IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 4, June 2023

Study on Behavior of Chlorine Effects to the Concrete and Behavior of Bond Stress of Concrete

P. Gambhire[1] and Dr. C. K. Shridhar[2]

[1]Student, Department of Civil Engineering

[2]HOD, Department of Civil Engineering

K. C. T. LT. G. N. Sapkal College of Engineering, Nashik, India

Abstract: *Today's large dependency on fossil fuel moving the world towards global warming, rise in earth temperature, decreasing fossil fuel from earth surface and many more. To avoid this all issue we have to move towards the maximum use of green energy. This paper gives the brief information about how Grid tie PV System works the components used in it. Also we had discuss a case study of roof top 20 kW Grid tie PV system, which is mounted in GGSF campus on GGCOE building. Future power demand and extension required in system to fulfil the upcoming demand.*

Keywords: Fossil fuel, global warming, green energy, PV Grid tie System

I. INTRODUCTION

Objectives and Scope

Chloride penetration refers to the depth to which chloride ions from the environment penetrate into the concrete. This can lead to corrosion in RCC structures, and thus study of chloride permeability is an important aspect that affects the durability of the concrete. The chloride ion content of concrete is usually measured in the laboratory using wet chemical analysis. Although laboratory testing is the most accurate, it is time consuming and often takes several weeks before results are available. As a result, field test kits have been developed. Chloride ions are among the primary causes of steel corrosion in reinforced concrete structures.Determination of the chloride content in the concrete cover and near the steel reinforcement isneeded for evaluating the risk of corrosion.

Introduction

In this document, a review of the current common methods for determining chloride penetrability of concrete is presented. First, some theoretical background of what influences the penetration of chlorides into concrete is presented in Section 3. The different mechanisms of chloride penetration are presented, followed by a further elaboration of the chloride diffusiontheory. The influence of basic properties of concrete on its chloride penetrability is also discussed. In Section 4, individual test procedures are presented. First, the existing longterm procedures are discussed, namely the salt pending (AASHTO T259) test and the Nordtest (NTBuild 443) bulk diffusion test. The existing short-term tests are then presented. For each test, the procedure, the theoretical basis, and any advantages and disadvantages are presented. Also included in this document as an appendix is a glossary of some of the common terms related to chloride ingress testing and measurement the interest of high strength concrete has increased considerably in the last few years. Several research works on this subject have contributed to a better understanding of the material properties and mechanical behavior in structural elements of high strength concrete.

Reinforced concrete structures are exposed to harsh environments yet are often expected tolast with little or no repair or maintenance for long periods of time (often 100 years or more). To do this, a durable structure needs to be produced. For reinforced concrete bridges, one of the major forms of environmental attack is chloride ingress, which leads to corrosion of the reinforcing steel and a subsequent reduction in the strength, serviceability, and aesthetics of thestructure. This may lead to early repair or premature replacement of the structure.

A common method of preventing such deterioration is to prevent chlorides from penetratingthe structure to the level of the reinforcing steel bar by using relatively impenetrable concrete.The ability of chloride ions to penetrate the concrete must then be known for design as well asquality control purposes. The penetration of the concrete by chloride ions, however, is a slow process. It cannot be determined directly in a time frame that would be useful as a quality control measure. Therefore, in order to assess chloride penetration, a test method that accelerates the process is needed, to allow the determination of diffusion values in a reasonabletimeOne subject, which needs some investigation as far as the use of high strength concrete in building construction is conceded, is the prediction of "in situ" concrete strength. It is known that the strength measured on standard specimens, at 28 days and cured in standard conditions, only gives the potential value of the concrete strength, which is useful for quality control purposes and for checking the acceptability of the concrete as it is produced (1, 2). However, this reference strength is normally achieved by the real structure at ages much higher than 28 days, depending on various parameters, mostly associated with curing conditions. On the otherhand, it is often necessary to know the strength of concrete before 28 days to determine when the forms can be disassembled or to know the structure performance at certain age. As a way of estimating the "in situ" strength for high strength concrete, some techniques, previously usedin normal strength concrete, have been adapted and used.

