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ACT Assignment no. 1

1. Explain the physical properties, and IS code guide lines for M-S and GGBS.

→ Following are the physical properties of MS and.

i. Shape - Cubical particles
ii. Gradation - Can be controlled
iii. Silt and organic impurities - absent
iv. Specific gravity - 2.5 - 2.9
v. Water absorption - 2.4 %.
vi. Moisture - upto 10%.
vii. Soundness - Relatively sound
viii. Alkali silica reactivity - 0.001 at - 0.005

Following are the IS code guidelines for M-Sand.

i. All the sand particles should have higher crushing strength.
ii. The surface texture of the particles should be smooth.
iii. The edges of the particles should be grounded.
iv. The ratio of fines below 600 microns in sand should not be less than 30%.
v. There should not be any organic impurities.
vi. Silt in sand should not be more than 2%, for crushed sand.
vii. In manufactured sand the permissible limit of fines below 75 microns shall not exceed 15%.

The following are the physical properties of GGBS:
specific gravity - 2.9
Bulk density - 1200 Kg/m^3
Fineness - 350 m^2/Kg
Calcium Oxide content - high
Odour - None or slight sulphur odour.
Appearance - white to light grey powder.
size - less than 30 micron
pH - 10 - 12.

Following guidelines should be followed.
i. GGBS should be stored enclosed such as product bags or silos, and avoid storing out in the open. If so to prevent wind blown dust, it should be stored in a damp state.
ii. Avoid contact with eyes and skin.
iii. If possible recover the spillage in a dry state by mechanical means such as vaccuming, to minimise generation of airborne dust.
iv. Avoid generation of dust.

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2. Explain in brief quality control criteria given by IS code and also identify the need of quality control of RMC.

→ IS guidelines for quality control:

i. Sampling of concrete:
Three fresh samples of totaling not less than 0.02 m^3 taken directly from mixture or from placed concrete at time of placing collected for fresh concrete tests and checking 28 days strength.

ii. Three test specimens shall be made for each sample for testing at 28 days. Additional samples may be required for various purposes such as to determine the strength of concrete at 7 days.

iii. The specimen shall be tested as described in IS516

iv. The test results of sample shall be the average of the strength of three specimens. The individual variation should not be more than ±15 percent of the average.

v. Characteristics strength of concrete, which is the strength of material below which not more than 5% of the test results are expected to fall.

vi. Target strength should be higher than characteristics strength and calculated as
$f_t = f_{ck} + kxs$

vii. Probability factor for tolerance is 1.65, hence relation is $f_t = f_{ck} + 1.65s$.

viii. minimum frequency of sampling should be followed
for $5m^3$ → no. of samples is 1 and for $6-5m^3$ → 2, for $16-30m^3$ → 3, for $16-30m^3$ → 3, for $31-50m^3$ → → 4, 51 above → 4+1.

ix. Standard deviation of each grade should be determine from test strength results of samples. Total no. of test samples required should not be less than 30.

Grade of concrete		Standard deviation
M15	→	3.5
M20 to M25	→	4.0
M30 to M50	→	5.0

Need of quality control of RMC:

i) Different factors such as equipments, slump test, air content, unit weight, temperature, molds, flexural strength, curing, testing machine should be properly maintained and checked.
ii) Moisture test, specific gravity test, gradation of aggregates should be done to ensure quality.
iii) Also trial batches of concrete, setting time test, split tensile strength, penetration resistance test, organic matter level, compressive strength of mortars cubes, consistency test on cements should be followed.

For all these reasons there is need of quality control of RMC.

3. Decide the special concrete you prefer for following applications and justify why?

→ Case I: Non load bearing wall panels, building blocks, etc. to minimize dead load of structure. For such a condition light weight concrete should be used as it is having very less density 1450 to 1550 Kg/m^3 and some cases ultra light weight concrete can be also used LWC concrete reduced dead load but at same time good compressive strength is maintained. weight of aggregates is very less.

Case II: Parking areas, garden pathways, sidewalls to minimizes flash flooding.
In this situtation Pervious concrete should be used. This concrete allows water from precipitation and other sources to pass through, thereby reducing the runoff from a site and allowing groundwater recharge.

Case III: High rise structures, long span bridges, where concrete want more durability in severe environments with high strength.
In this case High Performance concrete should be used. This should be used because of toughness, impact resistant, resistant to chemical attacks, no segregation, and strength upto 70 MPa.

4. Explain how geopolymer is different than HPC and HSC considering material used, methodology and application area.

→ Considering material used:
Well superplasticizers are used in all these three types. HPC uses almost all type of materials for ex Retards, Accelerators, water reducers, etc.
Geopolymer concrete have well graded aggregates, crush sand as per Zone II, superplasticizers and alkaline activators.
Considering methodology used:
In HPC pozzolanas, superplastizers, retarders, etc are used curing rate accelerated for early strength, portlandite for good bonding.
In HSC 20 mm coarse aggregates, cement content higher, lower w/c content, temperature higher, wodability should be higher. In Geopolymer cours aggregates, fine aggregates, flyash used with alkaline solution, heat generated and get performance binding.
Application area:-
Geopolymers are used in water retaining structure like water tank Light pavements, precast panels for retaining wall, precast concrete products, marine structure & chemical resistant HPC application is totally different. High rise bldg, parking guarages, HSC application → High rise, Highload carrying bldgs, prestress number, industrial structures, dams, offshore structures.