



**SUBCHAPTER 10
STRUCTURAL WORK**

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ARTICLE 1 SCOPE AND GENERAL REQUIREMENTS

§[C26-1000.1] 27-580 **Scope.** -The provisions of this subchapter, supplemented by the additional requirements of subchapter eleven of this chapter, shall establish minimum requirements for materials, designs, and construction to be used for all structural elements in buildings. In addition, within special flood hazard areas and below the regulatory flood datum, as described in article ten of subchapter four of this chapter, materials, designs and construction required for structural elements by reference standard RS 4-5 shall be applicable.

§[C26-1000.2] 27-581 **Standards.** -The provisions of reference standard RS-10 shall be a part of this subchapter.

§[C26-1000.3] 27-582 **Definitions.** -For definitions to be used in the interpretation of this subchapter, see subchapter two of this chapter.

§[C26-1000.4] 27-583 **Plans.** -For the requirements governing the filing of plans and the work to be shown on the plans, see subchapter one of this chapter.

§[C26-1000.5] 27-584 **Permits.** - For the requirements governing equipment work permits and equipment use permits, see subchapter one of this chapter.

§[C26-1000.6] 27-585 **General requirements.** -

For purposes of this code, the structural elements of a building shall normally include all floor, roof, and wall framing members and slabs (but not including slabs-on-grade); all piers, walls, footings, piles, and similar elements of the foundation; and all other elements of both foundation and superstructure which, in engineering practice, are proportioned on the basis of calculated stress. Where doubt exists as to the structural nature of an element, the provisions of this subchapter, and of subchapter eleven of this chapter, shall be deemed to apply only to an element in which the materials are stressed in excess of thirty-three and one-third percent of the allowable stress values (without increase for infrequent stress conditions) for such material in its proposed use, or to an element wherein public safety would be involved in the event of excessive distortion under the applied loads.

§[C26-1000.7] 27-586 **Materials and methods of construction.** - Materials and methods of construction used in the manufacture and/or placement of structural elements in a building shall be subject to the requirements of article seven of subchapter one of this chapter, the inspection provisions established in tables 10-1 and 10-2 and the detailed requirements of articles four through twelve of this subchapter and article thirteen of subchapter eleven of this chapter.

§[C26-1000.8] 27-587 **Fire protection requirements to apply.**-Where a material or method of construction in a specific use is required to provide fire protection as well as structural adequacy, the material or method of construction shall meet both specified requirements.

§[C26-1000.9] 27-588 **Use of used and unidentified materials.**- The utilization of used materials and unidentified or ungraded materials shall be limited to non-structural elements, except:

(a) Such materials (or elements) may be reused, or continued in use, at stress levels to which the materials or elements were subjected in the previous construction, or at load capacity as demonstrated by load test procedures as described in subdivision (a) of section 27-599 of article three of this subchapter.

(b) Unidentified materials may be graded by the recovery and test of representative samples, or by other means satisfactory to the commissioner.

(c) Used materials shall be considered to be graded where the grade is clearly indicated on the approved plans for the existing construction and may be used at the allowable stress levels for that grade of like material as established in the building code in force at the time the plans for the existing construction were approved.

§[C26-1000.10] 27-589 **Equivalent systems of design.** - Nothing in this subchapter shall be construed to prohibit the use of any system of design, alternate to those indicated, provided that it can be demonstrated to the satisfaction of the commissioner that such system of design will provide a factor of safety against structural

failure consistent with the requirements of articles four through twelve of this subchapter, fire safety in consonance with the requirements of subchapters three through eight of this chapter, and such other characteristics pertinent to the safety of life, health, and property as prescribed in this subchapter or as may be required by the commissioner.

(a) Alternate or equivalent materials or methods of construction shall be subject to the provisions of section 27-133 of article seven of subchapter one of this chapter.

§[C26-1000.11] 27-590 Deferred detailing. -

Where structural elements are normally detailed on shop or working drawings, the application for the permit shall so state, and issuance of the permit shall be conditioned upon future submission of such shop or working drawings showing the approval of an architect or engineer with regard to such

elements, or of a signed statement by an architect or engineer to the effect that such drawings were prepared to his or her satisfaction. In cases where the detailing of structural elements has been made on the basis of fire-resistance ratings, load tables, or similar data as given in manufacturer's catalogues, the application for approval of the plans shall so state and issuance of such acceptance shall be conditional upon submission of a statement by the manufacturer, or of other supporting documentary evidence of accreditation furnished by the manufacturer, attesting to the accuracy of the data and stating that such data were derived in conformance with the provisions of this code. Where the detailing of structural elements has been made on the basis of data published in technical documents of recognized authority issued by, or accredited by the agency or association promulgating the applicable reference standard cited in this code, such statements will not be required.

TABLE 10-1 INSPECTION OF MATERIALS AND ASSEMBLIES

Materials	Elements That Shall be Subject to Controlled Inspection ^{a,b,d}	Elements That Are Not Subject to Controlled Inspection ^{a,c,d}
Steel	None	All structural elements and connections.
Concrete	Materials for all structural elements proportioned on the basis of calculated stresses seventy per cent or greater, of basic allowable values. See article five for specific requirements relating to "quality control of materials and batching."	(1) All materials for structural elements proportioned on the basis of calculated stresses less than seventy percent of basic allowable values. (2) Concrete materials for: (a) Short span floor and roof construction proportioned as per section 27-610. (b) Walls and footings for buildings in occupancy group J-3. (3) Metal reinforcement.
Aluminum	None	All structural elements and connections.
Wood	None	All structural elements and connections.
Reinforced gypsum concrete	None	All structural elements.
Masonry	None	All structural elements.
Other	Requirements as may be established in other subchapters of this code or by the commissioner.	

Notes for Table 10-1:

^aFor general provisions relating to inspection see section 27-132.

^bAll structural materials and assemblies subject to controlled inspection shall be tested and/or inspected at their place of manufacture and evidence of compliance with the provisions of this subchapter shall be provided as stipulated in articles four through twelve.

^cMill, manufacturer's and supplier's inspection and test reports will be accepted as evidence of compliance with the provisions of this code for all structural materials and assemblies not subject to controlled inspection.

^dBasic allowable stress values as referenced herein shall denote allowable stress value without increase for infrequent stress conditions as established in this code or in the applicable reference standard for the material or element in its proposed use.

**ARTICLE 2 STRUCTURAL DESIGN-
GENERAL REQUIREMENTS**

§[C26-1001.1] 27-591 Stability. -Except as provided in article twelve of subchapter eleven of this chapter with regard to foundation elements, a building, or any

element thereof shall be proportioned to provide a minimum factor of safety of 1.50 against failure by sliding or overturning. The required stability shall be provided solely by the dead load plus any permanent anchorages, which may be provided.

§[C26-1001.2] 27-592 Bracing. -Unless otherwise specified in the reference standards, members used to brace compression members shall be proportioned to resist an axial load of at least two percent of the total compressive design stress in the member braced, plus any transverse shear therein.

§[C26-1001.3] 27-593 Secondary stresses. - Secondary stresses in trusses shall be considered and where of significant magnitude, their effects shall be provided for in the design.

****§[C26-1001.4] 27-594 Combination of loads.** - Dead loads, live loads (including impact) and reduced live loads, where applicable, shall be considered as basic loads. Wind, earthquake, thermal forces, shrinkage, and unreduced live loads (where live load reduction is permitted by subchapter nine of this chapter) shall be considered as loads of infrequent occurrence. Members shall have adequate capacity to resist all applicable combinations of the loads listed in subchapter nine of this chapter, in accordance with the following:

****Local Law 17-1995.**

(a) Where design is based on allowable working stresses, the loads as described in subchapter nine of this chapter shall be multiplied by the following factors and the design shall be based on the resulting load values:

(1) For combinations of basic loads, only, the factor shall be 1.0, except that for the design of temporary structures (defined as a structure, which will be in place six months or less) the factor shall be 0.75.

(2) For any combination of one or more basic loads with any one load of infrequent occurrence, the factor shall be 0.75, except that for the design of temporary structures the factor shall be 0.67.

(3) For any combination of one or more basic loads with two or more loads of infrequent occurrence, the factor shall be 0.67.

Exception.—The provisions of reference standards RS 10-8 and RS 10-9 relating to increases of allowable unit stresses for short-time loading shall apply.

(b) Where design is based on ultimate strength criteria (including plastic design of steel structures and proportioning of suspended structures), the loads, as described in subchapter nine of this chapter shall be multiplied by the factors indicated in subdivision (e) of section 27-639 of article eleven of this subchapter and in the applicable reference standards. The design shall be based on the resulting load values.

Exceptions.—1. Where combinations of load for which factors are given in the reference standard include the load of wind (or earthquake) the design additionally shall consider combinations of load wherein each other of the loads of frequent* occurrence as listed in this paragraph are substituted for the load of wind.

2. The design also shall consider combinations of load wherein two most critical of the loads of infrequent

occurrence are combined with the basic loads. For such combination, however, the factors indicated in the reference standards and in subdivision (e) of section 27-639 of article eleven of this subchapter for suspended structures, for the combination of basic loads plus one load of infrequent occurrence may be reduced fifteen percent.

**As enacted but "infrequent" probably intended.*

§[C26-1001.5] 27-595 Deflection limitations. - The applicable provisions of the several reference standards cited in this subchapter shall apply. In addition, the total of the dead plus live load vertical deflections (including effects of creep and shrinkage) of members, supporting walls, veneered walls, or partitions constructed of or containing panels of masonry, glass, or other frangible materials shall not exceed 1/360 of the span.

ARTICLE 3 ADEQUACY OF THE STRUCTURAL DESIGN

§[C26-1002.1] 27-596 General. - The structural design of a member or assembly shall be deemed to be adequate if the design computations demonstrate conformance with the applicable standards noted in articles four through twelve of this subchapter. Where, because of practical difficulties, such computations cannot be executed, the structural design may be deemed adequate if the member or assembly is subjected to, and satisfactorily performs under, load tests in accordance with the provisions of subdivision (a) of section 27-599 of this article. Where there is a question as to the adequacy of a completed or partly completed construction, the provisions of section 27-597, 27-598 and subdivision (b) of section 27-599 of this article shall apply.