One of those techniques consists on calibrating a relationship between the compressive strength of a given concrete and its resistance to penetration by a steel probe fired into the concrete surface. This test, generally known as Windsor Probe Test System, has only shown its applicability in concretes in which strengths are no more than 50 MPa (measured in cubes of 150 mm). In an attempt to use Windsor Probe Test System in high strength concrete, performedby the authors, it was found that the available probes and/or the power level are unsuitable; probes didn't penetrate the concrete surface. It means that probably a new probe and/or a new power level has to be provided by manufacturer in order to be possible its use in high strengthconcrete.

On the present investigation the possibility of using an alternative firing apparatus to the traditional Windsor Probe Test System was evaluated for the range of concrete compressivestrength varying from 50 MPa to 90 MPa. A previous study, comparing the reliability of both apparatus, is also presented for the range of concrete compressive strength up to 50 MPa. In an environment exposed to seawater, chloride-induced corrosion of reinforcing steel is the most important deterioration mechanism of reinforced concrete structures. Under chloride attack, the reinforcing steel corrodes more easily The volume of the corrosion products is about four to sixtimes larger than the steel This volume increase would induce internal tensile stresses in the cover concrete, resulting in cracking, de lamination and spelling. Therefore, in the durability design of these structures, the most important factor that determines their service life is the chloride transport properties of the concrete. (Mehta and Monteiro, 2006).Extensive studies have been conducted over the past decades to study the chloride transport properties of concrete. Most of the studies were carried out on sound and un cracked concrete (Zhang and Gojri, 1996; Wang etal., 2005; Song etal., 2008; Pack etal., 2010). However, in most cases, cracks (micro cracks) may exist in reinforced concrete structures for different reasons. A restrained volume change is one of the most common causes of cracks in concrete. Concrete will shrink during the hydration process. If the shrinkage is restrained, tensile stress will develop. Once the stresses exceed the tensile strength of the concrete, cracks will occur (Carin and Clifton, 1995) ... Durability problems also can lead to cracks, such as freeze thaw action, alkali-aggregate reaction, sulfate ingress, and corrosion of reinforcement. Other reasons for concrete cracking could lie in poor construction practices, construction over load errors in design and externally applied loads (ACI 224.1R-07, 2007). Several studies have focused on the effect of cracks on the chloride transport properties of concrete using both experiments. Permeation is yet another mechanism by which penetration of chloride ions can occur which isdriven by pressure gradients. Consider a closed volume made of concrete whose inside bottomface is under hydrostatic pressure caused due to a liquid and if the same also contain chloride ion then permeation would occur. Absorption through capillary is yet another mechanism through which chloride ingress occurs. Concrete surfaces that are exposed to alternate wetting & drying conditions often undergo chloride ingress by this mechanism. In such conditions, where concrete comes in contact with water containing chlorides then, as mentioned above, dueto a moisture gradient capillary suction pressure develops and absorption of chloride ions through the pores occurs. Interesting here would be to note that unless the concrete quality is very poor the absorption of chloride ions by this mechanism would not reach the reinforcing steel because the depth of drying is usually quite small. Though still it does assist in bringing the chlorides inside concrete and reducing the distance that needs to be covered to reach the steel [Thomas, et al., 1995]

Reinforced concrete structures are exposed to harsh environments yet is often expectedto last with little or no repair or maintenance for long periods of time (often 100 years or more).To do this, a durable structure needs to be produced. For reinforced concrete bridges, one of the major forms of environmental attack is chloride ingress, which leads to corrosion of the reinforcing steel and a subsequent reduction in the strength, serviceability, and aesthetics of thestructure. This may lead to early repair or premature replacement of the structure. A common method of preventing such deterioration is to prevent chlorides from penetrating the structure to the level of the reinforcing steel bar by using relatively impenetrable concrete. The ability ofchloride ions to penetrate the concrete must then be known for design as well as quality controlpurposes. The penetration of the concrete by chloride ions, however, is a slow process. It cannotbe determined directly in a time frame that would be useful as a quality control measure. Therefore, in order to assess chloride penetration, a test method that accelerates the process is needed, to allow the determination of diffusion values in a reasonable time.

