

1 RCNY §5-01

CHAPTER 5 CONCRETE

§5-01 Conveyance by Pumping Methods.

The specified compressive strength f_c , of concrete conveyed by pumping methods shall not exceed 5,000 pounds per square inch.

(b) *Mix Proportioning.*

(1) All controlled concrete to be pumped shall:

(i) Comply with all provisions of §27-605: Mixes

(ii) [*sic*] Normal and Heavyweight Concrete to [*sic*] be proportioned in accordance with ACI 211.1-74, utilizing Table 1.

Table 1. Volume of Coarse Aggregate per Unit of Volume of Concrete¹

Maximum size of aggregate	Volume of dry-rodded coarse aggregate per unit. Volume of concrete for different finness**			
	Moduli of Sand ²			
	2.40	2.60	2.80	3.00
3/8	.475	.456	.437	.418
1/2	.561	.542	.523	.504
3/4	.627	.608	.509	.570
1	.675	.656	.637	.617
1 1/2	.712	.693	.675	.655
2	.741	.722	.703	.684
3	.779	.760	.741	.722

1. Values established at Median-Point (reduced 5%). See footnote Table 5.3.6 ACI 211.1-74.

2. The type and gradation [*sic*] of the course aggregate, delivery system and job conditions may require these values to be varied. However in no event shall the variations exceed the maximum allowance noted in ACI 211.1-74 Table 5.3.6.

(iii) For sand lightweight concrete [*sic*] proportioned in accordance with ACI 211.2.-69 utilizing Table 2 except that the air dry unit weight of the concrete may exceed 115 lb. per cu. ft. when tested at age 56 days in accordance with procedure in ASTM C 567.

Table 2. Volume of Coarse Lightweight Aggregate per Cubic Yard of Concrete¹

Maximum size lightweight aggregate, in	Fineness Module of Natural Sand			
	2.40	2.60	2.80	3.00
	Course* aggregate cu. Ft. per yard ²			
3/8	9.3	8.9	8.5	8.1
1/2	11.1	10.7	10.3	9.9
3/4	13.2	12.8	12.4	12.0

Notes:

¹ Volumes are based upon lightweight aggregate at a total moisture content of 8 percent in loose conditions as described in ASTM C29.

² These values may be increased based upon the type, gradation [*sic*] and moisture content of the aggregates, delivery system and job conditions.

2) (i) The type, gradation [*sic*] and moisture content of the aggregate delivery system and job conditions may affect the slump necessary at the mixer for the proper conveying of the concrete. For these reasons in addition to the recommended mix established from the preliminary trial mix data obtained in accordance with §27-605(a)(2), two alternate mixes also shall be recommended. These alternate mixes shall be based upon the water cement ratio curve in the preliminary test data to produce concrete having slumps greater than the maximum specified in §27-605(a)(2) in increments of 1-inch for concrete manufactured with gravel or stone aggregate but [*sic*] not to exceed 8 inches or increments of 2 inches for concrete manufactured with lightweight aggregates but not to exceed 9 inches.

(ii) It shall be permissible to use these mixes interchangeably during the course of the work, providing the slump at [*sic*] the mixer is equal to or less than that provided for the applicable recommended mix.

(iii) The recommended preliminary trial mix shall indicate the design unit weight in lbs. per cu. ft. of the fresh concrete and the estimated air dry unit weight at 56 days.

(c) *Testing and inspection of controlled concrete.*

(1) Those samples of concrete for test purposes required by RS-10-3, §4.3.1. which are designated to be "taken out of the bucket, hopper or forms" shall be obtained by passing a receptacle completely through the discharge stream of the delivery line or by completely diverting the discharge into a container. Transport the sample concrete to the place where fresh concrete tests of slump, air content, temperature and unit weight are to be performed and where specimens for strength tests are to be molded in accordance with RS-10-51 and RS 10-52 as directed by the Architect or Engineer designated for controlled concrete inspection.

Each of the foregoing three (3) test cylinders per one hundred and fifty (150) cubic yards required under §4.3.1 of RS 10-3 shall be taken from a different delivery vehicle.

