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Detailed Study of Mix Design of Self Compacted Concrete

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ABSTRACT

The self-compacted concrete can be explained as an innovative product in Civil Engineering discipline in India. This product is necessary for civil engineers in order to win difficulty of workmanship. This product was first used in Japan and followed via Europe and United States. Sizeable research becomes achieved with regard to the residences of SCC due to the properly-controlled conditions. Examples of applications are proven, each for prefabricated concrete elements and in- situ structures. On this examine the location has been covered is making the layout mix of self-compacted concrete and its overall performance – financial comparisons with winning traditional grade of concrete of m-40 grade.

Keywords: *Compacted Concrete, Construction Website, Mix Design of Concrete.*

1. INTRODUCTION

Self-compacting concrete (SCC) become first developed in Japan, within the early 1990s of the preceding century, underneath the stimulating leadership of professor Okamura. The main concept at the back of self-compacting concrete changed into, that the sort of concrete is robust and relatively insensitive to horrific workmanship. The primary power to broaden self-compacting concrete's was the choice to enhance the exertions situations at the constructing web page and in the manufacturing unit. For the duration of latest years self-compacting concrete evolved to investigate a big range of research initiatives, followed by means of guidelines for capacity users. Particularly for the precast concrete industry self-compacting concrete turned into a progressive leap forward. Contrary to that, casting of SCC at the construction website online was appeared with greater reservation. Not with standing a number of successful examples, a few troubles because of wrong use of SCC generated in addition skepticism. Consequently, the important undertaking now is to broaden SCC combos, which might be much less sensitive to deviations in properties of the additives and external situations. The primary reasons at the back of the popularity of self-compacted concrete are indexed beneath.

- Quicker production
- Reduction in website online manpower
- Higher floor end
- clean placing
- improved durability
- Greater freedom in layout
- Thinner concrete sections
- Absence of vibration, decreased noise ranges
- Safer operating surroundings

Mix Design of concrete for M40

Given data

Grade designation M-40
Nominal size of aggregate 20 mm
Water- cement ratio 0.45
Type of mineral admixture Fly Ash
Slump 110mm
Exposure condition Severe

Test data for material
Specific gravity of cement = 3.15
Specific gravity of fly ash = 2.2
Specific gravity of fine aggregate = 2.73
Specific gravity of coarse aggregate = 2.83
Water absorption of coarse aggregate = 0.6%
Water absorption of fine aggregate = 1%
Target strength for mix proportions

$$F'_{ck} = f_{ck} + 1.65s$$

Where s = standard deviation
Adopting s = *5* for M40
Hence fck' = *40 + 1.65 x 5 = 48.25* N/mm^2
Adopting water cement ratio *0.42*
Maximum water content for *20 mm* aggregate= *186* litres (for *50 mm* slump)
Beyond 50mm slump every *25 mm* slump will be given *3%* increment
Hence total value of water content = $\left(186 \times \frac{9}{100}\right) + 186 = 202$ *litres*
Using super plasticizer water content can be reduced up to 30%. Based on trial mixes water content reduction of 26% has been achieved.
Total required water content = *202 x 0.74 = 149.48 litres*
Total quantity of cementitious materials (cement + fly ash) = *149.48/ 0.42*
= *355.90 Kg/ m^3*
But IS code recommends that minimum cement content for severe conditions = *320 kg/ m^3*
Increase 12% cementitious materials = *355.90 x 1.12* = *398.6 Kg/ m^3*
Water content = *149.48 litres*
Water- Cement ratio = *149.48/398.6* = *0.375*
Fly ash @ 30% of total cementitious materials = *398.6 x 0.3*
= *119.5 kg/ m^3*
Cement = *398.6 – 119.5* = *279.1 Kg/ m^3*
Saving of cement while using fly ash = *355.9 – 279.1* = *76.8 kg/ m^3*
Flyash being utilized = *119.5 kg/ m^3*

Mix calculations

Volume of concrete (a) - 1 m^3
Volume of cement (b) - mass of cement/ Sp. Gravity of cement x 1000
= *279.1/3.15 x 1000*
= *0.0886 m^3*
Volume of fly ash (c) = mass of fly ash/ Sp. Gravity of fly ash x 1000
= *119.5/2.2 x 1000*
= *0.0543 m^3*
Volume of water (d) = *149.48/1000*
= *0.149 m^3*
Volume of chemical admixture @ 2% by weight of cementitious materials
(e) = *7/ 1.145 x 1000*
= *0.007 m^3*
Volume of all aggregates (coarse + fine) = *[a – (b + c + d + e)]*
= *[1 – (0.0886 + 0.0543 + 0.1492 + 0.0071)]*
= *0.7008 m^3*
Mass of coarse aggregates = *0.7008 x 0.56 x 2.83 x 1000*
= *1110.62 Kg*
Mass of fine aggregates = *0.7008 x 0.44 x 2.73 x 1000*
= *841.8 Kg*

2. CONCLUSION

Component	Cement	Coarse Aggregate	Fine Aggregate	Fly ash	Water	Chemical admixture
Quantity (kg)	*279.10*	*1110.62*	*841.80*	*119.5*	*149.48*	*7*

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