§[C26-1002.2] 27-597 Questionable construction. - If, upon inspection, it is found that a construction or any part thereof, as built, shows open cracks, spallings, or other signs of distress; or should inspection records show more** significant deficiency of construction; or should laboratory tests on concrete or other materials that have been incorporated into the work indicate deficiency of strength; or should there be a reasonable doubt as to the strength, stability, or adequacy of the construction or any part thereof, such construction may be checked to verify the adequacy thereof either by computation, or by core or load tests conducted in accordance with the provisions of section 27-598 or subdivision (b) of section 27-599 of this article or by any combination of these means. Should the adequacy of construction not be verified within a reasonable time, such construction shall be rejected and shall be demolished or reinforced or rebuilt to be made safe in conformance with the requirements of this code. In the event of a disagreement, the final decision as to the acceptance of the work shall be made by the commissioner. All such tests shall be made without expense to the city.

***As enacted but "some" probably intended.*

TABLE 10-2 INSPECTION OF METHODS OF CONSTRUCTION

Materials	Operations on Structural Elements That Shall be Subject to Controlled Inspection ^{a,b,d}	Operations on Structural Elements That Are Not Subject to Controlled Inspection ^{a,c,d}
Steel	<ol style="list-style-type: none"> (1) Welding operations and the tensioning of high strength bolts in connections where the calculated stresses in the welds or bolts are fifty percent or more of basic allowable values. (2) Connection of fittings to wire cables for suspended structures, except where cables together with their attached fittings are proof-loaded to not less than fifty-five percent of ultimate capacity. 	<ol style="list-style-type: none"> (1) Welding operations and the tensioning of high strength bolts in connections where the calculated stresses in the welds or bolts are less than fifty percent of basic allowable values. (2) All other fabrication and erection operations not designated for controlled inspection.
Concrete	Except for those operations specifically designated in this table are*** not subject to controlled inspection, for all concrete, the operations described in subdivision (a) of section 27-607 shall be subject to controlled inspection.	<ol style="list-style-type: none"> (1) All operations relating to the construction of members and assemblies (other than prestressed members) which involve the placement of a total of less than fifty cubic yards of concrete and wherein said concrete is used at levels of calculated stress seventy percent or less of basic allowable values. (2) Placing and curing of concrete for all: <ol style="list-style-type: none"> (a) Short span floor and roof construction as per section 27-610. (b) Walls and footings for buildings in occupancy group J-3. (3) Size and location of reinforcement for walls and footings for buildings in occupancy group J-3. (4) All other operations not described in subdivision (a) of section 27-607.
Aluminum	Welding operations in connections where the calculated stresses in the welds are fifty percent or more of the basic allowable values.	<ol style="list-style-type: none"> (1) Welding operations in connections where the calculated stresses in the welds are less than fifty percent of basic allowable values. (2) All other fabrication and erection operations not designated for controlled inspection.
Wood	Fabrication of glued - laminated assemblies and of plywood components.	All other operations not designated for controlled inspection.
Reinforced Gypsum Concrete	None	All operations incident to the fabrication and placement of structural elements.
**Reinforced Masonry	<ol style="list-style-type: none"> (1) Fabrication of prefabricated units. (2) Placement and bedding of units, sizes of members, including thickness of walls and wythes; sizes of columns; the size and position of reinforcement, in place, and provisions for curing and protection against freezing for all reinforced masonry construction unless such operations are specifically not designated for controlled inspection. 	<ol style="list-style-type: none"> ** (1) All masonry work for buildings in occupancy group J-3. ** (2) All mixing of mortar. ** (3) All other operations not designated for controlled inspection.
**Un-Reinforced Masonry	Placement and bedding of units and sizes of members including thickness of walls and wythes; sizes of columns; and provisions for curing and protection against freezing for all masonry construction proportioned on the basis of structural analysis as described in section four of reference standard RS 10-1A*, unless such operations are specifically not designated for controlled inspection.	<ol style="list-style-type: none"> ** (1) All masonry work for buildings in occupancy group J-3. ** (2) All mixing of mortar. ** (3) All other operations not designated for controlled inspection.
Piling	See provisions of subchapter eleven.	
Other	Requirements as may be established in other subchapters on this code.	

Notes for Table 10-2:

^aFor general provisions relating to inspection see section 27-132.

^bAll construction operations designated for controlled inspection shall be inspected by the architect or engineer designated for controlled inspection during the performance of such operation.

^cCertification by the fabricator or erector, as applicable, will be accepted as evidence of compliance with the provisions of this code for all construction operations not subject to controlled inspection.

^dBasic allowable stress values as referenced herein shall denote allowable stress value without increase for infrequent stress conditions as established in this code or in the applicable reference standard for the material or element in its proposed use.

* *"A" not enacted but probably intended*

** *Local Law 17-1995.*

*** *"are" enacted "is" probably intended.*

§[C26-1002.3] 27-598 Core tests of concrete construction.-

The adequacy of the concrete in a building may be ascertained by the recovery and testing of cores. Cores shall be taken and tested in accordance with the procedure described in reference standard RS 10-16. In lieu thereof, cores cast-in-place and originally cured with the parent concrete, or other device acceptable to the architect or engineer designated for controlled inspection and which will produce test specimens simulating the condition of the concrete in place including the size and proportions specified for core specimens may be utilized to demonstrate the adequacy of the concrete in place. The compressive strength so determined shall meet the requirements for strength tests as described in reference standard RS 10-3.

§[C26-1002.4] 27-599 Load tests. -

(a) Prequalifying load tests.- The provisions of this section shall apply only to load tests made for the purpose of establishing the structural adequacy of members or assemblies before such members or assemblies are incorporated into the work. Load tests for the purpose of establishing the strength of an element or assembly, in place, after construction, shall conform to the requirements of subdivision (b) of this section.

(1) TEST SPECIMENS. -The test specimens shall be a true representation of the units or assemblies to be used in the work and, unless sufficient tests are conducted on differing specimens to interpolate the performance of members of varying characteristics, test specimens shall be substantially identical with the units or assemblies to be used in service. Particular attention shall be given to matching the type and grade of material and, in the case of concrete, the mix, age, curing, and other pertinent variables.

(2) SUPPORT CONDITIONS AND INTERACTION.- Load tests shall be performed in such a manner that the supports for the members or assemblies being tested will simulate the conditions of support in the building, except that conditions of partial fixity may be approximated by condition of full or zero restraint, whichever produces a more severe stress condition in the member being tested. The test conditions shall be such as to obviate all interaction of fills, finishes, partitions, supports, or members whose interaction normally would be neglected in design. Where continuous, multiple, intersecting, or connected members are used in the test, all interacting members shall be simultaneously and fully loaded and additional tests shall be performed under the partial

loading conditions specified in subchapter nine of this chapter. Test specimens shall not be unloaded and reloaded or subjected to cyclical loading, except as specifically required by the provisions of this code and except that the adding of increments of additional load to a member already under load and the application of the test load as described in subparagraph (b) of paragraph three of this subdivision following removal of the test load described in subparagraph (a) of paragraph three of this subdivision will be permitted.

(3) STRENGTH REQUIREMENTS. -The member or assembly, supported as described in paragraph two of this subdivision, shall be capable of supporting:

- a. Without visible damage (other than hairline cracks) its own weight plus a test load equal to one hundred fifty percent of the design live load plus one hundred fifty percent of any dead load that will be added at the site; and
- b. Without collapse, its own weight plus a test load equal to fifty percent of its own weight plus two hundred fifty percent of the design live load plus two hundred fifty percent of any dead load that will be added at the site. The latter loading shall remain in place for a minimum period of one week. All loading conditions described in subchapter nine of this chapter shall be considered. The design live load shall be the nominal value reduced for contributory area as described in subchapter nine. Except as permitted under paragraph five of this subdivision, units to be tested shall be full size. Load bearing wall and partition assemblies shall be tested both with and without window and door framing where such framing will be included in the final assemblies.

Exception: If the load tests are conducted and the results promulgated in a manner that will permit clear differentiation between the dead and live load components added at the site, then the capacity of the member or assembly without visible damage other than hairline cracks as determined under load test condition in subparagraph a of paragraph three of this subdivision, may be reduced to the weight of the member, plus any dead load that will be added at the site, plus one hundred fifty percent of the design live load; and the capacity of the member or assembly to resist collapse as determined under load test condition in subparagraph b of paragraph three of this subdivision may be reduced to one hundred fifty percent of the weight of the member, plus one hundred fifty percent of any dead load that will

be added at the site, plus two hundred fifty percent of the design live load.

(4) **DEFLECTION REQUIREMENT.** -With the member or assembly supported as described in paragraph two of this subdivision, and after loading as required by the provisions of subparagraph a of paragraph three of this subdivision and the removal of said load, the percentage of recovery of the deflection caused by the superimposed load shall be at least seventy-five percent. The deflection under the design live load shall not exceed that permitted in this subchapter.

(5) **MODEL TESTS.** -Tests on models less than full size may be used to determine the relative intensity, direction, and distribution of stresses and applied loads, but shall not be considered as a proper method for evaluating stresses in, nor the strength of, individual members unless approved by the commissioner for this purpose. Where model analysis is proposed as a means of establishing the structural design, the following conditions shall be met:

a. Analysis shall be made by a firm or a corporation satisfactory to the commissioner.

b. The similitude, scaling, and validity of the analysis shall be attested to by an officer or principal of the firm or corporation making the analysis.

c. A report on the analysis shall be submitted showing test set-ups, equipment, and readings.

(b) Load tests of completed construction.- The provisions of this subdivision shall apply to any type of construction where the appropriate reference standard does not provide for load test of completed construction and the construction is questionable. When the appropriate reference standard provides for such load testing, the provisions of reference standard shall be used.

(1) **STRENGTH.** -The construction shall be loaded in two stages:

(a) With all dead load to which it will be subjected in service plus a superimposed load equal to the design live load reduced as described in subchapter nine of this chapter; and

(b) With a total load, including its own weight, equal to one hundred fifty percent of the total dead load to be supported in service plus one hundred eighty percent of the design live load, reduced for contributory area as described in subchapter nine of this chapter, which load shall remain in place for a minimum period of twenty-four hours.

(2) **DEFLECTION REQUIREMENT.** -Under the first stage loading, the deflection shall not exceed that permitted in the applicable reference standard. The residual deflection after removal of the second stage loading shall not exceed twenty-five percent of the calculated elastic deflection under the superimposed test load. The structure, after recovery of the deflection shall not show any evidence of serious distress.

(3) **INTERACTION.**- The load area shall extend to include the loading of all framing and elements that contribute to the strength of the element or elements under test, by way of interaction.

