NORTH CAROLINA STATE BUILDING CODE

Volume I-A

FIRE RESISTANCE RATINGS

1967 Edition

Adopted by the North Carolina Building Code Council in accordance with Act of the General Assembly of 1957, Chapter 1138

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GENERAL NOTES

This Volume of the N. C. State Building Code is taken directly from book of Fire Resistance Ratings as published by the American Insurance Association.

Please refer to Table 600 of Volume I to determine the number of hours of fire resistance required for various structural parts of buildings based on type of construction.

This book does not give the flame spread ratings of various materials. This information can be obtained from the Building Materials List of Underwriters Laboratories.

Please consult the Building Materials List of Underwriters Laboratories for various fire ratings on assemblies tested since publication of Code.

Some examples of tested designs as published in Building Materials List are given in back of book. Please note that in order to obtain rating assigned, it is necessary to follow the design as tested.

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FIRE RESISTANCE RATINGS

of

Beam, Girder and Truss Protections,
Ceiling Constructions,
Column Protections,
Floor and Ceiling Constructions,
Roof Constructions,
Walls and Partitions

THE AMERICAN INSURANCE ASSOCIATION
formerly

THE NATIONAL BOARD OF FIRE UNDERWRITERS
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CONTENTS

TECHNICAL INFORMATION
ON
FIRE RESISTANCE RATINGS

The following tables present for the information of building inspectors and other public officials, architects, engineers and others interested in fire safety in buildings, types of construction which provide fire resistance ratings of 1, 1½, 2, 2½, 3 and 4 hours, as may be required by codes or regulations. The data cover,

Beam, girder and truss protections
Ceiling constructions
Column protections
Floor and ceiling constructions
Roof constructions
Walls and partitions.

The tables are set up in terms of minimum requirements (type of protection material, details of construction and thickness of materials) for the specified fire resistance, and in such form as to fit the requirements for hours fire resistance given in building codes. Some constructions, such as brick walls and certain floor constructions and column protections, have obtained test ratings higher than required by building codes, and hence higher than indicated in the tables. For further data the original references, shown by numbers in parenthesis, should be consulted.

The fire resistance rating of a wall or partition or floor and ceiling construction is essentially the time in hours the construction will remain in place and prevent temperatures on the unexposed side from exceeding a certain amount when the construction is exposed to the standard test fire. The fire resistance rating of a column is the time in hours the column will stay in place and carry its load. The usefulness of the assembly after the fire exposure is not taken into account, and damage to the assembly is not necessarily a factor in the rating.

Ratings are based on Standard Fire Tests made substantially in accord with the "Standard Methods of Fire Tests of Building Construction and Materials," ASTM E119, NFPA 251, U.L. 263 unless identified as estimated ratings.

In addition to ratings based on standard tests are estimated ratings of certain forms of construction based on certain standard tests or which have been commonly recognized and used for many years but for which standard test data have not been available. Such ratings have been included to fill some of the important gaps in the tables of ratings based on standard tests, so that building inspectors and other users of these tables would have some information to go by pending the time when more adequate test data become available.

The data given under estimated ratings do not include details on attachment, but it is assumed that the protection will be securely attached in such a way that it will remain in place during fire exposure.

Attention is called to the fact that with ratings based on currently published listings by Underwriters' Laboratories, Inc., and Underwriters Laboratories of Canada there is reasonable assurance that the listed materials will conform in weight, dimension, and quality to those which developed the original test rating, but that with other ratings the materials currently available may not necessarily be the same weight, dimensions and quality as those which were originally tested and rated.

Where an assembly is specified to be of noncombustible materials, care must be exercised in selecting from the tables only assemblies which are made of noncombustible materials.

Analyzing Test Data. In judging and interpreting test results it is necessary to analyze carefully the test data if ratings therefrom are to be on a comparable basis.

With many of the older fire tests the fire exposure differed to a considerable extent from the present standard fire exposure, and with many of the early floor fire tests top surface temperatures were not observed.

Many of the tests on columns were made prior to 1925 with column loads somewhat lower than permitted today. In certain cases this necessitates consideration of the effect of greater allowable loads on the fire resistance rating.

Many tests have been made on samples smaller than the minimum size specified in the standard fire test. Such tests cannot be considered the equivalent of tests made on samples of standard size. In some cases they may be satisfactory in determining heat transmission characteristics, from which fairly reliable estimates of the fire resistance rating may be made, provided other characteristics affecting performance of the assembly in the standard fire test have been established, but such estimates may be made with considerable caution.

The above factors have been taken into account in arriving at the ratings shown in the following tables.

Applying Test Results to Modified Forms of Construction. Because small differences in quality of materials, forms of construction and dimensions of parts, in some cases, make large differences in the fire resistance, care must be exercised in applying test ratings to constructions which differ from those actually tested. Some of the factors which need to be considered are the following.

CONCRETE. The fire resistance of concrete depends to a considerable extent on the kind and quality of coarse aggregate used. Siliceous gravel aggregates which contain a large percentage of chert or flint give lower ratings than limestone, trap rock, slag and a number of other aggregates. Where expanded shale aggregate is called for it is of the rotary kiln type unless otherwise noted.

The relation between kind of aggregate and fire resistance ratings is well illustrated in the ratings given for concrete protections for steel columns.

PLASTER. In constructions where plaster coatings provide an important part of the fire resistance, it is important to note the kind of plaster, its thickness, the type and proportions of the ingredients, and the type and method of fastening the lath. Gypsum plaster is superior to portland cement or lime plaster in resisting heat transmission. Unless asbestos or other fiber is added to portland cement plaster, its fire resistance is further limited by cracking and spalling.

The richness of the plaster mix has a considerable effect on the fire resistance, particularly with gypsum plaster, and if the listed ratings are to be obtained the mix must be as specified.

The increase in fire resistance obtained by addition of a plaster coating is shown in the tables for certain constructions. In general, a facing of ¾-inch portland cement or gypsum plaster will usually increase the fire resistance of a 1-hour assembly by ½-hour. On 2-, 3- and 4-hour assemblies the increase for the same kind and thickness of plaster will be progressively greater, amounting usually to about 1 hour on a 4-hour assembly. If applied to two sides of a masonry partition the effectiveness is double that of plaster on one side. Plaster coatings, to be effective in adding to the fire resistance periods when combustible structural members are framed in, must be on the exposed faces of the walls opposite to the faces in which the combustible members are inserted.

The use of perlite or vermiculite aggregate in place of sand in plaster, increases its resistance to fire.

ACOUSTICAL TILE. The type of acoustical tile suspension system specified in the tables is important. Exposed or lay-in tile steel suspension systems result in a more rapid heat build-up in the concealed ceiling space than do concealed tile suspension systems that support tile in a recessed groove (kerf) in tile edge. Tile hold down clips are included in all assemblies incorporating exposed tile suspension systems.

PRESTRESSED CONCRETE. The high-tensile steel wires or cables imbedded in but not necessarily bonded to the concrete may be pretensioned or post-tensioned. Factors such as cell configuration in hollow slabs, effect of moisture trapped in grouted cable ducts of post-tensioned members, the effect of end supports or end connections and the point of temperature failure of high-tensile steel will influence the fire resistance rating. Most fire tests of prestressed concrete have been conducted with ends and edges of the test assembly restrained. If field erection is not as tested, performance under fire conditions may not give the rating in the tables.

SPRAYED FIBER. Performance of fire proofing materials such as sprayed fiber applied directly to steel or other surfaces depends on the condition of the surface receiving the sprayed fiber. The surface should be free of oil, rust or other foreign matter. Many fiber protections first require a special adhesive or water application on the surface to receive the fiber. Where required the fiber should be tamped to the required thickness.

WALLBOARD. Special gypsum wallboard or coreboard with a specially formulated core affords greater fire resistance than does the conventional or regular gypsum wallboard or coreboard of the same thickness. If the wallboard or coreboard in the description is "U.L. Listed," then wallboard or coreboard having an attached Underwriters' Laboratories, Inc. label stating the same type of construction and design number as that given in the description must be used. Constructions incorporating a special wallboard or coreboard are so noted under details of construction.

HOLLOW UNITS. It should be noted that with hollow constructions and with constructions composed of hollow units the thickness of the hollow space is a relatively minor factor in the fire resistance. Comparative tests have indicated that it is the total thickness of solid material in the unit rather than the total thickness of the unit which is the principal factor. Therefore, with constructions involving hollow block or tile, use of thicker unit of the same material will increase the rating only if and as the thickness of solid material in the unit is increased. An increase in rating may be obtained by filling the cores.

CRITICAL FEATURES IN FIRE RESISTANCE RATINGS. With masonry walls and partitions the critical feature in determining the fire resistance rating under the standard fire test is usually the temperature rise on the unexposed surface or in other words its resistance to heat transmission. However, with some constructions. the critical feature may be the load carrying ability under fire exposure or the resistance to hose stream penetration.

With columns, beams and girders the critical feature is usually the ability to carry the load under fire exposure, which in turn is usually dependent on the heat insulating value of the protective covering and its ability to stay in place during the fire exposure.

With noncombustible floor constructions the critical feature has usually been the temperature rise on the top (unexposed) surface in view of adequate protection provided on the under side, but ceiling protection is important and if deficient the critical feature becomes the load carrying ability under fire exposure which is dependent on the ceiling protection. Where the ceiling protection consists chiefly of plaster on some form of lath the method of attachment of the lath and the security with which it and the plaster are held in place during the fire exposure are often critical features. Falling of any considerable portion of the plaster and lath during the fire exposure period makes the possible collapse of such floors under load (whether of combustible or noncombustible construction) a critical feature in the test results. This has been the case in a number of floor tests.

It should be noted that ratings of plaster facings on walls and partitions are not applicable to similar finishes on ceilings, for under fire exposure plaster may fall from a ceiling considerably before it will fall from a vertical surface, even though it be applied to the same plaster base in both cases.

Fire Walls. Fire resistance ratings as determined by the standard fire test do not provide an adequate basis for specifying minimum thickness of fire walls of buildings. In brief general terms, the standard fire test is made on a sample wall about 10 feet square and to be rated as a 4-hour wall, for example, the sample must stand up under the standard exposure fire and bear its rated load, if of load bearing construction, for a period of 4 hours without attaining a temperature on its unexposed face higher than 250 F. above the starting temperature. The hose stream test which is also specified is made on a like sample exposed to only a 1-hour fire so that this test is not a critical factor in such walls.

It is obvious that a fire test as described will not measure the ability of a wall many times the size of the test panel to stand up against fire exposure extending over more or less its entire area. Walls expand when heated and in severe building fires it is common to see them curl and fall as the result of such expansion on the heated side. Ability to withstand the impact from collapsing floors and falling objects is also important.

When a wall is called upon to stop a spreading fire that is reaching or has attained conflagration proportions it must have stability against collapse or overturning far in excess of that presented by certain types of construction which develop a 4-hour resistance in the standard fire test, if it is to serve its purpose.

Therefore until tests have been developed that will measure the kind of performance required in fire walls of buildings, it is necessary to a considerable extent, as in the National Building Code, to specify thickness and required

lateral support of walls on the basis of experience and their performance in actual fires.

GENERAL NOTES

Materials and Forms of Construction

All ratings are based on use of materials and forms of construction in full conformity with requirements of the National Building Code, and in compliance with any applicable material specifications of the American Society for Testing and Materials.

The thickness of walls, partitions and floor slabs specified in the tables are based on fire resistance only and are not to be construed as permitting such thicknesses where other considerations require greater thicknesses. See for example the Code provisions regarding height and thickness of masonry walls in the National Building Code.

Ceiling Constructions

Ceiling constructions described under Floor and Ceiling Constructions cannot be used interchangeably with other floor constructions to obtain the fire resistance rating of the floor and ceiling construction from which the ceiling construction was taken.

Openings in a fire resisting ceiling for pipes, ducts and other service equipment should only be permitted on the basis of fire tests of fire resisting ceilings with such openings, except that one electrical outlet box not exceeding 16 square inches in area may be installed in such ceilings in each 90 square feet of ceiling area.

Firestopping of concealed spaces formed by a fire resisting ceiling and floor above should be provided in accordance with building code provisions.

Plaster

Plaster mixes are designated as follows: "1:2, 1:3 gypsum and sand plaster" which indicates two coats of plaster, the first or scratch coat made of 1 part gypsum to 2 parts sand, and the second or brown coat of 1 part gypsum to 3 parts sand.

Plaster proportions are by weight unless otherwise indicated.

Plaster of cement and sand may be richer in cement content than specified for a given rating unless otherwise indicated.

Plaster of gypsum and sand may be richer in gypsum content than specified for a given rating unless otherwise indicated.

Plasters with vermiculite or perlite aggregate must be of the proportions as specified for a given rating.

Thickness of plaster is measured from the face of the plaster base, except that with metal lath it is measured from the back of the lath unless otherwise stated. The usual 1/16 in. white or finish coat of plaster may be included in the required plaster thickness.

Ceilings of plaster on metal lath, unless otherwise specified in individual ratings, may be in contact, furred, or suspended.

Explanatory Notes and References

The abbreviation "Comb." appearing in the tables under Rating means the assembly is rated as combustible according to the Standard Methods of Fire Tests of Building Construction and Materials, NFPA Standard No. 251, U.L. 263. An assembly is rated as combustible when it involves materials which do not classify as noncombustible as defined in the National Building Code and NFPA Standard No. 220.

When an assembly is designated as combustible it does not necessarily mean that all the materials in the construction are combustible but that there is a significant amount of combustible material in it.

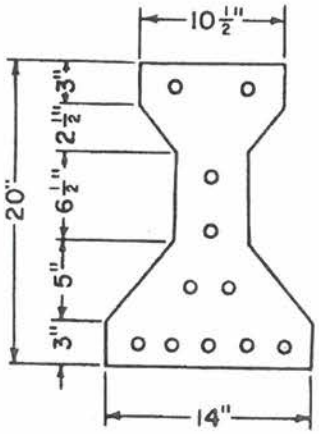
Letters appearing in the tables as superscripts refer to explanatory notes given at the end of the tables.

Numbers in parenthesis given in the tables under details of construction or details of protection refer to references to sources of data listed at the end of the tables, after the notes.

U.L. refers to Underwriters' Laboratories, Inc.

BEAM, GIRDER AND TRUSS PROTECTIONS

Pretensioned (Prestressed) Concrete Beam



Protection Type	Details of Protection	Rating
Concrete (Minimum cross sectional area. 167.75 sq. in.)	2 in. minimum concrete protection to steel tendons. Concrete coarse aggregate limestone or expanded shale (Rotary kiln). (136)	3 hrs.

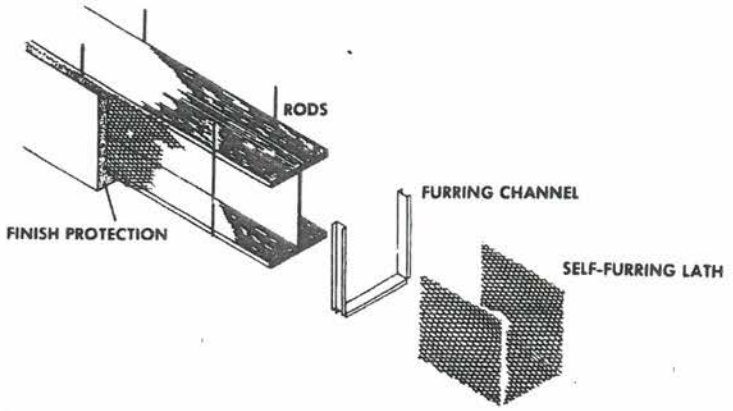
Reinforced Concrete Beams, Girders and Trusses

Concrete	1½ in.[1] concrete, coarse aggregate air cooled slag, expanded slag, expanded shale (Rotary kiln), crushed limestone, calcareous gravel, siliceous gravel or traprock. (62, 128).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDER AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected



PROTECTION CAGED AROUND STEEL MEMBER

Protection Type	Details of Protection	Rating
Acoustical Material	2 in. (measured from face of lath) U.L. listed acoustical material applied to metal lath cage around beam and supported by No. 8 SWG galvanized wire spaced 12¾ in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 10-4 HR (Beam 4 HR).	4 hrs.
Cementitious Mixture on Metal Lath	1 in. (measured from face of lath) U.L. listed cementitious mixture machine applied directly to metal lath cage secured to lath hangers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 23-3 HR (Beam 4 HR).	4 hrs.
	2 in. (measured from face of lath) U.L. listed cementitious mixture machine applied to metal lath cage secured to flange edges by spring steel wire clips. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 24-4 HR (Beam 4 HR).	4 hrs.
	1½ in. (measured from face of lath) U.L. listed cementitious mixture applied to self furring metal lath cage secured to beam flanges with lath clips of No. 11 SWG spring steel wire spaced 9 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 29-4 HR (Beam only).	4 hrs.
	1¼ in. (measured from face of lath) U.L. listed cementitious mixture, machine applied to metal lath cage held in place by No. 8 gauge galvanized wires inserted through the floor units and wrapped around the beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 32-4 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDER AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Cementitious Mixture on Metal Lath	7/8 in. (measured from face of lath) U.L. listed cementitious mixture machine applied to metal lath cage around steel beam and supported by No. 9 SWG galvanized lath hanger wires spaced 16 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 90-2 HR (Beam 4 HR).	4 hrs.
	1 5/8 in. (measured from face of lath) U.L. listed cementitious mixture machine applied to beam bottom flange area of metal lath cage secured to lath hangers and 1 13/16 in. vertical sides of metal lath cage. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 14-2 HR (Beam 4 HR).	4 hrs.
	1 in. (measured from face of lath) U.L. listed cementitious mixture applied to self furring metal lath cage tied every 6 in. on centers to lath hangers of No. 9 gauge galvanized steel wrapped around beam and bent over bottom flange and spaced not more than 18 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 10-2 HR (Beam 3 HR).	3 hrs.
	1 1/4 in. (measured from face of lath) U.L. listed cementitious mixture applied to metal lath cage secured to beam flanges with No. 11 SWG spring steel wire clips spaced 9 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 19-3 HR (Beam only).	3 hrs.
	1 1/8 in. (measured from face of lath) U.L. listed cementitious mixture applied to self furring metal lath cage secured to beam flanges with No. 11 SWG gauge spring steel wire clips spaced 9 in. on centers. Lath spaced 1 in. below bottom flange of beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 6-2 HR (Beam only).	2 hrs.
Fiber, Sprayed	1 1/8 in. (measured from face of lath) U.L. listed sprayed fiber on metal lath bent around 3/4 in. U-shaped channels stiffened with 3/4 in. or 1 in. channels, putting face of lath 1 3/4 in. from 3/4 in. U.L. listed sprayed fiber on beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 6-4 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDER AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Fiber, Sprayed	1¼ in. and 1½ in. (measured from face of lath) U.L. listed sprayed fiber on metal lath cage supported by metal lath hangers. 1¼ in. thickness of sprayed fiber on beam cage faces and 1½ in. thickness on beam soffit. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 20-4 HR (Beam 4 HR).	4 hrs.
	1½ in. (measured from face of lath) U.L. listed sprayed fiber on adhesive coated metal lath supported by metal lath hangers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 15-3 HR (Beam 4 HR).	4 hrs.
	2 in. (measured from face of lath) U.L. listed sprayed fiber on ribbed metal lath cage spaced at least 2 in. from bottom of beam flange. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 18-5 HR (Beam 5 HR).	4 hrs.
	1½ in. (measured from face of lath) U.L. listed sprayed fiber applied to adhesive coated metal lath boxed around and 1½ in, from steel beam. ¾ in. U.L. listed sprayed fiber also applied to adhesive coated beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 4-3 HR (Beam 4 HR).	4 hrs.
	1 in. (tamped) on sides and 15/16 in. (tamped) on bottom (measurements from face of lath) U.L. listed sprayed fiber applied to adhesive coated metal lath cage around beam and spaced 1 in. below bottom flange. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C114-2 HR (Beam 4 HR).	4 hrs.
	1¼ in. and 1⅜ in. (minimum thickness) U.L. listed sprayed fiber (tamped) applied to sides and bottom respectively of adhesive coated metal lath cage spaced ¾ in. below bottom flange of steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C125-3 HR (Beam 4 HR).	4 hrs.
	1-5/16 in. (measured from face of lath) U.L. listed sprayed fiber applied to metal lath cage around beam and supported by metal lath hangers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 33-3 HR (Beam 3 HR).	3 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDER AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Fiber, Sprayed	1½ in. (measured from face of lath) tamped U.L. listed sprayed fiber applied to metal lath boxed around beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 27-3 HR (Beam 3 HR).	3 hrs.
	1 in. (measured from face of lath) U.L. listed sprayed fiber applied to adhesive coated metal lath boxed around and 2 in. from steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 2-3 HR (Beam 2 HR).	2 hrs.
	1⅞ in. (measured from face of lath) U.L. listed sprayed fiber on metal lath cage supported by metal channel framing spaced at least 2 in. below bottom flange of steel member. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-5 HR (Beam 2 HR).	2 hrs.
	1½ in. (measured from face of lath) U.L. listed sprayed fiber on metal lath cage supported by metal channel framing spaced at least 3 in. from the bottom and 2 in. from edges of structural members. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-3 HR (Beam 1 HR).	1 hr.
Gypsum Perlite on Metal Lath	1½ in. (measured from face of lath) gypsum-perlite plaster on metal lath cage of self furring metal lath which puts back of lath ¼ in. from steel. Plaster mix: scratch and brown coat 2 cu. ft. U.L. listed perlite to 100 lbs. gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 5-3 HR (Beam 4 HR) or Design No. 8-4 HR.	4 hrs.
	1½ in. (measured from face of lath) gypsum-perlite plaster on ribbed metal lath attached to lath hangers wrapped completely around beam. Plaster mix: scratch and brown coats 2½ cu. ft. U.L. listed perlite aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 15-5 HR (Beam 4 HR).	4 hrs.
	1 in. (measured from face of lath) gypsum-perlite plaster on metal lath (heavy plaster key) on metal lath cage around and spaced 3 in. from beam. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-4 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Gypsum Perlite on Metal Lath	1 in. (measured from face of lath) gypsum-perlite plaster on metal lath supported by ¾ in. channels boxed around beam, which puts back of lath at least 1⅛ in. from structural members. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 6-3 HR (Beam 2 HR).	2 hrs.
	1 in. (measured from face of lath) gypsum-perlite plaster on metal lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-1 HR (Beam 1 HR).	1 hr.
	⅞ in. (measured from face of lath) gypsum-perlite plaster on metal lath boxed around beam and supported by No. 8 SWG galvanized wire spaced 12 in. on centers. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. RC2-1 HR (Beam 1 HR).	1 hr.
Gypsum Vermiculite on Metal Lath	2 in. (measured from face of lath) U.L. listed vermiculite acoustical plastic or plaster on metal lath cage. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 10-4 (Beam 4 HR).	4 hrs.
	1⅛ in. (measured from face of lath) gypusm-vermiculite plaster on metal lath attached to ¾ in. furring channels. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed uncoated vermiculite to 100 lbs. fibered gypsum or scratch coat and brown coat of 2 cu. ft. U.L. listed coated or uncoated vermiculite to 100 lbs. fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 16-4 HR (Beam 4 HR).	4 hrs.
	⅞ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported on metal lath hangers. Plaster mix: scratch and brown coat 2 cu. ft. U.L. listed vermiculite aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 49-2 HR and 40-2 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Gypsum Vermiculite on Metal Lath	1½ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath cage. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. uncoated U.L. listed vermiculite to 100 lbs. fibered gypsum or scratch and brown coat 2 cu. ft. coated or uncoated U.L. listed vermiculite to 100 lbs. fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 19-4 HR (Beam 5 HR).	4 hrs.
	¾ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath spaced 1 in. from beam and supported by ¼ in. diameter steel rods spaced 16 in. on centers. Plaster mix: scratch and brown coats 4 cu. ft. of U.L. listed vermiculite to 150 lbs. gypsum. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C104-3 HR.	3 hrs.
	1⅛ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath cage on metal lath hangers spaced 12 in. on centers. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed uncoated vermiculite to 100 lbs. of fibered gypsum or scratch and brown coat of 2 cu. ft. U.L. listed coated or uncoated vermiculite to 100 lbs. fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-3 HR (Beam 3 HR).	3 hrs.
	1⅛ in. (measured from face of lath) gypsum-verviculite plaster on metal lath cage wire tied to No. 9 galvanized wire lath hangers spaced 12 in. on centers. Corner beads wire tied to lath 8 in. on centers. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. of U.L. listed uncoated vermiculite plaster aggregate to 100 lbs. of fibered gypsum or scratch and brown coats of 2 cu. ft. of U.L. listed coated or uncoated vermiculite to 100 lbs. fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 11-2 HR (Beam 2 HR).	2 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

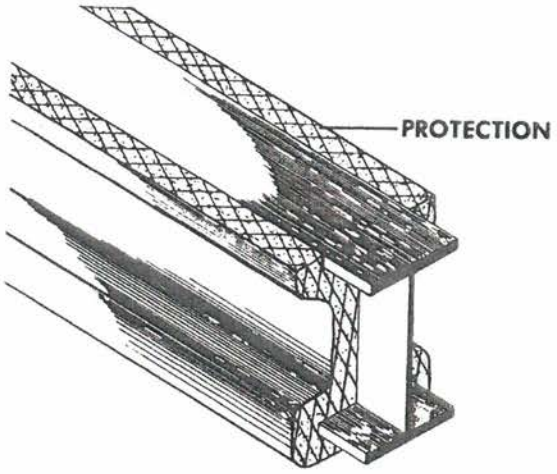
Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Gypsum Vermiculite on Metal Lath	7/8 in. (measured from face of lath) gypsum-vermiculite plaster on metal lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed uncoated vermiculite to 100 lbs. fibered gypsum or scratch and brown coat of 2 cu. ft. U.L. listed coated or uncoated vermiculite to 100 lbs. fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 7-3 HR (Beam 2 HR).	2 hrs.
	1 in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported by metal lath hangers. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed uncoated vermiculite to 100 lbs. of fibered gypsum or scratch and brown coat of 2 cu. ft. U.L. listed coated or uncoated vermiculite to 100 lbs. fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-2 HR (Beam 2 HR).	2 hrs.
	7/8 in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported by metal lath hangers anchored in concrete pads over beams. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed uncoated vermiculite to 100 lbs. fibered gypsum or scratch and brown coat of 2 cu. ft. of U.L. listed coated or uncoated vermiculite to 100 lbs. fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions — Desgin No. RC1-1½ HR (Beam 1½ HR).	1½ hrs.
Precast Concrete	Beam protection of U.L. listed precast concrete units. Joints ½ in. wide filled with mortar mix consisting of 2½ cu. ft. U.L. listed perlite to 100 lbs. of gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 30-4 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)



PROTECTION APPLIED DIRECTLY TO STEEL MEMBER

Protection Type	Details of Protection	Rating
Cementitious Mixtures	9/16 in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 48-3 HR (Beam 5 HR).	4 hrs.
	1 in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beams. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 51-2 HR (Beam 5 HR).	4 hrs.
	1¼ in. (minimum thickness) U.L. listed cementitious mixture machine-applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 34-5 HR, 52-3 HR, 97-2 HR (Beam 4 HR)	4 hrs.
	1½ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 24-3 HR (Beam 4 HR).	4 hrs.
	1¾ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 22-3 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Cementitious Mixtures	2⅛ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 15-2 HR (Beam 4 HR) or Design No. 28-3 HR (Beam 4 HR).	4 hrs.
	2½ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 23-4 HR (Beam 4 HR).	4 hrs.
	1¼ in. (minimum thickness) U.L. of Canada listed cementitious material machine applied directly to steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C112-3 HR (Beam 4 HR).	4 hrs.
	1⅛ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. C128-2 HR (Beam 4 HR).	4 hrs.
	1 in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 38-2 HR (Beam 3 HR) or Design No. 67-3 HR (Beam only).	3 hrs.
	1¼ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 32-3 HR (Beam 3 HR).....	3 hrs.
	1¾ in. (minimum thickness) U.L. listed cementitious mixture sprayed directly on the steel beams. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 31-3 HR (Beam only).	3 hrs.
	1⅞ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 21-3 HR (Beam 3 HR).....	3 hrs.
	2 in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 16-3 HR (Beam 3 HR).....	3 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Cementitious Mixtures	1 in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 68-2 HR (Beam 2 HR).	2 hrs.
	1¼ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions — Design No. RC2-2 HR (Beam 2 HR).	2 hrs.
	2 in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-2 HR (Beam 2 HR).	2 hrs.
Fiber, Sprayed—on Adhesive Coated Steel	15/16 in. (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 50-3 HR (Beam 4 HR).	4 hrs.
	1 in. tamped (1-5/16 in. untamped) (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 62-3 HR (Beam 4 HR).	4 hrs.
	1 in. tamped (1½ in. untamped) (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 58-3 HR (Beam 4 HR).	4 hrs.
	1-1/16 in. (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 29-3 HR, 41-3 HR and 46-3 HR (Beam 4 HR).	4 hrs.
	1-3/16 in. U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 48-2 HR (Beam 4 HR) or Design No. 44-3 HR (Beam 4 HR).	4 hrs.
	1⅜ in. (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 33-4 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Fiber, Sprayed— on Adhesive Coated Steel	1⅞ in. (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 25-5 HR (Beam 5 HR).	4 hrs.
	2⅛ in. (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions—Design No. 14-3 HR (Beam 4 HR).	4 hrs.
	1 in. tamped (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. C115-2 HR (Beam 4 HR) or Design No. C130-3 HR (Beam 4 HR).	4 hrs.
	1¼ in. (minimum thickness) tamped U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. C124-3 HR (Beam 4 HR).	4 hrs.
	1¾ in. (minimum thickness) U.L. listed sprayed fiber applied to steel beam. 1-9/16 in. fiber applied at edge of cut outs in web. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C113-3 HR (Beam 4 HR).	4 hrs.
	13/16 in. tamped (1-3/16 in. untamped) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 89-2 HR (Beam 3 HR).	3 hrs.
	⅞ in. (minimum thickness) U.L. listed sprayed fiber applied directly to adhesive coated steel beam and tamped. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 35-3 HR, 37-2 HR and 52-2 HR (Beam 3 HR)	3 hrs.
	2½ in. (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions — Design No. 9-4 HR (Beam 3 HR) or Design No. 9-3 HR.	3 hrs.
	⅞ in. tamped (minimum thickness) U.L. of Canada listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C129-3 HR (Beam 3 HR).	3 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Fiber, Sprayed— on Adhesive Coated Steel	1-1/16 in. (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C110-3 HR (Beam 3 HR).	3 hrs.
	1-7/16 in. (minimum thickness) tamped U.L. of Canada listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C102-3 HR (Beam 3 HR).	3 hrs.
	1½ in. tamped (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C105-3 HR (Beam 3 HR).	3 hrs.
	1⅛ in. (minimum thickness) U.L. listed sprayed fiber applied directly to adhesive coated steel beam. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C103-2 HR (Beam 2 HR).	2 hrs.
Fiber, Sprayed— no Adhesive Coating on Steel	¾ in. (minimum thickness) tamped (1½ in. untamped) U.L. listed sprayed fiber applied to water sprayed steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 64-3 HR (Beam 4 HR).	4 hrs.
	⅞ in. (minimum thickness) tamped U.L. listed sprayed fiber applied to water sprayed steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 66-3 HR (Beam 4 HR).	4 hrs.
	15/16 in. (minimum thickness) tamped (1⅛ in. untamped) U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 61-3 HR (Beam 5 HR).	4 hrs.
	1 in. tamped (1-3/16 in. untamped) (minimum thickness) U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 51-3 HR (Beam 4 HR).	4 hrs.
	1¾ in. (minimum thickness) U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 28-4 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDERS AND TRUSS PROTECTIONS—Continued

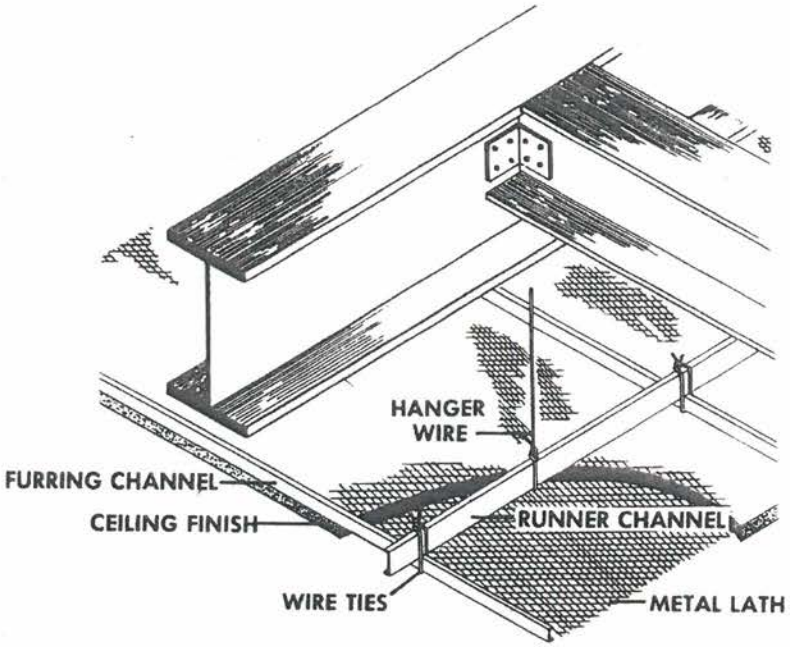
Steel Beams, Girders and Trusses— Individually Protected (Continued)

Protection Type	Details of Protection	Rating
Fiber, Sprayed— no Adhesive Coating on Steel	3⅛ in. (minimum thickness) U.L. listed sprayed fiber applied simultaneously with binder directly to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 26-4 HR (Beam 4 HR).	4 hrs.
	⅞ in. (minimum thickness) U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 37-3 HR (Beam only).	3 hrs.
	1⅞ in. (minimum thickness) tamped U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection— Design No. 20-3 HR (Beam 3 HR).	3 hrs.
	1¾ in. (minimum thickness) tamped U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection— Design No. 26-3 HR (Beam 3 HR).	3 hrs.
	2½ in. (minimum thickness) U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection— Design No. 19-2 HR (Beam 2 HR).	2 hrs.
	⅝ in. (minimum thickness) U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 50-2 HR (Beam only).	2 hrs.
	½ in. (minimum thickness) U.L. listed sprayed fiber applied to steel beam. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 54-2 HR (Beam only).	2 hrs.

Letter superscripts refer to notes, page 139.

BEAM, GIRDER AND TRUSS PROTECTIONS—Continued

Steel Beams, Girders and Trusses— Protected by a Ceiling[j]



SUSPENDED CEILING

Protection Type	Details of Protection	Rating
Cementitious Mixture	Ceiling of 11/16 in. (measured from face of lath) U.L. listed cementitious mixture on metal lath suspended beneath structural members and ducts. Lath supported not less than 3½ in. below structural members and not less than 15½ in. below bottom of floor or roof. Protection, and location of duct openings and other details as specified in U.L. listing[c], under Floor or Roof and Ceiling Constructions—Design No. 10-3 HR (Beam only).	3 hrs.
	Any ceiling protection described under Floor and Ceiling Constructions, Steel, if the beams, girders or trusses do not extend below the level of the ceiling surface more than 6 in. (see note j) and the other details are the same.	Same as Floor and Ceiling Rating

Letter superscripts refer to notes, page 139.

BEAM, GIRDER AND TRUSS PROTECTIONS—Continued

Estimated Ratings

Reinforced Concrete Beams, Girders and Trusses (Estimated)

Protection Type	Details of Protection	Rating
Concrete	1 in.[l] concrete.	1 hr.

Steel Beams, Girders and Trusses— Individually Protected (Estimated)

Plaster and Metal Lath	Two ¾ in. layers of 1:3 gypsum and sand plaster on metal lath, with ¾ in. air space between.	2½ hrs.
	Two ⅞ in. layers 1:2½ portland cement and sand plaster on metal lath, with ¾ in. air space between.	2 hrs.
	¾ in. 1:3 gypsum and sand plaster on metal lath.	1 hr.
	1 in. 1:2½ portland cement and sand plaster on metal lath.	1 hr.

Protection Type	Details of Protection	Minimum Thickness[l] Inches, for Rating of			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Clay tile, Concrete, Brick, or Gypsum	Clay tile or concrete block; plastered with ½ in. portland cement or gypsum plaster.	—	—	2	2
	Clay tile or concrete block; plastered with ½ in. portland cement or gypsum plaster; all spaces between member and tile or block filled solid.	—	2	2	2
	Clay tile or concrete block; unplastered.	—	—	—	2
	Clay tile or concrete block; unplastered; all spaces between member and tile or block filled solid.	—	—	2	2
	Concrete, Group 1 coarse aggregates[k]; metal ties bent around beam flanges and other projecting parts.	2	2	1½	1
	Concrete, Group 2 coarse aggregates[k]; with 3 in. or finer metal mesh placed 1 in. from the finished surface.	2½	2½	2	1½
	Brick, hollow or solid (clay, concrete or sand-lime).	3¾	3¾	2¼	2¼
	Gypsum blocks, hollow; plastered with ½ in. gypsum plaster.	3	3	2	2
	Gypsum blocks, hollow; unplastered; joints grouted.	—	3	2	2
	Gypsum blocks, solid; plastered with ½ in. gypsum plaster.	2	2	2	2
	Gypsum blocks, solid; unplastered; joints grouted.	—	—	2	2
	Gypsum poured; plastered with ½ in. gypsum plaster.	1½	1½	1	½
	Gypsum, poured; unplastered.	2	2	1½	1

Letter superscripts refer to notes, page 139.

