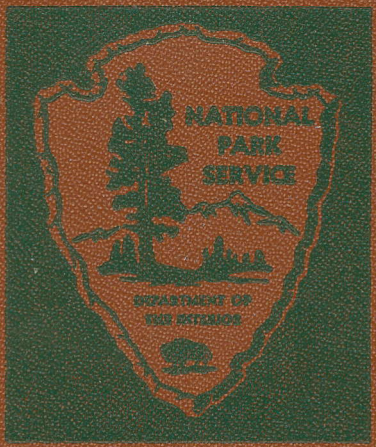
NATIONAL PARK SERVICE

BUILDING CONSTRUCTION HANDBOOK

1958 EDITION



UNITED STATES DEPARTMENT OF THE INTERIOR
National Park Service

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Building Construction Handbook

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PREFACE

This Building Construction Handbook prescribes regulations governing the planning, location, construction, alteration, repair, moving and demolition of buildings in the National Park System.

The requirements set forth are minimum standards and are not to be interpreted as mandatory requirements excluding higher standards or other nationally recognized methods of construction.

The Handbook is issued in loose-leaf form in order to permit insertion of future pages supplementing or superseding pages contained in the original issue.

INTRODUCTION

The National Park System is composed of national parks, parkways, historical parks and historic sites, military parks, battlefield parks and sites, monuments, memorials and memorial parks, recreational parks and projects and certain national cemeteries.

The Congress of the United States in 1916 established the National Park Service as a bureau of the Department of the Interior to correlate the administration of the National Park System. The Service is charged with promoting and regulating the public use of the parks and with preserving and protecting them for the benefit and enjoyment of this and future generations.

To accomplish this objective and to provide facilities of standards which the American people want and have a right to expect, a program has been formulated as a basis for preparing, operating and developing plans that would meet the problem of park use today and in the future.

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CHAPTER 1

ADMINISTRATION

100 SCOPE

100.1 General

The provisions of this Handbook apply to the use, occupancy, safety, location, construction, alteration, repair, removal, and demolition of buildings and structures and their service equipment in areas under the administrative jurisdiction of the National Park Service.

100.2 Standards

a. The latest provisions of the National Building Code and/or the Uniform Building Code may be applied in the design and construction of structures, except where such provisions are lower than the standards contained herein.

b. The adoption of lower standards and requirements other than those provided herein is prohibited, but adoption of higher standards is permissible and encouraged.

101 COMMITTEE

101.1 Established

A Committee has been established to select and formulate the material in this Handbook and to maintain it in current status.

101.2 The Building Construction Committee

The Building Construction Committee, hereinafter referred to as the Committee, shall be composed of members approved by the Director and as listed in the Administrative Manual.

101.3 Duties of the Committee

a. Make such revisions or additions necessary to maintain this Handbook in current status in respect to the in-

troduction of new regulations, new materials, equipment and methods of construction.

b. Review and make decisions in respect to interpretation of, and requested deviations from, the provisions of this Handbook.

c. In discharging the above duties, the Committee shall convene upon the call of the Chairman or the Director. Action of the Committee shall be subject to the review of the Director.

102 REVISIONS

102.1 Recommend Changes

Officials responsible for buildings and structures and their service equipment are urged to recommend changes which they consider are necessary to bring the provisions of this Handbook fully abreast of the times.

102.2 Convene

The Committee shall meet periodically for review of the Handbook and for consideration of any recommendations submitted. Whenever the provisions of this Handbook are found to be inadequate or obsolete, necessary revisions or amendments shall be submitted, with recommendations to the Director for approval.

103 EXCEPTIONS AND DEVIATIONS

Whenever circumstances appear to warrant exceeding the limitations of, or departures from, the provisions of this Handbook, request shall be made to the Committee, with full explanation of the circumstances and proposed changes with sufficient information to facilitate review.

104 BUILDING TYPES

This volume deals with the various types of buildings forming the development of the National Park System. In

cases where a building to be constructed is not of a type included herein, such building shall conform to the type of building herein closest in resemblance to it in regard to use and occupancy.

105 ARRANGEMENT

105.1 Chapters

This Handbook is arranged in chapters, with the greatest number of chapters dealing with subject matter. Other chapters deal with use and occupancy, with reference to subject matter.

105.2 Sections

Each chapter is divided into sections and sections have identifying paragraphs and sub-paragraphs.

105.3 Numbers

Chapters are numbered in series, such as 1, 2, 3, etc.; sections are numbered 100, 101, 102, etc.; paragraphs are numbered 100.1, 100.2, 100.3, etc.; sub-paragraphs are identified with small letters a, b, c, etc., and numbers in parentheses (1), (2), (3), etc.

105.4 Page Numbers

a. Pages are numbered consecutively. In case of revisions requiring additions of pages between the first and last pages, the added pages shall be identified with the number of the preceding page and a small letter, such as 3a, 3b, 3c, etc.

b. Each page that has been revised or added, since the publication of this 1958 Edition of the Handbook shall be dated at the bottom right hand corner of the page.

CHAPTER 2
DEFINITIONS

200 INTRODUCTION

200.1 Terms

Unless otherwise expressly stated, the following terms shall, for the purpose of this Handbook, have the meanings indicated in this Chapter.

200.2 Terms Not Defined

Where terms are not defined, they shall have their ordinarily accepted meanings or such as the context may imply.

201 ACCEPTED ENGINEERING PRACTICE—That which conforms to accepted principles, tests or standards of nationally recognized technical or scientific authorities.

202 ADMINISTRATION BUILDING—The main office in any National Park, usually including the Superintendent's office.

203 ADMINISTRATIVE AUTHORITY—The authority of the Director or the authority delegated to the Superintendents, Regional Directors, Chief of EODC, Chief of WODC, and others to give approvals in accordance with the provisions of Volume 12 of the Administrative Manual.

204 ADMINISTRATIVE BUILDINGS (See Section 502)

205 ALTERATION—Any change, addition, or modification in the construction of a building.

206 APARTMENT (See DWELLINGS)

207 APARTMENT HOUSE (See DWELLINGS)

208 APPROVED—Approval by the Director or other official having delegated authority to act for him.

209 ARCHITECT—An individual, including a Government employee, technically and legally qualified to practice the profession of architecture.

210 AREA—This is divided into two categories: the ground floor area and the total floor area. For determining the maximum area limitation for buildings of the various construction types, the maximum horizontal projected area shall be used. For estimating purposes the total area of all floors shall be used and open porches and attached garages shall be figured at one-half the floor area.

In computing square foot areas, measurements shall be taken to the outside of the walls or foundations.

211 AREAWAY—An uncovered sub-surface space adjacent to a building.

212 ASSEMBLY ROOM—A room designed for the purpose of assembling 50 or more persons.

213 BASEMENT—A portion of the building partly underground with floor level 2 feet or more below finished grade.

214 BEARING WALL (See WALLS)

215 BUILDING—A structure built for the support, shelter, or enclosure of persons, animals or property of any kind.

216 BUILDING AUTHORITY—The officer or other designated authority charged with the administration and enforcement of this Handbook, or his duly authorized representative.

217 BUILDING SERVICE EQUIPMENT—Equipment which provides sanitation, power, heating, ventilation, fire fighting, transportation, and other facilities essential for the use and occupancy of the structure.

218 BUNK HOUSE (See DWELLINGS)

219 CABIN—A building or unit of a building containing three (3) or less rooms affording transient or temporary living and/or sleeping quarters for an individual or family group.

220 CONCESSIONER—A person, firm or corporation conducting business in a National Park, under privilege, lease and/or permit granted by the Secretary of the Interior.

221 COURT—An open, uncovered, unoccupied space partially or wholly surrounded by the walls of a structure or structures.

222 CUBAGE—The cubic content of the actual space inclosed within the outer surfaces of the outside walls and contained between the outside of roof and bottom of basement floor slab. Enclosed porches shall be computed in full volume. Porches, if built as extensions to a house and not enclosed, or having no sash, shall be computed at ½ volume. Gable roofs shall be computed at ½ width x length x height; hip roofs at ⅓ width x length x height, and dormers and chimneys at full volume. Partial basements shall be computed separately and the result added to the figure for the main part of the building. Garages shall be computed at ½ volume.

223 DORMITORY (See DWELLINGS)

224 DWELLINGS

224.1 Apartment—One or more rooms comprising a dwelling unit or serving as the home or residence of an individual, a family or a household and usually considered one unit of an apartment house.

224.2 Apartment House—A building containing more than two dwelling units.

224.3 Bunk House—A building arranged or used for lodging six (6) but not more than twenty (20) individuals per room and having common toilet and bathroom facilities.

224.4 Dormitory—A building, or portion of a building containing a room, or rooms, with sleeping accommodations for five (5) or more individuals, not a family group, and having common and/or private bathroom facilities. No

more than 20 persons shall be accommodated in any dormitory room.

224.5 Duplex Residence—A residential building containing two dwelling units.

224.6 Dwelling Unit—One or more rooms arranged for use as a single housekeeping unit, with cooking, living, sanitary, and sleeping facilities.

224.7 Multiple Cabin Units—Multiple cabin units are a number of bedrooms (with or without baths) included in one building, each unit with its own exterior entrance .

224.8 Multiple Housing—Permanent—Permanent multiple family house means a building occupied as the home of three or more individuals, or families or households living independently of each other and doing cooking within their dwelling units.

224.9 Multiple Housing—Seasonal—A seasonal multiple house is a building occupied as the temporary home of three or more individuals, or families or households living independently of each other. Each unit may consist of one or more rooms with limited living facilities and shall have its own exterior entrance.

224.10 Quarters—One or more rooms arranged for use solely as living accommodations for one or more individuals.

224.11 Residence—A building containing four (4) or more rooms, used solely as a single housekeeping unit, with cooking, living, sanitary and sleeping facilities.

225 ENGINEER—An individual, including a Government employee, technically and legally qualified to practice the profession of engineering.

226 EXISTING BUILDING—A building already erected for use or occupancy.

227 EXIT—EXITWAY—A doorway or such opening with connecting hallways, passages, or stairs designed especially to provide safe egress to the outside of and away from a structure.

228 FIRE DOOR—Fire door means a door and its assembly, so constructed and assembled in place as to give protection against the passage of fire.

229 FIRE RESISTANCE—That property of materials or their assemblies which retards or prevents the passage of excessive heat under conditions of use.

230 FIRE-RESISTIVE RATING—The time in hours that materials or their assemblies will resist fire exposure as determined by fire tests conducted in compliance with recognized standards.

231 FIRE SEPARATION—Walls and floors designed to effectively resist passage of fire from one portion of a building to the other portion, for definite periods of time.

232 FIRE WALL (See WALLS)

233 FLOOR AREA—The total area of all floors, measured inside the exterior walls of a building.

234 GARAGE

234.1 Private Garage—A building or portion thereof used solely for storing passenger motor vehicles owned or used by the occupants of a residence.

234.2 Public Garage—A building or portion thereof used for the storage, care and repair of motor vehicles and not included in the term "Private Garage."

235 GAS VENT—A flue for removing products of combustion from gas appliances.

236 GRADE—The average finish level of the ground adjoining a building on all sides.

237 HEIGHT

237.1 Building—The vertical distance measured from the average finish grade to the average elevation of the roof.

237.2 Story—The vertical distance from floor to floor or floor to ceiling.

237.3 Wall—The vertical distance from the foundation wall or other immediate support of such wall, to the top of the wall.

238 HOTEL—A building containing six (6) or more rooms designed primarily for use as transient sleeping accommodations, for compensation.

239 HOUSEKEEPING CABIN—A building or unit thereof containing three (3) or less housekeeping rooms and for transient or temporary occupancy.

240 INN (See LODGE)

241 LOADS

241.1 Dead—The weight of all permanent construction, such as floors, roofs, permanent partitions, stairways and walls.

241.2 Live—The weight superimposed by use and occupancy of a structure, not including the wind load, earthquake load or dead load.

242 LODGE—A building used primarily for sheltering, sleeping and feeding transient guests for compensation.

243 MASONRY—That form of construction composed of stone, brick, concrete blocks, gypsum, hollow clay tile or other similar building units or materials or a combination of these materials built unit by unit in mortar.

243.1 Hollow Unit Masonry—A wall built of masonry units so arranged as to provide air space within the wall.

243.2 Masonry Veneer—A wall having a facing of

masonry, securely attached to the structural wall but not so bonded as to exert common action under load.

243.3 Solid Masonry—Masonry built of units without hollow spaces.

244 OCCUPANCY—The purpose for which a building is used or intended to be used.

245 OFFICE BUILDING—A building used primarily for office purposes.

246 PASSAGEWAY—An enclosed hallway, exitway or corridor connecting a required exit to the outside of a building.

247 PREFABRICATED—Fabricated prior to erection or installation in a building.

248 PUBLIC SPACE—Rooms or spaces within a building or area adjoining a building designated to be used by the public.

249 RANGER STATION—A building or a group of buildings, including living quarters, for rangers, for use as a point of operation for the protection of a park or portion thereof.

250 RECOMMENDED—Advisable, but not mandatory.

251 REPAIR—The replacement of existing work with equivalent materials for the purpose of maintaining original condition and use of a building.

252 RESIDENCE (See DWELLINGS)

253 SANITARY ENGINEER—An individual qualified and employed to deal with sanitation matters in the National Park System.

254 SEATING CAPACITY—The number of people that can be seated in an assembly room or other rooms or structures intended for seating people.

255 SHAFT—A vertical opening or passage through one or more floors of a building or through floors and roof.

256 SHALL—A mandatory requirement.

257 SHOULD—Recommended but not mandatory.

258 SPRINKLERED—Equipped with an approved automatic sprinkler system properly maintained.

259 STAIRWAY—One or more stairs and the necessary landings and platforms connecting them to form a continuous and uninterrupted passage from one floor to another.

260 STORY—That part of a building comprised between a floor and and the floor above, except, the top story shall be that part of a building comprised between the floor and the ceiling, or roof above.

261 STRUCTURE—An edifice or building of any kind or any piece of work constructed or built of parts joined together in some definite manner to form a construction unit that is safe and stable.

262 SUPERINTENDENT—The Superintendent and/or coordinating Superintendent of a National Park.

263 USE—The purpose for which a building or structure is designed, used, or intended to be used.

264 VENEER (See Masonry Veneer)

265 VENTILATION—The process of supplying or removing air by natural or mechanical means to or from any building or enclosed space.

266 VISITOR CENTER—A major building used primarily for providing interpretive facilities for visitors and in many cases including Park offices and other facilities.

267 WALLS

267.1 Bearing Wall—A wall which supports any vertical load in addition to its own weight.

267.2 Cavity Wall—A wall built of masonry units or of plain concrete, or a combination of these materials, arranged to provide an air space within the wall, and in which the

inner and outer parts of the wall are tied together with metal ties.

267.3 Curtain Wall—A non-bearing wall between columns or piers and not supported at each story.

267.4 Faced Wall—A wall in which the masonry facing and backing are so bonded as to exert common action under load.

267.5 Fire Partition—A partition which subdivides the floor area of a building to restrict the spread of fire.

267.6 Fire Wall—A wall having adequate fire resistance and structural stability under fire conditions to accomplish the purpose of completely subdividing a building or of completely separating adjoining buildings to resist the spread of fire.

267.7 Foundation Wall—A wall below the floor nearest grade serving as a support for a wall, pier, column, or other structural part of a building.

267.8 Hollow Masonry Wall—A wall built of masonry units so arranged as to provide an air space within the wall, and in which the facing and backing of the wall are bonded together with masonry units.

267.9 Non-bearing Wall—A wall which supports no vertical load other than its own weight.

267.10 Panel or Skeleton Wall—A non-bearing wall supported at each story on a skeleton frame.

267.11 Parapet Wall—That part of any wall entirely above the roof line.

267.12 Retaining Wall—A wall designed to resist lateral pressure.

267.13 Veneer Wall—A wall having a facing of masonry or other materials securely attached to the backing but not so bonded as to exert common action under load.

CHAPTER 3

DRAWINGS AND SPECIFICATIONS

300 GENERAL

300.1 Where Required

a. Preliminary drawings and working drawings and specifications are required for all building construction projects.

b. They shall be prepared, numbered, submitted and approved in accordance with requirements contained herein.

c. Drawings for a building construction project shall not be undertaken until the project is shown on the approved Master Plan and included in the approved construction program.

301 PRELIMINARY DRAWINGS

301.1 Procedure

a. Required—Preliminary drawings shall be prepared for all new buildings proposed for construction and for all existing buildings proposed for alteration. This requirement is for all National Park Service buildings, concessioners' buildings and buildings of other agencies to be erected on property administered by the National Park Service.

b. Exceptions

(1) Where the preparation of a working drawing would involve little additional work over and above the work required for preparing a preliminary drawing, the requirements for preparing a preliminary drawing may be waived. However, such working drawings shall be handled in the same manner as a preliminary drawing for submission, review and approval.

(2) Where the alteration, restoration or rehabilitation of an existing building does not involve a new design, the

construction drawing may serve as a preliminary drawing, following the same procedure for submission, review and approval as a preliminary drawing.

c. Conformance to program—The preliminary drawings shall be prepared in accordance with the work outlined in the approved Project Construction Program Proposal Form.

d. Decision of differences—If, in the course of development of the preliminary drawings, there is a difference between the Design Office and the Superintendent that they cannot resolve themselves, the matter shall be referred to the Regional Director for a decision.

301.2 Preparation of Drawings

a. Size of sheets—Preliminary drawings shall be prepared on standard printed sheets wherever practicable. In cases where larger sheets are required to properly present the design, the review, approval and title blocks shall be identical with those on the standard printed sheets.

b. Drawings shall include

(1) Plan of each floor.

(2) Two direct elevations or one elevation and a perspective.

(3) Location plan.

(4) An outline specification indicating the materials, equipment and facilities to be employed in the work.

(5) The estimated total construction cost.

(6) The drawings shall be designated by the word PRELIMINARY, placed immediately above the title block.

c. Scale and clarity—The drawings shall be of such scale and clarity as to properly show the plan and arrangement with respect to function and operation, size of the structure and individual rooms, and ceiling heights; and to show the appearance of the structure and the harmonious adaptability of the project in its entirety to conditions of the site

d. Approval panels

(1) Approval panels shall be provided on all preliminary drawings for signatures of recommendation, clearance and approval.

(2) In cases where the drawings include more than one sheet, the approval panel shall be required only on the first sheet.

301.3 Submission and Approval of Drawings

a. Prepared in Design Office—The Design Office shall submit the preliminary drawings to the Superintendent and copies to the Director and the Regional Director. Air mail shall be used where necessary to expedite delivery. In the absence of comment from the Director or Regional Director within ten (10) days from the date of transmittal by the Design Office, the Superintendent may approve the drawings.

b. Prepared in the park—When preliminary drawings are prepared in the park, copies of the drawings shall be sent to the Design Office, Regional Office and Washington Office for review and comment. In the absence of comment from these offices within the ten (10) days from the date of transmittal, the Superintendent may approve the drawings.

c. Prepared in the Regional Office—Submission and approval of preliminary drawings prepared in the Regional Office shall follow the same procedure as is required for the park.

d. Clearance by the Regional Director—The Regional Director shall clear the preliminary drawings for architectural style in a newly developed area or when there is a departure from the style of architecture previously established in an area of a park.

e. Concessioners drawings

(1) Concessioners will submit five (5) sets of all preliminary drawings to the Superintendent.

(2) On receipt of preliminary drawings from the Concessioner, the Superintendent shall forward a copy to the Director with his comments, two copies to the appropriate Design Office and one copy to the Regional Office with his comments. In the absence of comment by the Director or the Design Office ten (10) days from the date of transmittal by the Superintendent, the Regional Director may approve the preliminary drawings. On the basis of the approved preliminary drawings the Concessioner may have the final working drawings prepared. Any material changes from the approved preliminary drawings will require the submission and approval of revised preliminary drawings.

302 WORKING DRAWINGS AND SPECIFICATIONS

302.1 Procedure

a. Where required—Working drawings and specifications shall be prepared for all building construction projects.

b. Order to proceed—The approval of preliminary drawings amounts to an order for the Design Office to prepare working drawings and specifications in accordance with the approved preliminary drawings.

c. Compliance—Whenever working drawings are developed from approved preliminary drawings, there shall be no substantial deviation from the approved preliminary drawings.

d. Major changes—In cases where it is desired to make major changes from the approved preliminary drawings in developing the working drawings, revised preliminary drawings shall be submitted for approval before proceeding with the working drawings.

e. Approval—Unless there are departures from the approved preliminary drawings, approval of the final working drawings is not required; except for working drawings sub-

mitted by the concessioner and working drawings for historic structures.

f. Drawings certified—The Chief of the Design Office shall certify on the first sheet of the working drawings as follows:

"This drawing has been prepared in compliance with Preliminary Drawing No. —, Approval by (Superintendent, Regional Director or Director) on —, date."

g. Concessioners drawings—On receipt of the working drawings from the concessioners, the Superintendent shall forward two (2) copies to the appropriate Design Office, one (1) copy to the Regional Director, and one (1) copy to the Director. In the absence of comment from the Director, Regional Director and the Design Office within ten (10) days of transmittal by the Superintendent, the Superintendent may approve the final working drawings.

302.2 Preparation of Working Drawings

a. Size of sheet—Working drawings shall be prepared on standard printed sheets wherever practicable.

b. Drawings included—Working drawings shall consist of the necessary plans, elevations, sections, details, profile, etc. to show in a comprehensive manner all phases of the work contemplated.

c. Scale—The drawings shall be drawn to scale at not less than ⅛ inch to one (1) foot for the essential parts of the building.

d. Designation—The drawings shall be designated by the words WORKING DRAWING placed immediately above the title block.

e. Approval panels

(1) Approval panels shall be provided on all working drawings for signatures of recommendation, clearance and approval.

(2) In cases where the drawings include more than one sheet, the approval panel shall be required only on the first sheet.

302.3 Specifications

The working drawings shall be accompanied by specifications, either as a separate document or in the form of notes applied to the drawings, sufficient in detail to define exactly the kind and quality of materials, equipment and workmanship to be employed in the work.

303 DRAWINGS FOR HISTORIC STRUCTURES

303.1 General

Drawings shall be required for the restoration, rehabilitation, preservation and reconstruction of historic buildings and shall be prepared by the appropriate Design Office.

303.2 Historic Structures Report

An historic structures report shall be prepared outlining the condition of the structure, work to be undertaken and the course of historical data. The Regional Director shall coordinate the preparation of the report.

303.3 Preliminary Drawings

Preliminary drawings will not normally be required for restoration, rehabilitation and preservation projects since a new design is not involved. However, preliminary drawings will be required for reconstruction projects.

303.4 Measured Drawings

Complete measured drawings shall be made of every historic structure programed for restoration, rehabilitation or preservation. They shall show all phases of the existing structure.

303.5 Working Drawings

Working drawings shall include all plans, elevations, details, profiles and specifications necessary to show completely all phases of the work contemplated.

303.6 Submission and Approval

a. The sections of the report containing the results of the complete architectural, archeological and historical research, with plans, and recommendations for the work shall be submitted to the Regional Director who shall assemble all sections and forward them to the Director, the Superintendent and the appropriate Design Office for review. The Regional Director may forward separate sections of the report for preliminary review, if in his judgment such action will hasten the final review of the report.

b. In the absence of comments, within the ten day review period, from the Director, the Regional Director or the Design Office, the Superintendent may approve the report.

c. Generally, preliminary drawings are not required for the rehabilitation and restoration of historic structures. In such cases the Report will serve in lieu of a preliminary drawing. Where preliminary drawings are required, the Design Office shall be responsible for the preparation and submission of the drawings. The submission and approval of preliminary drawings shall follow the same procedure as is required for the Historic Buildings Report.

d. Following the approval of the Historic Buildings Report and/or the preliminary drawings, the Design Office shall prepare working drawings and specifications in accordance with the report and drawings and transmit prints for review. The working drawings shall be recommended for approval by the Regional Director, the Superintendent and the Chief of the Design Office, and approved by the Director or Associate Director.

304 SPECIAL APPROVALS

The Superintendent or the Regional Director may request the Director to approve any drawing, and the Director may designate any drawing for his approval.

305 PUBLIC HEALTH SERVICE

The Chief of the Eastern Office or the Western Office, Division of Design and Construction shall confer with, correspond with and route drawings to the U. S. Public Health Service concerning all health and sanitation matters in connection with building construction projects within his designated territory.

306 NUMBERING OF DRAWINGS

306.1 General

Every drawing prepared by the National Park Service, and every drawing prepared by concessioners or other agencies for a building to be constructed within the National Park System, shall have a Service number in all instances. In cases where other agencies desire to use their own number, such number shall be in addition to, but not in lieu of, the Service number. It is the duty of the official transmitting such drawing to apply a Service number to the drawing.

306.2 Number Composition

a. The entire number of a drawing shall be composed of four different parts as described below:

(1) Classification prefix—This will indicate the type of park, such as National Park, National Monument, National Military Park, etc.

(2) Park prefix—This will indicate the name of the park, such as Shenandoah, Glacier, etc.

(3) Key number—This will be the file number, such as 3012, etc.

(4) Suffix—This will indicate the number of drawings prepared for a specific project, such as 3012–A, etc.

(5) Example—The drawings for a building or structure shall be numbered such as, $\frac{\text{NP–GLA}}{3012}$, $\frac{\text{NP–GLA}}{3012\text{–A}}$, etc., showing the suffix added for each revision.

CHAPTER 4

DOCUMENTS

400 REFERENCES

The following documents are referred to throughout this Handbook and the latest edition of such documents shall govern in all cases.

400.1 BUILDING CODES

a. National Building Code—Published by the National Board of Fire Underwriters, 85 John Street, New York, N. Y.; 222 West Adams Street, Chicago 6, Ill.; 465 California Street, San Francisco 4, Calif.

b. Uniform Building Code—Published by the International Conference of Building Officials, 610 South Broadway, Los Angeles 14, Calif.

c. Southern Standard Building Code—Published by the Southern Building Code Congress, Brown-Marx Building, Birmingham, Ala.

d. Basis Building Code—Published by the Building Officials Conference of America, Inc., 110 East 42nd Street, New York, N. Y.

400.2 NATIONAL BOARD OF FIRE UNDERWRITERS PUBLICATIONS

National Board of Fire Underwriters, 85 John Street, New York, N. Y.; 222 West Adams Street, Chicago 6, Ill.; 465 California Street, San Francisco 4, Calif.

a. No. 10—First Aid Fire Appliances

b. No. 13—Sprinkler Systems

c. No. 20—Centrifugal Fire Pumps

d. No. 22—Water Tanks for Private Fire Protection Service

e. No. 30—Containers for Storing and Handling Flammable Liquids

f. No. 31—Oil Burning Equipment
g. No. 32—Dry Cleaning Plants
h. No. 80—Protection of Openings in Walls and Partitions
i. No. 310—Small Heating and Cooking Appliances

400.3 NATIONAL ELECTRIC CODE—Published by the National Fire Protection Association, 60 Batterymarch Street, Boston 10, Mass.

400.4 HEATING, VENTILATING, AND AIR CONDITIONING GUIDE—Published by the American Society of Heating and Ventilating Engineers, 51 Madison Avenue, New York, N. Y.

400.5 GRAVITY CODE AND MANUAL FOR THE DESIGN AND INSTALLATION OF GRAVITY WARM AIR HEATING SYSTEMS, MANUAL 5—Published by the National Warm Air Heating and Air Conditioning Association, 145 Public Square, Cleveland, Ohio.

400.6 CODE AND MANUAL FOR THE DESIGN AND INSTALLATION OF WARM AIR CEILING PANEL SYSTEM, MANUAL 7A—Published by the National Warm Air Heating and Air Conditioning Association, 145 Public Square, Cleveland, Ohio.

400.7 CODE AND MANUAL FOR THE DESIGN AND INSTALLATION OF WARM AIR WINTER AIR CONDITIONING SYSTEM, MANUAL 9—Published by the National Warm Air Heating and Air Conditioning Association, 145 Public Square, Cleveland, Ohio.

400.8 NATIONAL PLUMBING CODE—Published by the U. S. Department of Commerce. (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

400.9 RECOMMENDED MINIMUM REQUIREMENTS FOR PLUMBING—Published by the U. S. Department of Commerce, Bureau of Standards. (Superintendent

of Documents, U. S. Government Printing Office, Washington 25, D. C.)

400.10 LIGHTNING PROTECTION HANDBOOK—Published by the U. S. Department of Agriculture, Forest Service. (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

400.11 CODE PROTECTION AGAINST LIGHTNING (HANDBOOK 46)—Published by the National Bureau of Standards. (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

400.12 BLASTERS' HANDBOOK—Published by E. I. DuPont de Nemours Company, Inc., Wilmington, Del.

400.13 MANUAL OF ACCIDENT PREVENTION—Published by Associated General Contractors of America, Inc., 1227 Munsey Building, Washington, D. C.

400.14 PREVENTION AND CONTROL OF FIRE LOSSES (A HANDBOOK)—Published by the U. S. Department of the Interior. (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

400.15 MANUAL OF FIRE-LOSS PREVENTION OF THE FEDERAL FIRE COUNCIL—Published by the General Services Administration. (Superintendent of Documents, Government Printing Office, Washington 25, D. C.)

400.16 LUMBER STANDARDS

a. Standard Grading Rules—Published by Western Pine Association, 510 Yron Building, Portland 4, Oreg.

b. The Strength and Related Properties of Redwood—Published by the U. S. Department of Agriculture. (Superintendent of Documents, U. S. Government Printing Office, Washintgon 25, D. C.)

c. Grading Rules for Southern Pine Lumber—Published by the Southern Pine Association, New Orleans, La.

d. Standard Grading Rules—Published by the South-

ern Cypress Manufacturers' Association, Barnett National Bank Building, Jacksonville 2, Fla.

e. **Standard Grading and Dressing Rules**—Published by the West Coast Lumbermen's Association, 1410 S. W. Morrison Street, Portland, Oreg.

400.17 WOOD HANDBOOK—Published by the U. S. Forest Service (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

400.18 WOOD STRUCTURAL DESIGN DATA—Published by the National Lumber Manufacturers' Association, 1319 18th Street N. W., Washington 6, D. C.

400.19 STEEL CONSTRUCTION MANUAL—of the American Institute of Steel Construction, 101 Park Avenue, New York 17, N. Y.

400.20 REINFORCED CONCRETE DESIGN HANDBOOK—Published by the American Concrete Institute, 7400 Second Boulevard, Detroit, Mich.

400.21 SAFETY CODE FOR MECHANICAL REFRIGERATION—Published by the American Standard Association, 70 East 45th Street, New York 17, N. Y.

400.22 NATIONAL FIRE PROTECTION ASSOCIATION PUBLICATIONS—National Fire Protection Association, 60 Batterymarch Street, Boston 10, Mass.

a. **Handbook of Fire Protection**
b. **No. 14—Standpipe and Hose Systems**
c. **No. 52—Liquefied Petroleum Gas Piping and Appliance Installations in Buildings**
d. **No. 58—Storage and Handling of Liquefied Petroleum Gases**
e. **No. 78—Lightning Code**
f. **No. 90B—Standards for Installation of Residence Type Warm Air Heating and Air Conditioning Systems**
g. **No. 101—Building Exit Code**

CHAPTER 5

CLASSIFICATION BY USE AND OCCUPANCY

500 GENERAL

Every new and existing building or part thereof shall be classified according to the following specific uses and occupancies: Administrative Buildings, Public Buildings, Residence Buildings, and Utility Buildings.

501 CHANGES

No change shall be made in the use and occupancy for which a building was originally approved without first obtaining administrative authority.

502 ADMINISTRATIVE BUILDINGS

502.1 Buildings Included

Buildings or parts thereof used primarily for the administration, interpretation and protection of the park shall be included under this classification.

a. Administrative Buildings
b. Camptender Stations
c. Contact Stations
d. Fire Lookouts
e. Jails
f. Laboratories
g. Libraries
h. Observation Stations
i. Office Buildings
j. Patrol Stations
k. Radio Stations
l. Ranger Stations
m. Telephone Exchanges
n. Visitor Centers

503 PUBLIC USE BUILDINGS

503.1 Buildings Included

Buildings or parts thereof for use primarily by the visiting public shall be included under this classification.

a. Assembly Buildings
- Assembly Halls
- Auditoriums
- Lecture Halls

b. Amphitheaters

c. Churches

d. Comfort Stations

e. Commercial Structures
- Bath Houses
- Boat Houses
- Dry Cleaning Plants
- Garages (Public)
- Laundries (Public)
- Service Stations

f. Dining Structures
- Cafes
- Cafeterias
- Coffee Shops
- Dining Rooms
- Restaurants
- Snack Bars
- Soda Fountains

g. Exhibit Buildings
- Exhibit Structures
- Museums
- Visitor Centers

h. Hospitals

i. Lodging Structures
- Cabins (for Public)
- Hotels
- Inns
- Lodges
- Motels

j. Passenger Stations

k. Post Offices

l. Recreational Buildings
- Community Buildings
- Picnic Shelters
- Recreation Halls
- Ski Lodges

m. Schools
n. Store Buildings
Curio Shops
Stores
Studios
Trading Posts
o. Theaters
p. Trail Shelters

504 RESIDENCE BUILDINGS

504.1 Buildings Included

Buildings in which families or households live, or in which sleeping accommodations are provided for other than for transient use, shall be included under this classification.

a. Apartments
b. Bunkhouses
c. Dormitories
d. Duplex Residences
e. Dwellings
f. Multiple Units—Permanent
g. Multiple Units—Seasonal
h. Quarters
i. Ranger Stations (with Quarters)
j. Residences

505 UTILITY BUILDINGS

505.1 Buildings Included

Buildings used primarily for utility and maintenance purposes shall be included under this classification.

a. Barns
b. Boat Houses
c. Central Heating Plants
d. Equipment Storage Buildings
e. Explosives Magazines
f. Fire Houses
g. Garages (Private)

h. Gas and Oil Buildings
i. Hose Houses
j. Maintenance Buildings
k. Material Storage Buildings
l. Offices (Maintenance)
m. Paint Houses
n. Power Plants
o. Pump Houses
p. Shops

Automotive Repair Shops	Machine Shops
Carpentry Shops	Paint Shops
Electric Shops	Plumbing Shops
Heating Repair Shops	Radio Shops
	Repair Shops
	Sign Shops

q. Warehouses

506 COMBINATION OF USE AND OCCUPANCY

506.1 General

a. The combination of use and occupancy of all buildings or parts thereof shall be in accordance with the charts on the following pages.

b. The combination of use and occupancies shown in Chart No. 1 with use and occupancies shown in Chart No. 2 is prohibited, except as specifically shown in the charts.