(4) **LATERAL LOADS.**- Where the elements in question must resist lateral loads in service, such loads shall be simulated in the tests. In such case, the magnitude of the applied live load and lateral load components of the test load may be adjusted as described in section 27-594 of article two of this subchapter, provided that the stress condition under the load increments described in paragraph one of this subdivision is not more critical.

(5) **RELOADING.** -Unloading and reloading or cyclical loading of test areas will not be permitted, except for the addition of increments of additional load to a member already under load.

[(6) **LIMITATION ON USE OF LOAD TESTS OF CONCRETE STRUCTURES.** -Where the strength tests of the concrete (as defined in reference standard RS 10-3) that initiate the requirement for load tests show strengths less than 2/3 of the strength required by the design of the specific element, the use of load tests to show the adequacy of the structure will not be permitted.]*

**Copy in brackets not enacted but probably intended.*

ARTICLE 4 MASONRY

§[C26-1003.1] **27-600 General requirements.** -

(a) Unreinforced masonry. - Materials, design, and construction of unreinforced masonry shall meet the requirements of reference standard RS 10-1.

(b) Reinforced masonry. - Materials, design, and construction of reinforced masonry shall meet the requirements of reference standard RS 10-2.

§[C26-1003.2] **27-601 Identification.** -

(a) Masonry units. -Masonry units shall be clearly identified to show the grade of the unit and the compressive strength where called for on the plans.

(b) Metal reinforcement.- Reinforcing bars shall be rolled so as to identify the grade of steel and the size. Bundles and rolls of cold-drawn steel wire or welded wire fabric shall be tagged so as to identify the type and grade of steel and the size.

§[C26-1003.3] **27-602 Inspection.** -The inspection of masonry and masonry construction shall conform to the requirements of tables 10-1 and 10-2.

ARTICLE 5 CONCRETE

*§[C26-1004.1] **27-603 General requirements.** -

Concrete materials, design, construction, quality, inspection and testing shall meet the requirements of reference standard RS 10-3. Precast concrete construction utilizing a thin skin or slab stiffened or supported by a system of ribs shall conform to the requirements of reference standard RS 10-4.

**Local Law 65-1990.*

§[C26-1004.2] **27-604 Identification of metal-reinforcement.**-

Reinforcing bars shall be rolled so as to identify type and grade of steel, and size. Bundles and rolls of wire,

strands, or welded wire fabric shall be tagged so as to identify the type and grade of steel and the size.

*§[C26-1004.3] 27-605 Mixes.- Concrete may be proportioned, batched, and mixed by any of the following methods:

*Local Law 65-1990.

(a) Method I. -Mixes with Minimum Cement Content. -

(1) MINIMUM CEMENT CONTENT. -The cement content used in the work shall not be less than the content given in table 10-3 for the corresponding strength of concrete.

(2) WATER-CEMENT OR STRENGTH-CEMENT RATIO.- Normal weight concrete proportioned on the basis of preliminary tests shall be produced by using a water-cement ratio corresponding to a point on a strength-cement or water-cement ratio curve. Proportioning of lightweight and heavyweight concrete, and concrete using an aggregate other than natural sand, gravel or stone shall be by using a strength-cement content curve. The point on the respective curves shall represent a strength of concrete at the slump and age called for on the plans at least twenty-five percent higher than the specified strength, f_c . The cement content shall not be less than the content shown in table 10-3.

(3) PRELIMINARY TESTS. -Preliminary tests of concrete shall be made in advance of any concreting operation by a licensed concrete testing laboratory acceptable to the architect or engineer of record. Preliminary tests shall consist of compression strength tests of molded concrete cylinders made in accordance with reference standards RS 10-17 and RS 10-21. A curve representing the relation between the average strength of the concrete at twenty-eight days, or at any other specified age filed with the department, and the strength-cement ratio or the water-cement ratio shall be established for the range of strength values at the slump required for the work. The tests shall include at least four mixes with different strength-cement ratios or four mixes with different water-cement ratios and at least four cylinder specimens for each mix. The cylinder strength tests shall be supplemented by tests to confirm that the cement and aggregates conform to the provisions of reference standard RS 10-3.

(4) PREVIOUSLY ACCEPTED MIXES. -In lieu of the requirements of paragraph three of this subdivision, the architect or engineer designated for controlled inspection may permit the use of mix proportions of aggregates having the same specific gravity, size and gradation; cements of the same type and batch weight; admixtures of the same type and quantity; and other ingredients the same as or equal to those that have been previously submitted with applicable preliminary tests which complied with paragraphs one and two of this subdivision, and which have been accepted by the commissioner within the past year. If any of the mix proportions or ingredients are changed, a separate submission for acceptance shall be required.

(5) QUALITY CONTROL AND INSPECTION OF MATERIALS AND OF BATCHING. -Where concrete materials are used for structural elements defined in section 27-585 of article one of this subchapter, quality control and inspection shall be provided at the batch plant by a licensed concrete testing laboratory under the

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supervision of the architect or engineer designated for controlled inspection, in accordance with the requirements of table 10-1 and in sufficient scope to:

a. Determine and record the actual batched weights of the ingredients and the volume of water charged into the mixer;

b. Verify that such weights conform to the weights and proportions required by the preliminary test mix, adjusted for moisture content, fineness modulus and gradation of aggregates;

c. Verify conformance of the quality and condition of the materials to reference standard RS 10-3;

d. Verify that the aggregates have the same specific gravity, size and gradation; the cement is the same type and batch weight, the admixtures are the same type and quantity; and that any other ingredients are the same as or equal to those used for the preparation of the preliminary test mixes;

e. For all concrete, whether or not designated for controlled inspection, attestation of the results of quality control and inspection at the batch plant shall appear on a ticket accompanying each load of concrete. The attestation for subparagraphs a, b, c and d of this paragraph shall be executed by the licensed concrete testing laboratory.

f. The licensed concrete testing laboratory shall also attest that the slump entrained air content and unit weight of the fresh concrete, as discharged from the mixer at the job site, were tested in accordance with reference standards RS 10-49, RS 10-51, RS 10-52, RS 10-61, RS 10-62, RS 10-63 and RS 10-64, and that all were in compliance with the accepted mix design.

(b) Method II. -Proportioning on the basis of field experience. -

(1) PROPORTIONING.- For the computation of the standard deviation in accordance with reference standard RS 10-14, mixes with test data from previous projects, similarly proportioned in accordance with the provisions of subdivision (a) of this section, and having materials of similar density and admixtures and having a slump equal to or greater than that at which the concrete is to be placed shall be used. Such mixes may be accepted subject to the approval of the architect or engineer designated for controlled inspection.

(2) STRENGTH. -The required average strength, f_{cr} , to be used as the basis for the selection of mix proportions, shall in no case be less than fifteen percent higher than the specified strength called for on the plans.

***As enacted but " f_c " probably intended.*

(3) BATCHING. -The concrete shall be produced either in the concrete production facility used to produce the concrete from which the tests were made to develop the field experience data referred to in paragraph one of this subdivision or, subject to the approval of the architect or engineer designated for controlled inspection, in any concrete production facility that has data showing a record of standard deviation equal to or less than that of the original facility. All concrete proportioned according to field experience shall be produced in a plant with automatic recording equipment for all ingredients.

(4) QUALITY CONTROL AND INSPECTION OF MATERIALS AND OF BATCHING. - When the concrete is batched in a plant where automatic recording

equipment documents the batched weights or volumes of cement, aggregates, admixtures and water, no inspection of the materials or of the batching, nor any attestation by a licensed concrete testing laboratory responsible to the architect or engineer designated for controlled inspection, shall be required. A concrete producer shall:

- a. Verify that such weights conform to the required weights and proportions, and to the strength-cement ratio or water-cement ratio required by the proportioning established pursuant to paragraph one of this subdivision, adjusted for moisture content, fineness modules and gradation of aggregates.
- b. Verify conformance of the quality and condition of the materials to reference standard RS 10-3.
- c. Attest, on a ticket accompanying each load, to the specified strength of the concrete, the actual weights or volume of the ingredients, and the weight or volume of water charged into the mixer at the batch plant or to be added at the job site. A statement that subparagraph b of this paragraph has been complied with shall also be included.
- d. If at any time the automatic recording equipment becomes inoperative, the concrete production facility may be permitted, but only with the approval of the architect or engineer designated for controlled inspection, to batch and mix concrete for a period not to exceed three consecutive working days. During such a period, the concrete production facility shall engage a concrete batch plant inspector from a licensed concrete testing laboratory to observe and record the actual weights of the cement, aggregates, admixtures and other ingredients, and the weight or volume of water charged into the mixers. If the automatic recording equipment is inoperative for a period longer than three consecutive working days the concrete production facility shall not batch or mix concrete and the architect or engineer designated for controlled inspection shall notify the commissioner in writing that such equipment is inoperative.

***TABLE 10-3 MINIMUM CEMENT CONTENT**

Specified Compressive Strength in 28 Days (f'c)-psi	Minimum Pounds of Cement Per Cubic Yard of Concrete (all aggregates)
3,000	540
3,500	610
4,000	660
5,000	800
Over 5,000	Permitted only by reference standard RS 10-3
6,000 and over	Permitted only by reference standard RS 10-3 "Special Requirements for High Strength Concrete."

NOTE: Minimum pounds of cement may be reduced up to 8 percent by the addition of an accepted admixture.

**Local Law 65-1990.*

(c) Method III. -Average concrete. -

(1) in lieu of making preliminary tests, average concrete limited to the concrete strengths shown in table 10-3A

below may be used, and the cement content shall not be less than the value given in table 10-3A for the corresponding specified compressive strengths, nor shall the total volume of water (moisture plus added water) exceed that specified therein, provided that the total yardage placed does not exceed fifty cubic yards and the levels of calculated stress do not exceed seventy percent of the basic allowable stresses.

***TABLE 10-3A**

Specified compressive strength in twenty-eight days (f'c) pounds per square inch	Minimum pounds of cement per cubic yard of concrete	Maximum permissible total volume of water, U.S. gallons per cubic yard of concrete
2000	520	40
2500	560	41
3000	610	42

**Local Law 65-1990.*

(2) Each load of concrete shall be certified by the producer to the owner, whether produced at a ready mixed plant or site mixed, as to the total quantity of concrete, concrete strength and actual quantities per cubic yard of each material, including water, contained therein. A copy of such certificate shall be available to the department during the progress of the work and for two years thereafter.

