project into the flue. No wood-work shall be placed with-

Smoke
Pipes
and
Thimbles

Secs. 3705-3707

in six (6) inches of the thimble. When a smoke pipe enters a chimney breast through a studded off chimney partition the thimble shall be kept six (6) inches clear of all woodwork.

Sec. 3706. All fireplace walls shall be not less than eight (8) inches thick and if built of stone or hollow units shall be not less than twelve (12) inches thick. The faces of all such minimum thickness walls exposed to fire shall be lined with fire brick, soap stone, cast iron or other suitable fire-resistive material. When lined with four (4) inches of fire brick such lining may be included in the required minimum thickness. All fireplaces shall be connected to a regulation chimney as specified in Section 3701.

Fire-places

All fireplaces and chimney breasts shall have trimmer arches or other approved fire-resistive construction supporting hearths. The arches and hearths shall be not less than twenty (20) inches wide measured from the face of the chimney breast and not less than twelve (12) inches wider than the fireplace opening on each side. The arches shall be of brick, stone or hollow tile not less than four (4) inches thick. A flat stone or reinforced concrete slab may be used to carry the hearth instead of an arch if it be properly supported and a suitable fill provided between it and the hearth. Hearths shall be of brick, stone, tile or concrete. Wood centering under a trimmer arch shall be removed after the masonry has thoroughly set.

False fireplaces for gas or electrical heaters shall not be constructed in imitation of fireplaces unless complying with all the requirements for fireplaces. Gas and electrical space heaters may be installed in recesses not more than six (6) inches in depth, provided the entire recess is constructed of incombustible material. Such recesses shall be labeled by means of a metal plate bearing the words "For Gas and Electrical Appliances Only".

No heater burning solid or liquid fuel shall be placed in a fireplace which does not comply with the requirements of this Section. No such heaters shall be connected to a gas vent flue. No wood shall be placed within eight (8) inches of the jambs or within twelve (12) inches of the top or arch of any fireplace opening.

Sec. 3707. Warm air furnaces designed to burn solid or liquid fuel shall be encased in a double metal shield with an air space between and shall be protected with at least three (3) inches of sand on top and shall rest on masonry or concrete floors. No wood partitions shall be built within seven (7) feet of the front or four (4) feet of the sides of the outer shield of such furnaces, but the distance to the partitions at the side may be reduced to two (2) feet if they are covered with sheet metal or metal lath and plaster. The distance from the top shield of such furnace to any ceiling or framing of wood above shall be not less than twenty-four (24) inches unless such wood ceiling or framing is protected with not less than one-hour fire-resistive construction.

Warm Air Furnaces

Every furnace designed to burn solid or liquid fuel shall set upon a masonry floor or be placed on a bed of not less than four (4) inches of masonry and every portion thereof including the smoke pipe shall be at least two (2) feet from any com-

Secs. 3707-3709

bustible material or such combustible material shall be protected by a covering of number twenty-four (No. 24) U. S. Gauge galvanized iron furred with metal furring not less than one and one-half (1-1/2) inches from such combustible construction or shall be entirely covered by one-hour fire-resistive construction. Any such furnace set in brick shall be completely and tightly covered with at least four (4) inches of brick, concrete, tile, sand or a combination of such materials. Every such furnace shall be connected to a regulation chimney as specified in Section 3701.

Every gas furnace other than single pipe floor furnaces shall be set in a furnace room upon a masonry floor or shall be set upon not less than two (2) inches of masonry on asbestos board not less than one-half (1/2) inch in thickness covered with No. 20 U. S. Standard Gauge galvanized iron or steel. The top of such furnace shall be not less than nine (9) inches from protected combustible material nor less than eighteen (18) inches from unprotected combustible material. Gas furnaces shall not be installed in any location inaccessible for inspection and repair. An opening or door not less than thirty by thirty-six inches (30"x36") shall be provided for access to the room or space in which any gas furnace is installed. Every such furnace shall be vented into a regulation chimney as specified in Section 3701 or as provided in Section 3703.

An air supply for combustion shall be provided for every warm air furnace. Such supply shall be from outside the building into the furnace space through one or more openings. Such openings shall have a net area of not less than four hundred (400) square inches. No obstruction of any kind shall be placed over such openings except wire netting with openings not less than one-half (1/2) inch square. Air used for conveying heat and for ventilation may be taken from outside the building, from inside the building or from both sources. Where such air is taken from inside the building or from both inside and outside the building it shall be conducted to the furnace by means of ducts of incombustible material.

The furnace room or rooms shall be located in the basement or cellar of any building having a gravity system and the least horizontal dimension of such room shall be six (6) feet. The floor of the furnace room shall be not less than seven (7) feet in the clear below the bottom of the lowest joists of any floor under which lateral heat pipes from the furnace or furnaces are taken and such floor shall be constructed of incombustible materials. An opening into such furnace room space not less than thirty inches by thirty-six inches (30"x36") shall be provided.

**Low
Pressure
Steam
Heating
Plants**

Sec. 3708. Steam hot water heating plants, for not more than fifteen (15) pounds pressure, and hot water heaters using solid or liquid fuel, shall rest upon masonry or reinforced concrete floors and shall be protected on the outside by asbestos. The clearance of wooden partitions, ceilings, and other combustible materials shall be the same as given for warm air furnaces.

Boilers

Sec. 3709. Large boilers for power or steam purposes or for generating high pressure steam shall be so located that no

Secs. 3709-3712

wood or other combustible material shall be less than five (5) feet from the top or sides or ten (10) feet from the front of such apparatus and all combustible material less than ten (10) feet from the top or sides or less than twenty (20) feet from the front shall be protected with at least four (4) inches of concrete, brick or other similar incombustible material and shall be well ventilated to prevent the temperature rising above one hundred and twenty-five (125) degrees Fahrenheit. Steel, cast iron or concrete columns adjacent to such boilers shall not be in direct contact with furnace settings but there shall be an open and unobstructed space at least four (4) inches wide for ventilation.

Sec. 3710. All stoves used for heating, cooking or laundry purposes using solid or liquid fuel shall have all combustible partitions in back of and extending not less than twelve (12) inches beyond each side of such stove protected by not less than one-hour fire-resistive construction as specified in Chapter 43. Such stoves shall be securely supported at least twelve (12) inches above any wood floors by metal supports and there shall be a metal and asbestos pad at least three-eighths (3/8) of an inch thick below such stove extending at least six (6) inches beyond each side and at least twelve (12) inches in front of such stove. Such stoves shall not be placed nearer than six (6) inches to any combustible partition.

Stoves

All such stoves shall be connected by a smoke pipe to a chimney meeting the requirements as specified in Section 3701.

Sec. 3711. Gas ranges, domestic hot water heaters and hot plates shall be supported at least six (6) inches above any wood floor or other combustible material and where burners are not provided with a shield below, the wood or other combustible material shall be protected with a double metal shield and with a one (1) inch air space between or with a one-half (1/2) inch pad of metal and asbestos. Combustible partitions or walls within six (6) inches of any such appliance shall be protected by one-fourth (1/4) of an inch of asbestos covered with a twenty-six (26) gauge metal covering or shall have not less than a one-hour fire-resistive protection as specified in Chapter 43. Wood ceilings or other combustible materials shall be at least three (3) feet above such installations. The oven of ranges and all water heaters shall be connected to a vent pipe meeting the requirements of Section 3703 or to a regulation chimney as specified in Section 3701.

Gas Ranges, Domestic Water Heaters and Hot Plates

Sec. 3712. Gas ranges for restaurants, bakeries or hotels shall be supported at least six (6) inches above any wood floor and if less than twelve (12) inches above the floor, the wood shall be protected by a metal shield or such ranges may rest on a steel and masonry support. Such ranges shall not be placed nearer to any wood partitions or other combustible material than six (6) inches and if nearer than twelve (12) inches, such partitions shall be protected with a metal or asbestos shield. The distance from any such range to any wood ceiling or other combustible material above shall not be less than twelve (12) inches; and if less than three (3) feet, the ceiling or combustible

Gas Ranges For Restaurants and Hotels

Secs. 3712-3715

material above shall be protected with a double metal shield with one (1) inch air space between or with one (1) inch of metal lath and Portland cement plaster or one (1) inch of asbestos. Hood and ventilating flues from such ranges may be of sheet metal or masonry and if of sheet metal shall be protected from all wood or other combustible materials by four (4) inches of concrete, gypsum or terra cotta tile or an eight (8) inch air space and a metal shield. Such ventilating flues shall not be carried through wood floors or up combustible partitions unless protected by at least four (4) inches of masonry or concrete.

**Oil
Burners**

Sec. 3713. Stoves, furnaces and other heating or power apparatus in which oil burners are installed shall be constructed and erected as required for similar apparatus using solid fuel.

Oil burning apparatus using commercial fuel oil, furnace oil, diesel oil or other inflammable liquids shall be constructed and installed in compliance with the regulations of the National Board of Fire Underwriters for the Construction and Installation of Oil Burning Equipments and for the Storage and Use of Oil Fuels in Connection Therewith recommended by the National Fire Protection Association, Edition of 1928.

**Other
Sources
of Heat**

Sec. 3714. Other sources of heat and flame not specifically mentioned herein shall be constructed and so protected as to prevent heating any wood or other combustible material used in the construction of floors, ceilings, partitions or other parts of a building to a temperature of over one hundred and twenty-five (125) degrees Fahrenheit, when in full operation, and shall be so constructed as not to be liable to undue corrosion or deterioration and not subject to accidental overturn or other disarrangement conducive to dangerous conditions.

**Warm Air
Ducts and
Appurtenances**

Sec. 3715. For gravity systems no leader heat pipes shall be over twenty (20) feet in length measured horizontal, except where a booster fan is installed when such length shall not exceed forty (40) feet. All such pipes under first floor joists shall have a uniform rise of at least one (1) inch per lineal foot of horizontal run. Warm air pipes and appurtenances serving first floor rooms shall have a minimum cross sectional area in square inches of not less than the cubic foot capacity of the room or rooms in which registers are located, divided by forty (40); provided, that no leader pipe shall have a net area less than fifty (50) square inches. Risers and appurtenances serving floors above the first floor shall have a net area of not less than two-thirds (2/3) that required to serve the first floor.

Registers shall be located in or near the wall of the room nearest the furnace. No register shall be located in outside walls except in cases of absolute necessity. Where double registers are supplied by one leader pipe each register shall have a capacity of not less than two-thirds (2/3) the area of the leader pipe. When necessary to install appurtenances in an outside wall at least the weather side shall be covered with air-cell asbestos paper.

Ninety (90) degree bends in round pipe shall be made by

Secs. 3715-3716

not less than four (4) piece elbows. Sixty (60) degree bends shall be made by means of not less than three (3) piece elbows. All warm air pipes and fittings, cold air or re-circulating pipes, ducts, boxes and fittings shall be made of bright tin or galvanized iron. All such appurtenances except leader heat pipes under the first floor shall be covered with two thicknesses of asbestos paper weighing at least eight (8) pounds to one hundred (100) square feet or with air-cell asbestos insulation or shall be double walled with a one-fourth ($\frac{1}{4}$) inch space between the inner and outer walls. Horizontal warm air pipes shall be kept at least three (3) inches from any combustible material or shall be protected with an asbestos shield and a one (1) inch air space. Air-cell asbestos paper not less than one-fourth ($\frac{1}{4}$) of an inch in thickness shall be securely cemented around all leader pipes.

All riser pipes shall be braced or held in place by means of metal strips securely fastened to the pipe and shall in no case be held in place by nailing diagonally through the corners of such pipe. No joint shall depend wholly upon solder to make it tight. All leader pipes shall be securely fastened in place by means of wires or metal strips.

In the installation of Y runs or branch runs the cross sectional area of the warm air pipe at the furnace shall equal in square inches the cubic contents of all the rooms served by such warm air pipe divided by forty (40). Sizes of branch runs shall be determined in the same manner on the basis of the room or rooms served. Branches from trunk lines shall be taken off in a generally horizontal plane at an angle not less than forty-five (45) degrees from the line of the pipe. Fifteen (15) degree Y branches may be permitted in forced draft systems. Riser pipes shall not be taken off the top of the first floor register boxes.

Where warm air pipes and appurtenances are to be installed in a building the joists and studs shall be so arranged as to provide not less than fourteen (14) inches clear space in continuous horizontal runs and/or vertical risers from the gas furnace to the register served.

Sec. 3716. All incinerators which are built as an integral part of a building shall have the enclosing walls of the fire boxes or combustion chamber of solid masonry or reinforced concrete not less than eight (8) inches in thickness where the horizontal area does not exceed fifteen (15) square feet and not less than twelve (12) inches in thickness where the combustion chamber is of greater area. The inner four (4) inches of such combustion chamber walls shall be of fire brick laid in fire clay or cement mortar, except that the walls surrounding the ash chamber below the fire grate need not be so lined. The inner walls of any combustion chamber shall not be offset in excess of one (1) inch for every three (3) inches of rise in the height of the wall unless supported by reinforced concrete or structural steel.

Incinerators

Chimneys for every incinerator shall be as specified in Section 3701.

Secs. 3801-3802

CHAPTER 38

FIRE EXTINGUISHING APPARATUS

Automatic Sprink- lers; Where Re- quired

Sec. 3801. Standard automatic sprinklers shall be installed as specified in this Chapter in the following places:

1. In the cellar of every building.
2. In buildings of Groups A, B and C occupancy; under the gridiron, under the stage floor, under all fly and tie galleries, in all dressing rooms, storerooms, property rooms, carpenter shops, paint shops, passageways and all other places back of the proscenium wall, a line of sprinklers shall be installed in the arch of the proscenium opening in front of every proscenium curtain.
3. In all Group E buildings occupied wholly or in part as a planing mill, box factory, wood working establishment where lumber is made into a finished product and in which more than two power operated wood working machines exclusive of saws are used.
4. In all Group E buildings occupied wholly or in part as a mattress factory used to manufacture, assemble or renovate mattresses or stuffed furniture using cotton, silk floss, mohair or other like material for packing or stuffing.
5. In all Group E buildings used as film exchanges.
6. In Group B and C buildings in any enclosed occupied space below or over a stairway, except where the entire construction is as required for Type I buildings, and in all portions of basements or cellars used for storage or maintenance work rooms.

Exceptions: The above provisions shall not apply in the following places:

Automatic sprinklers shall not be required in the cellars of dwellings and/or apartment houses having four or less apartments, nor in the cellars of Group C, D, E, F, G and H buildings when the ceiling of such cellar or basement is three (3) feet or more above grade, nor when such cellars or basements have an area of fifteen hundred (1500) square feet or less.

Automatic Sprinkler Require- ments

Sec. 3802. Every automatic sprinkler system required by this Code shall comply in all respects with the regulations of the National Board of Fire Underwriters governing the installation of automatic sprinkler equipment, edition of 1928, where not contrary to the specific statements in this Chapter.

Exceptions: A single water supply equal to the primary supply required by such regulations may be accepted as complying with the requirements of this Code. In no case where a connection to a city water main constitutes the source of supply shall such connection be less than four (4) inches in diameter.

Sprinklers required in paragraph 6 above may be supplied from the domestic water system and need not comply with the provisions of this section except as to pipe sizes and spacing of heads, provided that where the domestic water supply has a

Secs. 3802-3804

pressure less than fifteen (15) pounds per square inch, an approved automatic chemical extinguisher may be used in lieu of the sprinklers.

The alarm valve required for a standard automatic sprinkler system shall not be required in the cellars of Group C, D, E, F, G and H building when the area of such cellar is less than three thousand (3000) square feet.

Sec. 3803. Every building three (3) or more stories in height shall be equipped with one (1) or more dry standpipes.

Dry Standpipes; Where Required

Sec. 3804. Construction. Dry standpipes shall be of wrought iron or galvanized steel and together with fittings and connections shall be of sufficient strength to withstand three hundred (300) pounds of water pressure to the square inch when ready for service, without leaking at the joints, valves or fittings.

Dry Standpipe Requirements

Tests shall be conducted by the owner or contractor in the presence of a representative of the Fire Department whenever deemed necessary and ordered by the Building Inspector. The tests shall be applied at the top and bottom connections of such standpipes and the owner or contractor shall be responsible for any damage caused by breakage or faulty installation while such tests are being conducted. After such standpipes have been tested, the owner or contractor shall remove all water therefrom.

Size. Dry standpipes shall be of such a size as to be capable of delivering two hundred and fifty (250) gallons per minute from each of any three (3) outlets simultaneously under the pressure created by one fire engine or pumper, based on the existing city equipment available. No part of a dry standpipe system other than hose connections shall be less than three (3) inches in diameter.

Number required. Every building three (3) or more stories in height where the area of any floor above the second floor is ten thousand (10,000) square feet or less shall be equipped with not less than one (1) dry standpipe and an additional standpipe shall be installed for each additional ten thousand (10,000) square feet or fractional part thereof.

Location. Standpipes shall be located within stairway enclosures or as near such stairways as possible or shall be on the outside of, embedded within, or immediately inside of an exterior wall and within one (1) foot of an opening in a stairway enclosure or the balcony or vestibule of a smokeproof tower or an outside exit stairway.

Siamese Connections. All four (4) inch dry standpipes shall be equipped with a two-way (2) Siamese fire department connection. All five (5) inch dry standpipes shall be equipped with a three-way (3) Siamese fire department connections and all six (6) inch dry standpipes shall be equipped with a four-way (4) Siamese fire department connection. All Siamese inlet connections shall be located on a street front of the building and not less than one (1) foot nor more than four (4) feet above the grade and shall be equipped with clapper-checks and substan-

Secs. 3804-3806

tial plugs. All Siamese inlet connections shall be recessed in the wall or otherwise substantially protected.

Outlets. All dry standpipes shall extend from the ground floor to and over the roof and shall be equipped with a two and one-half (2-1/2) inch outlet not more than four (4) feet above the floor level at each story. All dry standpipes shall be equipped with a two-way two and one-half (2-1/2) inch outlet above the roof. All outlets shall be equipped with gate-valves with substantial chains.

Threads. All hose in connection with such standpipe installations shall be uniform with that used by the local fire department.

Signs. An iron or bronze sign with raised letters at least one (1) inch in height shall be rigidly attached to the building adjacent to all Siamese connections and such sign shall read: "CONNECTION TO DRY STANDPIPE."

**Wet
Standpipes;
Where
Required**

Sec. 3805. Every Group A, B and C building of any height and every Group D, E, F, G and H building three (3) or more stories in height shall be equipped with one (1) or more interior wet standpipes extending from the cellar or basement into the topmost story.

**Wet
Standpipe
Require-
ments**

Sec. 3806. Construction. Interior wet standpipes shall be constructed as required for dry standpipes.

Size. Interior wet standpipes shall have an internal diameter sufficient to deliver fifty (50) gallons of water per minute under thirty (30) pounds per square inch pressure at the hose connection, based on the available water supply. Buildings of Groups A and B occupancies shall have wet standpipe systems capable of delivering the required quantity and pressure from any two (2) outlets simultaneously, for all other occupancies only one (1) outlet need be figured to be open at one time. In no case shall the internal diameter of a wet standpipe be less than two (2) inches.

Any approved formula which determines pipe sizes on a pressure drop basis may be used to determine pipe sizes for wet standpipe systems. The Building Inspector may require delivery and pressure tests on completed wet standpipe systems before approving such systems.

Number Required. Wet standpipes shall be so located that any portion of the building can be reached therefrom with a hose not exceeding seventy-five (75) feet in length.

Location. In Groups A, B, and C occupancy, outlets shall be located as follows:

On each side of the stage, on each side of the rear of the auditorium and on each side of the rear of the balconies. Where seating capacities are less than five hundred (500) the number of locations noted above may be reduced upon the approval of the Building Inspector. In buildings of Group D, E, F, G, H, I and J the location of all interior wet standpipes shall be approved by the Building Inspector.

Siamese Connections. All interior wet standpipes shall be

equipped with a Siamese fire department inlet connection located on the street front of the building and such connection shall have two (2) inlets for buildings five (5) stories or less in height, three (3) inlets for buildings six (6) to ten (10) stories inclusive in height, and four (4) inlets for buildings more than ten (10) stories in height.

Outlets. All interior wet standpipes shall be equipped with a one and one-half (1½) inch straightway composition gate-valve in each story including the basement or cellar of the building and located not less than one (1) foot nor more than five (5) feet above the floor.

Threads. All hose threads in connection with the installation of such standpipes, including valves and reducing fittings, shall be uniform with that used by the local fire department.

Signs. An iron or bronze sign with raised letters at least one (1) inch in height shall be rigidly attached to the building adjacent to all Siamese connections and shall read: "CONNECTION TO WET STANDPIPE."

Water Supplies. All interior wet standpipes shall be connected to a street water main of not less than four (4) inches in diameter or when the water pressure is insufficient to maintain thirty (30) pounds pressure at the highest hose outlet such standpipe shall be connected to a pressure tank, gravity tank or fire pump. Such supply shall be sufficient to furnish at least thirty (30) pounds pressure at the topmost standpipe outlet.

When more than one (1) interior wet standpipe is required in the building, such standpipes shall be connected at their bases or at their tops by pipes of equal size.

Pressure and Gravity Tanks. Tanks shall have a capacity sufficient to furnish at least two hundred and fifty (250) gallons per minute for a period of not less than ten (10) minutes. Such tanks shall be located so as to provide not less than twenty-five (25) pounds pressure at the topmost hose outlet for its entire supply. Discharge pipes from pressure tanks shall extend two (2) inches into and above the bottom of such tanks. All tanks shall be equipped with a manhole, ladder and platform, drain pipe, water and pressure gauges. Every pressure tank shall be tested in place after installation and proved tight at a hydrostatic pressure fifty (50) per cent in excess of the working pressure required. Where such tanks are used for domestic purposes the supply pipe for such purposes shall be located at or above the center line of such tanks. Incombustible supports shall be provided for all such supply tanks and not less than a three (3) foot clearance shall be maintained over the top and under the bottom of all pressure tanks.

Fire Pumps. Fire pumps shall have a capacity of not less than two hundred and fifty (250) gallons per minute with a pressure of not less than twenty-five (25) pounds at the topmost hose outlet. The source of supply for such pumps shall be a street water main of not less than four (4) inch diameter or a well or cistern containing a one (1) hour supply. Such pumps shall be supplied with an adequate source of power and shall be automatic in operation.

Secs. 3806-3807

Hose and Hose Reels. Each hose outlet of all interior wet standpipes shall be supplied with a hose not less than one and one-half (1-1/2) inches in diameter. Such hose shall be equipped with a suitable brass or bronze nozzle and shall be not over seventy-five (75) feet in length. An approved standard form of wall hose reel or rack shall be provided for the hose and shall be located so as to make the hose readily accessible at all times and shall be recessed in the walls or protected by suitable cabinets.

**Basement
Pipe
Inlets**

Sec. 3807. Basement pipe inlets shall be installed in the first floor of every store, warehouse or factory where there are cellars or basements under same, except where in such cellar or basements there is installed an automatic sprinkler system as specified by this Code, or where the cellars or basements are used for banking purposes, safe deposit vaults or similar uses.

All basement pipe inlets shall be of cast iron, steel, brass or bronze with lids of cast brass or bronze and shall consist of a sleeve not less than eight (8) inches in diameter through the floor extending to and flush with the ceiling below and with a top flange, recessed with an inside shoulder, to receive the lid and flush with the finished floor surface. The lid shall be a solid casting and have a ring lift recessed in the top thereof, so as to be flush. The lid shall have the words "Fire Department Only," "Do Not Cover Up," cast in the top thereof. The lid shall be installed in such a manner as to readily permit its removal from the inlet.

The location of such basement pipe inlets shall be approved by the Building Inspector and shall be kept readily accessible at all times to the Fire Department.

CHAPTER 39.—STAGE

Sec. 3901. There shall be one or more ventilators constructed of metal or other incombustible material near the center and above the highest part of any permanent stage raised above the stage roof and have a total ventilation area equal to at least five (5) per cent of the floor area within the stage walls. The entire equipment shall conform to the following requirements or their equivalent.

**Stage
Ventilators**

(1) Doors shall open by force of gravity sufficient to overcome the effects of neglect, rust, dirt, frost, snow or expansion by heat or warping of the framework.

(2) Glass, if used in ventilators, must be protected against falling on the stage. A wire screen, if used under the glass, must be so placed that if clogged it cannot reduce the required ventilating area or interfere with the operating mechanism or obstruct the distribution of water from the automatic sprinklers.

(3) The doors and other covers shall be arranged to open instantly after the outbreak of fire, by the use of approved automatic fusible links which will fuse and separate at not more than one hundred and sixty (160) degrees Fahrenheit. A manual control must also be provided by a cord running down to the stage at a point on each side of the stage designated by the Building Inspector.

(4) The fusible link and the cord must hold the doors closed against a force of at least thirty (30) pounds excess counter-weight tending to open the door. The fusible links shall be placed in the ventilator above the roof line and in at least two other points in each controlling cord and so located as not to be affected by the sprinkler heads above. Each stage ventilator shall be operated to an open and closed position at least once before each performance.

Sec. 3902. Gridirons, fly galleries and pin-rails shall be constructed of incombustible materials and fireproofing of steel and iron may be omitted. Gridirons and fly galleries shall be designed to support not less than seventy-five (75) pounds per square foot.

Gridirons

The main counter-weight shear beam shall be designed to support a horizontal and vertical uniformly distributed load equal to not less than five (5) pounds per square foot over the area of the gridiron directly back of the proscenium opening;

Sec. 3903. In buildings of Groups A and B occupancy, Division 1, the dressing room sections, workshops, and storerooms shall be located on the stage side of the proscenium wall and shall be separated from each other and from the stage by a "Special Fire Separation" as provided in Section 503.

**Rooms
Accessory
to Stage**

In buildings of Group C occupancy the dressing room sections, workshops and storerooms shall be located as required for Groups A and B occupancy and shall be separated from the rest of the building and from each other by an "Ordinary Fire Separation".

Secs. 3904-3907

**Proscenium
Walls**

Sec. 3904. In buildings of Groups A and B occupancy, a stage as defined in Section 401 shall be completely separated from the auditorium by a proscenium wall of solid masonry of not less than four-hour fire-resistive construction as provided in Section 4302. The proscenium wall shall extend not less than four (4) feet above the roof over the auditorium.

In buildings of Group C occupancy, a stage as defined in Section 401, shall be completely separated from the auditorium by a proscenium wall of solid masonry or by metal incombustible studs protected on the stage side by two (2) inches of Portland cement stucco on metal lath and on the auditorium side by three-quarters ($\frac{3}{4}$) of an inch of plaster on metal lath.

A proscenium wall shall have not more than four (4) openings as follows: one (1) at the orchestra pit level, two (2) at the auditorium floor or stage level and the main opening for viewing performances.

Proscenium walls may have, in addition to the main proscenium opening, one (1) opening at the orchestra pit level and not more than two (2) openings at the stage floor level, each of which shall be not more than twenty-five (25) square feet in area.

The openings in the proscenium wall other than the main opening shall be not more than twenty-five (25) square feet in area.

Openings in the proscenium wall shall be protected on each side by one-hour fire-resistive doors as specified in Section 4304, except that in buildings of Group C occupancy only one (1) fire-door will be required for each opening. The proscenium opening, which shall be the main opening for viewing performances, shall be provided with a self-closing fire-resistive curtain as provided in Chapter 41.

**Stage
Floors**

Sec. 3905. For buildings of Group A and B occupancy, and when the space under the stage is usable in Group C occupancy all parts of stage floors shall be of Type I construction except the part of the stage extending back from and the full width of the proscenium opening, which may be constructed of steel or heavy timbers covered with a wood floor not less than one and five-eighths ($1 \frac{5}{8}$) inches thick. No part of the combustible construction except the floor finish shall be carried through the proscenium opening. All parts of the stage floor shall be designed to support not less than one hundred and twenty-five (125) pounds per square foot.

**Platform
Floors**

Sec. 3906. Walls and ceilings of a platform in an assembly room shall be fire-protected on the inside with not less than the equivalent of metal lath and plaster.

Any trapped air space of more than two (2) feet in height, over a platform, shall be vented through the roof to the outside with vents having an area of not less than two (2) per cent of the horizontal projection of the trapped area, controlled as specified for stage ventilators.

Any usable space under a raised platform of an assembly room shall be of one-hour fire-resistive construction throughout.

**Stage
Exits**

Sec. 3907. Stage Exits. Not less than one (1) exit two feet and six inches (2'-6") wide shall be provided from each side of

Secs. 3907-3908

the stage opening directly or by means of a passageway not less than three (3) feet in width to a street or exit court. An exit stair not less than two feet and six inches (2'-6") wide shall be provided for egress from each fly gallery. Each tier of dressing rooms shall be provided with at least two (2) means of egress not less than two feet and six inches (2'-6") wide and all such stairs shall be constructed as specified in Chapter 33. The stairs required in this sub-section need not be enclosed.

Sec. 3908. A protecting hood shall be provided over the full length of the stage switchboard.

Miscellaneous

CHAPTER 40

MOTION PICTURE MACHINE BOOTHS

**Motion
Picture
Machine
Booths**

Sec. 4001. Every motion picture machine using inflammable films, together with all electrical devices, rheostats, sewing machines and all films present in any Group A, B or C building, shall be enclosed in a booth large enough to permit the operator to walk freely on either side or in back of the machine and shall be not less than seven (7) feet high and have a floor area of not less than fifty (50) square feet to each motion picture machine in such booth.

The floor of such booth shall be constructed of masonry or reinforced concrete or shall be covered with not less than two (2) inches of masonry. The walls and ceiling shall be of not less than one-hour fire-resistive construction as specified in Chapter 43.

The entrance to booth shall be equipped with a tight fitting self-closing fire door of Types 4, 5 or 6 as specified in Section 4304. Such door shall open outwardly and shall not be equipped with any latch.

Machine and observation posts in machine booth walls shall be of three kinds; projection ports, observation ports, and combination observation and spot light ports. These ports shall be limited in size and number as follows: There shall be not more than one projection port for each machine head, including stereopticon machines. The area of each projection port shall be more than one hundred and twenty (120) square inches. There shall be not more than one observation port for each projection port and their area shall not exceed one hundred and fifty (150) square inches each. There shall be not more than three combination observation and spot light ports and they shall not exceed thirty (30) inches by twenty-four (24) inches. Where the openings in the front wall of the projection booths are larger than the ports specified, they may be reduced to the required size by bolting No. 10 gauge steel plate over the opening on the booth side of the wall, in such a manner that they cannot be readily removed or moved on the slides. These steel plates shall have the openings of the required size cut in them. There shall be not less than one (1) foot of wall space between openings for combination ports. In no case shall the openings which are to be reduced in size by the steel plate be larger than thirty-six (36) inches square. Each port opening in the projection booth wall shall be completely covered with a single pane of plate glass. Each such opening together with any fresh air inlets, shall be provided with a shutter of not less than No. 10 gauge sheet metal large enough to overlap at least one (1) inch on all sides of such opening and arranged to slide without binding. These shutters shall be held normally open by means of small chains fastened to a one hundred and sixty (160) degree Fahrenheit fusible link, the whole so arranged that the shutters may be easily released and closed either by hand or automatically when released by the fusible link and shall be so designed as to effect a weight of not less than eight (8) pounds on each fusible link. Pieces of film shall not be used in place of fusible links. The shutters shall

Sec. 4001

be so hung that the operation of closing shall be smooth and without noise. The closing of all shutters shall be effected in five (5) seconds. Each such opening, together with any fresh air inlets, shall be provided with a shutter of not less than fourteen (14) U. S. gauge sheet metal large enough to overlap at least one (1) inch on all sides of such opening and arranged to slide without binding and with the joint between the shutter and the wall to be smoke tight when shutter is down. These shutters shall be held normally open by means of a fine combustible cord fastened to a one hundred and sixty (160) degrees Fahrenheit fusible link (pieces of film shall not be used in place of fusible links), the whole so arranged that the shutters may be easily released and closed either by hand or automatically when released by the fusible link and shall be so designed as to effect a weight of not less than eight (8) pounds on each fusible link.

Every booth shall be equipped with a ventilating inlet not less than thirty (30) square inches in area placed near the floor on each of three sides and protected by wire netting. At the top of every booth there shall be at least a ten (10) inch diameter vent for each motion picture machine. Such vent shall be constructed of sheet metal not less than twenty-four (24) U. S. gauge and shall connect into a masonry flue or go directly through the roof and twelve (12) inches above, and shall be provided with an exhaust fan which will produce a complete change of air in the booth every ten (10) minutes. No wood or other combustible material shall be allowed to come within four (4) inches of the vent. There shall be not more than one elbow or change in direction of this metal vent in any attic space. No such vent shall pass through any occupied room unless encased in not less than four (4) inches of solid masonry.

All shelves, furniture and fixtures within the booth shall be constructed of metal or other incombustible material. Every motion picture machine shall be securely fastened to the floor to prevent overturning.

All films not in actual use shall be stored in metal cabinets or boxes constructed of galvanized iron or steel with metal partitions and shelves. Each such compartment shall not have a capacity in excess of ten (10) reels of film, and shall have tight self-closing doors of iron or steel. No solder shall be used in the construction of such metal boxes or cabinets.

CHAPTER 41

PROSCENIUM CURTAINS

General

Sec. 4101. Proscenium curtains for Groups A and B buildings shall be made of incombustible materials constructed and mounted so as to intercept hot gases, flame and smoke, and to prevent glow from a severe fire on the stage showing on the auditorium side within a period of five (5) minutes. The curtain shall be raised and lowered each evening at the close of the performance. The closing of the curtain from the full open position shall be effected in less than thirty (30) seconds, but the last five (5) feet of travel shall require not less than five (5) seconds.