506.2 Uncertainty of Combinations

Wherever there is an uncertainty as to combinations, determination shall be made by the Committee.

506.3 Prohibition of Combinations

Prohibition of combinations are based on undesirability as well as fire hazard.

506.4 Fire Separation

Fire Separations are determined by construction types, degree of fire hazard and other requirements and restrictions contained herein pertaining to the units involved.

506.5 Separation of Areas

Each portion of a building separated by one or more fire walls conforming to Section 1204 may be considered a separate building.

506.6 Use and Occupancy Chart No. 1

LEGEND

N Combination permitted with No Fire Separation required
S Combination permitted with Fire Separation required
P Combination Prohibited

	Admin. Building	Assembly Building	Bathhouse	Bunkhouse	Campfire Station	Central Heat. Plant	Comfort Station	Contact Station	Dining Structure	Dormitory	Dry Cleaning Plant	Dwelling	Fire House	Garage (Private)	Garage (Public)	Hotel, Inn, etc.	Laundry Building	Lodging Structure	Mess Hall	Office Building	Ranger Station	Recreation Struct.	Service Station	Ski Lodge	Store Building	Visitor Center
Admin. Building		N	P	P	P	S	N	N	P	P	P	P	P	P	P	P	P	P	P	N	N	P	P	P	P	N
Assembly Building	N		P	P	P	S	N	N	S	P	P	P	P	P	P	N	P	N	S	N	P	N	P	N	S	N
Bathhouse	P	P		N	P	S	N	P	S	N	P	P	P	S	P	N	N	N	N	P	P	N	P	N	P	P
Bunkhouse	P	P	N		P	P	P	P	N	N	P	P	P	S	P	N	P	N	N	P	N	P	P	P	P	P
Camptender Station	P	P	P	P		P	N	N	P	P	P	N	P	S	P	P	P	P	P	P	P	P	P	P	P	P
Central Heat. Plant	S	S	S	P	P		S	P	S	P	P	P	P	P	P	S	S	S	P	S	P	P	P	P	S	S
Comfort Station	N	N	N	P	P	N	S		N	N	P	S	P	S	P	S	N	S	P	N	P	N	S	N	N	N
Contact Station	N	N	P	S	N	P	N		P	P	S	P	P	P	P	P	P	P	N	N	N	P	P	N	P	N
Dining Structure	P	S	S	N	P	S	N	P		S	P	P	P	S	P	N	S	N	N	N	P	N	P	N	N	P
Dormitory	P	P	N	N	P	P	N	P	S		P	P	P	S	P	N	P	N	N	N	P	P	P	N	S	P
Dry Cleaning Plant	P	P	P	P	P	P	S	P	P	P		P	P	P	P	S	S	S	P	P	P	P	P	P	S	P
Dwelling	P	P	P	P	N	P	P	N	P	P	P		P	S	P	P	P	P	P	P	N	P	P	P	P	P
Fire House	P	P	P	P	P	P	S	P	P	P	P	P		S	P	P	P	P	P	P	P	P	P	P	P	P
Garage (Private)	P	P	S	S	S	P	S	P	S	S	P	S	S		P	S	S	S	S	S	S	P	P	S	S	P
Garage (Public)	P	P	P	P	P	P	S	P	P	P	P	P	P	P		S	S	S	N	N	P	P	P	P	S	P
Hotel, Inn, etc.	P	N	N	N	P	S	N	P	N	N	N	S	P	S	S		S	N	N	N	P	P	P	N	N	P
Laundry Building	P	P	N	P	P	S	S	S	S	P	S	S	P	S	S	S		S	S	P	P	P	P	P	S	P
Lodging Structure	P	N	N	N	P	S	N	P	N	N	S	P	P	S	S	N	S		N	N	P	P	S	N	N	P
Mess Hall	P	S	N	N	P	P	P	N	N	N	P	P	P	S	S	P	N	S		N	N	N	P	N	N	N
Office Building	N	N	P	P	P	S	N	N	N	N	P	P	P	S	P	N	P	N	N		N	N	P	N	N	N
Ranger Station	N	P	P	N	N	P	P	N	P	P	P	N	P	S	P	P	P	P	N	N		P	P	N	N	N
Recreation Struct.	P	N	N	P	P	P	P	N	P	N	P	P	P	P	P	P	P	P	S	N	P		P	N	N	P
Service Station	P	P	P	P	P	P	S	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		N	P	P
Ski Lodge	P	N	N	P	P	P	N	N	N	N	P	P	P	S	P	N	S	N	N	N	N	N	P		N	P
Store Building	P	S	P	P	P	S	N	P	N	S	S	P	P	S	P	S	N	S	N	N	N	N	P	N		P
Visitor Center	N	N	P	P	P	S	N	N	P	P	P	P	P	P	P	P	P	P	P	N	N	P	P	P	P	

506.7 Use and Occupancy Chart No. 2

LEGEND

N Combination permitted with No Fire Separation required
S Combination permitted with Fire Separation required
P Combination Prohibited

	Auto Repair Shop	Barn	Boat House	Bunkhouse	Carpentry Shop	Centrl. Heat. Plant	Dwell. (All types)	Elec. & Radio Shop	Equip. Stor. Bldg.	Fire House	Garage (Private)	Garage (Public)	Gas and Oil Bldg.	Heat. & Plumb. Shop	Machine Shop	Maintenance Bldg.	Materl. Stor. Bldg.	Mess Hall	Office (Maint.)	Paint House & Shop	Power Plant	Pump House	Ranger Station	Repair Shop	Service Station	Sign Shop	Warehouse
Auto Repair Shop		P	S	P	S	S	P	N	S	S	S	S	S	S	N	S	S	P	N	S	P	S	P	N	S	S	S
Barn	P		P	P	P	P	P	P	S	P	S	P	P	P	P	S	S	P	P	P	P	P	P	P	P	P	S
Boat House	S	P		S	S	P	P	S	S	P	S	P	S	S	S	S	S	P	N	P	P	S	N	P	S	S	S
Bunkhouse	P	P	S		P	P	P	P	S	S	S	P	P	P	P	P	P	N	P	S	P	S	P	S	P	P	S
Carpentry Shop	S	P	S	P		P	P	S	S	P	S	P	P	S	S	S	S	P	N	S	P	S	P	S	P	N	S
Centrl. Heat. Plnt	S	P	P	P	P		P	S	P	P	P	P	P	S	S	S	S	P	S	P	S	S	P	S	P	P	P
Dwell. (All types)	P	P	P	P	P	P		P	P	S	S	P	P	P	P	P	P	P	P	P	P	S	N	P	P	P	P
Elec. & Radio Shop	N	P	S	P	S	S	P		S	S	S	S	P	S	N	N	S	P	N	S	S	S	P	N	S	S	S
Equip. Stor. Bldg	S	S	S	S	S	P	P	S		S	S	S	P	S	S	S	S	P	S	P	P	P	S	S	P	S	S
Fire House	S	P	P	S	P	S	S	S	S		S	P	P	S	P	S	S	P	S	P	P	S	S	S	P	P	P
Garage (Private)	S	S	S	S	S	P	S	S	S	S		N	P	S	S	S	P	S	P	P	P	S	P	S	P	P	S
Garage (Public)	S	P	P	P	P	P	P	S	S	P	N		P	S	S	S	S	P	S	P	P	S	P	S	P	P	S
Gas and Oil Bldg	S	P	S	P	P	P	P	P	P	P	P	P		P	S	P	P	P	S	P	P	P	P	S	N	P	S
Heat. & Plumb. Shop	S	P	S	P	S	S	P	S	S	S	S	S	P		N	S	S	P	N	S	S	S	P	N	S	S	S
Machine Shop	N	P	S	P	S	S	S	P	N	S	P	S	S	S	N		S	S	P	N	S	S	S	P	N	S	S
Maintenance Bldg	S	S	S	P	S	S	P	N	S	S	S	S	S	P	S	S		S	P	N	S	S	S	P	N	P	S
Materl. Stor. Bldg	S	S	S	P	S	P	P	P	S	P	P	S	P	P	S	S	S		P	S	P	P	S	P	S	P	S
Mess Hall	P	P	P	N	P	P	P	P	P	P	S	P	P	P	P	P	P	P		S	P	P	S	N	P	P	P
Office (Maint.)	N	P	N	P	N	S	P	N	S	S	P	S	P	S	N	N	S	S	S		S	S	P	N	N	S	N
Paint House & Shop	S	P	S	P	S	P	P	S	P	P	P	P	P	S	S	S	S	P	P	S		P	P	S	P	P	S
Power Plant	P	P	P	P	P	S	P	S	P	P	P	P	P	S	S	P	S	P	P	S	P		S	P	S	P	P
Pump House	S	P	S	S	S	S	S	S	P	S	S	S	P	S	S	S	S	P	S	S	P	S		S	S	S	S
Ranger Station	P	P	S	P	N	P	P	N	P	S	S	P	P	P	P	P	P	P	N	N	P	S	S		S	P	P
Repair Shop	N	P	S	P	S	S	P	N	S	S	S	S	N	N	N	N	S	P	N	S	P	S	S	S		S	S
Service Station	S	P	S	P	P	P	P	P	S	P	P	P	N	P	S	P	P	P	S	P	P	S	P	S	S		P
Sign Shop	S	P	S	P	N	P	P	S	S	P	P	P	P	S	S	S	S	P	N	S	P	S	P	S	S	P	
Warehouse	S	S	S	P	S	P	P	S	S	P	S	S	S	S	S	S	S	P	N	S	P	S	P	S	S	S	

CHAPTER 6

CLASSIFICATION OF CONSTRUCTION

600 CLASSIFICATION

All buildings shall be classified into general types according to the character and materials employed and their method of assembly as follows:

TYPE I—Fire-Resistive
TYPE II—Heavy Timber
TYPE III—Non-Combustible
TYPE IV—Ordinary
TYPE V—Wood Frame

601 TYPE I. FIRE-RESISTIVE CONSTRUCTION

601.1 General

a. Fire-resistive construction is that type of construction in which the walls, partitions and structural elements are of noncombustible materials with fire-resistance ratings not less than those specified hereinafter.

b. No pipes, conduit, wires, cables or other service equipment shall be embedded in fireproofing of structural members. They may be used between structural members and required fire-proofing in cases where members are protected by a fire-resisting ceiling.

601.2 Foundations

Foundations shall be constructed of masonry or reinforced concrete extending to natural solid ground and below the frost line, except that foundations resting on solid rock, hardpan, walls or other supports may be constructed above the frost line.

601.3 Walls

a. Exterior walls, bearing walls and fire walls shall be constructed of masonry or of reinforced concrete and shall have a fire-resistance rating of not less than 4 hours.

b. Lintels of spans exceeding 4 feet shall be protected as required for structural members.

601.5 Structural Frame

a. Structural framing members supporting masonry or concrete walls shall be of reinforced concrete or structural steel protected by fire-resistance material and shall have a 4 hour fire-resistance rating.

b. Framing members shall be individually protected to provide for a 4 hour rating; except that framing members may be protected by a fire-resisting ceiling which will provide a 3 hour rating for the floor and ceiling assembly or roof and ceiling assembly. The space above the ceiling shall have a noncombustible firestop for each 1000 square feet of area.

601.6 Floors and Roofs

a. Floor and roof construction shall be reinforced concrete, masonry or protected structural steel and metal providing a fire-resistance rating of not less than 3 hours.

b. Roof covering shall be of fire-retardant roofing material.

601.7 Partitions

Partitions shall be constructed of concrete, masonry or protected metal, with a fire-resistance rating of not less than 1 hour.

601.8 Interior Finish

Interior finish including the floor finish may be of wood or other combustible material.

602 TYPE II. HEAVY TIMBER CONSTRUCTION

602.1 General

a. Heavy timber construction is that type of construction in which structural members consist of heavy timbers of not less than specified dimensions, with no concealed or inaccessible spaces; floors and roofs of heavy plank or lami-

nated construction and walls of masonry or other noncombustible materials having the required fire-resistance. Interior structural members other than wood having at least 1 hour fire-resistance may be substituted for heavy timber members.

b. Wood used in heavy timber construction shall be thoroughly seasoned material.

602.2 Foundations

Foundations shall be constructed of masonry or reinforced concrete extending to natural solid ground and below the frost line, except that foundations resting on solid rock, hardpan, walls or other supports may be constructed above the frost line.

602.3 Walls

a. Exterior walls and all bearing walls shall be of masonry or reinforced concrete having a fire-resistance rating of not less than 2 hours.

b. Lintels over openings shall be masonry arches, or steel or reinforced concrete with a fire-resistance rating of not less than 3 hours.

c. Any structural members of steel or reinforced concrete supporting masonry or reinforced concrete walls shall have a fire-resistance rating of not less than 3 hours.

602.4 Structural Frame

a. Wood columns shall be not less than 8 inches, nominal in any dimension, and columns shall be superimposed on each other throughout all stories, on properly designed post caps.

b. Steel and cast iron columns used in place of timber columns shall have a fire-resistance rating of not less than 1 hour.

c. Columns shall not rest on floor timbers; nor shall they rest on masonry foundations without properly designed bases for transmission of their loads.

d. Wood beams and girders shall be not less than 6 inches, nominal in width, nor less than 10 inches nominal in depth.

e. Where beams and girders meet columns, such devices or metal connectors shall be properly designed to transfer the stresses and loads to the columns.

f. Intermediate beams shall rest on top of girders or they may be supported by approved metal hangers.

g. Wood beams and girders supported by walls shall have at least 4 inches of masonry between their ends and the outside face of the wall.

h. Steel beams, girders and trusses used in place of wood beams, girders and trusses shall have a fire-resistance rating of not less than one hour.

602.5 Floors

Floors shall be constructed of splined or tongue and groove planks not less than 3 inches nominal thickness or of laminated planks not less than 4 inches nominal width, set on edge and spiked together and covered with flooring of 1 inch nominal thickness.

602.6 Roofs

a. Roof decks shall be of matched or splined plank not less than 2 inches nominal thickness or of laminated planks not less than 3 inches nominal width, set on edge. Other approved forms of roof decks may be used if of noncombustible materials.

b. Timber arches or trusses may be used to support roof loads. The framing members shall be not less than 4 by 6 inches, nominal dimensions.

c. Roof covering shall be of fire-retardant roofing material.

603 TYPE III. NONCOMBUSTIBLE CONSTRUCTION

603.1 General

a. Noncombustible construction is that type of construction in which all structural members and walls, including wall surfaces, wall framing, floors, ceilings, roofs and their supports are of noncombustible materials.

b. In buildings over two stories in height and without a sprinkler system, all walls, partitions, floors, roofs and their supporting structural members shall have a fire-resistance rating of not less than one hour.

603.2 Foundations

Foundations shall be constructed of masonry or reinforced concrete extending to natural solid ground and below the frost line, except that foundations resting on solid rock, hardpan, walls or other supports may be constructed above the frost line.

603.3 Walls

Wall surfaces shall be of steel, iron, or other metal or asbestos, masonry, reinforced concrete or other noncombustible materials which will provide a durable weatherproof exterior and that are fire-protected only where specified in this Chapter.

603.4 Structural Members

All structural members shall be of steel, iron, reinforced concrete or other approved noncombustible materials.

603.5 Partitions

Partitions may be of combustible or noncombustible materials. If combustible materials enter into the construction of partitions, they shall be built to have a fire-resistance rating of not less than one hour. Doors and windows in partitions may be of wood except when the partitions are required to be fire partitions.

603.6 Floors

Floors shall be constructed of noncombustible materials.

603.7 Roofs

a. Roof decks shall be constructed of noncombustible material.

b. Roof covering shall be noncombustible or fire-retardant roofing material.

604 TYPE IV. ORDINARY CONSTRUCTION

604.1 General

Ordinary construction is that type of construction in which exterior walls, bearing walls, fire walls and party walls are of masonry, reinforced concrete, or of approved materials or assembly of materials that provide fire-resistance as required under this Section and in which the structural members are wholly or partly of wood or unprotected iron or steel, except that fire protection shall be provided, as required hereinafter.

604.2 Foundations

Foundations shall be constructed of masonry or reinforced concrete extending to natural solid ground and below the frost line, except that foundations resting on solid rock, hardpan, walls or other supports may be constructed above the frost line.

604.3 Walls

a. Exterior walls, bearing walls, fire walls, and party walls shall be of masonry, reinforced concrete or approved other materials.

b. Lintels over openings shall be masonry arches, steel, reinforced concrete or reinforced masonry.

604.4 Structural Frame

a. Structural framing members shall be of wood, steel or iron and shall have bearings of at least 3 inches in length.

b. Wood beams and girders supported by masonry walls

shall have 4 inches of masonry between their ends and the outside wall surface.

c. Ends of wood beams and joists resting in masonry walls shall be cut to a bevel of three inches in their depth.

d. Columns shall be wood, steel, iron or reinforced concrete, properly designed for the load. Wood columns shall be superimposed on each other throughout all stories.

e. All trimmers, beams, girders and every other joist, resting on masonry shall be secured to such walls by metal anchors attached near the bottom in a manner to be self-releasing. Anchors and ties shall be so arranged as to form continuous ties between opposite masonry walls. Where joists or beams run parallel to masonry walls, such walls shall be secured to four or more joists by approved metal anchors spaced at intervals of 6 feet. Sills and plates on masonry walls shall be anchored with approved metal anchors spaced at intervals of 4 feet.

604.5 Floors

Floors shall be tongue and groove or laminated planks.

604.6 Roofs

a. Roof deck shall be tongue and groove sheathing, laminated planks, or plywood.

b. Roof covering shall be fire-retardant roofing material.

604.7 Firestopping

a. Furred walls and interior stud partitions shall be firestopped at floors and ceilings. Joists shall be firestopped at ends and over supports the full depth of the joists. Firestopping material shall be noncombustible material or wood not less than 2 inches in thickness.

b. Attic spaces shall be divided into areas of 3000 square feet or less by approved tight firestops. The space between a suspended ceiling and flooring shall be divided into areas of 1000 square feet or less by tight firestops.

605 TYPE V. WOOD FRAME CONSTRUCTION

605.1 General

Wood frame construction is that type of construction in which walls and interior construction are wholly or partly of wood.

605.2 Foundations

Foundations for all walls, load-bearing partitions, piers and columns shall be constructed of masonry or reinforced concrete extending to natural solid ground and below the frost line, except that foundations resting on solid rock, hardpan, walls or other supports may be constructed above the frost line.

605.3 Walls

a. Framing for exterior walls and bearing partitions shall be constructed to develop a strength and rigidity equivalent to wooden studding not less than 2 x 4 inches spaced 16 inches on centers, with the larger dimension perpendicular to the wall and braced with sheathing or diagonal corner bracing.

b. In buildings more than two stories in height the first story studs shall be not less than 2 x 6 inches, 16 inches on center.

c. Exterior walls and bearing partitions may be constructed of 4 x 4 inch posts spaced not more than 5 feet on centers or may be of post and beam framing with plank sheathing.

d. Plates and soles or sills shall be provided for all stud walls and partitions, with plates doubled where joists or rafters are supported.

e. Stud walls and partitions over eight feet in height shall have horizontal bridging not less than 2 inches in thickness and the full width of the studs.

f. Lintels for openings in stud walls shall be not less than 2 x 6 inch members for spans up to 4 feet and for

spans more than 4 feet the lintels shall be properly designed to withstand the imposed loads.

605.4 Anchorage

a. All structural framing members shall be securely anchored or fastened to supporting members.

b. Sills, beams and girders shall be anchored to foundations with not less than ½ inch by 16 inch bolts. Anchor bolts for sills and plates installed on masonry walls shall be spaced not more than 4 feet on centers.

605.5 Wall Covering

a. Exterior stud walls shall be covered on the outside with solid sheathing except that sheathing may be omitted from well-braced walls of utility buildings and from other buildings after approval for the omission has been obtained from the Committee.

b. Exterior walls shall be covered on the outside face with weatherboarding, shingles, masonry, stucco, metal or other approved materials.

605.6 Structural Frame

a. Framing for columns, beams, girders, joists, rafters, trimmers and headers shall conform to the requirements of Paragraph 604.4.

b. Floors and ceiling joists and roof rafters shall be properly designed to support the loads imposed thereon.

c. Working stresses and maximum allowable spacing of joists and rafters are included in Chapter 11.

605.7 Floors

a. Floors shall be constructed of 1″ x 6″ (nominal dimension) subflooring laid diagonal to the joists or ¾″ plywood sheets, and covered with tongue and groove end matched wood flooring.

b. Resilient floor covering may be laid on the finish flooring or on the ¾″ plywood sheets but in no case shall resilient flooring be laid on 1″ x 6″ subflooring.

605.8 Roofs

a. Roof sheathing shall be tongue and groove planks installed perpendicular to the rafters or joist.

b. Roof covering may be of fire-retardant or ordinary roofing material. Selection of the roof covering shall depend on the degree of fire protection required for each individual case.

605.9 Firestopping

a. Firestopping shall be provided to cut off all concealed draft openings, both vertical and horizontal, and form an effective fire barrier between stories and between top story and roof space. It shall be used in specific locations as follows:

(1) All stud walls, partitions and furred spaces, so that the maximum dimension of the concealed space is not over 8 feet.

(2) Between joists, rafters and stair stringers, at ends and over supports the full depth of the members.

(3) Top, bottom and sides of sliding pocket doors.

(4) Attic spaces, divided into areas of not more than 3000 square feet.

(5) Space between suspended ceiling and flooring, divided into areas of not more than 1000 square feet.

(6) Any other location not specifically mentioned above which would afford a passage for flames.

b. Firestopping material shall be noncombustible material or wood not less than 2 inches in thickness.

606 SPECIAL STRUCTURAL CONDITIONS

The architectural and structural design of buildings in localities subject to heavy snowfall, freezing temperature, other severe weather or seismic forces shall be appropriate and adequate to meet the condition.

607 WATERPROOFING AND DAMPPROOFING

Where conditions require, by reason of dampness in the ground and in climates where excessive dampness prevails, floors on earth and exterior walls shall be rendered waterproof or dampproof by processes and methods conforming to nationally recognized good practice.

CHAPTER 7

GENERAL BUILDING RESTRICTIONS

700 GENERAL

The provisions of this Chapter shall govern the spacing, location, height and area of every new building erected and every existing building altered. Matters not covered herein shall conform to the latest provisions of the National Building Code, and/or the Uniform Building Code.

701 HEIGHT AND AREA

701.1 Maximum

Except where other limitations are specified for certain buildings, the maximum height and ground floor area of buildings shall be in accordance with the following table. The height shall be measured from the average finish grade to the top of the roof.

HEIGHT AND AREA LIMITATIONS

Type of Construction	Maximum Height	Maximum Ground Floor Area
	Feet	
Type I—Fire-Resistive	45	NO LIMIT
Type II—Heavy Timber	45	1 Story, 12,000 sq. ft. 2 Story, 8,000 sq. ft. 3 Story, 8,000 sq. ft.
Type III—Noncombustible	35	1 Story, 9,000 sq. ft. 2 Story, 6,000 sq. ft. 3 Story, 6,000 sq. ft.
Type IV—Ordinary	45	1 Story, 9,000 sq. ft. 2 Story, 6,000 sq. ft. 3 Story, 6,000 sq. ft.
Type V—Wood Frame	35	1 Story, 6,000 sq. ft. 2 Story, 4,000 sq. ft. 3 Story, 4,000 sq. ft.

701.2 Area Modifications

a. The area limits may be increased 100 percent when a public space, street or yard, more than 20 feet in width

extends on all sides of a building and is readily accessible from streets or safe open spaces.

b. The area limits may be increased 200 percent when a building is equipped with an automatic sprinkler system, and increased 300 percent when a building is equipped with an automatic sprinkler system and is only one story if not more than 25 feet average height.

701.3 Exceptions

a. Area—Open porches, sheds, platforms, walkways and similar structures attached to one side of a building shall not be included in the area limitation if the aggregate area of such appendages does not exceed the area limitation provided in the preceding table of paragraph 701.1.

b. Height

(1) Chimneys, tanks and supports, parapets not over 4 feet high, bulkheads, and penthouses should not be considered in determining the height of a building.

(2) Fire towers and lookout towers are not limited in height as proscribed in the table of Paragraph 701.1.

701.4 Basement

a. The basement or cellar of a building shall not be counted as a story if the floor of such basement or cellar is more than 2 feet below the finish grade.

b. The basement or cellar of a building on a slope shall not be counted as a story if the floor of such basement or cellar is more than 2 feet below finish grade at three sides of the building.

c. The basement or cellar of a building on a slope may be counted as a story if the floor of such basement or cellar is above the finish grade on three sides of the building.

702 SPACING AND LOCATION OF BUILDINGS

702.1 Spacing

a. The minimum spacing between any buildings of Type I construction shall be not less than 30 feet, and 40 feet for all other types of construction except where greater spacing requirements are specified.

b. Greater spacing requirements between buildings of certain uses and of high hazard use are provided in other chapters dealing with uses and occupancy.

702.2 Locations

Buildings shall be located in accordance with approved Master Plans but in no case shall a building be located less than 15 feet from road curb or sidewalk adjoining road, except residence buildings shall be located not less than 25 feet from such road, curbs or sidewalks.

703 COMBINATIONS

703.1 General

When a building has two or more uses or occupancies or is of different types of construction, the area shall be allowed for the most restricted use, occupancy or construction.

703.2 Fire Separation

Each portion of a building separated by a continuous fire wall extended from the foundation through the roof, may be considered a separate building.

703.3 Connections

Where two or more buildings not of fire-resistive construction are connected by enclosed bridges, corridors, tunnels or other connections and the aggregate area of the buildings so connected exceeds the allowable area of any of the buildings, the openings onto such interconnections between the buildings shall be restricted to doorways or other open-

ings protected by approved self-closing fire doors. The construction of the bridges, corridors, tunnels or other similar connections between the buildings shall be of noncombustible construction or equivalent to the type of construction of the building having the highest allowable area.

704 SPECIAL CONDITIONS

All building shall conform to the provisions of the chapter, except under special conditions, departure may be permitted upon the recommendations of the Chief of Design and Construction and the approval of the Regional Director.

CHAPTER 8

LIGHT, VENTILATION AND SANITATION

800 GENERAL

The provisions of this Chapter shall govern the means of providing adequate light, ventilation and sanitation for every building erected and for every existing building, room or space altered which changes the use or occupancy of such space. The provisions herein are minimum requirements and do not restrict the supply of greater amounts of light, ventilation and sanitation.

801 LIGHT AND VENTILATION

801.1 Habitable and Occupiable Rooms

a. Every habitable and occupiable room shall be provided with adequate natural light and ventilation by one or more windows opening directly to the outside, unless otherwise specifically provided herein.

b. The glass area of windows for required light and ventilation shall be not less than $1/10$ of the floor area of the room served by them, provided that such glass area shall be not less than 10 square feet.

c. No habitable room shall have an area of less than 90 square feet.

801.2 Public Use Buildings

Every room used for public or group assembly shall be provided with windows having an aggregate glass area of not less than $1/10$ of the floor area and evenly spaced where practicable for distribution of light and ventilation except in assembly buildings, exhibit buildings and store buildings,

artificial light and mechanical ventilation will be accepted as an alternate for natural light and ventilation.

801.3 Bathrooms and Toilet Compartments

Every bathroom and every room containing one or more water closets or urinals shall be provided with light and ventilation by one or more windows having a total glass area of $1/10$ of the area of the room, and not less than 3 square feet in area, except in public toilets and bathrooms in lodging structures artificial light and mechanical ventilation will be accepted as an alternate for natural light and ventilation.

801.4 Basements and Cellars

Basements and cellars not used for habitable purposes shall be provided with windows having an aggregate glass area of not less than $1/50$ of the floor area served.

801.5 Special Spaces

a. Alcoves—Any alcove opening off a habitable room, unless separately lighted and ventilated shall be included as part of that room in computing the amount of window area required. The unobstructed opening between the alcove and main room shall be at least 80 percent of the common wall area.

b. Attic spaces—All attic spaces and spaces between roofs and top floor ceilings shall be ventilated by not less than two (2) opposite windows, louvers or vents having a total clear area of not less than $1/300$ of the horizontal projected roof area.

c. Crawl spaces—Crawl spaces under the first floor not considered as basement or cellar of a building shall have a clearance of 24″ between the ground and the floor joists; and such space shall be vented with not less than four (4) screened foundation wall vents having a total clear area of not less than $1/300$ of the enclosed building area.

801.6 Rooms Having Special Hazards

Rooms in which, by reason of use and occupancy, dust, fumes, gases, vapor or other noxious or deleterious impurities tending to injure the health of occupants or to create a fire hazard, exist or develop, shall be provided with an approved system of ventilation to remove effectively such impurities during occupancy.

801.7 Stairways and Exitways

a. Every stairway, public hall or corridor in multifamily houses and in lodging buildings of more than four rooms, shall be provided with one or more windows to the outside or shall be provided with mechanical ventilation and artificial lighting.

b. Windows having a glass area of not less than 10 square feet shall be provided for every 20 lineal feet of corridor unless a window is placed at the end of a corridor so that it will adequately light the corridor for the entire length.

c. Ventilating skylights of required area may be used in lieu of windows for buildings not more than three stories in height.

d. Any part of a public hallway, recessed or offset, with a depth or length of twice the width of such hall shall be deemed a separate hall or corridor within the meaning of this Section.

801.8 Courts

a. No inner courts shall be introduced into buildings for the purpose of providing the only means of light and ventilation for habitable rooms.

b. This is not intended to prohibit patios or enclosed areas of generous proportions but is intended to eliminate such limitation of light, ventilation and view provided in average inner courts of city buildings.

801.9 Windows

a. All windows shall open directly to the outside air, except windows in bathrooms and toilet rooms may open directly into a vent shaft.

b. Windows shall be so located as to provide the maximum light and ventilation in all portions of the room or space served.

c. Windows for required light and ventilation shall be so designed as to provide an aggregate openable area of at least 50 per cent of the glass area required for lighting.

d. In lieu of windows, the glass area of exterior doors may be accepted for the entire light requirement but not more than 25 per cent of the ventilation requirement.

801.10 Skylights

Skylights shall conform to the requirements of the latest edition of the National Building Code and/or the Uniform Building Code.

801.11 Vent Shafts

a. Vent shafts shall have a cross-section area of not less than ⅓ of a square foot for each foot of height, with minimum horizontal dimensions of 4′ x 4′.

b. All vent shafts shall be entirely open at the top to the outer air and shafts extending more than two stories shall be connected at the bottom to the open air by means of horizontal ducts or other approved means.

c. All vent shafts shall be properly drained and shall be made accessible for cleaning or other purposes.

801.12 Mechanical Ventilation

a. Where mechanical ventilation is required or is permitted as an alternate, the system shall be designed and constructed in accordance with generally accepted good practice, to provide the necessary changes of air and to provide a minimum supply of fresh air as outlined below.

REQUIRED MINIMUM FRESH AIR SUPPLY

Spaces	Number of air changes per hour	Cubic feet per minute per sq. ft.
Assembly rooms	6	2
Bath and toilet rooms, private	5	1
Bath and toilet rooms, public	6	2
Kitchens, public	8	3
Locker and rest rooms	4	1½
Work rooms (under 1000 cu. ft.)	4	1½
Work rooms (over 1000 cu. ft.)	2	½

b. Mechanical ventilation systems, equipment and distribution ducts shall be installed in accordance with the provisions of Chapter 14 and the system shall be kept in operation at all times during normal occupancy of the space so used.

801.13 Artificial Lighting

Public stairways, hallways and toilets shall be provided with ample electric lighting to properly illuminate the spaces served. In no case shall the light intensity be less than one foot-candle at floor level during normal occupancy.

802 SANITATION

802.1 Requirements

Every building erected where there is continuous human occupancy or employment, unless otherwise prescribed, shall have a sufficient number of toilet rooms or bath rooms containing one or more water closets, properly connected with the drainage system, to serve the occupants.

802.2 Separate Facilities

Except in family dwelling units, separate toilet rooms shall be provided for the sexes.

802.3 Restrictions

Toilet rooms opening into rooms where food is prepared, served or stored shall have a vestibule and two doors separating the rooms.

CHAPTER 9

MEANS OF EGRESS

900 GENERAL

900.1 Scope

The provisions of this Chapter shall control the design, construction and arrangement of exit facilities to insure safe means of egress from all new buildings hereafter erected and from all existing buildings hereafter altered to a new use or occupancy.

900.2 Plans and Specifications

Plans and Specifications for new structures and alterations of existing structures shall show in detail the location, construction, size and character of all exits and exit ways together with the arrangement of aisles, corridors, passageways and hallways leading thereto.

900.3 Further Provisions

The National Building Code and/or the Uniform Building Code shall be used in determining the exit requirements of buildings and for special conditions, not included in this Chapter.

901 EXIT DEFINED

901.1 Exit

An exit is a way of departure from the interior of a building or structure to the outside at ground level.

901.2 Exit Doorway

A doorway opening to the exterior, to a horizontal exit, to an exit stairway or to a similar place of safety.

901.3 Exit Way

The exit doorway or doorways together with connecting hallways or stairways which provide safe access to the outside.

901.4 Horizontal Exit

An exit way consisting of protected openings through or around a fire wall, exterior wall, party wall or fire partition connecting two floor areas.

901.5 Stairways

One or more flights of stairs with connecting landings and platforms which provide a continuous and uninterrupted passage from one story to another in a building or structure.

902 NUMBER OF EXITS

902.1 General

a. Every building and structure and part thereof shall have the prescribed number of exists of one or more of the approved types defined in this Chapter to provide safe and continuous means of egress to a safe open space.

b. Every story shall have at least one exit way and every story of fire-resistive construction for 60 or more occupants or 45 or more occupants in buildings of other than fire-resistive construction shall have at least two separate exit ways.

902.2 Residential Buildings

a. Every story used as a residential occupancy for 10 or more persons shall have not less than two separate exit ways; except that a single exit way is permitted for multifamily houses of fire-resistive construction not exceeding two stories in height and containing not more than 12 dwelling units, or of ordinary construction not exceeding two stories in height and containing not more than 8 dwelling units. Each dwelling unit shall have a separate direct means of egress to the exit way.

b. Residential occupancy shall include, among others, the following: apartments, residences, multiple housing units, dormitories, bunk houses.