***§[C26-1004.4] 27-606 Documentation.-** All mix proportions and supporting data shall be submitted for acceptance to the commissioner or to the architect or engineer designated for controlled inspection, as required, prior to the start of any work. All required attestations shall become a part of the documentation to be filed with the commissioner, and shall be subject to verification by strength tests, as hereinafter described, by check sampling of ingredients, or by such other inspections as the commissioner or the architect or engineer designated for controlled inspection may elect. Copies of all documentation filed with the commissioner, all the licensed concrete testing laboratory test data and required attestations, together with the tapes recording the batch weight where automatic recording equipment is used shall be available for inspection for a period of two years after the completion of the project. Such records shall be maintained by the architect or engineer designated for controlled inspection.

**Local Law 65-1990.*

***§[C26-1004.5] 27-607 Inspections. -** Inspection of concrete and concrete construction shall conform to the requirements of tables 10-1 and 10-2 and the provisions of this subchapter.

(a) Controlled inspection. - Controlled inspection of concrete construction shall include:

(1) STRENGTH TESTS. - Strength tests shall be performed on all structural concrete. The provisions of reference standard RS 10-3 shall apply. A licensed concrete testing laboratory shall, in compliance with reference standards RS 10-17, RS 10-51 and RS 10-52, sample the concrete, make and cure the test specimens at the job site, transport the specimens to the laboratory and test the specimens for compressive strength. Written reports of the results shall be furnished to the architect or engineer designated for controlled inspection and to the concrete producer immediately, but not more than five days following the conclusion of the compression strength tests. Test specimens shall be stored on the job site in an insulated curing box of sufficient size and strength to contain all the specimens made in any four consecutive working days and to protect the specimens from falling over, being jarred or otherwise disturbed during the period of initial curing. The box shall be erected, furnished and maintained by the concrete contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by reference standard RS 10-52. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Specimens shall remain undisturbed in the curing box until ready for delivery to the testing laboratory but not less than sixteen hours. Specimens delivered to the laboratory prior to an age of forty-eight hours shall not be demolded prior to delivery. All specimens shall be carefully removed from the box and transported to the laboratory by the licensed concrete testing laboratory in accordance with the provisions of reference standard RS 10-52. All specimens shall be delivered to the laboratory before the laboratory closes at the end of the second working day following the day the specimens were molded. The date of arrival at the laboratory shall be recorded on the specimen test reports. All concrete failing to meet the specified minimum strength requirements shall be rejected by the architect or engineer designated for controlled inspection pending verification of the adequacy of the construction as described in section 27-598 of article three of this subchapter.

(2) ADDITIONAL TESTS. -Each sample of fresh concrete made in accordance with reference standard RS 10-51 for the purpose of molding strength test specimens shall be made under the supervision of the architect or engineer designated for controlled inspection. Each sample shall be tested by the licensed concrete testing laboratory to determine its slump in accordance with reference standard RS 10-49, its entrained air content in accordance with reference standards RS 10-61 and RS 10-62, its unit weight in accordance with reference standards RS 10-63 and RS 10-64 and its temperature. If any of the tests fail to meet the specified requirements, the concrete shall be sampled again and the particular test that failed

shall be repeated. If the second test fails to meet the specified requirements, then, with the approval of the architect or engineer designated for controlled inspection, adjustments shall be made to the concrete in the mixer to correct the deficiency. Test specimens shall not be molded from any sample that did not meet the specified requirements nor shall the concrete from which the sample was taken be placed in the structure, provided, however, that such concrete may be used elsewhere in the work where it meets or exceeds the specified requirements, but only with the approval of the architect or engineer designated for controlled inspection. In such case, test specimens shall be molded by the licensed concrete testing laboratory, which shall also record the precise location where the concrete was placed in the structure.

(3) CONTROLLED INSPECTION LOG BOOK. - A controlled inspection log book, limited solely to the concrete construction work, readily available to inspectors and representatives of the department, concrete suppliers and the architect and/or engineer of record, shall be maintained at the job site by the architect or engineer designated for controlled inspection, who shall make therein daily entries pertaining to the progress of the work. The entries shall describe, but not be limited to, the location, size and dimensions of the concrete members for which forms were constructed that day; the reinforcement installed in, and the specific locations and time spans of, every concrete placement; the air temperature, wind velocity and direction and other weather conditions during the twenty-four hours after concrete has been placed, specifically at 8 a.m., noon and four p.m., the protections taken against excessive temperatures and adverse weather conditions at each placement made that day; the method used, to cure the concrete and the period during which such methods were maintained; the actual hour when forms were stripped and shores were reinstalled and tensioning was applied to all prestressed members. The log shall become a part of the documentation to be filed with the commissioner as provided in section 27-606 and shall include the attestation of the architect or engineer designated for controlled inspection that the concrete construction work complies with the approved plans and the provisions of this code.

(b) **Other required inspection.** -Quality control or inspection shall be provided with respect to all operations of mixing and placing concrete and reinforcement that are not designated for controlled inspection. In the case of sidewalks, curbs, paving, slabs-on-grade and any work designated in table 10-1 under the caption "Elements That Are Not Subject To Controlled Inspection" or in table 10-2 under the caption "Operations on Structural Elements That Are Not Subject to Controlled Inspection," all inspections shall be subject to and in accordance with the requirements of subdivision (b) of section 27-132. If any test to determine the quality or compressive strength of the concrete is required, the fresh concrete shall be sampled and tested for slump, entrained air content, unit

weight and temperature. Compression strength test specimens shall be molded only by a licensed concrete testing laboratory or by a person certified by the American Concrete Institute as qualified to perform such function. Attestation shall be executed by the person superintending the use of the material in accordance with the requirements of subdivision (b) of section 27-132 of article seven of subchapter one of this chapter.

**Local Law 65-1990.*

***§[C26-1004.6] 27-608 Admixtures.** -Admixtures may be used in the concrete only where included in the preliminary test mixes made in accordance with paragraph three of subdivision (a) of section 27-605 or mixes proportioned in accordance with the provisions of reference standard RS 10-3. In the case of mixes proportioned in accordance with subdivision (c) of section 27-605, there shall be no reduction of the cement content called for in table 10-3A because admixtures are used in the mix. Where admixtures are used, the provisions of reference standards RS 10-3 and RS 10-44 shall apply. In addition, no anti-freeze agents shall be used. Admixtures shall be added in measured quantities in conformance with the accepted mix design.

**Local Law 65-1990.*

***§[C26-1004.7] 27-609 Licensed concrete testing laboratories.** -All strength tests of concrete and testing of concrete materials required by the provisions of this section shall be performed by concrete testing laboratories licensed in accordance with the requirements of article nine of subchapter two of chapter one of title twenty-six of the administrative code and rules promulgated by the commissioner. The licensed concrete testing laboratory shall, among other things, analyze, evaluate and test concrete materials; determine whether the materials comply with specifications and pertinent referenced national standards in reference standard RS 10-3; select mix proportions for preliminary tests; recommend the mix proportions to be used on the project for which the tests were made; analyze data from previous projects and compute the standard deviation; and recommend the mix proportions to be used based on such field experience data. At the batch plant or at the job site, the licensed concrete testing laboratory shall, among other things, sample concrete and test for slump, entrained air content, unit weight and temperature, mold compression test specimens; store and cure such specimens on the job site; remove, transport and deliver such specimens to the laboratory; demold, store, cure, cap and test such specimens at the laboratory and furnish written reports of the results of all tests of the materials and concrete to the architect or engineer designated for controlled inspection and to the concrete producer. When tests of the hardened concrete are required, they shall be made by the licensed concrete testing laboratory in accordance with reference standard RS 10-3 and the national

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standards for making tests for penetration resistance, rebound number, pullout strength and of drilled cores. The architect or engineer designated for controlled inspection is authorized either to dismiss or to employ a particular licensed concrete testing laboratory at any time during the progress of the work.

**Local Law 65-1990.*

§[C26-1004.8] 27-610 Short-span concrete floor and roof construction supported on steel beams. -In lieu of analysis, the following empirical procedures may be used for the design of short-span concrete floor and roof slabs containing draped reinforcement and supported on steel beams. The empirical equations described in subdivisions (c) and (d) of this section shall apply only where the steel beams are placed, or are encased, in a manner that will provide section for the transfer of shear from slabs to beams equivalent to, or in excess of, the slab thickness required by said equations.

(a) Concrete. -The concrete shall have a minimum compressive strength at twenty-eight days of seven hundred psi.

(b) Reinforcement. -Reinforcement shall consist of steel fabric, rods, or other suitable shapes that shall be continuous or successively lapped to function as a continuous sheet. The main reinforcement shall be at least 0.15% of the gross cross section where continuous steel fabric is used and at least 0.25% of the gross cross section where other forms of steel reinforcement are used. All reinforcing shall be draped, with the center of the reinforcement at the center of the span one inch above the bottom of the slab and the center of reinforcement over the support one inch below the top of the slab.

(c) Minimum slab thickness. -The minimum total thickness of concrete floor and roof construction shall be determined by the following formula, but shall not be less than four inches:

$$t = \left| \frac{L}{2} \right| + \left| \frac{w-75}{200} \right|$$

where: t = total thickness (in.)

L = clear span between steel flanges (ft.)

w = gross uniform load (dead load plus reduced live load) (psf).

(d) Allowable load. -The allowable load shall be determined by the following formula:

$$w = \frac{3CA_s}{L^2}$$

where: w = gross uniform load (psf)

A_s = cross sectional area of main reinforcement (sq. in. per ft. of slab width)

L = clear span between steel flanges in feet. (L shall not exceed ten feet in any case, and when the gross floor load exceeds two hundred psi shall not exceed eight feet)

C = the following coefficient for steel having an ultimate strength of at least fifty-five thousand psi;

1. For lightweight aggregate concrete:
 - a. twenty thousand when reinforcement is continuous.
 - b. fourteen thousand when reinforcement is hooked or attached to one or both supports.
 2. For stone concrete:
 - a. twenty-three thousand when reinforcement is continuous.
 - b. fifteen thousand when reinforcement is hooked or attached to one or both supports.
- (1) When the above formula is used the reinforcement shall be hooked or attached to one or both supports or be continuous.
- (2) If steel of an ultimate strength in excess of fifty-five thousand psi is used, the above coefficient may be increased in the ratio of the ultimate strength to fifty-five thousand but at most by thirty percent.
- (e) Openings in floors and roofs.** -Openings more than one foot six inches on a side shall be framed. All areas encompassing multiple openings aggregating more than one foot six inches in any ten foot width or span of floor or roof slab shall be framed.

§[C26-1004.9] 27-611 Pneumatically placed concrete.- Construction methods shall conform to the applicable provisions and recommendations of reference standard RS 10-15.