CEILING CONSTRUCTIONS

	Rating
Any ceiling construction described under Floor and Ceiling Constructions, **provided there are no combustible materials above the ceiling and the other details are the same.**	Same as Floor and Ceiling Rating

Note. The fire resistance rating of the ceiling constructions described under Floor and Ceiling Constructions is the time in hours the ceiling will protect the structural members above it. Where there is combustible material above the ceiling the fire resistance rating of the ceiling construction will be considerably less than the rating of the floor construction employing the same ceiling protection. See General Notes, page 4.

COLUMN PROTECTIONS

Cast Iron Columns—
7 in. diam., min.[m]

Protection Type	Details of Protection	Rating
Clay Tile	2 in.[l] hollow clay tile with outside wire ties[q]; ¾ in. mortar between tile and column; no fill. (9, 26) ...	3 hrs.
Concrete	2 in., aggregate cinders[o], 1:2:5 mix; no fill. (9, 26)	2½ hrs.
Plaster on Metal Lath	1½ in. portland cement plaster on ¾ in. rib metal lath, with plaster pushed through sufficiently to leave not over ½ in. air space; Plaster mix (by volume): 1:1/10:2½ portland cement, lime and sand; no fill. (9, 26)	3 hrs.

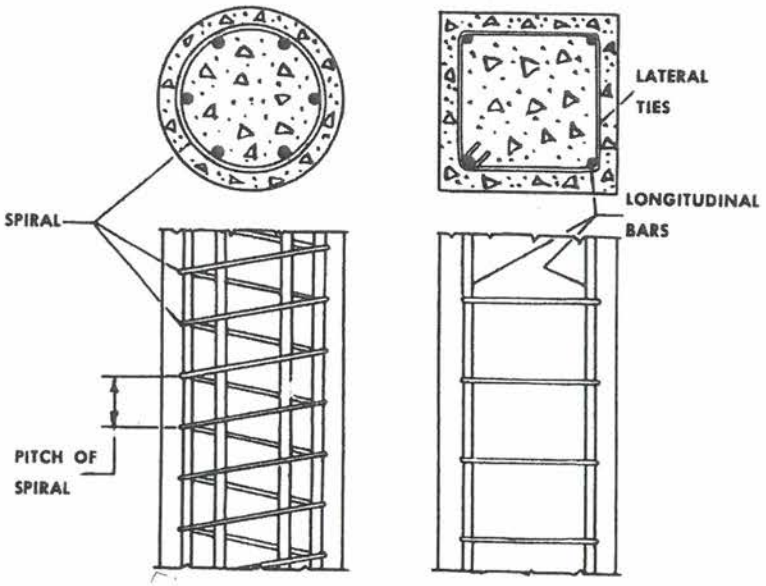
Prefabricated Steel Building Columns

Insulating Concrete	Columns consisting of load bearing elements varied in shape such as steel angles, pipe, tubular or solid wide flange steel sections, protected with insulating concrete all within an exterior protective steel shell. Outside diameter of column varies from approximately 6 to 12¾ inches. Members attached to the column and connections shall have a fire resistance rating not less than the column. Load bearing element shall extend not less than ½ in. beyond insulating concrete and protective shell. Columns having fire resistance indicated below may be identified by the corresponding "Column Design No." on the label of Underwriters Laboratories, Inc. affixed to the column.	
	Design No. 5-4 HR or Design No. 14-4 HR.	4 hrs.
	Design No. 4-3 HR or Design No. 11-3 HR.	3 hrs.
	Design No. 3-2 HR or Design No. 6-2 HR.	2 hrs.
	Design No. 1-1½ HR.	1½ hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Reinforced Concrete[y] Columns

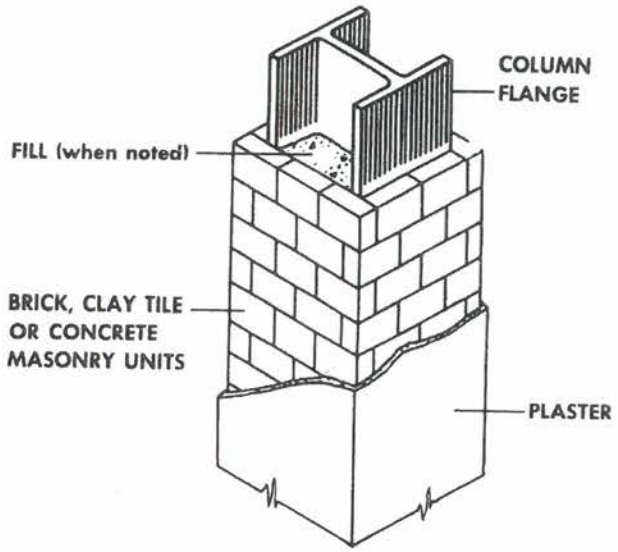


Protection Type	Details of Protection	Rating
Concrete	1½ in.[l] concrete, coarse aggregate limestone, calcareous[n] gravel, trap rock or blast furnace slag; 12 in. or larger round or square columns.[m] (27)	4 hrs.
	2½ in. concrete, coarse aggregate granite, sandstone, or siliceous gravel[s]; 16 in. or larger round or square columns.[m] (27)	4 hrs.
	1½ in. concrete, coarse aggregate granite, sandstone, or siliceous gravel[s]; light 2 in. mesh expanded metal centrally located in the protective covering. 14 in. or larger round or square columns.[m] (27)	4 hrs.
	1½ in. concrete, coarse aggregate granite, sandstone, or siliceous gravel[s]; light 2 in. mesh expanded metal centrally located in the protective covering. 12 in. or larger round or square columns.[m] (27)	3 hrs.
	1½ in. concrete, coarse aggregate granite, sandstone, or siliceous gravel[s]; 16 in. or larger round or square columns.[m] (27)	3 hrs.
	1½ in. concrete, coarse aggregate granite, sandstone, or siliceous gravel[s]; 12 in. or larger round or square columns.[m] (27)	2 hrs.
Concrete and Plaster	1½ in. concrete, ½ in. coarse aggregate granite, sandstone, or siliceous gravel[s]; covered with 1 in. 1:2½ (by volume) portland cement and sand or gypsum and sand plaster, with admixture of not over ½ part lime; surface of column hacked or column cast in metal lath form, 16 in. or larger round or square columns.[m] (27)	4 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns



Protection Type	Details of Protection	Rating
Brick	3¾ in. solid clay brick; brick fill. (26)	4 hrs.
	2¼ in. solid clay brick; brick fill. (26)	1 hr.
Clay Tile, Spaced out from Column	4 in. hollow clay tile, two 2 in. layers; ½ in. mortar between tile and column; ⅜ in. metal mesh in horizontal joints; hollow clay tile fill. (26)	4 hrs.
	2 in. hollow clay tile plastered with ¾ in. 1:3 (by volume) gypsum and sand plaster; ¾ in. mortar between tile and column, ⅜ in. metal mesh in horizontal joints; limestone concrete fill. (26)	4 hrs.
	4 in. hollow clay tile plastered with ⅝ in. 1:2½ (by volume) lime and sand plaster; 1⅛ in. mortar between tile and column, ⅜ in. metal mesh in horizontal joints; limestone concrete fill. (26)	4 hrs.
	2 in. hollow clay tile with outside wire ties[q], or with ⅜ in. metal mesh in horizontal joints; limestone or trap rock concrete fill, extending 1 in. outside column on all sides. (26)	3 hrs.
	2 in. hollow clay tile with outside wire ties[q], with or without concrete fill; ¾ in. mortar between tile and column. (26)	1 hr.
Concrete Masonry Units	3 in. concrete block, hollow, cinder; fill of cinder concrete slabs and mortar with 1¼ in. mortar between column and blocks[r]. (29)	4 hrs.
	4 in. concrete masonry units, solid, expanded clay or shale (rotary kiln); 1½ in. space between column and masonry units. No fill. (113)	4 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

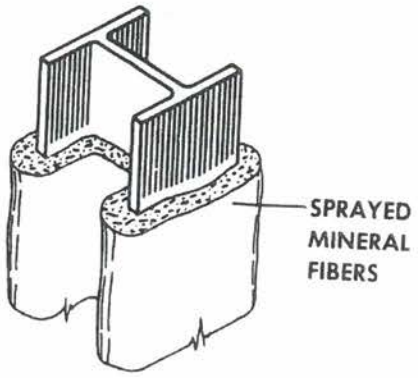
Steel Columns (Continued)

Protection Type	Details of Protection	Rating
Cementitious Material—Direct Application	2½ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 15-4 HR.	4 hrs.
	1⅞ in. U.L. listed cementitious mixture machine applied directly to steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 17-3 HR.	3 hrs.
	2⅛ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 13-3 HR.	3 hrs.
	1½ in. U.L. listed cementitious mixture machine applied directly to steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 7-2 HR.	2 hrs.
Cementitious Material—on Plaster Base	1¾ in. (measured from face of lath) U.L. listed cementitious mixture on self-furring metal lath. No fill. Other details as specified in U.L. listing[c], Column Protection—Design No. 6-4 HR.	4 hrs.
	1⅞ in. (measured from face of lath) U.L. listed cementitious mixture on metal lath spaced ½ in. from column with cementitious mixture pushed through to column flanges. No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 3-4 HR.	4 hrs.
	1¾ in. (measured from face of lath) U.L. listed cement and plaster mixture on ⅜ in. ribbed metal lath wrapped around column. No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 2-3 HR.	3 hrs.
	2 3/16 in. U.L. listed cementitious mixture on ½ in. U.L. listed gypsum wallboard tied to column with No. 18 SWG wire spaced 20 in. on centers. Cementitious mixture reinforced with No. 12 SWG wire (2 in. x 2 in. mesh) spaced 1 in. from wallboard by ⅛ in. thick x ½ in. wide metal lugs welded 20 in. on centers at corners of column. Corner beads tied to wire reinforcing with No. 16 gauge wire, 20 in. on centers. Other details as specified in U.L. listing[c], under Column Protection—Design No. 21-4 HR.	4 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)



Protection Type	Details of Protection	Rating
Fiber, Sprayed—Direct Application	1¾ in. untamped (minimum thickness) U.L. listed sprayed fiber applied to water sprayed steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 20-4 HR.	4 hrs.
	2½ in. tamped (minimum thickness) U.L. listed sprayed fiber applied directly to adhesive coated steel column. Other details as specified in U.L. listing[c], under Column Protection — Design No. 11-5 HR.	4 hrs.
	2¾ in. tamped (minimum thickness) U.L. listed sprayed fiber applied to water sprayed steel column. Two applications: first coat 2⅜ in. tamped (3 in. untamped), second coat making total depth 3⅛ in. untamped. Other details as specified in U.L. listing[c], under Column Protection—Design No. 18-4 HR.	4 hrs.
	3 in. (minimum thickness) tamped U.L. listed sprayed fiber applied directly to adhesive coated steel column. Other details as specified in U.L. listing[c], under Column Protection — Design No. 16-4 HR.	4 hrs.
	3¼ in. (minimum thickness) tamped (untamped thickness 4 to 4⅛ in.) U.L. listed sprayed fiber applied to adhesive coated steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 19-4 HR.	4 hrs.
	3½ in. tamped (minimum thickness) U.L. listed sprayed fiber applied directly to adhesive coated steel column. Other details as specified in U.L. listing[c], under Column Protection — Design No. 17-4 HR.	4 hrs.
	3⅜ in. tamped (minimum thickness) U.L. listed sprayed fiber applied directly to steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 12-5 HR.	4 hrs.
	2 in. tamped (minimum thickness) U.L. listed sprayed fiber applied directly to adhesive coated steel column. Other details as specified in U.L. listing[c], under Column Protection — Design No. 12-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

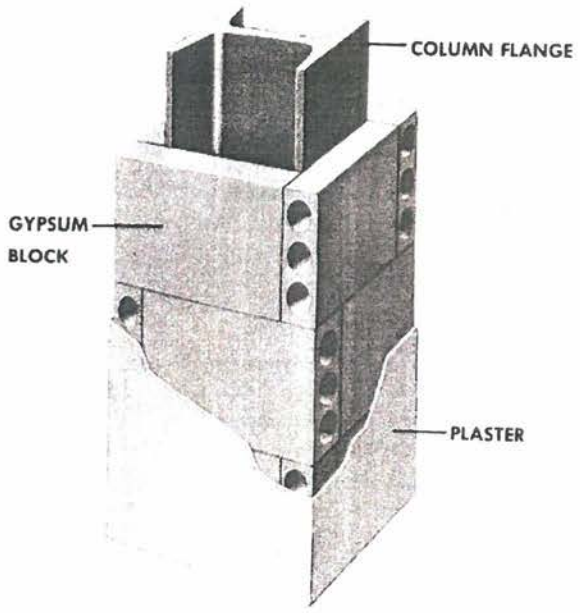
Steel Columns (Continued)

Protection Type	Details of Protection	Rating
Fiber, Sprayed—Direct Application	2¼ in. tamped (minimum thickness) U.L. listed sprayed fiber applied directly to steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 10-3 HR.	3 hrs.
	2¾ in. tamped (minimum thickness) (3 to 3⅛ in. untamped) U.L. listed sprayed fiber applied directly to adhesive coated steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 16-3 HR.	3 hrs.
	3⅝ in. tamped (minimum thickness) U.L. listed sprayed fiber applied to adhesive coated steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 15-3 HR.....	3 hrs.
	1⅛ in. (minimum thickness) untamped U.L. listed sprayed fiber applied to water sprayed 14WF steel column. Other details as specified in U.L. listing[c], under Column Protection—Design No. 19-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)

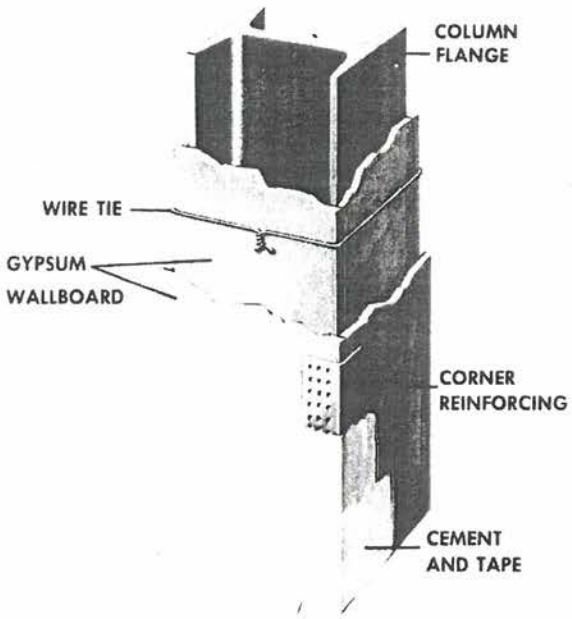


Protection Type	Details of Protection	Rating
Gypsum Block, Hollow or Solid	4 in. gypsum block, solid; corrugated metal ties or ⅜ in. metal mesh in horizontal joints; gypsum block or poured gypsum fill; ¾ in. gypsum mortar between column and block. (26)	4 hrs.
	2 in. gypsum block, solid; plastered with ½ in. gypsum and sand plaster; ⅞ in. 12 gauge metal cramps set in holes drilled in blocks to link adjacent blocks of the same course together; no fill. (28)	4 hrs.
	2 in. gypsum block, solid; wire lath strips laid in horizontal joints; fill of gypsum block and mortar with ½ in. mortar between column and blocks and with ½ in. gypsum and sand plaster on outside. (28)	4 hrs.
	3 in. gypsum block, hollow; covered with ½ in. gypsum and sand plaster; ⅞ in. 12 gauge metal cramps linking adjacent blocks of same course; ¼ in. mortar between column flange and block; no fill. (28)	4 hrs.
	2 in. gypsum block, solid; unplastered; ⅞ in. 12 gauge metal cramps set in holes drilled in blocks to link adjacent blocks of same course together; no fill. (28)	2 hrs.
	2 in. gypsum block, solid; corrugated metal ties or ⅜ in. metal mesh in horizontal joints; gypsum block or poured gypsum fill; ¾ in. gypsum mortar between column and block. (26)	2 hrs.
	3 in. gypsum block, hollow; unplastered; ⅞ in. 12 gauge metal cramps linking adjacent blocks of same course; no fill. (28)	2 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)



Protection Type	Details of Protection	Rating
Gypsum Wallboard	Three layers of ½ in. thick U.L. listed gypsum wallboard. Wallboard secured to two sections of 24 gauge sheet steel liner each forming two sides of column protection by 1⅞ in. self-drilling, self-tapping steel screws spaced 12 in. on centers. Two sections of column protection spaced 1¼ in. from column by noncombustible spacers and joined at opposite corners by ½ in. self-drilling, self-tapping steel screws 12 in. on centers. Sheet steel liner covered with ½ in. U.L. listed mineral board and secured to liner by 1 in. self-drilling, self- tapping steel screws 12 in. on centers. Other details as specified in U.L. listing[c], under Column Protection—Design No. 22-4 HR.	4 hrs.
	Three layers of ⅝ in. thick U.L. listed gypsum wallboard. Inner layer secured to column by wire ties; second layer cemented and wire tied to inner layer; outer layer cemented to second layer. Corner beads used for each layer. Wire ties of No. 18 gauge spaced 21 in. on centers and two outer layers of wallboard secured through corner beads of each layer with 1 in. long screws spaced 12 in. on centers. Other details as specified in U.L. listing[c], under Column Protection — Design No. 14-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)

Protection Type	Details of Protection	Rating
Gypsum Wallboard	Three layers of 5/8 in. U.L. listed gypsum wallboard. Inner layer spaced 1⅜ in. from column flanges and secured to 1⅜ x 1⅝ in. spacer studs at corners of column with 1 in. self-tapping sheet metal screws spaced 24 in. on centers. Second layer secured to spacer studs with 1¾ in. self-tapping sheet metal screws spaced 12 in. on centers and reinforced with double strands of No. 18 gauge soft steel wire spaced 24 in. on centers. Outer layer secured to spacer studs with 2¼ in. self-tapping sheet metal screws spaced 12 in. on centers. No. 25 gauge galvanized corner beads secured to outer layers with 1¾ in. nails 12 in. on centers at each leg of corner bead. Other details as specified in U.L. listing[c], under Column Protection—Design No. 18-3 HR.	3 hrs.
	Four layers ½ in. gypsum wallboard. Inner three layers cemented and clinch nailed together, cemented to column flanges and tied to column with double strands 18 gauge tie wire at 15 in. spacing. Outer layer cemented to inner layer; corners cemented and taped. (69)	2½ hrs.
	Three layers of 5/8 in. U.L. listed gypsum wallboard; first layer applied to steel columns with ends of wallboard secured by nailing 1⅜ in. ring-shank nails having 5/16 in. heads spaced 24 in. on centers. Second layer of wallboard applied to first layer by same method. 1¼ in. by 1¼ in. by 0.021 in. angles attached to corners of column protection and secured by metal strapping 0.015 in. in thickness at center of column and 18 in. from each end. Third layer of wallboard attached to previous layer by 1 in. long self-tapping screws spaced 12 in. on centers and screwed to metal angles at corners. Corner bead and finishing compound applied to third layer. Other details as specified in U.L. listing[c], under Column Protection — Design No. 5-2 HR.	2 hrs.
	Two layers of 5/8 in. U.L. listed gypsum wallboard applied to 1⅝ x 1⅜ in. metal studs spacing wallboard 1⅜ in. from column flange. Inner layer secured to studs with 1 in. self-tapping sheet metal screws spaced 24 in. on centers; outer layer secured to studs with 1¾ in. self-tapping sheet metal screws spaced 12 in. on centers. Corner beads attached to wallboard with 1¾ in. 6d nails spaced 12 in. on centers. Other details as specified in U.L. listing[c], under Column Protection—Design No. 8-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

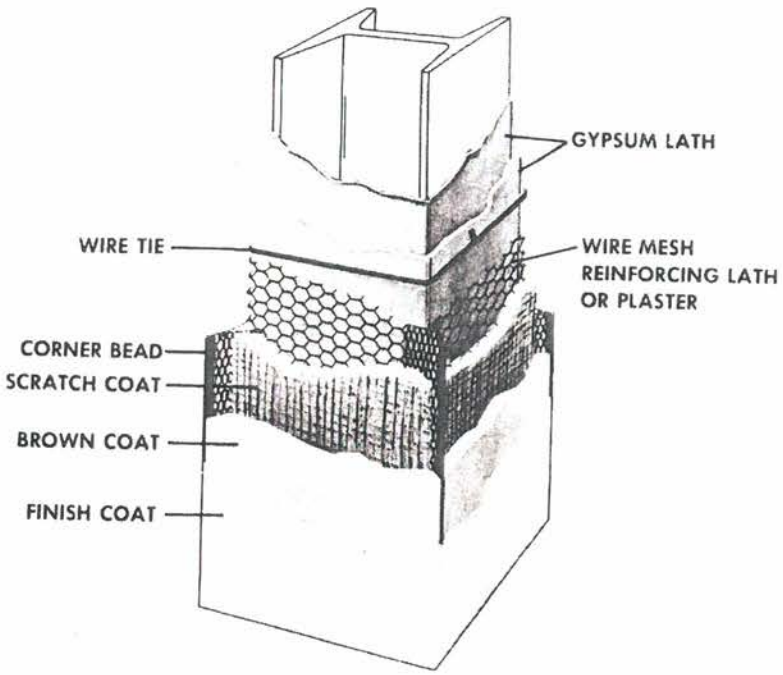
Steel Columns (Continued)

Protection Type	Details of Protection	Rating
Gypsum Wallboard	Three layers ½ in. gypsum wallboard. Inner two layers cemented and clinch nailed together, cemented to column flanges and tied to column with double strands 18 gauge tie wire at 15 in. spacing. Outer layer cemented to inner layer; corners cemented and taped. (69)	1½ hrs.
	Two layers ½ in. gypsum wallboard. Inner layer cemented to column flanges and tied to column with double strands 18 gauge tie wire at 15 in. spacing. Outer layer cemented to inner layer; corners cemented and taped. (69)	1 hr.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)



Protection Type	Details of Protection	Rating
Plaster on Gypsum Lath (two layers)	1½ in. gypsum-vermiculite plaster on two layers of ½ in. gypsum lath boxed around column, fastened with wire ties and reinforced with 1 in. wire mesh. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. vermiculite to 100 lbs. gypsum. (92)	4 hrs.
	1½ in. gypsum-perlite plaster on two layers of ½ in. gypsum lath boxed around column, fastened with wire ties and reinforced with 1 in. wire mesh. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. gypsum. (92)	4 hrs.
	1 in. gypsum-perlite plaster on two layers of ½ in. gypsum lath boxed around column, fastened with wire ties and reinforced with 1 in. wire mesh. Plaster mix: 100 lbs. gypsum to 2½ cu. ft. perlite. (92)	3 hrs.
	1⅜ in. gypsum-perlite plaster, on two layers of ½ in. gypsum lath boxed around column and fastened with wire ties. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. gypsum. (92)	3 hrs.
	1¼ in. gypsum-vermiculite plaster on two layers ⅜ in. perforated gypsum lath boxed around column and fastened with wire ties. Plaster mix: 2¼ cu. ft. U.L. listed vermiculite plaster aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Column Protection—Design No. 5-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

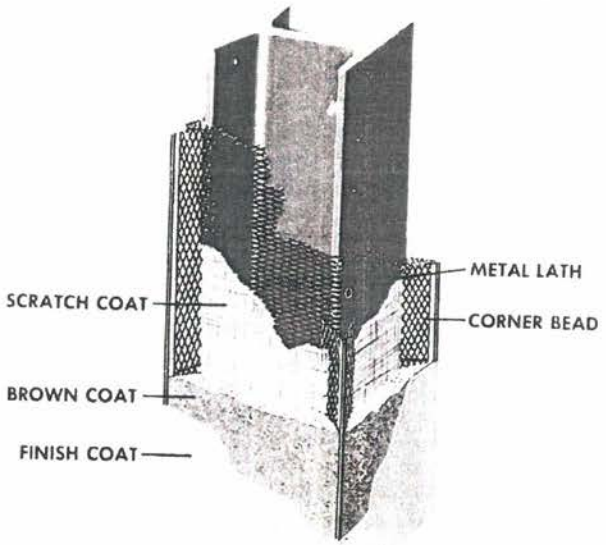
Steel Columns (Continued)

Protection Type	Details of Protection	Rating
Plaster on Gypsum Lath (one layer)	2⅛ in. gypsum-perlite plaster reinforced with poultry netting, on ½ in. gypsum wallboard boxed around column. Plaster mix: scratch coat 3½ cu. ft. and brown coat 4 cu. ft. U.L. listed perlite plaster aggregate to 100 lbs. unfibered gypsum. No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 4-4 HR.	4 hrs.
	1½ in. gypsum-perlite plaster reinforced with wire mesh, on ½ in. gypsum lath boxed around column and fastened with wire ties. Plaster mix: 100 lbs. gypsum to 2½ cu. ft. perlite. (92)	3 hrs.
	2 in. gypsum and sand plaster on ⅜ in. perforated gypsum lath boxed around column and fastened with wire ties. Plaster mix: scratch coat 200 lbs. and brown coat 300 lbs. sand to 100 lbs. fibered gypsum. (90)	3 hrs.
	1⅜ in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath boxed around column and fastened with wire ties. Corner bead wings not in contact with gypsum lath for full height of column but attached to gypsum lath by 2 in. long extensions spaced 12 in. on centers. Extensions formed by cutting metal wings of corner beads on a diagonal every 12 in. to such a depth that when the resulting loose flaps are folded over they produce 2 in. extensions to the metal wings. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. gypsum. (116)	3 hrs.
	1½ in. gypsum-perlite plaster, on ⅜ in. perforated gypsum lath boxed around column and fastened with wire ties. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. gypsum. (92)	2½ hrs.
	1 in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath boxed around column and fastened with wire ties. Plaster mix: 100 lbs. gypsum to 2½ cu. ft. perlite. (92)	2 hrs.
	½ in. 1:2½ gypsum and sand plaster on ⅜ in. perforated gypsum lath boxed around column and fastened with wire ties. (92)	1 hr.
	⅝ in. 1:2½ gypsum and sand plaster on ⅜ in. perforated gypsum lath boxed around column and fastened with wire ties. (92)	1½ hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)



Protection Type	Details of Protection	Rating
Plaster on Metal Lath	¾ in. 1:3 gypsum and sand plaster or 1 in. 1:2½ portland cement and sand plaster, on metal lath. (9)	1 hr.
	1 in. plaster, 1:1/10:2½ (by volume) portland cement, lime and sand on metal lath; no fill. (26)	1 hr.
Plaster on Metal Lath, Self Furring Type	1¾ in. (measured from face of lath) gypsum-perlite plaster on self-furring metal lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 6-4 HR.	4 hrs.
	1¾ in. (measured from face of lath) gypsum-vermiculite plaster on self-furring metal lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed uncoated vermiculite plaster aggregate to 100 lbs. fibered gypsum or scratch and brown coats of 2 cu. ft. U.L. listed uncoated or coated vermiculite plaster aggregate to 100 lbs. of fibered gypsum (scratch coat) and 100 lbs. unfibered gypsum (brown coat). No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 9-4 HR.	4 hrs.
	1⅜ in. (measured from face of lath) gypsum-perlite plaster on self-furring metal lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. of perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Column Protection—Design No. 6-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

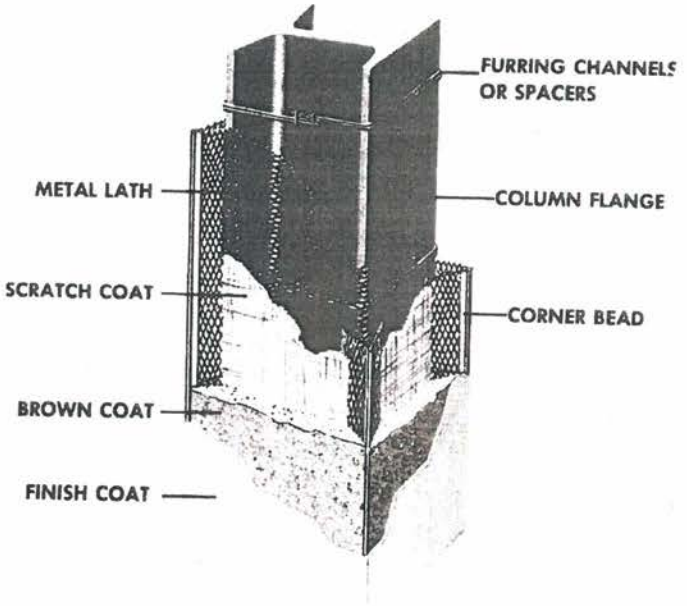
Steel Columns (Continued)

Protection Type	Details of Protection	Rating
Plaster on Metal Lath, Self Furring Type	1⅜ in. (measured from face of lath) gypsum-vermiculite plaster on self-furring metal lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed vermiculite plaster aggregate to 100 lbs. fibered gypsum. No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 8-3 HR.	3 hrs.
	1 in. (measured from face of lath) gypsum-perlite plaster on self-furring metal lath to fur lath ¼ in. from steel. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Column Protection—Design No. 2-2 HR.	2 hrs.
Plaster on Metal Lath, Space Between Two Layers of Plaster	Two ¾ in. layers of 1:3 gypsum and sand plaster or two 1 in. layers of 1:2½ portland cement and sand plaster, on metal lath, with ¾ in. air space between the two layers; no fill. (9)	2½ hrs.
	2½ in. plaster, two ⅞ in. layers 1:1/10:2½ (by volume) portland cement, lime and sand on metal lath; ¾ in. air space between layers; no fill. (26)	2 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)



Protection Type	Details of Protection	Rating
Plaster on Metal Lath spaced from column	1½ in. (measured from face of lath) gypsum-perlite plaster on metal lath spaced from flanges by ¾ in. steel furring channels at approx. 2 ft. vertical spacings. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. No fill. Other details as specified in U.L. listing[c], under Column Protection — Design No. 7-4 HR.	4 hrs.
	1½ in. (measured from face of lath) gypsum-perlite plaster on metal lath spaced 1¼ in. from column with plaster pushed through to column flanges. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite plaster aggregate to 100 lbs. fibered gypsum. No fill. Other details as specified in U.L. listing[c], under Column Protection —Design No. 2-4 HR.	4 hrs.
	1 in. gypsum-vermiculite plaster (measured from face of lath) on metal lath spaced 1 in. from column. Plaster mix: 4:1 by weight of approx. 100 lbs. fibered gypsum to 2½ cu. ft. vermiculite. Loose vermiculite fill. (32)	4 hrs.
	1 in. (measured from face of lath) gypsum-perlite plaster on metal lath spaced 1¼ in. from column, with plaster pushed through to column flanges. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite plaster aggregate to 100 lbs. fibered gypsum. No fill. Other details as specified in U.L. listing[c], under Column Protection —Design No. 3-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

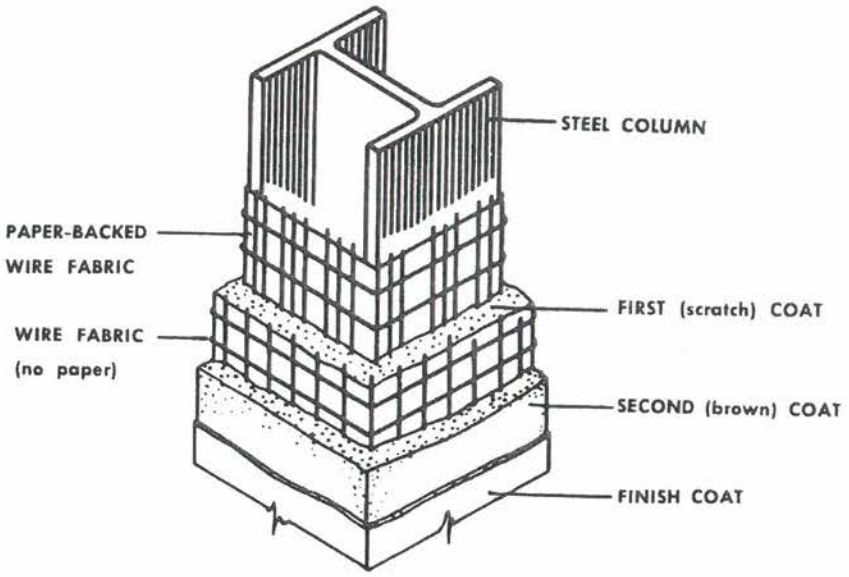
Steel Columns (Continued)

Protection Type	Details of Protection	Rating
Plaster on Metal Lath spaced from column	1½ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath spaced 1¼ in. from column. Plaster mix: scratch coat 2 cu. ft. of U.L. listed vermiculite to 100 lbs. fibered gypsum and brown coat 4 cu. ft. of U.L. listed vermiculite to 150 lbs. fibered gypsum. No. fill. Other details as specified in U.L. listing[c], under Column Protection —Design No. 9-3 HR.	3 hrs.
	1 in. (measured from face of lath) gypsum-perlite plaster on metal lath spaced 1¼ in. from column. Plaster mix. scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite plaster aggregate to 100 lbs. fibered gypsum. No. fill. Other details as specified in U.L. listing[c], under Column Protection —Design No. 1-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)

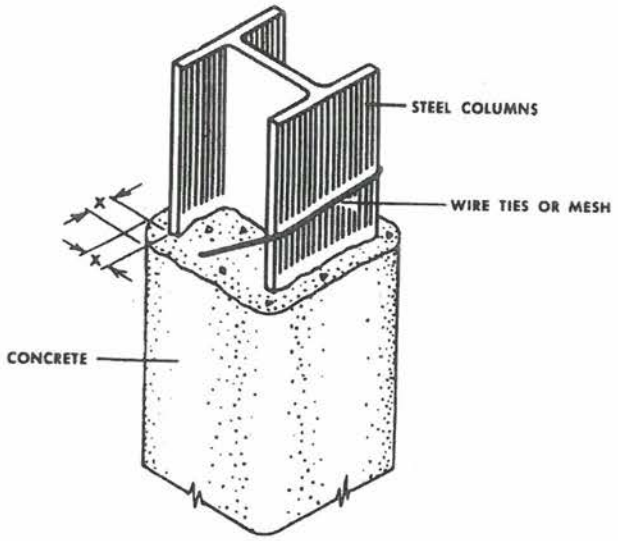


Protection Type	Details of Protection	Rating
Plaster on Wire Fabric	2 in. portland cement vermiculite plaster reinforced with plain wire fabric, on paper-backed No. 16 gauge welded wire fabric. Plaster mix: 4 cu. ft. U.L. listed vermiculite plaster aggregate to 94 lbs. of portland cement. No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 10-4 HR.	4 hrs.
	2⅛ in. perlite-plaster reinforced with plain wire fabric, on paper-backed No. 16 gauge welded wire fabric. Plaster mix: 3½ cu. ft. U.L. listed perlite plaster aggregate to 94 lbs. of portland cement. No fill. Other details as specified in U.L. listing[c], under Column Protection—Design No. 8-4 HR.	4 hrs.

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Steel Columns (Continued)



Protection Type	Details of Protection	Minimum Thickness[l] Inches, for Rating of			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Portland Cement or Gypsum Concrete	Concrete, coarse aggregate calcareous[n] or limestone; fill of same material. (9, 26)				
	6 x 6 in. or larger[m]	2	1½	1	1
	8 x 8 in. or larger	1½	1	1	1
	12 x 12 in. or larger	1	1	1	1
	Concrete, coarse aggregate trap rock; fill of same material; steel wire ties[p]. (9, 26)				
	6 x 6 in. or larger[m]	2½	2	1½	1
	8 x 8 in. or larger	2	1½	1	1
	12 x 12 in. or larger	1½	1	1	1
	Concrete, coarse aggregate granite, sandstone, siliceous[x] gravel or cinders[o]; fill of same material; steel wire ties[aa]. (95)				
	6 x 6 in. or larger[m]	3	2	1½	1
	8 x 8 in. or larger	2½	2	1	1
	12 x 12 in. or larger	2	1	1	1
	Gypsum concrete, poured; fill of same material; 4 x 4 in. wire mesh reinforcement wrapped around column[t]. (28)	2	—	—	—

Letter superscripts refer to notes, page 139.

COLUMN PROTECTIONS—Continued

Timber Columns—

Long Leaf Pine or Douglas Fir. Minimum Area 120 *sq. in.*

Protection Type	Details of Protection	Rating
Gypsum Wallboard	⅜ in. gypsum wallboard on column and covering cast iron or steel cap. (9, 26)	1 hr. comb.
Plaster on Metal Lath	1 in. 1:2½ portland cement and sand plaster on metal lath spaced ¾ in. from column. Plaster protecting cast iron or steel cap. (9, 26)	2 hrs. comb.