Materials

Sec. 4102. A proscenium curtain for stage openings not over sixty (60) feet in width shall be of not less fire-resistive qualities than as specified in this Section. The curtain shall be made of one thickness of asbestos cloth weighing not less than three and one-quarter ($3\frac{1}{4}$) pounds per square yard.

The asbestos cloth used in the construction of the curtain shall have incorporated into the yarn before weaving, either monel metal, nickel, brass or other metal or alloy having not less strength than these metals at temperatures up to seventeen hundred (1700) degrees Fahrenheit and no less resistance to corrosion at ordinary temperatures. Asbestos cloth made of long fibre blue crocidolite asbestos may be used in place of chrysotile asbestos cloth of the same weight. The wires used to reinforce the yarn shall be either single or double but the tensile strength of each wire shall be sufficient to support a load of not less than three (3) pounds at ordinary temperatures, and the strength of two strands of yarn and one wire twisted together shall be sufficient to support a load of six (6) pounds. The strength of the cloth in tension when tested by the strip method shall be not less than one hundred and sixty (160) pounds per inch of width of warp and fifty-two (52) pounds per inch of filling.

The asbestos fibre of yarns may contain cotton or other combustible fibre not to exceed twenty (20) per cent of the weight of the asbestos. The total carbon content of the cloth shall not exceed ten (10) per cent of the total weight of the fibre. When required by the Building Inspector, a sample of the cloth of sufficient size for testing shall be submitted.

In addition to any decoration, the curtain shall be painted on both sides with a mineral paint having a silicate of soda binder, which will completely fill the cloth. Filler paint shall have not less than four (4) parts of casein in each ten (10) parts of silicate of soda. This paint shall be well brushed into the cloth so that no light or smoke can come through.

Design
and
Construction

Sec. 4103. The curtain shall be made of continuous strips of asbestos cloth. The widths of cloth shall overlap at the seams not less than one (1) inch and shall be sewed with a double row of stitching of asbestos thread.

The curtain shall be wide enough to extend into steel smoke grooves on each side of the proscenium opening at least eight (8) inches, and shall overlap the top of the proscenium opening at least twelve (12) inches.

Six (6) inch pockets shall be sewed in the top and the bottom of the curtain to hold the pipe battens; the sides shall be hemmed at least three (3) inches deep. A two (2) inch pipe batten

Secs. 4103-4104

shall be placed at the top and a one and one-half ($1\frac{1}{2}$) inch batten at the bottom. For stage openings over forty (40) feet in width the bottom batten shall be not less than two and one-half ($2\frac{1}{2}$) inches in diameter. The battens shall be reinforced at the joints with six (6) foot sections of pipe housed and riveted. Both top and bottom battens shall have six (6) inch nipples reamed and welded on each end.

The curtain shall be held to structural steel guides in the smoke pockets with substantial roller grips riveted or bolted to the side hem, not more than eighteen (18) inches on center. Each roller grip shall be fastened to the curtain with not less than three (3) bolts or rivets. Sixteen (16) gauge galvanized metal strips not less than six (6) inches wide shall be placed vertically along each side edge, to which shall be riveted the side roller grips.

The top of the curtain shall have a smoke stop fitted to make it as smoke tight as practicable. The bottom of the curtain shall have a yielding pad of incombustible material not less than three (3) inches thick to form a seal against the floor.

Sec. 4104. Structural steel guides shall be built into the side smoke pockets and shall extend from the floor to the gridiron. Guides and roller grips shall be designed, constructed and attached to the curtain so as to safely support it and work smoothly with a wind load of one (1) pound per square foot over the entire area of the curtain.

Operating
Equipment

The support for the curtain shall be not less than six (6) three-eighths inch flexible steel cables. These cables shall be spaced not more than fourteen (14) feet on centers. Supporting cables shall be tied to the top batten with a clove hitch and the end secured with two (2) three-eighths inch iron rope clips.

The supporting cables shall pass through sheaves in the gridiron and over to the counter-weight guides and shall fasten to the counter-weight by means of three-eighths inch shackle and eye turnbuckles with clove hitches and wire cable clips. Eveners shall be provided where the cables connect to the counter-weights so that the weight of the counter-weights will be evenly divided on the cables.

There shall be at least six (6) safety stop chains of one-quarter inch straight link welded chain, fastened to the top curtain batten. The other end shall be attached to the proscenium wall by means of seven-eighths inch bolts passing entirely through the wall, or equally substantial supports. Safety chains shall be so adjusted as to support the curtain when it is lowered and the bottom batten is on the floor.

All cables shall be carried over head and loft blocks of not less than sixteen (16) inch diameter wheels. These blocks shall be ball bearing and the wheel grooves shall be machined. All blocks supporting the asbestos curtain shall be supported on the proscenium wall by means of steel brackets or shall be mounted on the beams of the gridiron with through bolts.

The mechanism and devices for controlling the curtain shall be of simple design and shall be positive in operation. Opening of the curtain may be by hand, hydraulic or electric power. Closing for emergency or for automatic operation shall be the same as for ordinary operation and shall be by gravity obtained by counterbalancing the curtain by counter-weights weighing not

Secs. 4104-4106

less than one-quarter ($\frac{1}{4}$) pound per square foot of curtain.

The operating hand line shall be not less than three-quarter-inch manila rope permanently fastened to the top and bottom of the counter-weight arbor and shall pass through the stage floor and over a tension pulley, not less than eleven (11) inches in diameter, under the stage floor. This operating line shall be fitted to an automatic control line, or becket of sash cord, which when freed by the breaking of a fusible link will allow the curtain to automatically lower itself by means of a bucket release. Not less than four (4) fusible links shall be placed on the automatic control line, one on each side of the stage and two overhead in the gridiron.

Smoke grooves which protect the sides of the curtain shall be of structural steel shapes and plates not less than one-quarter ($\frac{1}{4}$) inch thick. These grooves shall be not less than twelve (12) inches deep and six (6) inches wide. Grooves shall extend from the stage floor to a point immediately under the gridiron, and shall be securely bolted to the proscenium wall. Details of grooves shall be submitted to the Building Inspector for approval.

Top and bottom counter-weights shall be cast iron four (4) inches wide by three (3) inches high by sixteen and three-quarters ($16\frac{3}{4}$) inches long. There shall be smooth grooves on the ends of the top and bottom weights which engage the steel guides. Intermediate weights shall be four (4) inches wide by three (3) inches high by twelve (12) inches long, grooved to drop into place on top of the lower carrying weight. Two (2) three-quarter-inch bolts shall pass through each arbor of counter-weights. These bolts shall hold the sections of the counter-weight together and shall also have the supporting cables tied to them.

Counter-weight guide tracks shall be of cold rolled steel elevator tees two and three-quarters by two by twenty-three thirty-seconds ($2\frac{3}{4} \times 2 \times 23/32$) inches. The guide frame shall be securely bolted to the proscenium wall, and shall extend from the stage floor to the gridiron.

All machines and hoisting gear shall be designed in accordance with the Safety Code for Elevators, Dumb-waiters and Escalators, published in 1931 by the American Society of Mechanical Engineers, as such requirements are specified for passenger elevators, machines and cables. Travel limit stops and room for over-travel shall be provided.

Tests

Sec. 4105. The complete installation of every proscenium curtain shall be subjected to operating tests and any theatre in which such proscenium curtain is placed shall not be opened to public performances until after the proscenium curtain has been accepted and approved by the Building Inspector.

New Designs

Sec. 4106. Curtains of other designs and materials, when not obviously of greater fire-resistance than specified in this Chapter, shall before acceptance be subjected to the standard fire test specified in Chapter 42, as applicable to non-bearing partitions, except that such tests shall be continued only for a period of five (5) minutes unless failure shall have occurred previously. The unexposed face of the curtain shall not glow within a period of five (5) minutes nor shall there be any passage of smoke or flame through the curtain.

PART VIII

FIRE-RESISTIVE STANDARDS FOR FIRE PROTECTION

CHAPTER 42—GENERAL

Sec. 4201. Building materials, systems, units and forms of construction as regulated by this Code shall be classified as "four-hour fire-resistive construction," "three-hour fire-resistive construction," "two-hour fire-resistive construction" and "one-hour fire-resistive construction," for fire-resistive purposes and protection. Materials, systems, units and forms of construction, in order to be classed as four-hour, three-hour, two-hour or one-hour fire-resistive construction shall meet the respective requirements for such rating as specified in the Standard Specifications for Fire Tests of Building Construction and Materials, A. S. T. M. Designation C19-33, of the American Society for Testing Materials.

Fire-Resistive Construction Defined

Any materials, systems, units or forms of construction which meet the requirements of the aforesaid Standard Specifications shall be accepted as fire-resistive construction of the degree specified, if and when they shall be shown by an authoritative test conducted in accordance with all of the provisions of such aforesaid specifications, to possess such fire resistance.

Sec. 4202. The following materials, combinations of materials, systems and units shall be classed as fire-resistive materials:

Fire-Resistive Materials

Brick
Concrete brick, block or tile
Gypsum block or tile
Gypsum (plain or reinforced)
Gypsum plaster board (or lath) and plaster.
Hollow clay tile
Metal
Metal and asbestos
Metal lath and plaster
Portland cement concrete (plain or reinforced)
Sand-lime brick

Sec. 4203. All fire-resistive construction of burned clay, concrete or gypsum units or other similar units shall be solidly bedded and laid in gypsum mortar, lime-cement mortar or cement mortar; provided, that gypsum units shall be laid in gypsum mortar only. All such units shall be thoroughly bonded together by broken joints in alternate courses or by sufficient metal ties or bonds.

Fire-Resistive Construction

All concrete, gunite, gypsum or similar protection for steel or iron structural members which is cast, poured or similarly applied shall be reinforced at the edges of such members in a sufficient manner to prevent cracking and disintegrating of such protection. All such applied fire protection materials shall be reinforced by metal rods, wire or mesh to

Sec. 4203

provide against cracking and disintegrating of the protecting material.

All plaster fire protection shall consist of gypsum mortar, Portland cement mortar or other equally fire-resistive material. Gypsum plaster only shall be used for plastering on gypsum units. Wherever plaster is used for fire protection purposes it shall be reinforced with a metal mesh or lath; provided, that where such plastering is placed on masonry or reinforced concrete such reinforcing may be omitted when the plastering is not more than one (1) inch thick. Guniting applied to masonry need not be reinforced and when properly bonded shall be considered a part of the required thickness.

Sec. 4301

CHAPTER 43

FIRE-RESISTIVE STANDARDS

Sec. 4301. The thickness of fire-resistive materials for fire protection of structural parts shall be as shown in the following table for the respective degrees of fire protection shown. The figures shown shall be the net thickness of the protecting materials and shall not include any hollow space or spaces between the fire protecting materials and the member protected. The thickness of plaster protection shall be measured from the face of the plaster to the plane of the back surface of the metal or wire lath where such lath is used and shall include two-thirds ($2/3$) of the thickness of the gypsum plaster board (or lath) where such board (or lath) is used.

Protection of
Structural
Parts

Sec. 4301

MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS FOR
VARIOUS INCOMBUSTIBLE INSULATING MATERIALS

Structural Parts to Be Protected	Insulating Material Used	Minimum thickness of material in inches for the following fire-resistant periods			
		4 hr.	3 hr.	2 hr.	1 hr.
Steel or Cast Iron Columns; Projecting Steel Beam or Girder Flanges; All Members of Primary Trusses	Grade A concrete	2	2	1½	1
	Grade B concrete	3	2½	2	1½
	Gunitite	2	1½	1	¾
	Brick of clay, shale, concrete or sand-lime	3¾	3¾	2¼	1¾
	Clay tile, clay tile and concrete or concrete block (see note 2)	4 or 2 pl.	4 or 2 pl.	2	2
	Solid gypsum blocks	2 pl.	2 pl.	2	2
	Hollow gypsum blocks	3 pl.	3	2	2
	Poured gypsum	2	1½	1	1
	Metal lath and gypsum or Portland cement plaster	.....	.....	2½*	1
	Grade A concrete	2	1½	1	1
Webs of Steel Beams and Girders	Grade B concrete	3	2½	1½	1
	Gunitite	2	1½	1	¾
	Brick of clay, shale, concrete or sand-lime	3¾	2¼	2¼	2¼
	Clay tile, clay tile and concrete or concrete block	3 or 2 pl.	2	2	2
	Solid gypsum block	2 pl.	2	2	2
	Hollow gypsum block	3 pl.	2	2	2
	Poured gypsum	2	1½	1	1
	Metal lath and gypsum or Portland cement plaster	.....	.....	2	1
	Grade A concrete	1½	1½	1½	1
	Grade B concrete	2	1½	1½	1
Reinforcing Steel in Reinforced Concrete Columns, Beams, Girders & Trusses	Grade A concrete	1½	1½	1½	1
Reinforcing Steel in Reinforced Concrete Joists	Grade A concrete	1¾	1¾	1	¾
	Grade B concrete	1¾	1½	1	¾
Ceiling Protection for Roof Members including Roof Trusses and Secondary Trusses	Metal or Wire Lath and Gypsum or Cement Plaster, Concrete, Burned Clay Products or Gypsum	2	1½	1	¾
	Gunitite	1½	1	¾	¾
Reinforcing and Tie Rods in Floor and Roof Slabs	Grade A concrete	1	1	¾	¾
	Grade B concrete	1¾	1	1	¾
	Gypsum	1	1	¾	¾

NOTE: (1) pl. in above table shall be not less than ½ in. gypsum or cement plaster.

(2) Re-entrant parts of protected members shall be filled solid for 4 and 3 hour protections.
* Two 7/8 in. layers with 3/4 in. air space between.

NOTE:

Grade A concrete shall mean concrete with a coarse aggregate of lime-stone, pumice, calcareous pebbles, trap rock, blast furnace slag, burnt clay, burnt shale or other coarse aggregates containing not more than sixty-five (65) per cent of siliceous material, such as granite, sandstone, chert pebbles, flint, cinders or quartz.

Grade B concrete shall mean concrete with a coarse aggregate other than that allowed in Grade A concrete.

For flat ceilings where the ceiling protection for beams, girders or slabs is suspended to form a free air space of not less than one (1) inch between the member and the protection, the protection thicknesses may be one-half ($\frac{1}{2}$) inch less than that required in the above table for flat ceiling protection, but no thickness shall be less than three-fourths ($\frac{3}{4}$) of an inch.

Soffit tile protecting beam and girder flanges shall be tied to the flange with steel or iron ties.

If the structural part is of iron or steel the thickness given in the foregoing table shall be measured outside of the extreme edges of the structural shapes, except that projecting edges of lugs and brackets shall be given a minimum protection of one (1) inch thickness. For reinforced concrete members, the thickness given in the foregoing table shall be outside of the reinforcement. For purposes of design the protection shall not be considered as carrying load except as permitted for tied columns in Section 2621.

Plaster protections of over one (1) inch in thickness shall have an additional layer of metal lath, wire or metal mesh embedded not more than three-fourths ($\frac{3}{4}$) of an inch from the surface and securely tied into the supporting members.

Wire of not less than number ten (No. 10) B. and S. gauge wound or tied around members at not more than a six (6) inch pitch, or wire or expanded metal mesh shall be placed and well embedded in all concrete poured gypsum and gunite protections.

Wire mesh or other forms of metal ties in concrete protections shall be held away from the structural members and embedded in the protection not less than three-fourths ($\frac{3}{4}$) of an inch from its outer surface at points of minimum thickness. Hollow tile or gypsum block protections shall have iron or steel ties embedded in each horizontal joint, or have outside iron or steel ties over each unit, the diameter of wire to be 0.18 inch, or of equivalent area in ties of other forms. Wire mesh, where used for tying protections, shall weigh not less than one and one-half ($1\frac{1}{2}$) pounds per square yard. Where metal lath or wire mesh is used as a plaster base or tie it shall weigh not less than two and two-tenths (2.2) pounds per square yard, and two and one-half ($2\frac{1}{2}$) or more meshes per inch or equivalent. Gypsum plaster board not less than three-eighths ($\frac{3}{8}$) of an inch thick and having not more than fifteen (15) per cent combustible material combined with the gypsum may be substituted for metal lath for resistance periods of not more than two (2) hours, provided the plaster is reinforced with metal or wire mesh weighing not less than one and one-half ($1\frac{1}{2}$) pounds per square yard, standing away from the board and secured to the support-

Secs. 4301-4302

ing members, and two-thirds ($2/3$) of the thickness of the plaster board may be considered as plaster.

Concrete aggregates whose mineral composition is unknown or undetermined shall for the application of these regulations be classed as Grade B aggregates.

Fire-Resistive Walls and Partitions

Sec. 4302. Fire-resistive bearing and non-bearing walls and partitions shall be of not less than the thicknesses and construction specified in this Section, to be classed for the respective degrees of protection indicated.

The structural requirements of the following masonry and reinforced concrete walls are specified in Chapters 24 and 29 for the specific location or use of the walls and all walls shall comply with those structural requirements as well as the fire-resistive limitations as specified in this Section.

The following tabulated thicknesses are minimum and shall not be broken into; provided that where combustible floor or partition members project into solid masonry or reinforced concrete walls or partitions the required effective thickness of wall shall be measured from two (2) inches back along the member from the end in the wall, to the opposite face of the wall. Where such members project into hollow walls and the space between the members and for not less than four (4) inches above and below them is filled solid with fire-resistive incombustible materials for the full thickness of the wall, or where such hollow walls are constructed of hollow units laid with cells horizontal (side construction) the required thickness shall be measured as specified for solid masonry walls in this paragraph. Where the hollow spaces are not thus filled or where hollow units are laid with cells vertical (end construction) the required effective thickness of wall shall be measured from the end of member in wall to the opposite face of wall.

Plaster, in order that it may be considered as adding to the fire resistance of walls and partitions shall be gypsum or Portland cement plaster applied to an average thickness of not less than one-half ($1/2$) of an inch on each side. Plaster over one (1) inch in thickness, as measured to the plaster base, shall have an additional layer of metal lath, wire or metal mesh embedded not more than three-fourths ($3/4$) of an inch from the surface and securely tied into the supporting members.

Required fire-resistive plastering or stucco on the outside of exterior masonry walls may be omitted from inaccessible portions of the wall provided the inside plastering opposite the inaccessible portions is doubled in thickness.

Gypsum plaster board (or lath) not less than three-eighths ($3/8$) of an inch in thickness and having not more than fifteen (15) per cent of combustible material combined with the gypsum may be substituted for metal lath for resistance periods of not more than two (2) hours, provided the plaster is reinforced with metal or wire mesh weighing not less than one and one-half ($1\frac{1}{2}$) pounds per square yard, standing away from the board (or lath) and secured to the supporting studs or joists. Two-thirds ($2/3$) of the thickness of the plaster board (or lath) may be considered as plaster.

Gypsum plaster board (or lath) conforming to the speci-

Sec. 4302

fications contained in the preceding paragraph may be substituted for metal lath and the reinforcement of the plaster omitted, provided, that the joints of the plaster board (or lath) are covered with strips of metal fabric not less than three (3) inches in width and the plaster board (or lath) is plastered with not less than one-half ($\frac{1}{2}$) inch of fibered gypsum plaster containing not more than thirty-three and one-third ($33 \frac{1}{3}$) per cent by weight of silica.

Metal or wire lath shall weigh not less than two and two-tenths (2.2) pounds per square yard. Metal or wire mesh where used as ties in concrete shall weigh not less than one and one-

Sec. 4302

Rated Fire Resistance Periods for Various Walls and Partitions

MATERIAL	CONSTRUCTION	Minimum Finished Thickness face to face (including plaster where mentioned) in inches			
		4-hr.	3-hr.	2-hr.	1-hr.
Brick of Clay, Shale, Sand-Lime or Concrete, and Plain Concrete	Solid unplastered	8			4*
	Solid plastered	9		5*	
	Hollow (rowlock) unplastered	12	10	8	
	Hollow (rowlock) plastered	9			
Hollow Clay Tile Wall	End or side construction. One cell in wall thickness. Plastered				3*
	End or side construction. Two cells in 8-in. or less thickness. Unplastered	16	12		6* or 8
	End or side construction. Two cells in 8-in. or less thickness. Plastered	13	9	7*	
	End or side construction. Two cells in wall thickness. Unplastered			6	
Hollow Clay Tile A. S. T. M. Load-Bearing	End or side construction. Two cells in wall thickness. Plastered.			5*	
	End or side construction. Three cells in 8-in. or less thickness. Unplastered.	12			
	End or side construction. Three cells in 8-in. or less thickness. Plastered one side		8½		
	End or side construction. Three cells in 8-in. or less thickness. Plastered	9			
Combination of Brick and A. S. T. M. Load-Bearing Tile	4-in. brick and 4-in. tile plastered one side (tile side)	9			
Special Hollow Concrete Block or Tile	One cell in 8-in. or less thickness. Unplastered	12†	8	6	4*
	One cell in 8-in. or less thickness. Plastered	9†		5*	
Hollow Concrete Block or Tile	One cell in 8-in. or less thickness. Unplastered	16	12	10	6* or 8
	One cell in 8-in. or less thickness. Plastered	13	11	7* or 9	7*
	Reinforcement not less than 0.2% in each direction	6	5*	4*	2*
Solid Concrete	Reinforcement not less than 0.2% in each direction	5* or 6	4*	3*	2*
	Unplastered	6*	5*	4*	3*
Hollow Gypsum Blocks	Plastered	5*	4*	4*	3*
	Outer shell 2-in. thick for 10-in. wall and 1½ in. thick for 8-in. wall	10*	8*		
Hollow Wall of Reinforced Gunitite	Incombustible studding with metal or wire lath				2*
	Incombustible studding with metal or wire lath. ¾ in. plaster on each side				3*
Solid Gypsum or Portland Cement Plaster	Incombustible studding with metal or wire lath. 1 in. plaster on each side			4½*	
	Wood studs with metal or wire lath. Fire-stopped				3* or 5

*Indicates that such walls and partitions shall be used for non-bearing purposes only.

†This thickness to be given a four-hour rating only after an A. S. T. M. certified fire test.

Secs. 4302-4303

half ($1\frac{1}{2}$) pounds per square yard. Where used as ties for plaster it shall weigh not less than two and two-tenths (2.2) pounds per square yard and have not less than two and one-half ($2\frac{1}{2}$) meshes per inch, or equivalent.

Wood studs for bearing partitions or walls shall be not less than the two inch by four inch (2"x4") nominal size and be spaced not more than sixteen (16) inches apart.

Note: The term "plastered" in following table shall mean walls plastered with not less than one-half ($\frac{1}{2}$) inch of gypsum or Portland cement plaster on each side of wall.

Sec. 4303. Fire-resistive floor construction shall be accepted for the following respective degrees of fire-resistive protection when constructed as specified in this Section. For the structural details of any floor construction, the particular details specified under Part VI of this Code shall govern.

**Fire-Resistive
Floor
Construction**

Four-hour, three-hour and two-hour fire-resistive floors as specified in this Section shall be constructed entirely of incombustible materials.

(a) Four-hour fire-resistive floor construction shall consist of reinforced concrete, gypsum and/or solid masonry slabs or arches not less than four (4) inches in thickness or shall consist of hollow masonry slabs or arches not less than four (4) inches in thickness with a top covering of not less than two (2) inches of solid masonry, or shall consist of steel joists protected with fire-resistive materials of the kind and thickness shown in the table in this Section. Except in the case of steel joisted construction, all reinforcing, tie rods and supporting structural members in such floors shall be protected with not less than four-hour fire-resistive construction as specified in Section 4301.

(b) Three-hour fire-resistive floor construction shall consist of reinforced concrete, gypsum and/or solid masonry slabs or arches not less than three (3) inches in thickness or shall consist of hollow masonry slabs or arches not less than four (4) inches in thickness with a top covering of solid masonry not less than one and one-half ($1\frac{1}{2}$) inches in thickness, or shall consist of steel joists protected with fire-resistive materials of the kind and thickness shown in the table in this Section. Except in the case of steel joisted construction, all reinforcing, tie rods and supporting structural members in such floor construction shall be protected with not less than three-hour fire-resistive construction as specified in Section 4301.

(c) Two-hour fire-resistive floor construction shall consist of reinforced concrete, gypsum and/or solid masonry slabs or arches not less than two and one-half ($2\frac{1}{2}$) inches in thickness or shall consist of hollow masonry slabs or arches not less than three (3) inches in thickness with a top covering of not less than one (1) inch of solid masonry, or shall consist of steel joists protected with fire-resistive materials of the kind and thickness shown in the table in this Section. Except in the case of steel joisted construction, all reinforcing, tie rods and supporting structural members in such floor construction shall be protected with not less than two-hour fire-resistive construction as specified in Section 4301.

(d) One-hour fire-resistive floor construction shall consist

Secs. 4303-4304

of reinforced concrete, gypsum and/or solid masonry slabs or arches not less than two and one-half ($2\frac{1}{2}$) inches in thickness or shall consist of hollow masonry slabs or arches not less than three (3) inches in thickness with all joints in such hollow unit construction thoroughly filled with cement or gypsum mortar or shall consist of steel joists protected with fire-resistive materials of the kinds and thickness shown in the table in this Section. Except in the case of steel joisted construction, all reinforcing, tie rods and supporting structural members shall be protected with not less than one-hour fire-resistive construction as specified in Section 4301; or

Wood joisted construction with a double wood floor on top (the sub floor not less than three-fourths ($\frac{3}{4}$) of an inch thick, and the total thickness of the two layers not less than one and one-fourth ($1\frac{1}{4}$) inches thick) and with a fire-resistive ceiling, as shown in the table in this Section, securely fastened to or suspended from the under side of such joists. Except the metal lath and plaster ceiling shall not be required below the lowest floor joist over unusable space.

All flat ceilings where the ceiling protection for beams, girders or slabs is suspended to form a free air space between the member and the protection, the protection thicknesses may be one-half ($\frac{1}{2}$) inch less than that required in the following table for flat ceiling protection, but no thickness shall be less than three-fourths ($\frac{3}{4}$) of an inch minimum protection of metal and wood joists based on time periods for various insulating materials.

In any reinforced concrete floor construction which includes a metal lath and cement or gypsum plastered ceiling on the under side, not less than three-fourths ($\frac{3}{4}$) of an inch thick, the required slab thickness may be reduced one-half ($\frac{1}{2}$) inch but in no case shall be less than two and one-half ($2\frac{1}{2}$) inches thick.

**Minimum Protection for Metal and Wood Joists
Based on Time Periods for Various Insulating Materials**

Joists to be Protected	Insulating Material Used	Minimum thickness of material in inches for the following fire-resistive periods			
		4-hr.	3-hr.	2-hr.	1-hr.
Ceiling protection of Steel Joists, where incombustible slab not less than $2\frac{1}{2}$ in. thick is placed above	Metal or wire lath and gypsum or Portland cement plaster, concrete, burned clay products or gypsum	2	$1\frac{1}{2}$	1	$\frac{3}{4}$
	Gunite	$1\frac{1}{2}$	1	$\frac{3}{4}$	$\frac{3}{4}$
Ceiling Protection of Wood Joists with double floor on top	Metal or wire lath and gypsum or Portland cement plaster				$\frac{3}{4}$

Sec. 4304. (a) Fire-resistive Doors. One-hour fire-resistive doors shall be constructed as specified for one of the following types, 1, 2 or 3, or any door which will successfully pass

**Fire
Doors,
Shutters
and
Windows**

Sec. 4304

the one-hour fire test specified in Section 4201, and all such doors to receive the one-hour rating, shall be hung in place as specified in this Section:

1. Tin-clad wood-core doors with the core made of three (3) plies of wood one (1) inch nominal in thickness and covered with sheet metal, the door to be constructed in accordance with the "Underwriters' Standard for Tin-Clad Fire Doors and Shutters," Edition of March, 1926, and July, 1927; reprinted, 1928.

2. Sheet metal doors constructed of two (2) sheets of not less than twenty-six (26) U. S. Gauge corrugated sheet metal, one sheet on each side of a structural steel frame, corrugations vertical on one side and horizontal on the other and having not less than one-sixteenth ($1/16$) of an inch of asbestos placed in between the two metal sheets;

3. Sheet metal doors constructed of two (2) sheets of metal of not less than twenty-six (26) U. S. Gauge fastened to a structural steel frame in such manner as to leave a one (1) inch space in the panels, which space shall be filled with asbestos and with a one-eighth ($1/8$) inch asbestos covering on the stiles and structural steel frame.

Fire-resistive doors used for openings in stairway enclosures, smokeproof towers, corridors and passageways, moving picture booths, room partitions, exterior walls facing streets or more than twenty-five (25) feet from adjacent property lines and for "Ordinary Fire Separations" as specified in Section 503, shall be constructed as specified for one of the following types, 1, 2, 3, 4, 5 or 6 or any door which will provide equivalent protection against fire when hung in place as specified in this Section:

4. Tin-clad wood-core doors made of two (2) plies of wood one (1) inch nominal in thickness and covered with sheet metal, the door to be constructed in accordance with the "Underwriters' Standard for Tin-Clad Fire Doors and Shutters," Edition of March, 1926, and July, 1927; reprinted, 1928.

5. Sheet metal doors as specified in paragraph 3 above, but with one-fourth ($1/4$) of an inch of asbestos placed between the metal sheets in the panels and with no asbestos required on the stiles and structural frame;

6. Metal-clad doors which shall be wood panel doors with frame not less than one and three-fourths ($1\frac{3}{4}$) inches in thickness and with wood panels not less than three-fourths ($3/4$) of an inch in thickness, the whole door covered with not less than number twenty-six (No. 26) gauge metal. The panels of such doors shall fit into the frame not less than three-fourths ($3/4$) of an inch and all joints of metal shall be lapped and nailed tightly to the wood frame.

Metal shall in all cases be fastened to the wood or metal frame by nailing, bolting or riveting and no solder shall be used on any door except for filling of joints.

Glass panels of one-quarter ($1/4$) inch wire glass shall be permitted in any of the above doors except when such doors are used on openings in fire walls, fire division walls, all openings for the stage portion of any Group A building or for openings in "Special Fire Separations" as specified in Section 503.

Sec. 4304

Such glass panels shall be not more than seven hundred and twenty (720) square inches in area, nor exceed fifty-four (54) inches in height or forty-eight (48) inches in width. Grooves not less than three-fourths ($\frac{3}{4}$) of an inch in depth and three-eighths ($\frac{3}{8}$) of an inch wide, providing, not less than five-eighths ($\frac{5}{8}$) of an inch of bearing for the glass shall be required.

Fire doors bearing the label of the Underwriters' Laboratories, Incorporated, shall be accepted as meeting the requirements of any of the above doors.

Hardware for sheet metal and tin-clad fire doors referred to in paragraphs No. 1, 2, 3 and 4, shall be made of good quality malleable iron not less than one-fourth ($\frac{1}{4}$) of an inch thick or of flat rolled structural steel not less than three-eighths ($\frac{3}{8}$) of an inch thick; provided, that tubular steel track made of at least one-eighth ($\frac{1}{8}$) inch steel may be used. Sliding tracks shall be supported so that a wall fastening is directly opposite each door hanger when door is in a closed position. Hangers supporting doors shall be fastened to the door with not less than three (3) one-half ($\frac{1}{2}$) inch bolts extending through the door. Latches for fire doors shall be not less than two and one-half inches by three-eighths inch ($2\frac{1}{2}'' \times \frac{3}{8}''$), and latch bars shall be not less than one and one-half inches by one-fourth inch ($1\frac{1}{2}'' \times \frac{1}{4}''$).

Hardware for swinging hollow metal and metal-clad doors as referred to in paragraphs No. 5 and 6 shall be made as follows:

Hinges. For doors not exceeding eight (8) feet in height the hinges shall be of steel or bronze. If made of steel they may be either full, half surfaced, or butt hinges four and one-half inches by four and one-half inches ($4\frac{1}{2}'' \times 4\frac{1}{2}''$) and not less than one-eighth ($\frac{1}{8}$) inch in thickness. If made of bronze they shall be butt hinges four and one-half by four and one-half inches ($4\frac{1}{2}'' \times 4\frac{1}{2}''$) and not less than three-sixteenths ($\frac{3}{16}$) of an inch in thickness. When bronze hinges are used a steel stud and socket shall be provided at each hinge. The studs shall be attached to the rear jamb and shall engage a socket at least three-fourths ($\frac{3}{4}$) inch deep in the rear edge of the door.

Locks. Doors shall be provided with a mortise or unit lock which has a latch bolt with a throw of not less than three-fourths ($\frac{3}{4}$) of an inch.

When mounted in pairs the normally standing door shall have a push bolt at the top and at the bottom which has a throw of not less than three-fourths ($\frac{3}{4}$) of an inch.

Special locking devices shall be provided as required in Part III under occupancy, also as provided in Sections 3304, 3311 and 3315.

Astragals. Swinging fire doors mounted in pairs shall be provided with at least one astragal attached to one door and overlapping the opposite door at least three-fourths ($\frac{3}{4}$) of an inch. The above provision need not apply when the doors meet on a mullion.

Fire doors required by this Code shall be installed in the

Secs. 4304-4305

manner prescribed in the "Regulations of the National Board of Fire Underwriters for the Protection of Openings in Walls and Partitions Against Fire," recommended by the National Fire Protection Association, Edition of 1927.

All fire doors shall be so hung that when closed they will fit tightly into place against the wall or frame so as to prove an effective stop for fire and smoke. Space around fire doors necessary for their operation shall at all times be kept unobstructed and, when deemed necessary by the Building Inspector, a screen or railing protection shall be installed to insure no storing or placing of material against any fire door which would prevent its operation in case of emergency.