***§27-611.1 Conveying concrete by pumping methods.**- All classes and strengths of concrete may be conveyed by pumping methods. All materials and methods used shall conform to the rules promulgated by the commissioner for conveying concrete by pumping methods.
**Local Law 65-1990.*

§[C26-1004.10] 27-612 Formwork, slip form construction, lift method construction, precast and prestressed construction.- The provisions of subchapter nineteen of this chapter shall apply.
**Local Law 65-1990.*

§[C26-1004.11] 27-613 Concrete utilizing preplaced aggregate. -The use of concrete formed by the injection of grout into a mass of preplaced coarse aggregate will be permitted where it can be demonstrated by successful prototype installation that the proposed mix, materials, and method of placement will produce a concrete of the specified strength and free of areas or inclusions of uncemented aggregate.

(a) Prototypes. -At least two prototypes, from either previous work or samples prepared for the proposed project shall be prepared. The forms shall be stripped, and a minimum of six cores recovered and tested to demonstrate the strength of the concrete produced by the proposed materials and methods of installation. In addition, the homogeneity of the prototypes shall be demonstrated by demolishing the prototypes.

(b) In-place concrete. -The concrete, as finally placed in the work, shall be prepared using the same materials, mix, equipment, and procedures utilized to prepare the successful prototype installations.

***(c) Inspection.** -All preparation and placement of structural concrete utilizing preplaced aggregates shall be subject to controlled inspection. Compression test specimens shall be prepared and tested as required for premixed concrete, except that the specimens shall be prepared under conditions that will simulate the conditions under which the concrete in the work is installed.
**Local Law 65-1990.*

***§27-613.1 Precast and prestressed concrete.** - The provisions of reference standard RS 10-3 shall apply.
**Local Law 65-1990.*

***§27-613.2 Thin-section precast concrete construction.**- The provisions of reference standard RS 10-4 shall apply.
**Local Law 65-1990.*

ARTICLE 6 STEEL

§[C26-1005.1] 27-614 General requirements. - Materials, design, and construction methods shall meet the requirements of the following reference standards:
(a) Structural steel. -Reference standard RS 10-5.
(b) Light *gauge cold formed steel.** - Reference standard RS 10-6.
****(c) Open web steel joists.**- Reference standard RS 10-7. The commissioner shall amend RS 10-7 to establish minimum acceptable fireproofing methods for open web steel joists and to redefine the limitations or restrictions on the buildings or occupancies in which the use of open web steel joists shall be permitted.
***Local Law 26-2004.*
**** As enacted but "gage" probably intended.*

§[C26-1005.2] 27-615 Identification. -Structural steel that is required to have a minimum yield point greater than thirty-six thousand psi shall at all times in the fabricator's plant, be marked, segregated, or otherwise handled so that the separate alloys and tempers are positively identified, and after completion of fabrication, shall be marked to identify the alloy and temper. Such markings shall be affixed to completed members and assemblies or to boxed or bundled shipments of multiple units prior to shipment from the fabricator's plant. Open web steel joists shall have identification affixed to each bundle or lift showing size and type.

§[C26-1005.3] 27-616 Quality control. -
(a) Reference.- The provisions of tables 10-1 and 10-2 shall apply.
(b) Welding operations. -
(1) Welding work shall be performed only by persons who have obtained a license from the commissioner.
(2) Where manual welding work is not performed in the city of New York, welds shall be made by welders qualified under the provisions of appendix D, parts II and III, of the AWS code for welding in building construction. Qualification with any of the steels permitted by the AWS code shall be considered as qualification to weld any of the other steels permitted by the code.

(3) Tack welds, which are later incorporated into finished welds carrying calculated stress, shall not be considered as structural welds.

(4) The inspection of welding operations stipulated in table 10-2 shall include a check to ascertain that the welders employed on the work have the required license or who are qualified in accordance with paragraph two of this subdivision.

ARTICLE 7 WOOD

§[C26-1006.1] 27-617 General Requirements. -

Materials (other than non-stress grade lumber), design, and construction methods shall meet the requirements of the following reference standards:

(a) **Lumber and timber.** -Reference standard RS 10-8.

(b) **Plywood.** -Reference standard RS 10-9.

(c) **Structural glued-laminated lumber.** -Reference standard RS 10-18.

§[C26-1006.2] 27-618 Identification.-

Except as provided for in subdivisions (a) and (c) of this section, all wood used for structural elements shall be identified as to grade and shall bear an identifying mark of an approved bureau or agency performing the grading, or the official grade mark and trade mark of the bureau or association under whose rules the wood was graded, in accordance with the following:

(a) **Lumber and timber.** -All lumber and timber, including non-stress grade lumber, shall be identified by the grade mark of a lumber grading or inspection bureau or agency approved by the commissioner, except that pre-cut material and rough-sawn lumber may be covered by a certificate of inspection issued by a lumber grading or inspection agency approved by the commissioner in lieu of grade marking.

(b) **Plywood.** -Plywood used structurally shall bear identification as to grade, type, and species group, or identification index. Such identification shall be affixed by and identified by the trademarks of a testing and grading agency approved by the commissioner.

(c) **Glued-laminated.** -Glued-laminated structural members shall bear identification and/or shall be accompanied by certification in accordance with the provisions of reference standard RS 10-18.

(d) **Resawn lumber.** -Resawn (or reused) lumber shall be marked in accordance with its regraded status.

§[C26-1006.3] 27-619 Use of non-stress grade wood.-

The use of non-stress grade wood in structural elements shall be limited to the following conditions:

(a) Studs, joists, and rafters proportioned on the basis of the empirical provisions of section 27-622 of this article.

(b) The architect or engineer responsible for the design may assign an allowable stress value for the proposed material based on the provisions of reference standard RS 10-8 relating to "other species and grade." Under

such condition, the required species and grade of wood, together with the assigned stress value, shall be conspicuously indicated on the plans.

§[C26-1006.4] 27-620 **Quality control.** -Inspection of the fabrication of glued-laminated assemblies, as stipulated in table 10-2, shall include a check of sizes of members, of fit, and of gluing operations.

§[C26-1006.5] 27-621 General construction requirements.-

The provisions of this section shall be considered as supplemental to the provisions of the applicable reference standards.

(a) **Firecutting.** -The ends of wood beams, joists, and rafters resting on masonry or concrete walls shall be firecut to a bevel of three inches in their depth.

(b) **Protection of members.** -

(1) Positive drainage shall be provided for all areas under the building not occupied by basements or cellars.

(2) All loose wood and debris and all wood forms shall be removed from spaces under the building. All stumps and roots shall be grubbed to a minimum depth of twelve inches.

(3) Wood members embedded in the ground and used for the support of buildings shall be treated.

(4) Wood joists or wood structural floors closer than eighteen inches, wood girders closer than twelve inches, or sills closer than eight inches to an exposed ground surface within or without the building shall be treated or shall be of an equivalent resistant species.

(5) Sleepers, sills, columns, and posts supported on concrete or masonry piers shall be treated or shall be of an equivalent resistant species unless isolated from the ground as specified in paragraph four of this subdivision or by a concrete slab. Where the isolation consists of a concrete slab-on-grade, the sleepers, sills, columns, or posts shall be raised at least three inches above the top of such slab.

(6) Ends of wood girders entering masonry or concrete walls shall be provided with a minimum one-half inch air space on top, sides, and at the end, unless the girder is treated or is of an equivalent resistant species.

(7) Wood or plywood used as siding or a combination of siding and sheathing shall be isolated from exposed ground by at least six inches.

(8) Crawl spaces shall be ventilated as required in subchapter twelve of this chapter.

(9) Where treated timber is required, the preservative treatment shall comply with reference standards RS 10-20 and RS 10-22. Treatment of wood poles shall comply with reference standard RS 10-28. All treated wood shall be handled in accordance with the provisions of reference standard RS 10-29.

§[C26-1006.6] 27-622 Empirical provisions in lieu of design. -

The provisions of this section may be used in lieu of structural analysis only for those buildings in

occupancy group J-3 where the specific occupancies correspond to a live load requirement of forty psf, or less, and to constructions wherein the supporting framing consists of multiple, closely spaced members, such as joists, studs, platform or balloon frames. All wood structural members in other classes of construction shall be proportioned on the basis of the analysis of stresses. All requirements established in this section may be reduced when an analysis of stresses, executed in accordance with reference standard RS 10-8, indicates such reduction is feasible. Sizes of wood members stated in this section are nominal sizes.

(a) Stud walls and partitions. -

- (1) Studs shall be of equivalent or better grade than the minimum grades for the various species as established in reference standard RS 10-13.
- (2) Corner posts shall be 3-stud members or members of equivalent strength.
- (3) Load bearing studs shall be set with the larger cross section dimension perpendicular to the wall or partition. Studs in exterior walls of one story buildings of construction class II-D and II-E shall be at least two inches by three inches spaced not more than sixteen inches on center, or where studs are two inches by four inches, spaced not more than twenty-four inches on center. Studs for other classes of construction shall be at least two inches by four inches spaced not more than sixteen inches on center.
- (4) Stud walls resting on concrete or masonry shall have sills at least two inches in nominal thickness. Where such sills bear on concrete, they shall be fastened with minimum one-half inch bolts embedded at least six inches. Each sill piece shall have at least two anchor bolts, with one bolt located at least one inch from each end of the plate, and with intermediate spacing not more than eight feet. Where such sills bear on masonry, they shall be anchored in accordance with the applicable provisions of reference standard RS 10-1.
- (5) Stud partitions that rest directly over each other and are not parallel to floor joists or beams may extend down between the joists and rest on the top plate of the partition, partition girder, or foundation below, or may be constructed on sill plates running on top of the beams or joists.
- (6) All load bearing stud partitions shall be supported on walls, other partitions, double joists or beams, solid bridging, or on beams at least as wide as the studs. Joists supporting a partition parallel to the joists wherein the joists are spaced apart to permit the passage of piping or duct work shall be provided with solid blocking at intervals of not more than sixteen inches.
- (7) Load bearing partitions perpendicular to joists shall not be offset from supporting girders, walls, or partitions by more than the depth of the joists unless the joists are proportioned on the basis of analysis of stress.
- (8) In interior walls and in bearing partitions, double studs shall be provided at the sides of openings that are

greater than three feet six inches up to six feet in width, and triple-studs shall be provided at the sides of openings of greater width.