Estimated Ratings

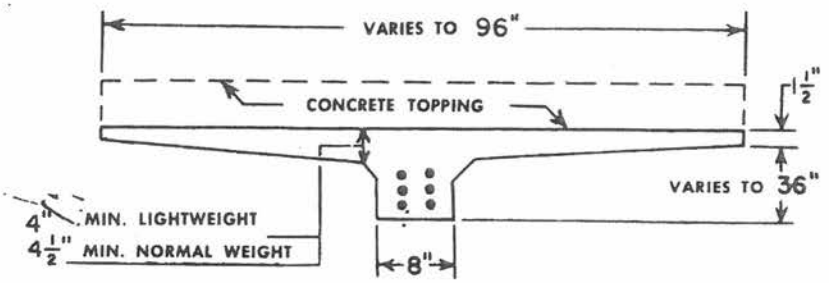
Steel Column

Protection Type	Details of Protection	Rating
Plaster on Gypsum Lath	1⅜ in. 1:2, 1:3 gypsum and sand plaster on ⅜ in. perforated gypsum lath wire tied to column. Additional wire ties around column through portions of corner beads reinforcing plaster.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS

Pretensioned (Prestressed) Concrete

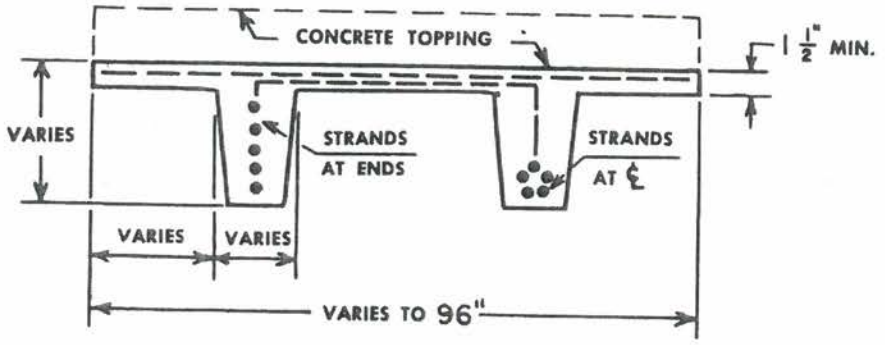


Ceiling Type	Details of Construction	Rating[ff]
None	U.L. listed precast concrete single "T" units of coarse aggregate calcareous (normal weight) gravel. 1½ in. minimum thickness top slab, overall unit depth 38 in. Minimum and maximum number of steel tendons, side and bottom concrete cover to steel tendon holddown device and steel tendons, location and size of reinforcing mesh and steel and other details as shown in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection and as specified in specifications of U.L., Inc. for labeled precast concrete units—Design No. 44-2 HR.	
	Above described units with the following type and thickness of concrete topping:	
	Concrete coarse aggregate limestone or calcareous.	
	2¼ in. (estimated)	1 hr.
	4 in.	2 hrs.
	4½ in. (estimated)	3 hrs.
	5½ in. (estimated)	4 hrs.
	U.L. listed precast concrete single "T" units of coarse aggregate expanded shale (light-weight). 1½ in. minimum thickness of top slab, overall maximum unit depth 37½ in. Minimum and maximum number of steel tendons, side and bottom concrete cover to steel tendon holddown device and steel tendons, location and size of reinforcing mesh and steel and other details as shown in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection and as specified in specifications of U.L., Inc. for labeled precast concrete units—Design No. 36-3 HR.	
	Above described units with the following type and thickness of concrete topping:	
	Concrete coarse aggregate expanded shale.	
	1½ in. (estimated)	1 hr.
	2½ in. (estimated)	2 hrs.
	3 in.	3 hrs.
	3¾ in. (estimated)	4 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Pretensioned (Prestressed) Concrete (Continued)

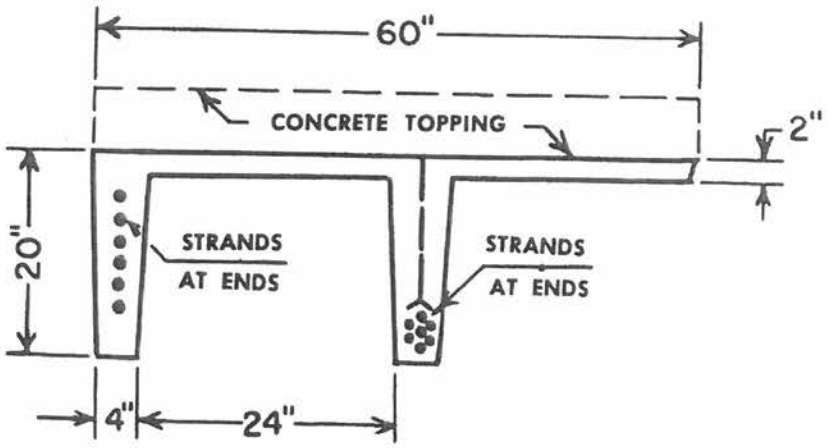


Ceiling Type	Details of Construction	Rating[ff]
None	U.L. listed precast concrete double "T" units of coarse aggregate calcareous, siliceous or limestone gravel. 1½ in. minimum thickness top slab. Number of steel tendons per stem, concrete cover to steel hold-down device and steel tendons, location and size of reinforcing mesh and steel, dimensions and other details as shown in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection and as specified in specifications of U.L., Inc. for labeled precast concrete units—Design No. 5-2 HR.	
	Above described units with the following type of concrete topping:	
	Concrete coarse aggregate limestone topping on limestone units. Topping plus slab.	
	3¾ in. total thickness (estimated)	1 hr.
	5 in. total thickness	2 hrs.
	Concrete coarse aggregate calcareous or siliceous topping on calcareous or siliceous units. Topping plus slab.	
	4 in. total thickness (estimated)	1 hr.
	5¼ in. total thickness	2 hrs.
	U.L. listed precast concrete double "T" units of coarse aggregate expanded shale (rotary kiln). 1½ in. minimum thickness top slab. Number of steel tendons per stem, side and bottom concrete cover to steel holddown device and steel tendons, location and size of reinforcing mesh and steel, dimensions and other details as shown in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection and as specified in specifications of U.L., Inc. for labeled precast concrete units—Design No. 67-2 HR.	
	Above described units with the following type of concrete topping:	
	Concrete coarse aggregate expanded shale topping on expanded shale units. Topping plus slab.	
	3 in. total thickness (estimated)	1 hr.
	4 in. total thickness	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Pretensioned (Prestressed) Concrete (Continued)

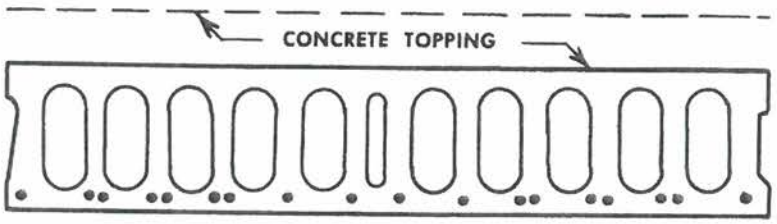


Ceiling Type	Details of Construction	Ratingff
None	U.L. listed precast concrete monowing units of coarse aggregate calcareous, siliceous or limestone. 2 in. minimum thickness top slab, overall maximum unit depth 20 in. Number of steel tendons, concrete cover to steel tendon hold-down device and steel tendons, location and size of reinforcing mesh and steel and other details as shown in U.L. listing[e], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 26-2 HR. or as specified in specifications of U.L., Inc. for labeled precast concrete units — Design No. 5-2 HR.	
	Above described units with the following type and thickness of concrete topping will provide the ratings indicated below:	
	Concrete coarse aggregate limestone topping on limestone units.	
	1¾ in. (estimated)	1 hr.
	3 in.	2 hrs.
	Concrete coarse aggregate calcareous siliceous topping on calcareous or siliceous units.	
	2 in. (estimated)	1 hr.
	3¼ in.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Pretensioned (Prestressed) Concrete (Continued)

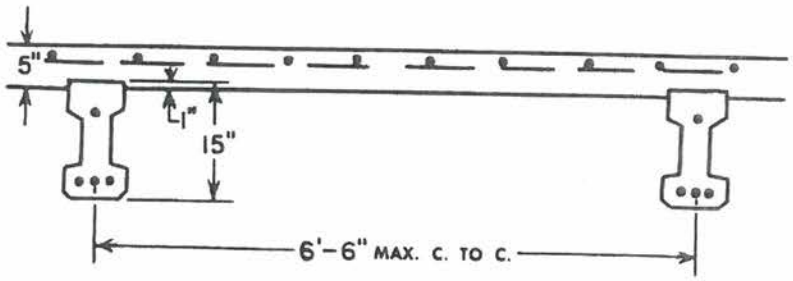


Ceiling Type	Details of Construction	Rating[ff]
None	**U.L. listed precast hollow core concrete units. Number, size and shape of cells per unit varies and concrete protection to steel tendons varies. Details in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protections.**	
	8 in. unit, 40 in. or 48 in wide, incorporating three types of concrete aggregate, 1½ in. concrete protection to steel tendons and 1½ in. thick concrete topping of coarse aggregate calcareous or limestone. Design No. 22-4 HR.	4 hrs.[cc]
	8 in. unit, 24 in. wide, incorporating calcareous aggregate, 1½ in. concrete protection to steel tendons and 2 in. thick concrete topping of coarse aggregate calcareous. Design No. 30-3 HR.	3 hrs.
	8 in. unit, 48 in. wide, incorporating limestone aggregate and 1⅛ in. concrete protection to steel tendons and 2 in. thick concrete topping of coarse aggregate limestone. Design No. 55-3 HR.	3 hrs.
	8 in. unit, 40 in. wide, incorporating three types of concrete aggregate and ¾ in. concrete protection to steel tendons. Design No. 9-2 HR.	2 hrs.
	8 in. unit, 24 in. wide, incorporating calcareous aggregate and 1½ in. concrete protection to steel tendons. Design No. 20-2 HR.	2 hrs.
	6 in. unit, 40 in. wide, incorporating calcareous aggregate, ¾ in. concrete protection to steel tendons and 2 in. thick concrete topping of coarse aggregate calcareous. Design No. 28-2 HR.	2 hrs.
	12 in. unit, 48 in. wire, incorporating expanded shale aggregate with 2¾ in. concrete topping, coarse aggregate expanded shale, 1 in. concrete protection to strands. Design No. 25-2 HR.	2 hrs.
	8 in. unit. 48 in. wide, incorporating expanded shale aggregate in bottom shell and expanded shale and limestone aggregate in remainder of unit. 1⅝ in. shell thickness and 1⅞ in. concrete protection to strands. Design No. 61-2 HR.	2 hrs.
	8 in. unit, 48 in. wide, incorporating limestone aggregate and 1-1/16 in. concrete protection to steel tendons. Design No. 10-1½ HR.	1½ hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Pretensioned (Prestressed) Concrete (Continued)



Ceiling Type	Details of Construction	Rating[ff]
None	5 in. reinforced concrete slab with limestone aggregate, 1 in. protection to slab reinforcing steel. Slab supported on 15 in. deep U.L. listed precast concrete units spaced not more than 6'–6" on centers. Number and location of steel tendons, side and bottom concrete cover to steel tendons, dimensions of units and other details as specified in specifications of U.L., Inc. for labeled precast concrete units—Design No. 75-2 HR.	2 hrs.
	Above described units with the following slab thickness of reinforced concrete with Group I aggregates will provide the ratings indicated:	
	3¾ in. (estimated)	1 hr.
	6 in. (estimated)	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Reinforced Concrete[u], Poured in Place

Ceiling Type	Details of Construction	Rating
Cementitious Mixture Applied Directly to Slab	2½ in. slab with siliceous aggregate. ¾ in. protection to steel reinforcement. Ceiling of ⅞ in. U.L. listed cementitious mixture applied directly to underside of concrete slab. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 99-2 HR.	2 hrs.
Plaster on Metal Lath	5 in. slab with limestone aggregate, with electrical raceways and junction boxes[dd]. Ceiling of 1 in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported from the bottom of the concrete slab. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu ft. U.L. listed vermiculite to 100 lbs. fibered gypsum. (62-K)	4 hrs.
	3 in. slab with limestone aggregate. Ceiling of 1 in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported from the bottom of the concrete slab. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed vermiculite to 100 lbs. fibered gypsum. (62-K)	4 hrs.
	4 in. slab with limestone aggregate, with electrical raceways and junction boxes[ee]. Ceiling of ¾ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported not less than 11½ in. from the bottom of the concrete slab. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed vermiculite to 100 lbs. fibered gypsum. (62-I)	3 hrs.
	2 in. slab with limestone aggregate. Ceiling of ¾ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported not less than 13½ in. from the bottom of the concrete slab. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed vermiculite to 100 lbs. fibered gypsum. (62-I)	3 hrs.
None	4½ in. slab with expanded slag aggregate. ¾ in. protection to steel reinforcement. (62-A)	4 hrs.
	5¼ in. slab with expanded shale aggregate (rotary kiln). ¾ in. protection to steel reinforcement. (128)	4 hrs.
	6 in. slab with air-cooled slag aggregate. 1 in. protection to steel reinforcement. (62-J)	4 hrs.
	6 in. slab with traprock calcareous or siliceous aggregate. 1 in. protection to steel reinforcement. (62-C,D,L,P)	3 hrs.
	6 in. slab with crushed limestone aggregate, with electrical raceways and junction boxes. 1 in. protection to steel reinforcement. (62-B,O)	3 hrs.[ii]
	4¾ in. slab with air-cooled slag aggregate. ¾ in. protection to steel reinforcement. (62-M)	2½ hrs.
	4¾ in. slab with traprock or siliceous gravel aggregate[s]. ¾ in. protection to steel reinforcement. (62-E,H)	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Reinforced Concrete[u], Poured in Place (Continued)

Ceiling Type	Details of Construction	Rating
None	4¾ in. slab with calcareous gravel or crushed limestone aggregate. 1 in. protection to steel reinforcement. (62-F,G)	2 hrs.
	4 in. slab with siliceous gravel aggregate. ¾ in. protection to steel reinforcement. (33)	1 hr.
	3 in. slab with limestone aggregate. ¾ in. protection to steel reinforcement. (62-Q)	1 hr.

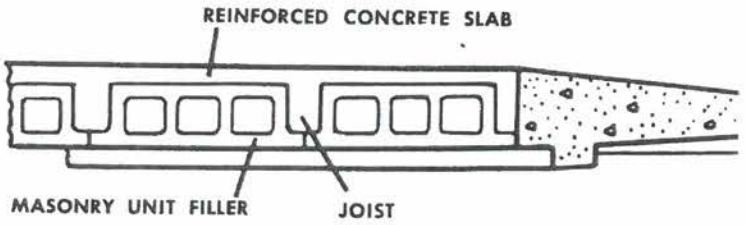
Reinforced Concrete—Precast

None	6 in. thick floor consisting of 3½ in. thick U.L. listed precast concrete units with 2½ in. concrete topping. Electrical raceways and junction boxes in concrete topping not more than 1 junction box in each 90 sq. ft. of floor area. Raceway not to exceed 2⅞ in. in width and 1⅜ in. in depth. Placing of precast concrete units and location of electrical raceways and junction boxes and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 30-4 HR.	4 hrs.
Fiber, Sprayed—Applied Directly to Concrete	1¾ in. concrete with expanded clay or shale aggregate (rotary kiln) on top of 4 in. U.L. listed precast concrete units. Ceiling of ⅜ in. U.L. listed sprayed fiber applied directly to adhesive coated precast concrete units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 35-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Reinforced Concrete—Masonry or Wood Fiber Fillers[u]



Filler Type	Details of Construction	Rating
Clay Tile	6 in. hollow clay tile fillers laid end to end in rows 2½ in. or more apart; reinforcing steel placed between rows and concrete cast around and over tile to a depth of 2 in. Ceiling plastered with ⅝ in. 1:3 gypsum and sand plaster. (33)	2 hrs.
	4 in. hollow clay tile fillers laid end to end in rows 2½ in. or more apart; reinforcing steel placed between these rows and concrete cast around and over tile to a depth of 1½ in. Ceiling plastered with ⅝ in. 1:3 gypsum and sand plaster. (33)	1½ hrs.
	4 in. hollow clay tile fillers laid end to end in rows 2½ in. or more apart; reinforcing steel placed between these rows and concrete cast around and over tile to a depth of 1½ in. (33)	1 hr.
Concrete Block	2½ in. slab with limestone aggregate. ¾ in. protection to steel reinforcement. Space between concrete joists filled with 3⅝ in. by 7⅝ in. by 15-9/16 in. concrete masonry units with expanded shale aggregate and having a minimum equivalent thickness[e] of 2.72 in. (62-N)	3 hrs.
Building Units	2½ in. slab and 8 in. deep joists having minimum width of 5 in. Slab and joist formed with 2 in. minimum thick U.L. listed building units. 1 in. concrete protection to slab steel reinforcing and ¾ in. concrete protection to joist steel reinforcing. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 35-4 HR.	4 hrs.

Reinforced Concrete Joists, Precast—Masonry Unit Fillers

None	7¼ in. thick floor consisting of 2 in. limestone concrete on cinder concrete masonry units 5¼ in. thick x 7⅝ in. x 26 in. supported on 8 in. reinforced concrete joists having 5 in. wide by 2¾ in. deep bottom flange providing 1¼ in. minimum bearing on concrete flange. 15/16 in. concrete protection to joist steel reinforcement. Masonry units 62% solid with 1-1/16 in. minimum face shell thickness. (120)	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u]

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. Ceiling Openings.	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed acoustical tile with face of tile supported not less than 18⅞ in. below underside of slab. Ceiling supported by concealed "Z" runner hangers and clips securing "Z" runners to 1½ in. channels secured to concrete slab by No. 8 SWG wire. Protection and location of recessed lighting fixture and duct opening, tile suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 24-2 HR.	2 hrs.
	2 in. concrete slab[v], on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile with face of tile supported not less than 22½ in. from underside of slab by 1½ in. furring channels spaced 48 in. on centers, concealed "H" runners 24 in. on centers and cross "T" to support tile. Ceiling openings framed with ¾ in. furring channels. Protection and location of recessed lighting fixture and duct opening, ceiling supports and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 34-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile supported not less than 11¼ in. below concrete slab by concealed No. 26 gauge galvanized steel "J" channels spaced 12 in. on centers and secured to joists by No. 11 SWG clips spaced 48 in. on centers. Flat splines of No. 26 gauge galvanized steel ¾ in. wide by 11½ in. long spaced 12 in. on centers perpendicular to "J" channels. Access tile installed in special splines and not to exceed one panel in each 100 sq. ft. of ceiling area. Protection and location of recessed lighting fixtures and duct openings, access panels and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 55-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed acoustical tile with face of tile supported not less than 19 in. below underside of slab. Ceiling supported by concealed "Z" runner hangers and No. 12 SWG wire clips securing "Z" runners to 1½ in. channels spaced not more than 28 in. on centers and along each side of light fixtures. Channels secured to bottom chord of steel joist by No. 12 SWG galvanized wire hangers spaced not over 48 in. on centers and at 4 corners of light fixtures. Protection and location of recessed lighting fixtures and duct openings, tile suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 60-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. Ceiling Openings.	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed acoustical tile supported not less than 17½ in. from underside of slab by "Z" runners 12 in. on centers secured by clips to 1½ in. furring channels wire tied to lower chord of joist by No. 12 SWG galvanized wire 48 in. on centers. One access tile in each 100 sq. ft. ceiling area. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 83-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ¾ in. (24 in. x 24 in.) U.L. listed acoustical tile supported not less than 23½ in. below underside of concrete slab by concealed "Z" runners attached with wire clips to 1½ in. channels spaced 48 in. on centers. A concealed crossed "T" resting on bottom flanges of "Z" runners inserted at each tile joint perpendicular to "Z" runners. Tile suspension system supported from bottom chord of joists with No. 12 SWG galvanized hanger wire spaced 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 92-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed acoustical tile supported not less than 17½ in. below underside of concrete slab by "J" runners spaced 24 in. on centers secured to 1½ in. channels spaced 48 in. on centers with wire clips. Intermediate joints in tile held in alignment with "T" splines. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 79-2 HR.	2 hrs.
	2⅛ in. concrete slab[v], on metal lath. Ceiling of ¾ in. thick U.L. listed acoustical tile with face of tile supported not less than 11¼ in. from underside of slab by "Z" runners spaced 12 in. on centers attached to joists with wire clips 48 in. on centers. Protection and location os recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 7-1½ HR.	1½ hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. Ceiling Openings.	2 in. limestone concrete slab[v] on metal lath. Ceiling of ½ in. U.L. listed acoustical tile supported by 1½ in. runner channels spaced 48 in. on centers wire clipped to concealed "J" channels spaced 12 in. on centers. Face of tile supported not less than 7 in. below joists by No. 12 SWG hanger wire spaced 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 26-1 HR.	1 hr.
	2 in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (12 in. x 12 in. or 24 in. x 24 in.) U.L. listed acoustical tile supported not less than 18 in. below underside of concrete slab by concealed "Z" runners spaced 12 in. on centers and attached to 1½ in. channels spaced 48 in. on centers with "Z" runner clips of No. 11 SWG wire. Hanger wires of No. 8 SWG wire supporting 1½ in. channels from concrete slab spaced 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings, access tile installation and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 35-1 HR.	1 hr.
Acoustical Tile—Nonventilating Type, Concealed Suspension. No Ceiling Openings.	3 in. concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile (24 in. by 24 in.) supported by concealed "Z" runners spaced 24 in. on centers and attached with wire clips to bottom chord of joists. Concealed crossed "T" perpendicular to and resting on the bottom flanges of "Z" runners at each tile joint. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 57-3 HR.	3 hrs.
	2½ in. limestone concrete floor slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile supported not less than ½ in. below bottom chord of joist by "Z" runners of No. 25 gauge galvanized steel spaced not more than 12 in. on centers and attached to joist with No. 11 SWG galvanized wire clips spaced 48 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 40-3 HR.	3 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ⅝ in. thick U.L. listed acoustical tile secured by "Z" runners or by "J" channels secured by wire clips to bottom chord of joists. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. 16-2 HR or 22-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. No Ceiling Openings.	2 in. concrete slab[v] on metal lath. Ceiling of ¾ in. thick U.L. listed acoustical tile attached to joists by "Z" runner and wire clips. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 29-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ⅝ or ¾ in. think (12 in. x 12 in. or 24 in. x 24 in.) U.L. listed acoustical tile attached to steel joists spaced 24 in. on centers by "H" runners and "H" runner clips. Access panel and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 23-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ¾ in. kerfed edge U.L. listed acoustical tile attached to bottom chord of joists with "J" channels and wire clips. Access tile and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 27-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ⅝ in. thick U.L. listed perforated acoustical tile attached to special runners spaced 12 in. on centers attached to steel joists with clips. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 8-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ¾ in. thick U.L. listed acoustical tile attached to steel joists spaced 24 in. on centers by wire clips and "Z" spline to 1½ in. runner channels spaced 48 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 41-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile supported by "Z" runners spaced 12 in. on centers and attached with wire clips to bottom chord of joists. Flat-ribbed splines in tile joints running right angles to "Z" runners. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 57-2 HR.	2 hrs.
	2 in. limestone concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile supported not less than ½ in. below bottom chord of joist by "Z" runners of No. 25 gauge galvanized steel spaced not more than 12 in. on centers and attached to joist with No. 11 SWG galvanized wire clips spaced 48 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions, and Beam Protection—Design No. 86-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. No Ceiling Openings.	2 in. concrete slab[v] on metal lath. Ceiling of ½ in. (24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 16½ in. below underside of slab at joists and not less than 6½ in. below bottom of joists by U.L. listed steel framing members. Steel framing system tied to bottom chord of joists with No. 12 SWG hanger wire spaced 48 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 9-1½ HR.	1½ hrs.
	2 in. concrete on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile supported by 1½ in. runner channel spaced not more than 48 in. on centers and wire tied not less than 1¾ in. below joist by No. 10 SWG galvanized wire spaced not more than 24 in. on centers. "Z" spline of No. 25 gauge galvanized steel attached to runner channels with No. 12 SWG galvanized wire clips spaced 12 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 6-1½ HR.	1½ hrs.
	2 in. concrete (minimum thickness over cells) on top of corrugated steel form units having ½ in. deep corrugations. Ceiling of ⅞ in. U.L. listed acoustical tile supported by concealed "H" channels and splines. "H" channels spaced 12 in. on centers and tied to every joist with double strand of No. 18 W&M gauge galvanized tile wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 11-1 HR.	1 hr.
	2 in. concrete slab[v] on metal lath. Ceiling of ¾ in. thick (10 in. x 10 in. to 24 in. x 24 in.) U.L. listed acoustical tile attached to steel joists spaced 24 in. on centers by wire clips, "Z" runners and flat or "T" splines. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 13-1 HR.	1 hr.
	2 in. limestone concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile secured to joists by "H" runners spaced 24 in. on centers and wire tied to joists with No. 12 SWG galvanized wire 48 in. on centers. Flat splices securing intermediate tile joists. "T" splices perpendicular to "H" runners spaced 12 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions, and Beam Protection—Design No. 18-1 HR.	1 hr.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of ¾ in. (12 in. x 12 in. to 24 in. x 24 in.) U.L. listed acoustical tile supported not less than 17½ in. from underside of concrete by "J" runners spaced 24 in. on centers secured to 1½ in. channels spaced 48 in. on centers with wire clips. Intermediate joints in tile held in alignment with splines. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor and Roof, and Ceiling Constructions and Beam Protection—Design No. 79-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed acoustical tile, ventilating or non-ventilating type supported not less than 21⅝ in. from underside of concrete slab by "Z" splines spaced 12 in. on centers and secured with special clips to 1½ in. channels spaced 48 in. on centers suspended with No. 12 SWG galvanized steel spaced 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings, installation of ventilating and non-ventilating tile and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions, and Beam Protection—Design No. 84-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ¾ in. (24 in. x 24 in.) U.L. listed acoustical tile, ventilating or nonventilating type, supported by grid system consisting of "H" runners and concealed cross "T" each spaced 24 in. on centers and wire tied with No. 12 SWG wire 48 in. on centers to bottom chord of joist. Facing of ceiling not less than 11 in. below bottom chord of joist. Protection and location of recessed lighting fixtures and duct openings, duct hangers, lighting fixture support channels and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 80-2 HR. (Beam 2 HR).	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed acoustical tile, ventilating or nonventilating type, supported not less than 20½ in. from underside of concrete slab by suspension system consisting of concealed "Z" runners spaced 12 in. on centers and attached with "Z" runner clips to 1½ in. channels spaced 48 in. on centers. 1½ in. channels supported from bottom chord of joists by No. 12 SWG galvanized wire spaced 48 in. on centers. Protection and location of lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 96-2 HR. (Beam 4 HR).	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile, ventilating type, supported not less than 18⅞ in. below underside of slab by concealed "Z" runners spaced 12 in. on centers attached with wire clips to 1½ in. runners spaced 48 in. on centers. Runners supported from bottom chord of joists by No. 12 SWG galvanized wire spaced 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings, access tile installation and location and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 91-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical tile, supported not less than 18⅞ in. below underside of slab by concealed "Z" runners spaced 12 in. on centers attached with wire clips to 1½ in. runners spaced 48 in. on centers. Runners supported from bottom chord of joists by No. 12 SWG galvanized wire spaced 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings and access tile installation and location and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 16-1½ HR.	1½ hrs.
Acoustical Tile—Ventilating Type, Concealed Suspension. No Ceiling Openings.	2 in. concrete slab[v] on metal lath. Ceiling of ¾ in. (12 in. x 12 in. to 24 in. x 24 in.) U.L. listed acoustical tile, supported by concealed crossed "T" at each joint perpendicular to "H" runners, "T" resting upon bottom flange of "H" runners running at right angle to crossed "T" and spaced 24 in. on centers and secured to bottom chord of joists with "H" runner clips. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 200-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed tongue and grooved acoustical tile with or without ventilating slots. Face of tile supported not less than 11¼ in. below the underside of the slab. Ceiling suspension system consisting of No. 25 gauge galvanized steel runners ¾ in. deep with ¾ in. flanges concealed in tile. Runners spaced 12 in. on centers and secured to joists by No. 11 SWG clips spaced 48 in. on centers. Splines, perpendicular to runners, when ventilating tile is used. Splines are No. 28 gauge steel, 7⅞ in. long by ⅞ in. wide with one opening ¼ in. by 1⅝ in. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 18-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of 1 in. U.L. listed acoustical tile (24 in. x 24 in. or 24 in. x 48 in.) supported not less than 21 in. below the top of the steel joist by U.L. listed steel framing members. Suspension system supported by No. 12 SWG wire spaced not over 48 in. on centers in one direction and 24 in. on centers in the other direction. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 36-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile supported by U.L. listed steel framing members so that face of tile is not less than 19¼ in. below bottom of underside of concrete. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Construction and Beam Protection—Design No. 58-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (24 in. x 48.) U.L. listed acoustical tile supported by exposed U.L. listed steel framing members with face of tile not less than 16½ in. below underside of concrete slab. Steel framing members wire tied to bottom chord of steel joist with No. 12 SWG galvanized wire. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings, ceiling suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 65-2 HR.	2 hrs.
	2½ in. limestone concrete slab[v] on metal lath. Ceiling of ½ in. (24 in. x 48 in.) U.L. listed acuostical tile with face of tile supported not less than 17 in. below underside of slab at joist. Ceiling supported by U.L. steel framing members and No. 12 SWG galvanized hanger wire tied to lower chord of joist spaced not more than 48 in. on centers and occurring at intersection of steel framing system. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 64-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of 5/8 in. (24 in. x 48 in.) U.L. listed acoustical tile supported not less than 18½ in. below the underside of the concrete slab by exposed U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures, ceiling suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 76-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed acoustical tile (24 in. x 48 in. or 24 in. x 24 in.) supported not less than 21⅜ in. below underside of concrete slab by U.L. listed steel framing members with exposed tile supports. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 88-2 HR (Beam 4 HR).	2 hrs.
	2-9/16 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. (24 in. x 48 in.) U.L. of Canada listed acoustical tile supported not les than 16⅜ in. below the underside of the concrete slab by exposed U.L. of Canada listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures, ceiling suspension system and other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C131-2 HR.	2 hrs.
	2 in. limestone concrete slab[v] on metal lath. Ceiling of ½ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 17 in. below underside of slab at joists and at least 7 in. below joists. Ceiling supported by U.L. steel framing members and No. 12 SWG galvanized hanger wire tied to lower chord of joists spaced not more than 48 in. on centers and occurring at intersection of steel framing system. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 12-1½ HR.	1½ hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ½ in. (24 in. x 48 in.) U.L. listed acoustical tile supported by No. 12 SWG hanger wire not less than 19 in. below underside of steel units by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 14-1½ HR.	1½ hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (24 in. x 24 in.) U.L. listed acoustical tile supported by exposed U.L. listed steel framing members with face of tile not less than 16½ in. below underside of concrete slab. Steel framing members wire tied to bottom chord of steel joist with No. 12 SWG galvanized wire. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings, ceiling suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 19-1½ HR.	1½ hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ½ in. (24 in. x 48 in.) U.L. listed acoustical tile supported by No. 12 SWG hanger wire not less than 21½ in. below underside of slab by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 18-1½ HR (Beam 3 HR).	1½ hrs.
Acoustical Tile—Nonventilating Type, Exposed Suspension. No Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. thick (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 14½ in. from underside of slab by U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 21-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 13⅝ in. below underside of slab by U.L. listed steel framing members attached to the bottom chord of joists by No. 12 SWG galvanized hanger wire. Tile hold down clips and hanger wire spacing, hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 31-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. thick (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 14½ in. below the underside of slab by U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 35-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Exposed Suspension. No Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. thick (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 15½ in. from underside of slab by U.L. listed steel framing members. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 45-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ or ¾ in. (24 in. x 24 in. or 24 in. x 48 in.) acoustical tile supported on exposed U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 66-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with hold down clips, supported not less than 17½ in. below underside of concrete slab by U.L. listed steel framing members incorporating exposed runner "T". Hanger wire of No. 12 SWG galvanized wire spaced 48 in. on centers. Tile hold down clips and other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C127-2 HR.	2 hrs
	2 in. concrete slab[v] on metal lath. Ceiling of ½ in. (24 in. x 24 in.) U.L. listed acoustical tile supported not less than 16½ in. below underside of slab by U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 32-1 HR.	1 hr.
	2 in. concrete slab[v] on metal lath. Ceiling of ¾ in. U.L. listed acoustical ceiling board (24 in. x 48 in. or 24 in. x 24 in.) supported not less than 13⅝ in. from underside of concrete slab by U.L. listed steel framing members incorporating exposed ceiling board supports. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 14-1 HR.	1 hr.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. concrete slab on metal lath. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with or without through perforations supported by U.L. listed steel framing members with face of tile not less than 21 in. below underside of concrete slab at joist. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 53-2 HR.	2 hrs.
	2½ in. concrete on metal lath. Ceiling of ⅝ in. thick (24 in. x 48 in.) U.L. listed acoustical tile supported by U.L. listed steel framing members placing face of tile not less than 5½ in. below bottom chord of joist. Protection and location of recessed lighting fixtures, tile hold-down clips, steel framing members and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 74-2 HR.	2 hrs.
	2½ in. concrete slab on metal lath. Ceiling of ⅝ in. thick (24 in. x 48 in.) U.L. listed acoustical tile (ventilating type) supported by U.L. listed steel framing members with face of tile not more than 8 in. from bottom chord of joist. Protection and location of recessed lighting fixtures and duct openings, acoustical tile hold-down clips, steel framing member installation and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 78-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical ceiling boards supported not less than 20½ in. below concrete slab by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 72-2 HR.	2 hrs.
	3 in. concrete slab[v] on metal lath. Ceiling of ⅝ in. thick (24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 18½ in. from underside of concrete slab by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 46-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

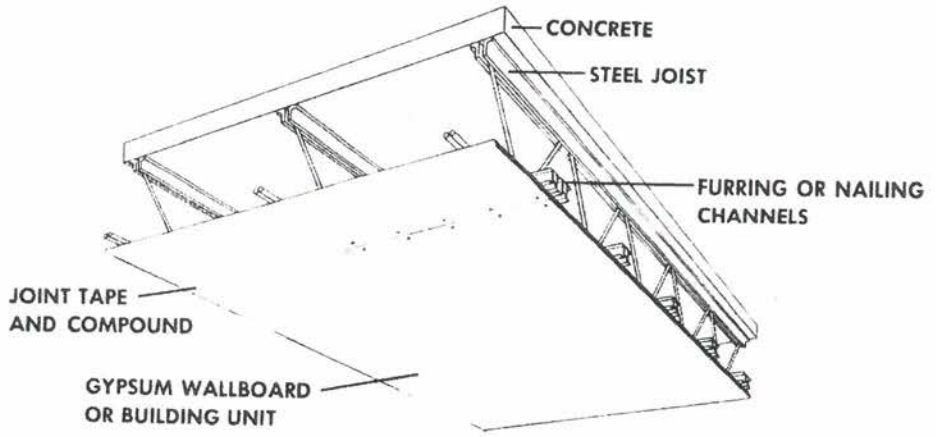
Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating Type, Exposed Suspension. Ceiling Openings.	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile. Base of tile supported not less than 16½ in. below underside of concrete, and supported by U.L. listed steel framing members. Steel framing members supported by No. 12 SWG galvanized hanger wire, wire tied to joist 48 in. on centers with additional hanger wires at all 4 corners of lighting fixture. Tile hold down clips, protecton and location of recessed lighting fixtures, suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 24-1 HR.	1 hr.
Acoustical Tile—Ventilating Type, Exposed Suspension. No Ceiling Openings.	2½ in. concrete slab[v] on metal lath. Ceiling of 5/8 in. thick (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 15 in. from underside of slab by U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions—Design No. 32-2 HR.	2 hrs.
Fiberboard or Mineral Board	2½ in. concrete slab[v] on metal lath. Ceiling of 5/8 in. thick (22½ in. x 64 in.) U.L. listed mineral and fiber board, secured to No. 25 gauge by 13/16 in. deep galvanized steel nailing channels spaced 16 in. on centers. Nailing channels tied to every other joist with double strand of No. 18 gauge steel wire. Intersection joints of building units secured with bridging clip. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 33-2 HR.	2 hrs.
Fiber, Sprayed and Gypsum Lath	2½ in. concrete (minimum thickness over top of corrugations) on top of U.L. listed steel form units. Ceiling of ¾ in. U.L. listed sprayed fiber reinforced with No. 20 gauge galvanized steel wire placed diagonally across ceiling, supporting ⅜ in. gypsum lath secured to nailing channels of No. 12 gauge galvanized steel spaced 12 in. on centers and tied to joists with double strand No. 18 gauge galvanized soft annealed steel. Diagonal reinforcing wire wrapped around nail heads. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 18-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*