Corrosion of Steel reinforcement is a civilian Concrete durability problem in NewZealand. It is caused by the depth or quality of Cover Concrete being insufficient to preventMoisture and air penetrating the Concrete Surface and migrating the reinforcement and is exacerbated when the Concrete Contains Chloride ions. In addition to increasing the risk ofreinforcement Corrosion after construction. Chloride affect ·Concrete s the 145 Seatingbehavior of fresh Subsequent Strength. Reinforced Canes he Structures are exposed to harshenvironments yet ark Expected to last with little of maintenance of Len offer no Foe loonyPeriods of time 100 years one attack of the major is Cloned forms often omental ingress Acommon method A common method deled orally is to the of Pac venting prevent chloridesfrom to the level the Reinforcing steel ban by using relatively impenetrable Concisely Such Cannot be deal, mined disquietly in a Frame Control -that would be

Corrosion of steel reinforcement is a significant concrete durability problem in New Zealand. It is caused by the depth or quality of cover concrete being insufficient to prevent moisture andair penetrating the concrete surface and migration to the reinforcement and is exacerbated whenthe concrete contains chloride ions

In addition to increasing the risk of reinforcement corrosion after construction chloridescan affect the seating behavior of fresh concrete and its subsequent strength Reinforcement concrete structures are expected to harsh environments yet are expected to last with little or no repair maintenance for long periods of time often 100 years or more one of the major formsof entertain mental attack is chloride ingress. A common method of preventing such deterioration is to prevent chloride from penetrating the structure to the level of the reinforcingsteel bar by using relatively impenetrable concrete. It cannot be determined directly in a time. Frame that would be useful as a quality control measures In general concrete is a heterogeneousmixture used is most of the construction works concrete has a complex nature in that it's properties in its fresh and hardened state are different This pores in the concrete pave way to water absorption and chloride ions penetration from the atmosphere which in turn leads to reinforcement corrosion but cementations composites are multiphase and multi - scaled material in nature with time variant characters annexing more complexities this has led to other studies focusing on the effect of Nano sized cementations composites on concrete. Chloride ions are among the primary cause of steel corrosion in reinforced concrete structuresdetermination of the evaluating risk of corrosion the drawbacks of conventional techniques fordetermination chloride content call for reliable techniques. The performance of embedded chloride sensor in cementitious material depends on the physical condition of the interfaces at the sensor's surface as well as the fore solution compositions. The presence of different ions inthe pore. Channels of this layer, subsequently affects the sensor's response this is mainly in view of pore solution composition and compactness of hydration products at the interface between sensor and cementations materials

Advantages

- It is relatively quick- can be used for quality control
- Has simple and convenient set up and procedures
- Provides results that are easy to interpret

Disadvantages

- May not represents the true permeability for concrete that containssupplementary Cementations material or chemical admixtures.
- May allow measurements before a steady state is achieved
- Can cause physical and chemical changes in the specimen , result in unrealisticvalues
- Has low inherent repeatability and productivity

The objectives of Phase B are

Propose chloride limits on the basis of total cementations materials; and

Evaluate the validity of current chloride limits for reinforced concrete stated in ACI 318.This report summarizes the findings in Phase A of the project.

II. MATERIALS AND MIXTURE PROPORTIONS

The following materials were used for the concrete mixtures:

- ASTM C150 Type II Portland cement (II) with C3A = 6.6% (Bogue)/4.0% (QXRD)*
- ASTM C150 Type V Portland cement (V) with C3A = 2.9% (Bogue)/2.6% (QXRD)
- ASTM C989 slag cement (SL)
- ASTM C618 Class F fly ash (FF)
- ASTM C618 Class C fly ash (CF)
- ASTM C1240 silica fume (SF
- ASTM C33 No. 57 crushed coarse aggregate with high chloride from Illinois (IL)

Powdered Calcium chloride (97.1% purity) * C3A calculated from Bogue equations is relevant to ASTM C150. The cement supplier also reported the C3A from direct phase determination method. Table 2 summarizes the chemical characteristics of the cementation's materials used in this project as reported by the supplier. The measured chloride content of the materials used for the concrete mixtures are reported in Table 3. The acid-soluble and water-soluble chloride contents of the different material ingredients were measured by ASTM C1152 and ASTM C1218, respectively.