902.3 Assembly Occupancy

a. Every room, gallery, balcony or other space used as an assembly room and having a capacity of 100 or more occupants shall have at least 2 exit ways, where the capacity is more than 600 occupants at least 3 exit ways and where the capacity is more than 1000 occupants at least 4 exit ways.

b. Assembly occupancy shall include among others, the following: theaters, motion picture houses, auditoriums, assembly halls, lecture halls, recreation halls, churches.

902.4 Business Occupancy

a. Every story used as business occupancy for 10 or more occupants shall have not less than two separate exit ways.

b. Business occupancy shall include, among others, the following: offices, telephone exchanges, shops, stores, markets, restaurants.

902.5 Educational Occupancy

a. Every story used as educational occupancy for 10 or more occupants shall have not less than two separate exit ways.

b. Educational occupancy shall include, among others, the following: schools, classrooms, libraries, laboratories.

902.6 Exhibit Occupancy

Every building, story, room or other space used for exhibit purposes and having a total area of more than 1000 square feet shall have not less than two separate exit ways.

902.7 Hazardous Occupancy

a. The following buildings and rooms of hazardous use and occupancy shall have two means of egress.

(1) Motion picture projection rooms.

(2) Boiler and furnace rooms in public use buildings, administration buildings, multifamily houses, and buildings of high hazard use.

(3) Boiler rooms housing one or more steam boilers

carrying more than 15 pounds pressure with a rating of more than 10 horsepower.

(4) Oil storage rooms, except in oil storage rooms less than 150 square feet in area a window may be substituted for one of the required means of egress.

(5) Paint rooms.

(6) Paint storage rooms, except in paint storage rooms less than 150 square feet in area a window may be substituted for one of the required means of egress.

(7) Other spaces or rooms of high hazard use or occupancy.

903 LOCATION OF EXITS

903.1 Arrangement

Exits shall be so located as to be always visible and readily accessible to assure easy egress to the safe outside.

903.2 Remote Location

When more than one exit is required for a room or space they shall be located as remote from each other as practicable.

903.3 Length of Travel

a. All exits shall be so located that the maximum length of unobstructed travel from the most remote point shall not exceed the distance given below:

75 feet for high hazard occupancies.

100 feet for residential, educational, industrial and storage occupancies.

150 feet for business and assembly occupancies.

b. When a building is subdivided into rooms or compartments the distance to an exit shall be measured from the corridor entrance of such rooms.

c. In buildings, other than those of high hazard use, equipped with an approved sprinkler system or of fire-resistive construction, the above distances to exits may be increased 50 per cent.

d. In all buildings the length of travel to the stairway on any floor more than one story below grade shall not exceed 75 feet.

904 OCCUPANCY REQUIREMENTS

904.1 Occupancy Load

a. In determining required exit facilities, the number of occupants for whom provision is made on any given floor area shall be the normal occupancy for which the floor area or part thereof is designed.

b. For determining the exit requirements, the minimum number of occupant content of any floor area shall be not less than as specified below:

OCCUPANCY ALLOWANCES

Space	*Floor area per person*
Assembly (fixed seats)	6 sq. ft.
Assembly (movable seats)	15 sq. ft.
Business	100 sq. ft.
Dining rooms	15 sq. ft.
Educational	40 sq. ft.
Industrial	100 sq. ft.
Lodging structures and multiple unit dwellings	125 sq. ft.
Storage	300 sq. ft.

905 CAPACITY OF EXITS

905.1 Unit of Exit Width

The unit of exit width for all types of exits and exit way facilities shall be 22 inches with a credit of one-half unit for each 12-inch width additional to one or more 22-inch units.

905.2 Design Allowance for Use Groups

Except as may be specifically modified the number of occupants that may be accommodated per unit of width shall be as shown on following table.

CAPACITY PER UNIT EXIT WIDTH

Use Group	Number of occupants per unit of exit width	
	Stairways	Doors
Assembly (ground floor)	75	100
Assembly	60	80
Business	60	80
Educational	60	80
High Hazard	30	40
Industrial	60	80
Residential	30	40
Storage	60	80

906 EXIT DOORWAYS

906.1 Size

The size of single exit doors shall be not less than 2′–8″ x 6′–8″. When a doorway is subdivided into two or more separate door openings, each opening shall be not less than 2′–6″ x 6′–8″ and each opening shall be computed separately in determining units of exit widths. The maximum width of a single exit door shall be 3′–8″.

906.2 General

a. Doors in an exit way or leading to an exit way from places of assembly or from rooms occupied by 45 or more persons, or from room considered as high hazard use or occupancy, shall swing in the direction of the exit travel.

b. No exit doorway shall open immediately on to a flight of stairs. A landing at least the width of the door shall be provided.

906.3 Revolving Doors

Revolving doors shall not be used as exits unless exit doors of required size are installed adjacent thereto. Re-

volving doors shall be of approved collapsible type and not less than 5′–6″ in diameter.

906.4 Hardware

Exit doors opening directly to the outside from places of assembly of 300 or more occupant capacity and from school buildings housing 100 or more students shall be equipped with approved panic release devices which releases under a pressure of fifteen (15) pounds.

907 INTERIOR STAIRWAYS

907.1 Construction

a. All interior stairways shall be of noncombustible material in buildings of fire-resistive construction and in other types of buildings over three stories in height.

b. All stairways shall have solid non-slip treads and solid risers, except basement stairs in one- and two-family dwellings may have open risers when the area under the stairs is not enclosed.

c. Stairways, platforms, landings and exit ways shall be designed to support the required live load, but shall not be less than 100 lbs. per sq. ft.

907.2 Arrangement

a. Every exit stairway shall lead either directly or through an exit hallway to the safe outside.

b. The continuity of the stairways shall be interrupted by partitions or doors or by such means that will clearly indicate the main floor level and indicate direct egress to the outside.

907.3 Enclosures

a. Unless otherwise required herein, all interior exit stairways shall be enclosed in partitions of two hour fire resistance rating; except in buildings not exceeding three stories in height the enclosure partition shall have one hour fire resistance rating.

b. Basement stairways located under stairways from upper stories shall be completely enclosed by construction with a fire resistance rating equal to the required enclosure above the basement.

907.4 Minimum Dimensions

a. Width—The unobstructed width of an exit stairway serving 45 or more occupants shall be not less than 44″. Stairways serving less than 45 occupants shall be not less than 36″ in width. Handrails on wall may project into the width not more than 3½″ on each side.

b. Headroom—Minimum headroom for all parts of the stairway shall be not less than 6′–8″.

c. Restriction—No stairway shall reduce in width in the direction of exit travel.

907.5 Treads and Risers

a. Treads and risers shall be so proportioned that the sum of two risers and one tread, exclusive of projections is not less than 24″ nor more than 25″.

b. No risers shall be more than 7¾″ and no tread shall be less than 9″.

c. Treads and risers shall be of uniform width and height in any one story.

d. Winders are prohibited in exit stairways.

907.6 Landings

a. No flight of stairs shall have a vertical rise of more than 12 feet between floors or landings and for assembly occupancy such vertical rise shall not exceed 8 feet.

b. The length and width of landings shall be not less than the width of stairways in which they occur.

907.7 Handrails

a. Stairs shall have walls or guards on both sides.

b. Stairs less than 44 inches in width shall have handrails on at least one side.

c. Stairs over 44 inches in width shall have handrails on both sides.

d. Stairs over 88 inches or more in width shall have intermediate handrails continuous between landings, with 66 inches maximum width between adjacent handrails.

907.8 Space under Stairs

Except for one- and two-family dwellings, the space under stairs built of combustible materials shall be used only as a means of egress or left entirely open and free.

908 EXTERIOR STAIRS

908.1 General

a. Exterior stair shall be constructed of noncombustible materials except on building of wood frame and ordinary construction not over three stories in height.

b. Exterior stairways shall conform to the requirements for interior stairway except enclosures shall not be required.

908.2 Access

Each story served by an exterior stairway shall have access to the stairway through an exit doorway.

908.3 Openings Protected

Except where wooden stairways are permitted all doors and windows on or within 10 feet of exterior stairways shall be protected by approved self-closing fire doors or fire windows.

908.4 Guards

Unless otherwise enclosed, metal mesh or other rigid guards at least 4 feet high without any openings greater than 8 inches in width shall be provided throughout on each unenclosed side of exterior stairs or stairways.

908.5 Enclosures

If exterior stairways, on buildings other than wood, are enclosed on any side, such enclosure shall be of noncombustible material.

908.6 Details

a. All stairways shall be built permanently to the ground.

b. Treads and risers may be perforated for purpose of drainage.

909 RAMPS

Ramps used in place of stairways shall be constructed and enclosed as required for the stairway displaced. Ramps used in exit ways shall have a slope not to exceed 1 foot in 10 feet and shall be provided with non-slip surfaces.

910 PASSAGEWAYS

910.1 Access

Direct access shall be provided to all means of egress through continuous passageways, hallways, or corridors.

910.2 Width

Width and exit capacity of passageways shall be not less than that required for the exit doorways leading from them in the direction of travel to the outside.

910.3 Dead Ends

Dead ends in passageways shall be avoided insofar as practicable and under no circumstance shall a dead end be more than 12 feet from an exit or stairway.

911 MOVING STAIRWAYS

Where moving stairways are provided, such stairways shall conform to the requirements of the National Building Code, and/or the Uniform Building Code.

912 FIRE ESCAPES

Fire escapes referred to in this Handbook shall conform to the requirements for exterior stairways. Ladders and similar types of facilities shall not be accepted as a required means of egress.

913 EXIT SIGNS AND LIGHTING

913.1 Signs

For new buildings and buildings altered hereafter and serving more than 100 persons, all exits other than those normally used for entrance shall be indicated at all times when the building is occupied by approved illuminated signs reading EXIT in red letters 6 inches high on a white background or in other approved distinguishable colors.

913.2 Power Source

The source of power shall be from an independently controlled electric circuit or from other sources of power. (See Section 1703)

913.3 Directional Signs

When an exit doorway is not visible from all locations in public passageways, directional signs shall be provided to direct occupants to the exits.

913.4 Lighting

All exit stairways, exit ways and passageways appurtenant thereto shall be properly illuminated at all points to facilitate egress. The intensities of illumination shall be not less than 1.0 foot-candle at floor level at all times when the building is occupied.

914 MAINTENANCE

All required exit ways shall at all times be maintained in good, safe, usable condition; shall at all times be kept free and clear of obstructions and shall be readily accessible.

CHAPTER 10

DESIGN LOADS

1000 GENERAL

Buildings and structures and all portions thereof, shall be designed and constructed to support all live and dead loads, whether permanent or temporary, in accordance with accepted good construction practice and as herein provided. Specific provisions of this Chapter shall not be deemed to suspend any requirements of good practice but should be regarded as emphasizing them as controlling factors.

1001 LIVE LOADS

1001.1 Floor Loads

The live loads to be assumed in the design of buildings and structures shall be the greatest load produced by the intended use and occupancy, but in no case less than those as provided in the following table:

MINIMUM UNIFORM DISTRIBUTED LIVE LOADS

Occupancy or use	*Pounds per square foot*
Assembly	
Assembly halls, auditoriums, churches, lecture halls, halls and similar assembly occupanices	
Fixed seats	60
Movable seats	100
Dance halls, exhibit rooms, lobbies, museums, recreation halls, restaurants	100
Theaters and motion picture houses	
Aisles, corridors, lobbies, projection rooms	100
Stages	150
Orchestra floors and balconies	60

MINIMUM UNIFORM DISTRIBUTED LIVE LOADS—Con.

Occupancy or use	*Pounds per square foot*
Business	
Offices	80
Stores, shops, markets	100
Educational	
Corridors and lobbies	100
Libraries	
Reading rooms	60
Stack rooms—actual weight with minimum of	150
Schools—classrooms	40
Hospitals—wards and rooms	40
Laboratories	100
Lodging structures	
Hotels, inns, motels, lodges, cabins	
Guest rooms	40
Public corridors	60
Public rooms and corridors serving public rooms	100
Maintenance	
Equipment storage	
Heavy equipment (over 1 ton but not less than actual weight)	250
Passenger cars and light trucks	100
Shops (to be designed for actual weights and use as required)	
Warehouses	
Heavy storage	250
Light storage	125
Residential	
Dormitories	
Nonpartitioned	80
Partitioned	40
Multiple dwellings	
Corridors	60
Private apartments	40
Public rooms	100
Single and duplex dwellings	40
Stairs	100

1001.2 Items Not Specifically Covered

For occupancies and uses not listed above the live loads shall be determined in accordance with nationally recognized good practice.

1001.3 Provisions for Partitions

In office building and buildings, in which subdividing partitions may be subsequently erected, rearranged or relocated, provisions shall be made to adequately support such partitions or an assumed load of not less than twenty (20) pounds per square foot of floor area shall be added to the specified uniformly distributed live load.

1001.4 Concentrated Floor Loads

In the design of floors where concentrated loads may occur, the supporting beams, girders and floors shall be designed to carry either the concentrated loads or the required uniform live load, whichever produces the greater stresses.

1001.5 Impact Loads

The live loads given in this Chapter include adequate allowance for ordinary impact conditions; however, where uses or loads involve unusual vibrations or impact forces, provisions shall be made in the structural design for such forces.

a. Elevators—All moving elevator loads shall be increased 100 per cent for impact.

b. Heavy machinery—The weight of heavy machinery and moving loads shall be increased not less than twenty-five (25) per cent for impact.

c. Craneways—Craneways shall be designed to resist a lateral transverse force equal to twenty-five (25) per cent of the crane capacity plus the weight of trolley applied one-half (½) at the top of each runway rail; and a horizontal longitudinal force equal to twelve and one-half (12½) per cent of the maximum wheel loads applied at the top of each rail.

d. Outdoor assembly structures—Grandstands, stadiums and similar outdoor assembly structures shall be designed to resist a horizontal swaying load applied parallel to the rows of seats, in addition to the wind loads, of not less than twenty-four (24) pounds per lineal foot of seats and of not less than ten (10) pounds per lineal foot of seats applied transversely.

1001.6 Reduction in Live Loads

a. No reduction shall be applied to the roof live load.

b. No reduction in live loads shall be made for floor areas to be occupied as a place of assembly or for parking motor vehicles.

c. For live loads of 100 pounds or less per square foot, the design live load on any member supporting a floor area of 150 square feet or more may be reduced in accordance with the following formula:

$$R = 100 \times \frac{D+L}{4.33L}$$

R=reduction in per cent
D=dead load per sq. ft. of area supported by the member
L=unit uniform design live load

In no case shall the reduction exceed 60 per cent of the live load nor more than 00.08 per cent per square foot of tributary floor area.

d. For live loads exceeding 100 pounds per square foot no reduction shall be made except that the design live load on columns may be reduced 20 per cent.

1001.7 Roof Loads

a. Ordinary roofs, either flat, pitched or curved shall be designed for a load of not less than 20 pounds per square foot of horizontal projection in addition to the dead load,

and in addition to either the wind or other loads, whichever produces the greater stresses.

b. When a roof, in addition to serving as a closure of a building or structure, is to be used as a floor, it shall be designed to carry safely the live load to be imposed but not less than the minimum live load prescribed in this Section for floors.

c. Scuttles, ribs of skylights and accessible ceilings shall be designed to support a concentrated load of 200 pounds occupying an area of 2½ feet square and so placed as to produce maximum stresses in affected members.

1001.8 Snow Loads

a. Minimum loads—In regions subject to light snow fall the assumed minimum snow load shall be 30 pounds per square foot.

b. Special snow loads—In localities subject to heavy snow fall, the minimum snow load design shall be increased accordingly based on the weight of snow per cubic foot for the particular locality.

c. Shape of roof—When the effect of the shape of roof structures as determined by actual test indicates lesser or greater snow retention value than specified herein, the roof load shall be modified accordingly.

1001.9 Loading Restrictions

No person shall place, or cause or permit to be placed, on any floor or roof of a building or structure a greater load than that for which such floor or roof is designed and approved.

1002 WIND LOADS

1002.1 Minimum Design Pressure

Buildings and structures shall be designed to withstand the horizontal wind pressures in accordance with the following table, allowing for wind from any direction. The height

is to be measured above the average level of the ground adjacent to the building. No allowance shall be made for the shielding effect of other structures.

WIND PRESSURE

Height Zone (Feet)	Wind Pressure Lbs. per sq. ft.
Less than 30	15
30–49	20
50–99	25

The above figures are based on a design wind velocity of 75 miles per hour corresponding roughly to a 5 minute average of 50 miles per hour at 30 feet from the ground.

1002.2 Unusual Wind Exposure

For buildings and structures to be located in geographical regions subjected to unusually high wind pressure, the design wind load shall be determined by the prevailing conditions.

1002.3 Exterior Walls

Exterior walls of structures shall be designed to withstand the pressure specified in the above table, acting either inward or outward.

1002.4 Roofs

a. The roofs of buildings and structures shall be designed and constructed to withstand wind pressures, acting outward normal to the roof surface, equal to 1¼ times the pressure specified in paragraph 1002.1.

b. Roofs or sections of roofs with slopes greater than 30° shall be designed to withstand pressures, acting inward normal to the surface, equal to those specified in paragraph 1002.1 and applied to the windward slope only.

c. Overhanging eaves and cornices shall be designed and constructed to withstand outward pressures equal to twice those specified in paragraph 1002.1.

1002.5 Chimneys, Tanks and Towers

Chimneys, tanks, towers and similar structures of circular cross section shall be designed and constructed to withstand 60 per cent of the pressure specified in paragraph 1002.1. All structures of square or rectangular cross sections shall be capable of withstanding the full pressure specified.

1002.6 Signs and Outdoor Display Structures

a. Signs in which the projected area exposed to wind consists of 70 per cent or more of the gross area shall be classified as solid signs.

b. Signs in which the projected area exposed to wind is less than 70 per cent of the gross area shall be classified as open signs.

c. All signs shall be designed and constructed to withstand wind pressures in accordance with the following table:

WIND PRESSURE

Height from ground to top of sign in feet	Wind pressure Lbs. per sq. ft.	
	solid signs	open signs
Less than 30	17	23
30–49	22	31

1002.7 Other Structures

The design wind pressures for structures not covered in this Chapter shall be in accordance with nationally recognized good practice and shall be subject to the approval of the Committee.

1002.8 Stability

The overturning moment due to wind pressure shall not exceed 66⅔ per cent of the moment of stability due to the dead load only, unless the structure is securely anchored to the foundation to resist this force.

CHAPTER 11

GENERAL CONSTRUCTION REQUIREMENTS

1100 GENERAL

The provisions of this Chapter shall control the fabrication, preparation and installation of materials used in the construction of all buildings and structures.

Matters not covered in this Chapter shall conform to the latest requirements of the National Building Code and/or the Uniform Building Code.

1101 EXCAVATION

Excavations for structures and excavation accessory thereto shall be properly guarded and protected to prevent them from becoming dangerous to life and where necessary, such excavated areas shall be sheet-piled or braced to prevent adjoining earth from caving in.

1102 FOUNDATIONS

1102.1 General

a. Except when erected on solid rock, hardpan or previously constructed permanent supports, foundation walls and other permanent supports shall be carried below the frost line and shall rest on solid ground, on level rock or on piles.

b. Foundations shall conform to nationally recognized good practices on matters not covered in this Chapter.

1102.2 Bearing Values of Soil

a. When the bearing value of soil is not definitely known or is in question, at the location of a proposed structure, subsurface explorations and load tests shall be made to determine the safe bearing value of the soil at that particular location.

b. In the absence of load tests of undisturbed earth, presumed bearing value per square foot of soil shall be as follows:

PRESUMPTIVE BEARING VALUE OF SOIL

Class of Material	*Tons per sq. ft.*
Soft clay	1.5
Firm clay	2.5
Sand, fine, loose	2.0
Sand, coarse, loose; compact fine sand; and loose sand-gravel mixture	3.0
Gravel, loose; and compact coarse sand	4.0
Sand-gravel mixture, compact	6.0
Hard pan	10.0
Sedimentary rocks such as hard shales, sandstones, limestones, siltstones in sound condition	15.0
Foliated rock such as schist or slate in sound condition	40.0
Massive bedrock such as granite, diorite, gneiss, traprock, in sound condition	100.0

c. No foundations of a structure shall be placed on fill material, organic material, or other unsatisfactory material unless the foundations are designed specifically for such conditions.

d. No foundations shall be constructed on frozen soil unless such frozen condition is of a permanent nature.

1102.3 Footings

a. Footings shall be provided under all walls where required to distribute the imposed loads in accordance with the allowable unit bearing values of supporting soils and under all columns whose loads are to be transmitted directly to the soil.

b. Footings may consist of either masonry, plain concrete or reinforced concrete.

c. The full dead load, including the weight of the footings, foundation, the overlying fill and the transmitted live loads, shall be considered in designing the footings and in no case shall the total loads exceed the bearing capacity of the soil.

d. The footings shall be so designed that the pressure on the soil per unit of area shall, so far as possible, be uniform under all parts of the building.

1102.4 Foundation Walls

a. Materials—Foundation walls shall be built of masonry, plain concrete or reinforced concrete.

b. Thickness

(1) Foundation walls shall be of adequate strength and thickness to resist lateral pressures from adjacent earth and to support their vertical loads.

(2) The thickness of foundation walls shall be not less than the thickness of the wall supported and the minimum thickness shall be limited to the various materials of construction as herein specified.

(3) Foundation walls shall be not less than 12 inches in thickness except as permitted in paragraphs below.

(4) Eight (8)-inch foundation walls may be permitted for dwellings with walls of frame, brick veneer on frame and 10-inch cavity walls, when the total height of wall supported including gables is not more than 20 feet.

(5) Solid masonry foundation walls that do not extend more than 5 feet below adjacent finish grade and wall of hollow masonry units extending not more than 4 feet below the finish grade may be 8 inches thick, provided the total height of the 8-inch wall and superstructure do not exceed 35 feet.

(6) Foundation walls of cast-in-place concrete shall be at least 8 inches thick.

1102.5 Pile Foundations

The requirements for pile foundations shall be in accordance with the provisions of the latest edition of the National Building Code and/or the Uniform Building Code.

1103 MASONRY

1103.1 Materials

a. The quality of all masonry materials used in the design and construction of buildings and structures shall conform to the latest Federal and A. S. T. M. standard specification for each type of material.

b. In the absence of applicable standards the quality of materials shall conform to nationally recognized good practice.

1103.2 Construction

a. All masonry construction shall comply with the provisions of this Chapter governing quality of materials and manner of construction; and shall be of adequate strength and proportions to support all superimposed loads within working stresses prescribed herein and the standards of accepted good practices.

b. Masonry shall be securely bonded and anchored in an approved manner at points of intersection; where they abutt or adjoin framing members and where they intersect floors and columns and are dependent upon them for lateral support.

c. No walls shall be built up more than 25 feet in height in advance of other walls except when carried by girders at each floor.

d. Unsupported height of piers shall not exceed 10 times their least dimension. Hollow masonry units shall not be used for isolated piers of height in excess of four times their least dimension unless the cellular spaces are filled solidly with concerte or approved mortar.

e. Openings in masonry walls shall be spanned by arches or by lintels having bearings proportioned to their loads but not less than 4 inches.

f. No masonry shall be supported on any form of wood construction except for wood piles.

g. During erection, masonry work shall be adequately braced and supported.

h. Gypsum block masonry shall not be used in bearing walls where subject to continuous dampness. Gypsum partition blocks shall not be used for partitions to receive portland cement plaster for ceramic tile, marble or structural glass wainscots unless self-furring metal lath is first placed over the gypsum blocks.

i. Horizontal and vertical joints in masonry constructed of solid units shall be filled with mortar.

1103.3 Mortar

a. Mortar used in masonry construction shall be classified as follows:

MORTAR CLASSIFICATIONS

Type	*Compressive strength of 2" cubes at 28 days P. S. I.*
A–1	2500 or over
A–2	1800 to 2500
B	750 to 1800
C	350 to 750
D	75 to 350

b. Where classification has not been established by approved compressive strength tests the following mortar proportions for types indicated shall be used.

MORTAR PROPORTIONS

Mortar type	Portland cement	Masonry cement	Hydrated lime or lime putty	Aggregate damp and loose
A-1	1	1	----------	2¼ to 3 times sum of volumes of cement and lime.
A-1	1	----------	¼	
A-2	½	1	----------	
A-2	1	----------	¼ to ½	
B	----------	1	----------	
B	1	----------	½ to 1¼	
C	----------	1	----------	
C	1	----------	1¼ to 1½	
D	1	----------	2½ to 4	

1103.4 Working Stresses

a. The maximum working stresses of masonry construction shall not exceed those specified in the latest edition of the National Building Code and/or the Uniform Building Code.

b. Working stresses shall conform to nationally recognized good practice when they are not specified in the code.

c. Stresses shall be calculated on actual dimensions and not nominal dimensions.

1103.5 Solid Masonry Walls, Except Stone Walls

a. Thickness of bearing walls

(1) Except as otherwise provided herein, the minimum thickness of solid masonry bearing walls shall be not less than 12 inches for the upper 35 feet of height, with increases of 4 inches for each successive 35 feet of height or fraction thereof measured downward from the top of the wall.

(2) In buildings of residence occupancy not more than 3 stories in height, walls may be 8 inches thick when not over 35 feet in height.

(3) The top story bearing wall of a building which does not exceed 35 feet in height may be 8 inches thick provided the top story wall is not over 12 feet in height and the roof construction imparts no lateral thrust on the wall.

b. Thickness of non-bearing exterior walls—The thickness of non-bearing exterior walls may be 4 inches less than the thickness required of bearing walls, but not less than 8 inches except panel walls as otherwise specified.

c. Lateral supports—Solid masonry walls shall be supported at right angles to the wall at intervals of not more than 20 times the wall thickness.

1103.6 Stone Walls

a. Thickness

(1) The thickness of walls of stone ashlar shall be the same as required for solid masonry walls.

(2) Rubble stone walls shall be 4 inches thicker than is required for solid masonry walls but not less than 16 inches thick and shall not exceed 40 feet in height.

b. Lateral supports—Lateral supports for stone walls shall conform to the requirements of solid masonary walls.

1103.7 Walls of Hollow Masonry Units

a. Thickness and height—The required thickness and height of walls of hollow masonry units shall be not less than that required for solid masonry walls.

b. Lateral supports—Lateral supports shall be at intervals not exceeding 18 times the normal wall thickness.

103.8 Other Masonry Wall Construction

The thickness, height, bond, lateral support, bearing, and other requirements for cavity and masonry bonded hollow walls; grouted masonry, faced walls, attachment of stone facing, reinforced masonry, glass block masonry and masonry panel walls; shall conform to the requirements for similar types of construction of the National Building Code and/or the Uniform Building Code.

1104 REINFORCED CONCRETE

1104.1 General

On matters not covered herein, reinforced concrete construction shall conform to the recommendations of the Amer-

ican Concrete Institute and other nationally recognized good practice.

1104.2 Working Stresses

Except for specific conditions given herein, design stresses shall not exceed the following limitations.

DESIGN STRESSES

Description	*Lbs. P.S.I.*
Extreme fiber of concrete in compression	900
Concrete in direct compression	500
Concrete in shear	60
Concrete in shear when diagonal tension is resisted by properly designed steel	240
Bond between concrete and steel	60
Bond between concrete and deformed bars	140
Steel in tension—structural grade	18,000
Steel in tension—intermediate or hard grade or rail steel	20,000
Cold drawn steel wire in tension	20,000

1104.3 Controlled Concrete

a. When controlled materials procedure is followed in the design and construction of reinforced concrete buildings and structures the allowable working stresses may be determined in accordance with nationally recognized good practice.

b. Controlled concrete shall be scientifically proportioned, following the recommendations of the American Concrete Institute, to meet the specific requirements imposed and the materials and mixture and placing shall be under competent supervision and shall be subject to test to determine fitness and proper mixture.

1104.4 Ordinary Concrete

When ordinary procedures are followed in the design and construction of concrete structures the average con-

crete shall consist of 1 part portland cement, 2½ parts fine aggregate, 3½ parts coarse aggregate by volume and not more than 7½ gallons of water per sack cement weighing 94 pounds.

1105 STRUCTURAL STEEL

The design, fabrication and erection of structural steel for buildings and structures shall conform to the latest publication of the American Institute of Steel Construction and with other nationally recognized good practice.

1106 WOOD CONSTRUCTION

1106.1 General

Wood construction shall conform to nationally recognized good practice on matters not covered herein.

1106.2 Material

No lumber of obviously unsuitable quality may be used in any construction. All lumber shall be sound and free from defects which would affect its durability or render it unsafe for the purpose for which it is intended.

1106.3 Working Stresses

a. The net sizes and strength of all structural lumber and timbers shall be sufficient to sustain safely their imposed loads without exceeding the working stresses for the respective species and grades.

b. Nominal sizes may be used when sizes of wood members are shown or specified on plans, but design computations shall be based on actual net sizes of the material.

c. When the grade of lumber is not identified as herein provided for controlled materials, the maximum allowable unit stresses for the species used shall not exceed the minimum working stresses of the stress-grade lumber for the respective species.

d. Working stresses of graded lumber not included in the following table shall conform to the standard grading rules of the Western Pine Association, West Coast Lumber-

men's Association, Southern Pine Association and other nationally recognized lumber associations and inspection bureaus.

WORKING STRESSES OF GRADE LUMBER

Lumber Grades	Extreme Fibre in Bending	Horizontal Shear	Modulus of Elasticity
No. 1 Southern pine	1450	125	1, 600, 000
No. 2 Southern pine	1100	85	1, 600, 000
No. 1 Longleaf and No. 1 Dense Southern pine	1700	150	1, 600, 000
No. 2 Longleaf and No. 2 Dense Southern pine	1250	100	1, 600, 000
Standard—Douglas fir [1]	1200	95	1, 760, 000
Construction—Douglas fir [2]	1500	120	1, 760, 000
Dense Construction—Douglas fir [2]	1750	120	1, 700, 000
Standard—W. C. Hemlock [1]	1200	80	1, 540, 000
Construction—W. C. Hemlock [1]	1500	100	1, 540, 000
Select structural—W. C. Hemlock [1]	1600	100	1, 540, 000

[1] Joists and planks. [2] Beams and stringers.

1106.4 Bearings

a. Wood beams, girders and joists shall have bearing lengths of not less than 3 inches except that joists shall have not less than 1½ inch bearing when supported on wood or metal.

b. Wood columns in the lowest story of a building shall rest on masonry or concrete foundations extending not less than 3 inches above the floor or paving.

1106.5 Protection

a. Wood used structurally under conditions which might result in decay or destruction shall be selected and/or protected to prevent eventual failure.

b. All parts of wood frame work shall be at least 6 inches above ground level.

c. There shall be not less than 18 inches between untreated wood framing and the ground beneath.

d. Wood construction members which are less than 18 inches from the ground level shall be heartwood grade of durable species or shall be pressure treated with an approved preservative.

e. In locations subjected to termite attack, provisions shall be made in the construction to guard against damage to woodwork resulting from such an attack.

1106.6 Maximum Allowable Spans

The following table gives the maximum allowable span for size of joists surfaced on four sides, spacing of joists, allowable stress, and live load indicated thereon.

MAXIMUM SPANS FOR JOISTS

(Based on dressed size)

Lumber Size (Nominal)		2 x 6		2 x 8		2 x 10		2 x 12	
Spacings O. C.		12″	16″	12″	16″	12″	16″	12″	16″
1100# Fibre Stress	*LL* 30#	12′11″	11′ 3″	17′ 0″	14′11″	21′ 3″	18′ 9″	25′ 6″	22′ 5″
	40#	11′ 5″	10′ 0″	15′ 1″	13′ 1″	19′ 0″	16′ 7″	22′10″	20′ 4″
	50#	10′ 5″	9′ 1″	13′ 9″	12′ 0″	17′ 4″	15′ 2″	20′10″	18′ 3″
1250# Fibre Stress	30#	13′ 9″	11′10″	18′ 1″	15′11″	22′ 9″	19′11″	27′ 2″	23′11″
	40#	12′ 2″	10′ 8″	16′ 2″	14′ 0″	20′ 3″	17′ 9″	24′ 4″	21′ 4″
	50#	11′ 1″	9′ 8″	14′ 8″	12′10″	18′ 6″	16′ 2″	22′ 2″	19′ 5″
1450# Fibre Stress	30#	14′ 9″	12′11″	19′ 6″	17′ 1″	24′ 6″	21′ 5″	29′ 3″	25′ 9″
	40#	13′ 2″	11′ 5″	17′ 4″	15′ 1″	21′10″	19′ 1″	26′ 2″	23′ 0″
	50#	11′11″	10′ 5″	15′10″	13′ 9″	19′11″	17′ 5″	23′11″	20′11″
1700# Fibre Stress	30#	16′ 1″	14′ 0″	22′ 0″	18′ 4″	26′ 5″	23′ 2″	31′ 9″	27′11″
	40#	14′ 3″	12′ 5″	18′10″	16′ 4″	23′ 7″	20′ 8″	28′ 4″	24′10″
	50#	12′11″	11′ 3″	17′ 2″	14′11″	21′ 6″	18′10″	25′11″	22′ 8″

Calculations include LL (live loads) as shown, plus weight of joist, 1″ sub-floor and 1″ finished floor.
Use 10# heavier live load where ceiling under joists is plastered.

1107 LATHING AND PLASTERING

1107.1 General

All interior and exterior lathing and plastering shall conform to nationally recognized good practice.

1107.2 Laths

Lathing base for plastering may consist of wood lath, gypsum lath, metal lath, wire cloth, approved fibre board or other approved lathing material.

1107.3 Plaster

Types of plaster may be portland cement plaster, Keene cement plaster, lime plaster, gypsum plaster, vermiculite and acoustical plaster.

1108 ROOF CONSTRUCTION

The design and construction of roofs shall conform to the requirement for types of construction as provided in Chapter 6 and also as provided in Chapters 10 and 12. Matters of design and construction not covered in the Handbook shall conform to nationally recognized good practice.

CHAPTER 12

FIRE PROTECTION AND FIRE RESISTANCE STANDARDS

1200 GENERAL

The provision of this Chapter shall govern the design and use of all materials and methods of construction in respect to required fire resistance as determined by the potential fire hazard of the use, occupancy and location of buildings and structures. Matters not covered herein shall conform to the latest provisions of the National Building Code and/or the Uniform Building Code.