Ceiling Type	Details of Construction	Rating
Gypsum Wallboard	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed gypsum wallboard secured to ⅞ in. No. 25 gauge galvanized steel furring channels spaced 24 in. on centers and at intermediate points to secure ends of wallboard with 1 in. self-tapping sheet metal type screws spaced 12 in. on centers with additional screws at joints. Channels secured with double strand of No. 18 SWG galvanized wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 60-3 HR.	3 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed gypsum wallboard secured to furring channels spaced 12 in. on centers by 1 in. long gypsum wallboard screws spaced 8 in. on centers. Furring channels secured to joists with double strand of No. 18 gauge SWG galvanized wire spaced 48 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 63-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed gypsum wallboard secured to ⅞ in. No. 25 gauge galvanized steel furring channels spaced 24 in. on centers and at intermediate points to secure ends of wallboard with 1 in. self-tapping sheet metal type screws spaced 12 in. on centers with additional screws at joints. Furring channels secured to each joist with double strand of No. 18 SWG galvanized wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 69-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Gypsum Wallboard	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed gypsum wallboard secured with 1 in. self-drilling, self-tapping screws spaced 12 in. on centers to ⅞ in. furring channels spaced 24 in. on centers with additional furring channels located at ends of wallboard. Channels secured with double strand No. 18 SWG galvanized wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 82-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ½ in. U.L. listed gypsum wallboard attached to ⅞ in. furring channels spaced 24 in. on centers and at intermediate points to secure ends of wallboard with 1 in. long self-tapping sheel metal type screws spaced 12 in. on centers with additional screws at joints. Channels secured with double strand of No. 18 SWG galvanized wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 94-2 HR.	2 hrs.
	2½ in. concrete slab[v] on metal lath. Ceiling of ⅝ in. (24 in. x 24 in.) U.L. listed gypsum wallboard supported not less than 6½ in. below bottom chord of joists by U.L. listed steel framing members incorporating exposed supporting "Ts". Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 208-2 HR.	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ½ in. U.L. listed gypsum wallboard secured to furring channels with 1 in. self-drilling screws spaced 12 in. on centers. Furring channels located 24 in. on centers and at butt and end joints and secured to joists with double strand No. 18 SWG galvanized wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-1½ HR.	1½ hrs.
	2 in. reinforced concrete slab[v] on metal lath. Ceiling of ⅝ in. U.L. listed wallboard base layer secured to ⅞ in. nailing channels with 1¼ in. annular type nails having 5/16 in. heads spaced 9 in. on centers. ½ in. U.L. listed wallboard face layer secured to separate ⅞ in. nailing channels with 1¾ in. annular type nails having 5/16 in. heads spaced 6 in. on centers. Joints of 2 layers staggered and not taped or cemented. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions—Design No. 2-1½ HR.	1½ hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Gypsum Wallboard	2 in. reinforced concrete slab[v] on metal lath. Ceiling of two layers of 5/8 in. U.L. listed wallboard secured to 7/8 in. nailing channels spaced 16 in. on centers. Two layers applied with long dimension at right angles to nailing channels with joints staggered. First layer secured by 1¼ in. long annular nails having 5/16 in. heads and spaced 8 in. on centers, outside layer by 1⅞ in. long annular nails having 5/16 in. heads and spaced 8 in. on centers. End butt joints held together by "H" clips spaced 8 in. on centers. End butt joints secured to first layer by 1½ in. long screws spaced 12 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions—Design No. 3-1½ HR.	1½ hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed gypsum wallboard secured to 7/8 in. furring channels spaced 24 in. on centers secured with double strand of No. 18 SWG galvanized wire. Wallboard secured by No. 6 sheet metal screws 1 in. long spaced ½ in. from edges and 12 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 13-1½ HR.	1½ hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed gypsum wallboard secured to 7/8 in. furring channels spaced 24 in. on centers with No. 6 x 1 in. self-drilling, self-tapping sheet metal screws having .345 in. diameter flat head and spaced 12 in. on centers. Channels attached to joists with double strand of No. 18 SWG wire, spaced 48 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 4-1½ HR.	1½ hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed gypsum wallboard attached with No. 6 sheet metal screws 1 in. long, 12 in. on centers to No. 26 gauge galvanized steel furring channels spaced 24 in. on centers and wire tied to joists with double strand No. 18 SWG wire 24 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 19-1 HR.	1 hr.
	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed gypsum wallboard secured to 7/8 in. No. 24 or 25 gauge nailing channel spaced 16 in. on centers by 1¼ in. barbed nails, having 3/8 in. diameter heads and spaced 7 in. on centers. Nailing channels attached by two strands No. 18 W&M gauge wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 8-1 HR.	1 hr.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

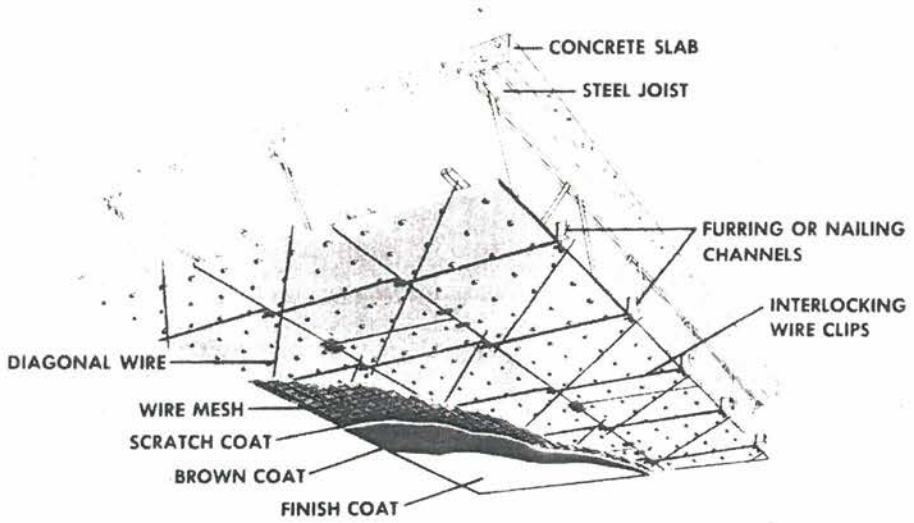
Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Gypsum Wallboard	2 in. reinforced concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed wallboard[cc] or 5/8 in. U.L. listed coreboard[cc] secured to 3/4 in. furring channels, with sheet-metal screws, or 7/8 in. nailing channels with 1¼ in. ring barbed nails. Joints unfinished. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 5-1 HR.	1 hr.
	2 in. reinforced concrete slab[v] on metal lath. Ceiling of 5/8 in. U.L. listed wallboard[cc], secured to 3/4 in. furring channels spaced 16 in. on centers, with sheet-metal screws, or to 7/8 in. nailing channels with 1¼ in. ring barbed nails. Joints unfinished. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 2-1 HR.	1 hr.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*



Ceiling Type	Details of Construction	Rating
Cementitious Mixture on Gypsum Lath	2 in. concrete slab[v] on metal lath. Ceiling of ½ in. U.L. listed cementitious mixture on ⅜ in. U.L. listed perforated gypsum lath. Lath secured by 1⅛ in. ring barbed nails spaced 5 in. on centers to No. 25 gauge galvanized steel nailing channels spaced 16 in. on centers which are secured to bottom chord of joist with 3 strands of No. 18 SWG wire. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 10-1 HR.	1 hr.
Plaster on Gypsum Lath	2 in. concrete slab[v] on metal lath. Ceiling of 1 in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath attached to ¾ in. furring channels spaced 12 in. on centers with interlocking wire clips giving continuous support to lath. Plaster reinforced with 20 ga. wire mesh. Wire mesh attached to furring channels at joints in lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. gypsum. (65)	4 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of ½ in. gypsum-perlite plaster, on ⅜ in. perforated gypsum lath attached to ¾ in. furring channels spaced 16 in. on centers, with special wire clips giving continuous support to lath. Plaster reinforced with 20 gauge wire mesh. Wire mesh attached to furring channels at joints in lath. Plaster mix: 2½ cu. ft. perlite to 100 lbs. gypsum. (65)	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Plaster on Gypsum Lath	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. gypsum-perlite plaster on 3/8 in. perforated gypsum lath attached to 3/4 in. furring channels spaced 12 in. on centers, with interlocking wire clips giving continuous support to lath. Plaster reinforced with 14 gauge galvanized wire scured diagonally to clips or channels at each intersection. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. gypsum. (65)	3 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of 5/8 in. gypsum-perlite plaster on 3/8 in. perforated gypsum lath attached to 3/4 in. furring channels spaced 12 in. on centers with special wire clips at edges of lath and third points of lath width at each channel. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. to 100 lbs. gypsum. (65)	3 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of 1/2 in. gypsum-perlite plaster applied to 3/8 in. perforated gypsum lath secured to 3/4 in. furring channels spaced 16 in. on centers, with interlocking wire clips giving continuous support to lath. 14 gauge galvanized wire secured diagonally to clips or channels at each intersection. Plaster Mix: 2 1/2 cu. ft. perlite to 100 lbs. gypsum. (65)	2 1/2 hrs.
	2 1/2 in. floor slab consisting of 2 in. reinforced gypsum concrete on 1/2 in. gypsum form boards. Ceiling of 5/8 in. gypsum-perlite plaster on 3/8 in. perforated gypsum lath attached to 3/4 in. furring channels spaced 12 in. on centers, with interlocking wire clips giving continuous support to lath. 14 gauge galvanized wire secured diagonally to clips or channels at each intersection. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. gypsum. (88)	2 hrs.
	2 in. concrete slab[v] on metal lath. Ceiling of 1 in. gypsum-perlite plaster, applied to 3/8 in. perforated gypsum lath attached to 3/4 in. furring channels spaced 16 in. on centers, with interlocking wire clips giving continuous support to lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. fibered gypsum. (65)	1 1/2 hrs.
	2 in. floor slab, consisting of 1 1/2 in. reinforced gypsum concrete on 1/2 in. gypsum form boards. Ceiling of 1 1/8 in. gypsum-perlite plaster on 3/8 in. perforated gypsum lath, attached to 3/4 in. furring channels spaced 12 in. on centers, with interlocking wire clips giving continuous support to lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. fibered gypsum. (65)	1 1/2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

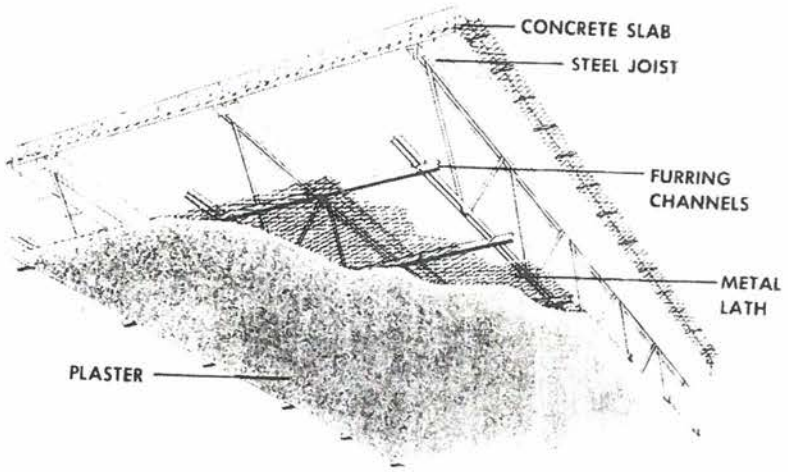
Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Plaster on Gypsum Lath	2 in. concrete floor slab[v] on metal lath. Ceiling of ½ in. gypsum-perlite plaster, on ⅜ in. perforated gypsum lath attached to ¾ in. furring channels spaced 16 in. on centers, with special wire clips at edges of lath and midpoint of lath width at each channel. Plaster mix: 2½ cu. ft. perlite to 100 lbs. gypsum. (65)	1 hr.
	2 in. concrete slab[v] on metal lath. Ceiling of ⅝ in. gypsum-perlite plaster, applied to ⅜ in. perforated gypsum lath attached to ¾ in. furring channels spaced 16 in. on centers, with interlocking wire clips giving continuous support to lath. Plaster mix: 2½ cu. ft. perlite to 100 lbs. gypsum. (65)	1 hr.
	2 in. reinforced concrete slab on metal lath. Ceiling of ⅝ in. gypsum-perlite plaster applied to ⅜ in. U.L. listed perforated gypsum lath attached to ¾ in. furring channels spaced 16 in. on centers, with interlocking wire clips giving continuous support to lath. Abutting ends of lath secured to each other with metal finger clips. Plaster mix: scratch coat and brown coat 2½ cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions—Design No. 7-1 HR.	1 hr.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*



Ceiling Type	Details of Construction	Rating
Plaster on Metal Lath	2½ in. concrete slab[v] on metal lath, or 2 in. reinforced gypsum slabs covered with ½ in. mortar, on joists. Ceiling of 1 in. gypsum-vermiculite plaster proportioned within the range of 3½ to 5½ cu. ft. vermiculite per 100 lbs. gypsum, on metal lath. (9)	4 hrs.
	2½ in. concrete (measured to bottom of corrugations) on top of No. 28 gauge or thicker corrugated steel centering deck. Ceiling of ¾ in. gypsum-vermiculite plaster on metal lath secured to ¾ in. furring channels spaced 13½ in. on centers and attached to joist with double strand No. 18 SWG galvanized wire and metal lath secured to furring channels with No. 18 SWG galvanized wire. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed vermiculite to 100 lbs. gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 11-4 HR.	4 hrs.
	2½ in. concrete on steel plate deck. Ceiling of 1 in. gypsum-vermiculite plaster proportioned within the range of 3½ to 5½ cu. ft. vermiculite per 100 lbs. gypsum on metal lath. (9)	4 hrs.
	2½ in. concrete on steel plate deck. Ceiling of 1 in. unsanded, wood-fibered gypsum plaster, or ¾ in. gypsum-vermiculite plaster proportioned within the range of 3½ to 5½ cu. ft. vermiculite per 100 lbs. gypsum, on metal lath. (9)	3 hrs.
	2½ in. cinder concrete plus ½ in. cement mortar finish, on steel plate deck. Ceiling of 1⅛ in. 1:1 gypsum and sand plaster on metal lath. (9)	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Plaster on Metal Lath	2 in. concrete floor slab[v] on metal lath, or 2¾ in. reinforced portland cement concrete plank with joints thoroughly grouted, on joists. Ceiling of 1 in. gypsum-vermiculite plaster (measured from face of lath) on metal lath. Plaster mix: 4:1 by weight or approximately 100 lbs. fibered gypsum to 2½ cu. ft. vermiculite. (32)	3 hrs.
	2½ in. concrete floor slab[v] on metal lath, or 2 in. reinforced gypsum tile covered with ½ in. mortar, on joists. Ceiling of 1 in. unsanded wood-fibered gypsum plaster, or ¾ in. gypsum-vermiculite plaster proportioned within the range of 3½ to 5½ cu. ft. vermiculite per 100 lbs. gypsum, on metal lath. (9)	3 hrs.
	2⅝ in. reinforced gypsum concrete on ⅜ in. gypsum plaster board supported by joists of which the lower ⅔ is encased in precast gypsum and the upper ⅓ extends into the floor slab; 1 in. minimum fireproofing on joists. Ceiling of ¾ in. 1:1 gypsum and sand plaster on metal lath. (22)	3 hrs.
	2½ in. (measured from bottom of corrugations) concrete on top of corrugated steel decking. Ceiling of ¾ in. gypsum vermiculite plaster on metal lath attached to ¾ in. furring channels spaced 13½ in. on centers and attached to joists with double strand No. 18 SWG galvanized wire at all points of intersection. Metal lath secured to furring channels 6 in. on centers with one strand No. 18 SWG galvanized wire. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed vermiculite to 100 lbs. gypsum (unfibered in brown coat). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 53-3 HR.	3 hrs.
	2½ in. perlite concrete slab[v] on paper-backed wire fabric. Ceiling of ¾ in. gypsum-perlite plaster (measured from face of lath) on metal lath secured to joists with wire clips. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 6-3 HR.	3 hrs.
	2 in. concrete floor slab[v] on metal lath, or 2 in. reinforced gypsum tile covered with ¼ in. mortar, on joists. Ceiling of 1 in. unsanded wood-fibered gypsum plaster, or ¾ in. gypsum-vermiculite plaster proportioned within the range of 3½ to 5½ cu. ft. vermiculite per 100 lbs. gypsum, on metal lath. (9)	2½ hrs.
	2½ in. concrete on steel plate deck. Ceiling of 1 in. 1:2 gypsum and sand plaster on metal lath. (9)	2½ hrs.
	2 in. concrete on steel plate deck. Ceiling of 1⅛ in. 1:1 gypsum-sand plaster, on metal lath; or 1½ in. 1:2 gypsum-sand plaster on ribbed metal lath. (9)	2½ hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Plaster on Metal Lath	2 in. concrete on steel plate deck. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster, or 1 in. 1:2, 1:2½ portland cement and sand plaster with 10 lbs. hydrated lime added per bag cement, on metal lath. (9)	2 hrs.
	2¼ in. concrete floor slab[v] on metal lath, or 2 in. reinforced gypsum tile covered with ¼ in. mortar finish, on joists. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster on metal lath. (9)	2 hrs.
	2½ in. concrete slab on ½ in. x 2¼ in. corrugated steel form unit. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster on metal lath attached to ¾ in. furring channels with single strand of No. 18 SWG hanger wire every 6 in. along channels. Furring channels attached to bottom chord of steel joists with double strands of No. 18 SWG wire at each intersection. (118)	2 hrs.
	2 in. concrete floor slab[v] on metal lath, or 2 in. reinforced gypsum tile, on joists. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster, or ¾ in. 1:2, 1:3 portland cement and sand plaster with 3 lbs. asbestos fiber and 15 lbs. hydrated lime per bag cement, on metal lath. (9)	1½ hrs.
	1½ in. concrete on steel plate deck. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster on metal lath. (9)	1½ hrs.
	1 in. concrete on steel plate deck. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster on metal lath. (33)	1 hr.
	⅞ in. wood flooring nailed to wood sleepers on covering of asbestos paper weighing 14 lbs. per 100 sq. ft. cemented on sheet steel deck. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster on metal lath. (9)	1 hr. comb.
Reinforced Gypsum Tile and Plaster	2 in. concrete slab[v] on metal lath, or 2 in. precast reinforced portland cement concrete or gypsum slabs, on joists, the precast slabs to be finished with top coating of ¼ in. mortar. Ceiling of 2 in. reinforced gypsum tile anchored to joists with metal ties and covered with ½ in. 1:3 gypsum and sand plaster. (9)	4 hrs.
	2 in. concrete on steel plate deck. Ceiling of 2 in. reinforced gypsum tile with ½ in. 1:3 gypsum and sand plaster. Tile clipped to channels which are clipped to joists. (9)	4 hrs.
	2½ in. reinforced gypsum concrete on ⅜ in. gypsum plaster board on joists, or 2½ in. cinder concrete on metal floor lath on joists. Ceiling of 2 in. precast, reinforced gypsum ceiling tile suspended ½ in. below 1 in. furring channels in turn suspended ½ in. below joists; gypsum ceiling tile corrugated on under surface for effective plaster bond; all joints grouted with gypsum; ceiling finished with ½ in. 1:1 gypsum and sand plaster. (17)	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Joists or Beams[u] *(Continued)*

Ceiling Type	Details of Construction	Rating
Reinforced Gypsum Tile and Plaster	2 in. precast, reinforced gypsum slabs on joists; joints grouted with gypsum. Ceiling of 2 in. precast, reinforced gypsum attached to bottoms of joists; joints grouted with gypsum; plastered with ¾ in. gypsum and sand plaster. (20)	3 hrs.
	2 in. concrete on steel plate deck. Ceiling of 2 in. interlocking unreinforced gypsum tile supported on upper face of lower beam flange, with ½ in. 1:3 gypsum and sand plaster. (9)	2 hrs.

Steel Floor Units[u]*—Cellular*

Acoustical Material—Plastic or Plaster	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 11/16 in. (minimum thickness) U.L. listed vermiculite acoustical plastic or plaster applied directly to underside of steel floor units; 1⅛ in. plastic or plaster thickness (measured from face of lath) at single cell floor units applied to metal lath over ¾ in. insulation board. Metal lath attached to steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 19-4 HR.	4 hrs.
	2½ in. concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed vermiculite acoustical plastic or plaster applied directly to flat plate of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 11-2 HR.	2 hrs.
Acoustical Tile—Nonventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. concrete (minimum thickness over cells) on U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile with face of tile supported not less than 17⅜ in. from underside of steel floor units and 7¼ in. below bottom flange of beam. Protection and location of recessed lighting fixtures and duct openings, tile support and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 36-4 HR (Beam 5 HR).	4 hrs.[jj]
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile with face of tile supported not less than 17¾ in. from underside of steel units by 1½ in. main channels spaced 48 in. on centers and runners and span-in-clips spaced 12 in. on centers. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 31-4 HR (Beam 4 HR).	4 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile with face of tile supported not less than 18 in. below underside of steel floor units. Ceiling supported by "J" channels clipped to 1½ in. runner channels spaced not more than 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 25-3 HR (Beam 5 HR).	3 hrs.
	2½ in. concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile supported by "Z" runners spaced 12 in. on centers and attached with wire clips to 1½ in. channels spaced 43 in. on centers which are supported by No. 12 SWG galvanized hanger wires spaced 48 in. on centers. One 12 in. by 12 in. access panel per 100 sq. ft. ceiling area. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 54-3 HR (Beam 4 HR).	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. (12 in. x 12 in. or 24 in. x 24 in.) U.L. listed acoustical tile supported not less than 14½ in. below underside of steel floor units. Ceiling supported by 1 in. x ¾ in. steel "H" runners spaced 24 in. on centers attached to 1½ in. channels spaced 48 in. on centers with "H" runner clips. Flat splines midway and parallel with "H" runners. Cross "T" 12 in. on centers perpendicular to "H" runners with ends resting on lower flange of "H" runners. 1½ in. channels supported from steel floor units by No. 12 SWG galvanized wire 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 95-2 HR. (Beam 3 HR).	2 hrs.
	2½ in. concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed acoustical tile supported not less than 16 in. below underside of steel floor units by "Z" runners spaced 12 in. on centers and clipped to 1½ in. channels spaced 48 in. on centers. One access tile (12 in. x 12 in.) per 100 sq. ft. ceiling area. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 70-2 HR (Beam 3 HR).	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed acoustical tile supported not less than 17¼ in. below bottom of steel floor units by "J" channels spaced 12 in. on centers secured by wire clips to 1½ in. runner channels spaced not over 48 in. on centers. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 81-2 HR (Beam 4 HR).	2 hrs.
Acoustical Tile—Nonventilating Type, Concealed Suspension. No Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile with face of tile supported approximately 11½ in. from underside of floor units by 1½ in. runner channels spaced 48 in. on centers and main runner spline clips spaced 12 in. on centers at right angle to runner channels. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 21-4 HR. (Beam 4 HR).	4 hrs.
	2½ in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. thick U.L. listed acoustical tile with face of tile supported not less than 11¼ in. below underside of floor units by 1½ in. runner channels spaced 48 in. on centers and 1-5/16 in. "Z" bars spaced 12 in. on centers. Access tile locations not less than 6 ft. from beams. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 34-3 HR. (Beam 3 HR).	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile supported by concealed suspension system placing face of tile not less than 14½ in. below underside of steel floor units. Ceiling supported by 1 in. deep by ¾ in. wide No. 25 gauge steel "H" runners spaced 24. in. on centers attached to 1½ in. furring channels spaced 48 in. on centers with "H" runner clips. Flat splines midway and parallel with "H" runners. Cross tees spaced 12 in. on centers perpendicular to "H" runners with ends resting on lower flange of "H" runners. 1½ in. furring channels supported from hanger clips hooked to steel floor units by No. 12 SWG galvanized wire 48 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 69-3 HR. (Beam 3 HR).	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile, ventilating or non-ventilating types supported by No. 8 SWG hanger wire not less than 18¼ in. below underside of steel floor units by "Z" splines spaced 12 in. on centers and secured with "Z" spline clips to 1½ in. channels spaced 48 in. on centers. Protecton and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 59-3 HR (Beam 4 HR).	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile with ventilating slots. Face of tile supported not less than 19½ in. below underside of steel units and not less than 8¾ in. below bottom flange of beam. Ceiling suspension system consisting of hanger clips secured to steel floor units and No. 8 SWG galvanized hanger wire spaced 48 in. on centers, 1½ in. No. 16 gauge steel runner channels spaced 48 in. on centers tied to ¾ in. No. 25 gauge steel "Z" runners spaced 12 in. on centers to receive tile. Protection and location of recessed lighting fixtures, suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 45-3 HR. (Beam 5 HR).	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile with or without through perforations with face of tile supported not less than 17½ in. below underside of steel floor units by suspension system consisting of hanger wire of No. 12 SWG galvanized wire, having a maximum spacing of 48 in. on centers suspended from steel floor units and secured to 1½ in. No. 16 gauge steel runner channels spaced not more than 48 in. on centers and on each side of duct openings: "Z" runners secured to runner channels with "Z" clips of No. 12 SWG galvanized wire spaced 12 in. on centers and concealed in ceiling tile. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 39-3 HR (Beam 3 HR).	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile, ventilating or non-ventilating type supported not less than 16⅜ in. from underside of steel floor units. Suspension system consisting of concealed "Z" runners spaced 12 in. on centers clipped to 1½ in. channels spaced 48 in. on centers suspended with No. 10 SWG galvanized wire spaced 48 in. on centers. Protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 85-2 HR (Beam 2 HR).	2 hrs.
Acoustical Tile—Ventilating Type, Concealed Suspension. No Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed acoustical tile with through perforations supported not less than 11½ in. below bottom of steel deck by 1½ in. No. 16 gauge steel channels spaced not less than 48 in. on centers. No. 25 gauge galvanized steel "Z" runners secured to channels by No. 12 SWG galvanized wire clips 12 in. on centers. Flanges of "Z" runners concealed by tongue and groove acoustical tile. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 42-3 HR. (Beam 4 HR).	3 hrs.
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. thick (24 in. x 48 in.) U.L. listed acoustical tile supported not less than 13⅝ in. below underside of floor units by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 30-2 HR (Beam 3 HR).	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. (24 in. x 48 in. or 24 in. x 24 in.) U.L. listed acoustical tile supported not less than 14¼ in. below underside of steel floor units by exposed flanges of U.L. listed steel framing members. Tile hold down clips, protection and location of lighting fixtures, and duct openings, suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 71-2 HR (Beam 3 HR).	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 16¼ in. below underside of steel floor units and at least 6¼ in. below steel beams by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 47-2 HR. (Beam 2 HR).	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile supported not less than 16⅛ in. below underside of steel floor units by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings an other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 73-2 HR (Beam 4 HR).	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed acoustical tile (24 in. by 48 in.) supported not less than 11½ in. from underside of steel floor units by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 15-1½ HR.	1½ hrs.
Acoustical Tile—Ventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. (24 in. x 48 in.) U.L. listed acoustical tile of ventilating or nonventilating types supported not less than 17 in. below underside of steel units by exposed U.L. listed steel framing members. Steel framing members supported by No. 12 SWG galvanized wire spaced 48 in. on centers along main runners and cross "T" and 24 in. on centers perpendicular to main runners. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 65-3 HR (Beam 5 HR).	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Cementitious Mixture—Applied to Steel Deck. Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed cementitious mixture machine applied directly to underside of steel floor units with ¾ in. thickness in flutes; 1 in. U.L. listed cementitious mixture under header ducts and extending beyond edges of header duct at least 2⅛ in. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 22-3 HR.	3 hrs.
Cementitious Mixture—Applied to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed cementitious mixture machine applied directly to steel floor units filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 24-4 HR.	4 hrs.
	2½ in. concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of 1 in. U.L. listed cementitious mixture, machine applied directly to steel floor units filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 32-4 HR.	4 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ½ in. (minimum thickness) U.L. listed cementitious mixture machine applied directly to steel units filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 28-3 HR.	3 hrs.
	2¾ in. concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of ⅜ in. U.L. listed cementitious mixture machine applied directly to underside of steel floor units filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 16-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ½ in. U.L. listed cementitious mixture machine applied to underside of deck following contour. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 67-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete incorporating No. 10 gauge, 6 x 6 mesh on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed cementitious mixture machine applied directly to underside of steel units following the contour of the cellular units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Cementitious Mixture—Applied to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) expanded shale concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. U.L. listed cementitious mixture applied directly to underside of cellular steel floor units following contour of floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 49-2 HR.	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ½ in. U.L. listed cementitious mixture applied directly to underside of steel floor units following contour of the cells. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 10-2 HR.	2 hrs.
Cementitious Mixture—Applied to Metal Lath. Ceiling Openings.	2 in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. (measured from face of lath) U.L. listed cementitious mixture on metal lath. Lath supported not less than 15½ in. from underside of steel floor units. Duct opening in ceiling not larger than 113 sq. in. in each 100 sq. ft. ceiling area, and protected by No. 14 USS gauge fire damper. Duct locations and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 11-3 HR. (Beam 4 HR).	3 hrs.
Fiber, Sprayed—Applied to Steel Deck. Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 9/16 in. tamped (1 in. untamped) U.L. listed sprayed fiber applied to underside of adhesive coated steel floor units and 1½ in. tamped (2⅛ in. untamped) directly under the 3 in. minimum each side of trench header duct. Two layers of ⅛ in. thick asbestos paper placed between bottom of trench header duct and steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 58-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1 in. U.L. listed sprayed fiber machine applied directly to underside of steel floor units completely filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 19-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Fiber, Sprayed—Applied to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of 11/16 in. U.L. listed sprayed fiber applied to underside of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 28-4 HR.	4 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1⅞ in. U.L. listed sprayed fiber applied simultaneously with binder directly to underside of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 26-4 HR.	4 hrs.
	2½ in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber applied directly to underside of adhesive coated cellular steel units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 25-5 HR.	4 hrs.
	2½ in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed sprayed fiber applied to underside of adhesive-coated cellular steel units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 16-4 HR.	4 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1½ in. U.L. listed sprayed fiber applied to underside of adhesive-coated cellular steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-4 HR.	4 hrs.
	2½ in. (minimum thickness over cells) reinforced concrete on top of U.L. listed cellular steel floor units. Ceiling of 1 in. U.L. listed sprayed fiber applied to underside of adhesive-coated cellular steel units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 18-5 HR.	4 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ½ in. (minimum thickness) U.L. listed sprayed fiber applied to underside of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 20-4 HR.	4 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Fiber, Sprayed—Applied to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed sprayed fiber applied to underside of adhesive coated steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. 41-3 HR or 46-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber applied to steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 20-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber applied directly to steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. 26-3 HR or 27-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1½ in. (minimum thickness) U.L. listed sprayed fiber applied directly to underside of adhesive coated cellular steel units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ¾ in. (minimum thickness) U.L. listed sprayed fiber applied directly to underside of adhesive-coated cellular steel units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 9-3 HR.	3 hrs.
	2½ in. concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of ⅝ in. U.L. listed sprayed fiber applied directly to adhesive coated steel floor units coated in a criss cross pattern. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 51-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed steel floor units. Ceiling of 7/16 in. tamped U.L. listed sprayed fiber applied to adhesive coated steel floor units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C102-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Fiber, Sprayed—Applied to Steel Deck. No Header Ducts.	2½ in. concrete (minimum thickness over cells) on top of U.L. of Canada listed cellular steel floor units. Ceiling of ½ in. tamped U.L. listed sprayed fiber applied to underside of adhesive coated steel units following the contour of the cellular units. Other details as specified in U.L. of Canada listed, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C129-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. of Canada listed cellular steel floor units. Ceiling of ⅝ in. tamped U.L. listed sprayed fiber applied directly to underside of adhesive coated steel floor units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. C104-3 HR, C105-3 HR and C113-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. of Canada listed cellular steel floor units. Ceiling of ½ in. U.L. of Canada listed sprayed fiber applied directly to underside of adhesive coated steel floor units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C103-2 HR.	2 hrs.
Fiber, Sprayed—on Metal Lath	2 in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1⅛ in. U.L. listed sprayed fiber on metal lath. Lath supported not less than 4½ in. from underside of steel floor. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 6-4 HR.	4 hrs.
	2 in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1 in. U.L. listed sprayed fiber on face of adhesive coated ribbed metal lath. Lath supported not less than 4½ in. from underside of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 2-3 HR.	3 hrs.
	2 in. (minimum thickness over cells) reinforced concrete on top of U.L. listed cellular steel floor units. Ceiling of 1⅛ in. U.L. listed sprayed fiber on face of adhesive coated metal lath. Lath supported not less than 4½ in. from underside of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 4-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Plaster and Gypsum Lath	2½ in. (minimum thickness over cells) concrete on top of cellular steel floor units. Ceiling of ½ in. gypsum-perlite plaster, on ⅜ in. perforated gypsum lath supported not less than 7¼ in. from underside of floor units and attached to ¾ in. furring channels spaced 12 in. on centers with steel wire clips giving continuous support to lath. Plaster mix: 2½ cu. ft. perlite to 100 lbs. gypsum. (108)	3 hrs.
Plaster on Metal Lath. Ceiling Openings.	2 in. reinforced concrete on top of U.L listed cellular steel floor units. Ceiling of ⅞ in. (measured from face of lath) gypsum-perlite plaster on metal lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. listed perlite to 100 lbs. fibered gypsum. Lath supported not less than 15½ in. from underside of steel floor, and spaced at least 3½ in. below steel beams. Duct location and protection and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 5-4 HR (Beam 4 HR).	4 hrs.
	2 in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅞ in. (measured from face of lath) gypsum-perlite plaster on metal lath suspended not less than 14¾ in. from underside of floor units, and spaced at least 2¾ in. below steel beams. Lath attached to ¾ or 1 in. furring channels spaced 12 in. on centers, which are attached to 1½ in. runner channels spaced 48 in. on centers. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. listed perlite to 100 lbs. fibered gypsum. Duct location and protection and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 8-3 HR (Beam 4 HR).	3 hrs.
	2 in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of ⅞ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath. Face of lath supported not less than 15⅜ in. from underside of floor units. Plaster mix: scratch coat 2 to 2½ cu. ft. and brown coat 3 to 3½ cu. ft. vermiculite to 100 lbs. fibered gypsum. Duct location and protection and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 1-3 HR (Beam 3 HR).....	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]*—Cellular (Continued)*

Ceiling Type	Details of Construction	Rating
Plaster and Metal Lath. No Ceiling Openings.	2 in. cinder concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling ⅞ in. (measured from face of lath) gypsum-vermiculite plaster on metal lath supported by ¾ in. furring channels attached to 1½ in. runner channels secured to bottom of floor units. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed uncoated vermiculite to 100 lbs. fibered gypsum or scratch and brown coat of 2 cu. ft. coated or uncoated U.L. listed vermiculite to 100 lbs. fibered gypsum (scratch) and 100 lbs. unfibered gypsum (brown). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 1-4 HR.	4 hrs.
	2 in. perlite concrete (minimum thickness over cells) on top of U.L. listed cellular steel floor units. Ceiling of 1 in. (measured from face of lath) gypsum-perlite plaster on metal lath, with back plaster on lath to be not less than 1 in. Lath supported not less than 3 in. from underside of steel floor units. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-4 HR.	4 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1⅛ in. (measured from face of lath) plaster consisting of ⅝ in. gypsum-vermiculite plaster and ½ in. U.L. listed vermiculite acoustical plastic or plaster on metal lath. Lath supported not less than 7¼ in. from underside of steel floor units. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. listed uncoated vermiculite to 100 lbs. fibered gypsum or scratch and brown coat of 2 cu. ft. coated or uncoated U.L. listed vermiculite to 100 lbs. fibered gypsum (scratch) and 100 lbs. unfibered gypsum (brown). Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 4-4 HR. (Beam 4 HR).	4 hrs.
	1½ in. concrete plus ½ in. cement mortar finish, on top of cellular steel units. Ceiling of 1 in. gypsum-vermiculite plaster proportioned within the range of 3½ to 5½ cu. ft. vermiculite per 100 lbs. gypsum, on metal lath secured not less than 2 in. below bottom of cellular steel units. (9)	4 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular (Continued)