III. METHODOLOGY

PROCEDURE

SAMPLING

The apparatus required for processing the sample shall be chosen for its suitability for the purposes of the investigation. A specimen to be tested for the determination of chlorides both acid and water-soluble shall not be removed from the structure until the concrete has become hard enough to permit removal without disturbing the bond between the mortar and the coarse aggregate. Normally concrete shall be 14days old before the specimens are removed. Specimens that show abnormal defects or have been damaged in removal shall not be used. A core drill shall be used for securing cylindrical core specimens (at least 100mmdiameter). The diameter of the core should be at least 2.5 times the maximum size of the aggregates and the length of the core should be at least 95 percent of core diameter. For specimens taken perpendicular to the horizontal surface, a short drill is sates factory. For inclined holes, a diamond drill is satisfactory. A saw having diamond or silicon carbidecutting edge shall be used for securing beam specimens from the structures or pavement. Samples morethan25 minimum maximum dimension shall be reduced in size by use of jaw crusher or broken into smaller pieces by hammering carefully to avoid loss of smaller pieces. Crush the particles to less than 25 minimum maximum dimensions using a rotatingpuck grinding apparatus or by using a disk pulverize operated to restrict to negligible levels the loss of fine particles. Sieve the crushed samples through 850~m IS Sieve. Thoroughly blend the material by transferring it from one glazed paper to another at least 10times

WATER SOLUBLE CHLORIDE

Weigh 1000 ± 5 g of the pulverized mortar or concrete sample in 2 liter capacity beaker and add 1 000 ml of distilled water (chloride free). Stir the mixture vigorously and wan gently for IS min. After allowing the mixture to standfor24 hr for settling, decant about 200ml of the supernatant solution into a clean dry250mlcapacity beaker. Immediately, filter the solution through what man filter paper No. 1and collect the filtrate.

Pipette SO ml of filtrate in a 250 ml capacity, conical flask. Add 5 ml of 6 N nitric acid. Add known volume (X). Preferably 25 ml of 0.2 N silver nitrate solution. Add 1mlferric alum and 5 ml of nitrobenzene. Shake vigorously to coagulate the precipitate. Titrate excess silver nitrate with 0.2N ammonium thiocyanate solution until permanent faint reddish brown color appears. Note down the volume (Y) of ammonium thiocyanate used.

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Volume 3, Issue 4, June 2023

METHOD OF TEST

Reagents

1. Quality of Reagent

Unless otherwise specified, pure chemicals of analytical reagent grade anddistilled water (see IS 1070) shall be used in the test. 2. Nitric Acid (HN03) Concentrated (Specific Gravity 1.42)

Prepare the solution, 6N (approximately), by diluting 38 ml of concentratednitric acid to) 00mlwithdistilled water.

Ferric Alum [FeNH4(S04)212H20]

Dissolve 10g of ferric alumni 100mlof distilled water and add 1ml of nitricacid

Potassium Chromate (K2 Cr0 4), 5 Percent Solution Dissolve 5 g ofpotassium chromate in 100mlofdistilled water.

Nitrobenzene (0°2)

Silver Nitrate (AgN03) Solution, 0.02 N

Weigh 1.7g, of silver nitrate, dissolve in distilled water and dilute to 500 mlin volumetric flask. Standardize the silver nitrate solution against 0.02 N sodium chloride solution using potassium chromate solution as indicator (5 percent wlv) in accordance with the procedure given in IS 3025 (Part32).

Ammonium Thiocyanate (NH4 SCN) Solution, 0.02N.

Weigh 1.7 g of ammonium thiocyanate and dissolve in one liter of distilledwatering volumetric flask. Shake well and standardize by titrating with 0.02N silver nitrate solutions using ferric alum solution as an indicator. Adjustthe normality exactly to 0.02 N.

Sodium Chloride (NaCI), 0.02 N

Weigh 1.1692g of sodium chloride dried at loss: I: 2°C dissolve in distilled water and make up to 1000 ml in a volumetric flask.

Use of Filter Paper

In the methods prescribed in this standard, relative numbers of what man filter paper only have been prescribed since these are commonly used. However, any other suitable brand of filter papers with equivalent porosity may be used.

Chemicals we are used in

Table No-1 List of Chemicals

SR. NO	MATERIAL DISCRIPTION	Quantity / Unit
1	Nitric Acid	500 ml.
2	Silver Nitrate	10 Gram.
3	Ferric Alum	50 Gram
4	Nitrobenzene	500 ml.
5	Ammonium thiocyanate	250 Gram.