(b) **Fire-resistive Shutters.** One-hour fire-resistive shutters shall be constructed as specified for any one of the types of fire-resistive doors specified in part (a) of this Section.

(c) **One-hour Fire-resistive Windows.** One-hour fire-resistive windows shall have frames and sash of solid metal bars or hollow metal forms fabricated by pressing, welding or crimping together but not by the use of solder or other fusible alloy. All glass used in fire-resistive windows shall be wire glass and shall be not less than one-fourth ($\frac{1}{4}$) of an inch in thickness and no one light shall exceed seven hundred and twenty (720) square inches in area. Grooves three-fourths ($\frac{3}{4}$) of an inch in depth shall be provided and glass so arranged as to have not less than five-eighths ($\frac{5}{8}$) of an inch of bearing in hollow metal frames and with grooves not less than one-half ($\frac{1}{2}$) inch and with glass provided with not less than three-eighths ($\frac{3}{8}$) of an inch of bearing in windows of solid metal section. Continuous glazing angles shall be provided on the inside. Fire-resistive windows with hollow metal frames shall be limited to a maximum size of sixty (60) square feet with a six (6) foot maximum width and a ten (10) foot maximum height for double hung and counterbalanced windows and to a maximum size of seventy (70) square feet with a seven (7) foot maximum width and ten (10) foot maximum height for stationary windows. Solid metal section windows shall be limited to a maximum size of eighty-four (84) square feet in area with a maximum dimension in either direction of twelve (12) feet. Multiple section windows of these above sizes may be used when hollow metal or solid section mullions are provided. Hollow metal mullions shall be limited to a maximum length of twelve (12) feet and shall be used for non-bearing purposes only. Solid section mullions when used in lengths exceeding twelve (12) feet shall be fireproofed as required in Section 4301 in accordance with the fire-resistive construction of the building in which they are placed. Where fire-resistive windows are required by this Code, wood sash and plain glass may be substituted when protected as specified in Parts (a) and (b) of this Section.

Fire-resistive windows bearing the label of the Underwriters' Laboratories, Incorporated, shall be accepted as one-hour fire-resistive windows.

Sec. 4305. Roof coverings for all buildings shall be either "Fire Retardant" or "Ordinary" roofings as specifically required either by Location in Part IV, by Type of Construction in

**Roof
Coverings**

Sec. 4305

Part V or as specified in Sections 1109 and 1209. The roof covering shall be securely fastened to the supporting roof construction.

(a) **Fire Retardant Roofings.** "Fire Retardant" roofings shall be any roof covering which meets any one of the following requirements, or shall be any roofing meeting the requirements of Class A or B specifications of the Underwriters' Laboratories, Incorporated. Roofings bearing the label, and laid in the manner provided by the Underwriters' Laboratories, Inc., for Class A and B may be accepted as meeting the requirements of this section for fire retardant roofs.

Roof coverings built of roll roofing, roofing felt, felt membrane, or asphalt shingles, shall conform to the following requirements as to physical properties of materials, weights, number of layers and method of laying. The following requirements shall not be construed to prohibit the use of more layers, substitution of materials with heavier dry felt base content of similar quality and of not less than equal finished weight of material so substituted.

1. Not less than two layers No. 32 (30 lb. asphalt roofing) or No. 41 (40 lb. asbestos roofing). For top layer see note below.
2. Not less than four layers No. 15 (14 lb. asphalt felt). For top layer see note below.
3. Not less than three layers of a combination of No. 32 (30 lb. asphalt roofing) or No. 41 (40 lb. asbestos roofing) and No. 15 (14 lb. asphalt felt) or No. 14 (14 lb. asbestos felt). For top layer see note below.
4. Not less than three layers of No. 18 (18 lb. asbestos felt membrane) or No. 20 (20 lb. asphalt membrane). For top layer see note below.
5. Not less than one layer of No. 30 (26 lb. asphalt felt) roofing felt and two layers of No. 15 (14 lb. asphalt felt) or No. 14 (14 lb. asbestos felt) or No. 18 (18 lb. asbestos felt membrane) or No. 20 (20 lb. asphalt membrane). For top layer see note below.

Note: The above composition fire retardant roofings, shall be thoroughly mopped between layers with a bituminous compound so that no one layer touches unmopped the layer next above, and every such roof covering shall have for its top layer a layer of No. 32 or any mineral surfaced roofing bearing the Class C label of the Underwriters' Laboratories, Inc., or No. 41 roll roofing, or two layers of No. 14 roofing felt, or two layers No. 18 felt membrane (any such top layer or layers so used shall be deemed to be a part of and counted as a substitute for one or more layers so substituted); or such roof covering shall be entirely covered with a flowing coat of bituminous compound and completely covered with gravel, crushed rock, crushed brick, other crushed earthenware or similar mineral surfacing material, a sufficient quantity being embedded in the bituminous compound in accordance with good standard practice.

Composition fire retardant roof covering except asphalt shingles, designed to be laid over a wood deck shall be laid over a layer of unsaturated building paper weighing not less than

Sec. 4305

five (5) pounds to each one hundred (100) square feet of such paper.

Bituminous compound for mopping plys together shall be air refined asphalt or coal tar pitch but shall not be any type of emulsion, cold cut back liquid cement, oil or grease.

6. Hydraulic compressed rigid shingles not less than one-eighth ($\frac{1}{8}$) inch thick, composed of Portland cement and asbestos fibers, laid over a layer of saturated felt weighing not less than fourteen (14) pounds to the one hundred (100) square feet; or hydraulic compressed rigid sheets not less than seven thirty-seconds ($\frac{7}{32}$) inch thick, composed of Portland cement and asbestos fibers. The aforesaid felt may be omitted when the compressed shingles are placed over an existing roof covering.

7. Asphalt saturated mineral surfaced prepared composition shingles laid so there shall be not less than two (2) thicknesses at all places. The combined weight of such shingles shall not be less than one hundred and ninety (190) pounds to the one hundred (100) square feet of completed roof area.

8. Concrete Slab or Concrete Tile. Concrete slab roofs shall be constructed as specified in Chapter 26 and need not be covered with any additional roof covering.

9. Metal Roof Covering. Metal roof covering may be of a corrugated, standing seam or flat type of not less than number twenty-six (No. 26) U. S. Gauge metal. All flat metal roof coverings shall be laid on solid sheathing. Corrugated or standing seam metal roof covering shall be designed to support the required live load between supporting members.

10. Slate. Each slate shingle shall be securely fastened to the supporting roof construction with copper nails or with copper nails and copper wire, with nails of such length as to provide not less than three-fourths ($\frac{3}{4}$) of an inch of penetration into the nailing strips or sheathing.

11. Clay Tile. Clay roof tile shall not absorb more than fifteen (15) per cent of the dry weight of the tile during a forty-eight (48) hour immersion test.

Roofing tile other than flat pan tile with or without flanges, or flat shingle tile, or flat decorative tile, shall satisfy the following strength requirement: When supported on the turned down edges at points six (6) inches each side of the center of the tile, giving four (4) points of support and a span of twelve (12) inches, and loaded with a concentration at the center, the average breaking load per tile for five (5) representative tile tested shall be not less than four hundred (400) pounds and the breaking load for any individual tile tested shall be not less than three hundred and fifty (350) pounds.

All clay roof tile without any projection lug shall be nailed and/or wired in place.

Copper nails and copper wire shall be used wherever nailing and wiring of tile is required in this sub-section; provided,

Sec. 4305

that when roofs do not exceed a one-third ($1/3$) pitch galvanized iron nails may be used. Wire shall be not smaller than number fourteen (No. 14) B. and S. gauge. Nails shall in all cases penetrate not less than three-fourths ($3/4$) of an inch after passing through the tile or other fastening device.

(b) **Ordinary Roofings.** "Ordinary" roof coverings shall be any roof covering which meets the requirements specified for the following roof coverings, 12 to 18, inclusive, or shall be any roofing meeting the Class C Specifications of the Underwriters' Laboratories, Incorporated.

12. One layer of No. 41 roll roofing, or one layer of No. 45, No. 52, or No. 82 roll roofing.

13. Such roof covering may be asphalt shingles laid in one or more layers.

14. Such roof covering may be a combination of one or more layers of No. 15 or No. 14 roofing felt and a layer of No. 32 roll roofing.

15. Two or more layers of No. 14 roofing felt or No. 18 felt membrane.

16. One layer No. 30 roofing felt and one layer No. 14 or No. 18.

17. Such roof covering may consist of not less than two layers of No. 15 roofing felt or No. 20 felt membrane, which shall have a covering of gravel as required for fire retardant roof covering.

18. Wood shingles used as roof covering shall be of clear vertical grain all-heart wood and shall be not less than five (5) shingles to two (2) inches in thickness at the butt (U. S. Government Standard) and shall be laid with the following exposures as compared to total length of shingle:

Total Length of Shingle	Permissible Exposed Length
16 in.	5 in.
18 in.	5½ in.
24 in.	7½ in.

All wood shingles shall be nailed firmly with copper, zinc, zinc-coated or commercially pure iron nails of at least twelve and one-half ($12\frac{1}{2}$) gauge and not less than one and one-fourth ($1\frac{1}{4}$) inches long. Each shingle shall be nailed with at least two (2) nails driven substantially into the supporting roof construction.

Wood shingles bearing the certification label of the Red Cedar Shingle Bureau, certifying compliance with Commercial Standard CS 31-31 of the United States Department of Commerce Bureau of Standards, may be accepted as meeting the requirements of this Code.

(c) **Physical Properties of Composition Roofing.** Physical properties of roll roofing, roofing felt, or felt membrane shall conform to the following requirements:

Felt is the dry or de-saturated product produced by "Felting" vegetable or animal fibres or other suitable materials; or "Felting" not less than eighty-five (85) per cent by weight of asbestos fibres.

Sec. 4305

Felt shall be smooth and when split or torn on the bias shall appear free from lumps of underbeaten stock or fragments of metal, leather or rubber.

Roofing felt is felt saturated with a bituminous compound.

Roll roofing is felt saturated with a bituminous saturant, then coated on both sides with a bituminous coating and then surfaced on both sides with powdered talc, mica or other suitable mineral matter; provided, that such roll roofing need not be coated nor surfaced if felt is produced from asbestos and two or more layers are used in combination.

Felt membrane is felt saturated with bituminous saturant, then coated on one or both sides with a bituminous coating.

Saturant and coating shall be principally of bitumin with a flash point of not less than four hundred (400) degrees Fahrenheit by the Pinsky-Martin closed-cup method.

Weight of roll roofings, roofing felts and felt membranes dry or de-saturated felt, and percentage of saturation, shall conform to not less than the specific minimum requirements given in the following table:

Reference Number	Name or Designation	Wt. per 108 sq. ft.	Felt Weight per 108 Sq. Ft.	Saturation Percentage
No. 32	Roll Roofing	30	6.5 (V)	130
No. 41	Roll Roofing	40	13.0 (A)	50
No. 43	Roll Roofing	41	6.4 (A)*	40
No. 42	Roll Roofing	40	10.0 (V)	140
No. 82	Roll Roofing	80	10.0 (V)**	140
No. 82	Shingles	80	10.0 (V)***	140
No. 15	Roofing Felt	14	5.6 (V)	140
No. 14	Roofing Felt	14	9.5 (A)	40
No. 18	Felt Membrane	18	8.5 (A)	50
No. 20	Felt Membrane	20	5.0 (V)	120
No. 30	Roofing Felt	26	10.0 (V)	140

Notes: "(V)" designates felt that is produced by felting vegetable and animal fibres.

"(A)" designates the felt that is produced by felting asbestos fibres.

* No. 43 roll roofing is produced with two or more layers of felt, each weighing 6.4 pounds, cemented together in the process of manufacture.

** No. 82 roll roofing is a mineral surfaced product.

*** Asbestos shingles are mineral surfaced and cut from not lighter than No. 82 roll roofing.

Pliability at seventy-seven (77) degrees Fahrenheit; four strips out of five of No. 32 and No. 42 roll roofing shall not crack on a ten (10) millimeter mandrel; four strips out of five of No. 15 roofing felt shall not crack when bent one hundred (100) degrees over a one-sixteenth (1/16) inch mandrel; four strips out of five of No. 14 roofing felt or No. 18 felt membrane shall not crack when bent one hundred and eighty (180) de-

Sec. 4305

grees over a one (1) inch mandrel. Asphalt shingles shall not be subject to any requirements for pliability.

Heating of roll roofing to one hundred and seventy-six (176) degrees Fahrenheit, for two (2) hours shall not show a loss of volatile matter exceeding one and eight-tenths (1.8) per cent and there shall be no flowing, sagging, blistering or absorption of the surface coatings. Mineral surfacing shall not slide more than one-sixteenth (1/16) inch when roofing is suspended vertically. Roofing felt and felt membranes when heated to two hundred and twenty-one (221) degrees Fahrenheit for five (5) hours shall not lose more than four (4) per cent of the weight thereof.

Finished roll roofing, roofing felt or felt membranes shall be free from visible external defects such as holes, breaks, cracks, tears, deeply ribbed surfaces, sagged or untrue edges. Mineral surfacing shall be sufficiently free from fine dust to permit adhesion of the larger particles uniformly distributed and embedded in the coating so that when rubbed vigorously the coating will remain completely covered.

Test Methods, used to determine the physical properties of roll roofing, roofing felt, or felt membrane shall be those methods set forth in the "Standard Methods of Testing Felted and Woven Fabrics Saturated With Bituminous Substances For Use In Waterproofing and Roofing." A. S. T. M. Designation D 146-27, of the American Society for Testing Materials. Such tests shall be confined to specific requirements given in this section for physical properties of such materials.

PART IX

REGULATIONS FOR USE OR OCCUPANCY OF STREETS
AND PROJECTIONS OVER PUBLIC PROPERTYCHAPTER 44.—TEMPORARY USE OF STREETS DURING
CONSTRUCTION

Sec. 4401. No building material or materials shall be placed upon the streets or sidewalks except as provided in this Chapter.

Building materials required for use immediately or in connection with the construction of a building may be placed upon the street or sidewalk in front of the building in course of construction or alteration. The maximum width of such occupied space shall not exceed one-third ($1/3$) the width of the street, measured between curbs, and in no case shall the space within five (5) feet of the nearest rail of any railway tracks be occupied for building materials. The sidewalk space may be occupied for building construction purposes provided the owner or his agent constructs a temporary sidewalk not less than five (5) feet in width in the outer portion of the permissible occupied space, and such temporary sidewalk shall be protected on the building side by a tight fence not less than eight (8) feet in height.

In Fire Zone No. 1 and when the proposed building exceeds a height of two (2) stories in any part of the city, the owner or his agent shall construct, before any building is commenced, a temporary covered walk-way not less than five (5) feet wide, of sufficient strength to protect the public from falling materials during construction and such covered walk-way shall remain in place until the completion of all of the exterior portions of the building. When the area occupied by the sidewalk or temporary walk-way is to be excavated, such walk shall be made of boards not less than two (2) inches thick, designed to support a load of not less than one hundred and fifty (150) pounds per square foot, provided with suitable ramps at each end, and with hand-rails on each side. The roof over such walk-way shall be the full width of the walk-way and of not less than two (2) layers of one (1) inch boards with joints broken, and shall be placed not less than ten (10) feet above the temporary walk-way. Whenever such roof is used for storing of materials a railing and foot board shall be so installed as to prevent the materials from spilling into the street.

Building materials may be placed in front of the property adjoining a building site under the same conditions as provided for the occupation of the street immediately in front of the building site, provided the written consent and waiver of claim for damages against the City of.....

is obtained from the owner or owners of such adjoining property, and filed in the office of the Building Inspector.

No building material, fence, shed or any obstruction of

**Temporary
Use of
Streets
During
Construc-
tion**

Sec. 4401

any kind shall be placed so as to obstruct free approach to any fire hydrant, lamp post, manhole, fire alarm box, or catch basin, or so as to interfere with the passage of water in the gutter.

Mortar or concrete may be prepared in the space permitted for storage of building materials, but shall be done in a mechanical mixer or in a tight box or on a tight mixing board in such a manner that dripping or splashing is prevented. Pavements shall be well cleaned of all building materials at the completion of the construction of a building.

The covered walk-way shall be kept well lighted continuously between sunset and sunrise and the outer edge of the occupied space of the street or sidewalk shall have placed thereon red lights which shall be kept burning continuously between sunset and sunrise.

The street side of any barricade or fence and handrails and sidewalks shall be kept reasonably smooth and in good repair while construction work is in progress or while such barricades, fences or walk-ways are placed on or over public property.

CHAPTER 45

PERMANENT OCCUPANCY OF PUBLIC PROPERTY

Permanent
Occupancy
of Public
Property

Sec. 4501. No portion of any building whatsoever nor any accessory thereto other than signs shall project over the public street or sidewalk except as specified in this Section.

(a) Unroofed porches, balconies or oriel windows may extend not more than three (3) feet over public streets or sidewalks, but shall in no case be less than ten (10) feet in the clear above the sidewalk or street level immediately below.

(b) Movable awnings of combustible materials supported throughout on metal frames may extend over the sidewalk portion of a public street a distance equal to two-thirds ($2/3$) the width of the sidewalk space; provided, that every such awning frame shall be not less than seven feet and six inches (7'-6") above the sidewalk immediately below and that any fringe attached to such awning shall be not less than seven (7) feet from the sidewalk level immediately below.

(c) Cornices constructed of fire-resistive materials if more than ten (10) feet above the sidewalk may project over a public street not more than four (4) feet.

(d) A fixed awning or marquee projecting over the sidewalk shall conform to the following regulations:

(1) Such awning or marquee shall be supported entirely from the building.

(2) All combustible materials used in the construction of any fixed awning or marquee shall be protected by not less than one-hour fire-resistive construction as specified in Chapter 43.

(3) Such awning or marquee shall be at least eight (8) feet in the clear between the lowest point of any projection and the sidewalk immediately below and shall not occupy more than two-thirds ($2/3$) the width of the sidewalk, measured from the building, except that when such awning or marquee is twelve (12) feet in the clear above the sidewalk immediately below, it may extend the full width of the sidewalk for a distance of not more than fifteen (15) feet along the direction of the length of the street.

(4) Every awning or marquee shall be so located as not to interfere with the operation of any exterior standpipes, stairways or exits from the building and such location shall meet with the approval of the Building Inspector.

(5) The roof of any such awning or marquee shall be sloped to down-spouts which shall conduct any drainage under the sidewalk to the curb.

(e) Water tables, belt courses, sills, bases, columns, pilasters, capitals or other decorative features shall not project more than six (6) inches beyond any lot line.

(f) No part of any show window, store, front or show case except the sill, as provided in paragraph (e) of this Section, shall project beyond the property line. Doors in Fire Zones

Sec. 4501

No. 1 and 2 shall not project more than one (1) foot beyond the property line bordering a street and shall not project into any alley. Doors in buildings outside of Fire Zones No. 1 and 2 which swing over the street property line shall be maintained normally closed.

(g) The space below the sidewalk level may be used for any purpose not inconsistent with any other requirements of this or other Ordinances, but the occupation of this space may be revoked by the City of.....at any time, and the owner of the building occupying such space shall be required to pay all costs attendant therewith.

(h) No projection whatsoever shall be allowed in alleys except a curb or buffer block extending not more than nine (9) inches from the face of the building and not more than nine (9) inches above the adjacent alley grade.

Secs. 4601-4721

PART X
LEGISLATIVE
CHAPTER 46—LEGISLATIVE

Sec. 4601. If any section, sub-section, sentence, clause or phrase of this Ordinance is, for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this Ordinance. The..... **Validity**

.....
 hereby declares that it would have passed this Ordinance, and each section, sub-section, clause or phrase thereof, irrespective of the fact that any one or more sections, sub-sections, sentences, clauses and phrases be declared unconstitutional.

Sec. 4602. The specifications, suggested ordinances and regulations which are mentioned by title and date of publication in various parts of this Ordinance are hereby declared to be a part of such Ordinance when not in conflict with a specific statement contained in the body of this Ordinance to the contrary. **Appended Documents**
 (See Appendix for list of above mentioned documents.)

Sec. 4603. Ordinance No.....and all ordinances amendatory thereto, and all ordinances or parts of ordinances in conflict with this Ordinance are hereby repealed. **Ordinances Repealed**

Sec. 4604. This ordinance shall be, and is hereby declared to be in full force and effect, from and after.....days **Date Effective**
 from its date of final passage and approval.

PART XI
SPECIAL ORDINANCES
CHAPTER 47—PLASTERING

Sec. 4701 to 4721, inclusive. Complete plastering provisions. **Plastering Provisions**
 (See Appendix Chapter 47.)

Secs. 4801-4903

CHAPTER 48

FILM STORAGE

Film Storage Secs. 4801 and 4802. Where it is desired to regulate for film storage complete provisions covering handling and storage of photographic and X-Ray nitrocellulose films may be found in Appendix Chapter 48.

CHAPTER 49

MECHANICAL REFRIGERATION

Refrigeration Secs. 4901 to 4903. Where it is desired to regulate the type and installation of mechanical refrigeration complete provisions may be found in Appendix Chapter 49.

APPENDIX

This Appendix contains suggestions and explanatory matter with reference to various details in the body of the Code but is not to be considered as a legal part of the Code. This date is given to assist in proper operation and use of the Uniform Building Code.

The Conference plans to expand this Appendix in the future with many suggestions of what is good practice in building construction.

Refer to Sec. 101. The blank spaces in this section should be filled in by the individual city in adopting the Code with the proper names and titles. There are a number of other places in the Code where similar blank spaces occur which must also be filled in at the time of adopting the Code.

Refer to Sec. 201. At the end of this section it will be noted that the signature of the architect, engineer or designer responsible for the preparation of plans submitted for permit is required. Some states require all structural designs to be certificated by a licensed engineer and the proper change should be made at this point so that the Code, when adopted, will not conflict with the state law.

Refer to Sec. 202. It is advisable and recommended that the Building Inspector keep in permanent file the plans for all large buildings, buildings involving complicated designs and buildings designed for future extensions or additions.

Refer to Sec. 203. Fees should ordinarily be paid to the Building Inspector when the form of government so permits in order that the building public may be most efficiently served.

Refer to Sec. 204. The form of general inspection as suggested in the first part of Section 204 has been found to operate very satisfactorily in many cities. A form of permit card posted on each job should be used to show by whom each successive inspection was made and to record the date of that inspection. General information such as permit number, names of owner and contractor and the location of the job should be included on such inspection card.

Special engineering supervision as provided in this Code is a necessary factor for greatest economy in building construction. It provides the safety necessary to the public where higher working stresses are allowed the various building materials. There is no building department sufficiently manned to properly inspect even the most important buildings and the inspection service required in Section 204 is more than paid for by granting increased working stresses in building materials.

Refer to Secs. 302, 303, 304. In order that the Code will not present a closed door to developments in building materials or methods of construction a means is provided in these three sections to permit their use when they are found safe and sufficient for their proposed use.

The Board of Examiners and Appeals serves not only as

a board of judgment on new materials and devices but also arbitrates any decision of the Building Inspector in matters affecting interpretations of the Code. It will be noted that no power is vested in the Board for amending the Code but that amendments must be made by the proper legislative authorities.

Through the provisions of these three sections the Code is given flexibility in operation, which has been found to be necessary in the operation of such a legal document.

The blank space in Section 304 should be filled in with the name of the person or body who is to appoint the Board of Examiners and Appeals.

Refer to Sec. 1502. The following suggestions are given as a guide for the detailed design and construction of reviewing stands.

Every reviewing stand shall be constructed with four inch by six inch (4"x6") girders running parallel to the front of such stand, spaced not more than six (6) feet apart, and supported at distances not exceeding six (6) feet apart by posts of not less than four inches by six inches (4"x6"). These posts shall be braced diagonally with one inch by six inch (1"x6") bracing, forming a continuous herringbone bracing, the full length of such stand for each vertical six (6) feet of such posts. The girders at the top of the posts shall be braced with braces not less than four inches by four inches (4"x4") at right angles to the joists above the girders. Every post or brace shall be thoroughly secured to a foot plate, which shall be of sound wood not less than two inches by six inches (2"x6") in cross section laid solidly on the ground at right angles to the front of the stand and forming the base for each line of posts. There shall be joists resting on the girders of not less than two inches by eight inches (2"x8") cross section. Such joists shall be spaced not exceeding forty (40) inches apart and two inch (2") plank shall be used for the seats and steps. Braces shall be provided whenever necessary to make a solid, substantial structure, which shall be safe under any possible emergency. All timbers forming the framing shall be thoroughly spiked together. There shall be a level stringer of two inches by six inches (2"x6") cross section at the bottom of each line of posts, parallel to the stand; also a horizontal piece of two inches by six inches (2"x6") cross section the full length of the stand and at right angles to same for every row of posts, and every six (6) feet of vertical height thereof. All timbers used in the construction of reviewing stands shall be sound (no secondhand or broken lumber permitted). Wherever the stand, or a portion thereof, extends over an excavation, the posts shall be extended to the bottom of said excavation and shall be braced with horizontal braces as hereinbefore provided.

Refer to Sec. 1601. It is impossible to include the districting requirements for each city so that provision is made in this section to incorporate by reference a separate ordinance outlining the limits of the various fire zones.

The following principles may be utilized in outlining the fire zones.

Fire Zone No. 1 should contain the general retail business portion of the city and the more highly congested areas.

Fire Zone No. 2 should include the area lying immediately beyond and adjacent to Fire Zone No. 1 and extensions of the retail district along main thoroughfares. By designating the areas along principal crosstown thoroughfares, barriers will be set up for proper protection of the city in the event of a general conflagration.

Fire Zone No. 3 should comprise the general residential areas and all of the territory not included in Fire Zones No. 1 and 2.

Refer to Sec. 1802. In the event that a zoning ordinance or other special ordinance provides height limits, it will be necessary to note in the ordinance of adoption that such regulations shall not be repealed in adopting this Code. Another means of providing against any possible conflict is to revise Section 1802 so as to include the maximum height limit.

Refer to Secs. 1804, 1904 and 2004. Where cities desire to permit the use of hollow wall units or hollow walls the word "solid" should be omitted.

Refer to Sec. 2204.

Minimum Foundation Requirements Shall Be as Set Forth in the Following Table:

TABLE

Minimum Foundation Requirements for Type V Buildings

Number of Stories	Thickness of Foundation Wall in Inches		Width of Footing in Inches	Thickness of Footing in Inches	Depth of Foundation Below Natural Surface of Ground and Finish Grade in Inches
	Concrete	Unit Masonry			
1	6	6	14	6	12
2	8	8	16	6	18
3	10	10	18	6	30

Refer to Sec. 2301.

WEIGHTS OF BUILDING MATERIALS

	Lbs. Per Cu. Ft.
Brick, Pressed	150
Brick, Common	125
Brick, Common, laid $\frac{3}{8}$ " joints	120
Brick, Soft, laid $\frac{3}{8}$ " joints	100
Cinders, dry, bituminous, in bulk	45
Concrete—	
Cinder, structural	110
Stone or gravel	144
Concrete Building Tile, 60% solid	87
Concrete Building Tile, 55% solid	79
Slag (blast furnace)	130
Cast Iron	450
Earth—	
Common loam, dry and loose	76

Clay and gravel, dry and loose	100
Common earth, dry and packed	100
Wet mud	120
Glass	157
Granite	170
Gravel, dry	120
Granite Masonry, dressed	165
Grant Masonry, rubble	155
Limestone Masonry, dressed	162
Marble Masonry, dressed	170
Mortar, hard, cement	135
Mortar, hard, lime	105
Partitions—	
	Lbs. Per Sq. Ft.
2"x4" studs, wood lath, 5/8" plaster, both sides.....	16
2"x4" studs, plaster board, 5/8" plaster, both sides	16
Channel studs, metal lath, cement plaster, solid 2" thick	20
Plaster on hollow clay tile (one side)	5
2" Hollow Clay Tile	13
3" Hollow Clay Tile	16
4" Hollow Clay Tile	18
5" Hollow Clay Tile	20
6" Hollow Clay Tile	25
8" Hollow Clay Tile	30
12" Hollow Clay Tile	45
Plaster on plaster block partitions (one side)	5
2" Plaster Blocks	7
2½" Plaster Blocks	8.5
3" Plaster Blocks	9.5
3½" Plaster Blocks	10.5
4" Plaster Blocks	12
5" Plaster Blocks	15
6" Plaster Blocks	18
8" Plaster Blocks	22
Ceilings—	
Wood, lath and and plaster	8
Metal lath and plaster suspended	10
Roofings—	
Wood shingles	3
Slate 3/16"	7
Slate ¼"	10
Tile and clay shingles	11 to 14
Roman tile, clay	12
Spanish tile, clay	19
Ludowici tile, Spanish	10
Tile roof laid in mortar, add.....	10
Copper (if no weight is specified)	1½
Tin	1
Corrugated iron	2
Tar and gravel	6
Prepared composition	1
	Lbs. Per Cu. Ft.
Sand, dry	100

Sand, wet	120
	Lbs. Per
	Sq. Ft.
Skylights, metal covered, wire glass	5
	Lbs. Per
	Cu. Ft.
Steel	490
Terra Cotta, filled with brickwork	120
Terra Cotta, Dennison interlock tile, laid.....	65
Timber—	
Fir, dry	32
Fir, wet	44
Oak	46
Water, fresh at 60 degrees Fahrenheit	62½

Refer to Sec. 2302. The live loads specified herein are intended to include a sufficient allowance to cover the effect of impact. In the case of special occupancies involving unusual impacts provision should be made by increasing the loads herein specified.

The view has been expressed that buildings designed for low live loads will be too flexible and that vibration due to dynamic loads, particularly in theater balconies and similar places, may seriously alarm the occupants. Several cases are reported of buildings which have required alterations for this reason. There is no evidence, however, that vibration indicates dangerous conditions. A well-built structure may be flexible; and the absence of vibration does not necessarily prove that a building is safe. Two structures may be equal in strength, but may differ in stiffness, particularly if one is of cantilever type.

When it is desirable for any reason to avoid vibration or undue deflection, care should be taken to that end by designing for greater live loads or by using more braces. Safety considerations, however, on which code requirements are based, do not justify live load assumptions greater than those given herein.

Refer to Sec. 2311. The following provisions are suggested for inclusion in the Code by cities located within an area subject to earthquake shocks. The design of buildings for earthquake shocks is a moot question but the following provisions will provide adequate additional strength when applied in the design of buildings or structures.

Sec. 2311 (a) LATERAL BRACING.

Every building or structure and every portion thereof, except Type V buildings of Group I occupancy which are less than twenty-five (25) feet in height, and minor accessory buildings, shall be designed and constructed to resist stresses produced by lateral forces as provided in this Section. Stresses shall be calculated as the effect of a force applied horizontally at each floor or roof level above the foundation, such force shall be proportioned to the total dead plus one-half ($\frac{1}{2}$) the vertical design live load, except for warehouses, in which case such force shall be proportioned to the total dead plus the total vertical

live load. The force shall be assumed to come from any horizontal direction.

All bracing systems both horizontal and vertical shall transmit all forces to the resisting members and shall be of sufficient extent and detail to resist the horizontal forces provided for in this section and shall be located symmetrically about the center of mass of the building or the building shall be designed for the resulting rotational forces about the vertical axis.

Junctures between distinct parts of buildings, such as wings which extend more than twenty (20) feet from the main portion of the building, shall be designed at the juncture with other parts of the building for rotational forces, or the juncture may be made by means of sliding fragile joint having a minimum width of not less than eight (8) inches. The details of such joints shall be made satisfactory to the Building Inspector.

Horizontal Force Formula:

In determining the horizontal force to be resisted, the following formula shall be used:

$$F = CW$$

where "F" equals the horizontal force in pounds.

"W" equals the total dead load plus one-half

($\frac{1}{2}$) the total vertical designed live load,

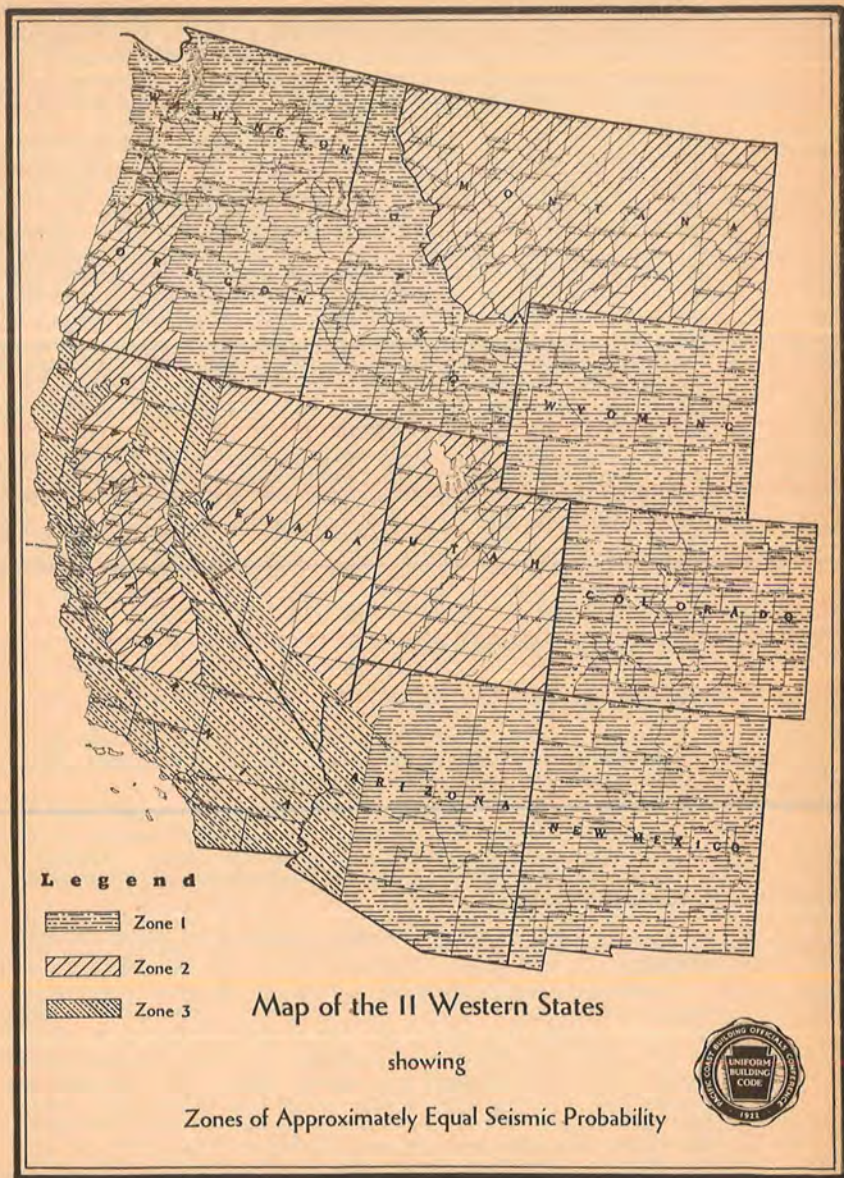
at and above the point or elevation under consideration, except for warehouses, in which case "W" shall equal the total dead load plus the total vertical designed live load at and above the point or elevation under consideration. Machinery or other fixed concentrated loads shall be considered as part of the dead load.