1201 LIMITED FIRE PROTECTION

Fire protection in National Parks is dependent primarily on limited local equipment, limited water supply and small trained fire fighting forces augmented by inexperienced helpers; therefore buildings and structures should be designed and located with this in mind. Spacing of buildings should be such as to provide reasonable protection without undue waste of ground space.

1202 FIRE-RESISTIVE MATERIALS

The following materials, combination of materials, systems and units shall be classified as fire-resistant materials:

Concrete
Concrete masonry units
Brick
Gypsum block or tile
Gypsum, plain or reinforced
Gypsum lath and plaster
Clay tile
Metal

Metal and asbestos
Metal lath and plaster
Other acceptable tested materials

1203 FIRE-RESISTIVE CONSTRUCTION

1203.1 Concrete

Concrete used for fire protection shall consist of one part portland cement and not more than six parts fine and coarse aggregate and shall be reinforced with wire or metal fabric.

1203.2 Masonry

a. All fire-resistive construction of burned clay, concrete or gypsum units or other similar units shall be solidly bedded and laid in gypsum mortar, cement-lime mortar or cement mortar; provided that gypsum units shall be laid in gypsum mortar only.

b. All such units shall be thoroughly bonded by broken joints in alternate courses or by sufficient metal ties or bonds.

1203.3 Plaster

a. All plaster fire protection shall consist of gypsum mortar, portland cement mortar or other equally fire-resistive material.

b. Gypsum plaster only shall be used for plastering on gypsum units.

c. 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 1 inch thick.

d. Gunite applied to masonry need not be reinforced and when properly bonded the gunite shall be considered a part of the required thickness.

1203.4 Other Acceptable Tested Materials

Other materials which meet the requirements of the Standard Methods of Fire Tests of Building Construction

and Material ASTM–E119, shall be accepted as fire-resistive to the degree of the specifications and tests.

1203.5 Firestopping

a. Where required—Firestopping shall be designed and constructed to close all concealed draft openings (both vertical and horizontal) and to form effectual fire barriers against the spread of fire between stories of every building and in all open structural spaces therein, including the following locations:

(1) In exterior and interior walls at ceiling and floor levels.

(2) In stud walls and partitions, including furred spaces so placed that the maximum dimension of any concealed space is not eight feet.

(3) Between stair stringers, at top, bottom and in the middle portion of each run. Between studs, along and in line with run of stairs adjoining stud walls and partitions.

(4) Around top, bottom, sides and ends of sliding door pockets.

(5) In spaces between chimneys and wood framing, using noncombustible material.

(6) For subdividing attic spaces into areas not exceeding 3000 square feet.

(7) For subdividing the space between a suspended ceiling and the floor above into areas not exceeding 1000 square feet.

(8) For any other location not specifically mentioned above which could afford a passage for flames.

b. Firestopping material—All firestopping shall consist of noncombustible materials, tightly fitted and securely fastened in place; except firestopping for frame construction may be of wood of 2″ nominal thickness.

1204 FIRE WALLS

1204.1 General

A fire wall is an interior wall which completely subdivides a building into limited fire areas in all stories or a wall which separates two or more buildings, to restrict the spread of fire; and which is supported on a foundation and extends continuously through all stories to and above the roof, except that where the roof is of fire-resistive construction the wall may be carried up tightly against the under side of the roof sheathing.

1204.2 Parapets

Parapets shall have fire resistance ratings not less than required for the fire wall except the required thickness need not exceed 12 inches but shall extend not less than 2 feet above the roof.

1205 FIRE PARTITIONS

1205.1 General

a. A fire partition is a partition which subdivides the floor area of a building to provide an area of refuge or to restrict the spread of fire, including stairway, elevator and public hallway enclosures.

b. In buildings not over three stories in height, fire partitions shall be constructed of noncombustible materials and shall have a fire resistance rating of not less than one hour.

1206 FIRE–RESISTIVE WALLS AND PARTITIONS

1206.1 Plaster

a. Fire-resistive plaster protection shall be gypsum or cement plaster, not less than ½ inch thick measured from the base to the plaster surface.

b. Plaster protection more than 1 inch in thickness shall be reinforced with an additional layer of metal lath embedded ¾ inch from the surface and securely fastened to supports.

1206.2 Ratings

Fire-resistive load-bearing and nonload-bearing walls and partitions shall have the ratings based on the thickness, material and type of construction as provided in the following table and also as provided in the National Building Code and/or Uniform Building Code.

FIRE-RESISTIVE RATINGS FOR WALLS AND PARTITIONS

Type	Construction	Minimum thickness in inches (including plaster where mentioned)			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Concrete.	Plain, solid	7½	6½	5½	[1] 4
	Reinforced, solid	6½	6	5	[1] 3½
	Reinforced solid, plastered each side.	7½	6½	5½	[1] 4½
Brick (clay, shale, concrete or sand-lime).	Solid	8	8	8	4
	Solid, plastered	9	9	[1] 5	[1] 5
	Cavity	10	10	10	10
Hollow Tile.	One cell, plastered each side	--------	--------	--------	[1] 3
	Two cells in 8 in. or less	--------	12	12	[1] 6 or 8
	Two cells in 8 in. or less, plastered each side.	13	9	[1] 7	[1] 7
Hollow Tile load-bearing.	Two cells in wall thickness	--------	--------	6	6
	Three cells in 8 in. or less thickness.	12	12	12	8
	Three cells in 8 in. or less thickness, plastered each side.	12	9	9	9
Hollow Tile brick-faced.	Load-bearing tile, 4″ brick, total thickness.	12	8	8	8
	Load-bearing tile, plastered one side, 4″ brick, total thickness.	9	9	9	9
Concrete Masonry Units 1¼″ face shells—load-bearing.	Unplastered	--------	--------	9	[1] 4
	Plastered each side	--------	9	[1] 5	[1] 5
	4″ Brick, plastered one side	9	9	9	9
Hollow Gypsum Blocks.	Unplastered	[1] 6	[1] 5	[1] 4	[1] 3
	Plastered each side	[1] 5	[1] 4	[1] 4	[1] 3
Solid Gypsum portland cement plaster.	Incombustible studding with metal lath.	--------	--------	--------	[1] 2
	Incombustible studding with metal lath Gypsum-Vermiculite plaster.	--------	--------	[1] 2½	[1] 2

[1] Non-Bearing.

FIRE-RESISTIVE RATINGS FOR WALLS AND PARTITIONS—Continued

Type	Construction	Minimum thickness in inches (including plaster where mentioned)			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Hollow stud partition with Gypsum or portland cement plaster on each side.	Incombustible studding with metal lath, ¾" plaster on each side.	--------	--------	--------	3
	Incombustible studding with metal lath and 1" plaster on each side.	--------	--------	4½	3
	Wood studs, metal lath, ¾" plaster of both sides, fire-stopped.	--------	--------	--------	[1] 3 or 5
	Wood studs, metal lath, 1" plaster on both sides, fire-stopped.	--------	--------	[1] 5	--------
	Wood studs with Gypsum lath, fire-stopped, ½" plaster on each side.	--------	--------	--------	[1] 3 or 5
	Wood studs with two layers of ½" Gypsum Wallboard on each side, joints staggered.	--------	--------	--------	5½

[1] Non-Bearing.

1207 FIRE-RESISTIVE FLOOR AND ROOF CONSTRUCTION

1207. Ratings

Fire-resistive floors and roof construction shall have the ratings as set forth in the following table.

FIRE-RESISTIVE RATINGS FOR FLOORS AND ROOFS CONSTRUCTION

Type	Construction	Minimum thickness of Floor or Roof slab in inches			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Reinforced concrete.	Solid slab with ¾ inch suspended metal lath and plaster ceiling.	4	3	2½	2½
Reinforced concrete joist.	Concrete slab with suspended metal lath and plaster ceiling.	--------	--------	2½	2
	Concrete slab without ceiling..	--------	--------	--------	3
Steel joists or light steel construction with attached or suspended metal lath and plaster ceiling.	Concrete or Gypsum slab, 1 inch Gypsum-Vermiculite plaster ceiling.	2½	2½	2	2
	Concrete or Gypsum slab, ¾-inch Gypsum plaster ceiling.	2½	2½	2¼	2
Steel Roof Deck on steel framing with suspended ceiling of metal lath and plaster.	Concrete on steel deck, 1 inch Gypsum-Vermiculite plaster ceiling.	2½	--------	--------	--------
	Concrete on steel deck, ¾ inch Gypsum plaster ceiling.	--------	--------	2	1
Heavy Timber.	Laminated plank floor with 1 inch finish flooring on top.	--------	--------	--------	6
Wood Joists.	¾ inch Sub-floor, ¾ T & G finish floor, 2 x 10 joists, 16 O. C., Gypsum plaster and metal lath ceiling protection.	--------	--------	--------	1½

1208 BEAM, GIRDER, TRUSS AND COLUMN PROTECTION

1208.1 Ratings

The fire resistance rating for protective material for beams, girders, trusses and columns shall conform to the following table.

FIRE RESISTANCE RATING FOR BEAM, GIRDER, TRUSS AND COLUMN PROTECTION

Type	Protection Material	Minimum thickness of Material in inches			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Steel Beams, Girders and Trusses.	Concrete	3	2½	2	1½
	Brick	3¾	3¾	2¼	1¼
	Clay tile, concrete block	4	4	2	2
	Hollow Gypsum block		3	2	2
	Solid Gypsum block			2	2
	Poured Gypsum	2	1½	1	1
	Metal lath and portland cement plaster.				1
	Metal lath and Gypsum plaster.				¾
Steel Columns 6″ x 6″.	Concrete	3	2	2	1
	Brick	3¾	3¾	3¾	2¼
	Clay tile, concrete block	4	4	2	2
	Gypsum Block		3	2	2
	Metal Lath and portland cement plaster.				1
	Metal Lath and Gypsum plaster.				¾
Reinforcing steel in Reinforced Concrete Beams, Girders, Trusses and Columns.	Concrete covering of steel	2	1½	1½	1

1209 ROOF COVERING

1209.1 General

Roof covering for all buildings shall be classified as either Fire-Retardant or Ordinary.

1209.2 Fire-Retardant Roof Covering

a. Roof covering meeting the requirements of the Class A, B or C specifications of the Underwriters Laboratories shall be classified as Fire-Retardant.

b. The following types of roof coverings classified as Fire-Retardant are effective against severe fire exposure and possess no flying brand hazard: Brick; Concrete tile; Slate; Cement-Asbestos shingles; Clay tile; 4 ply and 5 ply built-up pitch and gravel; Asphalt Asbestos built-up.

c. The following types of roof coverings classified as Fire-Retardant are effective against moderate fire exposure and possess no flying brand hazard: Corrugated iron; Galvanized iron; Galvanized iron shingles; Sheet copper; heavy Asphalt mineral surfaced shingles; heavy Asphalt-Asbestos felt roll roofing.

1209.3 Ordinary Roof Covering

The following roof covering shall be classified as Ordinary: 2 ply and 3 ply light composition roof; Asphalt shingles; wood shingles.

CHAPTER 13

CHIMNEYS, FLUES, AND VENTS

1300 GENERAL

Masonry chimneys as provided for in this Chapter are for low heat appliances.

Chimneys in which the products of combustion at the point of entrance have a temperature over 550° F during normal operation shall be constructed in accordance with the provisions of the National Building Code and/or the Uniform Building Code.

Chimneys, flues and vents shall be located, designed and constructed to convey, effectively and without nuisance, products of combustion to the outer air and shall not be potential sources of ignition to adjacent combustible materials, nor be health hazards.

Chimneys, flues and vents shall have adequate foundations and supports and shall be designed and constructed so as to be structurally safe, durable and tight.

1301 MATERIALS

1301.1 Types of Materials

Chimneys, flues, vents, and fireplaces shall be constructed of masonry properly bonded, and consisting of brick; concrete; sawed or dressed stone; reinforced concrete; or steel; or other approved noncombustible materials; as described herein.

1301.2 Flue Lining

Flue lining for masonry or reinforced concrete construction shall be of fire clay not less than ⅝″ thick.

1302 CONSTRUCTION

1302.1 General

a. Chimneys, flues, vents and fireplaces may be erected as freestanding or as constituting an integral part of a wall

or may be enclosed within a structure as a component part thereof. In every case a chimney shall be wholly supported on fire resistive construction or on solid masonry or concrete foundations designed to support only the chimney weight.

b. No framing members shall bear on chimney construction.

1302.2 Wall Thickness

a. In buildings other than one- and two-family residences, solid masonry and reinforced concrete chimney walls shall be not less than 8 inches thick except that rubble stone walls shall be not less than 12 inches thick.

b. Chimneys for residences shall have walls not less than 4 inches thick.

1302.3 Height

Chimneys shall extend at least 3 feet above the highest point where they pass through the roof and at least 2 feet above any roof ridge within 10 feet.

1302.4 Size

Flues and vents shall be of ample size for their use and purpose.

1302.5 Corbeling

No chimney shall be corbeled from a wall more than 6 inches and no corbeling shall be made from a wall less than 12 inches thick. Corbeling shall not exceed 1 inch projection for each course of brick.

1302.6 Change in Size or Shape

No change in the size or shape of a chimney shall be made within 6 inches of roof framing through which it passes.

1302.7 Clearance

Combustible materials shall not be placed within 2 inches of a chimney nor within 4 inches of the back of a fireplace. All spaces between wood framing and chimneys

shall be firestopped with noncombustible material at floors, ceilings and roofs.

1302.8 Lining

a. All masonry and concrete chimneys shall be lined with approved flue lining. Flue linings shall start not less than 12 inches below the intake and for fireplaces flue lining shall start from the top of the smoke chamber. They shall extend as nearly vertical as possible, for the entire height of the chimney.

b. Where two or more flues are located in the same chimney only pairs of flues may adjoin each other with only flue lining separation between them. The joints of adjacent flues shall be staggered at least 7 inches. Solid masonry separations of at least 4 inches thick, bonded to chimney construction, shall be provided to separate flues in pairs or singly.

1302.9 Cleanouts

A cast iron or steel cleanout door and frame shall be provided at the base of each flue.

1302.10 Fireplaces

a. Construction—Fireplaces shall be constructed of not less than 8 inches of solid masonry or reinforced concrete at back and sides, and lined with 2 inches of fire brick or other approved lining. Where a 4 inch thickness of fire brick lining is used it may be included in the required minimum thickness of the fireplace.

b. Factory-built—Factory-built fireplaces that are approved as a result of tests and listing by nationally recognized testing laboratories may be installed in accordance with the conditions of the approval.

c. Area—The net area of each flue, each throat and each damper shall be not less than $1/10$ of the area of the fireplace opening, and with a minimum area of 100 square inches.

d. Hearth—Fireplaces shall be constructed with a hearth of noncombustible material properly supported with no combustible material against the underside. Hearths shall extend not less than 20 inches in front and 12 inches on each side of the opening.

1302.11 Imitation Fireplaces

Imitation fireplaces are not permitted.

1303 METAL SMOKESTACKS

1303.1 General

a. Metal smokestacks as provided herein are for the purpose of serving low heat appliances.

b. Metal smokestacks serving medium or high heat appliances or incinerators shall be fabricated and erected in accordance with the National Building Code, and/or the Uniform Building Code.

1303.2 Construction

Metal smokestacks and chimneys shall be of adequate thickness, properly fabricated and securely supported. Metal shall be galvanized or painted unless suitably corrosion-resistant.

1303.3 Clearance

a. Metal smokestacks erected on the exterior of a building shall have sufficient clearance from buildings and structures to avoid overheating combustible materials and to permit inspection and maintenance operations on the smokestack.

b. No smokestack shall be nearer than 24 inches from wall openings and exits.

1303.4 Interior Smokestack Enclosure

a. Metal smokestacks or parts thereof erected within a multi-story building shall be enclosed with walls of not less than one hour fire resistance in all stories above that in which the appliance served thereby is located. Enclosure shall be

large enough for inspection and repair purposes and shall have a fire access door.

b. Where the smokestack passes through a roof constructed of combustile materials, it shall be guarded by a galvanized metal or other approved noncombustible ventilating thimble that extends at least 9 inches below and above the roof construction. The thimble shall be of a size to provide not less than 6 inch clearance on all sides of the smokestack.

c. Interior metal smokestacks shall not be carried up inside of ventilating ducts unless such ducts are constructed as required for smokestacks and are used solely for exhaust of air from the space in which the appliance served by the smokestack is located.

1304 CHIMNEYS, FLUES AND VENTS FOR GAS FUEL

Chimneys, flues and vents for gas fuels shall be constructed in accordance with the provisions of Chapter 19.

1305 PATENT CHIMNEYS

Factory-built chimneys and flues that are approved as a result of tests and listing by nationally recognized testing laboratories may be installed in accordance with the conditions of the approval.

CHAPTER 14

HEAT APPLIANCES, HEATING, VENTILATING, AIR CONDITIONING

1400 GENERAL

The provisions of this Chapter shall control the design and construction of all heat producing appliances and systems and all heating, ventilating and air conditioning systems, except appliances and systems using LP gases.

All materials, equipment, systems and installations shall conform to nationally recognized good practice as provided in the National Building Code and/or the Heating, Ventilating and Air Conditioning Guide.

1401 MATERIALS AND EQUIPMENT

All material and equipment shall be approved types and quality complying with nationally recognized standards as determined by approved testing agencies.

Equipment, except that using coal or wood fuel, shall be plainly marked with the name of the manufacturer and shall bear the testing agency's inspection label.

1402 HEATING REQUIREMENTS

1402.1 Where Required

Generally all buildings except certain utility buildings, shelters and cabins should have some form of heat producing equipment or system.

1402.2 Determination of Types

The heating requirements shall be carefully determined, and the type of system designed, for each building whether the building is an individual unit, or one of a group. Proper planning of a building or group of buildings will solve the problem of determining whether or not a group of buildings

should have a central heat generating plant or whether or not each building should have an independent system.

1403 SUPPORTS AND FOUNDATIONS

1403.1 General

Approved hangers or supports and foundations shall be installed at the required uniform spacing to maintain all materials and equipment in a rigid position.

1403.2 Expansion

All work shall be installed with proper allowance for expansion and contraction with anchors provided where necessary.

1403.3 Anchors

Heavy equipment shall be set on and anchored to reinforced concrete foundations as recommended by the manufacturers.

1403.4 Sound Insulation

Sound insulation and isolation materials, methods and devices shall be provided for all noisy equipment when installed in buildings where quietness is essential.

1404 HEATING SYSTEMS

1404.1 General

Heating systems shall be installed in accordance with standard practice for safe installation and use without danger of overheating combustible material and construction.

1404.2 Design for Economy

Each heating system shall be designed for economical installation and operation. The source of fuel should be considered in the design of any heating system.

1404.3 Boiler and Furnace Rooms

a. General requirements—Except in one- and two-family dwellings and as otherwise provided herein, boiler and furnace rooms in buildings shall be separated from other

parts of the building by walls, floors and ceiling assemblies having a fire resistance rating of not less than one hour.

b. High hazard—Boiler rooms housing high pressure boilers and boiler rooms located in buildings of high hazard use shall be so constructed as to safeguard against fire and explosion hazards in accordance with nationally recognized safe practice; or shall be located in segregated structures with walls, floors and roofs having a fire resistance rating of not less than two hours.

c. Residences—In one- and two-family residences heating boilers and furnaces may be located in basements or in utility rooms on the first floor, provided the appliances are mounted on masonry or concrete foundations not less than 3″ in thickness. Walls and ceilings of the utility rooms may be constructed of wood framing with ¾″ metal lath and plaster or of materials providing equivalent fire protection.

d. Exits—Boiler and furnace rooms shall have the required number of exits as provided in Section 902. Boiler and furnace rooms which are required to have one and two hour fire resistance ratings, shall have one exit opening directly to the outside of the building and all doorways shall be protected by self-closing fire doors.

e. Clearance—Boiler and furnace rooms shall be of sufficient size to allow ample clearance around and above the appliance for working space and to protect the surface of combustible material from becoming heated more than 175° F.

The ceiling height of boiler and furnace rooms shall not be less than 7 feet above the finish floor.

f. Air for combustion—An adequate supply of fresh air shall be made available for combustion for fuel burning appliances.

1404.4 Heating Furnaces and Boilers

a. Steam and hot water boilers—Steam and hot water boilers for low pressure heating shall be designed and built of steel or cast iron to operate efficiently under favorable conditions at prescribed gross output ratings for specific types of fuel.

b. Construction—Each boiler shall be constructed and tested in accordance with the ASME Boiler Construction Code and other nationally recognized codes.

c. Outlets—Sufficient outlets shall be provided for connecting pipings, gauges, valves, safety devices and breechings.

d. Furnaces—Furnaces for warm air heating shall be cast iron or steel designed and constructed for either gravity or mechanical heat distribution, with specific ratings in BTU per hour output.

1404.5 Low Pressure Heating Systems

a. Low pressure heating systems shall consist of radiation supplied with steam at not more than 15 pounds pressure or hot water at not more than 30 pounds pressure, for the purpose of heating buildings direetly or indirectly.

b. Radiators may be set in ducts for indirect heating or installed in the room for the direct radiation of heat.

c. In buildings of public assemblage, radiators in aisles or passageways used as exists shall be placed in recesses formed in the wall or partition to receive the same without any part projecting beyond the face of the wall.

d. All such recesses shall be lined with ¼ inch asbestos board or No. 26 gauge galvanized iron insulated with ⅛ inch asbestos paper on the back.

e. Cast iron radiators shall be of the best quality, steam or hot water pattern sections made up tight with corrosion-resisting nipples.

f. Fin type, noncorrosive metal radiators, unit heaters and/or unit ventilators of approved type may be used in place of cast iron radiators.

g. Steam or hot water from a boiler or some other source shall be circulated through the radiators by gravity or pump as required by the system.

h. Gate valves, check valves, pressure reducing valves, safety valves, automatic valves, strainers, steam traps, radiator valves, air valves and other necessary valves shall be installed when required for the proper operation of the system.

i. The pipe sizes and general design of the system shall be as recommended by the A. S. H. V. E. shown in the Heating, Ventilating and Air Conditioning Guide.

1404.6 Warm Air Heating Systems

a. Classification—Warm air heating systems in one- and two-family dwellings shall be classified as follows:

(1) Low temperature systems—Low temperature systems shall include all systems which use low pressure steam or hot water for heating the air and those systems which have automatically-fired warm air furnaces equipped with fans to circulate the air. The operation shall be controlled by automatic limit temperature controls that cannot be set higher than two hundred (200) degrees F.

(2) High temperature systems—High temperature systems shall include all gravity warm air hand-fired and automatically controlled systems in which the temperature limit controls can be set above two hundred (200) degrees F.; and any other system that does not conform to the requirements for low temperature systems.

b. Furnace controls of low temperature systems.

(1) Automatic shut-off—The furnaces of an automatically-fired low temperature system that is equipped with an air circulating fan shall be provided with an approved

automatic control to cut off the fuel supply whenever the temperature of the air in the furnace bonnet or at the main supply duct exceeds two hundred (200) degrees F.

(2) Over-run control—When the furnace is stoker-fired, it shall be equipped with an automatic over-run control to operate the fan when the air in the furnace bonnet or at the main supply duct reaches a temperature of two hundred (200) degrees F. after the stoker and fan have shut down in normal operation.

c. Furnace controls of high temperature systems—A high temperature system which has an automatic fuel supply controlled by thermostat shall have the same controls as a low temperature system; except that the temperature setting may permit a maximum of two hundred and fifty (250) degrees F.

d. Warm air furnaces.

(1) Mounting and clearances—The mounting and clearance of warm air heating furnaces shall conform to the requirements of the National Building Code.

(2) Gravity systems—Gravity warm air furnaces shall be encased in a double metal casing with intervening air spaces extending from the top of the casing down to the bottom of the fire-box. The top of the bonnet shall be insulated with not less than three (3) inches of sand or the equivalent in magnesia, asbestos or other approved noncombustible material. Gravity furnaces shall be equipped with automatic controls to shut off the fuel supply when the temperature of the warm air pipe at any point within twenty-four (24) inches of the furnace exceeds two hundred and fifty (250) degrees F.

e. Registers.

(1) Combustible construction—When a register is located in a floor or wall of combustible construction, the register box shall be covered with twelve (12) pound as-

bestos paper and a clear space of not less than five-sixteenths (5/16) inch shall be left between the sides of the box and any combustible material.

(2) Over-head furnace register—When a register is installed in the floor over the furnace, the register box shall be of double construction, with an intervening air space of not less than four (4) inches, except when the warm air duct is surrounded by a cold air passage.

(3) Non-automatic system—A system which is not automatically fired and which is not equipped with an approved temperature limit control shall be provided with dampers and shutters which are not capable of shutting off more than eighty (80) per cent of the total duct area; or in lieu thereof, one register or grille shall be installed without a closeable shutter, and the duct leading thereto shall be installed without a damper.

(4) Return duct connections—Registers on more than one floor shall not be connected to the same vertical duct stack for return air to the heater.

1405 WARM AND COLD AIR DUCTS

1405.1 General

The design and construction of ducts for air transmission in heating, ventilating or air conditioning systems shall conform to the requirements of the Heating, Ventilating and Air Conditioning Guide and as provided herein.

1405.2 Warm Air Ducts

a. Construction—Warm air ducts or pipes from warm air furnaces shall be constructed of galvanized sheet iron or steel not lighter than No. 26 U. S. standard gauge or of 100 pound bright cote tin or No. 24 B&S gauge aluminum, with all seams and joints securely locked or otherwise tightly fastened.

b. Fittings—Register boxes, boots, elbows, transition pieces and similar fittings shall be constructed in the same manner as the ducts and pipes, and all joints between ducts, pipes and/or fittings shall be securely and tightly fastened.

1405.3 Cold Air Ducts

Cold air ducts shall comply with all provisions governing hot air supply ducts except in respect to the requirements for heat insulation and clearance for combustible construction.

1405.4 Supports

a. All ducts, pipes and fittings shall be securely fastened in place and if located within a distance of 10 feet from the furnace (measured along the line of flow of heated air from the furnace) shall not be placed less than ¼ inch from any woodwork or other combustible material used in the construction of the building in which the ducts, pipes and fittings are installed.

b. Metal flanges shall be installed where ducts or pipes pass through floors or other locations where firestops are required by this Handbook.

1405.5 Rise

Horizontal ducts or pipes for gravity flow shall have a rise in the direction of the flow of the heated air of not less than one inch for each foot of run, and shall not exceed 20 feet in horizontal length; provided, however, that in case a booster fan is installed in such duct or pipe the horizontal length thereof may be increased to not more than 40 feet.

1405.6 Area

a. The net cross-sectional area of any duct, pipe or fitting for gravity flow shall be sufficient to heat the room served with an entering air temperature not exceeding 175 degrees F., and in no case shall the net area be less than 38 square inches.

b. No duct, pipe or fitting shall have a net area, in any part thereof, greater than the least net area of the duct, pipe or fitting supplying heated air from the furnace.

c. No pipe, duct or fitting shall have a net area less than combined net cross-sectional areas of the registers or outlets such pipe duct or fitting is designed to service.

1405.7 Other Devices

Dampers or other devices for shutting off the flow of heated air from a warm air furnace to registers or other outlets shall be arranged in such manner that at least one register or outlet will be open for the discharge of heated air when the furnace is being operated.

1405.8 Registers

a. Register plates or other outlets shall be fastened in such manner as to prevent leakage of heated air between such register plates or other outlets and the register or outlet boxes.

b. Supply registers to the rooms shall be properly located for uniform heating and have a sufficient area to keep the outlet velocity not to exceed 300 feet per minute.

1405.9 Air Intake

Every air intake required for a warm air furnace shall be either a fresh air intake from the outside of the building or a return air intake from the space to be heated by such furnace, and such air intake shall not be located in such manner as to draw air from the room or enclosure in which such furnace is installed or from the space immediately adjacent to any openings which are required for permanent ventilation of such room or enclosure.

1405.10 Automatic Fire Doors and Dampers

Automatic fire doors and dampers shall conform to the provisions of the National Building Code.

1406 STEAM AND HOT WATER PIPES

1406.1 Clearances

Unless otherwise specifically provided, all high pressure steam pipes shall have a minimum clearance of one (1) inch from all combustible materials; and when such pipes pass through combustible floors or partitions, the openings shall be protected by metal or other approved noncombustible sleeves; and vertical risers arranged in groups extending through two (2) or more stories shall be enclosed in a shaft of fire-resistive construction. The clearance of low pressure steam and hot water piping in walls, floors and ceilings of combustible construction shall be not less than one-half (½) inch.

1406.2 Floor Sleeves

When heating pipes pass through floors which may be subject to serious flooding, metal sleeves shall be installed to a height of at least six (6) inches above the finished floor surface and shall be provided with perforated cap plates.

1406.3 Firestopping

When heating pipes pass through floors and partitions, the open sleeve space shall be filled with noncombustible materials.

1406.4 Insulation

All coverings or insulation used on steam and hot water pipes shall be of approved noncombustible materials; and where such pipes pass through stock shelving or are in close proximity to other combustible materials, the insulation shall be not less than one (1) inch thick.

1406.5 Freezing Temperatures

All concealed heating pipes located in exterior walls shall be protected against freezing in accordance with nationally recognized good practice.

1406.6 Expansion and Contraction

All heating pipes shall be installed to provide for all expansion and contraction movements due to temperature changes.

1407 UNIT HEATERS

1407.1 Floor Mounted Unit Heaters

Floor mounted unit heaters shall be installed as provided for Heating Furnaces and Boilers.

1407.2 Suspended Type Unit Heaters

a. Suspended type, unit heaters shall be safely and adequately supported with due consideration given to their weight and vibration characteristics. Hangers, brackets and other such supports shall be of noncombustible material.

b. Suspended type, gas or liquid fuel burning or electric unit heaters, except as provided in subparagraph 1407.2 (c) shall be installed to provide a clearance in any direction to woodwork or other combustible material of not less than 18 inches. The clearance from the flue pipe of such an appliance burning liquid fuel shall be not less than 18 inches to combustible material. The clearance from the vent connector of such an appliance burning gas shall be not less than 9 inches to combustible material, except that from vertical gas vent the clearance may be 6 inches, and approved type B gas vents may be used and installed in accordance with the conditions of such approval.

c. Suspended type, gas or liquid fuel burning or electric unit heaters that are approved specifically for installation with lesser clearances than specified in subparagraph 1407.2 (b) may be installed in accordance with the conditions of such approval.

d. Suspended type, gas or liquid fuel burning or electric unit heaters shall not be attached to a warm air duct system unless approved by a nationally recognized testing agency

specifically for such installation and installed in accordance with the conditions of such approval.

1407.3 Steam or Hot Water Unit Heaters

Steam or hot water unit heaters shall be installed to provide clearances from all heated portions thereof to woodwork or other combustible material of not less than one inch.

1408 RECESSED HEATERS AND WALL HEATERS

1408.1 Definition

Recessed heaters and wall heaters mean self-contained heating appliances designed for incorporation in or permanent attachment to a wall, partition, floor or ceiling of the room being heated.

1408.2 Installation

a. Recessed heaters and wall heaters shall not be installed in or attached to walls, partitions, floors or ceilings constructed of combustible material unless approved specifically for such installation and installed in accordance with the conditions of such approval.

b. Recessed heaters and wall heaters shall be so located as not to cause a fire hazard to walls, floors, curtains, furniture and doors.

c. Panels, grilles and access doors which must be removed for normal servicing operations of recessed heaters and of wall heaters shall not be attached to the building construction.

1409 FLOOR FURNACES

1409.1 Location

A floor furnace shall be located so as to be readily accessible and shall not be installed in the floor of any corridor, aisle or passageway, nor in any exitway in a place of public assembly; nor shall any but a gas-fired floor furnace be installed above the first story of a building, and then only

when the furnace assembly projects below the floor into a non-habitable space, enclosed in two (2) hour fire-resistive walls, with clearances of at least six (6) inches on all sides and bottom, except as provided for one- and two-family dwellings.

1409.2 Enclosures

Enclosures of floor furnaces shall be constructed entirely of noncombustible materials with a fire resistance rating of not less than three-quarter (¾) hours, provided with suitable means for combustion-air intake which furnishes adequate direct air supply to insure proper combustion and with means of access for purposes of servicing the furnace.

1409.3 Furnace Supports

Floor furnaces shall be installed only in floors of noncombustible construction of not less than two (2) hours fire resistance, except as provided for one- and two-family dwellings with the following clearances:

1409.4 Pit Clearances

Such floor furnaces, when other than gas-fired, shall be mounted independently of the floor grille with the following clearances; six (6) inches at the bottom and twelve (12) inches at the sides, except that the clearance on the control side shall be not less than eighteen (18) inches.

1409.5 Pit Waterproofing

When there is likelihood of water rising above the bottom clearance, the pit shall be constructed with an approved watertight enclosure.

1409.6 Pit Access Openings

The access foundation wall opening or floor trap door shall be at least eighteen by twenty-four (18 x 24) inches in size; and the under floor passage to the furnace shall be at least twenty-four by twenty-four (24 x 24) inches in cross-section.

1409.7 One- and Two-Family Dwellings

Furnace enclosures may be constructed of noncombustible materials with a fire resistance rating of not less than three-quarter (¾) hours and a minimum clearance of six (6) inches at sides and bottom for servicing. Means shall be provided for supporting the furnace when the floor grille is removed.

1409.8 Pressure Regulator

The outlet duct temperatures shall be not greater than two hundred and fifty (250) degrees F., and in gas-fired furnaces a gas pressure regulator shall be provided so that the gas input does not exceed the manufacturer's rating.

1409.9 Location of Thermostat

A thermostat controlling a floor furnace shall not be located in a room or space which can be separated from the room or space in which the register of the floor furnace is located.

1410 OTHER SOURCES OF HEAT

Other types of heating systems and sources of heat not specifically mentioned herein shall be constructed and installed in a manner to prevent heating of 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 125 degrees F., when in full operation, and shall be so constructed as not to be subject to accidental overturn or other disarrangement conducive to dangerous conditions.

1411 VENTILATING SYSTEMS

1411.1 General

The general requirements of ventilating systems shall be to exhaust air, odors, heat, fumes, dust or bacteria and/or to supply properly conditioned air to maintain the proper temperature, humidity and air motion within the various portions of the buildings in accordance with the provisions

of the Heating, Ventilating and Air Conditioning Guide.

