

CODE

COMMENTARY

19.3.2 Requirements for concrete mixtures

19.3.2.1 Based on the exposure classes assigned from Table 19.3.1.1, concrete mixtures shall conform to the most restrictive requirements in Table 19.3.2.1.

(a) Exposure Class C0 is assigned if exposure conditions do not require additional protection against the initiation of reinforcement corrosion.

(b) Exposure Classes C1 and C2 are assigned to nonprestressed and prestressed concrete members, depending on the degree of exposure to external sources of moisture and chlorides in service. Examples of exposures to external sources of chlorides include concrete in direct contact with deicing chemicals, salt, salt water, brackish water, seawater, or spray from these sources.

R19.3.2 Requirements for concrete mixtures

Durability of concrete is impacted by the resistance of the concrete to fluid penetration. This is primarily affected by the w/cm and the composition of cementitious materials used in concrete. For a given w/cm , the use of fly ash, slag cement, silica fume, or a combination of these materials will typically increase the resistance of concrete to fluid penetration and thus improve concrete durability. The Code provides limits on w/cm in Table 19.3.2.1 to achieve low permeability and the intended durability. **ASTM C1202** can be used to provide an indication of concrete's resistance to fluid penetration.

Because w/cm of concrete cannot be accurately verified in the field using standard test methods, strength tests are used as a surrogate. Representative values for minimum f'_c have been assigned to each w/cm limit in Table 19.3.2.1. The acceptance criteria for strength tests in 26.12 establish a basis to indicate that the maximum w/cm has not been exceeded. For this approach to be reliable, the values of f'_c specified in construction documents should be consistent with the maximum w/cm . Considering the wide range of materials and concrete mixtures possible, including regional variations, the minimum f'_c limit in Table 19.3.2.1 associated with the maximum w/cm should not be considered absolute. The average strength of concrete mixtures for a given w/cm can in some cases be considerably higher than the average strength expected for the representative value of f'_c . For a given exposure class, the licensed design professional may choose to specify a higher value of f'_c than listed in the table to obtain better consistency between the maximum w/cm and f'_c . This improves the confidence that concrete complies with the w/cm limit if the strength acceptance criteria are satisfied.

As stated in the footnote to Table 19.3.2.1, maximum w/cm limits are not specified for lightweight concrete because the amount of mixing water that is absorbed by the lightweight aggregates makes calculation of w/cm uncertain. Therefore, only a minimum f'_c is specified to achieve the required durability.

Table 19.3.2.1 provides the requirements for concrete on the basis of the assigned exposure classes. The most restrictive requirements are applicable. For example, a member assigned to Exposure Class W1 and Exposure Class S2 would require concrete to comply with a maximum w/cm of