(2) Where the concrete is discharged directly into the forms by pumping methods the slump taken at the end of the delivery line shall be used to determine conformance with the slump specified for the work.

(3) The results of tests of samples taken at the end of the pump delivery line shall be shown on the same report with corresponding tests of samples taken from the same batch at the mixer.

(4) (i) Included in the duties of the on-site inspector as provided by §27-607 shall be:

(A) That water is added only to the mixer or under the following circumstances to the hopper of the pump:

When a portion of the concrete is discharged from the mixer into the pump hopper at a slump below that specified in the preliminary trial mix and too low for pumpability, water may be added to this concrete in the pump hopper to bring it to the specified slump provided all pumping action is stopped. Before pumping is resumed the concrete in the hopper must be thoroughly re-mixed for a minimum period of 2 minutes after all of the water has been added. If the concrete cannot be properly re-mixed it shall be removed from the hopper and discarded.

The balance of the batch in the mixer shall be adjusted to the specified slump before further discharge.

(B) Examination of the conveying line for leakage of cementitious material.

(C) Verify that no aluminum pipe is used.

(ii) Included in the duties of the batch plant inspector as provided for in §27-605(a).

(5) A.B., shall be:

(i) To make adjustments for variations in fineness modulus of the fine aggregate as per ASTM C 33, Section 3.4. When the difference of fineness modulus of the fine aggregate is more than 0.2 for each 0.2:

(A) Below the Design Fineness Modulus deduct 50 lbs. from the dry batch weight of the fine aggregates and add 50 lbs. for normal weight (20 lbs. lightweight) to the dry batch weight of the coarse aggregates.

(B) Above the Design Fineness Modulus add 50 lbs. to the dry batch weight of the fine aggregate and deduct 50 lbs. for normal weight (20 lbs. lightweight) from the dry batch weight of the coarse aggregates.

(ii) To test lightweight aggregates for total moisture content each day before the first concrete for the project is batched and thereafter at appropriate intervals during the day or whenever a moisture change may be evident. The moisture content of each test shall be reported on the corresponding inspection ticket accompanying each load of concrete.

(iii) To immediately notify the concrete producer and the contractor when the total moisture content of the lightweight aggregate [*sic*] is 8 percent or less, that a change to an alternate mix may be necessary to maintain the water cement ratio and the slump specified for the work as determined at the end of the delivery line.

(d) *Job Practices.*

(1) Slump shall be maintained as uniformly as possible from batch to batch in conformance with the specified slump.

(2) Delivery systems shall be in good condition. No dented or worn thin section shall be used.

(3) All connections shall have clean grooves, be equipped with gaskets and securely coupled except at the end of the system where sections are being reconnected gaskets may be omitted.

(4) All vertical risers shall be straight and firmly secured. Pipe bends shall also be restrained against movement caused by the pumping action.

(5) Clean out procedures shall assure that there is no uncontrolled ejection of concrete or clean out devices at the end of the delivery line. If pressure water is used for cleanout, care shall be taken that the water is not deposited into the form.

(6) Care shall be taken that portland cement and sand slurry used to prime the delivery line shall not be deposited in the form without the approval of the architect or engineer designated for Controlled Inspection. All other types of printing liquids shall not be permitted to be placed in the form.

(7) Pumping aids, coloring agents, and all other admixtures shall be permitted only when included in the preliminary trial mix design.

(8) Flexible hose, used in the system shall be handled so as to permit the full flow of the concrete without restriction, reduction of cross sectional area of kinking.

(9) Free hanging, coupling connected sections of flexible delivery line shall have additional restraint between each section across each joint.

(10) Personnel shall avoid standing close to the outlet end of the concrete pump.

(e) *Quality Control.*

(1) The engineer who designed the structure shall specify on his plans, or an amendment thereto, that concrete may be conveyed by pumping.

(2) The placement of concrete by pumping shall be suspended on any project where required test reports are not submitted to the Borough Superintendent within six weeks from the date of placement and sampling.