1411.2 Fans

a. Fans shall be installed on proper foundations or otherwise firmly secured to substantial supports, and constructed throughout of noncombustible materials. Housings of fans shall be of substantial construction, properly reinforced when required, and joints shall be airtight.

b. Fans shall be so located and installed as to be readily accessible for repairing, cleaning, inspecting and lubricating. Fans shall not be located in fire-division walls or fire-separation walls.

c. Exhauster fans, unless located outside of the building, shall be located within the rooms or areas from which flammable vapors are being removed, or in compartments of fire-resistive construction within these rooms or areas.

d. When flammable materials are to pass through fans the rotating elements shall be of non-sparking material or the casing shall consist of or be lined with such material.

e. Connections between discharge end of the fan and main duct shall be made in such a manner as to prevent leakage of fine dust.

1411.3 Air Washers

Approved air washers may be installed on the inlet side of a fan used for cleaning, cooling and humidifying. The washer shall consist of suitable nozzles arranged in a separate housing to completely spray the entire air passage. The housing shall be made of substantial rust-resisting material and shall be of sufficient size to maintain air velocities not exceedng 500 feet per minute.

1412 AIR CONDITIONING AND REFRIGERATION

1412.1 General

The provisions of this Section shall control the design, installation and maintenance of air conditioning, refriger-

ation and mechanical ventilation systems hereafter installed and all alterations or additions to existing systems.

1412.2 Installation

All approved systems shall be constructed, installed and maintained in accordance with nationally recognized good practice which conforms to the provisions of the American Standard Safety Code for Mechanical Refrigeration; the provisions of the National Board of Fire Underwriters, Standards for Air Conditioning, Air Cooling and Ventilating Systems and the NFPA Pamphlet 90A.

1413 OIL BURNERS

1413.1 General

Oil burning apparatus using commercial fuel oil, furnace oil or other flammable liquids shall be manufactured and installed in accordance with nationally recognized good standards and standards of the National Board of Fire Underwriters.

1413.2 Identification

Each approved burner shall have permanently and prominently affixed thereto a metal plate, tag or other approved device which certifies that it has been tested and approved by a nationally recognized testing agency. The certification shall also bear the manufacturer's or distributor's name, the number of the appliance, the hourly B. T. U. output rating, and the grade of fuel oil for which it is approved.

1413.3 Instruction Card

When installed, each burner shall be accompanied by complete printed instructions for igniting, operating, maintenance and shutdown procedure, which shall be attached in a convenient location near the installation.

1413.4 Construction

An approved burner, including the oil burning heater, shall be an assembly of approved parts which are suitable for use with each other and for the service intended.

1413.5 Safety Devices

Each burner shall be provided with approved safeguards and protective devices for control of the oil supply, the mixing of the air, the ignition, high pressure or high temperature limits, high and low water limits and for the control of the burner when ignition fails.

1413.6 Flexible Tubing

Flexible tubing over seventy-two (72) inches in length shall not be used as an integral part of a burner; and such tubing shall be of a type complying with the approved rules.

1413.7 Quality of Oil

Oil for use in oil burners shall be free from acid, grit, fibrous and other foreign matter, with a flash point not lower than one hundred (100) degrees F. and shall comply with the classified commercial standard fuel.

1413.8 Flue Gas

The operation of an approved burner shall insure a CO_2 content in the flue gas of not less than eight (8) percent without the emission of smoke throughout the operating range.

1413.9 Tests

When assembled, each burner shall be tested for defects and proper functioning throughout the operating range, to the satisfaction of the administrative authority.

1414 GAS-FIRED EQUIPMENT

1414.1 General

a. The provisions of this Section covers the requirements of material and equipment using gases other than LP gases.

b. All gas-fired boilers, furnaces and other equipment shall be provided with approved safety devices in accordance with the manufacturer's approved specifications to limit the

gas input in the event of low water, excessive steam or air pressures and excessive temperatures.

1414.2 Gas Space Heaters

Gas-fired space heaters used in sleeping rooms or other rooms normally kept closed shall be of the vented type equipped with an automatic pilot arranged to shut off the gas supply to the main burner when not in operation. Where appliances are installed in a tightly closed room, provisions shall be made to furnish necessary ventilation.

1414.3 Gas Piping Other Than for LP Gas

Gas piping shall be of wrought iron or steel with malleable iron or steel fittings or copper tube complying with the Plumbing Code. No cast iron pipe or fittings or aluminum tubing shall be used for gas piping. When subject to corrosion from surrounding materials, the piping shall be of approved corrosion-resistive alloys. All connections to appliances shall be of the rigid type; except that approved semi-rigid connections may be used on appliances which burn not more than ninety (90) cubic feet of gas per hour.

1414.4 Electric Connections and Wiring

All electric wiring shall comply with the requirements of Chapter 17 and the requirements of the National Electrical Code.

1414.5 Uninterrupted Power

All electric controls shall be connected into a permanent live circuit and gas-fired central heating plants shall be supplied from separate independent circuits.

1414.6 Control Circuits

Control circuits shall be run in multiple-conductor cable of not lighter than No. 18 B&S gage with approved thermoplastic coverings. Cables with more than two (2) conductors shall be color-coded.

1415 HOT WATER SUPPLY HEATERS

1415.1 General

All range boilers, hot water heaters and storage tanks shall be equipped with temperature limit controls and pressure relief valves as herein required.

1415.2 Automatic Hot Water Supply

Automatic or remote control ignition equipment on domestic hot water heating devices using gas or liquid fuel shall be installed only in connection with a burner equipped with a safety pilot or other approved device arranged to automatically shut off the fuel supply to the main burners if the pilot flame is extinguished. All gas water heaters with an automatic remote-control pilot, or with means of lighting other than a manual method, shall be equipped with approved down draft diverters on the flue pipe from the heater arranged to prevent extinguishment of the pilot or heating flame.

1415.3 Direct-fired Gage Equipment

Listed relief valves and pressure gages shall be installed in all direct-fired cast iron water heaters with cored sections, and in all heaters with a check valve located between the water meter and the heater or tank.

1415.4 Pressure Relief Valves

The rate of discharge of pressure valves shall limit the pressure rise to ten (10) per cent of the pressure at which the valve is set to open for any given heat input.

1415.5 Temperature Relief Valves

Temperature relief valves shall be capable of discharging sufficient hot water at two hundred and ten (210) degrees F. without further rise in temperature.

1415.6 Vacuum Relief Valves

All copper tanks shall be equipped with approved vacuum relief valves.

1415.7 Relief Outlet Wastes

The size of relief outlet waste valves shall be not less than the cross-sectional area of the valve discharge outlet. No pressure, temperature or other type relief valve shall discharge directly to the building drainage system.

1415.8 Prohibited Uses

No solid or liquid fuel or gas-fired water heaters shall be installed in bathrooms, bedrooms, or other habitable spaces or in any enclosed space with a volume of less than three hundred (300) cubic feet; nor shall vent pipes designed for use only with gas appliances be used with solid or liquid fuel-fired equipment.

1416 ELECTRIC HEATERS

1416.1 Types

Electric heaters or radiators bearing the Underwriters' Laboratories inspection label of the direct or indirect type may be used for heating under similar conditions as outlined for low pressure heating systems.

1416.2 Wiring

Each unit shall be separately connected to the wiring system as recommended by the N. B. F. U. in Article 422 of the National Electrical Code. Thermostats and switches indicating "ON" and "OFF" shall be on or near the heaters.

1417 RESTAURANT COOKING APPLIANCES

1417.1 General

The provisions of this Section shall apply to ranges, broilers, ovens, and other miscellaneous appliances of a type generally used in hotel and restaurant kitchens. Such appliances shall be installed level on a firm foundation.

1417.2 Mounting of Appliances

Floor mounted restaurant-type cooking appliances that are listed specifically for installation on a floor may be

mounted only in accordance with the conditions of such listings.

1417.3 Exceptions

a. Appliances which are set on legs which provide not less than eighteen inches (18″) open space under the base of the appliance, or which have no burners and no portion of any oven or broiler within eighteen inches (18″) of the floor, may be mounted on combustible floors, provided there is at least one sheet metal baffle between the burners and the floor.

b. Appliances which are set on legs which provide not less than eight inches (8″) open space under the base of the appliance, may be mounted on combustible floors, provided the floor under the appliance is protected with not less than three-eighth inch (⅜″) asbestos millboard covered with sheet metal of not less than 24 U. S. gauge. The above specified floor protection shall extend not less than six inches (6″) beyond the appliance on all sides, and where solid fuel is used shall extend not less than eighteen inches (18″) at the front or side where ashes are removed.

c. Appliances which are set on legs which provide not less than four inches (4″) open space under the base of the appliance, may be mounted on combustible floors, provided the floor under the appliance is protected with hollow masonry not less than four inches (4″) in thickness, covered with sheet metal of not less than 24 U. S. gauge. Such masonry course shall be laid with ends unsealed and joints matched in such a way as to provide a free circulation of air through the masonry. Where solid fuel is used, the floor for eighteen inches (18″) beyond the front of the appliance or side where ashes are removed shall be protected with not less than one-fourth-inch (¼″) asbestos millboard covered with sheet metal of not less than 24 U. S. gauge, or with protection equivalent thereto.

d. Appliances may be mounted on combustible floors, provided the floor under the appliance is protected by two courses of four-inch (4″) hollow clay tile or equivalent, with courses laid at right angles and with ends unsealed and joints matched in such a way as to provide a free circulation of air through such masonry courses, and covered with steel plate not less than three-sixteenths inch (3/16″) in thickness. Where solid fuel is used, the floor for eighteen inches (18″) beyond the front of the appliance or side where ashes are removed shall be protected with not less than one-fourth-inch (1/4″) asbestos millboard covered with sheet metal of not less than 24 U. S. gauge, or with protection equivalent thereto.

1417.4 Clearances

a. Ranges, broilers, and ovens shall be installed to provide a clearance to walls of combustible material not less than that specified in the conditions of approval. Listed gas-fired appliances shall be installed not less than six inches (6″) from combustible construction except that at least a two-inch (2″) clearance shall be maintained between the flue box or draft hood and combustible construction.

b. The cooking top and front of appliances shall have 48 inches clearance from combustible materials above and in front.

1417.5 Protection Above Appliances

Where a wall of combustible construction adjacent to the cooking top of an appliance is not shielded by a high shelf or ventilating system, the wall shall be protected by sheet metal of not less than 28 U. S. gauge over one-fourth-inch (1/4″) asbestos millboard extending at least twenty-four inches (24″) above the surface of the cooking top.

1417.6 Hoods

a. When required—Restaurant-type ranges, fry kettles, candy kettles, cruller furnaces, and appliances for the fry-

ing of bakery or confectionary products, shall be provided with ventilating hoods and ducts to the outside air to take off the smoke, gases, and vapors, unless such appliances are of the enclosed type and are vented in an approved manner.

b. Location—Such hoods shall not be raised more than seven feet (7′) above the floor. Hoods shall be of sufficient depth to extend at least six inches (6″) beyond all sides of units served.

c. Construction—Such hoods and their ducts shall be constructed of incombustible materials with tight unsoldered joints and if of metal shall be of not less than 24 U. S. gauge copper, galvanized iron, or other equivalent corrosion-resistant ferrous metal. Hood ducts shall not be connected with any other ventilating system, but connect into flues or stacks used for the same purpose and conforming to the requirements for smoke flues. The hood shall have a grease trough extending around the perimeter, draining into a grease container outside the hood. A sufficient number of cleanout openings shall be provided in horizontal runs of every duct to permit cleaning of all portions of the interior of such areas where grease is likely to condense and trap.

d. Grease extraction—Approved grease filters or grease baffles shall be installed at the inlet of the exhaust system.

e. Exhaust capacity—Exhaust-duct systems shall be so designed as to create a conveying air velocity of not less than fifteen hundred feet (1500′) and not more than twenty-two hundred feet (2200′) per minute.

f. The requirements for hoods and ducts as provided in the latest edition of the National Building Code and/or the UniformBuilding Code shall be acceptable as complying with the requirements of this Section.

CHAPTER 15

FIRE EXTINQUISHING AND FIRE ALARM EQUIPMENT

1500 GENERAL

The provisions of this Chapter shall control the construction, fabrication, installation, location and maintenance of fire extinguishing and fire alarm materials, equipment and systems.

1501 APPROVED DEVICES

Materials and devices labeled or listed by nationally recognized accredited testing laboratories shall be deemed to comply with the requirements of this Chapter when installation is made in accordance with the limit of the approval.

1502 TESTS

Before final approval and acceptance of fire extinguishing and fire alarm equipment and systems in any building are made, the installations shall be subjected to tests to demonstrate that such equipment and systems are properly installed and are in satisfactory working order.

1503 PERIODIC INSPECTIONS AND TESTS

Periodic inspections and tests of fire extinguishing and fire alarm equipment and systems shall be made to demonstrate that they are maintained in good operating condition and to familiarize the fire-fighting forces with existing conditions in all buildings and structures.

1504 AUTOMATIC SPRINKLER SYSTEMS

1504.1 Where Required

The installation of automatic sprinkler systems for building of construction Types II, III, IV, and V shall be

based on the merits of the specific use, occupancy and area of the building.

1504.2 Installations

a. Automatic sprinkler systems shall be installed to conform to nationally recognized good practice and in accordance with approved detailed drawings of the complete sprinkler layout.

b. Sprinkler systems shall be designed to withstand, when ready for service, a water pressure of not less than 200 pounds per square inch for two hours without leakage at any part.

c. Every sprinkler system shall be provided with an approved screw and yoke valve or indicator gate valve, located to be readily accessible to control all sources of water supply.

d. Each automatic sprinkler system shall have at least one automatic source of water supply of adequate pressure capacity and reliability. The water supply line shall be a separate connection from the water main and not metered.

1505 STANDPIPES

1505.1 Required

Standpipes shall be installed in administration buildings, offices, assembly buildings, dining structures, visitor centers, museums, hotels, theaters, apartment buildings, warehouse and utility buildings having multiple use.

1505.2 Number

The number of standpipe risers shall be such that all parts of every floor area can be reached by a 30 foot stream from a nozzle attached to 100 feet of hose connected to the riser outlet.

1505.3 Location

a. Standpipes shall be so located that they are protected against mechanical and fire damage.

b. Outlets shall be located within or near stairway enclosures insofar as practicable or accessible from interior or exterior stairways, or in public corridors.

1505.4 Installation

a. Standpipes shall be installed to conform to nationally recognized good practice.

b. Standpipes shall be of wrought iron or steel and shall be designed to withstand the pressure to which they may be subjected but not less than 100 pounds per square inch in excess of the static head of water due to the height of the standpipe.

1505.5 Size

Standpipes shall be of adequate sizes for the protection required but not less than 2½ inches in diameter for buildings not over 4 stories high.

1505.6 Hose Connections

Standpipes shall be equipped in every story with 2½″ diameter hose connections and valve located not more than 6 feet above the floor level.

1505.7 Hose

a. Standpipes located inside of buildings shall have 1½″ or 2½″ hose not less than 100 feet in length, attached to each outlet.

b. Easily removable 2½″ by 1½″ adapters may be placed in standpipe outlets for 1½″ hose connections.

c. Each line of hose shall be provided with an approved nozzle.

d. Hose shall be kept in an approved hose cabinet.

1505.8 Water Supply

a. Standpipes shall be supplied under full pressure from adequate water supply sufficient to supply at least 250 gallons per minute for one standpipe and at least 400 gallons per minute where two or more standpipes are required, for a

period of 12½ minutes. The flow pressure at the topmost outlet shall be not less than 20 P. S. I.

b. Connections to each water supply shall be provided with a check valve and gate valve and shall be a separate connection from the domestic connection.

c. When a tank which supplies a standpipe is also used for domestic supply, the inlet to the domestic supply pipe shall be placed at a sufficient height above the bottom of the tank to reserve for fire purposes not less than the quantity of water specified for such purposes.

1505.9 Interconnections

Where more than one standpipe is required in a building they shall be interconnected at their bases by pipes of a size equal to the larger standpipe.

1505.10 Fire Pumps

Fire pumps shall have a capacity of not less than 250 gallons per minute with a pressure of not less than 25 pounds at the topmost hose outlet.

1505.11 Gravity and Pressure Tanks

Gravity and pressure tanks shall have a capacity of not less than 5000 gallons and shall be so located as to provide not less than 20 pounds pressure at the topmost outlet.

1505.12 Tests

Upon the completion of a standpipe installation the standpipes shall be tested hydrostatically at not less than 200 pounds per square inch pressure for 2 hours.

1506 FIRE ALARM SYSTEMS

1506.1 Where Required

Interior fire alarm systems shall be installed in the following buildings:

a. Hotels, lodging buildings and dormitories having 15 or more sleeping rooms above the first floor with an occupancy load of 50 or more persons.

b. Hospitals accommodating 20 or more occupants above the first floor.

c. School buildings with provision for 30 or more children above the first floor.

d. All motion picture buildings, film laboratories, and buildings of similar high hazard use.

1506.2 Installation

Fire alarm systems shall be installed to conform to nationally recognized good practice.

1507 FIRE EXTINGUISHERS

1507.1 Hand-Operated

a. All hand-operated fire extinguishing equipment not covered in this Chapter shall be nationally recognized types suitable to the occupational use of the building and shall be installed in corridors or other locations, visible and readily accessible to the occupants of the building.

b. Hand-operated fire extinguishing equipment shall be in accordance with the following Table 1507.2.

c. More details concerning hand-operated fire extinguishing equipment are given in the National Park Service Handbook "Prevention and Control of Fire Losses," in the NBFU Pamphlet No. 10 "First Aid Fire Appliances," and in the Manual of Fire Loss Protection of the Federal Fire Council.

1507.2 Table

TYPES OF FIRE EXTINGUISHERS FOR CLASS OF FIRE

Class of Fires	Types of Fire Extinguishers
CLASS A Fires In buildings where fires may occur in ordinary combustion, such as wood, paper, textiles, rubbish, etc. Representative buildings include office buildings, lodging structures, schools, hospitals, residence buildings, warehouses, etc.	2½ gal. soda and acid,[1] 2½ gal. water type,[1] 2½ gal. calcium chloride,[2] 2½ gal. foam [1]
CLASS B Fires In buildings where flammables are used or stored, such as gasoline, oil, grease, paint, and other oil base products. Representative buildings include garages, equipment storage buildings, repair shops, machine shops, oil and paint buildings, paint shops, service stations, etc.	2½ gal. foam,[1] 15 lb. carbon dioxide, 12 lb. dry chemical
CLASS C Fires In buildings where fire may occur in electrical equipment installations. Representative buildings include power stations, transformer rooms, shops, etc.	15 lb. carbon dioxide, 12 lb. dry chemical

[1] Must be placed in locations where contents of extinguishers will not freeze.

[2] Calcium chloride solution may be mixed to avoid freezing at minus 40° F.

A careful survey should be made of the use and occupancy of each building in determining the size, type or types of extinguishers to be installed.

CHAPTER 16

SAFEGUARDS DURING CONSTRUCTION

1600 GENERAL

1600.1 Construction Operations

a. The provisions of this Chapter shall apply to the construction operations in connection with erection, alteration, repair, removal or demolition of buildings and structures.

b. On matters not covered herein, safeguard during construction shall conform to the provisions of the Manual of Accident Prevention on Construction of the Associated General Contractors of America, Inc.; to Safety Requirements, Department of the Army Corps of Engineers; and to the NBFU Pamphlet No. 241.

1600.2 State Agency Regulations

Nothing herein contained shall be construed to nullify any rules, regulations or statutes of state agencies governing the protection of the public and workmen from health and hazard.

1601 PROTECTION OF PUBLIC AND WORKMEN

1601.1 Applicable

Every operation of construction shall be conducted in a safe manner and adequate protection facilities for the general public and workmen thereon shall be provided.

1601.2 Barricades, Walkways and Protective Covering

a. Every construction operation located within 5 feet of street line shall be enclosed with a fence eight feet high. When located more than 5 feet from the street adequate fences or barricades shall be provided.

b. Whenever a structure within 10 feet of a street is to be erected to exceed 40 feet in height or when a structure more

than 25 feet in height is to be demolished, adequate overhead sidewalk protection shall be erected and maintained for the entire time the work is performed on the exterior of the structure.

1602 SCAFFOLDS

All scaffolds shall be designed and constructed in accordance with nationally recognized good practice to support the loads that may be imposed thereon to insure safety to persons working on them or passing under or near them. In no case shall the designed live load be less than 125 pounds per square foot.

1603 PLATFORMS

Planking for platforms of scaffolds and for walkways shall be not less than 2 inches thick of sound seasoned lumber.

Guardrails and toe boards shall be provided at platform level, 6 feet or more above grade, to prevent material from falling and to protect workmen.

1604 HOISTS

Temporary interior and exterior hoists shall be constructed, installed and maintained in accordance with nationally recognized good practice. Floor opening for interior hoists shall be enclosed the full height except for the necessary access doors.

1605 TEMPORARY STAIRS

Temporary stairs shall be substantially constructed of 2-inch nominal thickness, sound, seasoned lumber and shall be provided with adequate handrails.

1606 LADDERS

Ladders used in construction operations shall be of proper size and design for the uses intended. They shall be

strongly constructed of sound, seasoned lumber and shall be maintained at all times.

Each ladder shall rest on a firm level surface and the top shall be fastened to platforms or other means of support so that it cannot slide or overturn.

1607 EXCAVATIONS

Until permanent supports have been provided, all excavated areas shall have adequate safeguards for the protection of workmen.

When necessary such excavation shall be retained by temporary retaining walls, sheet-piling and bracing or other approved methods to support the adjoining earth.

1608 FLOOR OPENINGS

All floor openings, unless guarded by permanent enclosures or full-height temporary barriers, shall be covered with substantial temporary flooring, or guarded on all sides by substantial railings not less than 4 feet high set at least 2 feet from the edges of the openings, and by toe boards not less than 6 inches high set along the edges of the openings, except for such parts of the openings as are necessarily open for traffic purposes.

1609 FIRE PROTECTION

1609.1 General

During the construction operation, strict observance shall be made to safeguard against all fire hazards attendant upon construction operations.

1609.2 Concrete Forms

In buildings of reinforced concrete construction, forms of combustible material shall be stripped from the concrete and removed from the building as soon as practical.

1609.3 Fire Extinguishing Equipment

a. Fire extinguishers shall be placed in accessible locations throughout the building and in tool houses, storerooms, shanties, dressing rooms and shops and shall be maintained during the entire construction operation.

b. During construction operations free access to fire hydrants, outside standpipe connections, sprinklers or other fire extinguishing equipment, whether permanent or temporary, shall be provided and maintained at all times. No materials or equipment shall be placed within 10 feet of such hydrants or connections.

1610 HEATING

The permanent heating equipment shall be installed and put in operation as soon as practicable.

When temporary heating devices are used they shall not be set on combustible flooring or platforms unless thoroughly insulated with 4 inches of sand or other efficient protection. Such devices shall be not less than 2½ feet from any combustible material and shall have at least 6 feet of overhead clearance.

1611 STORAGE OF MATERIALS

All materials and equipment required in construction operations shall be stored and placed so as not to endanger property, workmen and other persons.

Materials and equipment shall be placed so as not to overload any part of the construction beyond its design capacity, nor interfere with the safe prosecution of the work; nor obstruct trafficways, walkways or access to various facilities.

1612 REMOVAL OF WASTE MATERIAL

No material shall be dropped by gravity or thrown out of buildings during erection or demolition. Adequate chutes

shall be provided for this purpose, and for all parts of demolition operations.

Material which in its removal causes an excessive amount of dust shall be wet down. Waste material and rubbish shall be removed from the site as rapidly as practicable. No material shall be disposed of by burning on the site without proper authority.

1613 WARNING LIGHTS

All pits, excavations, fences, barriers, builder's equipment, building materials or rubbish in or upon a street, alley, sidewalk or any other public place, shall have placed upon or by them, illuminated lamps with red globes, flares or other approved lights, in such manner that there shall be one light at each end, and at intermediate points as may be necessary to afford proper warning after darkness.

1614 LIGHTING

All parts of buildings or structures under construction and all sheds, scaffolds and other equipment in connection therewith, where work is being performed or persons must necessarily pass, shall be adequately lighted to insure safety.

1615 TEMPORARY WIRING

Transformers, wiring, equipment and over current protection shall be installed in accordance with accepted practice.

1616 SANITATION

Until permanent provisions are made, every building or structure in the course of erection, alteration, repair or demolition shall be provided with suitable and adequate drinking water and toilet facilities.

1617 ACCIDENTS

1617.1 First Aid

On every building operation a standard first aid kit shall be provided and maintained.

1617.2 Medical Attention

Arrangements shall be made for prompt medical attention in case of need.

1617.3 Reports

All accidents, no matter how trivial shall be reported immediately to the Park Superintendent and formal reports shall be prepared on forms supplied by him.

CHAPTER 17

ELECTRICAL INSTALLATION

1700 GENERAL

The design and construction of electrical installations and systems in buildings shall conform to methods and practice to safeguard persons and property from electrical hazards.

All new electrical installations and all extensions or alterations of existing electrical installations shall conform to the provisions of this Chapter.

On matters not covered herein, electrical installations shall conform to the provisions of the National Electrical Code and other nationally recognized good practice standards.

1701 MATERIALS AND EQUIPMENT

Electrical materials, equipment, appliances, and devices shall be approved code grade conforming to the requirements of the National Electrical Code, National Electrical Safety Code and in accordance with Federal specifications pertaining thereto.

All material, equipment, appliances, and devices shall bear the name of the manufacturer, the testing laboratory inspection label and the rating of the Manufacturers Association having jurisdiction thereof.

1702 INSTALLATION

1702.1 Supports and Foundations

a. Approved hangers, supports and foundations shall be installed at the required uniform spacing to maintain all materials and equipment in a rigid position.

b. Heavy equipment shall be set on and anchored to reinforced concrete foundations as recommended by the manufacturers.

c. Sound insulation materials and methods shall be provided where quietness is essential.

1702.2 Conduits

a. Conduits shall be of rigid corrosive-resistant metal or electric metallic tubing and shall be not less than ¾ inch in diameter. The sizes, fittings and details of installation shall be in accordance with the standards of the National Electrical Code.

b. Mineral insulated metal sheathed cable, type M. I. is acceptable in lieu of conduit and wire, in sizes approved by the National Electrical Code.

c. No conduit shall be installed in cinder fill.

d. Except as otherwise provided, wiring installations shall be made in conduit.

e. Conduit may be omitted in one and two-family residences and in one and two-family public cabin units where approved cable wiring is used.

f. Conduit will not be required for telephone and signal systems, except conduits are recommended for buildings where multiple telephone service is provided.

1702.3 Conductors

a. All conductors shall be insulated and shall be of proper size for the load requirement. Conductors in the interiors of buildings shall not be smaller than No. 12 AWG, except for signal systems as herein specified.

b. Service conductors shall be not less than No. 8 AWG.

1702.4 Grounding

a. All wiring systems and electrical equipment shall be grounded in accordance with Article 250 of the National Electrical Code in all cases requiring protection.

b. Adequate grounding shall be provided for metallic structures exposed to lighting.

c. Where one or more wires of any system are grounded they shall be identified with marked wires throughout the system.

d. All portable equipment and appliances shall be connected through a 3-wire receptacle cap and cord to properly ground the equipment and appliances.

1702.5 Service

a. Each electrical system shall have only one main service, either overhead or underground.

b. Overhead service conductors shall be covered with weatherproof insulation and shall be installed with a minimum clearance of 12 inches between conductors, 8 feet above roofs, 10 feet above the ground and 18 feet above roadways.

c. The service shall enter the building through a weathertight service head located not less than 10 feet above ground.

d. Underground services shall be of sizes and types specifically approved for the purpose. They may be installed either in trenches or in conduit and shall be protected from mechanical injury by conduit or by covering consisting of 2-inch creosoted timbers. Where underground services enter a building or are carried up a pole or under a roadway, they shall be protected by rigid metal conduit.

e. Each service shall extend to a main switch placed in a readily accessible location in the building.

1702.6 Hazardous Locations

Service equipment installed in hazardous locations shall comply with the requirements of the National Electrical Code.

1702.7 Wiring Systems

a. Wiring systems in buildings shall start at a main panelboard, then shall be distributed through branch cir-

cuits or singly to outlets and equipment, directly or through secondary panels.

b. All wiring systems and installations shall be properly protected against overcurrent by circuit breakers or switch fuse units.

c. Small installations where the total connected load does not exceed 35 amperes may be 2-wire, 110 volt systems.

d. Where the total connected load exceeds 36 amperes, a 3-wire, 110/220 volt system should be installed.

e. Large lighting installations may be connected to a 4-wire, 3-phase balanced system of approved design.

f. Branch circuit house runs for lighting shall be made from ceiling outlets; house runs for receptacles shall be made from exterior wall locations where possible.

g. Lighting and receptacle circuits shall be rated at 20 amperes with not more than 1600 watt load and a limit of 12 or less outlets.

h. A single duplex receptacle shall not be installed for any load exceeding 1600 watts.

i. Outlets for small kitchen appliances in dwellings shall be on a separate circuit or circuits.

j. Electric heaters of over 1000 watt capacity shall operate from a 220 volt system run in conduit.

k. Electric ranges shall operate from a 110/220 volt, 3-wire system run in conduit.

l. Small motors may be connected to 110 volt A. C. system.

m. Motors with 5 horsepower and above should be fed by 220 volt 3-phase A. C. systems.

n. Heaters, ranges and other equipment of over 1000 watt capacity shall have control switches at the equipment.

o. Wiring shall be arranged so that heat producing appliances using electrical controls shall have the controls connected into a permanently live circuit, not controlled by

a light switch. A separate circuit shall be provided for central heating gas appliances.

1703 EMERGENCY LIGHTING

1703.1 Requirements

a. Emergency lighting shall be provided for all exit lights in theaters, hotels and buildings where large public meetings are held and in all other locations required to enable persons to see their way out of the buildings safely.

b. When electric lights are used for emergency illumination they shall be connected to specially provided circuits taken through locked switches not interrupted by the building service switch, or supplied from storage batteries and automatic switches.

c. Exit lights shall consist of illuminated signs bearing the word "EXIT" in letters at least 6 inches high, and each such sign shall be provided with two separate lamp sockets, one supplied from a special circuit and the other by the general system.

1704 SIGNAL AND CONTROL SYSTEMS

1704.1 Operation

Signal and control systems shall operate on limited voltage supplied through approved transformers connected to the lighting system and protected with overcurrent and other safety devices and switches.

1704.2 Conductors

Conductors shall be not smaller than No. 18 AWG insulated and installed in conduit or they may be of approved cable.

1705 TELEPHONE SYSTEMS

1705.1 Public Systems

Telephones connected to the public telephone system shall be installed according to the requirements of the company supplying the service.

1705.2 Private Systems

Private telephone systems shall be installed as described for signal systems.

1706 HIGH VOLTAGE SYSTEMS

All electric systems operating at more than 600 volts are high voltage systems and shall be installed as such in accordance with the provisions of the National Electric Code.

1707 TRANSFORMERS

Transformers shall be installed in accordance with Article 450 of the National Electric Code. Dry type and askarel-insulated transformers may be located within buildings in conformance to Section 4521 and 4522 of the code.

1708 INSPECTIONS AND TESTS

1708.1 Inspections

The contracting officer shall, during the installation of an electric wiring system, make inspections to assure compliance with this Handbook.

1708.2 Tests

Each entire wiring system when completed shall be reinspected and tested to assure compliance with all requirements of this Handbook.

CHAPTER 18

PLUMBING

1800 GENERAL

All plumbing systems hereafter installed shall conform at least to the Report of the Coordinating Committee for a National Plumbing Code as issued jointly by the U. S. Department of Commerce, National Production Authority and the Housing and Home Finance Agency, Office of the Administrator, Washington 25, D. C., dated June 1951, or as subsequently revised, and to any other requirements contained herein.

1801 GENERAL REGULATIONS

1801.1 Grade of Horizontal Drainage Piping

a. Small piping—Horizontal drainage piping of 3-inch diameter and less shall be installed with a fall of not less than one-quarter inch per foot.

b. Large piping—Horizontal drainage piping of larger than 3-inch diameter shall be installed with a fall of not less than one-eighth inch per foot.

1801.2 Change in Direction

a. Fittings—Changes in direction in drainage piping shall be made by the appropriate use of 45° Y's, long-or-short-sweep quarter bends, sixth, eighth, or sixteenth bends, or by a combination of these or equivalent fittings. Single and double sanitary T's and quarter bends may be used in drainage lines only where the direction of flow is from the horizontal to the vertical.

b. Short sweeps—Short sweeps not less than 3 inches in diameter may be used in soil and waste lines where the change in direction of flow is from either the horizontal to the vertical or from the vertical to the horizontal and may

be used for making necessary offsets between the ceiling and the next floor above.

1801.3 Fittings and Connections

a. Fittings prohibited—No fitting having a hub in the direction opposite to flow, or T branch shall be used as a drainage fitting. No running threads, bands, or saddles shall be used in the drainage system. No drainage or vent piping shall be drilled or tapped.

b. Heel or side-inlet bend—A heel or side-inlet quarter bend shall not be used as a vent when the inlet is placed in a horizontal position.

c. Obstruction to flow—No fitting, connection, device, or method of installation which obstructs or retards the flow of water, sewage, wastes, or air in the drainage or venting systems in an amount greater than the normal frictional resistance to flow, shall be used unless it is indicated as acceptable in this Handbook or is approved by the administrative authority as having a desirable and acceptable function and as of ultimate benefit to the proper and continuing functioning of the plumbing system. For prohibited joints and connections see paragraph 1803.4.

1801.4 Sewer and Water Pipes in Same Trench

Water service pipes, or any underground water pipes, shall not be run or laid in the same trench as the building sewer or drainage piping, except as provided for in Chapters 10 and 11 the National Plumbing Code.

1801.5 Protection of Pipes

a. Breakage and corrosion—Pipes passing under or through walls shall be protected from breakage by arches, reinforcing, sleeves or other approved means. Pipes passing through or under cinder or concrete or other corrosive material, shall be protected against external corrosion by protective coating, wrapping, or other means.

b. Cutting or notching—No structural member shall be weakened or impaired by cutting, notching, or otherwise, except to the extent permitted by the proper administrative authority.

c. Soil tests—Where soil is suspected or known to have a corrosive effect on certain materials, no piping shall be installed under ground until determination has been made as to the type of material to be used and until such material is approved by the administrative authority.

1801.6 Piping in Relation to Footings

No piping shall be laid parallel to footings or outside bearing walls closer than 3 feet, except as may be approved by the administrative authority, upon a finding that a less distance is safe. Such piping installed deeper than footings or bearing walls shall be 45° therefrom, except as may be approved by the administrative authority, upon a finding that a greater angle is safe.