Ceiling Type	Details of Construction	Rating
Plaster and Metal Lath. No Ceiling Openings.	3¼ in. (minimum thickness over cells) concrete on top of U.L. listed cellular steel floor units. Ceiling of 1 in. gypsum-perlite plaster (measured from face of lath) on ribbed metal lath. Plaster mix: scratch and brown coats 2½ cu. ft. U.L. listed perlite aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 15-5 HR.	4 hrs.
	1½ in. concrete plus ½ in. cement mortar finish, on top of cellular steel units. Ceiling of 1 in. unsanded wood-fibered gypsum plaster on metal lath secured not less than 9 in. below bottom of cellular steel units. (9)	4 hrs.
	1½ in. concrete plus ½ in. cement mortar finish, on top of cellular steel units. Ceiling of 1 in. unsanded wood-fibered gypsum plaster on metal lath secured not less than 2 in. below bottom of cellular steel units. (9)	3 hrs.
Metal Pan and Insulation. Ceiling Openings.	2½ in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular steel floor units. Ceiling of U.L. listed metal pans supporting U.L. listed mineral wool batts. Face of ceiling supported not less than 18-3/16 in. below top of concrete slab by U.L. listed steel framing members. Protection and location of recessed lighting fixtures and duct openings, metal pan suspension system and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 49-3 HR (Beam 4 HR).	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed steel floor units. Ceiling of U.L. listed metal pans, No. 13 gauge galvanized steel wire mesh and U.L. listed mineral wool pad insulation with face of ceiling supported not less than 13¾ in. below underside of steel floor units and at least 3¾ in. below steel beams. Ceiling supported by special "snap-on T" bars spaced not over 24 in. on centers and clipped to 1½ in. runner channels suspended from steel floor units by No. 12 gauge galvanized wire. Runner channels 48 in. on centers and wire hangers 24 in. on centers. Protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 87-2 HR (Beam 2 HR).	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular and Fluted

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ¾ in. U.L. listed acoustical tile with face of tile supported not less than 18 in. below underside of steel floor units and at least 10 in. below steel beams. Ceiling supported by "J" channels clipped to 1½ in. runner channels spaced 48 in. on centers. Protection and location of recessed lighting fixtures, access tile and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 38-3 HR. (Beam 4 HR).	3 hrs.
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete over combination fluted and cellular U.L. listed steel floor units. Ceiling of ¼ in. U.L. of Canada acoustical tile with mineral wool batts on top of tile. Ceiling supported by U.L. listed steel framing members not less than 13½ in. below underside of steel units. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C93-2 HR (Beam 3 HR).	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅝ in. thick (24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 12¼ in. from underside of steel floor units and at least 2¼ in. below steel beams by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 43-2 HR (Beam 4 HR).	2 hrs.
Acoustical Tile—Nonventilating Type, Exposed Suspension. No Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed fluted and cellular steel floor units. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile supported not less than 12¼ in. below steel units by U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 56-2 HR (Beam 4 HR).	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅝ in. thick (24 in. x 48 in.) U.L. listed acoustical tile with face supported not less than 12 in. from underside of steel floor units and not less than 4 in. below steel beams by U.L. listed framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 39-2 HR. (Beam 4 HR).	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular and Fluted (Continued)

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating Type, Exposed Suspension. Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅝ in. (24 in. x 48 in.) U.L. listed acoustical tile with or without through perforations and supported by U.L. listed steel framing members so that fact of tile is not less than 14½ in. below underside of steel floor units. Tile hold down clips, protection and location of recessed lighting fixtures and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 47-3 HR. (Beam 4 HR).	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅝ in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile with through perforations or no through perforations and supported by U.L. listed steel framing members so that face of tile is not less than 14½ in. below underside of steel floor units. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 62-2 HR (Beam 4 HR).	2 hrs.
Acoustical Tile—Ventilating Type, Exposed Suspension. No Ceiling Openings.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅝ in. (24 in. x 48 in.) U.L. listed acoustical tile with through perforations supported on U.L. listed steel framing members[su] and hanger wires of No. 12 SWG galvanized steel wire so that face of ceiling is not less than 12 in. below underside of steel units and not less than 2 in. below bottom flange of beam. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 13-2 HR (Beam 3 HR).	2 hrs.
Cementitious Material—Applied Directly to Steel Deck. Header Ducts.	2½ in. (minimum thickness over cells) concrete incorporating trench header ducts on top of U.L. listed cellular and fluted steel floor units. Ceiling of U.L. listed cementitious mixture applied directly to underside of steel floor units as follows: ⅞ in. on flat plate sections and sides and bottoms of fluted sections, 1 in. at top of fluted sections, 1½ in. under and extending 5¼ in. each side of trench header duct. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 52-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular and Fluted (Continued)

Ceiling Type	Details of Construction	Rating
Cementitious Material—Applied Directly to Steel Deck. Header Ducts.	2½ in. (minimum thickness over cells) concrete incorporating header ducts and junction boxes on top of U.L. of Canada listed cellular and fluted steel floor units. Ceiling of U.L. of Canada listed cementitious mixture applied directly to underside of steel floor units as follows: ¾ in. thick on flat plate and bottom of flutes, 1 in. thick in flutes and 1¼ in. thick under and extending 6 in. each side of header ducts. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C112-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete incorporating header ducts and junction boxes on top of U.L. listed cellular and fluted steel floor units. Ceiling of U.L. listed cementitious mixture applied directly to underside of steel floor units as follows: ¾ in. thick on flat plate and fluted sections, following contour of units, 1¼ in. under and extending 6 in. each side of header duct. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. 14-2 HR or 15-2 HR.	2 hrs.
Cementitious Mixture—Applied Directly to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅞ in. U.L. listed cementitious mixture machine applied directly to underside of steel floor units following contour of units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 21-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) expanded shale concrete on U.L. listed cellular and fluted steel floor units. ¾ in. U.L. listed cementitious mixture, machine applied directly to underside of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design No. 68-2 HR.	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ½ in. (minimum thickness) U.L. listed cementitious mixture spray applied directly to underside of steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. 38-2 HR and 40-2 HR.	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ¾ in. U.L. listed cementitious mixture machine applied directly to steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 51-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular and Fluted (Continued)

Ceiling Type	Details of Construction	Rating
Cementitious Mixture—Applied Directly to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅝ in. U.L. listed cementitious mixture machine applied to underside of steel floor units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C128-2 HR.....	2 hrs.
Fiber, Sprayed—Applied to Steel Deck. Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed fluted and cellular steel floor unit with 1½ in. deep x 6¾ in. wide header ducts in concrete. Ceiling of U.L. listed sprayed fiber applied to adhesive coated steel floor units. Sprayed fiber 1⅛ in. thickness under header ducts; 1⅝ in. thick in fluted sections under header ducts; 1⅛ in. thick in fluted sections not located in header duct area; ½ in. thick under cellular units and lower portion of fluted sections in areas not located under header ducts. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 50-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete incorporating trench header duct on top of U.L. listed fluted and cellular steel floor units. Ceiling of tamped U.L. listed sprayed fiber applied to underside of adhesive coated steel units as follows: ½ in. (⅞ in. untamped) on flat plate of cellular units and bottoms of fluted sections, 1 in. (1-7/16 in. untamped) in crests of fluted sections. 1-9/16 in. (2-11/16 in. untamped) under and extending 3½ in. each side of trench header duct. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 62-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete incorporating trench header duct on top of U.L. listed fluted and cellular steel floor units. Ceiling of untamped U.L. listed sprayed fiber applied to underside of water sprayed steel units as follows: ½ in. on flat plate of cellular units and bottoms of fluted sections, ⅞ in. in crests of fluted sections; 1⅛ in. in crests of fluted sections under and extending 8 in. each side of trench header—1½ in. under trench header and bottoms of fluted sections. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 66-3 HR.	3 hrs.
Fiber, Sprayed—Applied to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ¾ in. U.L. listed sprayed fiber applied to underside of adhesive coated steel floor units with flutes completely filled. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 33-4 HR.	4 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular and Fluted (Continued)

Ceiling Type	Details of Construction	Rating
Fiber, Sprayed—Applied to Steel Deck. No-Header Ducts.	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of U.L. listed sprayed fiber applied directly to adhesive coated steel floor units as follows: 1¼ in. tamped on flat plate of cellular units and to an average depth of ¾ in. in the valleys of the fluted units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C110-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber on flat plate and bottom of flutes and ⅞ in. in flutes U.L. listed sprayed fiber applied directly to underside of adhesive coated steel floor units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C130-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of U.L. listed sprayed fiber applied directly to adhesive coated floor units; and tamped ½ in. thick on bottom of floor units and 1-1/16 in. thick in recessed sections of fluted steel floor units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. C124-3 HR or C125-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber applied directly to underside of adhesive coated steel floor units. Fluted sections filled with sprayed fiber. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 29-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) reinforced concrete on top of U.L. listed steel form units. Ceiling of 9/16 in. U.L. listed sprayed fiber applied directly to the underside of adhesive coated steel units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 33-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ¾ in. U.L. listed sprayed fiber applied directly to underside of adhesive coated steel units filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection — Design Nos. 14-3 HR or 15-3 HR.	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular and Fluted (Continued)

Ceiling Type	Details of Construction	Rating
Fiber, Sprayed—Applied to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) concrete incorporating No. 4 SWG wire fabric on top of U.L. listed steel form units. Ceiling of ½ in. tamped U.L. listed sprayed fiber applied to underside of adhesive coated steel units. Fiber applied in two applications: first application—¼ to ⅜ in. tamped (½ in. untamped), second coat applied to total thickness 1⅛ in. and tamped to ½ in. completed thickness. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 43-3 HR.	3 hrs.
	3 in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber applied directly to underside of adhesive coated steel floor units filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 44-3 HR.	3 hrs.
	2½ in. (minimum thickness) limestone concrete on U.L. listed steel floor units. Ceiling of ½ in. tamped U.L. listed sprayed fiber (¾ in. untamped) applied to steel units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 61-3 HR.	3 hrs.
	2½ in. (minimum thickness) concrete on top of U.L. listed steel floor units. Ceiling of U.L. listed sprayed fiber tamped to thickness of ½ in. on flat plate steel section, 1 in. in flutes of fluted steel section (1¾ in. untamped). Steel units water sprayed prior to fiber application. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 64-3 HR.	3 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of U.L. listed sprayed fiber applied directly to adhesive coated floor units; and tamped ⅜ in. thick on bottom of floor units and 1⅛ in. thick in recessed sections of fluted steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 37-2 HR.	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber applied directly to adhesive coated floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 52-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Cellular and Fluted (Continued)

Ceiling Type	Details of Construction	Rating
Fiber, Sprayed—Applied to Steel Deck. No Header Ducts.	2½ in. (minimum thickness over cells) limestone concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ½ in. U.L. listed sprayed fiber applied directly to underside of adhesive coated steel floor units filling flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 48-2 HR.	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed fluted and cellular steel floor units. Ceiling of tamped U.L. listed sprayed fiber applied to adhesive coated steel units as follows: 9/16 in. (⅞ in. untamped) on flat plate of cellular units, 9/16 in. (¾ in. untamped) on bottom of flutes, ⅞ in. (1-7/16 in. untamped) on sides and top of flutes. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 89-2 HR.	2 hrs.
	2½ in. (minimum thickness over cells) concrete on top of U.L. listed cellular and fluted steel floor units. Ceiling of ⅜ in. (tamped) U.L. listed sprayed fiber applied to adhesive coated steel units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design Nos. C114-2 HR or C115-2 HR.	2 hrs.
None	3 in. (minimum thickness) expanded slag concrete on top of U.L. listed steel floor units. Other details as specified in U.L. of Canada listing, under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. C122-1½ HR.	1½ hrs.

Steel Units[u]—Corrugated

Acoustical Material (Plaster or Plastic)—Applied to Steel Deck	4½ in. (measured from bottom of corrugations) limestone concrete on top of U.L. listed corrugated steel floor units. Ceiling of ½ in. (measured from the bottom of corrugations) U.L. listed acoustical material or cementitious mixture applied directly to underside of corrugated steel flool units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 10-4 HR.	4 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Units[u]—Corrugated (Continued)

Ceiling Type	Details of Construction	Rating
Cementitious Mixture—Applied to Steel Deck. Header Ducts.	4½ in. (measured from bottom of corrugations) reinforced expanded shale concrete on top of U.L. listed corrugated steel form units. Ceiling of ¾ in. U.L. listed cementitious mixture applied to underside of form units and 2⅛ in. under junction box area. Header ducts limited to not more than 3 in each 180 sq. ft. of floor area. Header duct location, cells in form units, location of additional thickness of cementitious mixture and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 23-4 HR.	4 hrs.
	4 in. (measured from bottom of corrugations) reinforced concrete on top of U.L. listed corrugated steel form units. Ceiling of ¾ in. U.L. listed cementitious mixture machine applied to underside of form units. 1-9/16 in. cementitious mixture under electrical junction box area. Junction box, header duct locations and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 24-3 HR.	3 hrs.
Cementitious Mixture—Applied to Steel Deck. No Header Ducts.	4 in. (measured from bottom of corrugations) concrete with No. 6 SWG wire 6 x 6 in. mesh on top of No. 22 gauge galvanized steel supported on and tack welded to steel-trussed "T" members spaced 16 in. on centers. Ceiling of ⅝ in. U.L. listed cementitious mixture machine applied directly to underside of steel floor units following corrugations. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 48-3 HR.	3 hrs.
Fiber, Sprayed—Applied to Steel Deck	4½ in. (measured from bottom of corrugations) limestone concrete on top of U.L. listed corrugated steel floor units. Ceiling of ⅞ in. (minimum thickness) U.L. listed sprayed fiber applied to underside of adhesive coated corrugated floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 9-4 HR.	4 hrs.
Plaster on Metal Lath. Header Ducts.	4½ in. (measured from bottom of corrugations) expanded slag concrete on top of U.L. listed corrugated steel floor units. Ceiling of ⅜ in. gypsum-perlite plaster (measured from face of lath attached to floor units) on metal lath, and sufficient plaster pushed through the lath to fill the corrugations of the floor units. Plaster mix: scratch and brown coat 2 cu. ft. U.L. listed perlite to 100 lbs. gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 8-4 HR.	4 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Units[u]—Corrugated (Continued)

Ceiling Type	Details of Construction	Rating
Plaster on Metal Lath. Header Ducts.	4½ in. (measured from bottom of corrugations) expanded slag concrete on top of U.L. listed corrugated steel floor units. Ceiling of ⅜ in. gypsum-perlite plaster (measured from face of lath attached directly to steel floor units) on metal lath, and sufficient plaster pushed through the lath to fill the corrugations of the steel floor units; 1 in. plaster thickness to the face of the lath in an area 3 ft. square centered below electrical raceway junction box; not more than one junction box in each 90 sq. ft. floor area. Plaster mix: scratch and brown coat 2 cu. ft. U.L. listed perlite to 100 lbs. gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 5-3 HR.	3 hrs.
Plaster on Metal Lath. No Header Ducts.	4½ in. (measured from bottom of corrugations) concrete on top of U.L. listed corrugated steel floor units. Ceiling of 1 in. (measured from face of lath) gypsum-vermiculite plaster on metal lath. Lath supported not less than 14½ in. from underside of steel floor. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. vermiculite to 100 lbs. gypsum. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 7-4 HR (Beam 4 HR).	4 hrs.
None	4½ in. (measured from bottom of corrugations) reinforced expanded shale concrete on top of U.L. listed corrugated steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 7-3 HR.	3 hrs.
	5¼ in. (measured from bottom of corrugations) reinforced limestone concrete on top of U.L. listed corrugated steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-2 HR.	2 hrs.
	4½ in. (measured from bottom of corrugations) crushed limestone concrete on top of U.L. listed corrugated steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 3-1 HR, or No. 4-1 HR.	1 hr.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Steel Floor Units[u]—Fluted

Ceiling Type	Details of Construction	Rating
Cementitious Mixture—Applied to Steel Deck	2½ in. (minimum thickness) concrete on top of U.L. listed steel form units. Ceiling of ¼ in. U.L. listed cementitious mixture applied directly to underside of steel form units filling crests of flutes solid. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 90-2 HR.	2 hrs.

Steel Floor Units[u]—Ribbed

Acoustical Materials (Plaster or Plastic)—Applied to Steel Deck. Header Ducts.	2½ in. (minimum thickness) concrete on top of U.L. listed ribbed steel floor units with reinforcing steel placed over steel beam. Ceiling of ¾ in. U.L. listed vermiculite acoustical plastic or plaster machine applied dicetly to underside of steel floor units filling flutes as follows: 1 in. under cells in steel units and header ducts; 1½ in. under junction boxes and extending at least 2 in. beyond edges of junction box. Not more than 3 header ducts in each 190 sq. ft. of floor area. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-3 HR.	3 hrs.
Cementitious Material—Applied to Steel Deck. Header Ducts.	2½ in. (minimum thickness) concrete on top of U.L. listed ribbed steel floor units with reinforcing steel placed over steel beam. Ceiling of ¾ in. U.L. listed cementitious material machine applied directly to underside of steel floor units filling flutes as follows: 1 in. under header duct extending at least 2-11/16 in. beyond edges. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 32-3 HR.	3 hrs.
Cementitious Material on Metal Lath, Ceiling Openings.	2 in. (minimum thickness) concrete on top of U.L. listed ribbed steel floor units. Ceiling of 15/16 in. (measured from face of lath) U.L. listed cementitious mixture on metal lath suspended not less than 15½ in. from ribs of floor units, and spaced at least 3½ in. below steel beams. Lath attached to ¾ in. furring channels supported by 1½ in. runner channels. Furring channels spaced not more than 13½ in. on centers. Protection and location of duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 12-4 HR (Beam 4 HR).	4 hrs.

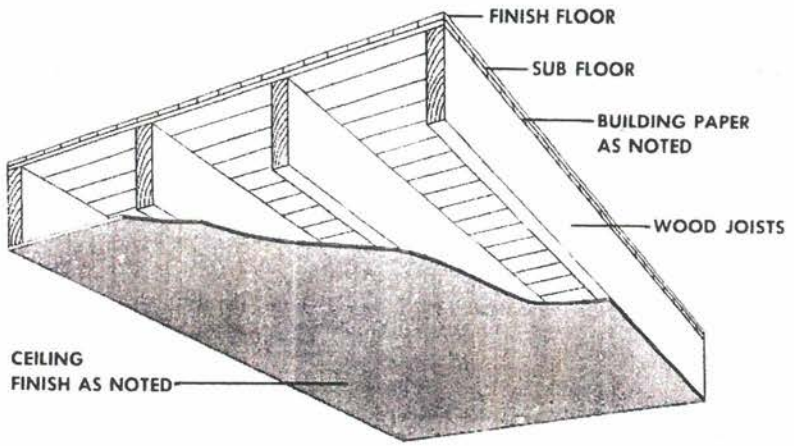
Heavy Timber

None	6 in. laminated plank floor with 1 in. finish flooring on top. (31)	1 hr. comb.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Wood Joists[nn]



Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension	5/8 in. U.L. listed acoustical tile attached to wood joists by "Z" clips spaced 12 in. on centers and nailing clips. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 9-1 HR.....	1 hr. comb.
	3/4 in. U.L. listed acoustical tile attached to joists by nailing hangers and "H" runners spacing the back of tile 3/4 in. from underside of joists. Installation of tile and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 12-1 HR.	1 hr. comb.
	3/4 in. U.L. listed acoustical tile supported by "J" channels 12 in. on centers secured to wood joists by hanger strap 1 in. x 4½ in. x 22 gauge galvanized steel spaced 48 in. on centers. Flat spline at right angles to "J" channels spaced 12 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 16-1 HR.	1 hr. comb.
	3/4 in. U.L. listed acoustical tile with face of tile supported not less than 1⅛ in. from bottom of wood joists by troffer clips attached to "Z" splines. Clips spaced 48 in. on centers on each joist. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 15-1 HR.	1 hr. comb.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Wood Joists[nn] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Concealed Suspension	¾ in. U.L. listed acoustical tile supported by concealed cross "T" spaced not more than 12 in. on centers resting on No. 25 gauge galvanized steel "H" runner 1 in. deep x ¾ in. wide spaced not more than 24 in. on centers and attached to No. 22 gauge galvanized steel hanger clips 7½ in. long x 2 in. wide nailed 24 in. on centers along each joist and to every third joist. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 20-1 HR.	1 hr. comb.
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	⅝ in. (24. in x 48 in.) U.L. listed acoustical tile supported by U.L. listed steel framing members with face of tile not less than 13½ in. below bottom of joists. Steel framing members supported by No. 12 SWG galvanized steel wire secured through joists 7½ in. from bottom of joist and spaced 48 in. on centers. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 22-1 HR.	1 hr. comb.
	½ in. (24 in. x 48 in.) U.L. listed acoustical tile supported by U.L. listed steel framing members with exposed tees supporting face of tile not less than 10¼ in. below bottom of joists. Steel framing members supported by No. 12 SWG galvanized wire attached to wood joist 5 in. above bottom of joist. Wire spaced not over 48 in. on centers for main runners and 24 in. on centers for cross "T". Protection and location of recessed lighting fixtures and duct openings, tile hold-down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 23-1 HR.	1 hr. comb.
	½ in. (24 in. x 48 in.) or ⅝ in. (24 in. x 48 in.) U.L. listed acoustical tile supported not less than 20 in. below underside of subfloor by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 27-1 HR.	1 hr. comb.
	½ in. U.L. listed acoustical tile (24 in. x 48 in.) supported not less than 19½ in. from underside of subflooring by U.L. listed steel framing members. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 30-1 HR.	1 hr. comb.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Wood Joists[nn] *(Continued)*

Ceiling Type	Details of Construction	Rating
Acoustical Tile—Nonventilating Type, Exposed Suspension. Ceiling Openings.	5/8 in. U.L. listed acoustical ceiling boards (24 in. x 48 in. or 24 in. x 24 in.) supported not less than 19 3/8 in. below underside of sub-flooring by exposed U.L. listed steel framing members secured with No. 12 SWG attached 5 in. above bottom of joists. Tile hold down clips, protection and location of recessed lighting fixtures and duct openings and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 31-1 HR.	1 hr. comb.
Acoustical Tile—Nonventilating Type, Exposed Suspension. No Ceiling Openings.	5/8 in. thick (24 in. x 48 in.) U.L. listed acoustical tile with face of tile supported not less than 9 3/4 in. below bottom of joists by U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 8-1 1/2 HR.	1 1/2 hrs. comb.
	5/8 in. thick (24 in. x 48 in. or 24 in. x 24 in.) U.L. listed acoustical tile with face of tile supported not less than 10 in. below joists by U.L. listed steel framing members. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 11-1 1/2 HR.	1 1/2 hrs. comb.
	5/8 in. (24 in. x 24 in. or 24 in. x 48 in.) U.L. listed acoustical tile supported not less than 8 1/4 in. from the bottom of joists by U.L. listed steel framing members with exposed flange of "T" supporting tile. Steel framing members supported by No. 12 SWG galvanized wire spaced 48 in. on centers. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 17-1 HR.	1 hr. comb.
	5/8 in. (24 in. x 48 in.) U.L. listed acoustical tile supported by U.L. listed steel framing members placing face of tile 7 1/2 in, below bottom of joist. Suspension system secured to joist by No. 12 SWG galvanized wire supporting main "T" on not more than 48 in. on centers. Tile hold down clips and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 21-1 HR.	1 hr. comb.
Gypsum Wallboard	Two layers 1/2 in. gypsum wallboard with 1 in. mesh wire fabric between. First layer of wallboard nailed with 1 5/8 in. nails having 7/32 in. heads; wire fabric and second layer of wallboard nailed with 2 3/8 in. nails having 1/4 in. heads. Outside joints and nailheads covered with joint compound. (53)	1 hr. comb.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Wood Joists[nn] *(Continued)*

Ceiling Type	Details of Construction	Rating
Gypsum Wallboard	5/8 in. U.L. listed wallboard nailed with 1 7/8 in. nails, 6 in. on centers. Joints covered with fiber tape and joint finisher. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 1-1 HR.	1 hr. comb.
	5/8 in. U.L. listed gypsum wallboard attached to furring channels of No. 25 gauge galvanized steel spaced 24 in. on centers and secured to joists with 1 1/4 in. furring channel and screws at each joist and joint. Joints and screw heads covered with tape and joint compound. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 25-1 HR.	1 hr. comb.
	1/2 in. U.L. listed gypsum wallboard applied to 5/8 in. deep galvanized steel furring channels placed perpendicular to joists and spaced 24 in. on centers and intermediate channels at end joints of wallboard. Furring channels nailed to joists and wallboard attached to furring channels with 1 in. self-drilling and self-tapping screws spaced 12 in. on centers and additional screw at intersection of wallboard. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 34-1 HR.	1 hr. comb.
	5/8 in. U.L. listed gypsum wallboard attached with laminating compound and anchors spaced 24 in. on centers to U.L. listed 1/2 in. gypsum wallboard with special joints. Wallboard with backing board special joints attached to wire nailing clips attached to joists with nails spaced 16 in. on centers. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 29-1 HR.	1 hr. comb.
	1/2 in. U.L. listed gypsum wallboard secured to 1/2 in. furring channels spaced 24 in. on centers and additional furring channels at ends of wallboard with 1 in. self-drilling and self-tapping screws spaced 12 in. on centers with extra screws at joints. Furring channels attached to bottom edge of joists with 2 in. nail. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 33-1 HR.	1 hr. comb.
Plaster and Gypsum Lath	1/2 in. gypsum-perlite plaster on 3/8 in. plain gypsum lath nailed to joists with 1 1/2 in. nails having 3/8 in. diameter heads. Plaster reinforced with 1 in. mesh wire fabric nailed to joists through lath, with 2 3/8 in. nails having 1/4 in. diameter heads. Plaster mix: scratch and brown coats, 2 1/2 cu. ft. to 100 lbs. fibered gypsum. (51)	1 1/2 hrs. comb.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Wood Joists[nn] *(Continued)*

Ceiling Type	Details of Construction	Rating
Plaster and Gypsum Lath	½ in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath, nailed to joists with 1-3/16 in. nails having 9/32 in. diameter heads. Plaster mix: scratch and brown coats 2½ cu. ft. perlite to 100 lbs. fibered gypsum. (52)	1 hr. comb.
Plaster and Metal Lath	¾ in. gypsum-vermiculite plaster on metal lath nailed to joists with 1½ in. barbed roofing nails, having 7/16 in. heads and spaced 4¾ in. on centers. Plaster applied with sufficient pressure to form large keys on back of lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. vermiculite to 100 lbs. fibered gypsum. (58)	1½ hrs. comb.
	¾ in. gypsum-perlite plaster on metal lath nailed to joists with 1½ in. barbed roofing nails having 7/16 in. heads and spaced 4¾ in. on centers. Plaster applied with sufficient pressure to form large keys on back of lath. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. fibered gypsum. (57)	1½ hrs. comb.
Plaster and Gypsum Lath	Double ⅞ in. tongue and groove wood flooring with insulating layer between. Ceiling of ½ in. 2:1 wood-fibered gypsum and sand plaster on ⅜ in. plain gypsum plaster base attached by 1¼ in. nails with 7/16 in. heads, 12 to each 16 x 48 in. lath; 3 in. strips expanded metal lath over all joints in gypsum lath. (25)	1 in. comb.
	Wood floor consisting of ¾ in. sub-floor and tongue and groove finish flooring with asbestos paper weighing 12 to 14 lbs. per 100 sq. ft. between. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster on metal lath nailed with 1½ in. No. 11 gauge barbed roofers' nails having 7/16 in. heads and spaced 6 in. on centers. (9)	1 hr. comb.
	Wood floor consisting of ¾ in. sub-floor and tongue and groove finish flooring with asbestos paper weighing 12 to 14 lbs. per 100 sq. ft. between. Ceiling of ½ in. 1:2 gypsum and sand plaster on ⅜ in. perforated gypsum lath attached by 1⅛ in. nails with ⅜ in. heads and spaced 4 in. on centers; 3 in. strips of expanded metal lath nailed over all joints in gypsum lath using 1¾ in. nails with ½ in. heads spaced 5 in. on centers along joists and with 2 nails to each joist for joints perpendicular to joists. (9)	1 hr. comb.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Wood Joists[nn] *(Continued)*

Ceiling Type	Details of Construction	Rating
Plaster and Metal Lath	Wood floor consisting of ¾ in. sub-floor and tongue and groove finish flooring with two layers of kraft paper with tar between weighing 5.6 lbs. per 100 sq. ft. between sub and finish flooring. Ceiling of ¾ in. 1:2, 1:3 portland cement and sand plaster with 3 lbs. asbestos fiber and 15 lbs. hydrated lime added per 94-lb. bag of cement, on metal lath nailed with 1½ in. No. 11 gauge barbed roofers' nails having 7/16 in. heads and spaced 6 in. on centers. (9)	1 hr. comb.

Wood Floor Panels

Gypsum Wallboard	Wood floor consisting of 1⅛ in. plywood with tongue and groove side joints and exterior grade laminating glue. Butt joints of plywood centered over doubled 2 x 10 joists spaced 4 ft. on centers. Ceiling of ⅝ in. U.L. listed gypsum wallboard attached to ⅞ in. metal furring channels with 1 in. wallboard screws spaced 12 in. on centers. Furring channels spaced 24 in. on centers and also located at joints. Gypsum wallboard secured to joists by 1¼ in. furring channel screws. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. 28-1 HR.	1 hr. comb.

Estimated Ratings

Brick Arch

Plaster	Minimum depth 4 in. for spans of 5 ft. or less; rise at least 1 in. per ft. of span; at least 2 in. concrete fill on top or arch; ceiling plastered with ¾ in. portland cement or gypsum plaster. (23)	3 hrs.
None	Minimum depth 8 in.; rise at least 1 in. per ft. of span. (23)	3 hrs.

Hollow Clay Tile Arch

Plaster	Minimum depth 6 in. with at least 2 cells in the depth; shells and webs not less than ⅝ in. in thickness; vertical and horizontal dimension of cells not greater than 4 in.; at least 2 in. concrete fill on top of arch; ceiling plastered with ¾ in. portland cement or gypsum plaster. (24)	3 hrs.

Letter superscripts refer to notes, page 139.

FLOOR AND CEILING CONSTRUCTIONS—Continued

Estimated Ratings—Continued

Precast Reinforced Concrete Joists
(30 *in. centers max.*)

Ceiling Type	Details of Construction	Rating
Plaster on Metal Lath	2½ in. reinforced[w] concrete floor slab on joists. Ceiling of 1 in. unsanded, wood-fibered gypsum plaster, or ¾ in. gypsum-perlite or gypsum-vermiculite plaster on metal lath. Plaster mix: scratch coat 2 to 2½ cu. ft. and brown coat 3 to 3½ cu. ft. perlite or vermiculite to 100 lbs. gypsum.	3 hrs.
	2¼ in. reinforced[w] concrete floor slab on joists. Ceiling of ¾ in. 1:2, 1:3 gypsum and sand plaster on metal lath.	2 hrs.

Letter superscripts refer to notes, page 139.

ROOF CONSTRUCTIONS

Building Units—Prefabricated

Ceiling Type	Details of Construction	Rating
Fiber, Sprayed on Metal Lath	4 in. deep U.L. listed cellular asbestos cement building units screwed together. Ceiling of 1 in. tamped (measured from face of lath) U.L. listed sprayed fiber applied to metal lath supported not less than 12 in. below underside of building units by No. 18 SWG wire. ¾ in. furring channels spaced 12 in. on centers and wire tied to 1½ in. runner channels spaced 42 in. on centers. Other details as specified in U.L. of Canada listing, under Roof and Ceiling Constructions—Design No. C123-2 HR (Beam 3 HR).	2 hrs.

Concrete, Precast

Acoustical Tile—Ventilating Type, Concealed Suspension	Class A, B or C, U.L. listed built-up roof covering over 1 in. thick U.L. listed mineral and plywood board nailed to 2 in. U.L. listed precast concrete units having tongue and groove steel edges. Units secured to steel supported members by sheet steel clips of No. 16 gauge galvanized steel. Ceiling of ¾ in. thick U.L. listed tongue and groove acoustical tile secured to No. 25 gauge "Z" runners spaced 12 in. on centers and attached to 1½ in. runner channels spaced not more than 48 in. on center by No. 11 SWG galvanized wire clips. Runner channels supported by No. 12 SWG galvanized hanger wire tied to sheet steel clips nailed to bottom edge of precast concrete units. Other details as specified in U.I.. listing[c], under Roof and Ceiling Constructions—Design No. RC4-2 HR.	2 hrs.
None	Class A, B or C, U.L. listed built-up roof covering over 3 in. thick U.L. listed perlite concrete tiles supported on U.L. listed pretensioned concrete joists. Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions — Design No. RC5-2 HR.	2 hrs.

Concrete on Metal Deck

Acoustical Material	2⅞ in. (measured to bottom of corrugations) vermiculite concrete on No. 26 gauge and ⅞ in. deep corrugations steel units. Ceiling of ⅞ in. U.L. listed acoustical material applied to steel deck following corrugations. Deck supported on U.L. listed precast reinforced concrete joists having coating of 1/16 in. U.L. listed acoustical material spaced not more than 6 ft. on centers. Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions—Design No. RC10-2 HR.	2 hrs.

Letter superscripts refer to notes, page 139.

ROOF CONSTRUCTIONS—Continued

Concrete on Metal Deck (Continued)

Ceiling Type	Details of Construction	Rating
None	3 in. U.L. listed reinforced vermiculite concrete on ribbed steel floor units. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions—Design No. RC1-1½ HR.	1½ hrs.
	3½ in. reinforced perlite concrete on corrugated steel form units. Concrete mix: 6 cu. ft. of U.L. listed perlite aggregate to 94 lbs. of portland cement and 1½ pints of air entraining agent. Other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions—Design Nos. 6-1 HR or RC2-1 HR.	1 hr.

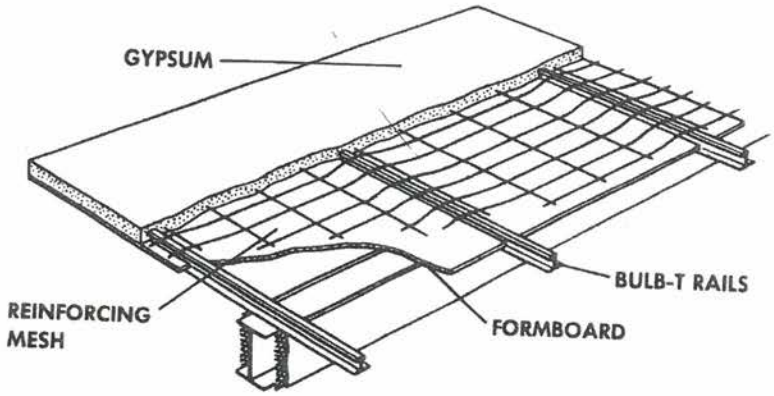
Concrete on Metal Lath

Plaster on Metal Lath	Class A, B or C, U.L. listed built-up roof covering over 2½ in. perlite concrete. Concrete mix: 6 cu. ft. perlite to 94 lbs. portland cement. Ceiling of ¾ in. (measured to face of lath) gypsum perlite plaster on metal lath wire tied to lower cord of joist 4¾ in. on centers with No. 18 SWG galvanized wire. Joists spaced 24 in. on centers. Beam supporting joists protected by gypsum perlite plaster on metal lath boxed around beam and supported on ¾ in. stiffening channels wire tied to hanger channels. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions—Design No. RC2-3 HR. (Beam 2 HR).	3 hrs.

Letter superscripts refer to notes, page 139.

ROOF CONSTRUCTIONS—Continued

Gypsum Concrete



Ceiling Type	Details of Construction	Rating
Acoustical Tile—Ventilating or Non-ventilating Type, Exposed Suspension	Class A, B or C, U.L. listed built-up roof covering on 1½ in. gypsum concrete on ½ in. U.L. listed gypsum formboard supported by steel bulb "Ts". Ceiling of ⅝ in. U.L. listed acoustical ceiling board supported not less than 21 in. below underside of gypsum formboard by exposed U.L. listed steel framing members. Duct openings not to exceed 110 sq. in. in each 100 sq. ft. of ceiling area and protected with fire damper of No. 18 gauge galvanized steel covered with asbestos paper. Recessed lighting fixture not to exceed 16 sq. ft. in each 100 sq ft. ceiling area with recessed portion completely protected with shield of U.L. listed 1¼ in. mineral wool batts. Tile hold down clips, air duct and lighting fixture installation and location and other details as specified in U.L. listing[c], under Floor or Roof, and Ceiling Constructions and Beam Protection—Design No. RC6-2 HR.....	2 hrs.
None	2½ in. reinforced gypsum concrete on ½ in. gypsum formboard supported on bulb-T rails 32⅝ in. on centers. (119)	2 hrs.
	2¼ in. gypsum concrete reinforced with 12 x 14 in. steel wire gauge 4 in. x 8 in. welded wire mesh on 1 in. thick 32 in. x 48 in. U.L. listed mineral fiber formboards supported on 1⅞ in. by 1⅞ in. steel bulb "Ts" and steel cross "Ts" 9/16 in. x 1¼ in. resting on flanges of bulb "Ts". Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions—Design No. RC2-2 HR.	2 hrs.
	2 in. reinforced gypsum concrete on ½ in. gypsum formboard supported on bulb-T rails 32⅝ in. on centers. (106)	1 hr.
Plaster	4 in. reinforced gypsum concrete slab supported on properly protected floor beams; reinforced ¾ in. above bottom of slab; ceiling plastered with ¾ in. gypsum and sand plaster. (18, 19)	3 hrs.

Letter superscripts refer to notes, page 139.