(9) Headers shall be provided over each opening in exterior walls and bearing partitions. Where the opening does not exceed three feet, each end of the header shall be supported on a stud or framing anchor. Where the opening exceeds three feet in width each end of the header shall be supported on one stud and where the opening exceeds six feet each end shall be supported on two studs.

(10) All studs in exterior walls and in bearing partitions shall be capped with double top plates installed to provide overlapping at corners and at intersections with other walls and bearing partitions. End joists in double top plates shall be offset at least twenty-four inches. In lieu of double top plates, a continuous header of similar dimensions may be used. For platform frame construction, studs shall rest on a single bottom plate.

(b) Bracing of exterior walls. -Exterior stud walls shall be braced by one inch by four inch continuous diagonal strips let into the face of the studs and into the top and bottom plates at each corner of the building. Bracing may also be provided by one of the following means:

- (1) Wood board sheathing of one inch nominal thickness, applied diagonally.
 - (2) For one and two-story dwellings, plywood sheathing at least four feet by eight feet (except where cut to fit around openings and for similar purposes) and at least five-sixteenths of an inch thick on studs spaced sixteen inches or less on centers and at least three-eighths of an inch thick on studs spaced more than sixteen inches but not exceeding twenty-four inches on centers.
 - (3) For one story dwellings and for the upper story of two story dwellings, fiberboard sheathing applied vertically in panels at least four feet by eight feet (except where cut to fit around openings and for similar purposes). Fiberboard sheathing shall be at least one-half inch thick and shall conform to the provisions of reference standard RS 10-27.
 - (4) For one story dwellings and for the upper story of two story dwellings, gypsum board sheathing applied horizontally in panels at least two feet by eight feet (except where cut to fit around openings and for similar purposes). Gypsum boards shall be at least one-half inch thick and shall conform to the provisions of reference standard RS 10-19.
- (c) Floor and roof framing. -**
- (1) SPAN TABLES. -Joists and rafters may be used in accordance with reference standard RS 10-13.
 - (2) BRIDGING. -In all floor and roof and roof framing, there shall be at least one line of bridging for each eight feet of span. The bridging shall consist of at least one inch by three inch lumber or equivalent metal bracing. A line of bridging or solid blocking shall also be required at supports unless lateral support is provided by nailing to a beam, header, or to the studs. Midspan

bridging is not required for floor or roof framing in one- and two-family dwellings where joist depth does not exceed twelve inches. Bridging shall bear securely against and be anchored to the members to be braced.

(3) NOTCHES. -Notches in the ends of joists and rafters shall not exceed one-fourth the depth unless adequate reinforcement is provided or analysis of stresses indicates that larger openings are feasible without the necessity for reinforcement. Notches in joists or rafters, located in the span shall not exceed one-sixth the depth and shall not be located in the middle third of the span. Bored holes shall not be within two inches of the top or bottom of the joists or rafter and the diameter of any such hole shall not exceed one-third the depth. For stair stringers, the minimum effective depth of the wood at any notch shall be three and one-half inches unless the stringer is continuously supported on a wall or partition.

(4) SUPPORT. -

- a. Floor or roof framing may be supported on stud partitions.
- b. Tail beams over twelve feet long and all header and trimmer beams over six feet long shall be hung in metal stirrups having anchors, or by other methods providing adequate support. Trimmers and headers shall be doubled where the header is four feet or more in length.
- c. Except where supported on a one inch by four inch ribbon strip and nailed to the adjoining stud, the ends of floor joists shall have at least one and one-half inches of bearing on wood or metal, nor less than four inches on masonry.
- d. Joists framing from opposite sides of and supported on a beam, girder, or partition shall be lapped at least four inches and fastened, butted end-to-end and tied by metal straps or dogs, or otherwise tied together in a manner providing adequate support.
- e. Joists framing into the side of a wood girder shall be supported by framing anchors, on ledger strips at least two inches by two inches, or by equivalent methods.
- f. Wood joists and rafters bearing on masonry walls shall be anchored to such walls in accordance with the applicable provisions of reference standard RS 10-1.

(5) RAFTERS AND CEILING JOISTS. -

- a. Where rafters meet to form a ridge, they shall be placed directly opposite each other and nailed to a ridge board at least one inch thick, and not less than the cut end of the rafters in depth.
- b. Provisions shall be made to resist the thrust from inclined rafters by connection of collar beams at least one inch by six inches, by connection to joists, or by equivalent means.
- c. Where ceiling joists are not parallel to rafters, subflooring or metal straps attached to the ends of the rafters shall be installed in a manner to provide a continuous tie across the building.

d. Ceiling joists shall be continuous, or where they meet over interior partitions, shall be securely joined to provide a continuous tie across the building.

e. Valley rafters shall be double members. Hip rafters may be single members. Valley and hip rafters shall be two inches deeper than jack rafters.

f. Trussed rafters shall be designed in accordance with the provisions of reference standard RS 10-8.

(6) Built-up members shall be securely spiked or bolted together and provision shall be made to resist the horizontal shear between laminations.

(d) Nailing schedule. -The size and number of nails for connections shall be in accordance with table 10-4.

§[C26-1006.7] 27-623 Heavy timber construction (construction class II-A). -

(a) Minimum sizes of members. -To conform to the fire resistance rating requirements for heavy timber construction (construction class II-A), members shall be solid sawn or solid glue-laminated and of the following minimum dimensions: (Sizes of wood members indicated in this section are nominal sizes).

(1) COLUMNS, FRAMES AND ARCHES. -

- a. Columns shall be at least eight inches in all dimensions when supporting floor loads, and at least six inches wide and eight inches deep when supporting roof and ceiling loads only.
- b. Beams and girders shall be at least six inches wide and ten inches deep.
- c. Frames or arches that spring from grade or the floor line and support floor loads shall be at least eight inches in all dimensions.
- d. Timber trusses supporting floor loads shall have members at least eight inches in all dimensions.
- e. Frames or arches for roof construction that spring from grade or the floor line and do not support floor loads shall have members at least six inches wide and eight inches deep for the lower half of the height, and at least six inches deep for the upper half.
- f. Frames or arches for roof construction that spring from the top of walls or wall abutments, framed timber trusses, and other roof framing, which do not support floor loads, shall have members at least four inches wide and six inches deep. Spaced members may be composed of two or more pieces at least three inches thick when blocked solidly through their intervening spaces or when such spaces are tightly closed by a continuous wood cover plate at least two inches thick secured to the underside of the members. Splice plates shall be at least three inches thick. When protected by approved automatic sprinklers under the roof deck, framing members shall be at least three inches wide.

TABLE 10-4 NAILING SCHEDULE

Building Element	Nail Type	Number and Distribution
Stud to sole plate	Common-toe-nail	4—8d
Stud to cap plate	Common-end-nail	2—16d
Double Studs	Common-direct	10d 12 in. o.c. or 16d 30in. in o.c.
Corner Studs	Common-direct	16d 30 in. o.c.
Sole plate to joist or blocking	Common	16d 16 in. o.c
Double cap plate	Common-direct	16d 24 in. o.c
Cap plate laps	Common-direct	3—16d
Ribbon strip, 6 in. or less	Common-direct	2—10d each bearing
Ribbon strip, over 6 in.	Common-direct	3—10d each bearing
Roof rafter to plate	Common-toe-nail	3—16d
Roof rafter to ridge	Common-toe-nail	2—16d
Jack rafter to hip	Common-toe-nail	3—10d
Floor joists to studs (no ceiling joists)	Common-direct	5—10d or 3—16d
Floor joists to studs (with ceiling joists)	Common-direct	2—10d
Floor joists to sill or girder	Common-toe-nail	2—16d
Double-joist to joist	Common-direct	10d—staggered at 16 in.
Ledger strip	Common-direct	3—16d at each joist
Ceiling joists to plate	Common-toe-nail	2—16d
Ceiling joists to every rafter	Common-direct	(see table following)
Ceiling joists (laps over partitions)	Common-direct	3—16d
Collar beam	Common-direct	4—10d
Bridging to joists and rafters	Common-direct	2—8d each end
Bridging to studs	Common-direct or toe	2—10d each end
Diagonal brace (to stud and plate)	Common-direct	2—8d each bearing
Tail beams to headers (when nailing permitted)	Common-end	1—20d each 4 sq. ft. floor area
Header beams to trimmers (when nailing permitted)	Common-end	1—20d each 8 sq. ft. floor area
1 in. Subflooring (6 in. or less in width)	Common-direct	2—8d each joist
1 in. Subflooring (over 6 in. in width)	Common-direct	3—8d each joist
2 in. Subflooring	Common-direct	2—20d each joist
1 in. Wall Sheathing (8 in. or less in width)	Common-direct	2—8d each stud
1 in. Wall sheathing (over 8 in. in width)	Common-direct	2—8d each stud
Plywood sheathing and subflooring ^a	Common-direct	
1 in. Roof sheathing (6 in. or less in width)		2—8d each rafter
1 in. Roof sheathing (over 6 in. in width)	Corrosion -direct	3—8d each rafter
Shingles, wood	Corrosion-resistive	2—No.15 B&S each bearing
Weather boarding	Common-resistive	2—8d each bearing
1/2 in. Fiberboard sheathing	1 1/2 in. galvanized roofing nail 6d common nail 16 ga. galvanized staples, 1 1/8 in. long, 7/16 in. crown	} 3 in c.c. on all edges and 6 in. c.c. at other bearings
25/32 in. Fiberboard sheathing	1 3/4 in. galvanized roofing nail 8d common nail 16 ga. galvanized staples, 1 1/2 in. long, 7/16 [in.]* crown	
1/2 in. Gypsumboard sheathing	1 1/2 in. galvanized roofing nail 11 ga. 3/8 in. to 7/16 in. head 16 ga. galvanized staples, 1 1/2 in. long, 7/16 [in.]* crown	

Notes for Table 10-4:

^aFor nailing of plywood, see reference standard RS 10-9.

*Copy in brackets not enacted but probably intended.

CEILING JOIST NAILING TO EVERY RAFTER
(Number of 16d nails)

Slope of Roof	4/12		5/12		6/12		7/12		9/12		12/12	
Rafter Spacing, o.c. (in.)	16	24	16	24	16	24	16	24	16	24	16	24
Width of building —												
Up to 24 ft.....	5	8	4	7	3	5	3	4	3	3	3	3
24 to 30 ft.....	7	11	6	9	4	7	3	6	3	4	3	3

(2) FLOORS. -

a. Planks shall be splined or tongue-and-groove, not less than three inches thick, covered with one inch tongue-and-groove flooring, laid crosswise or diagonally to the plank, or other surface having equivalent fire resistance; or shall be,

b. At least four inches wide, set on edge close together and well spiked, and covered the same as for three inch thick plank. The planks shall be laid so that there is no continuous line of end joints except at points of support. Floors shall not extend closer than one-half inch to walls to provide an expansion joint, but the joint shall be covered at top or bottom to avoid flue action.