1801.7 Venting

The drainage system shall be provided with a system of vent piping which will permit the admission or emission of air so that under no circumstance of normal or intended use shall the seal of any fixture trap be subjected to a pressure differential of more than 1 inch of water.

1801.8 Dead Ends

In the installation or removal of any part of a drainage system, dead ends shall be avoided except when necessary to extend for a cleanout.

1802 MATERIALS

All materials used in any plumbing or drainage system shall conform to the latest Federal or ASTM specifications.

1803 JOINTS AND CONNECTIONS

1803.1 Tightness

Joints and connections in the plumbing system shall be gastight and watertight for the pressures required by test,

with the exception of those portions of perforated or open-joint piping which are installed for the purpose of collecting and conveying ground or seepage water to the underground storm drains.

1803.2 Types and Use of Joints

Types of joints and use of joints shall conform to the requirements of the National Plumbing Code.

1803.3 Slip Joints

In drainage and water piping, slip joints may be used only on the inlet side of the trap or in the trap seal, and on the exposed fixture supply.

1803.4 Prohibited Joints and Connections

Any fitting or connection, which has an enlargement, chamber, or recess with a ledge, shoulder, or reduction of pipe area, that offers an obstruction to flow through the drain, is prohibited. The enlargement of a 3-inch closet bend or stub to 4 inches shall not be considered an obstruction.

1804 TRAPS AND CLEANOUTS

1804.1 Traps Where Required

a. Fixtures—Each fixture shall have a separate water-sealed trap, placed not more than 1 foot from the fixture, except that a set of not more than three laundry trays or lavatories or a set of two laundry trays and one sink may be connected with a single trap, provided the trap is placed centrally and the branches connect into the trap seal at an angle of not more than 60 degrees to the vertical arm.

b. Restrictions—In no case shall the waste from a bathtub or other fixture discharge into a water-closet trap. No fixture shall be double trapped.

1804.2 Fixture Traps

Plumbing fixtures, excepting those having integral traps, shall be separately trapped by a water-seal trap, placed as close to the fixture outlet as possible.

1804.3 Distance of Trap to Fixture

The vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches.

1804.4 Type and Size of Traps and Fixture Drains

The size (nominal diameter) of trap for a given fixture shall be sufficient to drain the fixture rapidly but in no case less than given in Table 1813.4.

1804.5 Trap Seal

Each fixture trap shall have a water seal of not less than 2 inches and not more than 4 inches, except where a deeper seal is found necessary by the administrative authority for special conditions.

1804.6 Trap Cleanouts

a. Each fixture trap, except those cast integral or in combination with fixtures in which the trap seal is readily accessible or except when a portion of the trap is readily removable for cleaning purposes, shall have an accessible brass trap screw of ample size protected by this water seal.

b. Cleanouts on the seal of a trap shall be made tight with threaded cleanout plug and approved washer.

1804.7 Prohibited Traps

a. No trap which depends for its seal upon the action of movable parts shall be used.

b. Full S traps are prohibited.

c. Bell traps are prohibited.

d. Crown-vented traps are prohibited.

1805 PIPE CLEANOUTS

1805.1 Location

Cleanouts shall be not more than 50 feet apart in horizontal drainage lines of 4-inch nominal diameter or less and not more than 100 feet apart for larger pipes.

1805.2 Size of Cleanouts

Cleanouts shall be of the same nominal size as the pipe up to 4 inches and not less than 4 inches for larger pipes;

except manholes shall be provided for underground pipes over 10 inches and located at each 90° change in direction, and at intervals of not more than 150 feet.

1805.3 Underground Drainage

Cleanouts, for underground drains, shall be extended to the finished grade directly above the cleanout through manholes, or may be extended to the outside of the building when found necessary by the administrative authority.

1805.4 Change of Direction

Cleanouts shall be installed at each change of direction of the building drain greater than 45°.

1805.5 Base of Stacks

A cleanout shall be provided at the base of each vertical stack. For buildings with a floor slab on earth or with less than 18-inch crawl space the drain may be extended to the outside of the building and terminated in an accessible cleanout, or the cleanout may be installed in the building drain downstream from the stack not more than 5 feet outside the building wall.

1805.6 Building Drain Junction

There shall be a cleanout near the junction of the building drain and building sewer or a cleanout with Y branch inside the building wall.

1805.7 Direction of Flow

Every cleanout shall open in a direction opposite to the flow of the drainage line or at right angle thereto.

1805.8 Limitations

Cleanout plugs shall not be used for new fixture or floor drain installations except where approved by the administrative authority.

1805.9 Cleanout Clearances

a. Large pipes—Cleanouts on 3-inch or larger pipe shall have a clearance of not less than 18 inches for the purpose of rodding.

b. Small pipes—Cleanouts for pipes smaller than 3 inches shall have a 12-inch clearance for rodding.

c. Concealment—Where it is necessary to conceal a cleanout plug, a cover plate or access door shall be provided which will permit ready access to the plug.

1806 GREASE INTERCEPTORS

1806.1 Where Required

A grease interceptor shall be installed in the waste line leading from sinks, drains, or other fixtures where a hazard exists, or where grease can be introduced into a drainage system in quantities that can effect line stoppage or hinder sewage disposal as in garages, kitchens, restaurants, etc.

1806.2 Residential Units

Grease interceptors are not required for individual dwelling units or any private living quarters.

1807 OIL SEPARATORS

An oil separator shall be installed in the drainage system or section of the system where oils or other flammables can be introduced or admitted into the drainage system, such as in gas and oil houses.

1808 SAND INTERCEPTORS

Sand interceptors and similar interceptors for heavy solids shall be so designed and located at to be readily accessible for cleaning, and shall have a water seal of not less than 6 inches. Each interceptor shall be properly vented.

1809 PLUMBING FIXTURES

1809.1 Quality of Fixtures

Plumbing fixtures shall have smooth impervious surfaces, free from defects and concealed fouling surfaces and except as permitted elsewhere in this Code shall conform in quality and design to the standard as described in the latest

Report of the Coordinating Committee for a National Plumbing Code.

1809.2 Cleaning

Plumbing fixtures shall be installed in a manner to afford easy access for cleaning. Where practical, all pipes from fixtures shall be run to the nearest wall.

1809.3 Prohibited Fixtures and Connections

a. Fixtures—Pan, valve, plunger, offset, washout, latrine, frostproof, and other water closets having an invisible seal or an unventilated space or having walls which are not thoroughly washed at each discharge, are prohibited. Any water closet which might permit siphonage of the contents of the bowl back into the tank are prohibited.

b. Connections—Fixtures having concealed slip-joint connections shall be provided with an access panel to make the slip connections accessible for inspection and repair.

1809.4 Urinals

a. Trough urinals—Trough urinals shall be permitted only in places of temporary occupancy. They shall be not less than 6 inches deep and shall be furnished with one-piece backs, strainers, and outlets of at least 1½ inches in diameter. The washdown pipe, clamped to the back of the urinal, shall be perforated so as to flush with an even curtain of water against the back of the urinal. The tanks shall have a flushing capacity of not less than 1½ gallons of water for each 2 feet of urinal length.

b. Equivalent length—Trough urinals shall be figured on the basis of one urinal for each 18 inches of length, provided that—

24-inch trough equals 1 urinal.
36-inch trough equals 2 urinals.
48-inch trough equals 2 urinals.
60-inch trough equals 3 urinals.
72-inch trough equals 4 urinals.

1809.5 Strainers and Fixture Outlets

All plumbing fixtures, other than water closets and syphon-action washdown or blowout urinals, shall be provided with metal strainers having waterway area of capacity consistent with good practice.

1809.6 Food-Waste-Grinder Units

a. Separate connections—Domestic food-waste-disposal units shall be connected and trapped separately from any other fixture or compartment. Units may have either automatic or hand-operated water supply control. (See paragraph 1811.2)

b. Restrictions—No food-waste grinder shall be connected through a grease interceptor.

c. Commercial-type grinders—Commercial-type food-grinders shall be provided with not less than a 2-inch waste line. Each waste line shall be trapped and vented as provided in another section of this Handbook.

1809.7 Drinking Fountains

a. Design and construction—Drinking fountains shall conform to American Standard Specifications for Drinking Fountains.

b. Material—The fountain should be constructed of impervious material such as vitreous china porcelain, enameled cast iron, other metals or stoneware.

c. Installation—The jet of the fountain should issue from a nozzle of nonoxidizing, impervious material set at an angle from the vertical such as to prevent the return of water in the jet to the orifice or orifices from whence the jet issues. The nozzle and every other opening in the water pipe or conductor leading to the nozzle should be above the edge of the bowl, so that such nozzle or opening cannot be flooded in case a drain from the bowl of the fountain becomes clogged.

d. Protection—The end of the nozzle should be protected by nonoxidizing guards to prevent the mouth and nose of the user from coming into contact with the nozzle. Guards should be so designed that the possibility of transmission of infection by touching the guards is reduced to a minimum.

e. Cleansing—The bowl of the fountain should be so designed and proportioned as to be free from corners which would be difficult to clean or which would collect dirt.

f. Traps—The drain from the fountain should not have a direct physical connection with a waste pipe, unless the drain is trapped.

g. Flow regulator—The water-supply pipe should be provided with an adjustable valve fitted with a loose key or an automatic valve permitting the regulation of the rate of flow of water to the fountain so that the valve manipulated by the users of the fountain will merely turn the water on or off.

1809.8 Drinking Fountains Prohibited

Drinking fountains shall not be installed in toilet rooms.

1809.9 Floor Drains

Floor drains shall have metal traps with a minimum water seal of 3 inches and shall be provided with removable strainers. The open area of strainer shall be at least two-thirds of the cross-section area of the drain line to which it connects.

1809.10 Dishwashing Machines

a. Protection—Domestic dishwashing machines shall meet the requirements for protection of potable water supply as required by the latest edition of the National Plumbing Code.

b. Separate trap—Each unit shall be separately trapped or discharged indirectly into a properly trapped and vented fixture.

c. Air gap—Commercial dishwashing machines shall be connected through an air gap or as required in Chapter 9, Indirect Waste Piping and Special Wastes, of the National Plumbing Code.

1809.11 Minimum Facilities

Wherever plumbing fixtures are installed the minimum number of each type of fixture installed shall be in accordance with Tables 1809.12, 1809.13, 1809.14, unless otherwise specifically provided.

1809.12 Table

MINIMUM FACILITIES

Type of Building or Occupancy	Water Closets		Urinals		Lavatories		Bathtubs or Showers [1]	Drinking Fountains
	Number of Persons	Number of Fixtures [1]	Number of Persons	Number of Fixtures [2]	Number of Persons	Number of Fixtures [1]		
Theaters and auditoriums.	1–100 101–200 201–400	1 2 3	1–200 201–400	1 2	1–200 201–400	1 2		
Offices and public buildings.	1– 15 16– 35 36– 55 56– 80	1 2 3 4	One urinal may be substituted for one water closet, but retain 2/3 of water closets required.		1– 15 16– 35 36– 60 61– 90	1 2 3 4		One for each 75 persons.
Work shops in maintenance areas.	1– 9 10– 24 25– 49	1 2 3	Same substitutes as above.		1– 15 16– 35 36– 60	1 2 3	One for 15 persons or less.	
Dwellings and apartment houses	One for each apartment or dwelling unit.				One for each apartment or dwelling unit.		One for each apartment or dwelling.	
	Laundry Tubs—One single compartment tub for each apartment or dwelling unit, or a multiple compartment tub for each 10 apartments. Kitchen Sinks—One for each apartment or dwelling unit.							

[1] Equal separate facilities for male and female, with approved exceptions.
[2] Male only.

1809.13 Table

MINIMUM FACILITIES

Type of Building or Occupancy	Water Closets			Urinals		Lavatories			Bathtubs or Showers		Drinking Fountains
	Number of Persons	Number of Fixtures		Number of Persons	Number of Fixtures [1]	Number of Persons	Number of Fixtures		Number of Persons	Number of Fixtures [2]	
		Male	Female				Male	Female			
Restaurants and other public dining rooms.	1– 50	1	1			1– 50	1	1			
	51–100	1	2	51–100	1	51–100	1	2			
	101–200	2	3	101–200	2	101–200	2	3			
	Add 1 fixture for each 50 add'l. males and 1 for each 50 add'l. females.			Add 1 fixture for each 100 add'l. males.		Add 1 fixture for each 50 add'l. males and 1 for each 50 add'l. females.					
Dormitories.	1– 6	1	1			1– 6	1	1	1– 6	1	
	7– 15	2	2	7– 30	1	7– 15	2	2	7–15	2	
	16– 30	2	3	31– 60	2	16– 30	3	3	16–25	3	
	31– 50	3	4	61–100	3	31– 50	4	4	26–35	4	
	51– 75	4	6			51– 75	5	5	36–45	5	
	76–100	6	8			76–100	6	7	46–55	6	
									Over 55 add 1 tub or shower for each 10 persons. Include at least 1 tub for females, with 1 tub for each 30 add'l. females.		

[1] Male only.
[2] Separate facilities for male and female.

1809.14 Table

MINIMUM FACILITIES

Type of Building or Occupancy	Water Closets			Urinals		Lavatories		
	Number of Sites	Number of Fixtures		Number of Sites	Number of Fixtures[2]	Number of Sites	Number of Fixtures	
		Male	Female				Male	Female
Comfort Stations[1] for camp grounds and trailer camps.	1-20	1	2	1-20	1	1-20	1	1
	21-30	2	3	21-30	2	21-30	2	2
	Water Closets			**Urinals**		**Lavatories**		
	Number of Car Parking Spaces	Number of Fixtures		Number of Car Parking Spaces	Number of Fixtures[2]	Number of Car Parking Spaces	Number of Fixtures	
		Male	Female				Male	Female
Comfort Stations for picnic areas.	1- 40	1	2	1- 40	1	1- 40	1	1
	41- 80	2	4	41- 80	2	41- 80	2	2
	81-120	3	6	81-120	3	81-120	3	3

A Comfort Station should provide facilities for sites within a 300 foot radius.

A Comfort Station with good balance should contain 2 water closets, 2 lavatories and one urinal for males, and 3 water closets and two lavatories for females. A sanistand substituted for one water closet is desirable for females.

[1] Minimum Requirements (Figured on a basis of 100% dependent trailers):

If a laundry does not exist in the Trailer Court Area, provisions should be made in one of the Comfort Stations for at least one double compartment laundry tray, one washing machine and one table, for every 30 trailer sites.

A flushing rim sink should be provided in each Comfort Station located within a Trailer Camp.

[2] Male only.

1810 HANGERS AND SUPPORTS

1810.1 General

Piping in a plumbing system shall be installed without undue strains and stresses and provision shall be made for expansion, contraction, and structural settlement.

1810.2 Horizontal Piping

a. Cast-iron pipe—Cast-iron soil pipe shall be supported at not more than 5-foot intervals.

b. Threaded pipe—Screwed pipe (SPS) shall be supported at approximately 12-foot intervals.

c. Copper pipe—Copper tubing shall be supported at approximately 6-foot intervals for piping 1½ inches and smaller and 10-foot intervals for piping 2 inches and larger.

d. Pipes in ground—Piping in the ground shall be laid on a firm bed for its entire length, except where support is otherwise provided and is adequate in the judgment of the administrative authority.

1810.3 Strains and Stresses

Piping in concrete or masonry walls shall be installed in chases or recesses which will permit access to the piping for repair or replacement and which will not permit stresses in walls to be transmitted to pipe.

1810.4 Base of Stacks

Bases of cast-iron soil stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction, or by other approved methods.

1811 WATER SUPPLY AND DISTRIBUTION

1811.1 Water Supply Mandatory

Every building in which plumbing fixtures are installed and are for human occupancy or habitation shall be provided with an ample supply of pure and wholesome water.

1811.2 Protection of Potable Water Supply

a. Cross-connections—Potable water-supply piping, water discharge outlets, backflow prevention devices, or simi-

lar equipment shall not be so located as to make possible their submergence in any contaminated or polluted liquid or substance.

b. Backflow—The water-distributing system shall be protected against backflow. Every water outlet shall be protected from backflow, preferably by having the outlet end from which the water flows spaced a distance above the flood-level rim of the receptacle into which the water flows sufficient to provide a "minimum required air gap" as defined in the National Plumbing Code. Where it is not possible to provide a minimum air gap, the water outlet shall be equipped with an accessibly located backflow preventer installed on the discharge side of the manual control valve.

1811.3 Water Service Pipe

The underground water-service pipe and the building drain or building sewer shall be not less than 10 feet apart horizontally and shall be separated by undisturbed or compacted earth, except as permitted in the National Plumbing Code, 1951, paragraph 10.6 to 10.6.4 inclusive.

1811.4 Water-Distribution Pipe, Tubing and Fittings

Materials for water-distributing pipes and tubing shall be brass, copper, lead, cast iron, wrought iron, open-hearth iron, or steel, with appropriate approved fittings. All threaded ferrous pipe and fittings shall be galvanized (zinc-coated) or cement lined. When used underground in corrosive soil, all ferrous pipe and fittings shall be coated and wrapped after installation.

1811.5 Water-Supply Control

a. Main control—A main shut-off valve on the water-service pipe shall be provided outside of the building and, also, an accessible shut-off valve with a drip valve shall be provided inside near the entrance of the water-service pipe into the building.

b. Water heating equipment—A shut-off valve shall be provided in the cold-water branch line to each water-storage tank or each water heater.

1811.6 Size of Fixture Supply

The minimum size of a fixture supply pipe shall be as follows:

Type of Fixture or Device:	*Pipe Size (inch)*
Bath tubs	½
Combination sink and tray	½
Drinking fountain	⅜
Dishwasher (domestic)	½
Kitchen sink, residential	½
Kitchen sink, commercial	¾
Lavatory	⅜
Laundry tray, 1, 2, or 3 compartments	½
Shower (single head)	½
Sinks (service, slop)	½
Sinks (flushing rim)	¾
Urinal (flush tank)	½
Urinal (direct flush valve)	¾
Water closet (tank type)	⅜
Water closet (flush valve type)	1
Hose bibbs	½
Wall hydrant	½

For fixtures not listed, the minimum supply branch may be made the same as for a comparable fixture.

1812 SAFETY DEVICES

1812.1 Pressure-Relief Valves

Pressure-relief valves shall be installed for all equipment used for heating or storage of hot water. The rate of discharge of such a valve shall limit the pressure rise for any given heat input to 10 per cent of the pressure at which the valve is set to open.

1812.2 Temperature-Relief Valves

Temperature-relief valves shall be installed for all equipment used for the heating or storage of hot water. Each valve shall be rated as to its B. T. U. capacity. At 210° F., it shall be capable of discharging sufficient hot water to prevent further rise in temperature.

1812.3 Relief-Valve Location

Temperature-relief valves shall be placed directly above tanks served and in no case more than 3 inches away from such tanks. Pressure-relief valves may be located adjacent to the equipment they serve. There shall be no check-valve or shut-off valve between a relief valve and the heater or tank for which it is installed.

1813 DRAINAGE SYSTEM

1813.1 Materials

a. Above-ground piping within buildings—Soil and waste piping for a drainage system within a building shall be of cast-iron, galvanized wrought iron, galvanized open-hearth iron, galvanized steel, lead, brass, or copper pipe, or copper tubing.

b. Underground piping within buildings—Drains within buildings, when underground, shall be of extra-heavy cast-iron soil pipe.

1813.2 Drainage Piping Installation

Horizontal Drainage Piping—See paragraph 1810.2

1813.3 Fixture Units

Fixture-unit values as given in the following Table 1813.4 designate the relative load weight of different kinds of fixtures which shall be employed in estimating the total load carried by a soil or waste pipe and shall be used in connection with the tables of sizes for soil, waste, and drain pipes for which the permissible load is given in terms of fixture units.

1813.4 Table

FIXTURE UNITS PER FIXTURE OR GROUP

Fixture type	Fixture-unit value as load factors	Minimum size of trap (inches)
1 Bathroom group consisting of water closet, lavatory and bathtub or shower stall.	Tank water closet 6 Flush-valve water closet 8	
Bathtub [1] (with or without overhead shower)	2	1½
Bathtub [1]	3	2
Combination sink-and-tray	3	1½
Combination sink-and-tray with food-disposal unit.	4	Separate traps 1½
Dishwasher, domestic [2]	2	1½
Drinking fountain	½	1
Floor drains [3]	1	2
Kitchen sink, domestic	2	1½
Kitchen sink, domestic, with food-disposal unit.	3	1½
Laundry tray (1 or 2 compartments)	2	1½
Lavatory [4]	1	Small stopper 1¼
Lavatory	2	Large stopper 1½
Shower stall, domestic	2	2
Showers (group) per head [2]	3	
Sinks:		
Flushing rim (with valve)	8	3
Service (Trap standard)	3	3
Service (P trap)	2	2
Urinal, pedestal, syphon jet, blowout	8	Nominal 3
Urinal, wall lip	4	1½
Urinal stall, washout	4	2
Urinal trough (each 2-foot section) [2]	2	1½
Wash sink (circular or multiple), [2] each set of faucets.	2	Nominal 1½
Water closet:		
Tank-operated	4	Nominal 3
Valve-operated	8	3

(1) A shower head over a bathtub does not increase the fixture value.
(2) See paragraphs 1813.5 and 1813.6 for method of computing unit value of fixture not listed in Table 1813.4 or for rating of devices with intermittent flows.
(3) Size of floor drain shall be determined by the area of surface water to be drained.
(4) Lavatories with 1¼ or 1½ inch traps have the same load value; larger stoppers have greater flow rate.

1813.5 Table

Fixtures not listed in Table 1813.4 shall be estimated in accordance with Table 1813.5.

Fixture drain or trap size	Fixture unit value	Fixture drain or trap size	Fixture unit value
1¼ inches and smaller	1	2½ inches	4
1½ inches	2	3 inches	5
2 inches	3	4 inches	6

1813.6 Values for Continuous Flow

For a continuous or semicontinuous flow into a drainage system, such as from a pump, pump ejector, air conditioning equipment, or similar device, two-fixture units shall be allowed for each gallon-per-minute of flow.

1813.7 Maximum Fixture-Unit Load

The maximum number of fixture units that may be connected to a given size of building sewer, building drain, horizontal branch, or vertical soil or waste stack is given in the following Tables 1813.8 and 1813.9.

1813.8 Table

BUILDING DRAINS AND SEWERS

Diameter of pipe (inches)	Maximum number of fixture units that may be connected to any portion[1] of the building drain or the building sewer			
	Fall per foot			
	1/16-inch	1/8-inch	1/4-inch	1/2-inch
2	----------	----------	21	26
2½	----------	----------	24	31
3	----------	[2] 20	[2] 27	[2] 36
4	----------	180	216	250
5	----------	390	480	575
6	----------	700	840	1, 000
8	1, 400	1, 600	1, 920	2, 300
10	2, 500	2, 900	3, 500	4, 200
12	3, 900	4, 600	5, 000	6, 700

[1] Includes branches of the building drain.
[2] Not over 2 water closets.

1813.9 Table

HORIZONTAL FIXTURE BRANCHES AND STACKS

Diameter of pipe (inches)	Maximum number of fixture units that may be connected to—			
	Any horizontal [1] fixture branch	1 Stack of 3 stories in height or 3 intervals	More than 3 stories in height	
			Total for stack	Total at 1 story or branch interval
1¼	1	2	2	1
1½	3	4	8	2
2	6	10	24	6
2½	12	20	42	9
3	[2] 20	[3] 30	[3] 60	[2] 16
4	160	240	500	90
5	360	540	1, 100	200
6	620	960	1, 900	350
8	1, 400	2, 200	3, 600	600
10	2, 500	3, 800	5, 600	1, 000
12	3, 900	6, 000	8, 400	1, 500

[1] Does not include branches of the building drain.
[2] Not over 2 water closets.
[3] Not over 6 water closets.

1813.10 Minimum Size of Soil and Waste Stacks

No soil or waste stack shall be smaller than the largest horizontal branch connected thereto except that a 4 x 3 W. C. connection shall not be considered as a reduction in pipe size.

1813.11 Minimum Size of Stack-Vent or Vent Stack

Any structure on which a building drain is installed shall have at least one stack-vent or vent stack carried full

size through the roof not less than 3 inches in diameter or the size of the building drain, whichever is the lesser.

1813.12 Future Fixtures

When provision is made for the future installation of fixtures those provided for shall be considered in determining the required sizes of drain pipes. Construction to provide for such future installation shall be terminated with a plugged fitting or fittings at the stack so as to form no dead end.

1813.13 Offsets on Drainage Piping

a. Offsets of 45° or less—An offset in a vertical stack, with a change of direction of 45° or less from the vertical, may be sized as a straight vertical stack. In case a horizontal branch connects to the stack within 2 feet above or below the offset, a relief vent shall be installed.

b. Waste stacks serving kitchen sinks—In a one-or-two-family dwelling only in which the waste stack or vent receives the discharge of a kitchen-type sink and also serves as a vent for fixtures connected to the horizontal portion of the branch served by the waste stack, the minimum size of the waste stack up to the highest sink branch connection shall be 2 inches in diameter. Above that point the size of the stack shall be governed by the total number of fixture units vented by the stack.

c. Above highest branch—An offset above the highest horizontal branch is an offset in the stack-vent and shall be considered only as it affects the developed length of the vent.

d. Below lowest branch—In the case of an offset in a soil or waste stack below the lowest horizontal branch, no change in diameter of the stack because of the offset shall be required if it is made at an angle not greater than 45°. If such an offset is made at an angle greater than 45°, the re-

quired diameter of the offset and the stack below it shall be determined as for a building drain. (See Table 1813.8)

e. Offsets of more than 45°—See paragraph 11.6, Offsets on drainage piping, the National Plumbing Code.

1813.14 Sumps and Ejectors

a. Building drains below sewer—Building drains which cannot be discharged to the sewer by gravity flow shall be discharged into a tightly covered and vented sump from which the liquid shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment or by an equally efficient, approved method.

b. Venting—The system of drainage piping below the sewer level shall be installed and vented, in a manner similar to that of the gravity system.

1813.15 Floor Drains

a. Accessibility—Floor drains shall connect into a trap so constructed that it can be readily cleaned and of a size to serve efficiently the purpose for which it is intended. The drain inlet shall be so located that it is, at all times, in full view.

b. Connection limitation—Floor drains subject to backflow shall not be directly connected to the drainage system.

c. Size—Floor-drain traps and drains, installed below a basement floor or underground, shall be not less than 2 inches in diameter.

1814 BUILDING SEWER

The sewer line leading from a building, when installed in a separate trench from the water-service pipe, shall be cast-iron sewer pipe, vitrified-clay sewer pipe, concrete sewer pipe, bituminized-fiber sewer pipe, or asbestos-cement sewer pipe. Joints shall be watertight and rootproof.

1815 VENTS AND VENTING

1815.1 Materials

Vent piping shall be of cast-iron, galvanized wrought iron, galvanized steel, and ferrous alloys, lead, brass, or copper pipe, or copper tubing.

1815.2 Protection of Trap Seals

The protection of trap seals from siphonage or back pressure shall be accomplished by the appropriate use of soil or waste stacks, vents, revents, back vents, loop vents, circuit or continuous vents, or combinations thereof, installed in accordance with the requirements of this Chapter.

1815.3 Vent Stacks

a. Installation—A vent stack or a main vent shall be installed with a soil or waste whenever back vents, relief vents, or other branch vents are required in two or more branch intervals.

b. Terminal—The vent stack shall terminate independently above the roof of the building or shall be connected with the extension of the soil or waste stack (stack-vent) at least 6 inches above the flood-level rim of the highest fixture.

c. Main stack—Every building in which plumbing is installed shall have at least one main stack, which shall run undiminished in size and as directly as possible, from the building drain through to the open air above the roof.

1815.4 Vent Terminals

a. Roof extensions—Extensions of vent pipes through a roof shall be terminated at least 6 inches above the roof.

b. Location of vent terminal—No vent terminal from a drainage system shall be directly beneath any door, window, or other ventilating opening of the building or of an adjacent building nor shall any such vent terminal be within 10

feet horizontally of such an opening unless it is at least 2 feet above the top of such opening.

c. Extensions outside of building—No soil, waste, or vent pipe extension shall be run or placed on the outside of a wall of any building, but shall be carried up inside the building.

1815.5 Frost Closure

Vent terminal—Where there is a possibility of frost closure, the vent extension through a roof shall be at least 3 inches in diameter. When it is found necessary to increase the size of the vent terminal, the change in diameter shall be made inside the building.

1815.6 Vent Grades and Connections

a. Grade—All vent and branch-vent pipes shall be so graded and connected as to drip back to the soil or waste pipe by gravity.

b. Vertical rise—Where vent pipes connect to a horizontal soil or waste pipe, the vent shall be taken off above the center line of the soil pipe, and the vent pipe shall rise vertically, or at an angle not more than 45° from the vertical, to a point at least 6 inches above the flood-level rim of the fixture it is venting before offsetting horizontally or before connecting to the branch vent.

c. Height above fixture—A connection between a vent pipe and a vent stack or stack-vent shall be made at least 6 inches above the flood-level rim of the highest fixtures served by the vent. Horizontal vent pipes forming branch vents, relief vents, or loop vents shall be at least 6 inches above the flood-level rim of the highest fixture served.

1815.7 Fixtures Back-to-Back

Two fixtures set back-to-back, within the distance allowed between a trap and its vent, may be served with one continuous soil- or waste-vent pipe, provided that such fix-

ture wastes separately into an approved double fitting having inlet openings at the same level. (See paragraph 1815.11)

1815.8 Fixture Vents

Each fixture trap shall have a protecting vent so located that the slope and the developed length in the fixture drain from the trap weir to the vent fitting are within the requirements for distance of trap from vent, set forth in the following Table 1815.9.

1815.9 Table

DISTANCE OF FIXTURE TRAP FROM VENT

Size of fixture drain (inches)	Distance trap to vent	
	Feet	Inches
1¼	2	6
1½	3	6
2	5	0
3	6	0
4	10	0

1815.10 Trap-Seal Protection

The plumbing system shall be provided with a system of vent piping which will permit the admission or emission of air so that under normal and intended use the seal of any fixture trap shall not be subjected to a pressure differential of more than 1 inch of water.

1815.11 Common Vent

a. Individual vent—An individual vent, installed vertically, may be used as a common vent for two fixture traps when both fixture drains connect with a vertical drain at the same level.

b. Common vent—A common vent may be used for two fixtures set on the same floor level but connecting at different

levels in the stack, provided the vertical drain is one pipe diameter larger than the upper fixture drain but in no case smaller than the lower fixture drain, whichever is the larger and that both drains conform to Table 1815.9.

1815.12 Wet Venting

a. Single bathroom groups—A single bathroom group of fixtures may be installed with the drain from a back-vented lavatory, kitchen sink, or combination fixture serving as wet vent for a bathtub or shower stall and for the water closet, provided that:

(1) Not more than one fixture unit is drained into a 1½-inch-diameter wet vent or not more than four fixture units drain into a 2-inch-diameter wet vent.

(2) The horizontal branch connects to the stack at the same level as the water-closet drain or below the water-closet drain when installed on the top floor. It may also connect to the water-closet bend.

1815.13 Table

SIZE OF VENT STACKS

Number of wet-vented fixtures	Diameter of vent stacks (inches)
1 or 2 bathtubs or showers	2
3 to 5 bathtubs or showers	2½
6 to 9 bathtubs or showers	3
10 to 16 bathtubs or showers	4

1815.14 Stack Venting

A group of fixtures consisting of one bathroom group and a kitchen sink or combination fixture may be installed without individual fixture vents, in a one story building,

provided each fixture drain connects independently to the stack and water closet and bathtub or shower-stall drain enters the stack at the same level and in accordance with the requirements of distance of the trap to the vent as shown in Table 1815.9.

1815.15 Circuit and Loop Venting

a. Battery venting—A branch soil or waste pipe to which two but not more than eight water closets (except blow-out type), pedestal urinals, trap standard to floor, shower stalls, or floor drains are connected in battery, shall be vented by a circuit or loop vent which shall take off in front of the last fixture connection. In addition, lower-floor branches serving more than three water closets shall be provided with a relief vent taken off in front of the first fixture connection. When lavatories or similar fixtures discharge above such branches, each vertical branch shall be provided with a continuous vent.

b. Dual branches—When parallel horizontal branches serve a total of eight water closets (four on each branch), each branch shall be provided with a relief vent at a point between the two most distant water closets. When other fixtures (than water closets) discharge above the horizontal branch, each such fixture shall be vented.

c. Vent connections—When the circuit, loop, or relief vent connections are taken off the horizontal branch, the vent branch connection shall be taken off at a vertical angle or from the top of the horizontal branch.

d. Fixtures back-to-back in battery—When fixtures are connected to one horizontal branch through a double Y or a sanitary T in a vertical position, a common vent for each two fixtures back-to-back or double connection shall be provided. The common vent shall be installed in a vertical position as a continuation of the double connection.

1815.16 Size and Length of Vents

a. Length—Length of the vent stack or main vent shall be its developed length from the lowest connection of the vent system with the soil stack, waste stack, or building drain to the vent stack terminal, if it terminates separately in the open air, or to the connection of the vent stack with the stack-vent, plus the developed length of the stack-vent from the connection to the terminal in the open air, if the two vents are connected together with a single extension to the open air.

b. Size of individual vents—The diameter of an individual vent shall be not less than 1¼ inches nor less than one-half the diameter of the drain to which it is connected.

c. Size of relief vent—The diameter of a relief vent shall be not less than one-half the diameter of the soil or waste branch to which it is connected.

d. Size of circuit or loop vent—The diameter of a circuit or loop vent shall be not less than one-half the size of the diameter of the horizontal soil or waste branch or the diameter of the vent stack, whichever is the smaller.

e. Size of vent piping—The size of vent piping shall be determined from its length and the total of fixture units connected thereto, as provided in the following Table 1815.17. Twenty per cent of the total length may be installed in a horizontal position.