Data for Mix Proportioning

The following data arc required for mix proportioning of a particular gradeof concrete:

Grade designation:

Type of cement;

Maximum nominal size of aggregate;

Minimum cement content:

Maximum water-cement ratio;

Workability;

Exposure conditions as per Table 4 and Table 5 of IS -t56;

Maximum temperature of concrete at the time of placing:

Method of Tran sporting and placing;

Early age strength requirements, if required:

Type of aggregate;

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Maximum cement content; and
Whether an ad mixture shall or shall not lx' used and the type of admixture and thecondition of use.

Target Strength for Mix Proportioning

In order that not more than the specified proportion of test results is likely to fall below the characteristic strength, the concrete mix has to be proportioned for higher target mean compressive strength J..,. The margin over characteristic strength is given by the following relation: f ck =f.ck + 1.65 s Where, f'ck = target mean compressive strength at 2 lit/days in N/rnm2 f'ck = Characteristic compressive strength at 2X day's in N/mm 2, and s = standard deviation N/mm

Standard Deviation

The standard deviation for each grade of concrete shall be calculated separately Standard deviation based on test strength of sample

Number of test results of samples - The total number of test strength of samples requiredto constitute an acceptable record for calculation of standard deviation shall he not lessthan 30 , Attempts should be made to obtain the 30 samples (taken from site), as early as possible. When a mix is used for the first time.

In case of significant changes in concreteWhen significant changes are made in the production of concrete batches (for example changes in the materials used, mixproportioning, equipment or technical control), the standard deviation value shall be separately calculated for such batches of concrete.

Standard deviation to be brought up-todate - The calculation of the standard deviation shall be brought up-to-date after every change of mix proportioning.

Assumed standard deviation

Where sufficient test results for a particular grade of concrete are not available, thevalue of standard deviation given in Table I may be assumed for the proportioning of mix in the first instance . As soon as the results of samples are available, actual calculated standard deviation shall be used and the mix proportioned properly. However, when adequate past records for a similar grade exist and justify to the designer a value of standard deviation different from that shown in Table I, it shallbe permissible to use that value.

Selection of mix proportions

Different cements, supplementary cementations materials and aggregates of differentmaximum size, grading, surface texture, shape and other characteristics may produce concretes of different compressive strength for the same free water-cement ratio. Therefore.The relationship between strength and free water-cement ratio should preferably be established for the materials actually to be used. In the absence of such data, the preliminary free watercement ratio (by mass) corresponding to the target strength at 28 days may be selected from the established relationship, if available. Otherwise. The water-cement ratiogiven in Table 5 of IS 456 for respective environment exposure conditions may be used asstarting point.

Selection of Water Content

The water content of concrete is influenced by a number of factors, such as aggregate size,aggregate shape, aggregate texture, workability, water-cement ratio, cement and other supplementary cementations material type and content, chemical admixture andenvironmental conditions. An increase in aggregates size, a reduction in water-cement ratioand slump, and use of rounded aggregate and water reducing admixtures will reduce the water demand. On the other hand increased temperature, cement content, slump, water- cement ratio, aggregate angularity and a decrease in the proportion of the coarse aggregate to fine aggregate will increase water demand. The quantity of maximum mixing water perunit volume of concrete may be determined from Table 2. The water content in Table 2 is for angular coarse aggregate and for 25 to 50 mm slump range. The water estimate in Table2 can be reduced by approximately 10 kg for sub-angular aggregates, 20 kg for gravel with some crushed particles and 25 kg for rounded gravel to produce same workability. For the desired workability (other than 25 to 50 mm slump range), the required water content may be established by trial or an increase by about 3 percent for every additional 25 mm slump or alternatively by use of chemical admixtures conforming to IS 9103. This illustrates the need for trial batch testing of local materials as each aggregate source is different and can influence concrete properties differently. Water reducing admixtures or super plasticizing admixtures usually decrease water content by 5 to 10 percent and 20 percent and above respectively at appropriate dosages.