ROOF CONSTRUCTIONS—Continued

Metal Deck

Ceiling Type	Details of Construction	Rating
Cementitious Mixture—Applied to Steel Deck	Class A, B or C, U.L. listed built-up roof covering over 1 in. thick U.L. listed mineral and fiber boards secured to No. 22 (minimum) gauge fluted steel deck with ribbons of U.L. listed adhesive. Ceiling of ⅞ in. (measured from face of lath) gypsum vermiculite plaster on metal lath secured with No. 18 SWG galvanized wire spaced 6 in. on centers to ¾ in. furring channels spaced 12 in. on centers and wire tied with No. 16 SWG galvanized wire to 2 in. runner channels spaced 32 in. on centers and wire tied to joists with No. 11 SWG galvanized wire. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. of U.L. listed vermiculite plaster aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions—Design No. RC1-2 HR.....	2 hrs.
	No. 16 gauge galvanized steel specially shaped U.L. listed steel roof units secured together with ⅜ in. bolts spaced 6 in. on centers and 3/16 in. thick by ⅜ in. wide rubber sealer. Ceiling of 2 in. U.L. listed cementitious mixture machine applied directly to underside of steel units. Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions—Design No. RC1-1 HR.	1 hr.
Plaster on Metal Lath	Class A, B or C, U.L. listed built-up roof covering over ¾ in. U.L. listed mineral and fiber boards secured to U.L. listed vapor barrier with U.L. listed adhesive. Vapor barriers secured to No. 22 gauge or heavier, 1½ in. deep fluted steel deck with adhesive. U.L. listed adhesive applied in approximately ½ in. ribbons at 0.4 gal. per 100 sq. ft. Ceiling of 1 in. gypsum vermiculite plaster on metal lath secured to ¾ in. furring channels spaced 12 in. on centers and secured to 2 in. deep steel channels spaced 32 in. on centers. Metal lath secured to furring channels 6 in. on centers and furring channels secured to 2 in. channels with No. 18 SWG galvanized wire. 2 in. channels wire tied to bottom chord of joists with No. 14 SWG galvanized wire. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. of U.L. listed vermiculite plastic aggregate to 100 lbs. of fibered gypsum. Other details as specified in U.L. listing[c], under Roof and Ceiling Constructions—Design No. RC8-2 HR.	2 hrs.
	Any construction described under "Floor and Ceiling Constructions."	Same as Floor and Ceiling Rating

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS

Brick, Hollow Tile and Hollow Tile Brick faced

Type	Details of Construction	Combustible Members Framed in Wall[a] — Minimum Thickness[b], Inches for Ratings of				Members Framed in Wall: None or Noncombustible — Minimum Thickness[b], Inches for Ratings of			
		4 hrs.	3 hrs.	2 hrs.	1 hr.	4 hrs.	3 hrs.	2 hrs.	1 hr.
Brick (clay, shale, concrete or sand-lime)	Solid walls plastered one side or unplastered. (1, 2, 3, 93)	12	12	8	8	8	8	8	4
	Solid walls plastered each side with ½ in. 1:3 gypsum and sand or portland cement and sand plaster, or ⅝ in. 1:2½ portland cement and sand or lime and sand plaster. (1, 2, 3, 93)	12	8	8	8	8	8	4	4
	Hollow "Cavity" type walls; ¼ in. round metal ties spaced 2 ft. horizontally every 6th course. (9, 93)	—	—	—[d]	10	10	10	10	10
		U=units		C=cells		See Note g			
Hollow Tiles (clay or shale) Load Bearing	Unplastered. (4)	16^{2U}_{4C}	16^{2U}_{4C}	12_{3C}	12_{3C}[n]	12^{2U}_{4C}	12^{2U}_{3C}	12_{3C}	8_{2C}
	Plastered one side[i] with ⅝ in. 1:3 gypsum and sand plaster. (4)	16^{2U}_{4C}	12_{3C}	12^{h}_{2C}	8_{2C}	12^{2U}_{3C}	12_{3C}	8_{3C}	8_{2C}
	Plastered each side as above. (4)	16^{2U}_{4C}	12_{3C}	12^{h}_{2C}	8_{2C}	12_{3C}	8_{2C}	8_{2C}	8_{2C}
Hollow Tile, Brick-faced	Hollow clay (or shale) load-bearing *tile of thickness shown,* bonded to 4 in. brick facing, unplastered. (9)	—	—	8	4	8	4	4	4
	Same as above with tile side plastered with ⅝ in. 1:3 gypsum and sand plaster. (4, 9)	—	12	8	4	4	4	4	4

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS

Brick

Type	Details of Construction	Rating
Cored	6 in. units 76% solid, unplastered; with noncombustible or no members framed into the wall. (91)	2½ hrs.
	4 in. units 83% solid, unplastered; with noncombustible or no members framed into the wall. (139)	1 hr.
Hollow	8 in. units 71% solid, plaster on both sides with ⅝ in. 1:3 gypsum and sand plaster: (64)	
	With noncombustible or no members framed into wall.	4 hrs.
	With combustible framed[a] in members fully embedded in mortar.	3 hrs.
	With unembedded combustible members framed[a] into wall.	2 hrs.
	8 in. units 71% solid, unplastered: (64)	
	With noncombustible or no members framed into wall.	3 hrs.
	With combustible framed[a] in members fully embedded in mortar.	2 hrs.
	With unembedded combustible members framed[a] into wall.	1½ hrs.

Clay Tile

Hollow	8 in. wall units 43% solid, 3 cells in wall thickness (4):	
	Noncombustible or no members framed into the wall.	
	Unplastered	2 hrs.
	Plastered one side	3 hrs.
	Plastered both sides	4 hrs.
	Combustible members framed in.	
	Plastered one side	1 hr.
	8 in. wall units 49% solid, 2 cells in wall thickness (4):	
	Noncombustible or no members framed into the wall.	
	Unplastered	2 hrs.
	Plastered one side	3 hrs.
	Plastered two sides	4 hrs.
	Combustible members framed in.	
	Unplastered	1 hr.
	Plastered one side	2 hrs.
Solid and Hollow	6⅜ in. partition with two units in wall thickness, one unit 3⅞ in., other 1¾ in. thick, with ¾ in. joint between filled with mortar. Position of units reversed on alternating courses. Tile cored not to exceed 25% in 4 in. unit, and not to exceed 15% in 1¾ in. unit. (13)	3 hrs.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Clay Tile (Continued)

Type	Details of Construction	Rating
Solid and Hollow	6 in. partition consisting of 4 in. tile cored not to exceed 41%, faced on fire exposed side with 1¾ in. tile cored not to exceed 15% with ⅜ in. mortar filled joint between, and plastered on opposite side with ¾ in. 1:3 gypsum and sand plaster. (12)	3 hrs.*
	6 in. partition consisting of 4 in. tile cored not to exceed 40.5%, faced on fire exposed side with 1¾ in. tile cored not to exceed 22.5% with ¼ in. mortar fill between. (117)	2 hrs.*
	4 in. facing tile cored not to exceed 25%, plastered on back side with ¾ in. 1:3 gypsum and sand plaster. (14)	2 hrs.*
	4 in. facing tile cored not to exceed 30%, plastered on back side with ¾ in. gypsum-vermiculite plaster composed of 3½ cu. ft. vermiculite to 100 lbs. gypsum. (16)	2 hrs.*
	4 in. hollow tile of medium burned clay, not less than 60% solid, two cells in thickness; both sides plastered with ⅝ in. 1:3 gypsum and sand plaster. (9, 59)	2 hrs.*
	6 in. hollow tile of medium burned clay, not less than 45% solid, two cells in thickness; both sides plastered with ⅝ in. 1:3 gypsum and sand plaster. (9, 59)	2 hrs.*
	6 in. hollow tile (stretcher) with cored shells, glazed one face, not less than 71% solid, three horizontal cells in thickness, unplastered. (112)	2 hrs.*
	6 in. hollow tile of medium burned clay, not less than 30% solid; plastered on both sides with ⅝ in. 1:3 gypsum and sand plaster. (9, 59)	1½ hrs.*
	4 in. hollow tile (stretcher) with surface and through perforations on one face, not less than 72% solid, two horizontal cells in thickness, 1 in. thick fibrous glass pad in ¾ in. thick cell on perforated side, unplastered. Through perforations into cell not more than 9% of face area, additional surface perforations not more than 2% of face area. (111)	1 hr.*
	3 in. hollow tile not less than 50% solid, or 4 in. hollow tile not less than 40% solid, of medium burned clay; plastered on both sides with ⅝ in. 1:3 gypsum and sand plaster. (9, 59)	1 hr.*
	4 in. facing tile cored not to exceed 47%, plastered on back side with ¾ in. 1:3 gypsum and sand plaster. (30)	1 hr.*
	4 in. hollow tile plastered each side with ¾ in. 1:3 gypsum and sand plaster. (5)	1 hr.*
	6 in. hollow tile plastered each side with ⅝ in. 1:3 gypsum and sand plaster. (9)	1 hr.*
	4 in. hollow tile having 2 cells in wall thickness plastered each side with ⅝ in. 1:3 gypsum and sand plaster. (9)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Composite Blocks

Type	Details of Construction	Rating
Unlisted With Brick Veneer	9½ in. wall consisting of 3 in. cement coated wood fiber composite units spaced 2¼ in. from 3¾ in. brick. Composite units plastered one side with ½ in. 1:2 gypsum and sand plaster. Two wythes bonded together by ½ in. diameter zinc alloy rods shaped as "Z" anchors and spaced 18½ in. vertically and 24 in. horizontally. (104)	4 hrs.*
U.L. Listed	4½ in. partition consisting of 3 in. thick U.L. listed building units. ¾ in. gypsum perlite plaster on both sides. Plaster mix: scratch and brown coat 2 cu. ft. and 3 cu. ft. U.L. listed perlite aggregate to 100 lbs. of fibered gypsum. Building units laid as specified in U.L. listing[c], under Walls and Partitions—Design No. 6-3 HR.	3 hrs.*
Structural Wood Fiber Units	4½ in. wall consisting of 3 in. U.L. listed building units, plastered on both sides with ¾ in. 1:1, 1:2 gypsum sand plaster. Mortar joints and other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 2-3 HR.	3 hrs.*
	4½ in. wall consisting of 3 in. U.L. listed building units (tongue and groove joints—without mortar but with 4 in. strips of metal lath nailed over joints), plastered on both sides with ¾ in. plaster. Scratch and brown coats 3 cu. ft. U.L. listed perlite plaster aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 4-3 HR.	3 hrs.*

Concrete

Poured-in-Place	8 in. monolithic wall reinforced as specified in U.L. listing[c], under Walls and Partitions—Design No. 4-4 HR and as described in detail in U.L. report R 3208 dated July 2, 1951.	4 hrs.†
Precast	8 in. hollow units of expanded slag concrete, 52% solid, minimum wall and web thickness 1½ in., unplastered. Units laid vertically on lintel with flange of ring anchors in center groove of units at the joints on the lintel. 3 in. paper tubing set on top of ring anchors and pressed into joint. Joints grouted to paper tubing. ¾ in. horizontal reinforcing rod inserted through the exposed section of ring anchors and tied in place. Floor strap anchors tied to reinforcing rod. All steel covered with concrete. (98)	4 hrs.
	6 in. U.L. listed precast concrete units; cells filled with grout; joints and top 6 in. of units reinforced and installed as specified in U.L. listing[c], under Walls and Partitions—Design No. 9-4 HR.	4 hrs.

* Nonbearing. † Rated as load bearing with noncombustible, or no members, framed into wall.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Concrete (Continued)

Type	Details of Construction	Rating
Precast	6 in. hollow panels of pumice concrete; core holes 3⅝ in. to 3⅞ in., face shell thickness 1 in. to 1¼ in. Panels held in alignment and secured together by removing top 5 in. of webs in each panel, and core holes, joints and top 5 in. filled with 1:5.33 cement sand grout. Joints and top of panels reinforced with ½ in. reinforcing bar. (101)	4 hrs.*
	6 in. U.L. listed concrete units; cells and spaces completely filled with fluid mortar mix and construction reinforced with ½ in. deformed steel spaced 24 in. on centers horizontally and vertically. Mortar mix: 5 cu. ft. pumice aggregate and 1 cu. ft. of cement. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 8-4 HR.	4 hrs.†
	4 in. U.L. listed building units set in reinforced concrete grooved lintel at top and steel 2½ in. base angles each side of wall at floor. ⅛ in. asbestos cement board splines between units for full height of wall and joints grouted. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 9-3 HR.	3 hrs.*
	2 in. precast concrete slabs of expanded shale aggregate, 16 in. by 8 ft. laid horizontally and attached each side of 8 in. steel columns spaced on 8 ft. centers. Horizontal joints shiplap type, sealed with mastic. Vertical joints butt type centered over columns and calked with asbestos wicking and cealed with mastic. (77)	2½ hrs.*
	6 in. U.L. listed precast concrete units; joints and top 6 in. of cells in units reinforced and filled with grout and installed as specified in U.L. listing[c], under Walls and Partitions—Design No. 6-2 HR.	2 hrs.

Estimated Ratings

Type	Details of Construction	Minimum Thickness[b], Inches for Ratings of			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Plain	Solid walls. (11, 33)	7½	6½	5½	4*
Reinforced	Solid walls, unplastered:				
	Group 1 Aggregates[k], ¾ in. maximum size. (11)	6½	6	5	3½
	Group 2 Aggregates[k], ¾ in. maximum size. (11, 33)	7½	6½	5½	4*
	Solid walls plastered each side with ¾ in. portland cement stucco or portland cement or gypsum plaster:				
	Group 1 Aggregates[k], ¾ in. maximum size. (11)	5	4	3*	3*
	Group 2 Aggregates[k], ¾ in. maximum size. (11)	6	5	4	3*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Concrete Masonry Units

Aggregate Type	Details of Construction	Rating
Expanded Shale, Brick-faced	6 in. units 61% solid; unplastered; faced with 2¼ in. brick. (9, 60)	4 hrs.†
Expanded Slag, Brick-faced	4 in. units 63% solid; plastered on one side with ½ in. 1:3 gypsum and sand plaster; other side faced with 3¾ in. brick. (9, 60)	4 hrs.†
Pumice, Brick-faced	4 in. U.L. listed concrete blocks, alternate courses reinforced; unplastered; faced with 3⅝ in. brick. 1 in. air space between block and brick. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 7-4 HR.	4 hrs.†
Cinder, Brick-faced	4 in. units 63% solid; plastered on one side with ½ in. 1:3 gypsum and sand plaster; other side faced with 3¾ in. brick. (9, 60)	4 hrs.†
	6 in. unplastered units, 61% solid; faced with 2¼ in. brick. (60)	4 hrs.†
U.L. Listed Units	8 or 12 in. U.L. listed concrete blocks, laid as specified in U.L. listing[c], under Walls and Partitions—Design No. 1-4 HR.	4 hrs.†
	8 or 12 in. U.L. listed concrete blocks; cells filled with loose, dry expanded slag, burned clay or shale (Rotary Kiln Process) and laid as specified in U.L. listing[c], under Walls and Partitions—Design No. 1-3 HR or No. 1-2 HR.	4 hrs.†
	8 or 12 in. U.L. listed concrete blocks, laid as specified in U.L. listing[c], under Walls and Partitions—Design No. 1-3 HR.	3 hrs.†
	8 or 12 in. U.L. listed concrete blocks, laid as specified in U.L. listing[c], under Walls and Partitions—Design No. 1-2 HR.	2 hrs.†
	8 or 12 in. U.L. listed concrete blocks with combustible members framed in wall, and plastered on face opposite framing with ¾ in. portland cement stucco or gypsum plaster; laid as specified in U.L. listing[c], under Walls and Partitions—Design No. 1-4 HR, or No. 1-3 HR, or No. 1-2 HR.	1½ hrs.
	8 or 12 in. U.L. listed concrete blocks with combustible members framed in wall; laid as specified in U.L. listing[c], under Walls and Partitions—Design No. 1-4 HR, or No. 1-3 HR, or No. 1-2 HR.	1 hr.
Expanded Shale	10 in. units 60% solid; unplastered. (9, 60)	4 hrs.†
	8 in. units, minimum face shell thickness 1½ in., minimum end shell thickness 1-5/16 in. and minimum interior web thickness 3-1/16 in. unplastered. Concrete studs built into wall on 2 ft. centers by filling every third cell along the length of the wall. Each stud reinforced with ½ in. round bar. (74)	2 hrs.*

* Nonbearing. † Rated as load bearing with noncombustible, or no members, framed into wall.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Concrete Masonry Units (Continued)

Aggregate Type	Details of Construction	Rating
Expanded Shale	4 in. units 76% solid; plastered on one side with ½ in. 1:3 gypsum and sand plaster. (60)	2 hrs.*
	8 in. units 68.8% solid, 3.59 in. equivalent thickness[kk], unplastered. (138)	2 hrs.*
	4 in. units 100% solid, 3.40 in. equivalent thickness[kk], unplastered. (139)	2 hrs.*
	6 in. units 61% solid; unplastered. (9, 60)	1½ hrs.*
	3 in. units 76% solid; plastered on both sides with ½ in. 1:3 gypsum and sand plaster. (9, 60)	1½ hrs.*
Expanded Slag	10 in. unplastered cavity wall of two 4 in. wythes 2 in. apart; units 63% solid. (9, 60)	4 hrs.‡
	6 in. units 76% solid; unplastered. (9, 60)	3 hrs.†
	6 in. units 61% solid; unplastered. (9, 60)	2 hrs.*
	6 in. units 50% solid; plastered on one side with ½ in. 1:3 gypsum and sand plaster. (9, 60)	2 hrs.*
	4 in. units 76% solid; plastered on one side with ½ in. 1:3 gypsum and sand plaster. (9, 60)	2 hrs.*
	3 in. units 76% solid; plastered on both sides with ½ in. 1:3 gypsum and sand plaster. (9, 60)	2 hrs.*
	4 in. units 63% solid; plastered on one side with ½ in. 1:3 gypsum and sand plaster. (9, 60)	1½ hrs.*
	4 in. units 63% solid; unplastered. (9, 60)	1 hr.*
Pumice	10 in. units 60% solid; unplastered. (60)	4 hrs.†
	4 in. units 63% solid; unplastered. (9, 60)	1 hr.*
Calcareous Gravel	8 in. unplastered units, 78% solid. (61)	3 hrs.†
	8 in. unplastered units, 57% solid. (61)	2 hrs.†
	4 in. units 63% solid; plastered on both sides with ½ in. 1:3 gypsum and sand plaster. (9, 61)	1½ hrs.*
	10 in. unplastered cavity wall of two 4 in. wythes 2 in. apart; units 63% solid. (9, 61)	1 hr.†
Cinder	10 in. unplastered cavity wall of two 4 in. wythes 2 in. apart; units 63% solid. (9, 60)	3 hrs.‡
	6 in. units 61% solid; plastered on one side with ½ in. 1:3 gypsum and sand plaster. (9, 60)	2 hrs.*
	6 in. units 50% solid; plastered on both sides with ½ in. 1:3 gypsum and sand plaster. (9, 60)	2 hrs.*
	6 in. units unplastered, 61% solid. (9, 60)	1½ hrs.*

* Nonbearing. † Rated as load bearing with noncombustible, or no members, framed into wall.

‡ With combustible members framed[a] into the wall, the rating is 2 hrs.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Concrete Masonry Units (Continued)

Aggregate Type	Details of Construction	Rating
Siliceous Gravel	12 in. unplastered wall, consisting of 8 in. units 57% solid and 4 in. units 67% solid. (9, 61)	4 hrs.‡
	12 in. units 58% solid; plastered both sides with ½ in. 1:3 gypsum and sand plaster. (61)	4 hrs.§
	4 in. units 74% solid; plastered on both sides with ½ in. 1:3 gypsum and sand plaster. (9, 61)	1 hr.*

Type	Type of Aggregate	Minimum Equivalent Thicknesskk and Approximate Face Shell and Web Thicknesses, Inches.§								
		2 hrs.†			3 hrs.†			4 hrs.†		
		Face Shell	Web	Equivalent Thickness	Face Shell	Web	Equivalent Thickness	Face Shell	Web	Equivalent Thickness
8 or 12 in. Unitshh	Natural, by-product, and processed, except those listed below. (96)	1¼	1	—	1½	1	—	2⅛	1½	—
	Burned clay or shale. (96)	1⅛	1	—	1⅜	1	—	—	—	—
	Burned clay or shale, rotary Kiln process. (96)	1¼	—	4.20ll	1½	—	4.85	1¾	—	5.35
	Expanded slag. (96)	1⅛	1	—	1⅜	1	—	1⅝	1	—
	Expanded slag. (140)	1¼	—	4.13mm	1½	—	4.78	1¾	—	5.30
	Pumice. (96)	—	—	—	—	—	—	1¼	1	—

Estimated Ratings

Type	Details of Construction	Members Framed in Wall: None or Noncombustiblef — Minimum Equivalent Thicknesse Inches, for Ratings of			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Unlisted Units	Coarse aggregate, expanded slag, or pumice. (43)	4.7	4.0	3.2	2.1
	Coarse aggregate, expanded clay or shale. (43)	5.7	4.8	3.8	2.6
	Coarse aggregate, limestone, cinders or unexpanded slag. (43)	5.9	5.0	4.0	2.7
	Coarse aggregate, calcareous gravel. (43)	6.2	5.3	4.2	2.8
	Coarse aggregate, siliceous gravel. (43)	6.7	5.7	4.5	3.0

* Nonbearing. † Rated as load bearing with noncombustible, or no members, framed into wall.

‡ With combustible members framed[a] into the wall, the rating is 2 hrs.

§ With combustible members framed[a] into the wall, the rating is 2½ hrs.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Masonry

Estimated Ratings

Type	Details of Construction	Minimum Thickness, Inches for Ratings of			
		4 hrs.	3 hrs.	2 hrs.	1 hr.
Stone Masonry	Solid walls	12	12	12	8

Gypsum Block or Plank

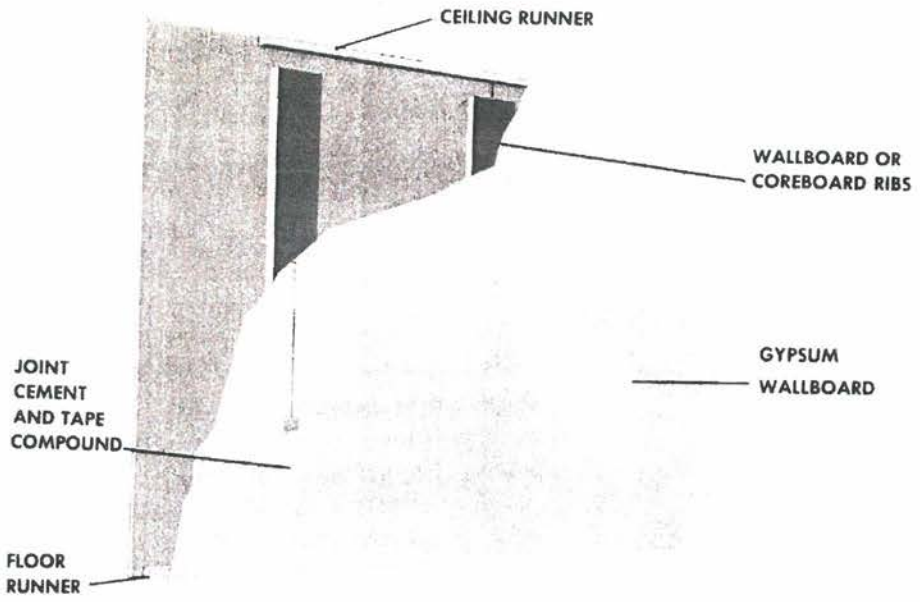
Type	Details of Construction	Rating
Gypsum Block	4 in. hollow blocks plastered each side with ½ in. 1:3 gypsum and sand plaster. (6, 83)	4 hrs.*
	3 in. hollow blocks plastered each side as above. (6, 82)	3 hrs.*
	3 in. solid blocks, unplastered. (6)	3 hrs.*
	4 in. hollow blocks plastered on either side with ½ in. 1:3 gypsum and sand plaster. (45, 89)	3 hrs.*
	3 in. hollow blocks plastered on one side with ½ in. 1:3 gypsum and sand plaster. (44)	1½ hrs.*
	2 in. solid blocks, unplastered. (6, 9)	1 hr.*
	3 in. hollow blocks, unplastered. (9)	1 hr.*
Gypsum Plank	3 in. gypsum plank with tongue and groove joints grouted with gypsum, surfaced one side with 20 gauge corrugated steel panels bolted to gypsum at top and bottom with ½ in. bolts 6 in. on centers. Plank made with 10 per cent wood sawdust, and reinforced with 2 in. wire mesh placed ½ in. from each face. (34)	4 hrs.*
	4½ in. gypsum plank with tongue and groove joints grouted with gypsum. Plank cast on 22 gauge corrugated (V beam) sheets which form one face. Plank made with 10 per cent wood sawdust, and reinforced with 4 in. wire mesh placed ½ in. from gypsum face. (35)	4 hrs.*
	2 in. gypsum planks with tongue and groove joints grouted with plaster. Planks cast on 22 gauge galvanized sheets which form one face, and made with 10% wood sawdust, reinforced with 4 in. wire mesh placed ½ in. from gypsum face. (68)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Gypsum Wallboard Partitions—Hollow



Type	Details of Construction	Rating
U.L. Listed	5 in. thick wall consisting of two layers of ⅝ in. U.L. listed wallboard attached each side of No. 24 gauge steel channel runners spaced ½ in. apart at floor, ceiling and edges. Wallboard reinforced by vertical wallboard ribs 6 in. wide consisting of two layers of ½ in. gypsum wallboard glued together. Outside layers of wallboard attached to ribs with glue and screws. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 5-3 HR.	‡‡3 hrs.*
	4⅛ in. thick wall consisting of two layers of ⅝ in. U.L. listed gypsum wallboard laminated and secured to 1 in. by 6 in. gypsum coreboard ribs. Wallboard layers cemented to each other and each layer secured to ribs by No. 10 x 1½ in. flathead wood screws spaced 24 in. on centers. Inside layer also cemented to ribs. Wallboard partition supported at floor and ceiling by No. 22 gauge steel 1 in. x 1⅜ in. angles. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 17-2 HR.	2 hrs.*
	4 in. thick wall consisting of two layers of ⅝ in. U.L. listed gypsum wallboard nailed each side of steel channels at floor, ceiling and edges. Wallboard reinforced by vertical wallboard ribs 6 in. wide consisting of two layers of ½ in. gypsum wallboard glued together. Outside layers of wallboard attached to ribs with glue and screws. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 7-2 HR.	‡‡2 hrs.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Gypsum Wallboard Partitions—Hollow (Continued)

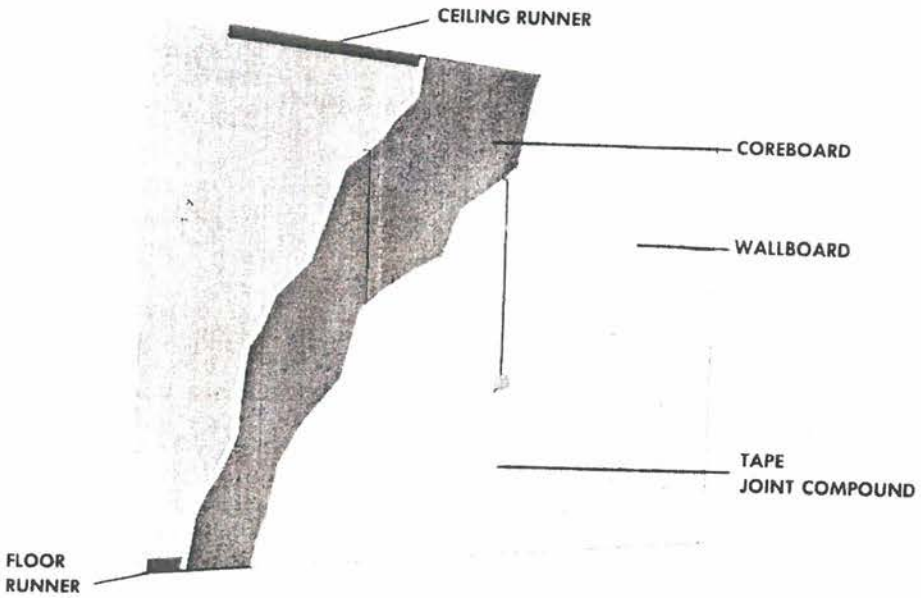
Type	Details of Construction	Rating
U.L. Listed	2¼ in. wall consisting of ⅝ in. U.L. listed wallboard on two ½ in. gypsum wallboard ribs glued together with U.L. listed adhesive to form 6 in. wide ribs. Wallboard attached to ribs with U.L. listed adhesive and 2 in. nails spaced 6 in. on centers; 1½ in. wood screws spaced 20 in. on centers at joints. Joints, nail and screw heads taped and finished. Wall secured to metal runners at floor, wall and ceiling. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 10-1 HR.	gg1 hr.*
	2⅞ in. thick wall consisting of ⅝ in. U.L. listed gypsum wallboard attached to gypsum wallboard ribs with No. 10 by 1½ in. flathead wood screws spaced vertically 18 in. on centers. Gypsum ribs consisting of two layers of ½ in. and one layer of ⅝ in. gypsum wallboard, 6 in. wide and spaced 24 in. on centers and located at vertical joints. Adhesive used when attaching wallboard to ribs. Partition held in place with No. 22 gauge galvanized steel channels used on sill, lintel and sides with concrete fasteners spaced 24 in. on centers. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 16-1 HR.	1 hr.*
Unlisted	3⅛ in. thick wall consisting of ½ in. gypsum wallboard laminated to 1 in. gypsum coreboard with joint finish compound and 2 in. screws not more than 2 ft. 3 in. on centers vertically. Each face set in No. 22 gauge angles anchored 2 ft. on centers providing 1⅛ in. space between coreboard. (130)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Gypsum Wallboard Partitions—Solid, Without Steel Framing



Type	Details of Construction	Rating
Gypsum Wallboard	2 in. total thickness consisting of 1 in. U.L. listed interlocking laminated gypsum coreboard placed vertically and set in floor and ceiling runners made of 20 gauge sheet metal. ½ in. U.L. listed wallboard[cc] applied to the coreboard vertically and secured to the coreboard by an adhesive coating. Wallboard joints butted and staggered with joints of coreboard. Outside joints covered with tape and joint finisher. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 3-2 HR.	2 hrs.*
	6 in. wall consisting of three 1 in. layers of ½ in. thick laminated U.L. listed gypsum coreboard with interlocking joints. Outer layers spaced 1 in. from middle layer. ½ in. U.L. listed gypsum wallboard finish surface laminated to outer layers. Coreboard attached to 1 in., U-shaped, No. 24 gauge galvanized steel floor, ceiling and wall tracks, on each side of middle layer of coreboard with 1⅝ in. self-drilling, self-tapping steel screws spaced 12 in. on centers. Intermediate steel tracks placed horizontally not to exceed 6 ft. from floor or ceiling. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 20-2 HR.	2 hrs.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Gypsum Wallboard Partitions—Solid, Without Steel Framing (Continued)

Type	Details of Construction	Rating
Gypsum Wallboard	4½ in. wall consisting of two layers of ⅝ in. U.L. listed gypsum wallboard spaced 2 in. apart by ½ in. gypsum wallboard cut and folded into accordian shaped studs. Metal plates located 24 in. on centers along studs. Inner layer attached to metal plates with 1¼ in. sheet metal screws and joint cement at folds of studs in contact with wallboard. Outer layer laminated to inner layer with joint cement beads 3 in. on centers and 1¼ in. sheet metal screws at metal plates and metal wall, floor and ceiling runners. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 15-2 HR.	2 hrs.*
	2¼ in. thick tongue and groove panels consisting of ⅝ in. gypsum wallboard laminated to 1 in. gypsum coreboard. Panels secured in ceiling, floor and wall runner channels of No. 16 gauge steel by No. 6 by ½ in. long sheet metal screws. (124)	1 hr.
	1¾ in. minimum total thickness consisting of 1 in. U.L. listed interlocking laminated gypsum coreboard erected vertically and set in floor and ceiling runners made of 20 gauge sheet metal. Outer layer of ⅜ in. or ½ in. U.L. listed wallboard applied vertically or horizontally and secured to coreboard by an adhesive. Vertical joints in wallboard butted and staggered with joints of coreboard. Outside joints covered with tape and joint finisher. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 9-1 HR.	1 hr.*
	3¼ in. wall consisting of ⅝ in. U.L. listed gypsum wallboard spaced 2 in. apart by ½ in. gypsum wallboard cut and folded into accordian shape studs. Metal plates located 24 in. on centers along studs. Joint cement placed at folds of studs in contact with wallboard facing. Wallboard facing attached to metal plates and wall runners with 1¼ in. sheet metal screws. Studs attached to floor and ceiling runners. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 15-1 HR.	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Metal Partition Panel Units

Core Type	Details of Construction	Rating
Gypsum Wallboard	15¼ in. wall consisting of U.L. listed ribbed steel facing units over two layers of ½ in. U.L. listed gypsum wallboard. Facing units and wallboard each side of 10 in. WF column and secured to horizontal structural steel supports located at floor, ceiling and mid-height of wall. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 8-3 HR.	3 hrs.*
	5⅝ in. wall consisting of five layers of ½ in. U.L. listed gypsum wallboard. Wallboard attached to U.L. listed steel facing units by U.L. listed impaling clips welded to facing units. Wall reinforced with horizontal steel bar subgirts at impaling clips. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 7-3 HR.	3 hrs.*
	5 in. wall consisting of four layers of ½ in. gypsum wallboard applied so that joints in adjacent layers are staggered. 1½ in. 18 gauge fluted metal facing sheets with tongue and groove, applied each side of core, and bolted together with ¼ in. by 2¾ in. long bolts. Wall secured to steel angles at floor, wall and ceiling with ¼ in. by 2¾ in. long bolts. (100)	2½ hrs.*
	5-5/16 in. wall consisting of U.L. listed fluted steel facing units over four layers of ½ in. U.L. listed gypsum wallboard. Horizontal metal subgirts located in center of wall and bolted through two layers of wallboard to facing unit. Two layers of wallboard and other facing unit secured to subgirts with 1½ in. self-tapping screws. Wall secured to floor and ceiling angles. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 12-2 HR.	2 hrs.*
	5-13/16 in. wall consisting of U.L. listed steel facing units and U.L. listed protected metal units having a core of two double layers of ½ in. U.L. listed gypsum wallboard. Facing units secured by No. 14 x 1½ in. sheet metal screws spaced 12 in. on centers through subgirt and bar subgirts located in partition. Partition secured by 2 x 2 or 2 x 8 in. by No. 18 gauge flashing angles and concrete nails spaced 18 in. on centers and No. 12 x ¾ in. sheet metal screws spaced 18 in. on centers and secured to partition units. Securing of flashing angles, support angles structural supporting channel, "Z" angles, and subgirt and other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 14-2 HR.	2 hrs.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Metal Partition Panel Units (Continued)

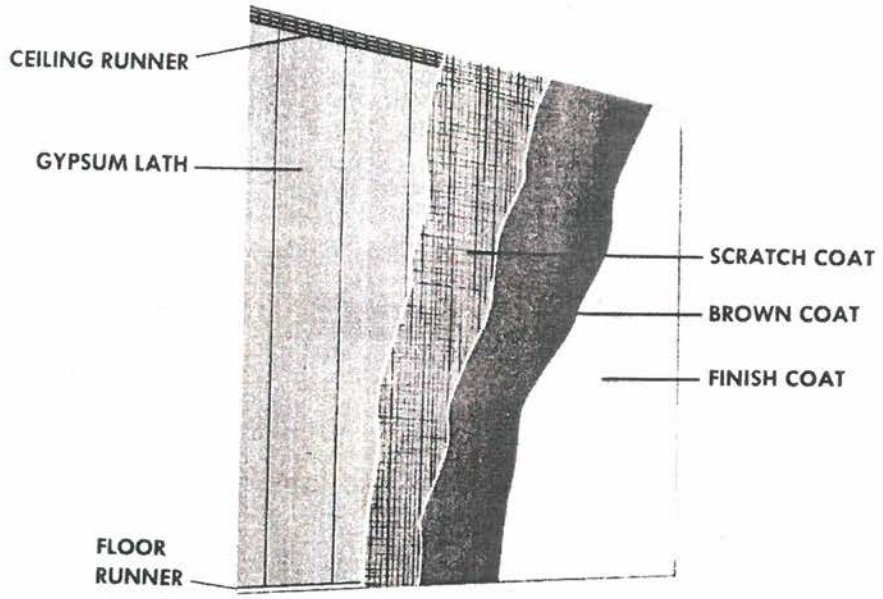
Core Type	Details of Construction	Rating
Gypsum Wallboard	5½ in. wall consisting of four layers of ½ in. U.L. listed gypsum wallboard. Joints in four layers of wallboard staggered and spiked together and secured to U.L. listed steel face units. ¼ in. diameter by 3 in. long bolts spaced 4 ft. on centers through wallboard and attached to steel facing units. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 10-2 HR.	2 hrs.*
	5¾ in. wall consisting of five layers of ½ in. U.L. listed gypsum wallboard faced with U.L. listed steel facing units on one side and U.L. listed aluminum facing units on the other. Wallboard attached to steel facing units by U.L. listed impaling clips. Wall reinforced by horizontal and vertical steel bar subgirt. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 9-2 HR.	2 hrs.*
	5-3/16 in. wall consisting of four layers of ½ in. U.L. listed wallboard, faced each side with U.L. listed steel facing units. Wall reinforced with steel bar subgirt spaced not more than 48 in. on centers vertically. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 8-2 HR.	2 hrs.*
Mineral Wool and Asbestos Cement Boards	3¾ in. wall composed of U.L. listed rockwool lined steel panels and a middle layer of ⅜ in. U.L. listed asbestos cement boards, secured to steel channels at floor, wall and ceiling. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 8-1 HR.	1 hr.*
Vermiculite Concrete	6 in. wall consisting of U.L. listed steel building units each side of vermiculite concrete reinforced by U.L. listed steel frame. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 10-4 HR.	4 hrs.†