"C" equals a numerical constant as shown in the following table:

Part or Portion	Value of "C"*	Direction of Force
The building as a whole**	.02 on soil, over 2000 lbs. .04 on soil, up to 2000 lbs.	Any horizontal direction
Bearing walls, curtain walls, enclosure walls, fire division walls, panel walls	.05	Normal to surface of wall
Cantilever parapet and other cantilever walls, except retaining walls.	.25	Normal to surface of wall
Exterior and interior ornamentations and appendages.	.25	Any direction horizontally
Towers, tanks, towers and tanks plus contents, chimneys, smoke stacks, and penthouses.	.05	Any direction horizontally

*See map on page 245 for zones. The values given "C" are minimum and should be adopted in locations not subjected to frequent seismic disturbances as shown in Zone 1. For locations in Zone 2, "C" should be doubled. For locations in Zone 3, "C" should be multiplied by four.

**Where a 20-lb. per square foot wind load would produce higher stresses, this load should be used in lieu of the factor shown.



Foundation ties:

In the design of buildings of Types I, II and III, where the foundations rest on piles or on soil having a safe bearing value of less than two thousand (2,000) pounds per square foot, the foundations shall be completely inter-connected in two (2) directions approximately at right angles to each other. Each such inter-connecting member shall be capable of transmitting by both tension and compression at least ten (10) per cent of the total vertical load carried by the heavier only of the footings or foundations connected. The minimum gross size of each such member if of reinforced concrete shall be twelve inches by twelve inches (12"x12") and shall be reinforced with not less than the minimum reinforcement specified in Section 2621. If the inter-connecting members are of structural steel, they shall be designed as provided in Section 2702, and encased in concrete. A reinforced concrete slab may be used in lieu of inter-connecting tie members, providing the slab thickness is not less than one forty-eighth ($1/48$) of the clear distance between the connected foundations; also providing the thickness is not less than six (6) inches.

The inter-connecting slabs shall be reinforced with not less than eleven-hundredths (.11) square inch of steel per foot of slab in a longitudinal direction and the same amount of steel in a transverse direction. The bottom of such slab shall not be more than twelve (12) inches above the tops of at least eighty (80) per cent of the piers or foundations. The footings and foundations shall be tied to the slab in such a manner as to be restrained in all horizontal directions.

Plans and Design Data:

With each set of plans filed, a brief statement of the following items shall be included:

- (a) A summation of the dead and live load of the building, floor by floor, which was used in figuring the shears for which the building is designed.
- (b) A brief description of the bracing system used, the manner in which the designer expects such system to act, and a clear statement of any assumptions used. Assumption as to location of all points of counter-flexure in members must be stated.
- (c) Sample calculation of a typical bent or equivalent.

Stresses

Stresses in materials shall not exceed by more than thirty-three and one-third ($33\frac{1}{3}$) per cent the allowable working stresses permitted in this Code, except that rivets may be stresses the same in tension as is allowed in shear. Tension and/or shear in brick work shall not exceed twenty (20) pounds per square inch where cement mortar is used or fifteen (15) pounds per square inch where lime-cement mortar is used. The allowable shear in reinforced concrete walls, six (6) inches or more in thickness, shall not exceed five one-hundredths (.05) of the ultimate compressive strength of the concrete.

GENERAL

(a) Bonding and Tying:

Cornices and ornamental details shall be bonded in the structure so as to form an integral part of it. This applies to the interior as well as to the exterior of the building.

(b) Overturning Moment:

In no case shall the overturning moment of any building and/or structure due to the forces provided for in this Section exceed fifty (50) per cent of the moment of stability of such building and/or structure.

(c) Additions:

Every addition to an existing building and/or structure shall be designed and constructed to resist and withstand the forces provided for in this Section, and in any case where an existing building and/or structure is increased in height all portions thereof affected by such increased height shall be reconstructed to resist and withstand the forces provided for in this Section.

(d) Alterations:

No existing building and/or structure shall be altered and/or reconstructed in such a manner that the resistance to the forces provided for in this Section will be less than that before such alteration and/or reconstruction was made; provided, however, that this provision shall not apply to non-bearing partitions, and shall not apply to other minor alterations which are made in a manner satisfactory to the Building Department.

(e) Lime mortars shall not be used in any unit masonry construction forming a part of a building.

(f) Veneer ties provided in Section 2936 shall be of sufficient strength to support the full weight of the veneer in tension.

Intention or Interpretation of Lateral Force Provisions:

These lateral force requirements are intended to make buildings earthquake-resistive. The provisions of this Section apply to the buildings as a unit and also to all parts thereof, including the structural frame or walls, floor and roof systems, and other structural features.

The provisions incorporated in this Section are general and, in specific cases, may be interpreted and/or added to as to detail by rulings of the Building Inspector in order that the intent shall be fulfilled.

Refer to Sec. 2410. If provisions covering the subject of Reinforced Brick Construction, the following should be included:

The formulas and assumptions used in the design of reinforced brick shall be the same as required for reinforced concrete in Chapter 26.

The unit working stresses used in the design of reinforced brick shall not exceed the following values:

Compression

Extreme fibre stress in bending	500 lbs. per sq. in.
Direct compression on piers	300 lbs. per sq. in.

Shear (Staggered mortar joints through plane of shear.)

No web reinforcement 30 lbs. per sq. in.
With adequate web reinforcement 60 lbs. per sq. in.

Shear (Continuous mortar joints through plane of shear)

No web reinforcement 20 lbs. per sq. in.
With adequate web reinforcement 60 lbs. per sq. in.

Bond (deformed bars)

Thickness of mortar between brick and steel not less than one-half diameter of bar 100 lbs. per sq. in.

Thickness of mortar between brick and steel less than one-half diameter of bar 70 lbs. per sq. in.

Modulus of Elasticity 1,500,000 lbs. per sq. in.

The allowable working stresses provided in this Section for reinforced brick construction shall be allowed only when workmanship and materials meet the following requirements:

Brick shall have an average compressive strength of twenty-five hundred (2500) pounds per square inch, with an allowable individual minimum of two thousand (2000) pounds per square inch, when tested as provided in Sections 2402, 2403 and 2404.

Mortar shall be composed of not less than one (1) part Portland cement to four and one-half ($4\frac{1}{2}$) parts of sand by volume, with an allowable addition of not more than one-half ($\frac{1}{2}$) part of lime putty or hydrated lime. All bed, end and wall joints shall be completely filled with mortar and all reinforcing steel shall be entirely embedded in the mortar.

All reinforced brick work shall be laid with full header courses not more than every fourth (4th) course in height or there shall be at least one (1) full header in every forty-eight (48) square inches of wall surface, except that in brick work laid with all interior joints grouted, such header courses need not be placed closer than every sixth (6th) course or its equivalent.

Reinforcing steel shall be braced and held in place firmly enough to prevent the breaking of bond while brick is being laid.

All clay brick shall be thoroughly wet not more than one (1) hour before laying and shall be damp at the time of laying.

Refer to Sec. 2502—2nd Paragraph. It is the intention of the writers of this Code to limit the actual size of any member to the dressed size specified in American Lumber Standards for lumber sawed rough to corresponding nominal dimensions. Care must be used in interpreting American Lumber Standards, however, as the condition of seasoning of the lumber at the time it is measured will have some effect on the results.

For example, a piece of 2x12 Douglas fir when sawn green from the tree will measure 2"x12". If surfaced immediately to A. L. S. dressed sizes of $1\frac{1}{2}$ "x11 $\frac{1}{2}$ " and then allowed to season until the moisture content is in equilibrium with the air, shrinkage will take place; in extreme cases this may amount to 4 per cent of either dimension and the piece may be 1/16" less than

the dressed size in thickness and/or $\frac{1}{2}$ " less than the dressed size in width.

If, however, the dressed piece when measured is still green, or if it has been allowed to season before dressing, it should measure the full dressed size shown in American Lumber Standards.

In either event it is safe to use the net section of the A. L. S. dressed size for figuring load carrying capacity of the piece since the allowable unit stresses in Chapter 25 are based on the strength of unseasoned (or green) lumber. Seasoning causes shrinkage and consequent reduction of net cross section, but it also results in increasing the strength of the lumber and such increase usually more than offsets any loss in net section of member.

Refer to Section 2503:

Unit working stresses must be established for all structural materials in order that safe as well as economical sizes of members may be determined for all conditions where such members are required to support loads.

The strength of lumber and timber (unlike that of any other structural material) can be closely estimated by visual inspection. However, there are numerous factors which affect the strength or load-bearing capacity of an individual piece of lumber and any intelligent estimate of strength or determination of safe working stresses must take them into consideration.

FACTORS INFLUENCING THE STRENGTH OF, AND WORKING STRESSES FOR, LUMBER AND TIMBER:

1. Species of wood—i. e. Douglas fir, redwood, larch, hemlock.
2. Physical Characteristics:

(a) Size of piece (b) Density (c) Rate of growth (d) Knots (e) Shakes and Checks (f) Slope of grain (g) Minor defects.	}	These factors determine Grade
--	---	-------------------------------
3. Use conditions:
 - (a) Purpose of use—i. e. joist, stringer, post.
 - (b) Exposure in service—i. e. always dry, usually dry, usually wet.
 - (c) Character of Loading—i. e. moving or impact loads, intermittent (short-time) loads, static (long-time) loads.
1. Species of Wood—

The strength of clear wood in different species of trees (i. e. Douglas fir, redwood, larch, hemlock, etc.,) differs considerably. Some species are inherently stronger than others. However, a piece of the inherently stronger species of wood, if it contains certain defects, may have less strength than a piece of the weaker species without such defects. In order to obtain a basis for

estimating the strength of any particular species of wood, the United States Forest Products Laboratory has made several hundred thousands of tests of the ultimate strength of small, clear specimens (2" x 2" x 30" in size) of many species of wood and has published the results in U. S. Department of Agriculture Bulletin No. 556.

Since most load-bearing members are larger than 2" x 2" in section and need not be clear and since there are other considerations to be taken into account which tend to make it unwise to depend on the ultimate strength of a piece of lumber, a factor similar to the familiar "factor of safety" has been applied to the results of the above mentioned tests and the following Table (from Bulletin 314 of the American Railway Engineering Association except for Inland Empire Douglas fir) shows the comparison between the various species with this factor included. (See Character of Loading.)

In assigning working stresses to any piece of lumber, therefore, it is first necessary to know the species of the wood, and the strength of clear wood of that species.

BASIC WORKING STRESSES FOR CLEAR WOOD OF STRUCTURAL SIZES

(Values shown are in pounds per square inch)

SPECIES	For Continuously Dry Locations			Maximum Horizontal Shear
	Extreme Fiber in Bending	Compression Perpendicular to Grain	Compression Parallel to Grain, L/D 10 or less	
Cedar, Western Red.....	1200	200	933	106
Cedar, Port Orford.....	1466	250	1200	120
Douglas Fir, Coast Region	2000	325	1466	120
Douglas Fir, Inland Empire	1893	315	1386	120
Douglas Fir, Rocky Mountain Region.....	1466	275	1066	113
Fir, Golden, Noble, Silver, White.....	1466	300	933	93
Hemlock, West Coast..	1733	300	1200	100
Larch, Western.....	1800	325	1466	133
Pine, Idaho White, Lodgepole, Sugar, Ponderosa, California White and Western Yellow.....	1200	250	1000	113
Redwood	1600	250	1333	93
Spruce, Sitka.....	1466	250	1066	113
Spruce, Engelmann.....	1000	175	800	93

The Basic Working Stresses for Clear Wood of Structural Sizes in the above Table, and Allowable Stresses in Tables I and

II of Section 2503 are based on the strength of "green" or unseasoned wood.

The reasons for this are that while seasoning of lumber has been found by the Forest Products Laboratory to bring about an increase in strength (in some cases to twice that of green lumber) due to the stiffening and strengthening of the wood fibers there occurs at the same time some decrease in strength due to checking and splitting. These changes are approximately equal in members over 4 inches thick. (For discussion of members 4 inches thick or less, see Physical Characteristics—Size of Piece, below).

2. Physical Characteristics—

(a) Size of Piece.

In dimension sizes, four inches and less in thickness, the development of defects during seasoning does not decrease the strength as much as seasoning increases the strength; and hence for these sizes used in dry locations, higher working stresses in extreme fiber in bending can be permitted with the same sized defects as in pieces of larger size; or greater defects can be permitted with the same working stresses.

This factor has been taken into account in the Structural Lumber Grades and the Structural Grade Examples. In assigning working stresses for Yard Lumber and Other Lumber it is automatically provided for by comparing the Grade of lumber to be used with the Grade Examples for "Common" Structural Material in the American Lumber Standards. Consequently this factor needs no other consideration in assigning working stresses.

(b) Effect of Density.

The strength of wood varies with the density or specific gravity of the wood. In three species of wood, Douglas fir, Western larch and Southern pine, the characteristics of growth are such that it is possible to determine fairly accurately by visual inspection the relative density of the wood. This is done by estimating on one end of the piece of wood, the proportion represented by the summerwood (darker portion of annual ring). The exact method of determining the proportion of summerwood is given in the American Lumber Standards.

Where this proportion exceeds 33 1/3 per cent and the rate of growth is six or more rings per inch, the piece may be used at a working stress 1/6 greater than otherwise, for extreme fiber in bending, compression parallel and perpendicular to grain, and for shear.

(c) Effect of Rate of Growth.

Many thousands of government experiments have shown that, in most species, lumber cut from trees of medium or slow rate of growth is stronger than lumber cut from trees of the same species but which had either a rapid growth, or an extremely slow rate of growth.

This factor is taken into account in the Grade Examples of American Lumber Standards covering the higher Grades of

"Structural material" but not in the Grade Examples for "Common" Structural.

Therefore, in assigning working stresses to "Yard Lumber" the Building Inspector need not take this rate of growth factor into account; although if the material conforms to the close grain rule of the lumber association under whose rules it is graded, 1/15 greater stress values may be assigned such lumber for extreme fiber in bending and for compression parallel and perpendicular to grain.

(d) Effect of Knots.

In dimension sizes the knot is likely to run directly through the piece (the ends of the knot showing on the wide faces of the piece) and the strength of the piece when used on edge, as affected by a knot on a wide face, is measured by the square of the effective depth of the piece, assuming the knot in its worst position, i. e., near the edge of the piece. The reduction in strength due to the knot is approximately twice the ratio of the size of the knot to the width of the face.

The sizes of knots permitted in the Grade Example for "Common" Structural Material for Joist and Plank are based on the above principle and the recommended Basic Working Stresses shown in Table II assume that knots of the size permitted may occur at any point on the wide face near the edge of the piece.

Therefore, a Grade of "Yard Lumber" which limits the sizes of knots to those permitted in "Common" Structural material should be allowed 100 per cent of the stresses shown in Table II insofar as the effect of knots is concerned.

Suppose, however, it was desired to use a Grade of "Yard Lumber" where the knots near the edge were larger than those permitted for "Common" Structural Material. For illustration, assume a 2"x12" joist with a 4" knot near the edge of the wide face.

For "Common" Structural Material the reduction in strength (from the strength of clear lumber) due to a knot is approximately twice the ratio of the size of the knot permitted (3 inches in a 12 inch joist) to the width of the face (12 inch) or; reduction in strength—2 times $3/12$ —50 per cent. Stated in other words this means the piece is 100 per cent the strength of clear lumber minus 50 per cent or 50 per cent of the strength of clear lumber. In the case of the joist with a 4 inch knot the reduction in strength would be 2 times $4/12$ or 66 $2/3$ per cent. This means the piece is 100 per cent minus 66 $2/3$ per cent or 33 $1/3$ per cent of the strength of clear lumber. Therefore, the ratio of the strength of lumber used to strength of "Common" Structural material would be 33 $1/3$ divided by 50 or 67 per cent. This figure must be taken into consideration in determining the unit working stresses to be assigned to the particular piece or Grade of lumber to be used.

As noted above, this method of determining relative strength is approximate and applies to dimension sizes (2 inches and under 5 inches thick) only. The method gives an error on the safe side in determining the relative strength of a piece with a larger knot than is permitted in the Grade to which it is compared.

The relative effect of knots should be compared only in pieces of the same widths since large knots have a greater proportional effect than smaller knots.

For timbers (5 inches thick and thicker in least dimension) it is recommended that no Grade of lumber be permitted in which the knots exceed those shown in the Grade Example for "Common" Structural material in the American Lumber Standards.

(e) Effect of Shakes and Checks.

A "shake" is a lengthwise separation of the wood, which occurs usually between and parallel to the rings of annual growth.

A "check" is a lengthwise separation of the wood, which occurs usually across the rings of annual growth.

Shakes and checks usually increase in size and effect as the lumber becomes drier. They chiefly influence the strength of a member in horizontal shear.

Lumber which is thoroughly dry will show the maximum shakes or checks which will develop. It is impracticable to limit the use of lumber in buildings to fully seasoned material; consequently arbitrary limits in the size of shakes or checks for both green and seasoned lumber have been established in the various "Structural" Grades. These vary, according to species of wood, from "none" to the maximum permitted under American Lumber Standards.

When "Yard Lumber" or "Other Lumber" is used it is necessary to determine by inspection the extent of shakes or checks. If it is found that they exceed the following limits the lumber should be rejected for load-bearing purposes.

MAXIMUM LIMITS FOR SHAKES OR CHECKS AS SET FORTH IN GRADE EXAMPLES FOR "COMMON" STRUCTURAL MATERIAL IN AMERICAN LUMBER STANDARDS

Use for Which Intended	Maximum Limits for Shakes or Checks	
	Green	Seasoned
Joist and Plank.....	4/10 width of end	4/ 9 width of end
Beams and Stringers.....	4/10 width of end	4/ 9 width of end
Posts and Timbers.....	1/ 2 width of end	6/10 width of end

(f) Effect of Slope of Grain.

The following definition is quoted from American Lumber Standards—"Cross-grained wood is that in which the cells or fibers do not run parallel with the axis, or sides of a piece."

The slope of grain of a piece of wood can be determined by observing the direction of surface checks, resin ducts, pores of the wood, etc. Slope of grain is expressed as—1 in. in a length of 10 in.—or sometimes as 1 in 10. It may be measured by using one edge of the piece of lumber as a base-line and determining the number of inches along this base-line from the point where any fiber leaves the base-line to the point where the fiber is 1-in. from the base-line. Slope of grain provisions are not customarily included in Grading Rules for Yard Lumber. It is

essential to know the Slope of Grain of any piece of lumber before working stresses can be intelligently assigned.

The effect of a slope of grain of 1 in 8, is to make a joist or beam about $1/2$ as strong as it would be if the fibers were parallel with the sides of the piece. The strength of the joists or beam will decrease rapidly from this point as the slope of grain increases. No attempt will be made, here, to evaluate numerically the effect of a slope of grain greater than 1 in 10 which is the maximum slope of grain permitted for "Common" Structural Material in American Lumber Standards.

It is believed sufficient to recommend that no horizontal load-bearing member should be used if the slope of grain exceeds 1 in 8, and that a member having a slope of 1 in 8 be assigned working stresses not exceeding 80 per cent of the stresses shown in Table II.

(g) Effect of Minor Defects.

A "defect" is defined in the American Lumber Standards as "any irregularity occurring in or on wood that may lower some of its strength, durability or utility values." Defects are listed in American Lumber Standards. The use of the word "defect" is somewhat misleading when applied to a Grade of lumber since the basis on which Grades are prepared is the presence of "defects" and what might be a "defect" in "clear" lumber would not necessarily be a defect, as the term is ordinarily used, in "Common" lumber.

The principal "defects" and their effect on the strength of lumber have been described in the preceding paragraphs. Other defects are of minor importance insofar as the strength of the lumber is concerned, with the exception of "decay."

The presence of decay in lumber will often reduce the Grade of the lumber and, when the decay is not apparent to the layman, it may seem as though the lumber had been improperly down-graded.

It is difficult to describe decay so that it can be detected with assurance by anyone not entirely familiar with the subject. It is recommended that Building Inspectors require identified lumber of a Grade which does not permit decay, if the lumber is to be used for load-bearing purposes.

No lumber of any kind should be used in permanent buildings if the lumber is known to contain typical decay.

3. Use Conditions—

(a) Purpose of Use.

The purpose for which a piece of lumber is used (i. e., in bending as a beam, joist, or plank, or in compression as a post or column) does not affect the strength of the piece. But there is a relation between the "Purpose of Use" and the influence of defects on the strength of the piece. The influence of knots, slope of grain, etc., on the strength of a beam, joist, or stringer is different than on a post or column. It will be recalled from "(d) Effect of Knots," that in addition to this "Purpose of Use" factor the size of the piece also has a relation to the influence of knots on its strength. It is for this reason that sizes or limitations of defects are varied in each Grade of Structural Lumber

in accordance with the "Purpose of Use" for which it is intended. The varying effects which knots have on members used for any of these purposes has been considered in establishing the working stresses permitted in Table I, and the Building Inspector need only be sure that the working stress assigned is selected from the proper column of Table I when "Structural Lumber" is used. (For beams, joists and plank, the working stresses should be taken from the columns headed, "Bending," "Horizontal Shear," and "Modulus of Elasticity." The stresses for posts and timbers should be taken from the column headed "Compression Parallel to Grain.")

In assigning safe working stresses to Grades of "Yard Lumber" or "Other Lumber" in conformance with Section 2503, the same principle (limitation of defects in accordance with the purpose for which the member is used) must be applied. This is accomplished by comparing the "Yard Lumber" Grade or the "Other Lumber" quality in question with the proper joist and plank, beam and stringer, or post and column specification in the Grade Example for "Common" Structural material, and selecting from Table II the stress under the corresponding column as the basis of establishing the proportionate allowable stress under the procedure of Section 2503 (b) and (c).

(b) Exposure in Service.

During use, construction material is subject to varying conditions of moisture, from the dry locations of a heated building to the continually wet condition of some pier and dock timbers. These conditions must be taken into account in recommending working stresses.

Since the uses to which lumber is put in buildings customarily provide "Continuously Dry" conditions of exposure, this factor need not be further discussed here except to recommend that in the case of open sheds, open docks, etc., the allowable working stresses be reduced by the Building Inspector in accordance with the recommendations of the Forest Products Laboratory.

(c) Character of Loading.

In determining working stresses, the Forest Products Laboratory has considered both elastic limit and ultimate strength. Elastic limit, however, is more variable and less definite than ultimate strength, and the latter is taken as the more dependable basis for the determination of safe working stresses.

The factor of safety at a given working stress varies materially with the duration of the stress. At the recommended working stresses, the average timber in buildings has a factor of safety of 6 on impact loadings*, 4 under five-minute loads and 2 1/4 under long-time loading, with a minimum factor of safety of 2 on 75 per cent of the pieces under long-time loading, while about one piece in 100 (of a character the carpenter probably would not use) of a very light weight and with maximum defects for the grade, would be expected to break at 1 1/2 times the recommended stress under the full permitted loading of approximately 10 years duration.

*If impact stresses are neglected when less than 100 per cent of the live load producing them, the factor of safety for such loads would be reduced from 6 to a minimum of 3.

Working stress values recommended by the Forest Products Laboratory may be used without allowance for impact up to impact of 100 per cent of loads figured. The ability of timbers to support loads is dependent on the duration of the stress. Tests have demonstrated that the load required to break timbers in several years is about 9/16 of that required to break them in ordinary laboratory tests. When the time is shortened still further, as in impact loading, the load required to break a timber is correspondingly increased. Approximately, this increase is 10 per cent when the time is reduced to 1/10 of the previous time.

This ability of wood to support short-time or intermittent loads to an extent practically twice the amount of long-time or steady loads, offers many opportunities for more efficient use of lumber. In oil derricks, for instance, the rated capacity of a given sized derrick when used in the customary manner, i. e., stressed by intermittent loads, is placed at 50 per cent greater than the designed capacity of the derrick for long-time loads.

Since actual conditions of loading cannot be known when tables of unit working stresses are prepared, the customary assumption is that the loading will be long-time or permanent and all estimates of the strength of lumber for the purpose of assigning working stresses should be, and the stresses allowed by this Code are, on this basis. Where actual conditions of loading are known the working stresses may safely be increased 50 per cent for five-minute loads and 100 per cent for instantaneous or impact loads.

How Grades of Lumber and Timber Are Determined—

Softwood lumber under the American Lumber Standards is classified in three main groups:

- (a) Yard Lumber—for general building purposes.
- (b) Structural Material—for strictly structural purposes.
- (c) Factory and Shop Lumber—for cutting up and re-manufacture.

The Building Inspector is concerned only with Yard Lumber and Structural Material.

"Yard Lumber" is further classified according to the sizes, shapes, and qualities required for ordinary construction and general purpose uses. Appearance, as well as strength, governs such classification.

"Structural Material," on the other hand, is classified almost solely on the basis of strength and stiffness.

The classification of lumber according to its qualities, i. e., strength, stiffness, appearance, etc., is termed "grading" and the rules drawn up governing the limitations of defects or physical characteristics for each specific "grade" of lumber are termed "Grading Rules."

Structural Lumber Grades—

As stated above, the factors determining the grades of Structural Lumber are:

- (b) Density.
- (c) Rate of Growth.
- (d) Size and Location of Knots.
- (e) Shakes and Checks.
- (f) Slope of Grain.
- (g) Minor Defects.

In order to afford a means for selecting lumber for strength, and for assured minimum strength, "structural" grading rules have been developed giving Grades which take into account the strength influencing factors herein discussed, and lumber is now graded at many sawmills into "structural" Grades. The use of lumber of a "structural" Grade permits the assignment of demonstrably safe working stresses and a ready evaluation of the effect of several of the factors referred to above; especially the effect of defects. All these factors have been fully and carefully considered in establishing the working stresses in Tables I and II of Section 2503 and no further consideration of this subject is required of the Building Inspector when "Structural Lumber" is used.

In addition to this many manufacturers now "grade-mark" Structural Lumber so that there can be no doubt as to the quality of the material. Such grade-marks, to be of value, should be accompanied by an Association trade-mark which indicates that the lumber so marked is graded under the supervision of a Lumber Association.

When lumber is graded according to published structural grading rules and is grade-marked for identification the use of the working stresses set forth in Table I, Section 2503, will afford not only assured minimum strength but also the maximum economy that can be obtained if assured minimum strength is desired. While the stresses recommended herein for the lowest structural Grades are somewhat less than many Building Codes have permitted in the past, it is felt that the former methods of assigning allowable stresses to lumber, with little or no attention to the "Grade" of the lumber, were unsound and should be replaced by fundamentally sound methods. The establishing of "Structural" Grades has made it possible to do this and the approval by the U. S. Forest Products Laboratory of working stresses based on such Grades is believed to be sufficient warrant for their use unless or until further information justifies a revision.

Yard Lumber:

"Yard Lumber" as defined in American Lumber Standards means "Lumber that is manufactured and classified into those sizes, shapes, and qualities required for ordinary construction and general purpose uses." This includes most of the lumber carried in retail lumber yard stocks and quite generally used for framing purposes in buildings.

"Yard Lumber" differs from "Structural Lumber" in that it is graded for appearance and general utility as well as strength whereas Structural Lumber is graded primarily for strength. The Building Inspector may approve Yard Lumber and it may be used for load-bearing purposes with entire safety when the factors affecting its strength are known and properly evaluated.

The grading of lumber is not an "exact" science and therefore a certain amount of judgment on the part of the Building Inspector will be necessary in assigning working stresses to "Yard Lumber."

The Building Inspector should use the Grade Example for "Common" Structural Material in American Lumber Standards as the basis of comparison for determining the strength of Yard

Lumber. This permits the assignment of allowable working stresses to Yard Lumber on the same basis as the U. S. Forest Products Laboratory uses for "Structural Material." (See Table II.)

From a practical standpoint the Building Inspector must have at least a general knowledge of or be able to recognize the qualities and Grades of the lumber customarily offered for sale in his city or he must inspect the lumber used, either before or after it is put into the structure, if he desires adequately and intelligently to perform the duties of his office. Grade-marked "Yard Lumber" while it does not afford the safeguards or ease of inspection afforded by "Structural Lumber" can be safely assigned unit working stresses equal to or somewhat less than the Basic Working Stresses in Table II by estimating the effect of the defects in the lumber and comparing them with the defects permitted in the lumber graded in accordance with the Grade Example for "Common" Structural Material. All defects must be considered separately and the worst conditions must govern the working stresses assigned. The method for assigning working stresses to "Yard Lumber" has been explained under the discussion of the factors influencing the strength of Lumber.*

Other Lumber:

This grouping is intended to include all lumber which is not manufactured in accordance with standards of regional lumber manufacturers' associations or those recognized by the U. S. Department of Commerce or other responsible agencies. Such lumber may be cut from the same kind of trees as those from which recognized standard lumber is cut and it may be just as strong as standard lumber. Provision has been made in Section 2503 and Section 2504 for the use of such non-standard lumber, but it should only be permitted after careful visual inspection by the Building Inspector and comparison with the known qualities and strength value of standard lumber.

Grading Rules:

Most of the lumber and timber used in the Western states is graded at the sawmill in accordance with Standard Grading and Dressing Rules of one of the following Associations:

West Coast Lumbermen's Association.

California Redwood Association.

Western Pine Association.

These Grading Rules are based on the provisions of American Lumber Standards as set forth in Simplified Practice Recommendations R16-29 of the U. S. Department of Commerce. They provide a means of knowing to what extent the above mentioned defects are limited within each specified Grade of lumber. They do not, however, assure the user of the lumber that the Grade of lumber specified will be the Grade of lumber used. To provide this assurance the various groups of lumber manufacturers comprising the regional Lumber Manufacturers' Associations have adopted a policy of grade-marking each piece of "Yard Lumber" as well as "Structural Lumber." In some cases the practice of grade-marking may not be practicable and specific

shipments of lumber may be inspected by an Association Inspector and a Certificate of Grade issued by the Association.*

When lumber is either grade-marked or covered by an Association Certificate of Grade the Building Inspector can readily determine the advisability of permitting its use for any specific purpose and can consistently assign working stresses therefor as explained herein. When the lumber is not identified its use should be permitted only after carefully inspecting each piece and estimating the effect of the defects therein.

General Notes:

Working values for horizontal shear are maximum values. The maximum unit horizontal shear at any point in a beam is $\frac{3}{2}$ of the average unit shear obtained by dividing the total shear at that point by the area of the cross section. To get the total safe shearing stress at any cross section, the area of the cross section should be multiplied by $\frac{2}{3}$ the maximum allowable horizontal shear. To obtain the required area to carry any given shear, the total shear should be divided by $\frac{2}{3}$ the maximum allowable unit shear.

Recognition of all loads in designing for loads concentrated near a support, or for moving loads, gives a calculated shearing stress higher than is actually developed.

(a) For concentrated loading, in calculating the shear at one end of a beam, the loads between that end and the nearer quarter point, or between that end and a point distant three times the depth of the beam from it, whichever would be the lesser distance from the support, may be considered as acting at that point.

(b) For moving loads, as on highway bridges or railway stringers, in computing the shear at one end it is safe to ignore the wheel loads between that end and the nearer quarter point, or between that end and a point three times the depth of the beam or stringer from it, whichever would be the lesser distance from the support, when the balance of the span is assumed to be loaded so as to give a maximum shear stress.

Straight grained wood has greater resistance to tension than to any other kind of stress. It has been found, however, practically impossible to design joints that will develop anywhere near the full tensile strength.

Stresses for Species Not Given in this Code:

Where the Building Code is adopted by cities where species of lumber other than those for which working stresses are given herein are used, care should be exercised to provide for such other species and to show the allowable unit stresses for them. Such information can be secured by communicating with the National Lumber Manufacturers' Association, Transportation Building, Washington, D. C.

Refer to Sec. 2504. In former editions of this Building Code tables were incorporated showing the safe loads in pounds per square inch of cross section area of square and rectangular

*For a complete discussion of the subject of "Structural Grades of Lumber and Method of Their Derivation" see Bulletin 314 of the American Railway Engineering Association—pages 1206 to 1224.

timber columns. The values given in these tables were determined by solving the Forest Products Laboratory formula given in Section 2504.