A-I STIPULATIONS FOR PROPORTIONING
Grade designation : M20
Type of cement : OPC 43 grade conforming to IS 8112
Maximum nominal size of aggregate : 20mm
Minimum cement content : 300 kg/m'
Maximum water-cement ratio : 0.55
Workability : 100 mm (slump)
Exposure condition : Mild (RCC IS 456:2000 Table No. 5)
Method of concrete placing : Pumping
Degree of supervision : Good
Type of aggregate : Crushed angular aggregate
m) Maximum cement content : 450 kg/m?

Preliminary investigation of natural aggregates
Various tests were carried out natural aggregates to study different physical properties there of Fine aggregates (sand): Locally available fine aggregates i.e. sand obtained from thenearby river of NASHIK was used.
The following necessary and important tests were carried out on sand
Specific gravity
Water absorption
Sieve analysis and fineness modulus.
These tests were carried out as per the relevant IS code of practice. The test result indicated that, the sand was satisfying the requirement according IS code.The salt content and clay lumps were within the limits. Same sand was used throughout all concrete mix.
Coarse aggregate: Coarse aggregate (natural aggregate) used was a crushed volcanic basalt rock. The following tests were carried out for the both natural and recycled coarse aggregates as per the procedure given is relevant IS code of practice
Sieve analysis and fineness modules
Specific gravity
Water absorption
Mechanical properties
The test result is described in the Table No. 2.2 and Table No. 2.3
Natural Aggregates:

Table 2.1: Properties of natural aggregates

Test	Result
Specific gravity	2.7
Water absorption	3.06%
Fineness modulus	3.09%
Aggregate crushing value	11.26%
Aggregate impact value	11.11%

Existing test methods for chloride penetration test:
AASHTO T259 (Salt Pounding Test)
Bulk Diffusion Test (Nordtest NTBuild 443)

AASHTO T277 (Rapid Chloride Permeability Test)
Electrical Migration Techniques
Rapid Migration Test (CTH Test)
Resistivity Techniques
Pressure Penetration Techniques
Indirect Measurement Techniques
Sorptivity

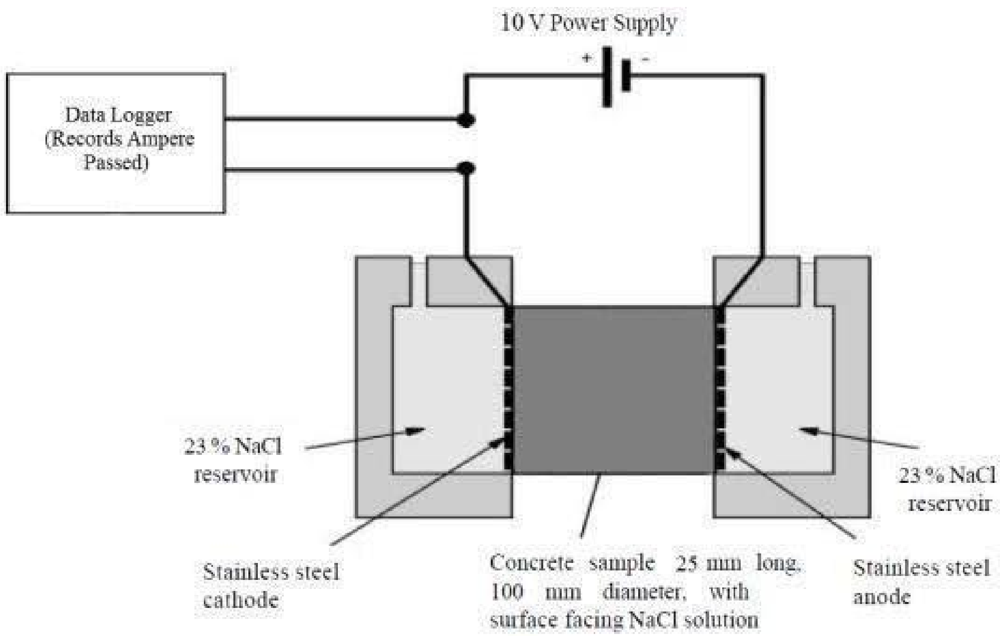

Fig. 1 AASHTO T277 (Rapid Chloride Permeability Test)