* Nonbearing. † Rated as load bearing with noncombustible, or no members, framed into wall.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Plaster and Gypsum Lath Partitions—Solid, Without Steel Framing



Plaster Type	Details of Construction	Rating
Gypsum and Perlite	2 in. total thickness consisting of ½ in. gypsum lath, faced on both sides with ¾ in. gypsum-perlite plaster. Scratch coat 2 cu. ft. and brown coat 3 cu. ft. of perlite to 100 lbs. gypsum. (63)	1½ hrs.*
Gypsum and Sand	2 in. total thickness, consisting of ½ in. gypsum lath, faced on both sides with ¾ in. gypsum and sand plaster. Top of lath attached to steel ceiling runner, and bottom engaged in groove of a wooden floor runner impregnated with fire retardant chemicals. Plaster mix for scratch coat 1:1 and brown coat 1:2 gypsum and sand. (54)	ɛɛ1 hr.* comb.
	2 in. total thickness of 13/16 in. 1:1, 1:2 gypsum and sand plaster each side ⅜ in. gypsum lath inserted at top and bottom in steel runners. (37)	1 hr.*
	2 in. total thickness of ¾ in. 1:1, 1:2 gypsum and sand plaster each side ½ in. gypsum lath inserted at top and bottom in steel runners. (41)	1 hr.*
	2 in. total thickness consisting of a 1 in. laminated core made up of two layers of ½ in. plain gypsum lath faced on both sides with ½ in. 1:2½ gypsum and sand plaster. Gypsum lath joined together by means of 8d common nails driven at angle through shiplap joints of lath. Top of lath wire tied to No. 24 gauge steel ceiling runner strip and bottom of lath placed in metal base clips. (109)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Plaster and Gypsum Lath Partitions—Solid, Without Steel Framing (Continued)

Plaster Type	Details of Construction	Rating
Gypsum and Vermiculite	2½ in. total thickness consisting of ½ in. gypsum lath, faced on both sides with 1 in. gypsum-vermiculite plaster. Scratch coat 2 cu. ft. and brown coat 3 cu. ft. vermiculite to 100 lbs. fibered gypsum. (79)	2 hrs.*

Plaster and Gypsum Lath Partitions—Solid, Steel Framing Embedded in Plaster

Gypsum and Sand	2⅛ in. total thickness of ⅞ in. 1:1 gypsum and sand plaster each side of ⅜ in. gypsum lath; steel stud supports. (15)	1 hr.*

Plaster and Metal Lath Partitions—Hollow, Exterior Walls. Finished Each Side as Noted

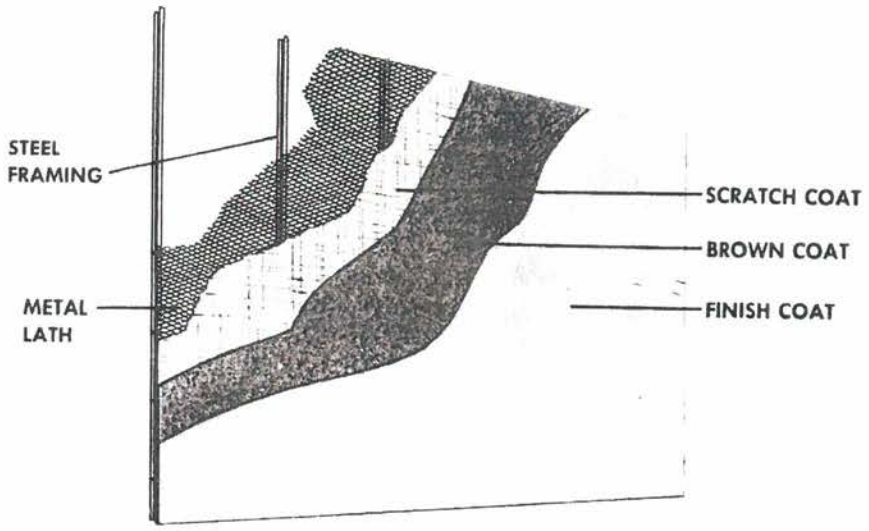
Gypsum and Sand	5⅜ in. wall consisting of ¾ in. 1:2, 1:2 gypsum and sand plaster on interior side and 1 in. 1:3½, 1:3½ portland cement and sand on exterior side; plaster applied to 3⅝ in. metal lath corrugated core sections (24 in. wide) covered with metal lath backed with paper mounted on aluminum foil with asphalt. 3⅝ in. No. 16 gauge steel "Z" framing spaced 48 in. on centers and secured to overlapping metal lath with wire ties 12 in. on centers. Intermediate joints having metal lath overlap and wire tied 12 in. on centers. Wall wire tied 12 in. on centers to steel floor and celing channels. (122)	1½ hrs. comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Plaster and Metal Lath Partitions—Solid, Steel Framing or Reinforcing Embedded in Plaster



Plaster Type	Details of Construction	Rating
Gypsum Neat	2½ in. total thickness of neat gypsum plaster on metal lath attached to ¾ in. or 1 in. steel channels. (9)	2½ hrs.*
Gypsum and Perlite	2½ in. total thickness of gypsum-perlite plaster, on metal lath attached to ¾ in. steel channels. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. U.L. listed perlite plaster aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 2-2 HR.	2 hrs.*
	1½ in. gypsum-perlite plaster on metal lath attached to ¾ in. steel channels. Plaster mix: for scratch and brown coats 2½ cu. ft. perlite to 100 lbs. fibered gypsum. (66)	1 hr.*
Gypsum and Sand	2½ in. total thickness of 1:½, 1:½ gypsum and sand plaster on metal lath on steel studs. (9)	2 hrs.*
	2 in. total thickness of 1:½, 1:½ gypsum and sand plaster on metal lath attached to ¾ in. or 1 in. steel channels. (9)	1½ hrs.*
	2½ in. total thickness of 1:2, 1:3 gypsum and sand plaster on metal lath on steel studs. (7, 9)	1 hr.*
	2¼ in. total thickness of ¾ in. plaster of 86 parts gypsum, 12 parts sawdust and 2 parts asbestos fiber each side ¾ in. asbestos lath (medium), with sheet-steel "H" supports. (7)	1 hr.*
	2 in. total thickness of 1:1 gypsum and sand plaster on metal lath on steel studs. (9)	1 hr.*
	2 in. total thickness of 1:2, 1:2 gypsum and sand plaster on metal lath on steel studs. (40)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Plaster and Metal Lath Partitions—Solid, Steel Framing or Reinforcing Embedded in Plaster (Continued)

Plaster Type	Details of Construction	Rating
Gypsum (unsanded)	2 in. total thickness of unsanded, wood-fibered gypsum plaster on metal lath on steel studs. (94)	2 hrs.*
Gypsum and Vermiculite	2½ in. total thickness of gypsum-vermiculite plaster on metal lath attached to ¾ in. steel channels. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. of vermiculite to 100 lbs. gypsum. (79)	2 hrs.*
Portland Cement and Perlite	6 in. wall consisting of 4 in. perlite-portland cement plaster on paper-backed wire fabric and encasing steel framing members on one face; 1 in. gypsum-perlite plaster applied on paper and aluminum foil-backed wire fabric on other face, with furring channels forming 1 in. air space between the two sections. Plaster mix for 4 in. face, 4 cu. ft. U.L. listed perlite to 94 lbs. portland cement, 3 lbs. asbestos fiber, and 1 fluid ounce air entraining solution; for other face, scratch coat 3½ cu. ft. and brown coat 4 cu. ft. U.L. listed perlite to 100 lbs. gypsum. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 3-4 HR.	4 hrs.*
	6⅛ in. solid wall composed of 1:4 portland cement and perlite concrete aggregate mixture, applied with spray gun equipment to paper-backed wire fabric, and reinforced with 16 gauge 2 in. x 2 in. welded wire mesh fastened to 3⅝ in. steel channel studs. (115)	4 hrs.
	3⅛ in. total thickness of perlite concrete machine applied to special paper-backed wire lath secured to truss type 4 in. wire studs spaced 16 in. on centers and secured to floor and ceiling metal runners. Paper-backed wire lath attached to studs with 1 in. annular ring nails spaced 6 in. on centers. Concrete mix: 3:2 cu. ft. U.L. listed perlite to 1 cu. ft. of portland cement. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 18-2 HR.	2 hrs.*
Portland Cement and Sand	6 in. solid wall composed of 1:4 portland cement and sand mixture, applied with spray gun equipment. Wall reinforced with ½ in. round bars on 12 in. centers each way at the mid-thickness of the wall. (72)	3 hrs.*
	2½ in. total thickness of 4½:1:7 portland cement, sawdust and sand mortar sprayed on 4 in. x 4 in. welded wire fabric on steel studs. (9)	1 hr.*
Portland Cement and Vermiculite	4¼ in. solid wall composed of 1 cu. ft. portland cement to 4 cu. ft. U.L. listed vermiculite plaster aggregate, applied with spray machine equipment to paper-backed wire fabric. Wall reinforced with 1½ in. steel channel studs 2 ft. on centers and spaced 1¾ in. from paper-backed wire fabric. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 6-5 HR.	4 hrs.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Plaster and Metal Lath Partitions—Solid, Without Steel Framing

Plaster Type	Details of Construction	Rating
Gypsum and Sand	2 in. total thickness of 1:2 gypsum and sand plaster, applied equally each side of metal lath attached top and bottom to steel runners. (67)	1 hr.*

Steel Stud—Brick-Veneered

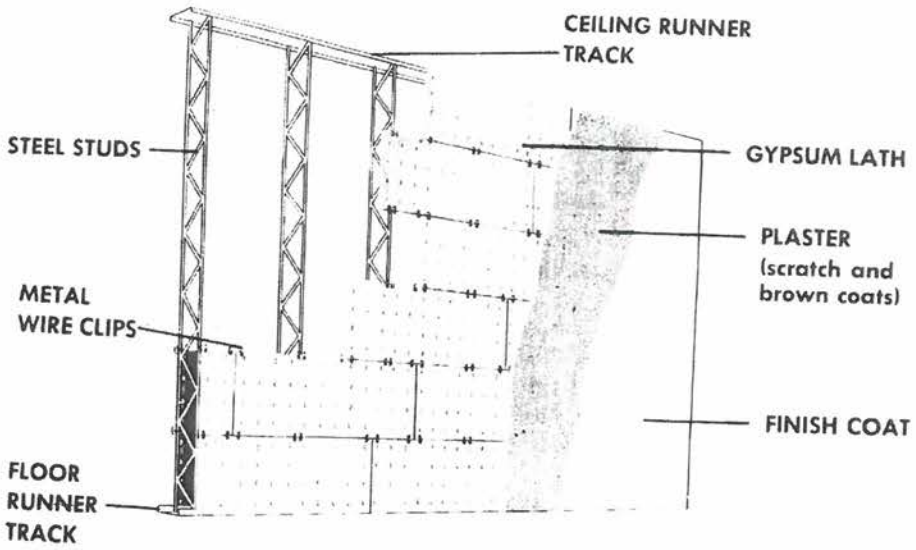
Gypsum Plaster on Interior	One side sheathed with paper-backed wire lath and 3¾ in. brick veneer secured by filling 1 in. space between brick and lath with mortar. Other side faced with 1 in. paper-backed mineral-wool blanket weighing 0.6 lb. per sq. ft. attached to studs; metal lath laid over blanket and attached to studs, covered with ¾ in. 1:2, 1:3 gypsum and sand plaster. (9)	4 hrs.[z]
	One side with ½ in. gypsum sheathing nailed to 2-5/16 in. studs, and 3¾ in. brick veneer secured with metal ties to studs every fifth course. Other side ½ in. 1:2 gypsum and sand plaster on ½ in. perforated gypsum lath. (78)	2 hrs.[z]
	One side sheathed with ½ in. wood fiber board sheathing next to studs; ¾ in. air space formed with ¾ in. x 1⅝ in. wood strips placed over the fiber board and secured to the studs; paper-backed wire lath nailed to these strips, 3¾ in. brick veneer held in place by filling ¾ in. space between brick and paper-backed lath with mortar. Inside facing of ¾ in. neat gypsum plaster on metal lath attached to 5/16 in. wood strips secured to edges of the studs. (9)	1½ hrs.[z] comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Steel Stud—Hollow Partitions, Plaster on Gypsum Lath. Finished Each Side as Noted



Finish Type	Details of Construction	Rating
Gypsum and Perlite	1 in. gypsum plaster on ⅜ in. perforated gypsum lath secured to 2½ in. studs by wire clips. Studs attached to No. 22 gauge steel floor and ceiling track. Plaster mix: scratch and brown coats 2 cu. ft. perlite to 100 lbs. of gypsum. (127)	2½ hrs.*
	¾ in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath secured to 2½ in. studs by wire clips. Studs attached to No. 22 gauge steel floor and ceiling track. Plaster mix: scratch and brown coats 2 cu. ft. perlite to 100 lbs. extra fibered gypsum. (126)	2 hrs.*
	½ in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath attached securely to 2½ or 4 in. studs by metal clips and with abutting ends of lath secured to each other with metal finger clips. Plaster mix for scratch and brown coats, 100 lbs. gypsum to 2½ cu. ft. perlite. (48, 110, 114)	1 hr.*
	½ in. gypsum-perlite plaster on ⅜ in. plain gypsum lath attached securely to 2½ in. studs by 1⅛ in. annular nails having ⅜ in. diameter heads spaced 6 in. on centers and with abutting ends of lath secured to each other with metal finger clips. ¾ in. channel bracing placed horizontally through studs at mid-height. Plaster mix: scratch and brown coats, 100 lbs. extra fibered gypsum to 2 cu. ft. perlite. (68)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Steel Stud—Hollow Partitions, Plaster on Gypsum Lath. Finished Each Side as Noted (Continued)

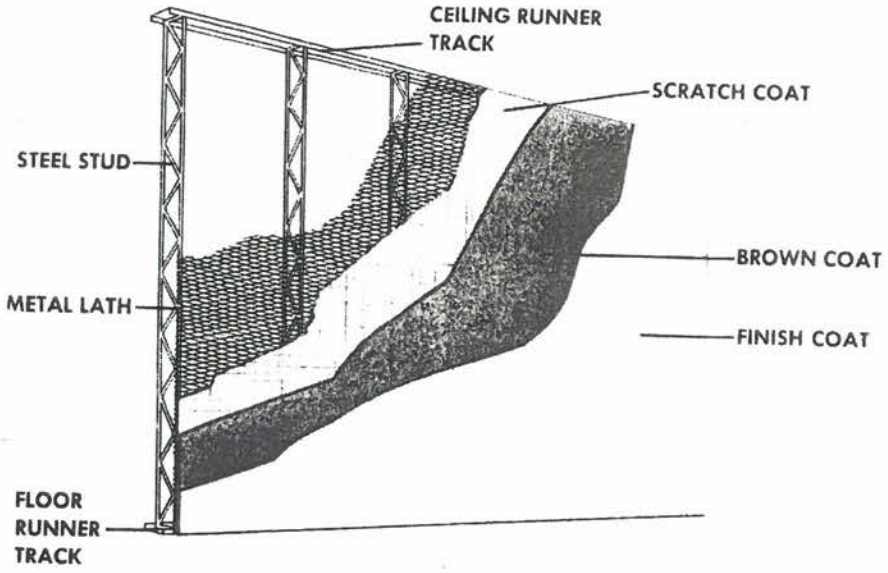
Finish Type	Details of Construction	Rating
Gypsum and Sand	½ in. 1:2 gypsum and sand plaster on ⅜ in. perforated gypsum lath, attached securely to 2½ or 3¼ in. studs by special metal clips across lath. Abutting ends of lath secured to each other with metal wire clips. Studs pressed into ceiling track and fastened with two double strands of tie-wires; attached to floor track with a double strand of wire ties each side of track. (84, 102, 103)	1½ hrs.*
	½ in. 1:2 gypsum and sand plaster on ⅜ in. perforated gypsum lath, attached securely by special wire clips to ¼ in. rods secured to 1⅝ in. studs by wire clips. Abutting ends of lath secured to each other with metal wire clips. Studs pressed into ceiling track and fastened with two double strands of No. 18 SWG tie wires attached to floor track. (131)	1½ hrs.*
	3¼ in. wall (total thickness) consisting of ¾ in. gypsum and sand plaster on ½ in. gypsum lath attached tightly to ¾ in. channel frame by wire ties. ¾ in. channels spaced 30 in. on centers horizontally and 5 ft. on centers vertically; tied at intersections. Channel frame attached to ¾ in. runner channels at ceiling, floor and wall edge. Plaster mix: scratch coat 100 lbs., brown coat 200 lbs. sand to 100 lbs. fibered gypsum. (107)	1 hr.*
	½ in. 1:2 gypsum and sand plaster on ⅜ in. perforated gypsum lath attached securely to 2½ in. nailable studs with 1⅛ in. long nails having ⅜ in. diameter heads spaced 6 in. on centers. Metal finger clips at intersection of lath joints. ¾ in. channel bracing placed horizontally through studs at mid-height. (135)	1 hr.*
	½ in. 1:1 gypsum and sand plaster on ⅜ in. gypsum lath on steel studs providing 1¼ in. central air space. (15)	1 hr.*
	½ in. 1:2 gypsum and sand plaster on ⅜ in. perforated gypsum lath, attached securely to 3¼ in. studs by metal clips, abutting ends of lath secured to each other with metal finger clips. (46)	1 hr.*
	½ in. 1:2½ gypsum and sand plaster on ⅜ in. perforated gypsum lath attached securely to 1⅝ in. or 2½ in. studs by metal finger clips and abutting ends of lath secured to each other with metal finger clips. (133, 134)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Steel Stud—Hollow Partitions, Plaster on Metal Lath. Finished Each Side as Noted



Finish Type	Details of Construction	Rating
Gypsum (unsanded)	1 in. unsanded, wood-fibered gypsum plaster on metal lath. (7, 9)	2 hrs.†
	⅞ in. unsanded, wood-fibered gypsum plaster on metal lath. (7, 9)	2 hrs.*
	¾ in. unsanded, wood-fibered gypsum plaster on metal lath. (7, 9)	1½ hrs.
Gypsum and Perlite	1⅛ in. gypsum-perlite plaster on metal lath attached to 4 in. studs, and sufficient plaster pushed through the lath to give an average total thickness of 1⅝ in. Plaster mix for scratch and brown coats, 100 lbs. fibered gypsum to 3.7 cu. ft. perlite. (70)	2 hrs.*
	1⅛ in. gypsum-perlite plaster on metal lath attached to 4 in. studs, and sufficient plaster pushed through the lath to give an average total thickness of 1½ in. Plaster mix for scratch and brown coats, 100 lbs. fibered gypsum to 4 cu. ft. perlite. (71)	2 hrs.*
	1 in. gypsum-perlite plaster on metal lath attached to 4 in. studs, and sufficient plaster pushed through the lath to give an average total thickness of 1⅜ in. Plaster mix for scratch and brown coats, 100 lbs. fibered gypsum to 3.75 cu. ft. perlite. (73)	2 hrs.*
	1 in. (measured from face of lath) gypsum-perlite plaster, on metal lath attached to 4 in. studs. Plaster mix: scratch coat 2 cu. ft. and brown coat 3 cu. ft. of perlite to 100 lbs. fibered gypsum. (55)	2 hrs.*

* Nonbearing. † Rated as load bearing with noncombustible, or no members, framed into wall.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Steel Stud—Hollow Partitions, Plaster on Metal Lath. Finished Each Side as Noted (Continued)

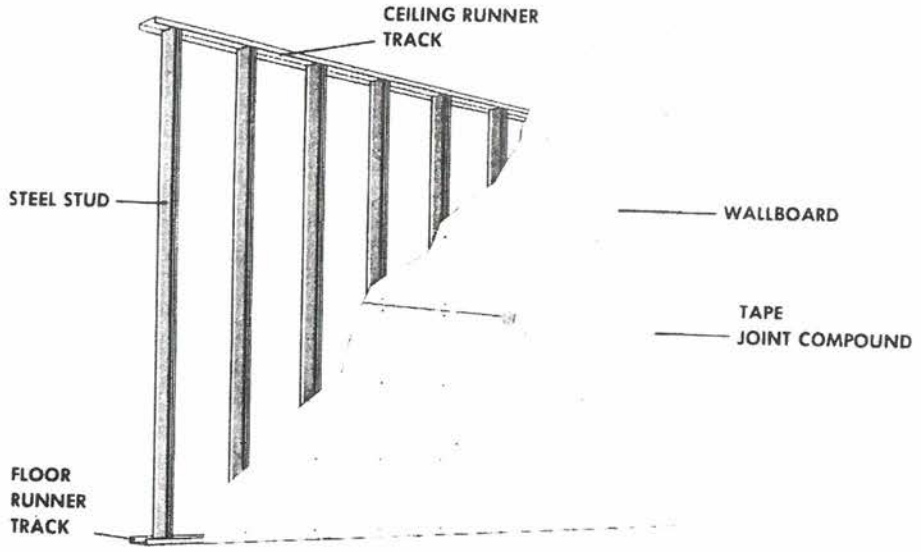
Finish Type	Details of Construction	Rating
Gypsum and Sand	¾ in. 1:2, 1:2 gypsum and sand plaster on metal lath backed with paper laminated to aluminum foil with asphalt. Metal lath attached to 3⅝ in. corrugated metal lath core sections (24 in.) secured to No. 16 gauge steel "Z" framing spaced 48 in. on centers with wire ties spaced 12 in. on centers. Intermediate joints having metal lath overlap and wire tied 12 in. on centers. Wall wire tied 12 in. on centers to steel floor and ceiling channels. (123)	2 hrs. comb.
	1 in. 1:½, 1:½ gypsum and sand plaster on metal lath. (9)	2 hrs.*
	⅞ in. 1:½, 1:½ gypsum and sand plaster on metal lath. (9)	1½ hrs.*
	⅞ in. 1:2, 1:3 gypsum and sand plaster on metal lath. (7, 9)	1 hr.
	¾ in. 1:2, 1:2 gypsum and sand plaster on metal lath. (7, 9)	1 hr.
	⅝ in. (measured from face of lath) 1:2 gypsum and sand plaster on metal lath attached securely to 2½ in. studs by ¾ in. annular nails having ⅜ in. diameter heads spaced 6 in. on centers. Lath lapped 1 in. and wire tied 6 in. on centers. ¾ in. channel bracing placed horizontally through studs at mid-height. (100)	1 hr.*
Portland Cement and Sand	⅞ in. 1:1/30:2, 1:1/30:3 portland cement, asbestos fiber and sand plaster on metal lath. (9)	1 hr.*
	¾ in. 1:2 portland cement and sand plaster in the scratch coat, 1:3 gypsum and sand plaster in the brown coat, on metal lath. (7)	1 hr.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Steel Stud—Hollow Partitions Without Plaster. Finished Each Side as Noted



Finish Type	Details of Construction	Rating
Cement Asbestos Board	½ in. cement-asbestos board on 3 in. steel studs; interior space filled with mineral wool under air pressure. (21)	1 hr.*
	3⅞ in. wall composed of 7/16 in. thick pigmented asbestos board weighing 2.2 to 2.4 lbs. per sq. ft., on open web 20 gauge steel box studs. Space between studs packed solid with mineral wool batts. (85)	1 hr.*
Gypsum Wallboard	Two layers of ⅝ in. U.L. listed gypsum wallboard attached to 3⅝ in. steel studs as follows: Inner layer attached with 1 in. steel self-drilling, self-tapping screws spaced 8 in. on centers at joint edges and 12 in. on centers at intermediate studs. Outer layer joint offset 12 in. and attached to inner layer with joint finisher cement and held in place by retainer channel at top and by 1 in. long screws 12 in. on center at bottom. Studs set in floor and ceiling runner and wall finished with base strip. Joints and screw heads in outer layer covered with fiber tape and joint compound. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 11-2 HR.	2 hrs.*

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Steel Stud—Hollow Partitions Without Plaster. Finished Each Side as Noted (Continued)

Finish Type	Details of Construction	Rating
Gypsum Wallboard	5/8 in. U.L. listed gypsum wallboard attached to 2½ in. channel studs of No. 25 gauge galvanized steel with 1⅛ in. self-tapping screws spaced 9 in. on centers. Wallboard reinforced at screws with vertical steel track ⅞ in. wide and covered with aluminum battens. Partition secured at floor and ceiling by 2½ in. wide No. 24 gauge galvanized steel channels. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 20-1 HR.	1 hr.*
	½ in. U.L. listed gypsum wallboard attached to 2½ in. steel studs with 1 in. self-tapping steel screws spaced 12 in. on centers along studs. Stud space filled with 2 in. thick U.L. listed mineral wool batts. Studs secured to floor and ceiling runners. Bottom of partition finished with base trim attached to base clips secured to floor runner with 1 in. self-tapping steel screws spaced 24 in. on centers. Details as specified in U.L. listing[c], under Walls and Partitions—Design No. 21-1 HR.	1 hr.*
	5/8 in. gypsum wallboard attached to 3⅝ in. steel studs, with 2 in. cement coated nails spaced about 7 in. on centers. Joints covered with fiber tape and compound. (87)	1 hr.
	5/8 in. U.L. listed gypsum wallboard attached to 3⅝ in. steel studs with 2½ in. nails spaced 8 in. on centers. Joints and nail heads covered with fiber tape and compound. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 2-1 HR.	1 hr.*
	5/8 in. U.L. listed gypsum wallboard attached to 3⅝ in. U.L. listed steel studs with 1½ in. annular nails spaced 6 in. on centers and used with ¾ in. nailing discs at wallboard joints. Studs attached to floor and ceiling track with plated No. 6, ¾ in. sheet metal screws. Nailheads in wallboard covered with compound and joints covered with fiber tape and compound. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 11-1 HR.	1 hr.*

Wood Partitions—Solid

Laminated	6 in. partition of 2 x 6 lumber; pieces nailed together flatwise; in vertical position if load bearing. (36)	1 hr. comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Wood Stud Partitions—Exterior Walls Only, Studs 2 x 4 in. or larger. Finished Each Side as Noted

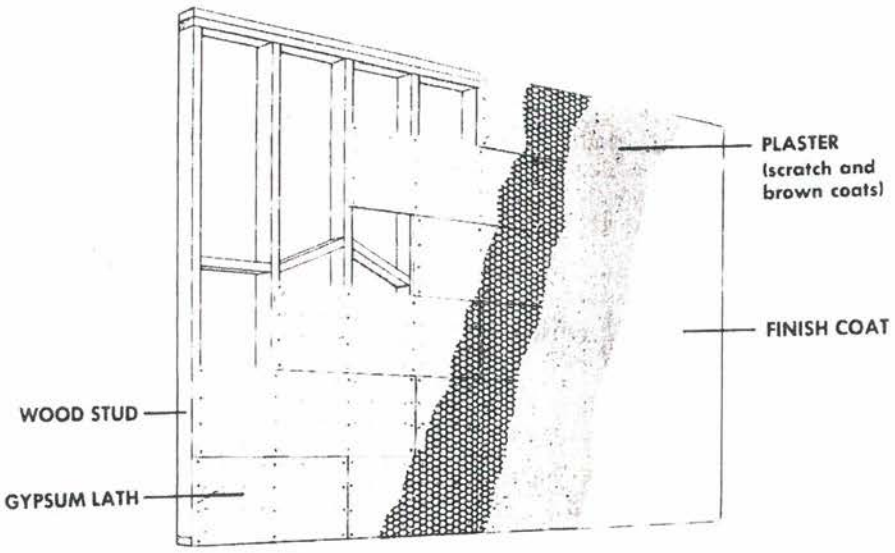
Finish Type	Details of Construction	Rating
Gypsum Board and Cement Asbestos Board	5/32 in. cement-asbestos shingles laid over 14 lbs. per 100 sq. ft. asbestos felt over ¾ in. wood sheathing on one side; 4 in. strips of ½ in. gypsum board over edges of studs under facing of 3/16 in. cement asbestos board on other side; filling of mineral wool batts. (9)	1 hr. comb.
Gypsum and Sand	One side sheathed with ½ in. gypsum sheathing covered with wood drop siding; other side faced with ½ in. 1:2 gypsum and sand plaster on ⅜ in. perforated gypsum lath. (39)	1 hr. comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Wood Stud Partitions, Plaster on Gypsum Lath.
Studs 2 x 4 in. or larger. Finished Each Side as Noted



Finish Type	Details of Construction	Rating
Gypsum (unsanded)	½ in. unsanded, wood-fibered gypsum plaster on ⅜ in. plain gypsum lath. (9)	1 hr. comb.
Gypsum and Perlite	1 in. 1:2½, 1:2½ by volume gypsum-perlite plaster on ⅜ in. perforated gypsum lath. Plaster reinforced with 1 in. hexagonal mesh. (105)	[bb]2 hrs. comb.
	½ in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath; plaster mix: 2½ cu. ft. perlite to 100 lbs. fibered gypsum. (49)	1 hr. comb. or 1½ hrs.* comb.
	9/16 in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath. Plaster mix for scratch and brown coats, 2 to 3 cu. ft. U.L. listed perlite to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Walls and Partitions — Design No. 7-1 HR.	1 hr. comb.
	½ in. gypsum-perlite plaster on ⅜ in. perforated gypsum lath, securely attached by metal clips. Plaster mix: 2 cu. ft. or 2½ cu. ft. perlite to 100 lbs. gypsum. (47, 132)	1 hr. comb.
Gypsum and Sand	½ in. 1:2 gypsum and sand plaster on ⅜ in. perforated gypsum lath. (7, 9)	1 hr. comb.
	½ in. 1:2, 1:2 gypsum and sand plaster on ⅜ in. plain gypsum lath attached by nails fitted with 1½ x 1¾ in. metal lath pads folded over heads, spaced 8 in. vertically, 16 in. horizontally. (7, 9)	1 hr. comb.
	½ in. 4:1 gypsum and sand plaster on ⅜ in. plain gypsum lath; 3 in. strips of metal lath over all joints. (8)	1 hr. comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Wood Stud Partitions, Plaster on Gypsum Lath. Studs 2 x 4 in. or larger. Finished Each Side as Noted (Continued)

Finish Type	Details of Construction	Rating
Gypsum and Sand	½ in. 1:2, 1:2 fibered gypsum and sand plaster on ⅜ in. gypsum lath plain or with pin type indentations on paper surfacing. (121, 125)	1 hr.
Gypsum and Vermiculite	½ in. gypsum-vermiculite plaster on ⅜ in. perforated gypsum lath. Plaster mix: 2½ cu. ft. vermiculite to 100 lbs. fibered gypsum. (50)	1 hr. comb. or 1½ hrs.* comb.

Wood Stud Partitions, Plaster on Wood Lath. Studs 2 x 4 in. or larger. Finished Each Side as Noted

Gypsum and Sand	½ in. 1:2, 1:3 gypsum and sand plaster on wood lath; stud spaces filled with mineral wool. (7, 9)	1 hr. comb.

Wood Stud Partitions, Plaster on Metal or Wire Lath. Studs 2 x 4 in. or larger. Finished Each Side as Noted

Gypsum (unsanded)	1 in. unsanded, wood-fibered gypsum plaster on metal lath. (9)	[bb]2 hrs.* comb.
	¾ in. unsanded, wood-fibered gypsum plaster on metal lath. (7, 9)	1½ hrs. comb.
Gypsum and Pumice	⅞ in. plaster, on metal lath attached to studs. Plaster mix for scratch and brown coats, 1:2 fibered gypsum plaster and pumice aggregate containing air entraining agent. (76)	1 hr. comb.
Gypsum and Sand	⅞ in. 1:2, 1:3 gypsum and sand plaster on metal lath; stud spaces filled with mineral wool. (9)	1½ hrs. comb.
	¾ in. 1:2, 1:2 gypsum and sand plaster on metal lath; stud spaces filled with mineral wool. (7, 9)	1½ hrs. comb.
	⅞ in. 1:2, 1:3 gypsum and sand plaster on metal lath. (7, 9)	1 hr. comb.
	¾ in. 1:2, 1:2 gypsum and sand plaster on metal lath. (7, 9)	1 hr. comb.
	¾ in. 1:2 gypsum and sand plaster on U.L. listed wire lath (paper-backed fabric) as specified in U.L. listing[c], under Walls and Partitions — Design No. 1-1 HR.	1 hr. comb.
	¾ in. 1:1½, 1:3 gypsum and sand plaster on ⅜ in. diamond mesh expanded metal lath of 26 U.S. gauge attached by 1½ in. 4-penny nails 6 in. apart or by equivalent staples. Studs 2 x 2 in. if nonbearing. (10)	1 hr. comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

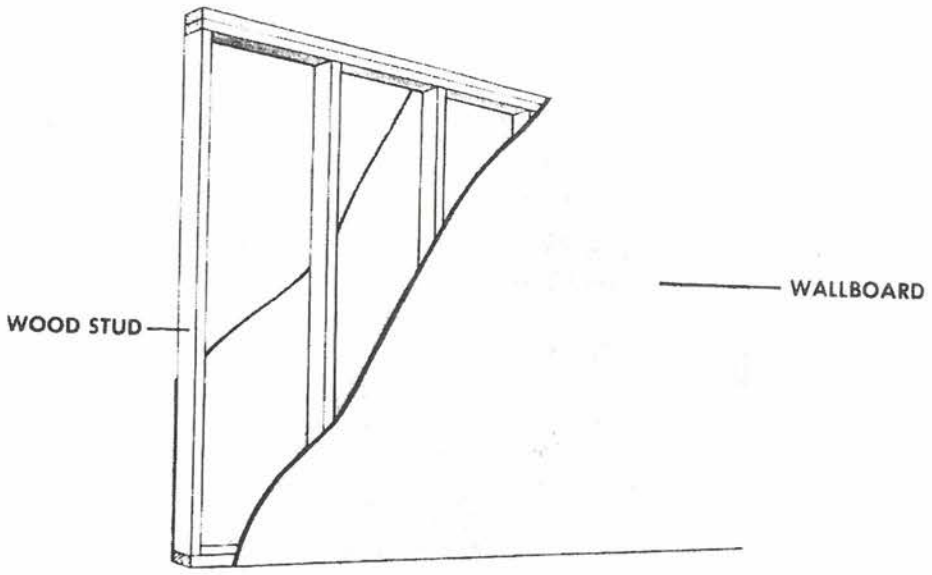
Wood Stud Partitions, Plaster on Metal or Wire Lath. Studs 2 x 4 in. or larger. Finished Each Side as Noted (Continued)

Finish Type	Details of Construction	Rating
Gypsum, Portland Cement and Sand	⅞ in. 1:1/10:1/30:2 portland cement, lime, asbestos fiber, sand and 1:3 gypsum and sand plaster on metal lath. (7)	1 hr. comb.
	⅞ in. 1:1/30:2, 1:1/30:3 portland cement, asbestos fiber and sand plaster on metal lath. (7, 9)	1 hr. comb.
Gypsum and Vermiculite	¾ in. gypsum-vermiculite plaster on metal lath. Plaster mix: scratch coat 2 to 2½ cu. ft. and brown coat 3 to 3½ cu. ft. U.L. listed vermiculite plaster aggregate to 100 lbs. fibered gypsum. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 3-1 HR.	1 hr. comb.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Wood Stud Partitions, Without Plaster.
Studs 2 x 4 in. or larger. Finished Each Side as Noted



Finish Type	Details of Construction	Rating
Gypsum Wallboard	Two layers 5/8 in. U.L. listed gypsum wallboard. First layer applied vertically with edge joints on the studs and attached with 1⅞ in. cement coated nails spaced 6 in. on centers; second layer applied horizontally with edge joints off the studs and attached with 1⅞ in. cement coated nails spaced 12 in. on centers. All joints and nailheads covered with tape and compound. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 4-2 HR.	2 hrs.[bb] comb.
	Two layers ½ in. gypsum wallboard. First layer attached with 1⅝ in. nails having 7/32 in. heads; second layer attached with 1⅞ in. nails having ¼ in. heads. Outside joints taped and pointed and nail heads covered with joint compound. (38)	1 hr. comb. or 1½ hrs.* comb.
	Two layers of ½ in. gypsum wallboard applied horizontally with end joints of both layers on studs. First layer attached with 1⅝ in. nails having 7/32 in. heads; outer layer with 2⅜ in. nails having 17/64 in. heads. All joints of finish layer covered with tape and compound. (56)	1½ hrs. comb.
	Two layers of ½ in. gypsum wallboard, the inner layer applied vertically with edge joints off the studs, and attached with 1⅝ in. nails having 7/32 in. heads; outer layer applied horizontally with end joints on studs, attached with 2⅜ in. nails having 17/64 in. heads. Joints finished with tape and compound. (75)	1 hr. comb. or 1½ hrs.* comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

WALLS AND PARTITIONS—Continued

Wood Stud Partitions, Without Plaster.
Studs 2 x 4 in. or larger. Finished Each Side as Noted (Continued)

Finish Type	Details of Construction	Rating
Gypsum Wallboard	Two layers ⅜ in. gypsum wallboard. First layer applied vertically and nailed to studs with 1½ in. cement coated nails on 8 in. centers. Back of second layer cemented and nailed to face of first layer, placed horizontally and nailed with 1¾ in. cement coated nails on 8 in. centers. Joints finished with tape and compound. (97)	1 hr. comb.
	½ in. U.L. listed gypsum wallboard nailed horizontally to studs with 1⅝ in. cement coated nails 7 in. on centers. 7/16 in. U.L. listed wood particle board over wallboard and nailed to studs with 2 in. finishing nails 7 in. on centers. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 4-1 HR.	1 hr. comb.
	⅝ in. U.L. listed wallboard, nailed to studs with 1⅞ in. nails; joints and nailheads exposed or covered with tape and compound. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 5-1 HR.	1 hr. comb.
	Two layers ⅜ in. U.L. listed wallboard, glued together and nailed to studs with 1⅞ in. nails; joints and nailheads covered with tape and compound. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 6-1 HR.	1 hr. comb.
	½ in. gypsum wallboard, stud spaces filled with mineral wool batts nailed in place. (7, 9)	1 hr. comb.
Gypsum Wallboard and Cement Asbestos Board	3/16 in. cement-asbestos sheets over ½ in. gypsum wallboard. (80)	1 hr. comb. or 1½ hrs.* comb.
	3/16 in. cement-asbestos boards over ⅜ in. gypsum wallboard. (9)	1 hr. comb.
	4 in. strips of ⅜ in. gypsum board over edges of studs under facing of 3/16 in. cement-asbestos board; filling of mineral wool batts. (9)	1 hr. comb.