The tables given in former editions of this Code were incomplete insofar as certain species of lumber were concerned and rather than extend those tables in this edition they have been omitted. Such tables for all species can be obtained upon request from the National Lumber Manufacturers' Association, Transportation Building, Washington, D. C.

Refer to Sec. 2511. The following provisions are recommended for inclusion in the Code in territories subject to termite attack. These recommendations have been made by the Termite Investigations Committee of California after several years of study and a comprehensive test program.

ORDINANCE ON CONSTRUCTION PRACTICES

(a) Before any new building is erected all stumps and roots shall be removed from the soil to a depth of at least twelve (12) inches below the surface of the ground in the area to be occupied by the building.

(b) The exterior walls of, and all wood posts supporting girders in, wood frame buildings over four hundred (400) square feet in area shall be placed on masonry or concrete foundation walls or piers.

(c) All masonry for foundation purposes shall be laid in Portland Cement mortar. Portland Cement mortar shall be composed of one part of cement and three parts of sand by volume with an allowable addition of lime putty or hydrated lime of not more than fifteen (15) per cent by volume of the cement content.

(d) The top of every masonry or concrete foundation wall or pier which supports and is in contact with wood construction of any kind shall be not less than six (6) inches above the final grade level or finished surface of any ground adjacent thereto (except as provided in the case of slabs). Masonry or concrete foundation walls shall in all cases extend at least as high as the top of any adjacent concrete or masonry slab which is supported by either natural ground or an earth fill.

(e) Floor joist shall have a clearance of not less than eighteen (18) inches between the bottom of the joists and the surface of the ground underneath. The ground underneath floor joists shall be leveled or smoothed off so as to maintain a reasonably even surface under the entire area covered by the floor joists.

(f) All wood sills, including mudsills and sole plates, which are placed directly on the ground or on masonry or concrete foundations, shall be of the grade and kind of lumber specified in paragraph (i).

(g) Wood sleepers or similar floor supports when placed directly on masonry or concrete which is in contact with the ground shall be of the grade and kind of lumber specified in paragraph (i).

(h) All wood members used to permanently support a load of any kind, in buildings over four hundred (400) square feet

in area, shall be of the grade and kind of lumber specified in paragraph (i) when any part of such member is placed within six (6) inches of any earth, either natural ground or earth fill.

(i) Lumber permitted in the above locations shall have physical properties equal to those of No. 1 common all-heart grade of either Port Orford cedar, Western red cedar or cypress; the Heart Common grade of redwood; or the No. 1 Common grade of any lumber which is pressure-treated by an empty cell process with a final retention of not less than eight (8) pounds of No. 1 grade of coal tar creosote per cubic foot of wood; grade of creosote and method of treatment to be in accordance with Specifications of the American Wood Preservers' Association. Such treated lumber shall show a penetration of creosote of not less than one-quarter ($\frac{1}{4}$) inch at any point.

(j) Wood posts or columns shall not extend through or be placed directly on concrete floors. They shall be supported on concrete footings extending at least two (2) inches above the finished floor or may be placed on a corrosion-resisting metal plate at least one-sixteenth ($\frac{1}{16}$) of an inch thick and not smaller than the base of the post or column. Such plate may be flush with the concrete floor.

(k) Where timbers extend into a masonry wall at a point below the level of the ground outside of the wall, metal wall boxes shall be provided or the end and all surfaces of the timber within one (1) foot of the end shall be painted with at least two (2) coats of hot coal tar creosote or other approved wood preservatives.

(l) Openings through foundation walls or exterior walls shall be provided for cross ventilation of the space below the first floor in every building in which the first floor is of wood frame construction. There shall be one opening at least two (2) square feet in net area within five (5) feet of every corner of the exterior walls of the building and there shall be two (2) square feet of opening for each twenty-five (25) lineal feet or major fraction thereof of exterior wall, provided, however, that such openings need not be placed in the front wall of the building.

(m) All wood forms which have been used in placing concrete, if within the ground or less than eighteen (18) inches above the ground, shall be removed before a building is occupied or used for any purpose.

(n) Loose or casual wood shall not be stored in direct contact with the ground under any building.

Refer to Sec. 2601. The requirements in Chapter 26 are based upon the recommendations of the "Joint Committee." The water-cement ratio method of proportioning concrete as outlined in Section 2606 is based upon a wide range of tests and experiences and has been found to be the best method of proportioning concrete. It should be noted, however, that the actual strength of the concrete is the ultimate measure to be used in design.

Refer to Sec. 2701. The requirements for steel construction incorporated in Chapter 27 follow the recommended practice of the American Institute of Steel Construction.

The inspection and tests noted in Section 2701 should not

necessarily be required where the mill tests of the steel may be readily obtained.

Refer to Sec. 4602. The following list includes all of the documents included in the Uniform Building Code in the order in which they occur. The S. D. reference at the end of each document name refers to the book Specification Documents:

1. Suggested Ordinance Regulating the Use, Handling, Storage and Sale of Flammable Liquids and the Products Thereof, adopted by the National Fire Protection Association, May, 1926; reprint of 1929. (S. D. page 373.)
2. Standard Methods of Testing Brick, A. S. T. M. Designation C67-31 of the American Society for Testing Materials. (S. D. page 129.)
3. Standard Specifications for Building Brick, A. S. T. M. Designation C62-30 of the American Society for Testing Materials. (S. D. page 119.)
4. Standard Specifications for Sand-Lime Building Brick, A. S. T. M. Designation C73-30 of the American Society for Testing Materials. (S. D. page 127.)
5. Standard Specifications for Concrete Building Brick, A. S. T. M. Designation C55-34 of the American Society for Testing Materials. (S. D. page 121.)
6. Standard Specifications for Tests of Concrete Block or Tile, Serial Designation P-1A-29 of the American Concrete Institute. (S. D. page 139.)
7. Underwriters' Laboratories' Standard for Hollow Concrete Building Units, February 21, 1929. (S. D. page 136.)
8. Standard Specifications for Gypsum Partition Tile or Block, A. S. T. M. Designation C52-33 of the American Society for Testing Materials. (S. D. page 112.)
9. Standard Specifications for Gypsum and Calcined Gypsum, A. S. T. M. Designations C22-25 and C23-30, respectively, of the American Society for Testing Materials. (S. D. pages 95-97.)
10. Tentative Specifications and Tests for Hollow Burned-Clay Load-Bearing Wall Tile, A. S. T. M. Designation C34-34T of the American Society for Testing Materials. (S. D. page 133.)
11. Tentative Specifications for Quicklime for Structural Purposes, A. S. T. M. Designation C5-34T of the American Society for Testing Materials. (S. D. page 151.)
12. Standard Specifications for Hydrated Lime for Structural Purposes, A. S. T. M. Designation C6-31 of the American Society for Testing Materials. (S. D. page 153.)
13. Standard Specifications and Tests for Portland Cement, A. S. T. M. Designation C9-30 of the American Society for Testing Materials. (S. D. page 15.)
14. Tentative Standard Specifications and Tests for

High Early Strengths Portland Cement, A. S. T. M. Designation C74-30T of the American Society for Testing Materials. (S. D. page 11.)

15. Standard Method of Test for Organic Impurities in Sands for Concrete, A. S. T. M. Designation C40-33 of the American Society for Testing Materials. (S. D. page 66.)

16. American Lumber Standards as set forth in "Simplified Practice Recommendations, R16-29" of the United States Department of Commerce, July 1, 1929. (S. D. page 257.)

17. Standard Specifications for Billet-Steel Concrete Reinforcement Bars of Structural, Intermediate or Hard Grade, A. S. T. M. Designation A15-33 of the American Society for Testing Materials. (S. D. page 72.)

18. Standard Specifications for Rail Steel Concrete Reinforcement Bars, A. S. T. M. Designation A16-33 of the American Society for Testing Materials. (S. D. page 77.)

19. Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement, A. S. T. M. Designation A82-34 of the American Society for Testing Materials. (S. D. page 80.)

20. Standard Methods of Making and Storing Specimens of Concrete in the Field, A. S. T. M. Designation C31-33 of the American Society for Testing Materials. (S. D. page 85.)

21. Standard Methods of Making Compression Tests of Concrete, A. S. T. M. Designation C39-33 of the American Society for Testing Materials. (S. D. page 89.)

22. Standard Specifications for Structural Steel for Buildings, A. S. T. M. Designation A9-34 of the American Society for Testing Materials. (S. D. page 185.)

23. Standard Specifications for Steel Castings, A. S. T. M. Designation A27-24 of the American Society for Testing Materials. (S. D. page 201.)

24. Tentative Specifications for Gray Iron Castings, A. S. T. M. Designation A48-32T of the American Society for Testing Materials. (S. D. page 214.)

25. American Welding Society Bulletin No. 2, published December, 1921. (S. D. page 206.)

26. A Standard Ordinance for Chimney Construction Recommended by the National Board of Fire Underwriters, Third Edition, Revised 1927. (S. D. page 451.)

27. Regulations for the Construction and Installation of Oil Burning Equipments and for the Storage and Use of Oil Fuels in Connection Therewith, Recommended by the National Fire Protection Association, Edition of 1934. (S. D. page 486.)

28. Regulations for the Installation of Sprinkler Equip-

ments, Recommended by the National Fire Protection Association, Edition of 1931. (S. D. page 402.)

29. Safety Code for Elevators of the American Engineering Standards Committee, published July, 1925. (S. D. page 481.)

30. Standard Specifications for Fire Tests of Building Construction and Materials, A. S. T. M. Designation C19-33 of the American Society for Testing Materials. (S. D. page 365.)

31. Underwriters' Standard for Tin-Clad Fire Doors and Shutters, Edition of March, 1926, and July, 1927; revised 1933. (S. D. page 347.)

32. Regulations of the National Board of Fire Underwriters for the Protection of Openings in Walls and Partitions Against Fire, Recommended by the National Fire Protection Association, Edition of 1930. (S. D. page 295.)

33. Specifications for Class C roof coverings of the Underwriters' Laboratories, Inc. (S. D. page 469.)

34. Standard Specifications for Keene's Cement, A. S. T. M. Designation C61-30 and C26-33 of the American Society for Testing Materials. (S. D. pages 102-116.)

35. Commercial Standard CS, 31-31 of the U. S. Department of Commerce, Bureau of Standards. (S. D. page 291.)

36. Standard Methods of Testing Felted and Woven Fabrics Saturated With Bituminous Substances For Use in Waterproofing and Roofing. A. S. T. M. Designation D146-27 of the American Society for Testing Materials. (S. D. page 473.)

Refer to Chapter 47. The following provisions are recommended for inclusion in the Code where complete plastering provisions are desired.

CHAPTER 47—PLASTERING—INTERIOR AND EXTERIOR

Sec. 4701. It shall be unlawful for any person to do or cause to be done any lathing or plastering, or any alteration of lathing or plastering in or upon any building or structure unless such lathing or plastering is done in the manner and of the materials hereafter specified in this Section, and in addition thereto, whenever plastering is required for fire protection it shall also comply with the provisions of Chapters 42 and 43.

The Building Inspector, upon notification from the permit holder or his agent, shall make the following inspections of lathing and plastering and shall either approve that portion of the construction as completed or shall notify the permit holder or his agent wherein the same fails to comply with the law:

1. After all lathing, interior and exterior, is in place and all plastering materials are on the job.
2. Seven (7) to ten (10) days after exterior walls have received second coat of stucco. The exact time of the

second inspection shall be at the discretion of the Building Inspector.

3. Final inspection of finished interior and exterior plastering.

Tests. The Building Inspector or his deputy is hereby authorized to make or cause to be made tests of plastering materials or lathing, and may require a complete analysis of samples of completed plastering or stucco. In case of dispute as to the thickness of the plastering, authority is given the Building Inspector or his deputy to make holes in the wall for the purpose of determining the thickness of the plaster. Such holes are not to be made unless it is necessary and are to be made only in the presence of the plastering contractor or the permit holder.

Sec. 4702. Wood lath shall be equal to No. 1 grade Douglas fir, spruce, cedar, redwood, pine or western hemlock, and shall be reasonably clear, evenly manufactured and free from detrimental defects. A few wormholes, small pitch pockets, well set or firm knots not more than three-fourths ($\frac{3}{4}$) inch in diameter and not bunched, and wane not more than one-third the thickness, width or length and not in combination with any other defect shall be permitted in wood lath. Wood lath shall measure not less than five-sixteenths ($\frac{5}{16}$) inch nor more than three-eighths ($\frac{3}{8}$) inch in thickness, not less than one and three-eighths ($1\frac{3}{8}$) inches nor more than one and five-eighths ($1\frac{5}{8}$) inches in width, and not more than one-fourth ($\frac{1}{4}$) inch less than four (4) feet in length. Each lath shall be nailed with 3d fine blued nails to a stud, joist or other support at each end thereof and at points not more than sixteen (16) inches apart along the length of such lath. Nails shall be driven full length. For lime plaster laths shall be spaced not less than three-eighths ($\frac{3}{8}$) inch and not more than one-half ($\frac{1}{2}$) inch apart, and for gypsum plaster not less than one-quarter ($\frac{1}{4}$) inch and not more than three-eighths ($\frac{3}{8}$) inch apart. Joints at the ends of laths shall be broken at least every eighth lath and not less than six (6) laths shall constitute a break. Studs, joists, or other supports for lathing shall be spaced at not to exceed sixteen (16) inches on center. No vertical or diagonal lathing or crooked or warped lath shall be used.

Approximately eight (8) hours before being nailed in place such lath shall be thoroughly soaked and kept damp until plaster is applied thereto.

It shall be unlawful to apply any interior wood lath until all exterior framing has been covered. All coves, bull noses and interior angles shall receive a strip of metal reinforcement before any plastering is applied. A strip of metal reinforcement shall also be used where masonry and wood join.

Sec. 4703. Wherever plaster lath is used it shall be composed of gypsum, wood and manila fibre, or of other similar materials; provided, that not less than eighty-five per cent (85%) by weight of such composition shall be of incombustible material.

Such plaster lath shall be not less than five-sixteenths ($\frac{5}{16}$)

**Gypsum
Plaster
Lath**

inch in thickness and shall be spaced one-quarter ($\frac{1}{4}$) inch apart horizontally and vertically and each joint broken. Such lath shall be not less than three-eighths ($\frac{3}{8}$) of an inch thick when used as required in Section 4302.

On wood joists, furring strips, studding or other wood supports the plaster lath shall be securely fastened by means of nails of sufficient length to extend at least three-fourths ($\frac{3}{4}$) inch into the joists, furring strips, studding or other supports. Such nails shall be spaced or driven not more than six (6) inches apart in one direction and sixteen (16) inches apart in the opposite direction. Where the furring strips, studs or other supports are of metal the plaster lath shall be securely fastened to the same with galvanized iron wire of not less than sixteen (16) W. & M. gauge or with twenty (20) U. S. gauge metal clips spaced the same as required for nails. All wire nails used for fastening plaster lath shall be at least number thirteen (13) W. & M. gauge with flat heads not less than three-eighths ($\frac{3}{8}$) inch in diameter.

It shall be unlawful to apply any interior plaster lath until all exterior framing has been covered. All coves, bull noses and interior angles shall receive a strip of metal reinforcement before any plastering is applied. A strip of metal reinforcement shall also be used where masonry and plaster lath join.

Fibre Board Lath

Sec. 4704. Any fibre board lath or other similar board lath which is equivalent to plaster board lath in strength, durability and bond may be used as a base for backing for plastering provided the type of such board lath shall have first been approved by the Building Inspector and all such board lath shall conform strictly to the type so approved.

Such approved board lath may be used wherever wood lath is permitted but shall not be used in substitution for plaster board lath or metal lath wherever such plaster board lath or metal lath are specifically required.

When fibre board lath is used it shall be applied in conformity with the provisions of Section 4703 for plaster board lath.

Metal Lath

Sec. 4705. 1. Interior Metal Lath. Interior metal lath shall be either ingot iron, rust-resisting alloy, galvanized or coated with an approved preservative material. Metal lath used on walls and ceilings shall be of a weight not less than that shown in the following table:

Spacing of Supports	Weight per square yard in pounds	
	For Walls	For Ceilings
12"	2.5	2.75
16"	2.75	3.4

Metal lath shall be lapped at least one (1) inch and shall be tied at joints in at least one place between supports. The tie wire used to attach and tie metal lath shall be not less than eighteen (18) W. & M. gauge. Metal lath shall be secured to

wood studs with not less than 4d wire nails driven to at least seven-eighths ($\frac{7}{8}$) inch penetration and the remaining portion of the nail bent up to engage at least one strand of fabric and must be bent in such a manner as to not break the strands.

Metal lath when applied to metal supports shall be fastened thereto with not smaller than eighteen (18) W. & M. gauge galvanized annealed wire or by metal clips of equivalent strength.

2. Exterior Metal Lath. Exterior metal lath shall weigh not less than three and four-tenths (3.4) pounds per square yard, and shall be galvanized, rust-resisting alloy, ingot iron or double coated with an approved preservative material. Such dip shall be alkali-resisting and shall be lime and acid proof. Metal lath shall be lapped not less than one (1) inch at each joint and shall be kept not less than one-quarter ($\frac{1}{4}$) inch away from all backing and supports by galvanized or blued furring nails, galvanized metal furring clips or other equivalent means of furring; provided, that when self-furring metal lath is used such furring nails, clips or other equivalent means of furring shall not be required. All metal shall be held in place by means of galvanized or blued nails not smaller than 4d in size or by means of galvanized staples not less than one (1) inch in length made of not smaller than fourteen (14) W. & M. gauge wire, or by any other approved method of equivalent strength.

Nails for holding metal lath in place shall be driven to approximately three-fourths ($\frac{3}{4}$) penetration and bent over one or more strands or its equivalent of such metal lath. Staples, furring nails, furring clips, or other methods of fastening metal lath shall develop a strength equivalent to the nails hereinbefore specified in this Section. No fastening of any kind for metal lath shall be cracked, broken or otherwise defective.

Metal lath shall be nailed or stapled to wood studs, joists or other supports or tied to metal supports at points not to exceed six (6) inches on center along such studs, joists or other supports.

Sec. 4706. Each suspended ceiling and each portion thereof shall be constructed and supported as hereinafter in this Section provided. **Suspended Ceilings**

The main runners or other supports for any suspended ceiling shall consist of steel channels, steel angles or steel tees, not smaller than one (1) inch in vertical depth when in place and weighing not less than four hundred forty-two (442) pounds per one thousand (1000) linear feet, or other structural members of equivalent strength.

Such main runners or other supports shall be spaced at not more than four (4) feet on centers and shall be supported by galvanized steel wire hangers not smaller than eight (8) W. & M. gauge spaced at not more than four (4) feet on center. Such wire hangers shall be securely fastened to the structural framing, masonry or concrete with approved metal clips or approved bolts and nuts, or such wire hangers shall be embedded in such

structural framing, masonry or concrete. Such wire hangers shall be secured to such main runners or other supports by wrapping each such wire hanger a full turn around the main runner or other support and twisting such wire hanger together over the top edge of the main runner or other support so as to develop the full strength of the wire.

The under side of such main runners or other supports shall be cross furred with steel channels which shall be not less than three-fourths ($\frac{3}{4}$) inch in vertical depth when in place and shall weigh not less than two hundred seventy-six (276) pounds per one thousand (1000) linear feet, and which shall be spaced at not more than twelve (12) inches on center. Each such three-quarter ($\frac{3}{4}$) inch channel shall be fastened to each main runner or other support directly above same by means of not smaller than sixteen (16) W. & M. gauge galvanized annealed wire wrapped around both members with a double turn and twisted securely together. Each main runner and cross furring channel shall be straight and true and shall be maintained in that condition until the finished ceiling has been applied. Any metal lath applied to such three-quarter ($\frac{3}{4}$) inch channels shall be of the quality and weight and shall be applied in the manner specified in Section 4705 for metal lath applied to metal supports.

Nothing contained in this Section shall be deemed or construed to prohibit the use of any other material or method of construction for any suspended ceiling in the event that such other material or method of construction is the equivalent of the material or method of construction hereinabove specified; and in the further event that such other material or method of construction shall have been first approved by the Building Inspector.

Each suspended ceiling, and each portion thereof, shall be constructed so as to be capable of sustaining a live load of not less than ten (10) pounds per square foot, in addition to all dead loads, without any deflection, settlement or distortion which will materially affect the strength, durability or safety thereof.

Whenever in the opinion of the Building Inspector any suspended ceiling or any portion thereof is not capable of sustaining such live and dead loads as hereinabove in this Section required the Building Inspector may require the owner, contractor, sub-contractor or other person constructing or causing to be constructed the suspended ceiling or any portion thereof to test or cause to be tested such suspended ceiling, or any portion thereof, with a load test of not less than twenty (20) pounds per square foot, and it shall be unlawful for any such owner, contractor, sub-contractor or other person to fail, refuse or neglect to make such load test within the time specified.

The load test hereinabove provided for may also be required on any altered or reconstructed portion of any existing suspended ceiling.

Sand

Sec. 4707. All sand used for making plaster for any building or structure shall be clean, sharp, abrasive sand and shall

not contain more than three per cent (3%) by weight of deleterious matter such as clay, loam and/or silt. In the test for organic matter the sodium hydroxide solution shall not be darker in color than the color indicated in the Standard Method of Test for Organic Impurities in Sands for Concrete, A. S. T. M. Designation C40-27 of the American Society for Testing Materials.

All the sand shall pass a No. 4 sieve and not more than eighty per cent (80%) and not less than sixty per cent (60%) shall pass a No. 20 mesh sieve, and not more than thirty-five per cent (35%) and not less than fifteen per cent (15%) shall pass a No. 40 mesh sieve. All remaining on the No. 4 sieve shall be considered gravel.

The sand shall be of such quality that when mixed in the proportion of one part Portland cement to two parts of sand the mortar shall develop a tensile strength of not less than two hundred ten (210) pounds per square inch at the age of ten (10) days.

Sec. 4708. Lime putty used for making plaster shall be made from fresh quicklime conforming to the Tentative Specifications for Quicklime for Structural Purposes, A. S. T. M. Designation C5-34T of the American Society for Testing Materials, or hydrated lime conforming to the Standard Specifications for Hydrated Lime for Structural Purposes, A. S. T. M. Designation C6-31, of the American Society for Testing Materials.

Lime

Quicklime shall be well slaked, run through a No. 16 screen, stored and protected in an approved manner for the time recommended in the manufacturers' specifications.

Sec. 4709. Any metal reinforcing material, woven wire netting, expanded metal fabric or welded wire fabric used for exterior stucco or for any interior or exterior plaster reinforcing shall be galvanized or coated with an approved preservative material, which coating shall be alkali resisting and shall be lime and acid proof. Plaster reinforcing shall be furred and fastened in place in the same manner as required herein for metal lath and shall have a mesh not exceeding two (2) inches in width and four (4) inches in length and each such mesh shall have an area of not more than six (6) square inches. Such metal reinforcing material, woven wire netting, expanded metal fabric or welded wire fabric shall weigh not less than one and five-tenths (1.5) pounds per square yard. When woven wire netting is used it shall be not less than sixteen (16) W. & M. gauge wire; provided, however, that a wire netting composed of eighteen (18) W. & M. gauge wire woven with a one (1) inch mesh and weighing not less than one and six-tenths (1.6) pounds per square yard may be used. All plaster reinforcing covered by this Section shall be lapped not less than two (2) inches.

**Plaster
Rein-
forcing**

Sec. 4710. Keene's cement shall have a tensile strength of not less than four hundred fifty (450) pounds per square inch, seven days in the air and shall conform to the Standard Speci-

**Keene's
Cement**

fications for Keene's Cement, A. S. T. M. Designation C61-30 and C26-30 of the American Society for Testing Materials.

Portland Cement

Sec. 4711. All Portland cement used for making plaster shall conform to the Standard Specifications and Tests for Portland Cement, A. S. T. M. Designation C9-30 of the American Society for Testing Materials. The Building Inspector may require tests of cement used, when, in his judgment, the cement does not comply with this ordinance.

Water-proof Paper and Metal Flashing

Sec. 4712. In all cases where plastering or stucco is applied to the exterior of a wood frame building such wood frame shall be covered with a substantial waterproof paper as hereinafter described in this Section.

Wherever in this Section waterproof building paper is required, a substantial waterproof building paper which successfully passes the fifty (50) pound Mullen test shall be used.

Wherever such paper is used it shall be applied so as to readily shed water and care must be exercised in the application of such paper. All corners and returns shall be carefully shingled with such paper and there shall be no holes or breaks in the paper. Horizontal joints shall be lapped not less than two (2) inches and vertical joints not less than six (6) inches beyond the stud on the weather side, except sheet lath, which shall be lapped not less than four (4) inches, and such paper shall be nailed to the backing with wire nails of not less than eleven (11) W. & M. gauge having a flat head of not less than three-eighths ($\frac{3}{8}$) inch in diameter. Such paper shall be nailed to the structural backing at points spaced at not more than twelve (12) inches on center vertically and sixteen (16) inches on center horizontally.

Provided, that any reinforced waterproof paper which is reinforced with metal in the process of manufacture, such reinforcement being in accordance with requirements of Section 4709 for plaster reinforcing, shall be lapped not less than two (2) inches horizontally and four (4) inches vertically.

Where sheathing or similar backing is not used an eighteen (18) W. & M. gauge or larger wire stretched taut horizontally across the stud frame at not more than six (6) inches on center vertically shall be securely fastened in place before the paper is applied; provided, that where such paper is fastened to the metal reinforcing in such a manner as not to affect the waterproofing qualities of such paper the wire need not be installed. Where the building is sheathed with wood, fibre board or plaster board sheathing the waterproof paper shall be applied on the outside of such wood, fibre board or plaster board sheathing.

All exterior openings exposed to the weather shall be thoroughly and effectively flashed with metal flashing in such a manner as to make them waterproof. All copings and parapet walls shall be thoroughly flashed with metal in a manner approved by the Building Inspector. Wherever metal flashing is required it shall consist of not less than sixteen (16) ounce copper or twenty-six (26) gauge galvanized iron or lead coated

or asphaltum dipped metal not less than twenty-six (26) gauge, such coating or dipping to be rust-resisting.

Sec. 4713. Except when applied to tile, masonry or concrete, all exterior hand plastering or stucco shall be three (3) coat work and shall be reinforced with metal lath or metal plaster reinforcing as specified in Sections 4705 and 4709.

**Exterior
Hand
Plastering
or
Stucco**

First Coat. The first coat shall consist of one part of Portland cement to not more than three and one-half parts of sand by volume, to which may be added slaked or hydrated lime or approved brands of diatomaceous silica in an amount not to exceed ten per cent (10%) by volume of cement; provided, that when approved waterproofing materials or compounds are used no hydrated or slaked lime shall be used.

The first coat shall be well forced through all spaces or openings in the metal reinforcing so as to form a good mechanical key and to solidly fill any space between such plaster reinforcing and backing. The first coat shall be thoroughly scored, combed or scratched in two directions at approximately right angles to each other in such a manner as to cause furrows or channels in such first coat, in order to provide a good mechanical bond to receive the second coat of plaster or stucco.

The first coat of plaster shall be kept moist during the first twenty-four (24) hours after it has been applied so that at the end of the period of wetting the plaster will show a thoroughly set and hard condition. The first coat shall have been applied for at least seven (7) days before second coat is applied thereto.

Every first coat of exterior plaster or stucco shall have a minimum thickness of not less than three-eighths ($\frac{3}{8}$) inch measured from the face of the backing. When plaster is applied to tile, masonry or concrete such tile, masonry or concrete shall be thoroughly washed and cleaned before any plaster is applied thereto.

Second Coat. The second coat of exterior plaster or stucco shall consist of one part of Portland cement to not more than three and one-half parts of sand by volume, to which may be added approved waterproofing or fattening compounds as provided for the first coat.

The second coat of plaster shall be applied and rodded and shall be water floated. The second coat shall have a minimum thickness of not less than three-eighths ($\frac{3}{8}$) inch measured from the face of the first coat of plaster. This coat must be kept wet as prescribed for the first coat.

The second coat shall stand for at least ten (10) days before the third coat is applied.

Third Coat. The third or finish coat of exterior plaster or stucco shall be composed of any material or materials approved by the Building Inspector and shall have a minimum thickness of not less than one-eighth ($\frac{1}{8}$) inch measured from the face of the second coat.

The total thickness of the three coats of stucco shall be not

less than seven-eighths ($\frac{7}{8}$) inch in any place measured from the backing; provided, that on three (3) story buildings where sheathing is required, such sheathing may be omitted, provided the stucco is not less than one and one-fourth ($1\frac{1}{4}$) inches in thickness and provided the reinforcement used shall be expanded metal weighing not less than four and five-tenths (4.5) pounds per square yard or welded wire fabric weighing not less than four and three-tenths (4.3) pounds per square yard.

Where corner beads are used on the exterior such corner beads shall be designed as exterior corner beads, shall be the full thickness of the required plaster and shall have metal lath attached thereto forming a cornerite.

Rodded Wall. A wall shall be said to be rodde when a five (5) foot straight edge placed upon the surface of the plaster in any position shall not show more than one-fourth ($\frac{1}{4}$) inch variation in the surface of the plaster at any point along the five (5) foot length of the straight edge. This permissible variation shall not be deemed to affect the thickness of the plaster as required but such plaster shall be the full required thickness at any point.

**Pneumat-
ically
Placed
Stucco**

Sec. 4714. Pneumatically placed stucco shall be deemed to be a mixture of Portland cement and sand mixed dry, conveyed by air through a pipe or flexible tube hydrated at the nozzle at the end of such conveyor and deposited by the air pressure in its place of final repose.

Rebound as applied to pneumatically placed stucco shall be defined as material ejected from the nozzle against a surface from which it rebounds and falls.

Sand used for pneumatically applied stucco shall comply with the requirements for sand for reinforced concrete construction as provided in Section 4707, provided, that the grading may vary from that required for concrete.

Rebound gathered up and screened may be used as sand in the mixture but shall not constitute more than twenty-five per cent (25%) of the total sand contained in any one batch.

Pneumatically applied stucco shall contain not less than one sack of cement to each five (5) cubic feet of sand or gravel used.

Hydrated lime or other approved materials in an amount not to exceed ten per cent (10%) of the volume of the cement may be added to the mixture.

Pneumatically applied stucco shall be applied in not less than two (2) coats to a total minimum thickness of seven-eighths ($\frac{7}{8}$) inch.

Not less than seven (7) days shall elapse between the application of the first and second coats, during which time the first coat shall be sprayed with water and properly cured.

The second coat shall be rodde as provided for the second coat of hand applied stucco. No third coat will be required over the second coat of pneumatically applied stucco.

On buildings where sheathing is required, such sheathing

may be omitted provided the frame is covered with not less than one (1) inch of pneumatically applied stucco reinforced by expanded metal weighing not less than four and five-tenths (4.5) pounds per square yard, or welded wire fabric weighing not less than four and three-tenths (4.3) pounds per square yard. Such pneumatically applied stucco shall be applied in the manner hereinabove specified.

Sec. 4715. Number of Coats Required. Plastering with lime mortar shall be three-coat work when applied over metal lath, plaster lath or fibre board, and may be two-coat work when applied over wood lath.

Plastering with gypsum or hardwall plaster shall be three-coat work when applied over metal lath, and not less than two-coat work when applied over wood lath, plaster lath or fibre board.

Plastering with cement mortar shall be three-coat work when applied over metal lath, expanded metal or wire mesh.

Cement plaster shall not be applied over gypsum lath, wood lath or fibre board unless such gypsum lath, wood lath or fibre board shall be first covered with a waterproofing paper and metal reinforcing as required for exterior plastering.

In no case will a brush coat be accepted as a third or finish coat where three-coat work is required.

All plaster staff work shall have lugs of pure fibre and plaster of Paris, and shall be securely installed and fastened into place in a manner approved by the Building Inspector.

Sec. 4716. First Coat. Lime mortar for first coat of interior plastering shall be mixed one part lime to not more than two and one-half parts of sand by volume. Each cubic yard of lime mortar shall contain not less than two hundred (200) pounds of Keene's cement. To each cubic yard of lime mortar used for first or scratch coat there shall be added not less than four (4) pounds of manila fibre, or loose hair, the same to be distributed thoroughly throughout the mortar.

The first coat of mortar applied over metal or plaster lath or fibre board shall be well scored so as to form a good mechanical key. The first coat over metal or plaster lath or fibre board shall be thoroughly set and dry before second coat is applied. The first coat shall completely embed and cover all of the lath.

Second Coat. The second coat of lime mortar shall be mixed one part of lime to not more than three parts of sand by volume and shall contain not less than one hundred fifty (150) pounds of Keene's cement in each cubic yard of mortar. To this shall be added not less than four (4) pounds of manila fibre, or loose hair. The second coat of lime mortar shall be rodded to a straight surface.

The minimum thickness of the two coats of lime mortar shall be not less than three-fourths ($\frac{3}{4}$) inch including the lath. The second coat of lime mortar shall be thoroughly set and dry before the third or finish coat is applied.

**Interior
Plastering**

**Plastering
With
Keene's
Cement
Lime
Mortar**

Third or Finish Coat. The third or finish coat may consist of one of the following:

1. A white coat mixed one part gypsum plaster or plaster of Paris to not more than one part of lime putty. Such white coat shall thoroughly cover all brown mortar surfaces and shall be troweled smoothly with a steel trowel, and must be free from blemishes.

