PUBLIC WORKS DEPARTMENT
BUILDINGS

OFFICE OF THE ENGINEER-IN-CHIEF (BUILDINGS) AND CHIEF ENGINEER (BUILDINGS) CHENNAI REGION, PWD., CHEPAUK, CHENNAI-5

TECHNICAL CIRCULAR No. AEE / T10 / 33566 /2017, dated 27.04.2017

Sub : PWD - Buildings –Grade of concrete (M20, M25, M30, M35, M40) – Limit of the aerial distance from Sea water front– Issued for Adoption – Regarding

Ref :
1. Chief Engineer (Buildings), PWD., Chennai Circular No.41 of 1989 No. AEE/T10/B/153720/88-41, dated 16.05.1989
2. Engineer-in-Chief (Buildings), PWD., Chennai Technical Circular No. AEE /T10/33566/2017 dated 31.03.2017
3. Superintending Engineer, PWD., Planning and Designs Circle, Chepauk, Chennai-5 letter No. SE-P&D / EE-BRS / /2017, dated 24.04.2017

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1) In this Office Circular 2nd cited, the Data evolved for Standardised Concrete Mix for the Grades M20, M25, M30, M35 and M40 to improve the durability of Reinforced Cement Concrete in accordance with the IS:456-2000 BIS code has been communicated for adoption in all works. Besides this, it was also instructed to adhere to all the provisions stipulated in IS:456-2000 BIS code.

2) Part of the table 5 of IS 456-2000 stipulates the minimum grade of concrete for various exposure condition as shown below:-

Sl. No	Exposure condition	For Reinforced Concrete
		Minimum Grade of Concrete
1	Mild	M20
2	Moderate	M25
3	Severe	M30
4	Very severe	M35
5	Extreme	M40

3) Clause 8.2.2 and Table 3 of IS 456:2000 classify, Environmental Exposure Condition as Five levels of Severity viz., Mild, Moderate, Severe, Very severe and Extreme condition of Environment to which the concrete will be exposed during its working life and is reproduced as below:-

Sl. No	Environment	Exposure conditions
(1)	(2)	(3)
i)	Mild	Concrete surfaces protected against weather or aggressive condition, except those situated in coastal area
ii)	Moderate	Concrete surfaces sheltered from severe rain or freezing whilst wet. Concrete exposed to condensation and rain. Concrete continuously under water. Concrete in contact or buried under non-aggressive soil / ground water. Concrete surfaces sheltered from saturated salt air in coastal area
iii)	Severe	Concrete surfaces exposed to severe rain, alternate wetting and drying or occasional freezing whilst wet or severe condensation Concrete completely immersed in sea water. Concrete exposed to coastal environment.
iv)	Very severe	Concrete surfaces exposed to sea water spray, correction fumes or severe freezing condition whilst wet. Concrete in contact with or buried under aggressive sub-oil / ground water.
v)	Extreme	Surface of members in tidal zone. Members in direct contact with liquid / solid aggressive chemicals.

4) IS 456-2000 code does not specify the limit of distance from the seawater front to be treated as coast. The extent of saline zone would depend on local condition of the humidity and wind characteristics. It is difficult to give a clear-cut specification as to the distance from the sea coast up to which the saline atmosphere would have effect on the Reinforced Concrete

5) In this connection, during the works review meetings with the Superintending Engineers / Executive Engineers this subject of limit of distance from sea water front for various grades were discussed

6) In the letter 3rd cited, the Superintending Engineer, PWD., Planning & Design Circle, Chennai has recommended the limit of distance from sea water front for various Grades of Concrete based on the scrutiny of reports of the various organizations as informed below :

   a) In the Chief Engineer (Buildings), PWD., Chennai Circular No. 41 of 1989 No. AEE / T10 / B / 153720 / 88-41, dated 16.05.1989, it was stated that, the extent of saline zone would depend on local conditions of the humidity and wind characteristics. However, considering the practice and recommendations of various organizations, in the above said circular it was fixed a distance of 24 Kms from the sea (crow fly) treated as Coast.

b) Further, as per Chief Engineer (Buildings), PWD., Chennai Circular No. 41 of 1989 No. AEE / T10 / B / 153720 / 88-41, dated 16.05.1989, the reports received from various Organisations are mentioned below:

Sl. No	Name of Department	Grade of mix adopted	Distance from sea
1	Ministry of shipping and Transport, Government of India – Instruction	M.20 grade (R.C.C.1:11/2:3 mix)	24 Km
2	Madras Port Trust	M.20 grade	10 Km
3	Central Public Works Department	M.20 grade	-
4	Military Engineering service	M.20 grade	-
5	Tamil Nadu High ways Department – High ways Research Station	M.20 grade	24 Km
6	Indian standard Specification No. 13.3 of I.S, 456/1978	M.20 grade	-
7	Indian Institute of Technology Madras – suggestion	M.20 grade	30 (to) 50 Km
8	Superintending Engineer (P & D) Circle – Madras - Recommendation	M.20 grade (R.C.C.1:11/2:3 mix)	24 Km

c) CPWD Specifications state that distances up to 10 km, be treated as coast.

d) Chennai Port Trust also considers 10 km as a distance from the seawater front as coast.

e) Dr. Manu Santhanam, the Eminent Professor of IIT Chennai expresses his views regarding the grade of concrete to be adopted with respect to the distance from sea water front in " Indian Concrete Journal (2012) " and stated below:-

> "Portion up to 10 km from coast has been classified as D1. Based on CPWD Specifications, Portion beyond 10 and up to 50 km classified as D2, Portion beyond 50 km classified as D3.based on AS3600 (Distance beyond 50 Km to be treated as Inland) and suggested various Grades of concrete M40, M30, M25 for D1, D2 and D3".

f) Considering all the above aspects, with due consideration of Safety, Sustainability as well as economy and also after having detailed discussions with the experts, the various grades of Concrete to be adopted normally in coastal and plain areas (ie.,M20, M25, M30, M35, M40) with respect to the Distance from sea water front is recommended by the Superintending Engineer, PWD., Planning & Design Circle, Chennai as below in order to improve the durability of Reinforced Cement Concrete in accordance with the IS:456-2000 BIS code.

Sl. No	Exposure condition	Grade of Concrete	Distance from Sea Water Front
1	Mild	M20	Beyond 24 Km
2	Moderate	M25	Beyond 10 Km and up to 24 Km
3	Severe	M30	Up to 10 Km
4 & 5	Very severe & Extreme	M35 & M40	Offshore Structures

g) The Superintending Engineer, PWD., Planning & Design Circle, Chennai has also suggested that, as a special case, higher grades of concrete shall be adopted from structural design point of view and the aggressive soil condition or ground water such as Sulphate and Chloride conditions irrespective of exposure condition based on the test reports subject to prior approval of the Superintending Engineer PWD, Planning & Designs Circle, Chennai–5.

In view of the above aspects and based on the recommendation of Superintending Engineer PWD, Planning & Designs Circle, Chennai–5 in the letter 3rd cited, the following circular instructions are issued for adoption.

1) Minimum Grade of Concrete to be adopted for Reinforced Concrete under various exposure conditions are tabled below for adoption.

Sl. No	Exposure condition	Grade of Concrete	Aerial Distance from Sea Water front
1	Mild	M20	Beyond 24 Km
2	Moderate	M25	Beyond 10 Km and up to 24 Km
3	Severe	M30	Up to 10 Km
4 & 5	Very severe & Extreme	M35 & M40	Offshore structures

2) As a special case, higher grades of concrete can be adopted irrespective of the exposure conditions considering the structural design aspects or aggressive soil or ground water conditions such as Sulphate and Chloride contents based on the test reports etc., subject to prior approval of the Superintending Engineer PWD, Planning & Designs Circle, Chennai–5 and concerned Chief Engineer.

SD/- (R. JAYASINGH)
ENGINEER-IN-CHIEF (BUILDINGS) AND
CHIEF ENGINEER (BUILDINGS) CHENNAI REGION, PWD.,
CHEPAUK, CHENNAI-5

To

The Chief Engineer (Buildings), PWD., Madurai Region, Madurai and Trichy Region, Trichy
All the Superintending Engineers of Buildings, PWD.
All the Executive Engineers of Buildings, PWD

Copy to the Principal Secretary to Government, PWD., Secretariat, Chennai
Copy to the Principal Secretary to Government, Finance Department, Secretariat, Chennai

// Forwarded by Order //

27-4-2017

for Engineer-in-Chief (Buildings) and
Chief Engineer (Buildings) Chennai Region, PWD.,
Chepauk, Chennai-5