1815.17 Table

SIZE AND LENGTH OF VENTS

Size of soil or waste stack (inches)	Fixture units connected	Diameter of vent required (inches)							
		1¼	1½	2	2½	3	4	5	6
		Maximum length of vent (feet)							
1¼	2	30							
1½	8	50	150						
1½	10	30	100						
2	12	30	75	200					
2	20	26	50	150					
2½	42	----	30	100	300				
3	10	----	30	100	200	600			
3	30	----	----	60	200	500			
3	60	----	----	50	80	400			
4	100	----	----	35	100	260	1,000		
4	200	----	----	30	90	250	900		
4	500	----	----	20	70	180	700		
5	200	----	----	----	35	80	350	1,000	
5	500	----	----	----	30	70	300	900	
5	1,100	----	----	----	20	50	200	700	
6	350	----	----	----	25	50	200	400	1,300
6	620	----	----	----	15	30	125	300	1,100
6	960	----	----	----	----	24	100	250	1,000
6	1,900	----	----	----	----	20	70	200	700

1816 STORM DRAINS

1816.1 Prohibited Drainage

Storm water drains and subsoil drains shall not be drained into sanitary sewers.

1816.2 Subsoil Drain

Where subsoil drains are placed under the cellar or basement floor or are used to surround the outer walls of a building, they shall be made of open-jointed or horizontally split or perforated clay tile, or perforated bituminized fiber

pipe or asbestos cement pipe, not less than 4 inches in diameter. When the building is subject to backwater, the subsoil drain shall be protected by an accessibly located backwater valve. Subsoil drains may discharge into a properly trapped area drain or sump. Such sumps do not require vents.

1816.3 Materials

a. Inside conductors—Conductors placed within a building or run in a vent or pipe shaft shall be of cast iron, galvanized steel, galvanized wrought iron, galvanized ferrous alloys, brass, copper, or lead.

b. Outside leaders—When outside leaders are of sheet metal and connected with a building storm drain or storm sewer, they shall be connected to a cast-iron drain extending above the finish grade, or the sheet-metal leader shall be protected against damage.

c. Underground storm drains—Building storm drains underground, inside the building, shall be of cast-iron soil pipe.

1816.4 Conductors and Connections

a. Combining storm with sanitary drainage—The sanitary and storm-drainage system of a building shall be entirely separate, except that where a combined sewer is available the building storm drain may be connected in the same horizontal plane through a single Y fitting to the combined drain or sewer at least 10 feet downstream from any branch to the building drain or from any soil stack.

b. Traps—Floor drains connected to a storm drain shall be trapped.

1817 ROOF DRAINS

1817.1 Material

Roof drains shall be of cast iron, copper, lead, or other acceptable corrosion-resisting material.

1817.2 Size of Leaders and Storm Drains

Vertical leaders shall be sized on the maximum projected roof area, according to the following table:

1817.3 Table

SIZE OF VERTICAL LEADERS

Diameter of leader or conductor [1] (inches)	Maximum projected roof area (sq. ft.)	Diameter of leader or conductor [1] (inches)	Maximum projected roof area (sq. ft.)
2	720	5	8, 650
2½	1, 300	6	13, 500
3	2, 200	8	29, 000
4	4, 600		

[1] The equivalent diameter of a square or rectangular leader may be taken as the diameter of that circle which may be inscribed within the cross-sectional area of the leader.

NOTE.—See footnote to Table 1817.5.

1817.4 Building Storm Drain

The size of the building storm drain or any of its horizontal branches having a slope of one-half inch or less per foot, shall be based upon the maximum projected roof area to be handled according to the following table:

1817.5 Table

SIZE OF HORIZONTAL STORM DRAINS

Diameter of drain (inches)	Maximum projected roof area for drain for various slopes		
	⅛ inch	¼ inch	½ inch
	Sq. Ft.	*Sq. Ft.*	*Sq. Ft.*
3	822	1, 160	1, 644
4	1, 880	2, 650	3, 760
5	3, 340	4, 720	6, 680
6	5, 350	7, 550	10, 700
8	11, 500	16, 300	23, 000

Tables 1817.3 and 1817.5 are based upon a maximum rate of rainfall of 4 inches per hour. If in any area the maximum rate of rainfall is more or less than 4 inches per hour, then the figure for the roof area must be adjusted proportionately by multiplying the figure by 4 and dividing by the maximum rate of rainfall in inches per hour.

1817.6 Roof Gutters

The size of semicircular gutters shall be based on the maximum projected roof area, according to the following table:

1817.7 Table

SIZE OF GUTTERS

Diameter of gutter [1] (inches)	Maximum projected roof area for gutters of various slopes			
	1/16 inch	⅛ inch	¼ inch	½ inch
	Sq. Ft.	*Sq. Ft.*	*Sq. Ft.*	*Sq. Ft.*
3	170	240	340	480
4	360	510	720	1, 020
5	625	880	1, 250	1, 770
6	960	1, 360	1, 920	2, 770
7	1, 380	1, 950	2, 760	3, 900
8	1, 990	2, 800	3, 980	5, 600
10	3, 600	5, 100	7, 200	10, 000

[1] Gutters other than semicircular may be used provided they have an equivalent cross-sectional area.

1818 VALUES FOR CONTINUOUS FLOW

Where there is a continuous or semicontinuous discharge into the building storm drain or building storm sewer, as from a pump, ejector, air-conditioning plant, or similar device, each gallon per minute of such discharge shall be computed as being equivalent to 24 square feet of roof area, based upon a 4-inch rainfall.

CHAPTER 19

LIQUEFIED PETROLEUM GAS INSTALLATIONS IN BUILDINGS

1900 GENERAL

The provisions of this Chapter shall control the design, fabrication, construction, location and use of liquefied petroleum gas installations in buildings and small ICC container installations located at buildings.

Except as limited or otherwise provided in this Chapter, all liquefied petroleum gas installations shall conform to the provisions of the NFPA Publication No. 52, Liquefied Petroleum Gas Piping and Appliance Installations in Buildings; the NFPA Publication No. 58, Standards for the Storage and Handling of Liquefied Petroleum Gases and subsequent revisions thereof.

1901 TYPES OF GAS

1901.1 Description

The terms "liquefied petroleum gas," "LPG" and "LP-Gas" referred to in this Chapter shall mean and include any material which is composed predominantly of any of the following hydrocarbons or mixtures of them: propane, propylene, butanes (normal butane or iso-butane) and butylenes.

1901.2 Other Types of Gas

The use of any other types of gas within buildings shall be subject to approval prior to such use or installation.

1902 ODORIZATION OF GASES

All liquefied petroleum gases used for equipment and appliances within buildings shall be effectively odorized by an approved agent of such character as to indicate positively,

by distinct odor, the presence of gas down to concentration in air of not over one-fifth the lower limit of flammability.

1903 PERMISSIBLE USAGE

Liquefied petroleum gas may be used as a fuel for cooking, water heating, refrigeration, space heating and laundry purposes.

Liquefied petroleum gas shall not be used for any other purposes whatsoever unless approval of such uses have been obtained from the Regional Director.

1904 STANDARD SYSTEMS

The installation of all systems in buildings shall be made in accordance with nationally recognized good standards.

Only such systems shall be used as have been examined, tested and found to be a safeguard as far as practicable.

1905 APPROVAL OF APPLIANCES, EQUIPMENT AND SYSTEMS

1905.1 Appliances and Equipment

Gas appliances and equipment shall not be installed unless their correctness as to design, construction and performance is certified by a nationally recognized testing laboratory. Evidence of certification may be by attachment of the seal or label of the laboratory or by description and identification of the item in the current registry of approved items of the laboratory.

1905.2 Systems

In all systems each regulator, container, container valve, excess flow valve, piping, and fittings shall have its correctness as to design, construction and performance determined by a nationally recognized testing laboratory.

1906 DRAWINGS AND SPECIFICATIONS

All new installations and revisions of existing installations shall be performed in accordance with approved de-

tailed working drawings and specifications showing clearly that all phases of the proposed work comply with the provisions of this Chapter.

1907 COMPETENCE OF WORKMEN

Installation and maintenance of all gas appliances, equipment, devices, and piping shall be performed by competent persons trained especially for such installation, and the specialized work involved and all work shall be performed with the gas turned off to eliminate hazards from escape of gas.

1908 INSTRUCTIONS AND PLANS

Complete printed installation, operation and maintenance instructions shall be supplied as a means of information for those persons performing these functions.

The instructions and diagrammatic sketches of the equipment and system shall be permanently attached in such a position as to be visible and legible for ready reference. Duplicate copies shall be kept on file in appropriate offices as designated by the Superintendent.

1909 APPLIANCES

1909.1 General

a. All domestic and commercial gas-consuming appliances shall be certified as to correctness of design, construction and performance by a nationally recognized testing agency. Any appliance having the testing agency's approval seal or label shall be considered as a "listed" appliance constituting compliance with the provisions of this Chapter. Any appliance that does not have the approval seal or label of a nationally recognized testing agency shall not be used.

b. Appliances to be used in high altitudes shall be certified for high altitude use.

1909.2 Location

a. Every appliance shall be located so that it will be readily accessible for operation and servicing and will not constitute a hazard to person or property.

b. Appliances shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas and proper ventilation under normal conditions.

c. Where appliances are installed in a confined space or in buildings of unusually tight construction, air for combustion and ventilation must be obtained from outdoors or from spaces freely communicating with the outdoors, ventilated crawl space or attic. Under these conditions the confined space shall be ventilated by openings located at the top and bottom of the enclosure. The openings of equal areas shall have a combined clear area of not less than one square inch per 1000 BTU input rating. These openings shall communicate with the sources of air supply by continuous ducts of the same cross section area as the opening. The minimum dimension of rectangular air ducts shall be 3″. The duct from the top opening may be horizontal or pitched upward.

d. Appliances shall not be installed in any location where flammable vapors are likely to be present.

e. Appliances shall not be installed in basements, crawl spaces or any space with depressed floors unless such depressed floors are partly above grade which would permit, under normal conditions, gas to escape at floor level to the outside of the building.

1909.3 Supports

Every appliance shall be adequately supported and so connected to the piping as not to exert undue strain on the connections.

1909.4 Connections

Appliances shall be connected with gas lines as set forth in Section 1912.

1909.5 Restrictions

a. The use of portable appliances as applied to this Chapter are prohibited.

b. No device or attachment shall be installed on any appliance which may in any way impair the combustion of gas.

1909.6 Combinations

Any combination of appliances, attachments or devices used together in any manner shall comply with the standards which apply to the individual appliance.

1909.7 Special Attention for Operation

When the operation of exhaust fans, ventilation systems and fireplaces causes unsatisfactory appliance operations, special attention shall be given to the appliance to avoid such unsatisfactory operation.

1909.8 Electrical Controls

a. The electrical circuit employed for operating the automatic main gas-control valve, automatic pilot, room temperature thermostat, limit control or other electrical devices used with the gas appliance shall be in accordance with the wiring diagrams supplied with the appliance.

b. All gas appliances using electrical controls shall have the controls connected into a permanently live electric circuit, i. e., one that is not controlled by a light switch.

c. Heating equipment and appliances shall be provided with a separate electrical circuit.

d. No appliance control shall be used if of such a character that failure of the electric current could result in the escape of unburned gas or in failure to reduce the supply of gas as normally required.

e. Gas piping shall not be used for an electrical ground.

1909.9 Domestic Ranges

a. Listed domestic gas ranges when installed on combustible floors shall be set on their own bases or legs and

shall be installed with clearances as shown on the following table:

MINIMUM CLEARANCE FOR LISTED DOMESTIC GAS RANGES

Type of Range	Spacing of Top Burner Opening from Side of Range	Distance from Combustible Construction (inches)			
		Sides		Rear	
		Wall Not Extending Above Cooking Top	Wall Extending Above Cooking Top	Body of Range	Projecting Flue Box
Uninsulated		6	6	6	1
Insulated	5 in. or more	½	½	1	1
Flush to Wall	Less than 5 in.	Flush	3	Flush	
Flush to Wall	5 in. or more	Flush	Flush	Flush	

b. Domestic ranges shall have a vertical clearance above the cooking top of 36 inches to overhead combustible construction. When the underside of such combustible construction is protected with ¼ inch thick asbestos millboard covered with No. 28 gauge sheet metal the distance may be reduced to 24 inches. The protection shall extend 9 inches beyond the sides of the range.

c. When a flue or vent connector is attached to a range. suitable provisions shall be made to protect adjacent combustible construction. (See Section 1911)

d. Ranges shall be installed so that cooking top and oven are level.

1909.10 Water Heaters

a. Water heaters shall not be installed in bathrooms, bedrooms, or adjoin closets or similar spaces communicating directly with such rooms.

b. Water heaters shall be located as close as practicable to the flue or vent and shall be so located as to provide short runs of piping to fixtures.

c. Listed water heaters may be installed on combustible floors when set on their own base or legs. They shall be

installed with clearance from combustible construction as shown in the following table:

MINIMUM CLEARANCES FOR LISTED GAS-FIRED WATER HEATERS

Type of Heater [1]	Distance from Combustible Construction (inches)	
	Nearest Part of Jacket	Flat Side
Type A	6	----------
Type B	2	----------
Type C	----------	Flush

[1] Type A—Miscellaneous (including circulating tank, instantaneous uninsulated underfired).
Type B—Underfired, insulated automatic storage heaters.
Type C—Type B units with one or more flat sides and tested for installation flush to wall.

d. The installation and adjustment of temperature, pressure and vacuum relief valves or combinations thereof and automatic gas shut-off valves shall be in accordance with the manufacturer's instructions and as required by the administrative authority.

e. The water supply to any automatic instantaneous water heater shall be of sufficient pressure to properly operate the water valve.

1909.11 Room or Space Heaters

a. A room or space heater shall be located to avoid hazard to walls, floors, curtains, furniture, doors when opened, etc., and to allow free movement of persons within the room. Appliances designed and marked "For use in incombustible fire-resistive fireplace only" shall not be installed elsewhere.

b. Listed room or space heaters shall be installed with clearances as provided in the following table, except that appliances listed for installation at lesser clearances may be installed in accordance with their listings.

MINIMUM CLEARANCES FOR LISTED GAS-FIRED ROOM OR SPACE HEATERS

Type	Distance from Combustible Construction (inches)	
	Jacket, Sides and Rear	Projecting Flue Box or Draft Hood
Warm Air Circulators	6	2
Radiant Heaters	6	2
Gas, Steam and Hot Water Radiators	6	2

1909.12 Central Heating Boilers, Furnaces and Recessed Heaters

a. Central heating boilers, furnaces and vented recessed heaters using LP–Gas shall not be installed in buildings without prior approval of the Director. Such approved installations shall conform to the standards contained in the NFPA Publication No. 52, except as otherwise provided herein.

b. The installation of conversion gas burners in boilers and furnaces originally designed for solid or liquid fuel is prohibited.

c. All recessed gas heaters shall be vented.

1909.13 Refrigerators

Gas refrigerators shall be installed with at least 2 inches clearance at back and sides and 12 inches clearance above the top and shall be installed in accordance with the manufacturer's instructions.

1909.14 Clothes Dryers

a. Listed clothes dryers shall be installed with a minimum clearance of 6 inches from combustible construction except clothes dryers listed for installation at lesser clearance may be installed in accordance with their listings.

b. A minimum clearance of 16 inches shall be provided between the top of the flue and the lower surface of combustible material located above the dryer.

c. Gas-fired clothes dryers installed for multiple family use shall be equipped with approved automatic pilots.

d. When dryers are installed within the living area of a dwelling, moisture exhaust ducts shall be installed. Ducts shall be constructed of 26 gauge galvanized iron or equivalent noncombustible material. The clearance of ducts from combustible materials shall be not less than 1 inch.

1909.15 Hot Plates and Laundry Stoves

a. Listed domestic hot plates and laundry stoves when installed on combustible surfaces shall be set on their own legs or bases. They shall be installed with minimum horizontal clearance of 6 inches from combustible construction.

b. The vertical distance between tops of all domestic hot plates and laundry stoves and combustible construction shall be at least 36 inches.

1909.16 Restaurant Type Cooking Appliances

a. Definition

(1) Floor mounted restaurant type cooking appliances shall include ranges, ovens, unit broilers, deep fat fryers and other miscellaneous cooking appliances designed for use in restaurant and hotel kitchens.

(2) Counter type appliances shall include commercial hot plates and griddles, food and dish warmers, coffee brewers and urns, waffle bakers, hot water immersion sterilizers and other heat producing appliances designed for counter installations in hotel and restaurant kitchens.

b. Floor mounted appliances

(1) Listed floor mounted appliances when set on their own bases or legs may be installed on unprotected combustible floors unless designed and marked "For use only in fire-resistive locations". Appliances so marked shall not be installed elsewhere.

(2) Listed appliances shall be installed at least 6 inches from combustible construction on sides and rear.

(3) The cooking top and front of appliances shall have 48 inches clearance from combustible material.

(4) Any portion of combustible materials adjacent to the cooking top of a range even though certified for close-to-wall installation, shall be protected for a distance of 24 inches above the surface of the cooking top.

c. Counter type appliances—Listed counter type appliances when installed on combustible surfaces shall be set on their own base or legs and shall be installed with a minimum horizontal clearance of 6 inches from combustible material.

1909.17 Venting of Appliances

a. Appliances of the following type shall be flue or vent connected or provided with approved means for exhausting the flue gases to the outside.

(1) Approved central heating appliances.

(2) Room or space heaters.

(3) Water heaters.

(4) Any appliance that is provided with a draft hood or a flue collar.

b. The following appliances are not required to be vented:

(1) Listed gas ranges.

(2) Listed hot plates and laundry stoves.

(3) Listed domestic clothes dryers (except as provided in paragraph 1909.14).

(4) Gas refrigerators and counter appliances listed for unvented use and installed as approved.

1909.18 Draft Hoods

a. Every vented appliance, except dual oven type combination ranges, and units designed for power burners or for forced venting, shall have a draft hood. If the draft hood is not a part of the appliance or supplied by the appliance manufacturer, it shall be supplied by the installer and in the absence of other instructions shall be the same size as the appliance flue collar. (For suggested general dimensions for such draft hoods, see NFPA Publication 52).

b. Where the draft hood is a part of the appliance or is supplied by the appliance manufacturer it shall be installed without alteration in accordance with the manufacturer's instructions. In the absence of manufacturer's instructions the draft hood shall be attached to the flue collar of the appliance or as near to the appliance as conditions permit. In no case shall a draft hood be installed in a false ceiling, in a different room, or in any manner that will permit a difference in pressure between the draft hood relief opening and the combustion air supply.

c. A draft hood shall be installed in the position for which it was designed with reference to the horizontal and vertical planes and shall be so located that the relief opening is not obstructed by any part of the appliance or adjacent construction.

d. Where the installer must supply a draft hood of special design, the design and installation shall meet the approval of the Director.

1910 TYPES OF FLUES OR VENTS

1910.1 General

a. Flues and vents required for venting gas-burning appliances shall be classified as Type A, Type B, and Type BW.

b. Flues and vents shall be designed, constructed and installed as near vertical as possible in order to remove completely and safely all products of combustion and vent gases to the outside without condensation in the vent or spillage at the draft hood.

1910.2 Type A

Type A flues or vents shall be constructed of masonry, reinforced concrete or steel conforming to the requirements of Chapter 13 for chimneys, flues and vents.

1910.3 Type B and Type BW

a. Material—Type B and Type BW vents shall be constructed of noncombustible, corrosion-resistant material of sufficient thickness, cross sectional area and heat insulating quality to avoid excess temperature on adjacent combustible construction and shall be approved as a result of tests and listing by a nationally recognized testing agency for venting gas appliances and recessed heaters. Type B vents shall be used for venting gas appliances and Type BW vents shall be used for venting recessed gas heaters.

b. Installation—Type B and Type BW vents shall be installed in full compliance with the terms of their approval and the manufacturer's written instructions.

c. Height—Gas vents shall extend at least 24 inches above the highest point where they pass through the roof and at least 24 inches higher than any portion of a building within 10 feet.

1910.4 Unlined Chimneys

Where an existing chimney is not lined or where there is indication that flue gas condensate might be a problem, suitable liners shall be installed within such chimneys.

1910.5 Flue and Vent Restrictions

Type B and Type BW flues or vents shall not be installed on the outside of buildings.

1911 FLUE AND VENT CONNECTORS

1911.1 Installation

a. Flue and vent connectors shall be made of noncombustible, corrosion-resistant material capable of withstanding the flue gas temperature of the appliance and shall be of sufficient thickness to withstand physical damage. Connectors of metal shall be not less than 26 gauge.

b. Each connector shall be as short as possible, securely supported, and shall maintain a rise of at least ¼ inch to the foot (horizontal) from the appliance to the vent.

c. The flue or vent connector shall not be smaller than the size of the flue collar or the size of the outlet of the draft hood supplied by the manufacturer of the appliance.

d. No flue or vent connector shall pass through any floor or ceiling.

e. Where flue or vent connectors pass through partitions of combustible construction, approved ventilated thimbles shall be used.

f. Connectors shall have a clearance of 6 inches from combustible material except as otherwise approved.

g. Connectors attached to gas appliances shall not be discharged into flues serving devices burning solid or liquid fuels.

h. Dampers shall not be installed in flue and vent connectors.

1912 INSTALLATION OF PIPING, TUBING AND FITTINGS

1912.1 Material

a. The installation of piping, tubing and fittings for LP-Gas distribution lines shall conform to the provisions contained in the latest edition of the National Fire Protection Association's Pamphlet No. 52, with the following exceptions:

(1) Aluminum piping, tubing and fittings shall not be used in LP-Gas installations.

(2) No soldered joints and fittings shall be used in LP-Gas installations. Copper tubing with flare-tube type connections shall be used for the entire installation where the main distribution line is not larger than ¾″ in diameter.

(3) Steel piping may be used for distribution lines of ¾″ and smaller only on the recommendation of the appropriate Office, Division of Design and Construction, and with the approval of the Regional Director.

1912.2 Installation

a. Service lines shall enter the building as near to the appliances served as is practicable.

b. Piping and tubing shall be of such size and so installed as to provide a supply of gas sufficient to meet the maximum demand without undue loss of pressure between the source and the appliance or appliances. The size of gas lines depends upon the following factors:

(1) Allowable loss in pressure from source to appliance.

(2) Maximum gas consumption to be provided for.

(3) Length of piping, tubing, and number of fittings.

(4) Specific gravity of the gas.

c. Lines shall be well supported and protected against physical damage.

d. Provision shall be made for expansion, contraction, jarring, and for settling. This may be accomplished by loops or bends.

e. Change in direction in copper tubing installations shall be made with proper bends and the use of ells shall be avoided wherever possible.

f. Lines shall not be run inside walls or partitions, unless protected against physical damage. This rule does not

apply to lines which is run through walls or partitions.

g. Gas lines that passes through walls and partitions shall be run in pipe sleeves. Where a service line enters a building directly from a container cabinet the sleeve shall be packed with lamp wick and white lead and equipped with rail flanges.

h. Lines shall not be run in or through an air-duct, clothes chute, chimney or flue, ventilating duct, dumb waiter or elevator shaft, except proper ducts for the purpose.

i. Where gas lines must be run under concrete floor slabs laid on earth, such line shall be installed in approved conduit. Any necessary bend in the conduit shall be not less than 18 inches in radius.

j. Gas lines exposed on the outside of buildings shall be protected by substantial guards or housings.

k. Where condensation may occur, the lines shall be pitched back to the container, or suitable means shall be provided for vaporization of the condensate.

l. Defective piping, tubing or fittings shall not be repaired but such section or fittings shall be replaced.

m. No device shall be placed inside the gas line or fittings that will reduce the cross sectional area or otherwise obstruct the free flow of gas.

n. Lines should be free of loose scale, dirt, dust, or other foreign material at the time of appliance installation.

o. Piping, tubing, fittings, valves, etc., removed from any existing installation shall not be again used until they have been thoroughly cleaned, inspected, and ascertained to be suitable for the service.

p. Each outlet, including a valve or cock outlet, shall be securely closed gas-tight with a positive plug or cap if appliance is not to be connected at that time. When an appliance is removed from an outlet and the outlet is not to be reconnected at that time, it shall be securely closed gas-tight.

In no case shall the outlet be closed with tin caps, wooden plugs, corks, etc.

q. A shut off valve or cock shall be installed in the supply line immediately ahead of each appliance.

r. Gas lines shall not be used as a ground for any electrical system, nor shall tubing be located in the same conduit with electrical wiring.

s. All gas lines shall be tested after installation and proven free from leaks at normal operation pressure.

1913 LIQUEFIED PETROLEUM GAS SUPPLY SYSTEM

1913.1 Description

The LP-Gas supply system as applied to this Chapter consists of two or more 100-pound ICC shipping containers with connector valves, connectors (high pressure copper tubing pigtails), manifold valve assembly, pressure regulator safety devices, excess flow and other devices for delivering gas in the vapor state to building service tubing and appliances at a pressure of 11 inch to 18 inch water column. Safety relief and excess flow devices may be incorporated in the design of the container valve and a safety relief device shall be an integral part of the pressure regulator.

1913.2 Design

a. The container and all related valves and devices shall be designed, constructed, listed and stamped in accordance with the Interstate Commerce Commission specifications, effective at the date of the manufacture.

b. Each container and all permanently attached fittings (except the cap) shall be marked with the water capacity in pounds and with its tare weight in pounds.

1913.3 Location

Containers and regulating and other equipment shall be located outside of buildings, above grade, preferably on the

downhill side of the structure and as near the appliances as is practicable.

1913.4 Cabinets

a. Containers and equipment shall be completely enclosed in a cabinet of adequate size to accommodate all containers connected to the system, as shown on Drawing No. PG–6030A herein.

b. Cabinets shall be rigidly constructed of metal or other approved materials and shall be anchored to a concrete foundation that extends at least 6 inches above and below grade. Suitable reinforcing shall be provided for mounting the regulator and manifold.

c. Each cabinet shall be vented at top and bottom, and shall be provided with suitable double doors and latching devices.

d. Cabinet shall be located at least 5 feet from any building opening.

e. Cabinets constructed of wood may be used in lieu of metal cabinets for enclosing containers and equipment. Such wood cabinets shall be constructed of sound two-inch nominal thickness tongue and groove stock, assembled with bolts or screws. Wood cabinets shall meet all other requirements specified for metal cabinets except for the wood walls, roof and doors. The roof shall be covered with an appropriate roofing material. The entire cabinet shall be painted three coats of lead and oil or stain.

1913.5 Installation

Containers shall be installed vertically and in no case shall they be stacked one above the other while installed for use.

1913.6 Container Valves and Accessories

a. Material

(1) All valves, fittings and accessories connected directly to the container including primary shut-off valves,

shall have a rated working pressure of at least 250 psig and shall be of material and design suitable for LP-Gas service.

(2) Each container shall be equipped with a shut-off valve including an integral or separate relief valve.

(3) Valves in the assembly of multiple container systems shall be arranged so that replacement of containers can be made without shutting off the flow of gas in the system.

(4) Regulating equipment and devices consisting of a regulator with integral safety relief valve, control manifold (manual or automatic), pressure gage (optional), and shut-off valve shall be located within the container enclosure and securely attached to the wall of the enclosure. The container shall be connected to the regulating equipment by nonrigid high pressure copper tubing connectors formed into loops.

(5) The discharge from safety relief valves shall be not less than 5 feet from any building opening which is below the level of such relief valve.

1913.7 Shut-Off Valves

a. A shut-off valve shall be provided in the enclosure between the regulator and the building distribution system.

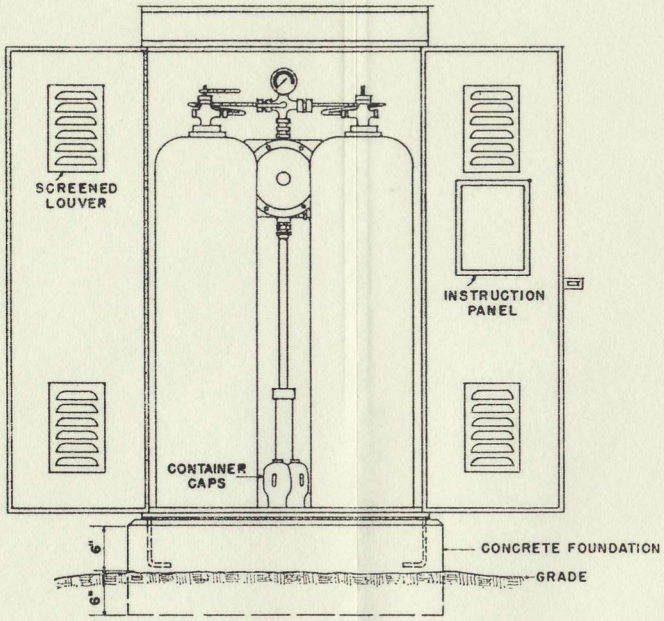
b. Where gas is supplied from a main distribution system a shut-off valve shall be installed above grade in the line leading from the main to the building and adequately protected from mechanical injury by an approved guard or housing.

1913.8 General Precautions

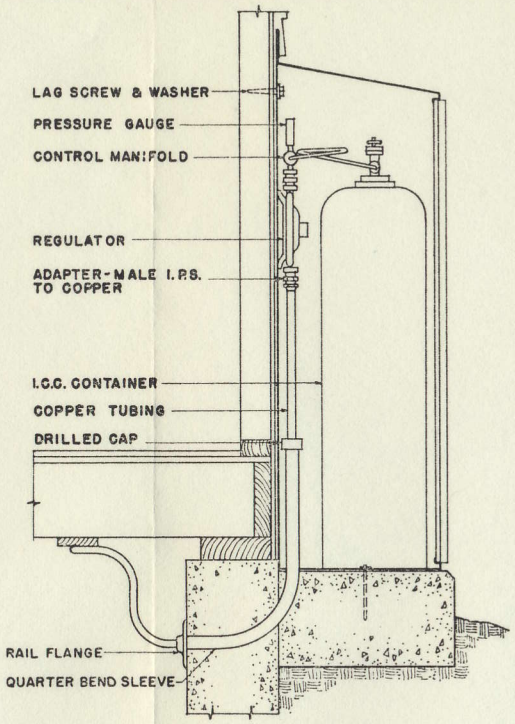
a. Valves and connections to the containers shall be protected while in transit, in storage and while being moved into final utilization.

b. Containers shall not be recharged at the installation.

c. When containers are not connected to the system the outlet valve shall be kept tightly closed, even though the containers are considered empty.



ELEVATION



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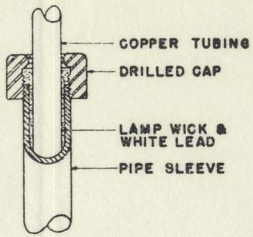
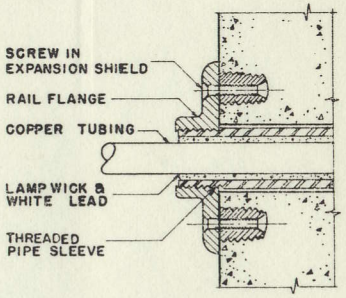
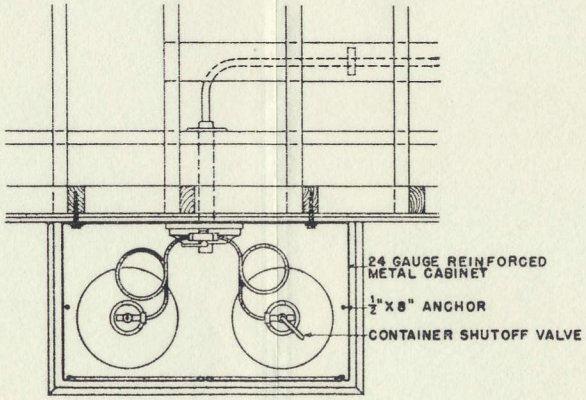


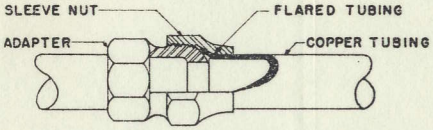
DETAIL OF DRILLED CAP



DETAIL OF PIPE SLEEVE



PLAN



DETAIL OF APPLIANCE CONNECTION

UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE DIVISION OF DESIGN AND CONSTRUCTION WASHINGTON, D.C.	SHEET 1 OF 1
STANDARD DETAILS LIQUEFIED PETROLEUM GAS INSTALLATION DOMESTIC SYSTEM USING I.C.C. CONTAINERS	DRAWING NO. PG 6030 A AUGUST 22,1958

d. Containers shall be changed by daylight only. No light involving flames or sparks shall be used in the vicinity of the changing operation.

e. Containers shall be handled with care, and when not in use they shall be stored in well ventilated roofed enclosures or structures well removed from other buildings.

f. Containers shall be stored with valve end up and cap in place.

g. The areas within ten feet of the container installation or container storage shall be kept free of accumulations of combustible and other materials, tools, equipment, etc.

h. The users shall exercise every precaution to assure that only those gases for which the system is designed are employed in its operation, and to assure that containers are properly filled.

1914 TESTS

Each completed LP-Gas installation, including ICC containers and devices, shall be thoroughly inspected, tested and approved by the administrative authority before the system is put into use.

Each completed installation shall be tested at normal operating pressure, using a manometer or other equivalent device to ascertain that the system is free of leaks. Tests shall not be made with a flame.

CHAPTER 20

ADMINISTRATIVE BUILDINGS

2000 DESCRIPTION

This group shall include structures as listed in Section 502 which provides facilities for administration, interpretation and protection.

2001 USE

2001.1 Limitation

All buildings in this group shall be used for the particular purpose for which they are constructed.

2001.2 Restrictions on Occupancy

No living or sleeping quarters shall be provided in any building in this group except that living or sleeping quarters may be provided in camptenders' stations, fire lookouts, patrol stations, and ranger stations. Sleeping quarters only may be provided in buildings where radio senders and receivers and telephone switchboards are installed.

2001.3 Mixed Occupancy

Administrative units may be included in portions of buildings used for other purposes provided that in such instances they conform to the requirements of this Chapter insofar as they apply, and to requirements of Chapters 5 and 12.

2002 CONSTRUCTION TYPES

Administrative units may be of any one of the construction types described in Chapter 6, and shall conform to the additional requirements of this Chapter.

2003 AREA AND HEIGHT

2003.1 Area

The area of any administrative unit shall not exceed the maximum specified in Chapter 7 for the construction type adopted.

2003.2 Height

The height of any administrative unit shall not exceed the maximum as specified in Chapter 7 for the construction type adopted, except the height of Fire Lookouts shall not be restricted.

2004 SPACING AND LOCATION OF BUILDINGS

2004.1 Minimum Spacing

The minimum spacing of any building in this group and any other building shall be 30 feet when of construction Type I and 40 feet for all other types of construction.