2. A sand finish consisting of one part gypsum plaster to not more than three parts of sand. Such sand finish shall thoroughly cover all brown mortar surfaces and may be left in any texture desired.

3. Any approved brand of interior stucco which shall cover all brown mortar surfaces.

Portland cement shall not be permitted for the third or finish coat over lime or gypsum brown mortar, nor shall any Portland cement be used over lime or gypsum mortar surfaces.

Lime mortar when applied over wood lath shall be mixed and applied as required for the brown coat and finish coat of lime mortar over metal lath, plaster lath or fibre board, except that the brown coat shall be mixed one part lime to not more than two and one-half parts of sand. It shall contain not less than two hundred (200) pounds of Keene's cement in each cubic yard of mortar. To the brown coat shall be added at least four (4) pounds of manila fibre or loose hair.

**Hardwall
or
Gypsum
Plaster**

Sec. 4717. Hardwall or gypsum plaster applied over wood lath, plaster lath or fibre board shall be not less than three-eighths ($\frac{3}{8}$) inch measured from the outer face of the lath.

The first or brown coat shall be mixed of one part of gypsum or hardwall plaster of an approved brand to not more than two parts of sand by volume. The first or brown coat shall have a minimum thickness of not less than one-fourth ($\frac{1}{4}$) inch measured from the outer face of the lath or board.

The first or brown coat shall be thoroughly set and shall be free from dry sets, sweat-outs, buckles or other harmful defects before the second or finish coat is applied.

The second or finish coat shall consist of one of the following:

1. Any approved brand of interior stucco, which may be applied over a brown mortar surface that is still green.

2. A white coat consisting of one part gypsum plaster to not more than an equal amount of lime putty thoroughly gauged together which shall be applied in the same manner as specified for white or putty coat over lime mortar.

3. A sand finish consisting of one part of gypsum plaster mixed with not more than two parts of sand. This may be applied over a brown mortar base while it is still green.

The second or finish coat of plaster applied over wood or plaster lath or fibre board shall be of sufficient thickness to bring the total minimum thickness of plaster measured from

the outer face of the lath to not less than three-eighths ($\frac{3}{8}$) inch.

In no case shall a white coat or putty coat be applied over any other than a thoroughly dry brown mortar base.

Sec. 4718. Interior hardwall or gypsum plaster over metal lath must be at least three-coat work with a minimum thickness of not less than three-fourths ($\frac{3}{4}$) inch, lath included, measured from the outer face of metal lath supports.

**Plaster
Over
Metal
Lath**

The first or scratch coat shall consist of one part of an approved brand of gypsum plaster to not more than two parts of sand by volume, and shall be thoroughly mixed in a manner so as not to damage the setting qualities of the plaster. This coat shall be scored so as to provide a good key for the second or brown coat.

The first or scratch coat shall be thoroughly set and dry before the brown coat is applied.

The second coat or brown coat of gypsum plaster shall be mixed one part of approved gypsum plaster to not more than two and one-half parts of sand by volume and shall be brought to a straight surface.

The third or finish coat shall be mixed and applied in the same manner as specified for the third coat over lime mortar, with the same time as required between second and third coats of lime mortar.

Sec. 4719. Interior hardwall or gypsum plaster over gypsum block, brick, clay tile or concrete, if thicker than a wash or brush coat, shall be not less than two-coat work.

**Interior
Plaster
Over
Masonry**

Such two-coat plaster work shall have a minimum thickness of three-eighths ($\frac{3}{8}$) inch over unit masonry or one-fourth ($\frac{1}{4}$) inch over monolithic concrete, except where plaster is used for fire-resistive purposes, in which case the minimum thickness shall be one-half ($\frac{1}{2}$) inch.

For application on brick, gypsum block or clay tile, gypsum plaster shall be mixed in the proportion of one part of gypsum plaster to not more than two and one-half parts of sand by volume.

When applied to concrete where moisture would affect the plaster, gypsum plaster shall be applied over a waterproofing coat of approved plaster bond, or bond plaster.

The finished coat shall not be applied until the first coat is thoroughly set and nearly dry, except when a putty coat finish is used, in which case the base shall be absolutely dry.

Concrete surfaces which are to be plastered shall be rough. If the required degree of roughness is not procured by using rough forms, the surface shall be hacked. Before plastering, all concrete surfaces shall be cleaned and all dust and loose particles removed. Grease, oil or efflorescence if present, shall be washed off with a solution of one part of commercial muriatic acid to four parts of water and the surface then washed again with clean water.

**Interior
Cement
Plaster**

Sec. 4720. Except where otherwise specified for fire retardant walls and ceilings, interior cement plaster shall be applied over plaster reinforcing as required for exterior plastering.

All interior cement plaster shall be three-coat work. The first two coats shall be mixed and applied with the same materials and in the same manner as required for the first two coats of exterior work.

The third or finish coat of interior cement plastering may be of the same materials, mixed and applied in the same manner as required for the third coat of gypsum plaster over metal lath or as required for the third coat of exterior stucco.

**Staff
Work**

Sec. 4721. All staff shall be thoroughly soaked before sticking. All lugs shall be of pure fibre and plaster of Paris. Excelsior shall not be used for lugs. In all cases where staff is heavy, auxiliary fastenings shall be used and such fastenings shall be not less than the equivalent of fourteen (14) gauge copper wire, shall in all cases be of sufficient strength to securely fasten the staff to the support, and shall be rust-resisting.

Refer to Chapter 48. The following provisions are recommended for inclusion in the Code where provisions covering the handling and storage of photographic and X-ray nitrocellulose films are desired:

CLASSES OF FILM EXCEPTED

Sec. 4801. The provisions in this Chapter do not apply to:

- (a) Film for amateur photographic use in original packages of "roll" and "film pack films" in quantities of less than fifty (50) cubic feet.
- (b) Safety film (cellulose acetate base).
- (c) Dental X-ray film.
- (d) Establishments manufacturing photographic films and storage incident thereto.
- (e) Films stored or being used in standard motion picture booths (see Chapter 40).

Safety photographic and X-ray film (cellulose acetate base) may be identified by the marking on the edge of the film. This marking shows plainly before and after developing. Where film is not so marked it shall be inspected to determine whether it is of the safety acetate or nitrate type.

GENERAL REGULATIONS

Sec. 4802. All regulations for the storage and handling of photographic and X-ray nitrocellulose films shall conform to the regulations of the National Board of Fire Underwriters for the Storage and Handling of Photographic and X-ray Nitrocellulose Films as recommended by the National Fire Protection Association, Edition of July 15, 1931.

Exceptions: Where definite fire-resistive materials are specified, materials of equal fire resistance as specified in this Code may be used.

Refer to Chapter 49: Where it is desired to regulate the

installation or alteration of refrigeration systems, the following provisions are recommended for inclusion in the Code:

GENERAL

Sec. 4901. It shall be unlawful for any person, firm or corporation to install or alter or cause to be installed or altered, any system of refrigeration, unless such system is an approved type and is installed in accordance with the provisions of the Safety Code for Mechanical Refrigeration, as published by the American Society of Refrigerating Engineers, which is hereby declared a part of this Chapter.

DEFINITIONS

Sec. 4902. "Approved". When this term is used to apply to systems, appliances and for materials in this Chapter, it shall mean that such systems, appliances and/or materials have either been listed as standard by the Underwriters' Laboratories, Incorporated, or have been approved by the Building Inspector.

SCOPE

Sec. 4903. Regulations of this Chapter shall apply to all refrigeration systems hereafter installed and to alterations of and additions to such existing systems.

Suggestions for Inspectors.

1. Remember always that you represent the City. A city is made up of all the people living therein and your actions should be governed accordingly.

2. Be particular at the beginning of a job. An erroneous method is more easily corrected the first time it is practiced than after it has been in use. The reputation of being slack or "easy," though it may be attained in a few days, is hard to overcome.

3. Be friendly with everyone on the job, but familiar with no one. Familiarity dulls the edge of the Inspector's authority.

4. Give orders to foremen, superintendents or contractor only. That rule does not apply to things of minor importance, such as the correction of form alignment, dirt in the bottom of forms for concrete, or other routine every-day occurrences. In such things it is proper for the Inspector to call the defect to the attention of the workmen responsible for that particular part of the job.

5. Do not waste workmen's time by talking to them.

6. Don't argue. Refer disputed questions to the Chief Inspector, and, until you have an answer from him, use your own judgment. Be sure that your judgment is so cool, fair and impartial and your knowledge of the work so thorough, that you command respect and obedience.

7. Do not try to magnify your own importance by telling outsiders of the errors you have corrected or the "crooked work" you have uncovered. The quality of the completed product will measure your ability.

8. Realize the importance of your work. The lives of many people are dependent in a large measure on the faithful performance of your duty. Consider your duties seriously and others will do likewise.

INDEX

NOTE: 1. The following abbreviations are used in this index:

- A. S. T. M.—American Society for Testing Materials
 A. S. A.—American Standards Association.
 A. W. S.—American Welding Society
 A. C. I.—American Concrete Institute
 A. L. S.—American Lumber Standards published by Bureau of Standards,
 July, 1929
 J. C.—Joint Committee on Reinforced Concrete
 N. B. F. U.—National Board of Fire Underwriters
 N. F. P. A.—National Fire Protection Association
 Und. Lab.—Underwriters' Laboratories, Inc.

2. For index by Parts, Chapters and Sections in numerical order see pages
 (a) to (k) in front of book.

	Section
A—occupancies	601
ABBREVIATIONS	
In concrete design	2612
In masonry construction	2410
In steel design	2702, 2703, 2704
In wood construction	2504
ACCESSORY BUILDINGS	1501
ACT—HOUSING	
For Group H buildings	1303, 1305
For Group I buildings	1403, 1405
ADDITIONS	
To buildings	104
To existing masonry walls	2941
ADJOINING BUILDINGS	
Foundation—to be protected when	2801
See LOCATION ON PROPERTY	
ADMINISTRATION BUILDINGS (PUBLIC)	
Seating more than 3500	601
Seating from 500 to 3500	701
Seating less than 500	801
ADMINISTRATIVE (see Part I for complete details)	
Appeals—required when	303
Approval required—by Building Inspector, when	302
Board of Examiners and Appeals	304
Bond—for registered inspector	204
Building classified by Building Inspector, when	501
Building Inspector acts as secretary	304
Building Inspector—definition of	401
Certificates required	205, 206
Condemnation—proceedings for	301
Inspection of buildings	204
Inspector approves plans when	202
Powers and duties of Building Inspector	301
Records kept by Building Inspector	203
Registered inspector—duties of	204
ADOPTION OF ORDINANCE—WHEN	4604
AGGREGATES	
For concrete	2604 (b)
For fire-resistive purposes—classified how	4301
Moisture content of	2408
Proportions in concrete	2607
AIR	
Supply for buildings (see VENTILATION)	
AIR INTAKES	
For furnaces	3707
For motion picture machine booths	4001
For private garages	1505
AIR SPACE	
Around timber in masonry	2506
In wood construction—to be divided	2510
Limited in concrete blocks	2406
Under flooring—to be divided	1810
 AISLES	
As access to stairway	3313

For Group A buildings	604 (f), 604 (l)
For Group B Buildings	704 (1), 704 (2)
For Group J buildings	1504 (b)
ALARM VALVE—AUTOMATIC SPRINKLERS	3801
ALLEY	
Definition of	401
ALLOWABLE WORKING STRESSES (see WORKING STRESSES ALLOWABLE)	
ALTERATION	
Definition of	401
Limited how	104
When in Fire Zone No. 1	1602
When in Fire Zone No. 2	1603
ALTERNATE MATERIALS AND CONSTRUCTION	
Board of Examiners and Appeals	304
Deposit required	303
May be approved by Building Inspector, when	302
May be used, when	304
AMERICAN CONCRETE INSTITUTE—Specifications	
For hollow concrete block or tile	2406
AMERICAN LUMBER STANDARDS	
For wood	2501
AMERICAN SOCIETY FOR TESTING MATERIALS—Specifications	
Brick	2402
Brick, concrete	2404
Brick, sand lime	2403
Cast iron	2701
Cast steel	2701
Cement, Portland	2409, 2604
Fire test standard	4201
Gypsum	2407
Gypsum block or tile	2407
Hollow clay tile	2408
Hydrated lime	2409
Quicklime	2409
Reinforcing steel for concrete	2604
Structural Steel	2701
AMERICAN STANDARDS ASSOCIATION	
Proscenium curtain-operating mechanism	4104
AMERICAN WELDING SOCIETY	
Welding Requirements	2710
AMUSEMENT PARK STRUCTURES (see GROUP J)	
Construction—special	1509
Light and ventilation	1506
Special loads	1502
ANCHORAGE	
Definition of—for reinforced concrete	2603
For masonry construction	2901, 2940
For wood construction (see WOOD)	
ANCHORS	
For beams and girders	2506
For facing—attachment of	2931
For fire-resistive materials	4301
For joists	2506
For masonry construction	2901, 2940
For masonry veneer to wood frame	2205 (d)
For panel and enclosure walls	2939
For reinforcing in concrete	2618
For roof framing	2508
For seats—required	604 (g), 702 (a)
For steel joists	2714 (d)
For stud walls and partitions	2507
For trusses	2509
For veneer—attachment of	2926
For walls	2940
For wood columns	2505
APARTMENT	
Definition of	401
APARTMENT HOUSE	
Classed as	1301
Definition of	401
APPEAL	
Board acts, how	304

From decision of Building Inspector, when	302
Method of making	303
APPENDAGES	
General regulations	4501
APPENDED DOCUMENTS	4602
APPLICATION	
For permit—details required	201
Of Code to buildings and/or structures	102
Required for demolishing	104 (a)
To additional stories	104 (a)
To additions	104 (c)
To alterations or repairs	103
To change use or occupancy	104 (b)
To existing buildings	104
To increased floor area	104 (c)
To major alterations and repairs	104 (a)
To minor alterations and repairs	104 (d)
To roofing repairs or removal	104 (d)
To structural alterations or repairs	104 (d)
APPROVAL	
After final inspection	206
For new materials	302, 304
For storage of materials in street	4401
Of chimneys	3701
Of plans for permit	202
Of proscenium curtain after test	4105
Of Registered Inspector	204
Of welding operator	2710
APPROVED	
Definition of	401
ARCHES	
In fireplace construction	3706
In floor construction	1810
In solid masonry	2906
Over proscenium opening	3904
ARCHITECT	
Name required on plans	201
ARC WELDS (see WELD)	
For steel joists	2714
General requirements	2710
AREA	
Allowable (see OCCUPANCY, FIRE ZONES and TYPE OF BUILDING)	
Definition of	401
ARMORIES	
Seating more than 3500	601
Seating from 500 to 3500	701
Seating less than 500	801
ARTIFICIAL STONE	
Requirements for	2924
ASBESTOS	
As roofing material	4305
For fire doors	4304
For heating equipment	3710, 3711, 3712
For proscenium curtains	4102
For warm air ducts	3715
ASHLAR—STONE FACING	2931
ASPHALT	
Paper on exterior walls	2205
In roof coverings	4305
ASSEMBLAGE—PLACES OF (see AUDITORIUMS)	
ASSUMPTIONS	
For live loads used in design	2304, 2305
For reinforced concrete design	2611
ASYLUMS (see GROUP D)	901
ATTIC	
Access to—required	3205
Story—definition of	401
Subdivision required in frame buildings	2208, 2510 (h)
AUDITORIUMS	
Seating more than 3500	601
Seating from 500 to 3500	701
Seating less than 500	801
AUTOMATIC SPRINKLERS	
Design and installation	3802
Where required	3801

AWNINGS	
Fixed—regulations for	4501 (d)
Movable—regulations for	4501 (b)
B—occupancies	701
BALCONY	
Exits from Group A buildings	604 (d)
Exits from Group B buildings	704
Exterior—construction of	3501
For smokeproof towers	3815
May project, how	4501 (a)
BALUSTRADES	
Must resist horizontal thrust	3501
On balconies for smokeproof towers	3815
Required for stairways—when	3805
When measuring stair clear width	3807
BARRICADES—Construction	1602 (f), 4401
BARS	
For concrete reinforcing (see REINFORCED CONCRETE)	
Prohibited over openings	604 (1)
BASEMENT	
Definition of	401
Protection of ceiling when	2010
Sprinkling of—when required	3801
Walls and floors—design of	2810
BASEMENT PIPE INLETS	
Design and installation	3807
Where required	3807
BAY WINDOW	
Construction of	3501
Definition of	401
May project—how	4501 (a)
BEAMS	
As Tees in reinforced concrete	2614 (d)
Design conditions—reinforced concrete (see REINFORCED CONCRETE)	
Ends cut on bevel	2506 (d)
Fireproofing of	4301
Of reinforced concrete	2614
Of wood in heavy timber construction	1908, 1910, 2506
BEARING PARTITIONS	
Masonry	2936
Wood frame	2507
BEARING PLATES	
For steel joists	2714 (d)
For wood beams and girders	2506
For wood columns	2505
BEARING WALL	
Definition of	401
Of hollow masonry—construction	2909
Of reinforced concrete—construction	2916
Of solid masonry—construction	2903
Of stone—construction	2921
BELT COURSES—May project	4501 (e)
BENDING MOMENTS—for Reinforced Concrete	2615, 2616, 2620, 2622
BLOCKS—CONCRETE (see CONCRETE BLOCKS)	
BOARD OF EXAMINERS AND APPEALS	
Appointed how	304
Consists of	304
Hear appeal, when	308
BOILER	
General requirements	3709
Room for (see BOILER ROOM—CONSTRUCTION)	
Smoke pipes for	3705
Smokestacks for	3702
BOILER ROOM—CONSTRUCTION	
For Group A buildings	608
For Group B buildings	708
For Group C buildings	808
For Group D buildings	908
For Group E buildings	1008
For Group H buildings	1808
BOLTS	
May be used, when	2709
On doors	604 (i), 904, 3304

Used in erection	2718 (b)
BOND	
Allowable stresses—concrete	2613
Assumptions for—concrete	2611
For additions to masonry walls	2941
For computations of—concrete	2619
For concrete surfaces	2609 (h)
For faced walls	2931
For hollow masonry construction	2910
For solid masonry construction	2904
For stone walls	2922
For veneer	2926
BOXES—THEATRE	
For Group A buildings	604 (h)
For Group B buildings	704 (2)
BRACING	
For patent chimneys	3704
For reinforced concrete forms	2610
For smokestacks	3702
For steel construction during erection	2711 (c), 2718 (a)
For stud walls and partitions	2507
For underpinning	2205
For wood trusses	2509
BRICK—CLAY	
Definition of	2402
Fire-resistive rating of	4301, 4302
Grades of	2402
Tests for determining grade	2402
Walls of (see WALLS)	
Working stresses—brick masonry	2410
BRICK—CONCRETE	
Fire-resistive rating of	4301, 4302
Quality and tests	2404
Walls of (see WALLS)	
Working stresses—masonry of	2410
BRICK—SAND LIME	
Fire-resistive rating of	4301, 4302
Quality and tests	2403
Walls of (see WALLS)	
Working stresses—masonry of	2410
BRIDGING	
For concrete joists	3102
For steel joists	2714 (c)
For wood joists	2506 (k)
BUILDING CODE	
Adopted When	4604
Application of	104
Enforced by	301
Purpose of	102
Scope of	103
Title of	101
BUILDING INSPECTOR	
Acts as secretary	304
Approves structural frame	204
Approves registered inspector, when	204
Approves welding operator when	2710 (d)
Certifies floor loads, when	2309
Classifies buildings, when	501
Definition of	401
Issues permit, when	202
May approve alternate construction or materials	302
May enter premises	301
May reject permit, when	202
May require registered inspector	204
May require tests	302, 2401
May stop work	301
Opinion necessary for change	1602 (e)
Powers and duties of	301
Record of permits required	203
Shall issue Certificate of Compliance, when	205

Shall make inspections, when.....	204
Shall require reports	204
Special permit issued when	1602 (f)
BUILDING INSPECTOR AUTHORIZATION REQUIRED	
Before changing plans	202
For changes of use or occupancy	104 (b)
For removal of existing safeguards	105
For structural alterations	202
BUILDINGS	
Change of use, when.....	207
Classified by type of construction	1702
Classified by use or occupancy	501, 503
Definition of	401
Regulated by fire zones	1602 to 1603 incl.
Require registered inspector, when	204
To be condemned	301
To be occupied, when	206
To conform to Code, when	104
BUILDING MATERIALS	
May be stored—how	4401
BUILT UP TIMBERS	2506 (b)
BUTTRESSED WALLS—Construction of	2903 (d)
C—occupancies	801
CEDAR	
Mudsills	2204, 2205
Piling	2803
Working stresses	2503, 2504
CEILINGS	
Fire-resistive required—for furnaces	3707
Fire-resistive required—in Type III buildings	2010
For fire protection purposes	4301
Minimum height of (see STORY)	
CELLAR	
Definition of	401
Protection of ceiling, when	2010
Sprinkling of—when required	3801
CELL BLOCKS—JAILS	
Construction of	909
CEMENT—PORTLAND (see PORTLAND CEMENT)	
CERTIFICATE	
Of Compliance—issued by Building Inspector	205
Of Occupancy—for change of use	207
Of Occupancy—issued to owner	206
Of Registration—for Registered Inspector	204
CERTIFICATE OF COMPLIANCE	
Required when	205
CERTIFICATE OF OCCUPANCY	
Issued by	206
Required when	206
CHANGE OF OCCUPANCY	
Certificate required for	207
CHASES (see RECESSES)	
CHIMNEYS	
Firestopping around	2207, 2510 (g)
General requirements	3701
Patent type	3704
Wood frame—spaced from	2207
CHURCHES	
Seating more than 3500	601
Seating 500 to 3500	701
Seating 500 or less	801
CITY	
Adopted this Code, when	4604
Clerk—files appended documents	4602
Council orders repairs, when	301
Grants permission for storage in streets	4401
Levies penalties, when	305
Permits use of space under sidewalks	4501 (g)

Requires bond of registered inspector	204
Requires permit, when	201
CLASSIFICATION	
Of fire-resistive construction (see Chapters 42 and 43)	
Of occupancies	501, 503
Of Types of Construction	1701, 1702
CLASSIFICATION OF BUILDINGS	
By fire zones	1602-1603 incl.
By occupancy	503
By type of construction	1702
CLAY ROOF TILE	4305
CLAY TILE—HOLLOW	
Bearing walls of (see HOLLOW MASONRY)	
For fire division walls	2934
For fire-resistive construction.....	4301, 4302
For fire walls	2933
For panel walls	2939
For partitions—bearing	2936
For partitions—non bearing	2937
CLEAN-OUT	
For concrete forms	2610 (a)
For patent chimneys	3704
CLEARANCE	
Around reinforcing in concrete.....	2610 (d)
Around smoke pipes	3705
Around smoke stack	3702
Around stoves and heaters	3710, 3711
Around timber in masonry	2506
Around warm air furnaces	3707
For swelling of wood floor	1910
Of wood framing	2207
Under first floor joists	2207
CLUBS	
Seating more than 3500	601
Seating 600 to 3500	701
Seating 500 or less	801
COLD STORAGE (see GROUP G)	
COLUMNS	
Capital—defined	2603
Composite—design	2621 (f)
Fireproofing of	4301
Heavy timber	1908
Masonry	2905, 2912
Mill construction	1908
Project beyond property line—when	4501 (e)
Reinforced concrete	2621
Reinforced concrete—definition of	2603
Structural steel—allowable stresses	2702
Wood—allowable stresses	2504
Wood—framing details	1908, 2505
COMBINED STRESSES	
Concrete	2621
Masonry	2411
Steel	2702
Wood	2503
COMBUSTIBLE GOODS—Sales and Storage (see GROUP F)	
COMBUSTIBLE MATERIALS	
Prohibited in Fire Zone No. 1	1602 (i)
Regulated in Type I buildings	1818
Regulated in Type II buildings	1916
Regulated in Type III buildings	2018
Regulated in Type IV buildings	2116
Regulated in Type V buildings	2211
COMMUNICATING OPENINGS	
Through fire separations	503
COMPLIANCE—CERTIFICATE OF	
COMPOSITION ROOFINGS	4305
COMPUTATIONS—may be required	201
CONCENTRATED LOADS	
Required to be distributed on masonry	2411
Special requirements for	2303
CONCRETE	

Blocks of (see CONCRETE BLOCKS)	
Brick—quality and design	2404
Definition of	2603
Design of—when reinforced	2602
Fire-resistive classification (see Chapter 43)	4301, 4302
For roofs—slab or tile	4305
Piles	2803 (c)
Plain—quality and design	2405
Reinforced—definition of	2603
Reinforced—design of (see Chapter 26)	2602
Tests—for reinforced concrete	2605, 2613
Transporting and placing	2609
Walls—plain	2901-2906, incl.
Walls—reinforced	2914
Working stresses of	2410, 2613
Working stresses—masonry units	2410
CONCRETE BLOCKS	
For fire division walls	2934
For fire-resistive construction	4302
For fire walls	2933
For masonry walls (see HOLLOW MASONRY)	
For panel walls	2939
For partitions—bearing	2936
For partitions—non-bearing	2937
Quality and design of	2404, 2406
CONDEMNATION	
By Building Inspector, when	301
Work ordered by City, when	301
CONNECTIONS	
Between fresh and hardened concrete	2609 (h)
Between wood and masonry	2506
For structural steel	2708
For additions to masonry walls	2941
In wood framing	2501, 2505
CONSTRUCTION	
Fire Zone No. 1	1603
Fire Zone No. 2	1603
Fire Zone No. 3	1604
For Group A buildings	602, 609
For Group B buildings	702, 709
For Group O buildings	802, 809
For Group D buildings	902, 909
For Group E buildings	1002, 1009
For Group F buildings	1102, 1109
For Group G buildings	1202, 1209
For Group H buildings	1302, 1309
For Group I buildings	1402, 1409
For Group J buildings	1502, 1509
For types of (see TYPES OF CONSTRUCTION)	
Lights required	4401
Temporary buildings and structures	4401
Temporary use of streets allowed during	4401
CONSTRUCTION JOINTS—IN CONCRETE	2610 (g)
CONSTRUCTION MATERIAL	
Allowed in streets, when	4401
Load to be provided for, when	2713
CONTENTS BY PARTS, CHAPTERS AND SECTIONS (see pages a to j inclusive)	
CONVENTS	1301
CORBELING	
Of hollow masonry	2907
Of incinerator walls	3716
Of reinforced concrete	2914
Of solid masonry	2901
CORNICES (see TYPE OF BUILDING)	4501
COST OF BUILDINGS—for permits	201, 202
COVERINGS	
For exteriors of frame buildings	2205
For fire protection	4301
For patent chimneys	3704
For roofs	4305
For warm air ducts	3715
For wood doors—when	4304

CROSS AISLES IN BALCONIES

Of Group A buildings	604 (f)
Of Group B buildings	704

CURB

Allowed in alley—when	4501 (h)
For skylights—constructed how	3402

CURTAIN

For proscenium opening (see PROSCENIUM CURTAIN)	
Wall—masonry—definition of	401

CURTAIN WALL

Definition of	401
Hollow masonry—construction of	2909
Reinforced concrete—construction of	2916
Solid masonry—construction of	2903

D—Occupancies

.....	901
-------	-----

DANCE HALLS

Seating more than 3500	601
Seating from 500 to 3500	701
Seating less than 500	801

DANGEROUS BUSINESS (see GROUP E)

.....	1001
-------	------

DEAD LOAD

Definition of	401, 2301
---------------------	-----------

DECORATIVE FEATURES—may project how

.....	4501 (e)
-------	----------

DETAILED REGULATIONS

Bays and balconies	3501
Chimneys and heating apparatus	3701-3716, incl.
Doors, windows and skylights	3401, 3402
Fire extinguishing apparatus	3801-3807, incl.
Floor construction	3101-3105, incl.
Enclosure of vertical openings	3001-3003, incl.
Excavations, footings and foundations	2801-2803, incl.
Motion picture machine booths	4001
Penthouses and roof structures	3601
Proscenium curtains	4101-4106, incl.
Roof construction and covering	3201-3206, incl.
Stage ventilators	3901
Stairs, ramps and smokeproof towers	3301-3316, incl.
Walls and partitions	2901-2941, incl.

DEFINITIONS

Of certain words	401, 2603
Of fire-resistive construction	4201
Of Group A buildings	601
Of Group B buildings	701
Of Group C buildings	801
Of Group D buildings	901
Of Group E buildings	1001
Of Group F buildings	1101
Of Group G buildings	1201
Of Group H buildings	1301
Of Group I buildings	1401
Of Group J buildings	1501
Of terms in concrete regulations	2603
Of Type I buildings	1801
Of Type II buildings	1901
Of Type III buildings	2001
Of Type IV buildings	2101
Of Type V buildings	2201

DEMOLISH—BUILDING

Required when	301
---------------------	-----

DEPTH OF FOUNDATIONS

Affects excavations when	2801
Governed by frost line	2938
Governed by soil conditions	2802

DESIGN

General	2302 (b)
Live loads for (see Chapter 23)	
Must be approved by Building Inspector	202
Of footings and foundations (see Chapter 28)	2306 (4)
Of masonry materials	2401
Of proscenium curtains	4101-4106, incl.
Of reinforced concrete	2602

Of structural steel	2701
Of walls	2901-2941, incl.
Of wood	2501
DIVISION	
Of attic space	2510 (b)
Of floor area (see maximum area requirements under OCCUPANCY)	
Of buildings for fire protection	503
DOCUMENTS—Subject and Reference	
Appended as part of Code	4602
Brick tests—A. S. T. M.—C67-31	2402, 2403, 2404
Brick—A. S. T. M.—C62-30	2402
Brick, concrete—A. S. T. M.—C55-33T	2404
Brick, sand-lime—A. S. T. M.—67-30	2403
Cast Iron—A. S. T. M.—A18-32T	2701
Cast steel—A. S. T. M.—A27-24	2701
Chimneys—N. B. F. U. Standard Ordinance for Chimney Construction 1927	3701
Clay tile—A. S. T. M.—C34-33T	2408
Cold-drawn steel wire—A. S. T. M.—A82-27	2604
Concrete block or tile—A. S. T. M.—C90-31T	2406
Concrete cylinder tests—A. S. T. M.—C31-27	2605
Concrete, testing of—A. S. T. M.—C39-27	2613
Fire doors, hanging of—N. F. P. A.—Protection of Openings in Walls and Partitions Against Fire, Edition of 1927	4304
Fire Doors—Und. Lab.—Standard for Tin-Clad Fire Doors and Shutters, Edition of March, 1926, and July, 1927	4304
Fire Tests—A. S. T. M.—C19-33	4201
Gypsum—A. S. T. M.—C22-25 and C23-30	2407
Gypsum tile—A. S. T. M.—C52-33	2407
Hydrated lime—A. S. T. M.—C6-31	2409
Inflammable liquids—S. F. P. O. Edition 1930	1008
Oil burners—N. B. F. U.—regulations for oil burning equipment, 1928	3713
On file with City Clerk	4602
Portland cement—A. S. T. M.—C9-30	2409
Proscenium curtains—A. S. A.—Safety Code for Elevators, published 1931	4104
Quicklime—A. S. T. M.—C5-26	2409
Rail steel reinforcing—A. S. T. M.—A16-14	2604 (d)
Sands, organic impurities in—A. S. T. M.—C40-27	2604 (b)
Roofs, Class C coverings—Und. Lab.	4305 (b)
Sprinklers—N. B. F. U.—Automatic Sprinkler Equipment, Edition 1928	3802
Structural, intermediate or hard-grade reinforcing—A. S. T. M.— A15-14	2604 (d)
Structural steel—A. S. T. M.—A9-33	2701
Welding—A. W. S.—Bulletin No. 2, December, 1921	2710
Wood—A. L. S.—R16-29—July 1, 1929	2501
DOORS	
Construction—for one-hour rating	4304
Fire-resistive—classification of	4304
Fire-resistive—design of	4304
Fire-resistive—shall be hung how	4304
Fire-resistive—when required (see under OCCUPANCY, FIRE ZONES and TYPE OF BUILDING)	
For enclosure walls of vertical openings	3002, 3003
For fire separations	503
For Group A buildings	604 (i)
For Group B buildings	703-706
For Group D buildings	904
For horizontal exits	3311
For motion picture machine booths	4001
For smokeproof towers	3315
For stage ventilators	3901
General requirements	3401
May not project over public property, when	4501 (f)
Pocketed in wood partitions	2510 (e)
DORMITORIES	
DOWNSPOUT	
For marqueises	4501 (d)
For roofs—general	3206
DRAINAGE FILL	
DRAWINGS	
Required for permit	201
Shall include what	201

DRESSING ROOMS	
Exits from	604 (a)
Fire protection of	607
Location of	602
DRIFTING	
Not permitted, when	2716 (b)
DRY CLEANING PLANTS	
Classified as	1001
Inflammable liquids regulated	1008
Open flame prohibited	1008
Steam fire extinguishing apparatus	1008
Ventilation of	1008
DRY STANDPIPES (see STANDPIPES)	
DUCTS	
For warm air furnaces	3715
For ventilation of motion picture booths	4001
DUTIES	
Of Board of Examiners and Appeals	304
Of Building Inspector (see BUILDING INSPECTOR)	301
DWELLING	
Definition of	401
Hollow masonry walls for	2909
In Group I Occupancy	1401
Solid masonry walls for	2903 (c)
When constructed on roof	1409
E—OCCUPANCIES	1001
EARTH PRESSURE	
Calculations for	2310
EARTHQUAKES—Provisions for	2311
ECCENTRIC LOADS	
In masonry construction	2411
Steel	2703
EFFECTIVE	
Date of ordinance	4604
EGRESS (see STAIRS)	
ELECTRIC WELDING (see WELD)	
ELEVATOR SHAFTS (see VERTICAL OPENINGS)	
EMERGENCY	
Controls for proscenium curtain	4104
Exits for—Group A buildings	604
Exits for—Group B buildings	704
Exits for—Group C buildings	804
For stage ventilators	3901
Release for picture booth openings	4001
Signs for exits	604, 3312
ENCLOSURE OF VERTICAL OPENINGS (see OCCUPANCY and TYPE OF BUILDING)	
For elevators	3002
For stairs and ramps	3002, 3308
Miscellaneous openings	3003
When required	3001
When smokeproof tower	3315
When through special fire separation	503 (b)
ENCLOSURE WALLS	
Construction of	2939
Definition of	401
ENGINEER—STRUCTURAL	
Name required on plans	201
ENGINEERING REGULATIONS—quality and design of the materials of construction	
Live and dead loads	2301-2311, incl.
Masonry (quality and design)	2401-2411, incl.
Reinforced concrete (quality and design)	2601-2622, incl.
Steel and iron (quality and design)	2701-2718, incl.
Wood (quality and design)	2501-2511, incl.
ENGINEERING SUPERVISION	
Required when	204
ERECTION	
Of concrete forms	2610
Of masonry walls	2901, 2940
Of new buildings	201
Of structural steel	2718
Of wireless masts	3602
Of wood construction	2505-2510, incl.