Testing for accurate M20 Grade concrete Mixture

For accurate m20 grade concrete admixture we need to 3 test (T1, T2, T3) every test wehave to cast 3 cubes of concert. The size of cube is 150x150x150mm and the ratio of cement, fine and coarse aggregate we used is as per the calculations of the following ratio

Test No.	Concrete	Super plaster	Admixture
1	1	2.73	3.71
2	1	2.65	3.75
3	1	2.83	3.70

Calculations

1. 1: 2.73: 3.71

1 + 2.73 +3.71= 7.44
3 x $(0.15)^3$ x 2580 = 26.12
Cement = $^{1}/7.44$ x 26.12 = 3.5 x 1.15 = 4 kg
Fine aggregate = 4 x 2.73 = 10.92 kg
Coarse aggregate = 3.71 x 4 = 14.84 kg Chemical admixture = $^{3}/100$ x 4 = 0.12 kgWater = $^{4}/0.58$ = 6.80 kg
1: 2.65: 3.75
1 + 2.65 + 3.75 = 7.4
3 x $(0.15)^3$ x 2580 = 26.12

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Cement = $^{1}/7.4$ x 26.12 = 3.52 x 1.15 = 4.128 kg
Fine aggregate = 4.128 x 2.65 = 10.93 kg
Coarse aggregate = 3.75 x 4.128 = 15.22 kg
Chemical admixture = $^{3}/100$ x 4 = 0.12 kg Water content = $^{4}/0.52$ = 7.70 kg
1: 2.83: 3.70
1 + 2.83 + 3.70 = 7.53
3 x $(0.15)^3$ x 2580 = 26.12
Cement = $^{1}/7.53$ x 26.12 = 3.5 x 1.15 = 4 kg
Fine aggregate = 4 x 2.83 = 11.32 kg
Coarse aggregate = 3.70 x 4 = 15 kg Chemical admixture = $^{3}/100$ x 4 = 0.12 kgWater content = $^{4}/0.52$ = 7.70 kg

Testing for accurate M30 Grade concrete Mixture
As like m20 grade of concrete, for accurate m30 grade concrete admixture we need to 3test (T1, T2, T3) every test we have to cast 3 cubes of concert. The size of cube is 150x150x150mm and the ratio of cement, fine and coarse aggregate we used is as per the calculations of the following ratio

Test No.	Concrete	Super plaster	Admixture
1	1	2.36	3.45
2	1	2.45	3.60
3	1	2.30	3.40

Calculations
1. 1: 2.36: 3.45
1 + 2.36 + 3.45 = 6.81
3 x $(0.15)^3$ x 2580 = 26.12
Cement = $^{1}/6.81$ x 26.12 = 3.83 x 1.15 = 4.5 kg
Fine aggregate = 4.5 x 2.36 = 10.60 kg
Coarse aggregate = 3.45 x 4.5 = 15.5 kg Chemical admixture = $^{3}/100$ x 4.5 = 0.135 kgWater content = $^{4.5}/0.45$ = 10 kg
1: 2.45: 3.60
1 + 2.45 + 3.60 = 7.05
3 x $(0.15)^3$ x 2580 = 26.12
Cement = $^{1}/7.05$ x 26.12 = 3.70 x 1.15 = 4.5 kg
Fine aggregate = 4.5 x 2.45 = 11.05 kg
Coarse aggregate = 4.5 x 3.60 = 16.2 kg Chemical admixture = $^{3}/100$ x 4.5 = 0.135 kgWater content = $^{4.5}/0.42$ = 10.71 kg
3. 1: 2.30: 3.40
1 + 2.30 + 3.40 = 6.7
3 x $(0.15)^3$ x 2580 = 26.12
Cement = $^{1}/6.7$ x 26.12 = 3.89 rt6g7h 8jik\][poiuytre43w2q1`x 1.15 = 4.5 kg
Fine aggregate = 4.5 x 2.36 = 10.60 kg
Coarse aggregate = 3.45 x 4.5 = 15.5 kg Chemical admixture = $^{3}/100$ x 4.5 = 0.135 kgWater content = $^{4.5}/0.45$ = 10 kg