(3) ROOF DECKS. -Roof decks shall be splined or tongue-and-groove planks at least two inches thick; or tongue-and-groove plywood panels (bonded with exterior glue) at least one and one-eighth inch thick, with face grain perpendicular to supports that shall be spaced not more than forty-eight inches on center; or of planks at least three inches wide set on edge close together and laid as required for floors.

(b) Construction details. -Self releasing type wall plate boxes or approved hangers shall be provided where beams and girders enter masonry.

§[C26-1006.8] 27-624 Construction methods. -

(a) Fabrication. -All timber shall be accurately cut and framed to a close fit in such a manner that the joints will have even bearing over the contact surfaces. Mortises shall be true to size for their full depth and tenons shall fit snugly. No shimming in joints, or open joints, shall be permitted.

(b) Erection. -

(1) ASSEMBLY. -Joints shall have a tight fit. Fasteners shall be installed in a manner that will not damage the wood. End compression joints shall be brought to full bearing. All framework shall be carried up true and plumb.

(2) TEMPORARY CONNECTIONS. - As erection progresses, the work shall be bolted, or nailed as necessary, to resist all dead load, wind, and erection stresses.

(3) ALIGNMENT. -The structure shall be properly aligned before final tightening of the connections.

ARTICLE 8 ALUMINUM

§[C26-1007.1] 27-625 General requirements. -

Materials, design, and construction methods shall meet the requirements of reference standards *RS 10-10A, RS 10-10B and RS 10-11.

*Reference Standard designations revised per DOB 9-2-01 promulgation.

§[C26-1007.2] 27-626 Identification. -Aluminum for structural elements shall at all times in the fabricator's plant, be marked, segregated, or otherwise handled so
revision: July 1, 2008

that the separate alloys and tempers are positively identified, and after completion of fabrication shall be marked to identify the alloy and temper. Such markings shall be affixed to completed members and assemblies or to boxed or bundled shipments of multiple units prior to shipment from the fabricator's plant.

§[C26-1007.3] 27-627 Quality control. -

(a) Reference. -The provisions of tables 10-1 and 10-2 shall apply.

(b) Welding operations. -

(1) Welding work shall be performed only by persons who have obtained a license from the commissioner.

(2) Where manual welding work is not performed in the city of New York, welds shall be made by welders qualified under the applicable provisions of reference standard RS 10-25.

(3) Tack welds that are not later incorporated into finished welds carrying calculated stress shall not be considered as structural welds.

(4) The inspection of welding operations stipulated in table 10-2 shall include a check to ascertain that the welders employed on the work have the required license or are qualified in accordance with paragraph two of this subdivision.

§[C26-1007.4] 27-628 Erection. -

(a) Bracing. -All framework shall be carried up true and plumb. Temporary bracing shall be provided to support all loads imposed upon the framework during construction that are in excess of those for which the framework was designed.

(b) Temporary connections. -As erection progresses, the work shall be securely bolted, or welded, to resist all dead loads, wind, and erection stresses.

(c) Alignment. -The structure shall be properly aligned before riveting, permanent bolting, or welding is performed.

ARTICLE 9 REINFORCED GYPSUM CONCRETE

§[C26-1008.1] 27-629 General requirements. -

Materials, design, and construction methods shall meet the requirements of reference standard RS 10-12.

§[C26-1008.2] 27-630 Identification of metal reinforcement. -

Bundles or rolls of welded wire fabric shall be securely tagged so as to identify the type and grade of steel, and the size.

§[C26-1008.3] 27-631 Limitations of use. -

Reinforced gypsum concrete shall not be used where exposed directly to the weather or where subject to frequent or continuous wetting. Precast units shall be protected by coverings or coatings from the weather and

from contact with moisture during shipment and during storage at the work site.

ARTICLE 10 THIN SHELL AND FOLDED-PLATE CONSTRUCTION

§[C26-1009.1] 27-632 **General requirements.** -Thin shell and folded-plate construction may be used for buildings or portions of buildings, as required in this section and subject to the provisions of this subchapter. The applicable provisions of the several reference standards relating to allowable stresses and the use of structural materials shall apply except as modified in this section.

§[C26-1009.2] 27-633 **Analysis.** -

- (1) Unless otherwise permitted by the commissioner, stresses, displacements, and stability of thin shell and folded-plate structures shall be determined on the basis of the assumption of elastic behavior. The shell or plate may be assumed to be homogeneous and isotropic.
- (2) The analysis for stability shall consider large deflections, creep effects and the deviation between the actual and theoretical shell surface.

§[C26-1009.3] 27-634 **Thin concrete shells.** -

The provisions of section 403, 404 and 405 of reference standard RS 10-45 shall apply with the following modifications. The remaining sections of reference standard RS 10-45 shall not apply.

- (1) The advisory provisions of this standard shall be considered as mandatory.
- (2) The minimum ultimate strength of concrete for thin shells shall be three thousand psi.
- (3) Change all references to "the building code (ACI 318-63)" to "reference standard RS 10-4."

ARTICLE 11 SUSPENDED STRUCTURES

§[C26-1010.1] 27-635 **General requirements.** -

The materials, design, and construction of suspended structures shall meet the applicable requirements of the code and the requirements of this article.

§[C26-1010.2] 27-636 **Suspenders.** -

(a) **Bridge Wire Cable.** -Bridge wire cables used for suspenders shall be either bridge strand or bridge rope fabricated from galvanized bridge wire.

(1) **WIRE.** -Wire shall be produced from rods rolled from high carbon steel, the composition of which shall be controlled to provide internal soundness, uniformity of chemical composition and physical properties, freedom from injurious surface imperfections, and shall meet the following requirements.

a. The minimum ultimate tensile strength of zinc-coated wire shall be as follows:

Class A coatingtwo hundred twenty thousand psi

Class B coatingtwo hundred ten thousand psi

Class C coatingtwo hundred thousand psi

b. Yield strength shall be one hundred fifty thousand psi minimum for zinc-coated wire with class A or Class B coating, one hundred forty thousand psi minimum for zinc-coated wire with class C coating, based on the cross-sectional area of the coated wire when loaded to 0.7% elongation in a ten inch gage length. In determining the yield strength, an initial stress equivalent to forty-two thousand psi, based on cross-sectional area of the coated wire, shall be applied to the wire sample. At this loading, the extensometer shall be attached and an initial dial reading set at the equivalent of 0.15% elongation.

c. Elongation shall be four percent minimum in a ten inch gage length, determined as the permanent increase in length after failure of a marked section of the wire originally ten inches [*sic*] in length except that a value of two percent will be permitted for wires 0.110 in. or less in diameter having a class A zinc coating.

d. The zinc-coated wire must withstand wrapping at a rate not exceeding fifteen turns per minute twice around a mandrel equal to three times the wire diameter without fracture of the steel.

e. The wire used in bridge strand or bridge rope shall be zinc-coated (galvanized) in accordance with the requirements of table 10-5. Weight of coating shall be determined in accordance with the provisions of reference standard RS 10-24.

TABLE 10-5-MINIMUM WEIGHTS OF COATING-BRIDGE WIRE, ZINC-COATED, FOR BRIDGE STRAND AND BRIDGE ROPE CONSTRUCTIONS

Diameter of coated Wire (in.)	Minimum Weight of Coating (Ounces per Sq. Ft. of Uncoated Wire Surface)		
	Class A	Class B	Class C
0.041 to 0.061 incl.....	0.40	0.80	1.20
Over 0.061 to 0.079 incl.....	0.50	1.00	1.50
Over 0.079 to 0.092 incl.....	0.60	1.20	1.80
Over 0.092 to 0.103 incl.....	0.70	1.40	2.10
Over 0.103 to 0.119 incl.....	0.80	1.60	2.40
Over 0.119 to 0.142 incl.....	0.85	1.70	2.55
Over 0.142 to 0.187 incl.....	0.90	1.80	2.70
Over 0.187.....	1.00	2.00	3.00

(2) BRIDGE STRAND. -Bridge strands shall be made from wires complying with subparagraphs a through e of paragraph one of this subdivision, and shall meet the following requirements:

a. The wires shall be made in such lengths that the strands can be manufactured with no splices in the outside wires. Splicing of inner wires during the stranding operation is permissible. When joints are necessary in any wires, they shall be electrically butt welded and shall be recoated in a workmanlike manner. Joints in the wires of strand shall be made and dispersed in a manner that will maintain the minimum specified breaking strength of the strand.

b. The minimum breaking strength shall be based on tests to destruction and shall be certified by the manufacturer.

c. Bridge strand shall be prestretched to produce a stable modulus of elasticity of at least the following values for strand wires having class A coating:

one-half inch to two and nine-sixteenths inches dia. twenty-four million psi
two and five-eighths inches and larger. twenty-three million psi
For bridge strands that have classes B and C zinc-coating on the outside wires, the modulus of elasticity shall not be more than one million psi less than the corresponding values for bridge strand with a class A coating. The pre-stretching load shall not exceed fifty-five percent of the breaking strength of the strand.

(3) BRIDGE ROPE. -Bridge rope shall be made from wires complying with subparagraphs a through e of paragraph one of this subdivision, and shall meet the following requirements:

a. Joints are permissible in inner and outer wires and shall be electrically butt welded and shall be recoated in a workmanlike manner. Joints in the wires of strand shall be made and dispersed in a manner that will maintain the minimum specified breaking strength of the rope.

b. The minimum breaking strength shall be based on tests to destruction and shall be certified by the manufacturer.

c. Bridge rope shall be prestretched to produce a stable modulus of elasticity of at least twenty million psi for rope wires having a class A coating. For bridge rope that has class B and C zinc-coatings on the outside wires, the modulus of elasticity shall not be more than one million psi less than the corresponding value for bridge rope with a class A coating. The prestretching load shall not exceed fifty-five percent of the breaking strength of the rope.

(b) Other materials. -Any structural material permitted for use under the provisions of other sections of this subchapter may be used for support of a suspended structure including, but not limited to, types of steel permitted for use under the provisions of reference standard RS 10-5; reinforcing steel and wire, prestressing wire and strand, and high strength alloy steel bars conforming to the requirements of reference standard RS 10-3; and steel conforming to the requirements of reference standards RS 10-66 and RS 10-69. Prestressing

wire and strand may be used for suspenders without the application of prestressing force. All such suspenders shall be protected as described in section 27-642 of this article.