EXCAVATIONS	
General details for	2801
Water to be removed from, when	2609 (c)
EXHAUST VENTILATION	
For automobile storage	1005
For dry cleaning establishments	1008
For motion picture machine booths	4001
EXISTING BUILDING	
Application of Code to	104
Definition of	401
EXISTING WALLS	
Extensions of	2941
EXIT LIGHTS	
For Group A buildings	604 (j)
For Group B buildings	704
General requirements	3306, 3312
EXITS, ETC.	
General requirements	3301
Group A buildings	604
Group B buildings	704
Group C buildings	804
Group D buildings	904
Group E buildings	1004
Group F buildings	1104
Group G buildings	1204
Group H buildings	1304
Group I buildings	1404
Group J buildings	1504
EXPANSION	
Provision for	2715
Rollers for	2702 (h)
EXPLANATION OF TERMS	
General	401
Of reinforced concrete	2603
EXPLOSIVES—STORAGE	
.....	1001
EXTERIOR OPENINGS—PROTECTION REQUIRED WHEN	
Because of location in Fire Zone	1602, 1608
Because of location on property (see OCCUPANCY GROUP)	
Because of Type of Construction (see TYPE OF BUILDING)	
EXTERIOR WALLS—Requirements for	
Construction of (see LOCATION ON PROPERTY or TYPE OF BUILDING)	
Construction when in Fire Zone No. 2	1603
Construction of openings (see Particular OCCUPANCY GROUP, TYPE OF CONSTRUCTION or FIRE ZONE)	
F—occupancies	1101
FACED WALLS (see WALLS)	
FACTORIES	
Moderately hazardous (see GROUP F)	1101
Non-hazardous (see GROUP G)	1201
FAMILY	
Definition of	401
FEES	
Additional fee required—when	305
Doubled—when	203
For building permits	203
Record required of	203
FENCES	
Classed as	1501
For construction purposes	1602, 4401
FILLED GROUND	
.....	2802
FILL UNDER FLOOR	
.....	1810
FILM EXCHANGES	
Classed as	1001, 4801
Sprinklers required for	3801
FILMS—INFLAMMABLE	
Storage and use of	4001
FINAL INSPECTION	
Certificate of Compliance required when	205
Made when	206
Required when	204
FINES—FOR VIOLATIONS	
.....	305
FIRE	
Classification of materials for resistance to (see Chapter 43)	

Extinguishing apparatus (see FIRE EXTINGUISHING APPARATUS)	
Separations required—for certain occupancies	503
Standards for resistance of (see Chapters 42 and 43)	
Standards	4201
Walls—hollow masonry	2933
Walls—solid masonry	2932
FIRE CLAY	
For flue lining	3701
For incinerator combustion chamber	3716
For patent chimneys	3704
FIRE CUT	
Required for timbers	2506
FIRE DAMAGE	
Causes condemnation—when	104, 301
Repairs allowed—When	104 (a)
FIRE DEPARTMENT	
Access to basement pipe inlets	3807
FIRE DIVISION WALL	
Construction of	2934
Definition of	401
FIRE EXTINGUISHING APPARATUS	
Automatic sprinklers—requirements for	3802
Automatic sprinklers—where required	3801
Basement pipe inlets—where required	3807
Dry standpipes—requirements	3804
Dry standpipes—where required	3803
For Group A buildings	607
For Group B buildings	707
For Group C buildings	807
For Group D buildings	907
For Group E buildings	1007
For Group F buildings	1107
For Group G buildings	1207
For Group H buildings	1307
For Group I buildings	1407
For Group J buildings	1507
Wet standpipes—requirements	3806
Wet standpipes—where required	3805
FIRE LIMITS	1601
FIREPLACES—CONSTRUCTION OF	3706
FIREPROOFING (see TYPE OF BUILDING)	
Requirements—detailed	4301
FIREPROOF PASSAGEWAYS	
For Group A buildings	604
For Group B buildings	704
For smokeproof towers	3315
FIRE PUMPS	
For wet standpipe supply	3806
FIRE-RESISTIVE	
Construction	4203
Construction defined	4201
Doors, windows and shutters	4304
Floor construction	4303
Inspection of plaster protection—when	204
Materials	4202
Materials, tests for	4201
Protection of structural parts	4301
Roof coverings	4305
Standards—specifications for	4201
Walls	4302
FIRE-RESISTIVE BUILDINGS (see TYPE I BUILDINGS)	1801-1816, incl.
FIRE-RESISTIVE STANDARDS	
For doors and shutters	4304
For floor construction	4303
For protection of structural parts	4301
For roof coverings	4305
For walls and partitions	4302
For windows	4304
FIRE-RESISTIVE STANDARDS FOR FIRE PROTECTION	
General requirements	4201-4203, incl.
Standards—detailed	4301-4305, incl.
FIRE SEPARATIONS	
Required when	503

FIRE STATIONS	1101
FIRESTOPPING	
Between wood sleepers	1810
For wood frame construction	2507, 2610
In Type III buildings	2011, 2016
In Type V buildings	2206, 2208
FIRE WALL	
Construction—hollow masonry	2933
Construction—solid masonry	2932
Definition of	401
May apply as fire separation when	503
FIRE ZONES	
Definition of	1601
Doors may not project—when	4501 (f)
Requirements for Fire Zone No. 1	1602
Requirements for Fire Zone No. 2	1603
Requirements for Fire Zone No. 3	1604
FLAG POLES	3601
FLAME—OPEN	
Prohibited when	1008
FLASHING	
Waterproof paper and metal	4712
FLAT SLAB—General requirements	2620
FLOOR AREA	
Definition of	401
Limited (see OCCUPANCY and FIRE ZONES)	
FLOOR CONSTRUCTION	
Concrete	3102
Fire protection—of certain floors	4301
Fire-resistive—classification of	4303
For fire-resistive construction	4303
General (see TYPE OF BUILDING)	3101
Mill construction	3104
Motion picture machine booths	4001
Stages	606, 609
Steel joist	3103
Under warm air furnaces	3707
Wood joist	3105
FLOOR FILL—Required when	1810
FLOOR LEVELS	
Determine sprinkler requirements—when	3801
For Group A buildings	602, 603, 604
For Group B buildings	702, 703, 704
For Group E buildings	1004
FLOOR LOADS	
Assumed live	2304
Definitions of	2301
Reductions allowed	2306
Required to be posted	2308
Special considerations	2308
FLOOR OPENINGS	
Enclosures of—when required (see VERTICAL OPENINGS—ENCLOSURE OF)	
In stages—construction of	606
FLOOR PROTECTION	
For wood joisted floor	4301
Over heating plants	3707, 3708
Over ranges	3711, 3712
Required in Type III buildings	2010
Under stoves	3710
FLUES	
Area required	3701
Lining for chimneys	3701
Lining for smokestacks	3702
FOOTINGS	
Concrete—design of	2622
Design of—general	2306, 2802
FORMS—for concrete construction	2610
May be removed—when	2610 (b)
FOUNDATION	
Concrete—design of	2622
Construction allowed (see TYPE OF BUILDING)	
Definition of	401
Design of	2306, 2802
Excavations for	2801

Footing design—isolated	2306,	2802
For retaining wall		2310
Inspection required for Type V buildings		204
Liability of adjoining property		2801
May be omitted—when		2204
May project beyond property line—when	4501	(g)
Openings in walls for ventilation.....		2204
Owner's liability for		2801
Piling for		2803
Soil bearing allowed		2802
Stepped—when		2204
Thickness of walls for Type V buildings		2204
Walls of		2938
FRAME BUILDINGS (see TYPE V BUILDINGS)		2201
FRAME INSPECTION		
Required when		204
FRAMING		
Around chimneys		2207
Of wood construction (see WOOD)		
FRAMEWORK—OF BUILDING (see TYPE OF BUILDING)		
FRONT OF LOT		
Definition of		401
FRONTAGE CONSENT REQUIRED		
For storage of building materials		4401
FROST		
Depth of foundations for		2938
Protection of concrete from	2009	(g)
FURNACES—WARM AIR		
Ducts and appurtenances for		3715
General requirements		3707
Intake required for		3707
FURRING		
Not allowed near chimney	2507	(h)
Of stucco reinforcement	2205	(c)
Requirements in wood frame construction	2510	(b)
FUSIBLE LINKS		
For automatic sprinkler systems		3802
For doors—automobile ramp enclosures		1006
For fire doors		3401
For horizontal exits, when		3311
For motion picture machine booths		4001
For proscenium curtains		4104
For stage ventilators		3901
For vents supplying air back stage		605
G—occupancies		1201
GALVANIZED IRON		
Casing for patent chimneys		3704
Used for roof		4305
Used as siding	2105,	2205 (c)
GARAGE		
Classified how		1001
Construction limited		1009
Definition of		401
Detailed requirements (see GROUP E)		
Private—classified as		1501
Private—definition of		401
Private—limited how		1509
GAS		
Furnaces		3707
Heaters		3711
Hot plates		3711
Ranges—domestic		3711
Ranges—large		3712
Shut-offs required (see GAS SERVICE—SHUT OFF)		
Vents—general requirements		3703
GAS CUTTING		
How performed	2716	(f)
GASOLINE SERVICE STATIONS (see GROUP E)		
Construction		1009
GAS SERVICE—SHUT-OFF REQUIRED		
For Group A buildings		608
For Group B buildings		708
For Group D buildings		908
GIRDERS		
Concrete (construction joints)		2610

Fireproofing of	4301
Loads reduced when	2306
Steel	2704
Wood	2207, 2503
GRADE	
Definition of	401
GRADES OF	
Brick	2402, 2403, 2404
Hollow clay or concrete building units	2406, 2408
GRADIENTS—allowed	
For automobile storage	1004
For ramps	3310
In Group A buildings	602, 604
In Group B buildings	704
GRAND STANDS	1501, 1502
GRAVITY TANKS	
For oil burning equipment	3713
For wet standpipe supply	3806
GREENHOUSE	
Roof to be constructed—how	3402
GRIDIRONS	
Construction of	609
GROUP A OCCUPANCY	
Area	602
Boxes	604 (h)
Chimney and heating apparatus	608
Construction	602
Defined	601
Doors and gates	604 (l)
Enclosure of vertical openings	606
Existing buildings—classified when	609
Exit courts	604 (b)
Exit lights	604 (j)
Fire extinguishing apparatus	607
Height	602
Light and ventilation	605
Location on property	603
Mixed occupancies—separations for	610
Moving picture machine booths	4001
Obstructions	604 (l)
Occupancies included	601
Protection of exterior openings	603
Running tracks—construction permitted	609
Seats	604 (g)
Smokeproof tower	604 (k)
Special hazards	608
Stairs and exits	604
Stage	609
GROUP B OCCUPANCY	
Area	702
Boxes	704
Chimneys and heating apparatus	708
Construction	702
Defined	701
Doors and gates	703
Enclosure of vertical openings	706
Exit lights	705
Fire extinguishing apparatus	707
Height	702
Inflammable liquids prohibited	708
Light and ventilation	705
Location on property	703
Main entrance	703, 704
Mixed occupancies—separation from	710
Motion picture machine booths	4001
Occupancies included	701
Protection of exterior openings	703
Running tracks—construction	709
Seating capacity may be increased, when	702 (a)
Seats	704

Special construction requirements	702 (b),	709
Special hazards		708
Stairs and exits		704
When located on second floor		706

GROUP C OCCUPANCY

Area		802
Chimneys and heating apparatus		808
Construction		802
Definition of		801
Enclosure of vertical openings		806
Fire extinguishing apparatus		807
Height		802
Light and ventilation		805
Location on property		803
Main exit located where		803
Mixed occupancies—separation from		810
Motion picture machine booths		4001
Occupancies included		801
Protection of exterior openings		803
Running tracks—construction of		809
Special construction	802 (b),	809
Special hazards		808

GROUP D OCCUPANCY

Area		902
Chimneys and heating apparatus		908
Construction		902
Definition of		901
Enclosure of vertical openings		906
Fire extinguishing apparatus		907
Height		902
Inflammable liquids—storage regulated		908
Jails—special construction		909
Light and ventilation		905
Location on property		903
Mixed occupancies—separation from		910
Motion picture machine booths		4001
Occupancies included		901
Protection of exterior openings		903
Ramps required, when		904
Self-releasing latches or panic bolts, when		904
Special construction	902 (b),	909
Special hazards		908
Stairs and exits		904

GROUP E OCCUPANCY

Area		1002
Automobile ramps		1004
Chimneys and heating apparatus		1008
Construction		1002
Definition of		1001
Dry cleaning—special construction		1008
Enclosure of vertical openings		1006
Exceptions and deviations		1009
Fire extinguishing apparatus		1007
Height		1002
Inflammable liquids—regulated		1008
Light, ventilation and sanitation		1005
Location on property		1003
Mixed occupancies—separation from		1010
Occupancies included		1001
Prohibited in Fire Zone No. 1	1602 (j)	
Prohibited in Fire Zone No. 3		1603
Protection of exterior openings		1003
Special hazards		1008
Stairs and exits		1004

GROUP F OCCUPANCY

Area		1102
Chimneys and heating apparatus		1108
Construction		1102
Definition of		1101
Enclosure of vertical openings		1106
Fire extinguishing apparatus		1107

Height	1102
Inflammable liquids—regulated	1108
Light, ventilation and sanitation	1105
Location on property	1103
Mixed occupancies—separation from	1110
Occupancies included	1101
Protection of exterior openings	1103
Special construction	1109
Special hazards	1108
Stairs and exits	1104
GROUP G OCCUPANCY	
Area	1202
Chimneys and heating apparatus	1208
Construction	1202
Definition of	1201
Enclosure of vertical openings	1206
Fire extinguishing apparatus	1207
Height	1202
Inflammable liquids—regulated	1208
Light, ventilation and sanitation	1205
Location on property	1203
Mixed occupancy—separation from	1210
Occupancies included	1201
Protection of exterior openings	1203
Special construction	1209
Special hazards	1208
Stairs and exits	1204
GROUP H OCCUPANCY	
Area	1302
Chimneys and heating apparatus	1308
Construction	1302
Definition of	1301
Enclosure of vertical openings	1306
Fire extinguishing apparatus	1307
Height	1302
Housing requirements	1303
Inflammable liquids—regulated	1308
Light, ventilation and sanitation	1305
Location on property	1303
Mixed occupancies—separation from	1310
Occupancies included	1301
Protection of exterior openings	1303
Special construction	1309
Special hazards	1308
Stairs and exits	1304
GROUP I OCCUPANCY	
Area	1402
Chimneys and heating apparatus	1408
Construction	1402
Definition of (dwellings)	1401
Dwellings when on roof	1409
Enclosure of vertical openings	1406
Fire extinguishing apparatus	1407
Height	1402
Housing requirements	1403, 1405
Inflammable liquids—regulated	1408
Light, ventilation and sanitation	1405
Location on property	1403
Mixed occupancies—separation from	1410
Protection of exterior openings	1403
Special hazards	1408
Stairs and exits	1404
GROUP J OCCUPANCY	
Aisles	1504 (b)
Area	1502
Automobile storage—limited	1509
Chimneys and heating apparatus	1503
Construction, height and area allowable	1502
Definition of	1501
Enclosure of vertical openings	1506
Fire extinguishing apparatus	1507
Height	1502
Inflammable liquids—regulated	1509

Light and ventilation	1505
Location on property	1503
Mixed occupancies—separation from	1510
Occupancies included	1501
Protection of exterior openings	1503
Seats	1504 (b)
Special construction—amusement structures	1509
Special hazards	1508
Stairs and exits	1504
GUEST	
Definition of	401
GUEST ROOM	
Definition of	401
GUNITE (also see Pneumatically Placed Shocco)	
As exterior covering for frame construction	2205
Definition of	2603
Enclosure and panel walls	2939
Fire-resistive standards	4301, 4302
Increasing thickness of existing walls	2941
Partitions — non-bearing	2937
Tests of	2613
GUTTERS—to be kept free of obstructions—when	4401
GYMNASIUMS—Special Construction	
For Group A buildings	609
For Group B buildings	709
For Group C buildings	809
GYPSON	
Blocks for fire-resistive construction	4302
Fire-resistive classification	4301, 4302
Partitions—non-bearing	2937
Plaster for fire-resistive purposes	4301, 4302
Plaster lath	4301, 4302
Quality and design	2407
Slabs	3103
Working stresses	2410
H—occupancies	1301
HANGERS REQUIRED	
For joists	2506 (i)
HAZARDOUS OCCUPANCIES	
Highly hazardous (see GROUP E)	1001
Moderately hazardous (see GROUP F)	1101
Non-hazardous (see GROUP G)	1201
HEADER—in frame construction	
Joists—support required	2506 (i)
Over opening in stud partitions	2507 (g)
HEATERS	
General requirements	3714
Using gas for fuel	3711
Using solid or liquid fuel	3708
HEATING PLANTS—LOW PRESSURE STEAM	3708
HEAVY TIMBER CONSTRUCTION (see TYPE II BUILDINGS) 1901-1916, incl.	
HEIGHT	
Additional for roof structures	3601
Adjoining building affects vents	3703
Affects stairways required	3309
Definition of	401
For awnings	4501 (b)
For Group A Occupancy	602
For Group B Occupancy	702
For Group C Occupancy	802
For Group D Occupancy	902
For Group E Occupancy	1002
For Group F Occupancy	1102
For Group G Occupancy	1202
For Group H Occupancy	1302
For Group I Occupancy	1402
For Group J Occupancy	1502
For marquees above sidewalk	4501 (d)
For permanent projections over property line	4501
For Type I Buildings (Fire-resistive)	1802
For Type II Buildings (Heavy Timber)	1902
For Type III Buildings (Ordinary Masonry)	2002, 2006
For Type IV Buildings (Metal Frame)	2102
For Type V Buildings (Wood Frame)	2202

Of masonry walls (see WALLS)	
Of veneer	2927
Towers or spires	3603
HOLLOW CLAY TILE	
Fire-resistive classification	4301, 4302
Quality and design	2408
Walls (see WALLS)	
Working stresses	2410
HOLLOW CONCRETE BLOCK OR TILE	
Quality and design	2408
Walls (see WALLS)	
Working stresses	2410
HOLLOW MASONRY WALLS (see WALLS)	
HORIZONTAL EXITS	
General requirements	3311
Signs for	3312
Substitute for stairways when	3309
HOSE	
As equipment for wet standpipe	3806
Used in fire tests	4201
HOSE CONNECTIONS	
To dry standpipes	3804
To wet standpipes	3806
HOSPITALS	901
HOTEL	
Classified how	1301
Definition of	401
Detailed requirements (see GROUP H)	
HOT PLATES—USING GAS	3711
HOUSES OF CORRECTION	901
HOUSING ACT (see ACT—HOUSING)	
I—occupancies	1401
ICE PLANTS	1201
ILLUMINATED SIGNS—AT EXITS	
General	3312
Of Group A buildings	604 (j)
Of Group B buildings	705
INCINERATORS	
Chimneys for	3701
Construction of	3716
INCLINES (see GRADIENTS)	
INFLAMMABLE LIQUIDS—Regulated	
In Group A buildings	608
In Group B buildings	708
In Group C buildings	808
In Group D buildings	908
In Group E buildings	1008
In Group F buildings	1108
In Group G buildings	1208
In Group H buildings	1308
In Group I buildings	1408
In Group J buildings	1508
Storage for heating purposes	3713
INNER COURT WALLS (see TYPE OF BUILDING)	
INSPECTION	
Final—required when	204
For change of occupancy	207
Of concrete units by Underwriters' Laboratories	2406
Of fire doors by Underwriters' Laboratories	4304
Of plans	202
By registered inspector	204
Of roofing by Underwriters' Laboratories	4305
Of windows by Underwriters' Laboratories	4304
Required when	204
INSULATION MATERIAL	
Regulations for	2016, 2211
INTERIOR TRIM	
For Type I buildings	1816
For Type II buildings	1916
INTERIOR WALL	
Definition of	401

INTERPRETATION OF CODE

By Board of Appeals	304
By Building Inspector	302
IRON	
Cast—allowable working stresses	2702
Cast columns—painted, when	2717 (d)
Cast — specifications for	2701
Galvanized — for exterior walls	2105, 2205
Galvanized — for roofs	1109, 1209, 4305
J—occupancies	1501
JAILS	901
JOIST HANGERS	2506 (i)
JOISTS	
Concrete	3102
Fireproofing of	4301, 4303
Steel	2714, 3103
Steel—tests required when	2714 (g)
Wood	2207, 2506
KEENE'S CEMENT	
Specifications for	4710
LADDERS	
As access to roof space	3205
LAITANCE	
Definition of	2603
LAMINATED FLOORS	
	1910
LANDING OF STAIRS	
	3307, 3308
LATERAL BRACING	
	2311
LATH	
Fibre board	4704
Gypsum	4301, 4302, 4703
Metal (see METAL LATH)	
Wood (see COMBUSTIBLE MATERIALS)	
LEGISLATIVE	4601-4604, incl.
LIBRARIES	
Seating more than 3500	601
Seating from 500 to 3500	701
Seating less than 500	801
LIFE OF PERMIT	
	305
LIGHT—Requirements for	
During construction	4401
For exit signs	3312
For Group A buildings	605
For Group B buildings	705
For Group C buildings	805
For Group D buildings	905
For Group E buildings	1005
For Group F buildings	1105
For Group G buildings	1205
For Group H buildings	1305
For Group I buildings	1405
For Group J buildings	1505
For stairways and exits	3306
LIME	
Proportions for mortar	2409
Specifications for	2409
LINING	
Of chimneys	3701
Of existing walls	2941
Of patent chimneys	3704
Of smokestacks	3702
LINTEL	
Definition of	401
Fireproofing omitted when	1809 (a-2), 1909 (a-2)
Special construction	2906, 2913, 2918
LIQUIDS (see INFLAMMABLE LIQUIDS).	
LIVE LOADS	
Concentrations of	2303
Definition of	401, 2301
For roofs	2305
Reductions allowed	2306

Required to be posted	2308
Special considerations	2308
Units—for certain occupancies	2304
LOADING PLATFORMS	
May be of wood — when	1814, 1914, 2014
LOADS (see LIVE AND DEAD LOADS)	
During construction	2718
For retaining wall design	2310
Piles—bearing power of	2803
Soil—bearing capacity of	2802
LOBBIES IN THEATRES	
Obstructions	604 (1)
Size required	604 (a)
LOCATION IN FIRE ZONES—Requirements for	
Fire Zone No. 1	1602
Fire Zone No. 2	1603
Fire Zone No. 3	1604
LOCATION ON PROPERTY—Requirements for	
General requirements	604
Group A buildings	603
Group B buildings	703
Group C buildings	803
Group D buildings	903
Group E buildings	1003
Group F buildings	1103
Group G buildings	1203
Group H buildings	1303
Group I buildings	1403
Group J buildings	1503
LODGES	
Seating more than 3500	601
Seating from 500 to 3500	701
Seating less than 500	801
LODGING HOUSE	1801
LONG COLUMNS	
Reinforced concrete	2621 (h)
LOT LINES (see LOCATION ON PROPERTY)	
LUMBER (see WOOD)	2501
MAINTENANCE	
Of buildings or structures	106
Of present safety devices	106
Requires authority from Building Inspector	106
MARQUESSES (see TYPE OF BUILDING)	4501 (d)
MASONRY	
Definition of	401, 2401
Materials classified	2401
Quality and design (see Chapter 24)	
Tests required	2401
Walls and partitions (see WALLS)	
MASONRY VENEER	
For masonry walls	2924
Over wood frame	2205 (d)
MATTRESS FACTORIES	1001
MEASUREMENT OF HEIGHTS	
Of buildings (see definition of HEIGHT)	401
MECHANICAL VENTILATION (see VENTILATION)	
METAL	
As lath (see METAL LATH)	
As roof covering	4305
Exterior wall covering	2105, 2205
For enclosing patent chimneys	3704
Frames with wire glass	4304
Gas vents of	3703
Required for doors—when	4304
Smokestacks of	3702
METAL FRAME BUILDINGS (see TYPE IV BUILDINGS)	2101-2110, incl.
METAL LATH	
For fire-resistive construction	4301, 4302, 4303
For floor construction	8103

For partitions	2937, 4302
For stucco reinforcing	2205
METHODS OF CALCULATIONS	3302
MEZZANINE OR MEZZANINE FLOOR	
Construction for Type I buildings	1816
Construction for Type II buildings	1916
Definition of	401
MILL CONSTRUCTION (see TYPE II BUILDINGS)	
MINIMUM REQUIREMENTS	
For classification of type of construction	1702
For fire protection of structural parts	4301, 4302, 4303
Purpose of Code	102
MINOR ALTERATIONS IN ZONE 1	1602-e
MIX	
For masonry mortars	2409
For reinforced concrete	2609 (a)
MIXED OCCUPANCIES	
Separations required	503
MONASTERIES	1301
MORTAR	
For masonry construction	2409
For reinforced concrete	2603
May be mixed in street—how	4401
MOTION PICTURE MACHINE BOOTHS	
Construction and design	4001
For Group A buildings	608
For Group B buildings	708
For Group C buildings	808
For Group D buildings	908
Sprinkler requirements	3801
MOVING—OF BUILDINGS	
When in Fire Zone No. 1	1602
When in Fire Zone No. 2	1603
When in Fire Zone No. 3	1604
Permit required for	202
GENERAL	4601, 4611
MOVING PICTURE THEATRES	
No stage	701
Seating 1,000 or more or with more than 5 ft. stage	601
MUDSILL	
Required when	2204, 2205
MUSEUMS	
Seating more than 3500	601
Seating 500 to 3500	701
Seating less than 500	801
NATIONAL BOARD OF FIRE UNDERWRITERS	
Ordinance for chimney construction	3701
Installation of automatic sprinklers	3802
Oil burner equipment	3713
Protection of openings	4304
NATIONAL FIRE PROTECTION ASSOCIATION	
Oil burner equipment	3713
Protection of openings, against fire	4304
Use, handling, storage and sale of inflammable liquids	1008
NEW METHODS	204
NIGHT LIGHTS—for stairs and exits	3806
NON-BEARING WALL	
Definition of	401
Hollow masonry—construction	2909
Reinforced concrete—construction	2916
Solid masonry—construction	2903
Stone—construction	2921
NOTICES	
For inspections by Building Inspector	204
Of appeals	303
Of approval required	204
Of condemnation	301
Of registered inspector	204
Of violations	305
NURSERIES	901

OBSTRUCTIONS—PROHIBITED

As locks on doors	3304
At fire doors	4304
At horizontal exits	3311
In Group A buildings	604 (1)
In Group D buildings	904
In gutter—when	4401
In stage ventilators	3901
In stairway enclosures	3308

OCCUPANCY

Certificate of	206
Change in use	502
Classified by Building Inspector, when	501
Classified how	501, 503
Definition of	401
Existing buildings classified how	502
Group A	601
Group B	701
Group C	801
Group D	901
Group E	1001
Group F	1101
Group G	1201
Group H	1301
Group I	1401
Group J	1501
Mixed	503
Permanent—of public property	4501
Separations required	503
Temporary—allowed for construction purposes	4401
When not specifically mentioned in Code	501

OFFICE BUILDINGS

1101

OIL

Burners—general requirements	3713
Protection against saturating wood floors	1009
Storage of	1001, 1008

OLD PEOPLE'S HOMES

1301

OPENINGS

Exterior—to be protected when (see LOCATION ON PROPERTY and FIRE ZONES)	
Vertical—to be protected when (see VERTICAL OPENINGS—ENCLOSURE OF)	

ORDINANCE

Adopted when	4604
Repealed by this ordinance	4603

ORDINARY MASONRY BUILDINGS (see TYPE III BUILDINGS) 2001-2016, incl.**ORIEL WINDOW**

Construction of	3501
Definition of	401

ORPHANAGES

901

OVERCROWDING PROHIBITED

In Group A buildings	604 (1)
Where moveable seats are used	2308

OVERLOADS OF FLOORS—not permitted

2308

OVERTURNING MOMENT

For wind calculations	2307
-----------------------------	------

OWNER

Employs registered inspector—when	204
May occupy sidewalk space—when	4401, 4501
Occupies building—when	206
Permits storage of materials in street—when	4401
Required to post signs	2308
Required to repair buildings—when	301
Responsibility of, when adjoining	2801

PAINTING

Of cast iron, when	2717
Of structural steel	2717

PAINT SHOPS

1001

PAINT STORAGE

1001

PANEL WALL

Construction of	2939
-----------------------	------

Definition of	401
PANIC BOLTS—Required when	
For smokeproof towers	3315
For stairway enclosures	3304
In Group A buildings	604 (1)
In Group B buildings	704
In Group C buildings	804
In Group D buildings	904
PAPER	
Tests for	2205
Waterproof—required when	2205
PARAPET WALL	
Construction of	2935
Definition of	401
For Type I buildings	1807
For Type II buildings	1905, 1907
For Type III buildings	2005, 2007
Required when	2935
PARTITIONS	
Bearing—combustible	2507
Bearing—incombustible	2006, 2936
Fire resistance—classification of	4302
For frame construction	2507
General (see TYPE OF BUILDING)	
Non-bearing—incombustible	2937
PARTY WALL	
Definition of	401
May function as fire wall—when	2932, 2933
PASSAGEWAYS	
For Group A buildings—with exits	604
For Group B buildings—with exits	703, 704
For smokeproof towers	3315
Required for stairways, when	3313
To be sprinkled—when	3801
PASSENGER STATIONS	
Seating more than 3500	601
Seating 500 to 3500	701
Seating less than 500	801
PATENT CHIMNEYS	3704
PEDESTAL	
Concrete—definition of	2603
Concrete—design of	2622 (h)
PENALTIES AND VIOLATIONS	
Provided by Code	305
PENTHOUSE	
For stairways—required when	3303
For Type I buildings	1815
For Type II buildings	1915
For Type III buildings	2015
For Type IV buildings	2115
For Type V buildings	2211
General requirements	3601
PERMIT	
Application for	201
Does not permit violation	305
Expires when	305
Fees doubled—when	203
Fees for	203
For alteration	201
For change of occupancy	207, 2309
For demolishing	201
For moving	201
For new buildings or structures	201
For storage of construction materials in street	4401
For temporary buildings	1602, 4401
For use or occupancy	206
Not valid—when	305
Plans required for	201
When required	201

PERSON	
Definition of	401
PETROLEUM STORAGE	1001
PHOTOGRAPHY	
Roof structures allowed for	3601
Special skylight construction for	3402
PIERS	
Hollow masonry	2912
Reinforced concrete	2917
Solid masonry	2906
PILES	
General requirements	2803
PINS	
Allowable stresses	2702
General requirements	2713
PLAIN CONCRETE	
Definition of	2405
Quality and design	2405
Walls (see WALLS)	
Working stresses	2410
PLANING MILLS	1001
PLANS	
Approved by Building Inspector	202
Required for permit when	201
Show water-cement ratio, when	2606
PLASTER AND PLASTERING	
As stucco (exterior)	2205, 4713, 4714
Cement, when not to be used	4715
Fire-resistive, classification of	4301, 4302
Inspection of	204
Materials for fire-resistive construction	4203
Over fibre board (interior)	4715
Over masonry (interior)	4719
Over metal lath (interior)	4715, 4718
Over wood lath (interior)	4715
Over plaster lath (interior)	4715
Pneumatically placed (exterior or interior)	4714
Reinforcing for	4709
Sand	4707
Staff	4721
With cement (interior)	4720
With hardwall gypsum (interior)	4717
With lime mortar (interior)	4716
PLASTERBOARD—GYPSUM	
For fire resistance—ceilings	4301
For fire resistance—partitions	4302
PLATE	
In bearing partitions	2507 (a)
Sill (see MUDSILL)	
PLATE GIRDERS	2704
PLUMBING	
Structural steel	2718
PNEUMATICALLY PLACED STUCCO	
Definition and method of placing	4714
POLICE STATIONS	1101
PORCHES (see TYPE OF BUILDING)	
May project—when	4501 (a)
PORTLAND CEMENT	
Definition of	2603
In masonry mortar	2409
Specifications for	2604 (a)
Storage of	2604 (e)
POWER PLANTS	1201
PRESSURE TANKS	
For wet standpipe supply	3805
PRINTING PLANTS	1101
PRISONS	901
PRIVATE GARAGE (see GARAGE)	
PROJECTIONS FROM BUILDING (see TYPE OF BUILDING)	
Awnings	4501 (b)
Bays and balconies	3501
Below sidewalk	4501 (g)
Cornices, marqueises etc.	4501
In alleys—when	4501 (h)