Wood Stud Partitions, Without Plaster.

Gypsum Wallboard	½ in. U.L. listed wood particle board secured to 2 in. x 3 in. studs (staggered) with 6d cement coated nails, 2 in. long, spaced 12 in. on centers along vertical edges and 30 in. on centers at intermediate studs. ⅝ in. U.L. listed gypsum wallboard secured to studs with 7d cement coated nails 2½ in. long, spaced 7 in. on centers. Other details as specified in U.L. listing[c], under Walls and Partitions—Design No. 17-1 HR.	1 hr. comb.

* Nonbearing.

Letter superscripts refer to notes, page 139.

NOTES

[a] The ratings for walls with combustible members framed into the wall, apply for members framed in not over 4 inches.

[b] Thicknesses given do not include the thickness of plaster where plaster is specified.

[c] See "Building Materials List" published annually and Bi-Monthly Supplements of Underwriters' Laboratories, Inc. The use of materials listed by Underwriters Laboratories, Inc., provides reasonable assurance that the materials conform to the standard for such materials established by the Laboratories in connection with the listing.

[d] A 10-inch wall may be used for this rating if hollow spaces near combustible members are filled with fire resistive material for the full thickness of the wall and for 4 inches or more above, below and between the combustible members.

[e] Equivalent thickness is the average thickness of the solid material in the wall. It may be found by taking the total volume of a wall unit, subtracting the volume of core spaces, dividing this by the area of the face of the unit. Where walls are plastered or faced with brick the thickness of plaster or brick may be included in determining the equivalent thickness.

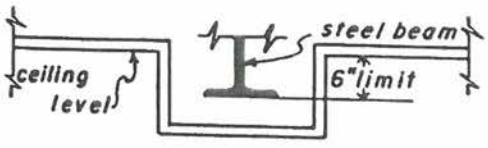
[f] Where combustible members are framed into the wall, the wall must be of such thickness or be so constructed that the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, will be not less than 93% of the thickness shown in the table.

[g] The ratings of load bearing hollow clay tile depend in certain cases on the number of cells and units in the wall thickness. These are shown in the table along with the total thickness (in inches) of the wall, "2U" represents for example, two units and "4C" representing four cells in the wall thickness.

[h] An 8-inch tile wall may be used for this rating if hollow spaces are filled as in Note[d].

[i] With combustible structural members framed into the wall, plaster is effective in increasing the fire resistance (over that for a similar wall or partition unplastered) only when applied on the side opposite that on which the structural members are framed in, and only with respect to fire exposure from the plastered side.

[j] Ratings given are applicable where there is no combustible material or construction in the enclosed ceiling space. Ceiling to be at such a level that the beams, girders or trusses to be considered as protected by the ceiling, will not extend below the level of the ceiling more than 6 in. (as illustrated below), unless otherwise specified. This depth at any point, to be considered as the average depth on the two sides. Ratings are for protection only from fire beneath the ceiling.



[k] Group 1 and group 2 aggregates are defined in the "Standard Specifications for Concrete and Reinforced Concrete" of the 1940 "Joint Committee Report" as follows:

"Group 1. Blast-furnace slag, limestone, calcareous gravel, trap rock, burnt clay or shale, cinders containing not more than 25% of combustible material and not more than 5% of volatile material, and other materials meeting the requirements of these specifications and containing not more than 30% quartz, chert, flint, and similar materials.

"Group 2. Granite, quartzite, siliceous gravel, sandstone, gneiss, cinders containing more than 25%, but not more than 40% of combustible material and not more than 5% of voltaile material and other materials meeting the requirements of these specifications, and containing more than 30% of quartz, chert, flint, and similar materials."

[l] Thicknesses given are of the protection around the outside of the steel column, beam, girder or truss, or cast iron column, and outside of the reinforcing steel in reinforced concrete columns, beams, girders and trusses. They do not include thickness of plaster except where the protection consists only of metal lath and plaster.

[m] The fire resistance of columns varies with the area of solid material in the cross section of the column—the larger the column the greater the fire resistance, for a given thickness of protection around the structural or reinforcing steel. The column dimensions given are the outer cross sectional dimensions of the steel or cast iron columns and the outside cross sectional dimensions of reinforced concrete columns. Columns smaller than those listed may require greater thicknesses of protection for the same degree of fire resistance. For columns which are not square the protection should correspond to that for the square column having the same or next smaller cross sectional area.

[n] Calcareous aggregate containing a combined total of not more than 10% quartz, chert and flint for the coarse aggregate.

[o] Cinders contained not over 10% unburned coal and not over 5% ash.

[p] Wire ties consisted of No. 5 B. & S. gauge (0.18 in. diam.) steel wire wound spirally around the steel column on a pitch of 8 in.

[q] Outside wire ties consisted of No. 12 B. & S. gauge (0.08 in. diam.) steel wire tied around the outside of each course of the tile at the middle.

[r] Tested with covering of ¾ in. gypsum and sand plaster, on which the rating was 7 hours.

[s] The aggregate used contained 60% or more of quartz, chert, or granite.

[t] Tested with covering of ½ in. gypsum and sand plaster, on which the rating was 6 hours.

[u] The "Standard Methods of Fire Tests of Building Construction and Materials" fix a temperature limit for wood members such as sleepers set into the top slab of a floor construction. Except where test data are available to show that wood members may be embedded in the top slab a certain depth without developing temperatures higher than the standard specifies, or except as otherwise specifically indicated, the rating of floor and ceiling constructions are based on the assumption that no wood sleepers or other combustible members will be embedded in the specified top covering of concrete or gypsum. Such members may rest on top of the specified thickness of concrete or gypsum with additional concrete or gypsum fill between sleepers.

[v] The thickness of concrete floor slab given is the minimum thickness over the joists. Between joists the thickness will be greater due to sagging of the metal lath. Tests at the National Bureau of Standards have indicated that this additional thickness between joists is necessary if the specified fire resistance is to be assured. If the normal sag between joists is not present the average thickness of slab should be ¼ in. greater. Concrete plank may be used for the top slab if joints are thoroughly grouted and the plank is at least ¼ in. thicker than the specified thickness for the top slab.

[w] Metal lath of approved weight serving as form for poured top slab may be considered as reinforcement.

[x] Siliceous gravel contained 100% clear quartz.

[y] These ratings apply to columns with standard ties or spirals, and to columns without spirals if designed on the basis that the protective concrete covering carries no load. If the design load is based on the gross column area and the column does not have adequate ties or spirals the actual fire resistance will be considerably lower.

z Ratings given are for fire exposures from the plastered side. Somewhat higher ratings were obtained with brick face exposed to fire.

aa Wire ties of No. 8 SWG (0.16 in. diam) steel wire wound spirally around steel column on a pitch of 8 in.

bb This construction is not acceptable for use where a 2-hour construction is required to be of noncombustible materials, as is specified for all two-hour partitions in the National Building Code.

cc Without concrete topping floors and roofs of such U.L. listed units, 2 hours.

dd Portions of this concrete slab not containing electrical raceways and junction boxes may consist of a 3 in. concrete slab.

ee Portions of this concrete slab not containing electrical raceways and junction boxes may consist of a 2 in. concrete slab.

ff Rating given applies only when the floor has a minimum bearing of 3 inches at edges and is restrained at all edges. The concrete topping is not considered as a structural element of the assembly.

gg Where wood ceiling, floor and wall runner strips are used in place of metal runner strips, the construction is considered as combustible.

hh The approximate face shell and web thicknesses are based on units having a cement-aggregate proportion of not more than 1:7 except for units incorporating burned clay or shale, rotary kiln process the proportion may be not more than 1:9.

ii Rating is 2½ hours when marker screws are installed in raceway outlets.

jj Substitution of half cell units and half cell units with flat plate (blend system) for cellular units will result in 2 hour rating. See Design No. 59-2 HR (Beam 3 HR).

kk Minimum equivalent thickness computed in accordance with ASTM C-140.

ll Cells filled with loose expanded shale aggregate gives a 4 hour fire resistance rating.

mm Cells filled with loose expanded slag aggregate gives a 4 hour fire resistance rating.

nn Unless otherwise noted wood flooring is 1 in. (nominal) tongue and groove sub and finish flooring with building paper between and no ceiling openings are permitted.

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(4) "Fire Resistance of Hollow Load-Bearing Wall Tile," National Bureau of Standards Research Paper No. 37, 1928.

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(20) Columbia University, Dept. of C. E. Testing Laboratories Report No. F. W. 20, Dec., 1922 (unpublished).

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(26) "Fire Tests of Building Columns," a joint report of Underwriters' Laboratories, Inc., the Associated Factory Mutual Fire Insurance Companies and the National Bureau of Standards, 1920.

(27) "Fire Resistance of Concrete Columns," National Bureau of Standards Technologic Paper No. 272, 1925.

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(32) Report of Committee on Tests Re: Cal. No. 163-46 SM, Bulletin of the Board of Standards and Appeals of the City of New York, Dec. 17, 1946.

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62-C—R3390	62-I —R3390-11	62-O—R3390-17
62-D—R3390-6	62-J —R3390-12	62-P —R3390-18
62-E—R3390-9	62-K—R3390-13	62-Q—R3390-19
62-F—R3390-3	62-L—R3390-10	

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(89) Ohio State University Engineering Experiment Station Project No. T-99, March, 1952 (unpublished).

(90) Based on test data obtained from unpublished report of recognized testing laboratory.

(91) "SCR Brick Wall Fire Resistance Test,, by Ohio State University Engineering Experiment Station, Research Report No. 2. Structural Clay Products Research Foundation, Sept. 22, 1952.

(92) "Fire Tests of Steel Columns Encased With Gypsum Lath and Plaster," National Bureau of Standards Report BMS 135, 1955.

(93) "Fire Tests of Brick Walls," National Bureau of Standards Report BMS 143, November 30, 1954.

(94) Based on test data obtained from unpublished report of recognized testing laboratory.

(95) "Fire Tests of Steel Columns Protected with Siliceous Aggregate Concrete," National Bureau of Standards Report BMS 124, 1951.

(96) Underwriters' Laboratories, Inc. Standard for Concrete Masonry Units. Subject 618, August, 1958.

(97) Ohio State University Engineering Experiment Station Project No. T-118, Reports No. 48 and 48-A, May, 1951 (unpublished).

(98) Ohio State University Engineering Experiment Station Project No. T-164, August, 1950 (unpublished). Test results in brief form published in Bulletin of the Board of Standards and Appeals of the City of New York, December 19, 1950.

(100) Ohio State University Engineering Experiment Station Project No. T-1576 (unpublished).

(101) Report of Raymond E. Davis, Consulting Engineer, University of California, March 22, 1955 (unpublished).

(102) Ohio State University Engineering Experiment Station Project No. T-346, February 4, 1955 (unpublished).

(103) Ohio State University Engineering Experiment Station Project No. T-304, December 29, 1954 (unpublished).

(104) Ohio State University Engineering Experiment Station Project T-539, November 1, 1956 (unpublished).

(105) Ohio State University Engineering Experiment Station Project No. T-961, January 15, 1959 (unpublished).

(106), (107) and **(108)** Based on test data obtained from unpublished report of recognized testing laboratory.

(109) Ohio State University Engineering Experiment Station Project No. T-737, November 13, 1957 (unpublished).

(110) Ohio State University Engineering Experiment Station Project No. T-118, Reports No. 55 and 55A, July, 1953 (unpublished).

(111) Ohio State University Engineering Experiment Station Project No. T-1437 (unpu' lished).

(112) Ohio State University Engineering Experiment Station Project No. T-1172 (unpublished).

(113) National Research Council of Canada, Fire Study No. 6, February, 1962.

(114) Ohio State University Engineering Experiment Station File No. T-397, October 6, 1955 (unpublished).

(115) and **(116)** Based on test data obtained from unpublished report of recognized testing laboratory.

(117) Ohio State University Engineering Experiment Station Project No. 45, August, 1946 (unpublished).

(118) Underwriters' Laboratories, Inc. Report on Floor and Ceiling Construction, April 9, 1963.

(119) and **(120)** Based on test data obtained from unpublished report of recognized testing laboratory.

(121) Ohio State University Engineering Experiment Station Project No. T-1380 (unpublished).

(122) Ohio State University Engineering Experiment Station Project No. T-1224 (unpublished).

(123) Ohio State University Engineering Experiment Station Project No. T-1223 (unpublished).

(124) Ohio State University Engineering Experiment Station Project No. T-1235 (unpublished).

(125) Ohio State University Engineering Experiment Station Project No. T-1571 (unpublished).

(126) Ohio State University Engineering Experiment Station Project T-1813 (unpublished).

(127) Ohio State University Engineering Experiment Station Project T-1452 (unpublished).

(128) Underwriters' Laboratories, Inc. Report on Reinforced Concrete Slab and Beam Construction, April 30, 1962.

(129) Ohio State University Engineering Experiment Station Project T-1450 (unpublished).

(130) Report of Raymond E. Davis, Consulting Engineer, University of California, March 26, 1963 (unpublished).

(131) Ohio State University Engineering Experiment Station Project T-1262 (unpublished).

(132) Ohio State University Engineering Experiment Station Project No. T-1449 (unpublished).

(133) Ohio State University Engineering Experiment Station Project No. T-1330 (unpublished).

(134) Ohio State University Engineering Experiment Station Project No. T-1332 (unpublished).

(135) Ohio State University Engineering Experiment Station Project No. T-1578 (unpublished).

(136) Based on test data obtained from unpublished report of recognized testing laboratory.

(137) Ohio State University Engineering Experiment Station Project No. T-3016 (unpublished).

(138) Fire Test of Nonbearing Wall, Fire Study No. 10, December, 1963, National Research Council of Canada.

(139) Fire Test of Nonbearing Wall, Fire Study No. 11, January, 1964, National Research Council of Canada.

(140) Underwriters' Laboratories, Inc. Retardant 3460-1, 2, 3, July 1, 1952.

Design No 58-2 Hr.

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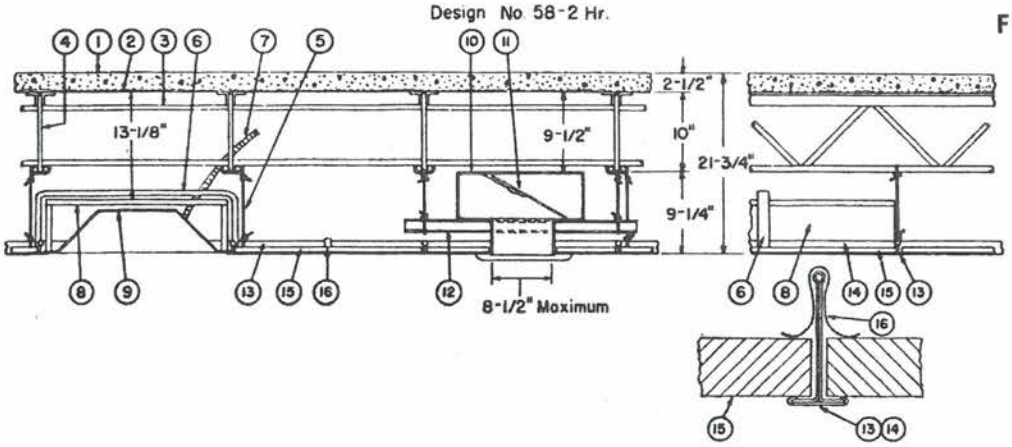
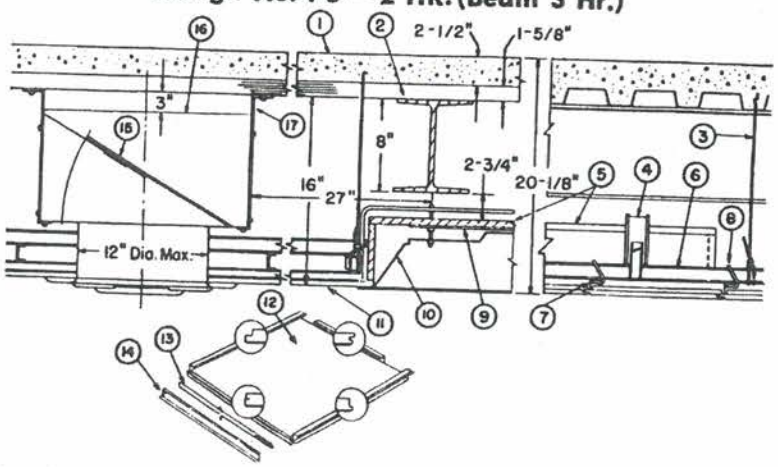
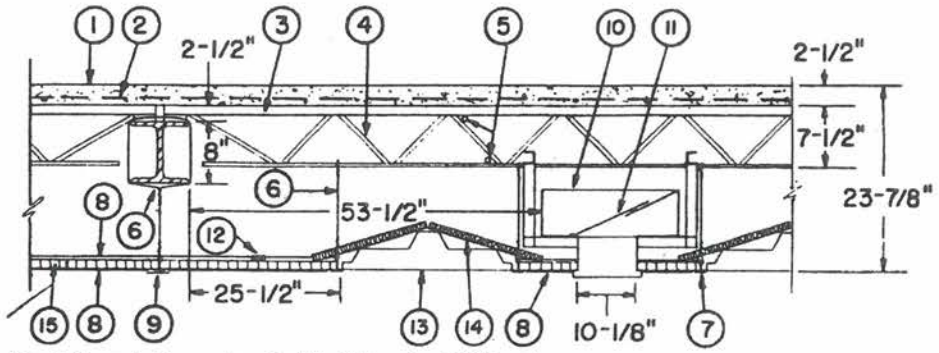


1. **Sand-Gravel Concrete**—1 :2½ :4 Mix, 3000-psi strength.
2. **Metal Lath**—3.4 lb, ⅜ in. rib, expanded metal, attached to joists with No. 13 SWG, 2⅝ in. long lath clips spaced 9 in. on center. Selvage overlap wire-tied with No. 18 SWG galvanized wire.
3. **Bridging**—½ in. diameter steel bars welded to top and bottom chord of each joist.
4. **Steel Joists**—Type 10S2, spaced 24 in. on center and welded to supports.
5. **Hanger Wire**—No. 12 SWG galvanized wire, wire-tied to lower chord of joists, spaced not over 48 in. on center, to occur at intersection of grid suspension system members and at all four corners of light fixtures.
6. **Light-Fixture Yoke**—One per light fixture assembly, No. 16 gauge steel channel attached to grid suspension members with No. 8, ¾ in. long sheet-metal screws at midspan of light fixtures.
7. **Armored Cable**—Listed by U. L., Inc., Guide No. 20 R0.
8. **Light Fixture Box**—Made of ⅝ in. thick acoustical tile listed by U. L., Inc., Guide No. 40 U18.1, 47¾ in. long, 23¾ in. wide, and 6 in. deep, assembled with 8d common nails spaced 12 in. on center, toenailed alternately at 45 deg. Ends of box are open.
9. **Recessed Type Electric Fixtures**—Steel housing. Listed by U. L., Inc., Guide No. 120 I2.18. 2 by 4 ft size, spacing not to exceed 8 per cent of ceiling area.
10. **Air Ducts**—Galvanized steel. Duct opening, not to exceed 28 sq in. per 100 sq ft of ceiling area, and no individual opening greater than 57 sq in., supported by 1½ in. cold-rolled channels.
11. **Damper**—No. 14 gauge steel, 14 in. square, protected with 1/16 in. thick asbestos paper on both sides, held open with fusible link listed by U. L., Inc., Guide No. 120 U0.
12. **Channels**—1½ in., No. 16 gauge cold-rolled steel, 29½ in. long, spaced 24 in. on center. Attached to No. 12 SWG galvanized hanger wire suspended from and wire-tied to lower chords of joists.
13. **Main Tees**—Nominally 12 ft long. Listed by U. L., Inc., Guide No. 40 U18.18. Spaced 4 ft on center. No minimum clearance required.
14. **Cross Tees**—Nominally 48 and 24 in. long. Listed by U. L., Inc., Guide No. 40 U18.18. No minimum clearance required.
15. **Acoustical Tile**—Nominally ⅝ by 24 by 24 in. or ⅝ by 24 by 48 in. Listed by U. L., Inc., Guide No. 40 U18.1.
16. **Hold-Down Clips**—No. 26 gauge spring steel, 1 in. high, 1 in. wide, and ½ in. deep. One clip per 4 sq ft of ceiling, symmetrically located.

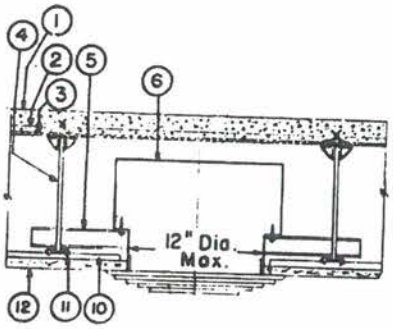
Design No. 70—2 HR. (Beam 3 Hr.)

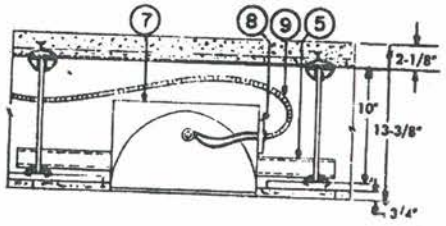


1. **Sand-Pea Gravel Concrete**—1:2½:3 mix, 3000 psi.
2. **Steel Floor Units**—Listed by U. L., Inc., in the Building Materials List under Guide No. 40 U18.19, alternating one fluted section, 24 in. wide, to one cellular section, 24 in. wide. Welded to supports 12 in. on center. Adjacent units button-punched 36 in. on center.
3. **Hanger Wires**—No. 12 Steel Wire Gauge galvanized wire, spaced not over 48 in. along each cold-rolled channel.
4. **Light-Fixture Yokes**—No. 18 gauge painted-steel channels formed as a yoke. Two provided and spaced 36 in. apart for each light fixture. Yokes attached to the cold-rolled channels by clamping-type brackets.
5. **Light-Fixture Protection Box**—Assembled from ⅝ in. thick mineral and fiber boards listed by U. L., Inc., in the Building Materials List under Guide No. 40 U18.12I. Box completely covers top of light fixture and is assembled by 8d common nails alternately toe-nailed at 45 deg.
6. **Cold-Rolled Channels**—1½ in. No. 16 gauge painted steel. Maximum spacing: 48 in. on centers and on each side of duct opening.
7. **Zee Runners**—No. 25 gauge galvanized steel, ⅞ in. deep, with 11/16 in. wide upper flange and 13/16 in. wide lower flange. A No. 25 gauge galvanized steel splice, 6¾ in. long, ¾ in. deep, with 3/16 and 7/16 in. flanges was used to join the zee runners; ½ in. end clearance of the zee runners at the splices.
8. **Zee-Runner Clips**--No. 12 Steel Wire Gauge galvanized, placed over cold-rolled channels and clipped to top flange of zee runner.
9. **Spacer Bars**—Two per light fixture assembly; No. 16 gauge steel, 16 in. long, each with two holes to support light-fixture assembly by studs of light-fixture yokes.
10. **Recessed-Type Light Fixture**—Steel housing. Listed by U. L., Inc., in the Electrical Construction Materials List under Guide No. 120 I2.18, 2 by 4 ft size with spacing not to exceed 25 sq ft per 100 sq ft of ceiling area.
11. **Acoustical Tile**—12 by 12 by ⅝ in., or thicker, tongue-and-groove kerfed-edge detail. Listed by U. L., Inc., in the Building Materials List under Guide No. 40 U18.1. Border tile supported by No. 24 gauge painted steel, 1¼ in. deep channel with ⅞ in. flanges.
12. **Access Tile**—The same 12 by 12 by ⅝ in., or thicker, tile with kerfed-edge detail used in the remainder of the ceiling listed by U. L., Inc., in the Building Materials List under Guide No. 40 U18.1. The back leg along one edge is cut flush with the inner edge of kerf. The tile is supported by a zee runner at one end and unsupported at opposite end with cut-back upper lip, and supported by accessible splines at both sides. To be located not closer than 18 in. to zee runner splices. Not more than one access panel per 100 sq ft of ceiling area.
13. **Accessible "E" Spline**—No. 24 gauge galvanized steel, 10⅞ in. long by ¾ in. deep with ⅜ in. leg, made to fit between lugs and hook onto the zee spline through the slot with the locking hook. One "E" spline engaged into the kerf of the access tile at opposite sides and hooked onto the zee splines.
14. **Accessible Zee Splines**—No. 24 gauge galvanized steel, 11⅞ in. long by 13/16 in. deep with ⅜ in. bottom leg and ¼ in. top leg, located perpendicular to and made to bear at each end on the bottom flanges of the zee runners. Two zee splices used at opposite sides of access tile.
15. **Damper**—No. 14 gauge steel, 15 by 15 in., protected with 1/16 in. asbestos paper both faces. Held with fusible link. Listed by U. L., Inc., in the Building Materials List under Guide No. 120 U0.
16. **Air Ducts**—Galvanized steel. Duct opening not greater than 113 sq in. in each 100 sq ft of ceiling.
17. **Duct Suspension Straps**—No. 22 gauge galvanized steel, double thickness, 1⅛ in. wide, spaced not over 4 ft on centers and attached to the steel deck units and ducts with sheet-metal screws.



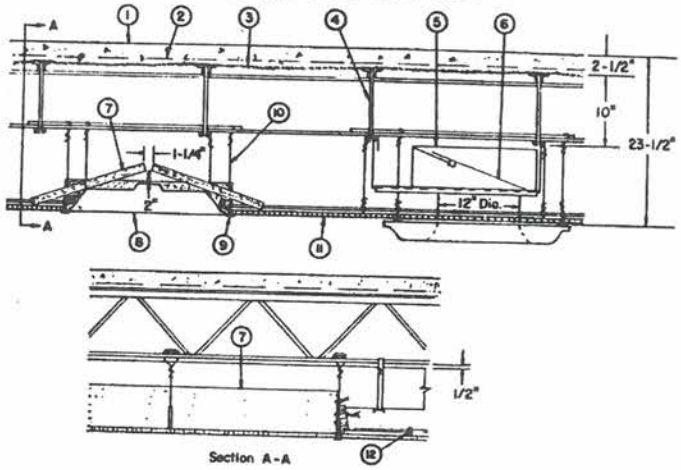
1. **Sand-Gravel Concrete**—1:2¾:3¾ mix, 3400 psi.
2. **Wire Fabric**—No. 10 SWG, 6 by 6 in. mesh.
3. **Metal Lath**—3.4 lb, ⅜ in. rib, expanded metal lath, wire-tied to joists, 9 in. O.C. with No. 18 SWG galvanized wire. Selvage overlap wire-tied once between joists.
4. **Steel Joists**—Type 8J2, spaced 24 in. O.C. and welded to supports.
5. **Bridging**—Steel bars, ½ in. diameter, welded to top and bottom chords of each joist.
6. **Hanger Wire**—No. 12 SWG, galvanized, spaced not over 24 in. O.C. and at ends of main runners and cross tees at the walls.
7. **Main Runner**—No. 24 gauge, 1½ in. high, 15/16 in. wide, 93¼ in. long and spaced 24 in. O.C. Ends of main runners engaged by splicer, No. 18 gauge, 1⅛ in. high, 8¾ in. long. Listed in the Building Materials List of U. L., Inc., under Guide No. 40 U18.18.
8. **Cross Tees**—No. 24 gauge, 1½ in. high, 15/16 in. wide, 24½ in. long and spaced 24 in. O.C. perpendicular to main runners. Listed in the Building Materials List of U. L., Inc., under Guide No. 40 U18.18.
9. **Cover Plate**—No. 30 gauge, painted steel, 3½ by 3½ in. cross at every intersection of suspension system members. Listed in the Building Materials List of U. L., Inc., under Guide No. 40 U18.18.
10. **Air Duct**—Duct opening not over 70 sq in. per 100 sq ft of ceiling area. Outside face of duct throat protected with 1/16 in. of abestos paper. Duct supported by 1½ in. cold-rolled channels bolted to No. 20 gauge galvanized steel duct hangers bent over lower chord of joists and bolted, spaced 48 in. O.C.
11. **Damper**—15 in. square, No. 16 gauge protected with 1/16 in. of asbestos paper on both faces. Held open with fusible link, listed in the Building Materials List of U. L., Inc., under Guide No. 120 U0.
12. **Hold-Down Clips**—1¼ in. wide, 15/16 in. high, ½ in. deep, made of 0.018 in. electrogalvanized steel. Two clips uniformly spaced (one per 24 in. length of tile) on each cross tee.
13. **Recessed-Type Electric Fixtures**—Listed by U. L., Inc., in the Electrical Construction Materials List under Guide No. 120 12.18, 2 by 4 ft, spacing not to exceed 24 sq ft per each 100 sq ft of ceiling area. Fixture housing to be of steel.
    Armored Cable—Listed by U. L., Inc., in the Electrical Construction Materials List, under Guide No. 20 R0.
14. **Mineral-Wool Batt Light-Fixture Cover**—Listed by U. L., Inc., in the Building Materials List, Guide No. 40 U18.2. Two 2 by 48 by 1¼ in. pieces, cut from 21½ by 48 by 1¼ in. batts, laid along the long dimensions of the fixture and against the suspension member supporting the fixture. Two 17 by 48 by 1¼ in. pieces slit for the hanger wires at the midspan of the fixture, placed to rest on each side of the fixture and the adjacent tile, and wire-tied to the hanger wires at the corners of the fixture. Two 4½ by 24 by 1¼ in. pieces, placed on top of the tile at each end of the fixture and wire-tied to the hanger wires at the corners of the fixture.
15. **Acoustical Tile**—24 by 48 by ⅝ in. and 24 by 24 by ⅝ in. Listed by U. L., Inc., in the Building Materials List under Guide No. 40 U18.1. Border tile supported by No. 24 gauge painted-steel wall channel, 1¾ in. deep with ¾ and 1 in. legs.





1. **Sand-Gravel Concrete**—1:2½:3¾ mix, 2500 psi.
2. **Wire Mesh**—No. 10 SWG, 6 by 6 in. mesh.
3. **Metal Lath**—3.4 lb, ⅜ in. rib, expanded metal, wire tied to joists.
4. **Steel Joists**—Type 10S3, spaced 24 in. O.C. and welded to supports.
5. **Supporting Channels**—1½ by 9/16 in. No. 16 ga painted steel.
6. **Air Ducts**—No. 26 ga galvanized steel, supported by channels 40 in. O.C. Duct opening no greater than 113 sq in. in each 100 sq ft of ceiling area.
7. **Recessed-Type Electric Fixtures**—Steel housing listed by U. L., Inc., Guide No. 120 12.18. Supported by channels. Opening 13 by 13⅛ in. size and spacing not to exceed 342 sq in. in each 100 sq ft of ceiling area.
8. **Outlet Box**—Listed by U. L., Inc., Guide No. 300 U4.
9. **Flexible Steel Conduit**—Listed by U. L., Inc., Guide No. 60 O2.
10. **"Z" Runners**—No. 25 ga steel, ⅞ in. deep, ⅜ in. top section, 3/16 in. bottom section. Attached to joints with wire clips 48 in. O.C. and to nearest joist at ceiling penetrations. Spaced 12 in. O.C. to clear walls 1 in. and with 1/32 in. gap at splices spaced not over 12 ft O.C. spliced with 6 in. long No. 26 ga steel channels located 20 in. from the nearest wire clip.
11. **Wire Clips**—No. 12 steel wire ga, 7-1/16 in. long.
12. **Acoustical Tile**—12 by 12 by ¾ in. tongue and grooved. Listed by U. L., Inc., Guide No. 40 U18.1. Border tile supported by ⅞ by ⅞ in. No. 24 ga painted steel angles. Tile provided with access clips as required.

Design No. 53-2 Hr.



1. **Sand-Pea Gravel Concrete**—1:2:2½ mix, 5500 psi, vibrated.
2. **Wire Fabric**—No. 10 steel wire gauge, 6 by 6 in. mesh.
3. **Metal Lath**—3.4 lb, ⅜ in. rib, expanded metal, wire tied to joists.
4. **Steel Joists**—Type 10J3, spaced 24 in. on center and welded to supports.
5. **Air Duct**—Galvanized steel. Duct opening not over 59 sq in. per 100 sq ft of ceiling area. Outside face of duct throat protected with 1/16 in. of asbestos paper. Supported by 1½ in., No. 16 gauge steel, channels bolted to 1¼ in. wide, No. 21 gauge steel straps, bent over lower chord of joists at each side of duct outlet and then 48 in. on center. Installed so that return air blower system automatically shuts down in fire.
6. **Damper**—No. 13 ga steel 15 in. square, protected with 1/16 in. of asbestos paper on both faces. Held open with fusible link, listed by U. L., Inc., Guide No. 120 U0.
7. **Mineral Wool Batt Light Fixture Cover**—Listed by U. L., Inc., Guide No. 40 U18.2. A 2 by 48 by 1¼ in. piece, cut from 24 by 48 by 1¼ in. batts, laid along the long dimensions of the fixture and against the suspension member supporting the fixture. A 17 by 48 by 1¼ in. piece, cut from 24 by 48 by 1¼ in. batts, slit for the hanger wires at the midspan of the fixture, placed to rest on each side of the fixture and the adjacent tile, and wire tied to the hanger wires at the corners of the fixture. A 4½ by 24 by 1¼ in. piece, cut from 24 by 48 by 1¼ in. batts placed on top of the tile at each end of the fixture and wire tied to the hanger wires at the corners of the fixture.
8. **Recessed Type Electric Fixture**—Steel housing. Listed by U. L., Inc., Guide No. 120 I2.18, 2 ft wide by 4 ft long. Spacing not to exceed 8 sq ft per 100 sq ft of ceiling area.
9. **Steel Framing Members**—Listed by U. L., Inc., Guide No. 40 U18.18. Main beams, 12 ft long, spaced 48 in. on center. Cross tees, 4 ft long, spaced perpendicular to main beams, 24 in. on center. When 24 by 24 in. tile is utilized, 2 ft long cross tees spaced 24 in. on center, midway between main beams. Minimum clearance to walls, 5/16 in.
10. **Hanger Wire**—No. 12 steel wire gauge, spaced not over 48 in. on center and at the ends of the main beams and cross tees near the walls. Additional hanger wires at each corner of each light fixture and 24 in. on center in both directions surrounding the duct outlet. Secured to lower chord of steel joists or to 1½ in., No. 16 gauge steel channels placed on top of lower chords of the joist and wire tied thereto, where the hanger wires cannot be directly suspended from the joists.
11. **Acoustical Tile**—24 by 48 by ⅝ and 24 by 24 by ⅝ in. Listed by U. L., Inc., Guide No. 40 U18.1. Border tile supported by No. 25 gauge painted steel, ¾ by 1 in. angles.
12. **Hold-Down Clips**—⅞ in. wide, 0.028 in. galvanized steel, spaced over cross tees, one per 24 in. length of tile.