§[C26-1010.3] 27-637 Tests of materials for bridge wire suspenders. -The following minimum quantities of bridge wire for suspenders shall be tested:

(1) Tensile strength tests of the wires shall be made of a specimen cut from each coil of zinc coated wire.

(2) Tests for elongation and for yield strength shall be made on samples from approximately ten percent of the coils of any one size finished wire. If any of these tests fail to meet the specified requirements, all the coils in that lot of finished wire shall be tested and only coils that satisfactorily pass the test shall be used.

(3) Tests of the zinc coating shall be made of approximately five percent of the coils of any one size of finished wire. If any of these tests fail to meet the specified requirements, all the coils in that lot of finished wire shall be tested and only coils that satisfactorily pass the test shall be used.

§[C26-1010.4] 27-638 Tests of materials for other types of suspenders.- The applicable provisions of reference standards RS 10-3 and RS 10-5 shall apply.

§[C26-1010.5] 27-639 Design.- The following design requirements shall supplement the applicable provisions of this subchapter.

(a) Flexibility.- Suspenders, unless encased, may be considered as perfectly flexible.

(b) Elastic stretch.- The elastic stretch of the suspenders shall be considered.

(c) Displacement.- Displacement resulting from changes in magnitude and position of load and its effects [*sic*] on stress shall be considered.

(d) Other considerations.- Consideration shall be given to the effects of temperature variations, partial and reversible wind loadings, and vibration.

(e) Allowable working load. -The allowable working load in suspenders formed from bridge wire cable shall be computed on the basis of factors equal to one and one-half times dead load plus two and one-half times live load or one and two-tenths times dead load plus two times live load plus two times wind load, applied to the specified, minimum, ultimate strength of the suspender. The allowable working load in suspenders conforming to the materials specifications or* several reference standards of this code shall be the allowable working stresses for tension members as prescribed in the applicable reference standard or, for those materials where allowable stresses for tension members are not prescribed, on factors of one and one-half times dead load plus two times live load or one and two-tenths times dead load plus one and one-half times live load, plus one and one-half times wind load, also applied to

the specified minimum, ultimate strength of the suspender. In no case, however, shall the factor, applied to the yield strength of the material or to the prestretching or prestressing force, exceed one and one-tenth times dead load plus one and one-quarter times live load.

**As enacted but "of" probably intended.*

§[C26-1010.6] 27-640 Fittings for wire cable suspenders.- Fittings for wire cable suspenders shall be capable of developing the specified minimum ultimate strength of the attached cable or strand without developing stresses in the fitting equal to, or in excess of, the yield strength of the material in the fitting. One end fitting, of each type and size to be used, shall be tested to insure the adequacy of the fitting to develop the ultimate strength of the cable or strand to which it is to be attached.

§[C26-1010.7] 27-641 Construction. -

(a) General. -The general provisions of reference standard RS 10-5 relating to erection of steel shall apply.

(b) Fitting for wire cable suspenders. -

(1) Only fittings designed for use with the specific wire cable shall be used.

(2) All fittings shall be galvanized in accordance with reference standard RS 10-23.

(3) Zinc used for attaching all splattered fittings shall be at least equal to the grade designated as "high grade" in reference standard RS 10-26.

§[C26-1010.8] 27-642 Protection of suspenders. -

(a) Protected locations. -All wires in bridge strands, bridge ropes, or other wire rope or strand suspenders placed on the interior of structures or concealed from exposure by interior finish shall have at least a class A coating of zinc. Rods, bars, plates, or shapes used for suspenders shall be given a protective coating as specified for the protection of like material in the applicable reference standard.

(b) Exposed locations. -The outside wires of bridge strand or bridge rope suspenders placed in locations exposed to the weather shall have at least a class B coating of zinc and the inside wires shall have at least a class A coating. Rods, bars, plates, or shapes used for suspenders shall be given a protective coating as specified for the protection of like material in the applicable reference standard.

ARTICLE 12 GLASS PANELS

§[C26-1011.1] 27-643 Scope.- The provisions of sections 27-644 through 27-648 of this article shall apply to the use of glass in the exterior wall of a building and shall be limited to exterior application wherein the glass would not be subjected to any loads normal to the face of glass other than those due to wind. For applications involving human impact, the provisions of section 27-651 of this article shall apply. For other cases, the strength and mode of installation of glass shall conform to accepted industry standards.

§[C26-1011.2] 27-644 Support for glass panels. -

Glass shall be firmly held in place. The supports shall be of adequate strength to resist the applicable design wind loads as prescribed in subchapter nine of this chapter.

§[C26-1011.3] 27-645 Glass requirements.- Glass shall meet the requirements of reference standard RS 10-68 for the applicable type, size, thickness and quality.

§[C26-1011.4] 27-646 Thickness of glass. -

Thicknesses of glass panels shall be chosen either on the basis of statistical probability of breakage (subdivision (a) of this section) or on the basis of table 10-7, at the designer's option.

(a) Statistical probability. -Thickness of glass panels shall be chosen so that the statistical probability of breakage when the glass is initially subjected to the design wind load specified in table RS 9-5-1 does not exceed the values indicated in table 10-6. Probability or load factors used for design shall be derived by test. The sufficiency and validity of such test data shall be subject to approval by the commissioner.

(b) Alternate requirements.- Alternative to the requirements of paragraph (a) above, the thickness of glass panels may be chosen from table 10-7. For glass with assured minimum thickness greater than required by reference standard RS 10-68, the maximum areas in table 10-7 may be increased in proportion to the assured minimum thickness.

[C26-1011.5] 27-647 Special glasses.- For types of glass other than single annealed sheet and plate glass, allowable maximum areas may be determined by multiplying values in table 10-7 by the appropriate multiplying factor listed in table 10-8.

§[C26-1011.6] 27-648 Installation of glass panels. -

Glass panels shall be handled and installed so that their strength is not impaired by chipping or scratching, shall be fully and firmly embedded [*sic*] in their supports, and shall be mounted in a manner that will accommodate differential movements due to thermal and loading conditions.

§[C26-1011.7] 27-649 Protection of glass panels. -

Glass panels installed in areas where they will be subject to unusual conditions of construction damage, such as spatter from welds or locations near materials hoists, shall be protected by a hardboard covering or its equivalent during the period that such work is in progress.

§[C26-1011.8] 27-650 Deflection of support.-

The deflection of members supporting glass panels under the design wind load (measured perpendicular to the plane of the panel) shall not exceed $L/175$, where L is the span of the supporting member. In no case shall such deflection exceed three-quarters of an inch.

**TABLE 10-6 PROBABILITY OF BREAKAGE FOR GLASS PANELS
(BASED ON COEFFICIENT OF VARIATION OF 25%)**

Elevation Above Grade of Mid-Point of Glass -Ft.....	Area of Panel — Sq. Ft.				
	0-60	60-80	80-100	100-120	120+
0-50.....	1.0%	1.0%	1.0%	1.0%	1.0%
*50 or more.....	1.0%	0.8%	0.6%	0.4%	0.2%

**As enacted but "more than 50" probably intended.*

TABLE 10-7 MAXIMUM AREA OF GLASS — SQ. FT.

Nominal Thickness of Glass-Inches	Elevation Above Grade of Mid-Point of Glass-Ft.			
	0-50	50-300	300-600	600+
Sheet Glass				
Single strength.....	9	9	8	7
Double strength.....	13	13	11	10
3/16".....	25	25	21	19
7/32".....	32	32	27	24
Plate and Float Glass				
13/64".....	25	25	21	19
1/4".....	37	37	32	28
5/16".....	54	54	46	40
3/8".....	78	74	63	58
1/2".....	114	100	86	75
5/8".....	152	120	103	90
3/4".....	210	137	118	103
7/8".....	241	158	135	118
1".....	312	204	175	153

TABLE 10-8 MULTIPLYING FACTORS FOR VARIOUS TYPES OF GLASS

Glass Type	Multiplying Factor
Full tempered.....	4.0
Heat strengthened.....	2.0
Factory-fabricated double glazing...	1.5*
Laminated.....	0.6
Wired.....	0.5
Sandblasted or etched.....	0.4

*For asymmetrical units base strength on thinner lite.

§[C26-1011.9] 27-651 Panels subject to human impact loads.- Glass in prime and storm doors, interior doors, fixed glass panels that may be mistaken for means of egress or ingress, shower doors and tub enclosures, or in similar installations wherein one or more of the following criteria apply, shall meet the requirements set forth in table 10-9, or by comparative tests shall be proven to produce equivalent performance:
 (a) openings are located in regularly occupied spaces.
 (b) lowest point of panel is less than eighteen inches above finished floor.
 (c) minimum dimension of panel is larger than eighteen inches.

TABLE 10-9 REQUIREMENTS FOR GLASS PANELS SUBJECT TO IMPACT LOADS^{a,b}

*3. Glass Type	Individual Opening Area	Requirements
Regular plate, sheet or rolled (annealed)	Over 6 sq. ft.	Not less than 3/16 in. thick. Must be protected by a push-bar or protective grille firmly attached on each exposed side ^c , if not divided by a muntin.
Regular plate, sheet or rolled (annealed), surface sandblasted, etched, or otherwise depreciated	Over 6 sq. ft.	Not less than 7/32 in. thick. Must be protected by a push-bar or protective grille firmly attached on each exposed side ^c .
Regular plate, sheet or rolled (annealed), obscure	Over 6 sq. ft.	Not less than 3/16 in. thick. Must be protected by a push-bar or grille firmly attached on each exposed side ^c .
Laminated	Over 6 sq. ft.	Not less than 1/4 in. thick. Shall pass impact test requirements of reference standard RS 10-67.
Fully-tempered	Over 6 sq. ft.	Shall pass impact test requirements of reference standard RS 10-67.
Wired	Over 6 sq. ft.	Not less than 7/32 in. thick. Shall pass impact test requirements of reference standard RS 10-67.
All unframed glass doors (swinging)		Shall be fully-tempered glass and pass impact test requirements of reference standard RS 10-67.

Notes for Table 10-9:

^aGlass less than single strength (SS) in thickness shall not be used.

^bIf short dimension is larger than 24 in., glass must be double strength (DS) or thicker.

^cBuilding owners and tenants shall maintain push-bars or protective grilles in safe condition at all times.

*"3." enacted but probably not intended.