Permanent (allowed over public property)	4501
PROPERTY ROOMS, GROUP A BUILDINGS (see STORE ROOMS)	
PROSCENIUM	
Curtain—construction of	4101, 4102
Curtain required	602 (b), 702 (b)
Curtain—tests	4105
Sprinkling of opening required	607, 3801
Wall	602 (b), 702 (b)
Wall openings allowed	602 (b), 702 (b)
PROSCENIUM CURTAIN	
Asbestos cloth—type of	4102
Automatic controls for	4104
Coverings for	4102
Design of	4103
Frame of	4103
General requirements	4101
Metal—type of	4102
New designs of	4106
Operation of	4104
Operation—required when	4101
Required where (see GROUP A and GROUP B)	
Tests of	4105
PUBLIC GARAGES	
Definition of	401
In Group E Occupancy	1001
Ramps for	1004
Special construction	1009
Separations required	503, 1505
Ventilation required	1005
PUMPING PLANTS	1201
PUMPS	
For oil burning equipment	3713
For part of oil storage equipment	1008
For wet standpipe supply	3806
PURPOSE	
Of Code	102
QUALITY AND DESIGN OF THE MATERIALS OF CONSTRUCTION	
Masonry	2401-2411, incl.
Reinforced concrete	2601-2622, incl.
Steel and iron	2701-2718, incl.
Wood	2501-2511, incl.
RAFTERS—WOOD	2506 (c), 2508
RAILWAY STATIONS—Passenger	601, 701, 801
RAMPS	
Automobile—enclosure for	1006
Construction of	3310
For automobile storage	1004
For hospitals and sanitariums	904
For temporary walk-way	4401
Substituted for stairways, when	3310
RANGE HOODS	3712
RANGES—GAS	
Domestic	3711
For restaurants and hotels	3712
RECESSES	
In fire walls	2932
In hollow masonry	2913
In reinforced concrete	2918
In solid masonry	2906
In stone	2923
Not allowed—when	4302
REDUCTION OF LIVE LOADS	2306
REDWOOD	
Mudsills	2204, 2205
Piles	2803
Working stresses	2503, 2504
REFORMATORIES	901
REGISTERED INSPECTOR	
Defined	204
Duties of	204
Required when	204
Shall inspect concrete forms	2609 (b)
Termination of duties, when	205
REGISTERS	
Equipped with fusible links—when	605
For warm air ducts	3715

REGISTRATION—CERTIFICATE OF

Fee for	204
Issued by Building Inspector	204
REGULATIONS FOR USE OR OCCUPANCY OF STREETS AND PROJECTIONS OVER PUBLIC PROPERTY (see Part IX)	

Permanent occupancy	4501
Temporary occupancy	4401

REINFORCED CONCRETE

Anchorage of reinforcement	2619
Assumptions for design	2611
Bond and anchorage	2619
Bonding—of concrete	2609
Columns—composite	2621 (f)
Columns—design of	2621
Columns—long	2621 (h)
Computations—flexural	2614
Concrete—quality of	2606
Consistency—of mix	2607
Construction joints	2610
Curing	2609
Definitions—of certain words	2603
Depositing in cold weather	2609
Design—assumptions for	2611
Design—formulas for fully restrained conditions	2616
Design—formulas for general conditions	2615
Design—general	2602
Design—non-uniform conditions	2617
Diagonal tension	2618
Fireproofing of (see TYPE OF BUILDING)	4301
Flat slab—design and construction	2620
Footings—design of	2622
Forms—cleaning of	2609
Forms—construction of	2610
Materials—specifications of	2604
Materials—tests of	2605
Mixing—of concrete	2609
Notation—for formulas used	2612
Placing—of concrete	2609
Proportions—control of	2608
Proportions of mix	2606, 2607
Quality of materials	2601, 2604
Reinforcement—allowable stresses	2613
Reinforcement—placing of	2610
Shear and diagonal tension	2618
Stresses—maximum allowable	2613
Tests of materials	2605
Walls of (see WALLS)	
Web reinforcement—design of	2613

REINFORCEMENT

Effective area of	2608
For columns—reinforced concrete	2621
For flat slab—reinforced concrete	2620
For slabs—reinforced concrete	2614 (d)
For stucco	2205 (c)
For T-beams—reinforced concrete	2614 (d)
For web (diagonal tension)—concrete	2618
Negative—definition of	2603
Of fire protection	4203, 4301
Placing—in reinforced concrete	2610
Positive—definition of	2603
Protection of	2610 (t)
Ratio—definition of	2603
Specifications for	2604 (d)
Splices of	2610 (e)
Stresses—allowable working	2613

REPAIR

Applied to change of use	104, 301, 502
Definition of	401
Of existing buildings	104

REPEALED—ORDINANCES

.....	4603
-------	------

REPORTS—Required

Of Board of Examiners and Appeals	304
Of fees collected by Building Inspector	203
Of registered inspector	204
Of tests of concrete	2606
Of tests of structural steel	2701

RESISTING MOMENT—DEAD LOAD	
For wind calculations	2307
RESTAURANTS	1101
RETAIL STORES	1101
RETAINING WALL	
Definition of	401
Design of	2310
Used as foundation walls for Type V buildings	2204
REQUIREMENTS BASED ON LOCATION IN FIRE ZONES (see Part IV)	
Fire zones defined	1601
For Fire Zone No. 1	1602
For Fire Zone No. 2	1603
For Fire Zone No. 3	1604
REQUIREMENTS BASED ON OCCUPANCY	
Classification of all buildings	501- 508, incl.
For Group A buildings (large assemblage)	601- 610, incl.
For Group B buildings (medium assemblage)	701- 710, incl.
For Group O buildings (small assemblage)	801- 810, incl.
For Group D buildings (hospitals and detention)	901- 910, incl.
For Group E buildings (highly hazardous)	1001-1010, incl.
For Group F buildings (moderately hazardous)	1101-1110, incl.
For Group G buildings (non-hazardous)	1201-1210, incl.
For Group H buildings (residential)	1301-1310, incl.
For Group I buildings (dwellings)	1401-1410, incl.
For Group J buildings (accessory)	1501-1511, incl.
REQUIREMENTS BASED ON TYPES OF CONSTRUCTION	
Classification of buildings	1701, 1702
Type I buildings (fire-resistive)	1801-1816, incl.
Type II buildings (heavy timber construction)	1901-1916, incl.
Type III buildings (ordinary masonry)	2001-2016, incl.
Type IV buildings (metal frame)	2101-2116, incl.
Type V buildings (wood frame)	2201-2211, incl.
REVIEWING STANDS	1501
Permitted in Fire Zone No. 1, when	1602 (f)
RIBBON—In Frame Construction	2506 (h)
RISE OF STAIR	3302, 3307
RISERS	
For dry standpipes	3804
For stairways	3307
For warm air furnaces	3716
For wet standpipes	3806
RIVETS	
Construction details	2711
General	2709
Holes—to be deducted when	2707
In connections	2708
In erection work	2718
To be driven how	2716 (g)
Working stresses for	2702
ROLLING SHUTTERS—Prohibited Where	3304
ROOF CONSTRUCTION (see TYPE OF BUILDING)	3201
Access to roof	3303
Access to roof space	3205
Construction and design	3202, 3203
Covering of	3204, 4305
Divided how	2510 (h)
Of marquee	4501 (d)
ROOFING (see TYPE OF BUILDING)	
Classified—all types	4305
Exceptions	1109, 1209
Fire-retardant—details for	4305 (a)
Ordinary—details for	4305 (b)
ROOF STRUCTURES	
Building requirements (see PENTHOUSE)	
General requirements	3601
Includes what	3601
Sky lights	3402
RUBBLE MASONRY	2019-2023, incl.

RUNNING TRACKS (see GYMNASIUMS)**RUN OF STAIRS**

Number of risers limited	3307
Variation in rise and tread not permitted.....	3302

SALES ROOMS

For combustible goods	1101
For incombustible goods	1201

SAND

For concrete—specifications	2604
For mortar	2409

SAND-LIME BRICK—(see BRICK—SAND-LIME)

SANITARIUMS	901
-------------------	-----

SCHOOLS	801
---------------	-----

SCOPE

Of Code	103
---------------	-----

SCUTTLE

Access to roof space	3205
Access to roof—when required	3303

SEATING CAPACITY

Definition of	401
Of Group A buildings	601
Of Group B buildings	701, 702
Of Group C buildings	801
Required to be posted, when	2308

SEATS

For Group A buildings	604 (g)
For Group B buildings	702
For Group J buildings	1504 (b)
Number of—to be posted when	2308

SELF-CLOSING DOOR

For attic partitions	2510 (h)
For automobile ramp enclosures	1006
For fire doors	3401
For horizontal exits	3311
For motion picture machine booths	4001
For ramp enclosures	3310
For smokeproof towers	3315
For stairway enclosures	3306

SERVICE STATIONS—GASOLINE (see GASOLINE SERVICE STATIONS)**SHALL**

Definition of	401
---------------------	-----

SHAFT

Construction—general	3003
Construction of enclosing walls	3002
Definition of	401
Required to be enclosed—when (see TYPE OF BUILDING)	3001
Special requirements (see occupancy GROUPS and TYPES OF BUILDING)	

SHEAR

In reinforced concrete—allowable stresses	2613
In reinforced concrete—design of	2613
In structural steel	2702
In wood	2503

SHEATHING	2205
-----------------	------

SHINGLES OR SHAKES

As roof covering	4305
As siding	2205 (b)

SHOW WINDOWS

In Type I buildings	1816
In Type II buildings	1916
Part may project over property line	4501 (f)

SHUTTERS

For fire-resistive construction	4304 (b)
For motion picture machine booths	4001
Required for stage vent ducts	605
Rolling—prohibited where	3304

SIAMESE CONNECTIONS

For dry standpipes	3304
--------------------------	------

For wet standpipes	3806
SIDEWALKS	
Glass lights in	3402
Live load for design of	2304
Railing required around—when	3402
Required to be protected when	4401
Space under—may be occupied when	4501 (g)
SIGNS	
For basement pipe inlets	3807
For dry standpipes	3804
For exit—Group A	604 (j)
For exit—Group B	704
For gas shut-off—Group A	608
For gas shut-off—Group B	708
For gas shut-off—Group D	908
For live load—required	2308
For seating capacity—required	2308
For stairs	3312
For wet standpipes	3806
For skylights	3402
SLAB	
Design—reinforced concrete (see REINFORCED CONCRETE)	
Gypsum	2410 (d)
Minimum thickness—for fire-resistive purposes	4303
Minimum thickness—for floors	3102, 3103
Minimum thickness—for roofs	3202
Reinforced concrete	2614, 2620
SLATE	
For roof covering	4305
In foundations	2511 (c)
SLEEPERS—WOOD	
To be divided—how	1810
SMOKE	
Curtain to be tight for	4103
Pipes for	3705
Stacks for	3702
Test for chimney	3701
SMOKE PIPES	3705
SMOKEPROOF TOWER—REQUIRED	
Construction and design	3315
For Group A buildings	604 (k)
For Group B buildings	704
For Group C buildings	804
For Group D buildings	904
For Group E buildings	1004
For Group F buildings	1104
For Group G buildings	1204
For Group H buildings	1304
Where and when	3315
SMOKE VENTS—Over Stage	3901
SOIL	
Bearing allowable	2802
Retaining walls for	2310, 2938
Tests required	2802
SOLID MASONRY (see MASONRY)	
Definition of	401, 2401
SOLID MASONRY WALLS (see WALLS)	
SPECIAL PERMIT	
For occupancy	206
For temporary buildings	1602
SPECIFICATIONS	
For brick	2402
For cast iron	2701
For cast steel	2701
For concrete block or tile	2406
For concrete brick	2404
For fire tests	4201
For gypsum	2407
For hollow clay tile	2408
For lime	2409
For reinforcing steel	2604 (d)
For Portland cement	2604

For sand-lime brick	2403
For structural steel	2701
For tests of concrete cylinders	2605, 2613
May be required for permit	201
SPIRES (see TOWERS)	
SPLICES	
Reinforcing steel	2610 (c)
Structural steel	2706
SPRINKLERS—AUTOMATIC (see AUTOMATIC SPRINKLERS)	
STAIRS	
Access and arrangement	3303, 3313
Access to roof	3303
Application to building—general (see occupancy GROUP and TYPE OF BUILDING)	
Design—general	3302
Doors—leading to	3304
Enclosures for	3308
Exceptions	3314
Firestopping (wood frame construction)	2510 (d)
Horizontal exits—affect number required	3309
In smokeproof tower	3315
Intermediate landings	3302, 3307
Lighting	3306
Locks—if provided	3304
May terminate at second floor—when	3303
Maximum separation	3303
Number required (see also GROUP A, B or C)	3309
Number required—may be reduced when	3303, 3309
Obstructions prohibited	3304, 3308
Outside of building	3316
Passageways required	3303, 3313
Railings	3305
Ramps—may be substituted	3310
Requirements—detailed	3307
Requirements—general	3301, 3302
Rise and tread	3302, 3307
Signs required	3303, 3312
Ventilation of enclosure	3308
Width—minimum	3307
Winders—permitted when	3302
STADIUMS	1501
STAGE	
Construction—Group A	602
Exits from	604 (e)
Floor openings in	606
Limited—Group B	701
Special construction	602, 609
Sprinklers required	607, 3801
Standpipes required	607
Ventilation of	607
STAMPED PLANS TO BE KEPT ON BUILDINGS	202
STANDPIPES	
Dry standpipes—design and construction	3804
Dry standpipes—where required	3803
Wet standpipes—design and construction	3806
Wet standpipes—where required	3805
STEAM HEATING PLANTS—Low Pressure	3708
STEEL—STRUCTURAL	
Beams and girders	2704
Bolts	2709
Cast—allowable stresses for	2702
Cast—properly annealed	2716 (e)
Combined stresses	2702 (f)
Connections in	2708
Construction details	2711
Design	2701
Eccentric loads	2703

Erection of	2718
Expansion	2715
Fireproofing of (see TYPE OF BUILDING)	4301
Gas Cutting	2716 (d)
Joists—design of	2714
Lattice—design of	2712
Net sections—in computations	2707
Quality	2701
Painting of	2717
Pins	2713
Plumbing of frame	2718
Rivets	2709, 2716 (g)
Splices—compression	2708
Tension members—net section	2707
Tests of	2701
Thickness of—minimum	2705
To be painted, when	2717
Trusses—design of	2711
Welded connections	2710
Working stresses—allowable	2702, 2710
Workmanship	2716
STIFFENERS	2704 (e)
STIRRUPS REQUIRED	2506 (i)
STONE	
Facing of	2928
Quality and design	2410 (f)
Veneer of	2924
Walls of (see WALLS)	
STORAGE	
Combustible goods	1101
Incombustible goods	1201
STORAGE OF INFLAMMABLES	1001, 1003
STORAGE OF MATERIALS IN STREETS	4401
STORES—RETAIL AND WHOLESALE	1101
STOREROOMS—GROUP A BUILDINGS	
Fire protection of	607
Inflammable liquids—storage regulated	608
Location of	602 (a)
STORY	
Definition of	401
STOVES	
Chimneys for	3701, 3704
General requirements	3710
STREET	
Definition of	401
May be used for storage, when	4401
STRENGTH OF MATERIALS (see QUALITY AND DESIGN OF THE MATERIALS OF CONSTRUCTION)	
STRESSES—OF MATERIALS OF CONSTRUCTION (see WORKING STRESSES—ALLOWABLE)	
Increase allowed—masonry	2411
Increase allowed—steel and iron	2702
Increase allowed—wood	2503
STRUCTURAL FRAMEWORK (see TYPE OF BUILDING)	
STUCCO	
General requirements	2205 (c)
Inspection of	204
STUD FRAME CONSTRUCTION	2507
STUDS—Minimum Size	2507
SUSPENDED CEILINGS	
For fire protection	4301
Method of hanging	4706
Required to support load	4301, 4706

TANKS	
For oil burning equipment.....	3713
For storage of inflammable liquids.....	1008
For wet standpipe supply.....	3806
Roof structures for	3601
T—BEAMS IN REINFORCED CONCRETE	2614
TEMPORARY BUILDINGS	
Permitted during construction	1602, 4401
Permitted, when	1602 (f), 1603 (f)
TEMPORARY PARTITIONS	
For Type I buildings	1806
For Type III buildings.....	2006
TENANT'S RESPONSIBILITY	2308
TERMITES	2511
TESTS	
For brick	2402, 2403, 2404
For cast iron	2701
For cast steel	2701
For chimneys	3701
For concrete	2605, 2613
For concrete aggregates	2604 (b)
For dry standpipes	3804
For fire-resistive ratings of materials.....	4201
For metal reinforcement	2604 (d)
For new materials and devices.....	302, 303
For pile—safe bearing	2803 (d)
For Portland cement	2604 (a)
For proscenium curtains	4101, 4105
For sprinkler systems	3802
For stage ventilators	3901
For structural steel	2701
For wet standpipes	3806
For wood	2503
Of masonry materials	2401
Of steel joists, when.....	2714 (g)
THEATRES	
Major	601
Moving picture	601, 701
THIMBLES IN CHIMNEYS	3705
TIE RODS	
Fireproofing of	4301
In floor construction—fireproofing required.....	4303
Proportioned—how	2711
Required when—Type I buildings.....	1810
TILE	
Of clay (see CLAY TILE)	
Of concrete (see CONCRETE BLOCKS)	
Of gypsum (see GYPSUM)	
TIMBER (see WOOD)	
TITLE	
Of Code	101
Reference—"this Code".....	101
TOILETS REQUIRED	
For Group E buildings.....	1005
For Group F buildings.....	1105
For Group G buildings.....	1205
For Group H buildings.....	1305
TOWERS (see TYPE OF BUILDING)	
General requirements	3602
Wind pressure	2307
TREADS OF STAIRS	3302, 3307
TRIM	
For Type I buildings.....	1816 (3)
For Type II buildings.....	1916 (3)
TRIMMER ARCHES—FOR FIREPLACES	3706
TRUSSES	
Fireproofing of	4301

Steel frame	2711 (a)
Wood framing	2509
TYPES OF CONSTRUCTION	
Classified how	1701
Classification of buildings	1702
TYPE I or TYPE I BUILDINGS	
Area allowable	1803
Bays and balconies	1814, 3501
Combustible materials regulated	1816
Cornices	1814
Definition of	1801
Design—general	1808
Doors and windows	1813, 3401
Drainage fill	1811
Enclosure of vertical openings	1807
Exterior openings—protection required	1813
Fireproofing—floor construction	1810
Fireproofing—may be omitted, when	1209, 1809
Fireproofing—of structural frame	1809
Floor construction	1810
Foundations	1804
Height allowable	1802
Marqueses	1814
Mezzanine floors	1816
Parapet wall—required when	1807
Partitions, interior	1806
Partitions, temporary	1806
Penthouses	1815, 3601
Projections from buildings	1814
Roof construction	1809, 1811, 1816
Roof structures	1815, 3601
Shafts—construction of	1807
Show windows	1816
Skylights	1815, 3402
Stairs	1812
Structural framework	1808
Structural members, fireproofing of	1809
Trim	1816
Vertical openings enclosure of	1807
Walls—exterior and inner court	1805
Windows and doors	1813, 3501
Wood platforms—permitted when	1814

TYPE II OR TYPE II BUILDINGS

Area allowable	1903
Bays and balconies	1914, 3501
Combustible materials—regulated	1914, 1916
Cornices	1914, 4501
Definition of	1901
Doors and windows	1913, 3401
Exterior openings—protection of	1913
Fireproofing—may be omitted when	1909
Floor construction	1910
Foundations	1904
Height allowable	1902
Marqueses	1914, 4501
Mezzanine floors	1916
Parapet walls	1905, 1907
Penthouses	1915, 3601
Partitions	1906
Projections from building	1914
Roof construction	1909, 1911
Show windows	1916
Skylights	1915, 3402
Stair construction	1912
Structural framework	1908
Structural members—fireproofing of	1909
Towers and spires	1902, 3602
Trim	1916
Vertical openings—enclosure of	1907
Walls—exterior and inner court	1905
Walls—parapet	1905, 1907
Windows and doors	1913, 3401

TYPE III OR TYPE III BUILDINGS

Area allowable	2003
Attic space—divided how	2011
Basement—special construction	2010
Bays and balconies	2014, 3501
Combustible materials regulated	2014, 2016
Cornices	2014, 4501
Definition of	2001
Doors and windows	2013, 3401
Fireproofing—may be omitted when	2009
Fireproofing structural members	2009
Floor construction	2010
Foundations	2004
Height allowable	2002
Insulating materials—placed how	2016
Marqueses	2014, 4501
Parapet walls	2007
Partitions	2006
Partitions—temporary	2006
Penthouses	2015, 3601
Projections from buildings	2014
Roof construction	2011
Skylights	2015, 3402
Stair construction	2012
Structural framework	2008
Towers and spires	2002, 3602
Vertical openings, enclosure of	2007
Walls—exterior and inner court	2005
Walls—parapet	2007
When 4 stories or more in height	2006, 2010
Windows and doors	2013, 3401

TYPE IV OR TYPE IV BUILDINGS

Area allowable	2103
Combustible materials—regulated	2114, 2116
Definition of	2101
Doors and windows	2113, 3401
Fireproofing structural members	2109
Floor construction	2110
Foundations	2104
Height allowable	2102
Partitions	2106
Penthouses	2115, 3601
Projections from the building	2114, 3501, 4501
Roof construction	2111
Skylights	2115, 3402
Stair construction	2112
Structural framework	2108
Towers and spires	2102, 3602
Vertical openings—enclosure of	2107
Walls—exterior	2105
Windows and doors	2118, 3401

TYPE V OR TYPE V BUILDINGS

Area allowable	2203
Attic spaces—divided how	2208
Ceiling construction	2208
Definition of	2201
Design—general requirements	2211
Floor construction	2207
Foundations	2204
Foundations—ventilating openings	2204, 2205
Foundation walls	2204
Height allowable	2202
Insulating materials—regulated	2211
Partitions—interior	2206
Roof construction	2208
Roof covering	2209
Towers and spires	2202, 3602
Ventilation under first floor	2204, 2205
Vertical openings—enclosure of	2210
Wall coverings (siding, stucco, veneer, etc.)	2205
Walls—exterior	2205

UNDERPINNING—	
Required, when	2801
UNDERTAKING PARLORS	1101
UNDERWRITERS' LABORATORIES, INC.—Inspection service	
On doors	4304
On hollow concrete building units.....	2406
On roofings	4305
On windows	4304
UNIT STRESSES (see WORKING STRESSES)	
UNLAWFUL TO OCCUPY—When.....	206, 301
VACATE	
Required, when.....	301
VALIDITY—OF THIS ORDINANCE	4601
VALUE	
Definition of	401
VENEER	
Definition of	401
Walls of (see WALLS)	
VENTILATION	
As air supply for warm air furnace.....	3707
For Group A buildings.....	605
For Group B buildings.....	705
For Group C buildings.....	805
For Group D buildings.....	905
For Group E buildings.....	1005
For Group F buildings.....	1105
For Group G buildings.....	1205
For Group H buildings.....	1305
For Group I buildings.....	1405
For Group J buildings.....	1505
For stairway enclosures.....	3308
In dry cleaning establishments.....	1008
In motion picture machine booths.....	4001
In private garages.....	1505
Over stage	3901
Under first floor of Type V buildings.....	2204, 2205
VENTS	
For dry cleaning plants.....	1008
For gas	3703
For motion picture machine booths.....	4001
For private garages	1505
For public garages	1005
Intake for warm air furnaces.....	3707
VENT SHAFTS (see VERTICAL OPENINGS)	
VERTICAL OPENINGS—ENCLOSURE OF	
For ducts and chutes.....	3003
For Group A buildings.....	606
For Group B buildings.....	706
For Group C buildings.....	806
For Group D buildings.....	906
For Group E buildings.....	1006
For Group F buildings.....	1106
For Group G buildings.....	1206
For Group H buildings.....	1306
For Group I buildings.....	1406
For Group J buildings.....	1506
For Type I buildings.....	1807
For Type II buildings.....	1907
For Type III buildings.....	2007
For Type IV buildings.....	2107
For Type V buildings.....	2210
General requirements	3002
VIOLATIONS AND PENALTIES	
Provided in this Code.....	305

WALLS

Anchoring of	2940
Are bearing partitions when.....	2936
As foundations—general requirements.....	2938
Buttressed—design of	2903 (d)
Construction required (see OCCUPANCY GROUP and TYPE OF BUILDING)	
Definition of	401
Extension of use when existing.....	2941
Faced—bond for	2931
Faced—quality of material.....	2928
Faced—thickness of	2930
Faced—working stresses	2929
Fire division—solid and hollow masonry.....	2934
Fire—hollow masonry	2933
Fire-resistive construction	4302
Fire—solid masonry	2932
General design (see Chapter 29)	
Hollow masonry—beam supports	2911
Hollow masonry—bearing partitions	2936
Hollow masonry—bond	2910
Hollow masonry—chases and recesses.....	2913
Hollow masonry—fire-resistive classification	4302
Hollow masonry—fire walls	2933, 2934
Hollow masonry—general provisions	2907
Hollow masonry—panel and enclosure.....	2939
Hollow masonry—piers	2912
Hollow masonry—thickness of exterior	2909
Hollow masonry—working stresses	2908
Of bays and oriel windows.....	3501
Of motion picture machine booths.....	4001
Of roof structures	3601
Of smokeproof towers	3315
Of stairway enclosures	3308
Of vertical openings	3002
Panel and enclosure.....	2939
Parapet—general requirements	2935
Reinforced concrete—chases and recesses.....	2918
Reinforced concrete—general provisions	2914
Reinforced concrete—piers	2917
Reinforced concrete—thickness of exterior.....	2916
Reinforced concrete—working stresses	2915
Solid masonry—bearing partitions	2936
Solid masonry—bond	2904
Solid masonry—chases and recesses.....	2906
Solid masonry—fire-resistive classification	4302
Solid masonry—fire walls	2932, 2934
Solid masonry—foundation walls	2938
Solid masonry—general provisions	2901
Solid masonry—panel and enclosure.....	2939
Solid masonry—piers	2905
Solid masonry—thickness of exterior	2903
Solid masonry—working stresses	2902
Stone—bond	2922
Stone—chases and recesses	2923
Stone—lateral support and thickness.....	2921
Stone—quality of material	2919
Stone—working stresses	2920
Veneered—allowable height of	2927
Veneered—attachment of	2926
Veneered—quality of material	2924
Veneered—working stresses	2925

WATER

Removal from excavations, when.....	2609
Requirements for concrete.....	2604 (c)
Retaining walls—design of.....	2310
Supply for automatic sprinkler system.....	3802
Supply for wet standpipes.....	3806

WATER-CEMENT RATIO

Consistency required	2607
Control of proportions.....	2608
Requirements for use.....	2606

WATER-CLOSET	
For Group E buildings.....	1005
For Group F buildings.....	1105
For Group G buildings.....	1205
For Group H buildings.....	1305
WATER PRESSURE	
In wet standpipes	3806
Walls to resist—design of.....	2310
WEATHER—AFFECTS CONCRETE CONSTRUCTION—How	2609 (g)
WEATHERBOARDING	2205
WEIGHTS OF BUILDING MATERIALS	
(See Appendix—Refer to Section 2301)	
WELD	
Connection—stresses allowed	2710
Electric spot	2710 (e)
Electrode wire for.....	2710 (c)
For steel joists.....	2714
In erection—allowed when	2718 (d)
Samples required by Building Inspector.....	2710 (d)
WET STANDPIPES (see STANDPIPES)	
WIDTH	
Of corridors	3313
Of entrance doors	604, 704
Of passageways from courts—Group A buildings.....	604 (b)
Of passageways from smokeproof towers.....	3315
Of stair landings	3307
Of stairs	3307
Of stair treads	3302, 3307
Of street allowed for storage.....	4401
WIND	
For roof design	2305
In erection—to be provided for.....	2718 (b)
Pressure for vertical surfaces.....	2307
Steel—increased stresses for.....	2702
Wood—increased stresses for.....	2503
WINDOWS	
General requirements	3401
Fire-resistive—design of	4304 (c)
For Group A buildings.....	603, 605
For Group B buildings.....	703, 705
For Group C buildings.....	803, 805
For Group D buildings.....	903, 905
For Group E buildings.....	1003, 1005
For Group F buildings.....	1103, 1105
For Group G buildings.....	1203, 1205
For Group H buildings.....	1303, 1305
For Group I buildings.....	1403, 1405
For Group J buildings.....	1503
In Fire Zone No. 1	1602 (g)
In Type I buildings.....	1813
In Type II buildings.....	1913
In Type III buildings.....	2013
In Type IV buildings.....	2113
WIND PRESSURE	
Design requirements	2307
Steel stresses may be increased for.....	2702
Wood stresses may be increased for.....	2503
WIRE	
For proscenium curtain reinforcing.....	4102
For stucco reinforcing	2205
For tying roofing materials.....	4305
Ties for fire-resistive materials.....	4301
WIRE GLASS	
In fire-resistive doors.....	4304 (a)
In fire-resistive windows.....	4304 (c)
In skylights—when	3402
Required by location (see LOCATION ON PROPERTY, FIRE ZONES DOORS AND WINDOWS)	
WIRE LATH (see METAL LATH)	

WIRE MESH REQUIRED	
For skylights—when	3402
For stage ventilators—when	3901
Over gypsum plaster lath—when	4301, 4302
WIRELESS	
Masts for—design	3602
WHOLESALE STORES	
	1101
WOOD	
Allowable stresses tabulated—columns	2504
Allowable stresses tabulated—flexure	2503
Beams and joists—may be cut, when	2506 (m)
Built up members	2506 (b)
Columns—allowable unit stresses	2504
Firestops—required	2510
General requirements	2501
Horizontal members—framing details	2506
Plaster lath	4702
Partitions—framing details	2507
Piles of	2303 (b)
Required sizes—determination of	2502
Roof framing	2503
Separation required between members	2506 (d), 4302
Shingles—for exterior walls	2205
Shingles—for roofs	4305
Siding	2205
Stud partitions—may be cut, how	2507 (f)
Stud walls—framing details	2507
Trusses	2509
Unit stresses—allowable	2503, 2504
Unit stresses—may be increased, when	2503
Use—conditions defined	2503
Vertical members—framing details	2505
Walls of	1905, 2205
Weatherboarding	2205
WOOD FRAME BUILDINGS (see TYPE V BUILDINGS)	
	2201-2211 incl.
WOODWORKING FACTORIES	
	1001
WORDS—Special Meaning of	
For reinforced concrete	2603
General	401
WORKING STRESSES—ALLOWABLE	
Cast iron	2702
Cloth— asbestos curtain	4102
Masonry construction	2410
May be increased—masonry construction	2411
Piles	2803
Reinforced concrete	2613
Soil	2802
Steel	2702, 2710
Wood	2503, 2504
WORKMANSHIP	
Inspection of	204
Structural steel	2716
WORKSHOPS	
Moderately hazardous	1101
Non-hazardous	1201
YARD	
Definition of	401

PUBLICATIONS OF THE PACIFIC COAST BUILDING OFFICIALS' CONFERENCE

Uniform Building Code:

Single copies or up to 24.....	\$1.00 ea.
25 to 49 copies.....	.95 ea.
50 to 99 copies.....	.90 ea.
100 to 499 copies.....	.85 ea.
500 copies or more.....	.80 ea.
Leather-bound copies with sewed backs (for greater durability and ease of handling).....	2.50 ea.
Charge for engraving name in gold on cover of leather-bound copy.....	.50 ea.

For codes desired to be sent by air mail enclose \$1.00 extra per copy ordered. Regular parcels post charges are prepaid.

Arrangements may be made with the publishers for the printing of such minor changes as would include filling in the blank spaces in the regular form of the code. A flat price of \$20.00 per order is made for this service.

Code orders may be placed through Conference Headquarters, 124 West Fourth St., Los Angeles, California, or sent direct to the official publishers, the Sun Printing & Publishing House, 430 Court St., San Bernardino, California.

Extracts from Uniform Building Code:

1. Chapter 22 and Sections 2506 to 2510, inclusive, applicable to Wood Frame Buildings.

2. Appendix Reference to Chapter 47, Sections 4701 to 4721, inclusive, applicable to Plastering.

Price 10c each in quantities of less than 100; 5c each for 100 or more.

Sold only by Conference Headquarters.

Specification Documents:

The Appended Documents of the Uniform Building Code are now available in book form under one cover. 528 pages with full cuts, diagrams and tables. Sixty-two documents, classified and arranged by subject matter, with table of contents and index in standard terminology. Sold only through Conference Headquarters. Cloth Bound, Price \$5.00. Fabricoid leather binding \$7.50.

Building Standards Monthly:

Official monthly publication of the Conference published at Conference Headquarters. Subscription price \$1.50 per year.

"Building Department" Forms:

Set of 23 forms covering building, electrical, plumbing and sewer permits. Obtainable direct from Sun Printing & Publishing House.

Price for single sets \$3.00. Quantity prices for individual forms obtainable by writing official publishers.

Prospectus:

Nineteen-page pamphlet on the history and purposes of the Uniform Building Code and the Pacific Coast Building Officials' Conference.

Obtainable without charge through Conference headquarters.