2004.2 Location

Buildings of this group located in a developed area shall be not less than 15 feet back from the inside line of the sidewalk, or road curb where no sidewalk occurs, on the side facing the access road.

2004.3 Restriction

Administration buildings, office buildings and visitor centers shall have one side, other than the one facing the access road, not less than 60 feet from any other building.

2005 GENERAL REQUIREMENTS

Stairways and exits; chimneys, flues and vents; heating and ventilating; heat appliances; plumbing; fire extinguishing apparatus; electrical installations; and motion picture machine booths shall be installed in accordance with the chapter on each subject, and shall conform to any special requirements of this Chapter.

2006 NUMBER OF STAIRWAYS REQUIRED

The minimum number of stairways for buildings in this group of more than one story in height shall be based on either the minimum exit requirements as provided Chapter 9 or as provided in the following table, whichever is the greater number.

NUMBER OF STAIRWAYS REQUIRED (Based on total floor area)	
Construction Type I or II	
No. of Stairways	Max. Total Floor Area in Sq. Ft.
1	Up to 5,000
2	Up to 12,000
3	Up to 24,000
4	Up to 40,000
Construction Type III, IV, or V	
No. of Stairways	Max. Total Floor Area in Sq. Ft.
1	Up to 5,000
2	Up to 8,000
3	Up to 12,000

2007 SPECIAL REQUIREMENTS FOR FIRE LOOKOUTS

2007.1 General

Fire Lookout towers and structures shall be constructed in accordance with the current issue of the U. S. Forest Service standard fire lookout plans.

2007.2 Window Frames

Window frames in observatory shall be of wood in all instances except where entire structure is of steel construction.

2007.3 Glass

All glass in observatory windows shall be clear plate glass, and shall be set slightly off vertical.

2007.4 Sill Height

The height of window sills in observatory shall be low enough to permit use of the fire finder to the greatest minus reading.

2007.5 Ventilation

In cases where windows of an observatory are fixed, louvres or other methods of ventilation shall be provided.

2007.6 Shades

Window shades shall not be installed on any observatory windows.

2007.7 Lightning Protection

All fire lookouts shall be provided with adequate protection from lightning in conformance with instructions contained in the U. S. Forest Service Lightning Protection Handbook—1940, or any subsequent revisions thereof.

2007.8 Interior Paint

The interior paint in observatory shall be a dull finish such as is obtained by the use of olive drab or similar nonglare paint.

2008 SPECIAL REQUIREMENTS FOR HISTORIC BUILDINGS RESTORATIONS

All restoration, preservation, rehabilitation and reconstruction work for historic structures shall be performed in strict accordance with working drawings approved by the Director.

The working drawings shall be based on the information and provisions set forth in the Historic Buildings Report approved by the Superintendent of the Park.

CHAPTER 21

PUBLIC USE BUILDINGS

2100 DESCRIPTION

This group shall include structures providing facilities primarily for the use of the visiting public as listed in Section 503.

2101 USE

All buildings in this group shall be used for the particular purpose for which they are constructed and in conformance to provisions for occupancy in Chapter 5.

2102 CONSTRUCTION TYPES

Public use units may be of any one of the construction types outlined in Chapter 6, and shall conform to the additional requirements of this Chapter.

2103 AREA AND HEIGHT

2103.1 Area

The area of any public use building shall not exceed the maximum specified in Chapter 7 for the construction type adopted.

2103.2 Height

The height as defined in Chapter 2 shall not exceed the maximum specified in Chapter 7 for the construction type adopted.

2104 SPACING AND LOCATION

2104.1 Minimum Spacing

The minimum spacing between any one of the units in this group and any other building whatsoever shall be 30 feet when of construction Type I and 40 feet when of any other type of construction.

2104.2 Location

For buildings of this group, situated in a developed area, the side facing the access road shall be not less than 15 feet back from the inside line of the sidewalk, or road curb where no sidewalk exists. Each building in this group shall have one side other than the one facing the access road, not less than 60 feet from any other building.

2105 RELATED REQUIREMENTS

Stairways and exits; chimneys, flues and vents; heating and ventilating; plumbing, and electrical installations and equipment and motion picture machine booths shall be designed and installed as specified in the chapters on each subject, and shall conform to any special requirements given in this Chapter.

2106 NUMBER OF STAIRWAYS REQUIRED

In all units in this group more than one story in height, the minimum of stairways shall be as follows:

NUMBER OF STAIRWAYS REQUIRED

(Based on total floor area)

Construction Type I or II

No. of Stairways	Max. Total Floor Area in Sq. Ft.
1	Up to 5,000.
2	Up to 12,000.
3	Up to 25,000.
4	Up to 40,000.

Construction Type III, IV, or V

No. of Stairways	Max. Total Floor Area in Sq. Ft.
1	Up to 5,000.
2	Up to 11,000.
3	Up to 18,000.
4	Up to 26,000.
5	Up to 37,000.

2107 MOTION PICTURE PROJECTION ROOMS

2107.1 Required

Motion picture projectors using nitrocellulose films, together with all electrical devices, rheostats, machines and all such film present shall be enclosed in a projection room large enough and so arranged as to permit the operator to walk freely on either side and back of the projector.

2107.2 Construction

Walls, ceilings and floors of projection rooms shall be of a form of construction having a fire resistance rating of not less than one hour. All joints shall be sufficiently tight to prevent the discharge of smoke.

2107.3 Minimum Size

Projection rooms shall have a floor area of not less than 80 square feet for one projector and 40 square feet for each additional projector. The ceiling height shall be not less than 8 feet from the finished floor.

2107.4 Exits

Every projection room shall have at least 2 exit doors, each door not less than 30 inches wide and 6 feet high, protected by an approved self-closing fire door.

2107.5 Other Openings

a. Number—Two openings shall be provided for each motion picture projector.

b. Size—The projection port shall be not larger than 120 square inches and the observation port shall be not larger than 200 square inches.

c. Shutters—Each opening shall be provided with approved gravity shutters of 10-gauge sheet metal or material with equivalent protection.

d. Fusible link—Each shutter shall have a fusible link located above it and also over each projector, which upon operating, will close all shutters.

e. Manual closing—Means shall be provided for manually closing all shutters simultaneously from a point within the projection room near each exit door. Shutters on openings not in use shall be kept closed.

2107.6 Miscellaneous Equipment

Shelves, cabinets, furniture, containers and other miscellaneous equipment shall be constructed of metal or other noncombustible material.

2107.7 Film storage

All films not in actual use shall be stored in approved metal cabinets having individual compartments for reels or shall be in ICC shipping containers.

2107.8 Ventilation

a. Required—Ventilation shall be provided by one or more mechanical exhaust systems which will draw air from each arc lamp housing and from one or more points near the ceiling.

b. Exhaust—Systems shall exhaust to outdoors either directly or through a noncombustible flue used for no other purpose.

c. Exhaust capacity—Exhaust capacity shall be not less than 15 cubic feet nor more than 50 cubic feet per minute for each arc lamp, plus 200 cubic feet per minute for the room itself.

d. Control—The exhaust system shall be controlled

from within the projection room and have pilot lights to indicate operation.

e. Exhaust ducts—Exhaust ducts shall be of noncombustible material and shall be kept 1 inch from combustible materials or covered with ½ inch of noncombustible heat-insulating material.

f. Restrictions—Ventilation of projection rooms shall not be connected in any way with ventilating or air-conditioning systems serving other portions of the building.

g. Inlets—Fresh air intakes other than those extending direct to the open air shall be protected by approved fire shutters arranged to operate automatically with the port shutters.

2108 SPECIAL REQUIREMENTS FOR SCHOOLS

All school buildings constructed in parks under the administrative jurisdiction of the National Park Service shall conform to the requirements of the County and/or State laws governing such buildings.

2109 SPECIAL REQUIREMENTS FOR CABINS FOR THE PUBLIC

2109.1 General

The following requirements on the use and occupancy of detached buildings used as guest rooms, in connection with hotels and lodges and which are designed for living, cooking and sleeping purposes, are in addition to other applicable items in this and other Chapters.

2109.2 Definitions

Tourist Cabins or Guest Room Cabins are used only for temporary (as distinguished from permanent) living and sleeping purposes.

2109.3 Light and Ventilation

Light, ventilation and sanitation requirements shall be provided as described in Chapter 8.

2109.4 Minimum Size of Rooms

Minimum size, ceiling height and cubic content of living and sleeping rooms shall be as described in Section 2206.

2109.5 Plumbing Fixtures Required

a. There shall be provided one water-closet for each sex for every 10 sleeping rooms and one lavatory and one bath tub or shower for each sex for every 20 sleeping rooms that are not supplied privately with such fixtures.

b. There shall be provided one drinking fountain for every 50 sleeping rooms in cabins without running water and in the Housekeeping Cabins every kitchen shall be provided with a kitchen sink.

c. Plumbing fixtures for community use shall be located not more than 150 feet, along the line of travel, from the cabin served.

d. Hose bibbs shall be provided for exterior hose attachments at convenient locations.

e. Plumbing installation shall be in accordance with the requirements in Chapter 18.

2109.6 Exceptions

a. Plumbing fixtures—Bath tubs or showers need not be installed in individual cabins provided community bathing facilities are available for the use of the occupants of such cabins.

b. Water supply—Where an adequate water supply is not available for a complete plumbing system, plumbing fixtures need not be installed, except that in kitchens, sinks shall be installed without water connections but with drainage outlets connected to a sewage system, and, provided that satisfactory community toilet facilities and outside hydrants supplying water under pressure are installed.

2110 PLUMBING AND SANITATION REQUIREMENTS

2110.1 Where Required

Assembly buildings, dining structures, exhibit buildings, lodging structures, schools, theaters and similar structures of public assembly shall be provided with adequate and separate toilet facilities for each sex as specified herein, in Chapter 18 and in accordance with good design standards.

2110.2 Lodging Structures

a. Water-closet—There shall be installed in every hotel, lodge, and similar use structure, a separate compartment on each floor not less than one water-closet for each sex. If there are more than ten guest rooms in such hotel or lodge there shall be installed on each floor not less than one water-closet for each sex for every ten guest rooms or fractional part thereof which are not provided with private water-closets.

b. Location—Each of such water-closet compartments shall be located on a public hallway on the same floor and not more than 100 feet distant from any guest room so served.

c. Bath—There shall be provided not less than one bath tub or shower in a separate compartment, located in a public hallway on the same floor for every ten guest rooms or fractional part thereof which are not provided with private baths.

d. Lavatories

(1) Every guest room shall be provided with a lavatory located in such room or in a separate compartment containing a water-closet, bath tub or shower for the exclusive use of such guest room.

(2) There shall be installed not less than one lavatory in the same compartment with or immediately adjoining every public or employee water-closet compartment.

2110.3 Dining and Assembly Rooms

a. There shall be installed for each sex not less than one water-closet and one lavatory in separate compartments located on a public hallway for any dining room, reception room, general amusement or entertainment room or similar room in any hotel constructed or used to accommodate the public. The required number of fixtures for occupancy loads shall conform to Tables 1809.12 and 1809.13.

b. There shall be installed for each sex in separate compartments located in suitable and convenient places not less than one water-closet and one lavatory for each 20 employees or fraction thereof.

2111 SOUND INSULATION

The wall and/or floors between lodging units shall be constructed and insulated against the transmission of sound from one unit to another.

CHAPTER 22

RESIDENCE BUILDINGS

2200 SCOPE

This group shall include buildings in which families or individuals live, or in which sleeping accommodations are provided for employees of the Government or Concessioners as listed in Chapter 5. Space may be provided for the storage of passenger cars owned or operated by the occupants, subject to the requirements specified herein.

2201 CONSTRUCTION TYPES

Dwellings may be of any one of the construction types described in Chapter 6 and shall conform to the additional requirements of this Chapter.

2202 AREA AND HEIGHT

2202.1 Area

The area of any building shall not exceed the maximum specified in Chapter 7.

2202.2 Height

The maximum height, as defined in Chapter 2 shall not exceed 35 feet, in which height there shall be no more than two stories above the basement, utilized for living quarters.

2203 SPACING AND LOCATION OF BUILDINGS

2203.1 Spacing

The minimum spacing between any one of the housing units and any other building regardless of construction type shall be in accordance with the following table, and the requirements on location given in Section 702.

	Feet
Apartment Buildings	40
Bunkhouses	40
Dormitories	40
Duplex Residences	30
Dwellings	30
Multifamily Dwellings	40
Quarters	30
Ranger Stations	30
Unit for Seasonal Occupancy	40

2203.2 Location

All buildings in this group shall be so located that the side facing the access road is not less than 25 feet back from the inside line of the sidewalk or road curb where no sidewalk occurs. Each building in this group shall have one side, other than the one facing the access road, not less than 60 feet from any other building.

2204 RELATED REQUIREMENTS

Exits and stairways; chimneys, flues, vents, shafts, heating and ventilating, electric and plumbing installations and equipment and appliances; housing requirements; and fire extinguishing equipment shall conform to the requirements of the several chapters of this Handbook and the special requirements of this Chapter.

2205 DESIGN STANDARDS

2205.1 General Requirements

Housing shall be designed to minimize operation and maintenance costs, to reduce the need for future alterations and additions, while providing a safe, healthful, adequate and desirable living environment. Such unusual design of accommodations as to require an employee to purchase special furnishings and equipment in order to live comfortably in a dwelling shall be avoided. The design shall lean toward standardized dwellings for employees to facilitate ad-

justments of employees and their families to their residences when transferred from one park to another. Architects shall however give due consideration to the site, climatic conditions and availability of building materials in each park in the design of dwellings.

2205.2 Permanent Housing

a. Permanent Family Housing in Service areas shall conform to the Design Standards prescribed by the Bureau of the Budget in Circular A–18 dated October 18, 1957, or as subsequently revised. Sufficient space and facilities should be supplied in connection with each dwelling unit to afford provision for living, sleeping, sanitation, storage for clothing and equipment, laundering, recreation and in the case for other than bunkhouses and dormitories, meal preparation and dining.

b. Housing for permanent or year-round occupancy by employees with families may be individual detached or semi-detached dwellings or multiple-family dwellings. They should be 2-bedroom and 3-bedroom units in the proportion of 60% 3-bedroom to 40% 2-bedroom. The multiple-family dwellings, principally for employees without children, shall be built in accordance with need and other conditions, consisting of two 3-bedroom units and four 2-bedroom units in a structure. Any percentage allocation should be based upon the total housing now available, plus that planned for the future. In areas where three or less dwellings are required, all of them shall have 3-bedrooms.

2205.3 Seasonal Housing

a. Multiple units—Housing for seasonal employees or for seasonal occupancy shall be multiple unit dwellings of 4, 6, 8, or 10 units each. Living room and one-bedroom units and the efficiency one room units shall be equally divided in each structure to permit flexibility of occupancy by assigning an extra room to those employees whose families cannot be

adapted to a single unit. Limited housekeeping facilities for single employees shall be provided in efficiency units where no mess hall is available.

b. Dormitories and bunkhouses—Dormitories and bunkhouses are recommended for housing single temporary or seasonal employees and work crews where the number normally employed exceeds that which might be accommodated in seasonal occupancy apartments. These buildings shall be used solely to provide living, sleeping or dining facilities for employees or facilities directly related thereto, except that this does not preclude the provision of these facilities in portions of buildings used for other purposes provided that in such instances the facilities shall conform to the requirements of this Chapter insofar as they apply, and to the requirements for occupancy and for fire separation given in Chapter 5, and in firehouses as described in Paragraph 2308.2.

2206 GENERAL HOUSING REQUIREMENTS

2206.1 Minimum Room Size

Habitable rooms shall contain not less than 90 square feet of clear floor space, and shall be not less than 7 feet in width for that portion of the room counted for computing the minimum area, and if designed for the accommodation of more than 2 persons the cubic air space shall be increased by not less than 500 cubic feet for each additional person.

2206.2 Dormitory Rooms

Dormitory rooms shall be limited to the accommodations of a maximum of twenty (20) persons, and the minimum size shall be not less than 630 cubic feet for occupancy by two persons and the cubic air space of the room shall be increased by not less than 500 cubic feet for each additional person the room is designed to accommodate.

2206.3 Minimum Room Height

All habitable rooms shall have a minimum ceiling height of not less than 7 feet 6 inches; provided that in rooms with sloping ceilings, the height shall be required only in one-half of the room area, but with not less than 60 square feet of the area.

2206.4 Closets

a. Each residential unit shall be provided with not less than one coat closet, one linen closet, and one closet for each bedroom. Bedroom closets shall have an inside width of not less than 22 inches and a minimum inside area of not less than 9 square feet. Provision should be made for adequate storage space. Where no basement or attic are provided this storage space should be in the form of storage space in closets or in utility room protected from the weather and dust and from access by rodents.

b. Closets with an area of 9 square feet or more should be provided with an electric light outlet.

2206.5 Storage

Ample storage space shall be provided in addition to the required closets. Such space may be in the form of a large closet or space in attics, basements or in garages.

2206.6 Closet Hardware

Closet and storage room door hardware shall have a knob of sufficient size for easy egress from the inside, regardless of whether or not the door is locked. The hardware shall be designed so that the door cannot be locked from the inside.

2206.7 Sound Insulation

The walls and/or floors between residential units shall be constructed and insulated against the transmission of sound from one unit to another.

2207 PLUMBING AND SANITATION REQUIREMENTS

2207.1 Bath Rooms and Toilets

a. Every residential unit containing two bedrooms or less shall be provided with not less than one water-closet, one bath tub or shower and one lavatory.

b. Every residential unit containing three bedrooms shall be provided with not less than one complete bath as described above, and one lavatory compartment containing a lavatory and a water-closet.

c. Each dormitory and each bunkhouse shall be provided with not less than the required number of water-closets, lavatories and bath tubs or showers as shown in Table 1809.13 when individual rooms are not provided with complete bath rooms; except that individual rooms may be provided with a lavatory or a compartment containing a lavatory and a water-closet, with the remaining facilities located in one or more community toilets or bath rooms.

2207.2 Access to Toilet

Access to a water closet in a residential unit shall not be through a bedroom unless every bedroom has direct access to a water-closet.

2207.3 Minimum Toilet Compartment Size

Every water closet compartment in every building shall be not less than 3 feet in clear width (this does not apply to stalls) and shall be not less than 4 feet from the back of the water-closet fixture to any other fixture or wall in front of the water-closet.

2207.4 Construction of Shower Compartments

The floor of every shower compartment shall be made water tight with waterproofing material which shall extend not less than 4 inches upon walls and curb. Walls of shower compartments shall be constructed of smooth water-resistant material.

2207.5 Kitchen Sinks

Each residential unit and each dormitory and bunkhouse with food preparation facilities shall have at least one sink with water supply and drainage connections.

2207.6 Laundry

Laundry facilities consisting of laundry trays and adequate space and plumbing and electric outlets for other laundry equipment, shall be provided in each housing unit.

2207.7 Enclosure of Fixtures

a. The space underneath any kitchen sink or laundry tray shall not be so enclosed as to prevent ventilation or inspection thereof.

b. Doors, panels or other closures may be provided around any or all sides of such space, but no permanently fixed closure shall be installed in the front of such space and removable front closures shall have at least 20 per cent of the area open for ventilation.

2207.8 Water Supply

An ample supply of hot and/or cold water shall be provided for each plumbing fixture from individual and/or central hot and cold water systems.

2207.9 Sewage Disposal

Each plumbing fixture shall be connected to an individual or a central sewage disposal system.

2208 SPECIAL REQUIREMENTS FOR CABINS

2208.1 Construction

Exterior walls and interior load bearing walls shall be supported on continuous foundations, or piers of concrete or masonry; provided that at exterior walls the spaces between piers below the sills shall be completely closed with wood sheathing or other approved material. Ventilation shall be provided by means of screened openings as described in Chapter 8.

2208.2 Chimney

In cabins providing sleeping accommodations only, which are of an inexpensive construction type, and which are occupied for limited periods only, patent flues as specified in Section 1305 may be used in lieu of masonry chimneys.

2208.3 Limitations

a. Single cabins of three rooms or less shall not be designed for employees quarters.

b. Cooking facilities shall be limited to a kitchenette.

c. Seasonal occupancy quarters where practicable shall be of the multiple-unit type consisting of equal numbers of living room and one bedroom units and living-bedroom efficiency units.

2209 GARAGES

2209.1 General

It is recommended as a general rule, that garage facilities where necessary should be provided as an integral part of any housing unit either below the first floor or attached to the building.

2209.2 Construction Type

The construction of garages as an integral part of a housing unit, shall conform to the construction type of the building in which they are located, and to the requirements contained therein.

2209.3 Floors

a. The floor level of a garage attached to a housing unit shall be not less than 6 inches lower than the floor level of the housing unit.

b. Floors shall be of noncombustible material, and shall be pitched to drain toward the entrance door or to a floor drain.

2209.4 Walls and Ceilings

a. Walls, partitions and/or ceilings separating the garage space from other parts of the building shall be of ma-

terials to restrict the passage of gases, smoke and odor from the garage to other parts of the building.

b. Materials and construction of such walls, partitions and/or ceilings shall be equivalent in fire resistance and gas tightness to ¾ inch gypsum lath and plaster on the garage side of the supporting studs and ceiling joists or rafters. Sound ¾ inch tongue and groove sheathing covered with ⅜ inch gypsum wall boards thoroughly spiked to studding and rafters or ceiling joists will be acceptable. The butting joints of the gypsum boards with floor, ceiling and walls shall be made absolutely tight with 4-inch strips of gypsum board or other equivalent materials.

c. Garages located beneath a dwelling unit shall have walls, partitions, floors and ceilings constructed of materials providing not less than ¾ fire resistance.

2209.5 Entrance Doors

Doors may be over-head, roll-a-way or outward-swinging types and shall be furnished with locks which can be operated from both the inside and outside of the garage.

2209.6 Other Doors or Openings

a. Openings from the building into the garage shall be restricted to a single doorway; such opening shall be provided with a flush type solid core wooden door of not less than one and three-quarter inches nominal thickness and shall be equipped with an approved self-closing device.

b. Where a garage and furnace room located on the same story adjoin, such spaces shall be separated by a wall or partition having a two-hour fire-resistance rating. Any doorway in the wall or partition shall have a 6-inch curb or the garage floor shall be 6 inches lower than the floor in the furnace room. The doorway shall be provided with a self-closing door having a two-hour fire-resistive rating.

2209.7 Entrance Driveways

Entrance driveways to garages shall either be on a level grade or shall slope upward toward the doors for a distance of not less than 50 feet in front of the doors. A down grade approach to the doors complicates the removal of cars in case of emergency and shall be avoided.

2210 FURNITURE AND EQUIPMENT

2210.1 Miscellaneous Equipment

Bureau of the Budget Circular A–15 as amended from time to time, lists items which may be included at government expense as an integral part of the building. Such items are limited to awnings, window shades, curtain rods, venetian blinds, ranges, refrigerators, and linoleum on kitchen floors. Recently by special authorization, garbage disposal units may be installed where the sewage system is adequate for their use and where they are desirable.

2210.2 Recommended Installations

In order to avoid the damage caused by the installation and removal by individual tenants, it is recommended that such items as curtain rods, and bath room accessories (towel racks, toilet paper holders, etc.), be installed as part of the building construction.

2210.3 Deepfreeze

Space and electric outlets for deepfreeze units shall be provided in dwellings where such equipment is essential to the normal storage of food by the occupants.

2210.4 Lockers

In non-housekeeping units, dormitories and bunkhouses only, lockers may be provided in bedrooms having no closets.

2210.5 Other Built-in Facilities

In addition to the above-mentioned items, other items such as kitchen cabinets, medicine cabinets, window seats,

bookcases, dividers, and storage chests are permitted if constructed or installed as an integral part of the building.

2210.6 Tested Equipment

All electric refrigerators, water heaters and ranges furnished by the government shall bear the label of the Underwriters' Laboratories, Inc., and for the gas refrigerators, water heaters and ranges the label of the American Gas Association, or by other nationally recognized testing laboratories.

CHAPTER 23

UTILITY BUILDINGS

2300 DESCRIPTION

This group shall include buildings primarily used for utility, maintenance and storage purposes as listed in Chapter 5.

2301 USE

2301.1 Limitation

All buildings in this group shall be used for the particular purpose for which they were constructed.

2301.2 Restriction

No combustible materials or objects, or volatile flammable liquids shall be stored with automotive equipment; and whenever they are stored in the same building, that portion of the building in which such material is stored shall be separated by a fire-separation as specified in Chapters 5, 7 and 12.

2301.3 Exception

Living and/or sleeping quarters may be provided in fire houses and, during winter months only, in snow removal equipment storage buildings, but not in any other buildings in this group.

2301.4 Mixed Occupancy

Any combination of the facilities outlined in Chapter 5 may be provided in the same building except as prohibited in 2301.2, and provided further that explosives magazines shall be individual units entirely separate from other units.

2302 CONSTRUCTION

2302.1 Types

Fire-resistive construction is recommended for all utility buildings but any of the construction types outlined in Chap-

ter 6 may be used, except structures for storage of explosives which shall be as specified in Section 2309 and gasoline service stations and oil and paint storage which shall be as specified in Sections 2311 and 2312.

2302.2 Roofing

Fire-retardant roofing is recommended for all utility buildings, regardless of construction types.

2303 AREA AND HEIGHT

2303.1 Area

The maximum area of utility buildings in the construction type adopted shall be as specified in Chapter 7 except that buildings of construction Type V, in which automotive equipment including passenger cars are stored, shall have a maximum length of 108 feet and a maximum area not to exceed 4000 square feet.

2303.2 Height

All utility buildings regardless of type of construction shall be limited to a maximum height of 35 feet, and not more than two stories.

2304 SPACING OF BUILDINGS

The minimum space between the various utility buildings of any type whatsoever shall be in accordance with the following:

	Feet
Explosives Magazines	1,000
Barns and Stables (from habitation)	500
Barns and Stables (from other than habitations)	100
Gas and Oil Buildings	50
Paint Shop	50
Fire Houses	50
Other Buildings of Construction Types II, III, IV, and V	40
Other Buildings of Construction Type	30

2305 GENERAL REQUIREMENTS

Stairs and exits, heat appliances, fire extinguishing apparatus, plumbing, heating and ventilating and electrical installations and equipment shall be as specified in the appropriate chapter on each subject, and shall conform to any special requirements given in this Chapter.

2306 HEATING

All heating boilers and furnaces in machine shops and repair shops shall be separated from other portions of the building by a fire separation as specified in Chapters 6 and 7 and no stoves, open heater or hot air heating systems shall be installed in the working space of such buildings.

2307 ELECTRICAL WORK

All electric wiring shall be in metal conduit. In buildings of construction Types I, II, III, and IV all conduit shall be of the rigid type, and in buildings of Type V conduit shall be of the rigid or the flexible type.

2308 SPECIAL REQUIREMENTS FOR BUILDINGS IN WHICH AUTOMOTIVE EQUIPMENT IS STORED

2308.1 Storage Buildings

a. Floors—Floors shall be of noncombustible material, such as concrete, gravel or dirt and should, preferably, slope toward the doors to facilitate the removal of equipment.

b. Separations—For inclosed storage buildings, solid partitions separating every fifth stall shall be provided. These partitions shall be solid from floor to underside of roof, without openings, and shall conform to the construction type of the building, but in no case shall a wood partition be less than 2 inches thick. (This requirement shall not apply to buildings used exclusively for the storage of Concessioners' busses.)

c. Doors—When doors are provided for storage buildings they may be overhead, roll-a-way or outward-swinging hinged types, and they shall be provided for locking only from the outside.

2308.2 Fire Houses

a. Arrangements—Fire Houses should be located so as to provide free and easy access for fire equipment, preferably arranged so that the fire equipment does not have to pass close to other buildings in the vicinity of the Fire House.

b. Quarters separation—Any living and/or sleeping quarters included in a Fire House shall be separated from the equipment storage space by a fire separation having a fire-resistive rating of not less than two hours. (See Chapters 5 and 7)

2309 SPECIAL REQUIREMENTS FOR EXPLOSIVES MAGAZINES

2309.1 Requirements

Explosives magazines shall conform to the requirements contained in the latest edition of the Blasters' Handbook, published by Dupont, and to other requirements contained herein.

2309.2 Type of Construction

Explosives magazines shall be bullet-proof, burglar-proof, weather-proof, fire-resistant, dry and well ventilated.

2309.3 Location

No explosives magazine shall be located nearer than 1000 feet from another building or from a public road.

2309.4 Foundations

Foundations shall be continuous and shall be constructed of masonry or concrete, with adequate ventilation provided for the space under the building.

2309.5 Walls

Walls above the foundation may be of brick 8″ in thickness or of wood framing constructed of wood studding not less than 6 inches wide, sheathed on the outside, and lined on the inside with tongue and groove boards. The space between the studs shall be filled with sand.

2309.6 Exterior Covering

Walls of frame construction shall be covered on the outside with flat galvanized iron of not less than 26 gauge, firmly secured to the building.

2309.7 Floors

Floors shall be of wood joists covered with a one-inch subflooring and a one-inch tongue and groove finish flooring.

2309.8 Floor Construction

The bottom of floor joists shall be not less than one foot above natural ground and all flooring, except in front of doors, shall be set back at least 2 inches from the walls.

2309.9 Roof and Ceiling Construction

a. Roof—The roof shall be covered with noncombustible weather tight material.

b. Ceiling—The ceiling shall be bullet-proof, constructed of ⅞″ tongue and groove boards on wood joists, covered with heavy building paper and not less than 4 inches of sand, and set back 2 inches from the walls.

2309.10 Doors

Doors shall be bullet-proof, constructed of not less than 3 thicknesses of ⅞ inch matched hardwood boards covered on the outside with a steel plate ⅜ of an inch in thickness.

2309.11 Free-standing Structures Recommended

The above requirements shall not preclude construction which is wholly or partially buried in natural ground, but free-standing structures are recommended wherever practicable.

2309.12 Protection from Dampness

In wholly or partially buried structures, proper precautions shall be taken against dampness; proper ventilation shall be provided; and all exposed portions shall conform to the requirements for a free-standing structure.

2309.13 Warning Sign

Adequate warning signs shall be placed on all sides of the structure.

2310 STORAGE OF BLASTING CAPS

2310.1 Restrictions

Blasting caps or electric blasting caps shall not be stored in the same magazine with other explosives.

2310.2 Requirements

Blasting caps shall be stored in boxes or caches which are burglar-proof, fire-resistant and dry.

2310.3 Isolation

Blasting cap storage facilities shall be located so that they are free from the danger of falling rocks or other objects, and also so that they are isolated from any developed area.

2310.4 Hinges and Hasps

When hasps, staples and/or hinges are used in the construction of storage facilities they shall be attached by rivets, or by bolts properly washered and with nuts on the inside.

2310.5 Locked

Storage facilities shall be kept securely locked at all times, except when actually storing or removing caps.

2311 SPECIAL REQUIREMENTS FOR GAS AND OIL HOUSES AND GASOLINE SERVICE STATIONS

2311.1 Requirements

The use, handling, storing and dispensing of gasoline, fuel oil and other flammable liquids shall comply with the requirements contained in the NBFU Pamphlet No. 30.

2311.2 Construction Types

Construction shall be of Type I, II, III, or IV, except that temporary units may be of any construction type outlined in Chapter 6.

2311.3 Floors

Floors for permanent and temporary buildings shall be of noncombustible materials such as concrete, masonry, gravel or dirt.

2311.4 Electric Wiring

All electric wiring shall be installed in rigid conduit, switches shall be explosion-proof type, and lighting fixtures shall be vaporproof.

2311.5 Vents

In each room where gas and oil are stored a vent not less than 6 inches in diameter shall be installed, with the inlet near the floor and the outlet extending above the roof of the building.

2311.6 Gasoline Pumps

a. Concessioners' pumps—All concessioners' gasoline pumps may be painted in recognized standard colors normally used by the oil company supplying the gasoline.

b. Service pumps—All service gasoline pumps, regardless of location, shall be painted the National Park Service green.

2312 SPECIAL REQUIREMENTS FOR PAINT SHOPS

2312.1 Definition

Paint shops shall include individual buildings or portions of buildings used for the storage and/or application of any form of paint product.

2312.2 Construction Requirements

All paint shops shall be individual buildings wherever it is practicable, but in cases where paint products are stored and/or applied in a portion of a building used for other pur-

poses, the paint storage and/or application portion shall be separated from the other portions by not less than one hour fire-resistive walls and/or floors, (see Chapter 12), with no openings whatsoever between the portions.

2312.3 Electric Wiring

Regardless of construction type, all electric wiring shall be in rigid conduit, switches shall be explosion-proof type, and lighting fixtures shall be vapor-proof.

2312.4 Construction Requirements

In rooms used for paint spraying, the walls and ceilings shall be sheathed or covered with appropriate materials to present a smooth surface, and the floors shall drain to the outside or to appropriate floor drains.

2312.5 Exhaust System

In rooms used for paint spraying an exhaust system shall be installed to remove the fumes and surplus spray. The motor for the exhaust system shall be placed outside of the rooms.

2313 SPECIAL REQUIREMENTS FOR DRY CLEANING PLANTS

2313.1 Requirements

Dry cleaning plants shall conform to the requirements contained in NBFU Pamphlet No. 32, and to the requirements contained herein.

2313.2 Construction Type

Dry cleaning buildings must be of Type I construction, as specified in Chapter 6, but must also conform to the additional requirements of this Chapter. A moderate amount of not more than one quart of dry cleaning liquid with nonflammable solvents, and pressing as an incidental service in a building, shall not require the building to be classed as a dry cleaning plant.

2313.3 Height Restrictions

Buildings used exclusively as dry cleaning plants shall be not over one story in height, without attics, concealed roof spaces, basement or pits.

2313.4 Mixed Occupancy Restrictions

When located in a building where portions of such building are used for other purposes, that portion used as a dry cleaning plant shall be of Type I construction and shall be entirely separated from other portions of the building by solid walls with no openings. In no case shall a dry cleaning plant be so situated as to have any other use occupancy above it.

2313.5 Ventilation

Walls of cleaning rooms shall have vents of not less than 16 square inches in area placed not more than 16 feet apart near the floor line, and properly protected by screened grills, or such rooms may be equipped with mechanical exhaust ventilation with outlets located near the floor line.

2313.6 Machine Safety Precaution

Each machine which uses a volatile flammable 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.

2313.7 Doors

All doors leading into rooms in which volatile flammable liquids are used shall have a fire rating of not less than one hour and shall be equipped with fusible links so arranged as to be self-closing when released.

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