Amount of Material we used for accurate amount and ratio od m20 and m30 gradeof concrete
Cement = 26 kg x 4 = 104 kg
Fine aggregate = 67 kg x 4 = 268 kg
Coarse aggregate = 92 x 4 = 368 kg
Chemical Admixture (Super plasticizer) = 0.765 kg x 4 = Approx 10 kg
Water content (distilled water) = 56 kg

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For which the accurate M20 grade is used for final testing is when the ratio of load carried by the cube of concrete and strength is up to the 26.6 and for the M30 grade is to be close to the 38.25

All the cubes which are cast by the ratio and proper admixtures are placed under water for next28 days curing in water to get maximum strength there were 3 cubes of test 1 M20, 3 are test 2M20 and 3 cubes are of test 3 M20 as well there are more 3 cubes are of test 1 M30 and 3 are test 2 of M30 and 3 cubes are more of test 3 M30

M20		
Test 1	Test 2	Test 3
Cube 1	Cube 1	Cube 1
Cube 2	Cube 2	Cube 2
Cube 1	Cube 1	Cube 1

Picture no. 1: curing of concrete cube in distilled water

M30		
Test 1	Test 2	Test 3
Cube 1	Cube 1	Cube 1
Cube 2	Cube 2	Cube 2
Cube 3	Cube 3	Cube 3

After 28 days of curing the cubes are placed under sunlight for up to the 2 hours until total wateris evaporated. Weight all the cubes on weight machine, note down all the weight in book.

Picture no. 2: curing of concrete cubes for 28 days after casting

After that to calculate the actual strength of the cube the (UTM) Universal Testing Machine is used. The cubes are placed in the machinery one by one and put pressure on it until the cubes getting cracks on surface, note down the strength of cube in KN this is used to calculate the ratioof load carried by the cube and strength of cube.

Grade	M20		
Test No.	Test 1	Test 2	Test 3
Cube 1	413 KN	477 KN	698 KN
Cube 2	450 KN	415 KN	570 KN
Cube 3	368 KN	341 KN	376 KN

Garde	M30		
Test No.	Test 1	Test 2	Test 3
Cube 1	1047 KN	403 KN	616 KN
Cube 2	774 KN	368 KN	829 KN
Cube 3	973 KN	410 KN	882 KN

Get the average of the weight of all cube of test 1, test 2 and test 3 of both m20 and 30 gradecubes

$$\frac{413+450+368}{3}$$

M20		
Test 1	Test 2	Test 3
410.33 KN	411 KN	548 KN

M30		
Test 1	Test 2	Test 3
931.33 KN	393.66 KN	775.67 KN

To calculate the accurate M20 grade and M30 grade the average weight or load is divided bythe size of the cube

$$\frac{410.33}{0.150 \times 0.150 \times 0.150}$$

After calculating all the load the nearest to 26.6 and 38.25 is accurate grade of M20 and M30respectively

Calculations

For M20

I. 410.33/0.150X0.150X0.150 = 61.5495 KN/M^2

II. 411/0.150X0.150X0.150 = 61.54 KN/M^2

III. 548/0.150X0.150X0.150 = 82.22 KN/M^2

Calculations

For M30

I. 931.33/0.150X0.150X0.150 = 139.69 KN/M^2

II. 393.66/0.150X0.150X0.150 = 59.04 KN/M^2

III. 775.67/0.150X0.150X0.150 = 116.35 KN/M^2

All above calculations conclude that for penetration test on concrete Test 1 of m20 grade cube mixture is use and for m30 Test 2 cube mixture is use

IV. CONCLUSION

First of all I chose a topic and it was called Study on behavior of chlorine effect to the concrete and behavior of bond sress of concrete. I have studied all the research papers related to that topic. I took the help of IS Code-14959 Part 2 (2001) and 10262 (2009) to check the concrete.

A lot of information was obtained from it, which was useful for me to do my project. I was using some chemicals to test the concrete; I bought those chemicals from the market. With the help of those chemicals I was perform the test on concrete through which I am come to a conclusion.

The conclusion is 1)Higher the grade of concrete and mixture higher the strength and durability of concrete in construction and vise versa

2) Sometimes chloride ions cause corrosion in steel which are used in construction as material with the concrete to prevent this chloride penetration test we done

3) High-volume fly ash replacing cement helps to improve the fluidity, volume stability, durability, and economy of concrete.

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