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APPENDICES

Appendix (A)

Data Sheet of Superplasticizer

Appendix(A)

Caplast Super-Special

DESCRIPTION:

Caplast Super-Special is a high range, high performance super plasticizer, which reduces water requirement considerably with significant enhancement of compressive strength.

FEATURES:

Caplast Super-Special increases the workability of concrete mixes by its powerful de-flocculating and dispersing effect on cement particles. The effect enables to produce high workability concrete and significant reduction in the free water content.

STANDARDS:

Caplast Super-Special complies with ASTM C 494 type F and BS 5075 part III.

USES:

Caplast Super-Special can be used for:

- Producing high workability, self compacting, high strength concrete especially for precast industries.
- Producing high workability concrete where heavily congested reinforcement poor access exists.
- For piling applications.
- For low water cement ratio concrete.

ADVANTAGES:

- Up to 25% water reduction.
- Flowable concrete with low w/c ratio.
- High range admixture which can be used as a conventional plasticizer to a super plasticizer.

- Initial and final set do not vary much with respect to concrete without admixture (reference mix).
- Imparts rheoplastic qualities to concrete with normal setting time.
- High early strength can significantly increase mold utilization in pre-cast work.
- Due to reduction in w/c ratio, hardened concrete shows high strength, impermeability, durability and dimensional stability (high elastic modulus, low shrinkage and creep).
- Substantial increase in workability can be obtained by addition of Caplast Super-Special to a mix having a slump in the range 50 mm to 100 mm, the magnitude of this increase is often such that the concrete becomes self compacting and no vibration is required to achieve a dense and void free concrete.

TYPICAL PROPERTIES:

Appearance:

Deep brown liquid

Specific gravity:

1.190 at 25°C

Solubility:

Soluble in water.

Chloride content:

Nil to BS 5075.

Air entrainment:

Conforming with ASTM C494 section 12.2.1

Retardation:

Negligible with normal dosage.

Toxicity:

Non toxic

Compatibility with cement:

Compatible with all types of Portland, Pozzolanic and blast furnace cements. Can also be used with mix designs containing fly ash and microsilica.

Compatibility with other admixtures:

Compatible with other Ahlia admixtures, provided they are added separately to the mix.

Shelf life:

At least 18 months if stored in tightly closed containers at normal ambient temperature.

DIRECTIONS FOR USE:

Caplast Super-Special is supplied ready to use. It should be added to concrete mixes during mixing process preferably at same time along with mix water.

Dosage:

Field trials should be conducted to determine the optimum dosage of Caplast Super-Special with actual concrete mix and job conditions. Rate of addition can be varied to get desired results. As a general guide, a dosage range of 0.4 to 1.5 liters per 50 kg of cement is recommended as a starting point.

For early high strength concrete, a higher dosage is required.

Dispensing:

Best by dispenser into the gauging water or directly with water into the mixer .

Overdosing:

An overdose of double the recommended dose will result in increased workability and set retardation.

Provided if properly cured, the ultimate strength of concrete will not be adversely effected.

SAFETY PRECAUTIONS:

Caplast Super-Special is nontoxic and non-flammable. Splashes to eyes and skin should be washed off at once with water. It is advisable to use goggles and gloves while handling Caplast Super-Special.

PACKAGING:

Caplast Super-Special is supplied in bulk (by arrangement), 205 liter barrels, or 20 liter cans.

STORAGE:

Preferably store in sealed conventional containers, protected from extreme weather conditions.

Appendix (B)

Mix Design and Laboratory Images

Appendix (B):

B.1 Mixes Proportions:

Characteristic strength: specified 30 N/mm^2 at 28 days.

Proportion Defective percent = 5%

Standard deviation: Fig 3 8 N/mm^2

Margin C1 1.64 * 8 = 13 N/mm^2

Target mean strength C2 30 + 13 =43 N/mm^2

Cement type Specified (OPC)

Aggregate type coarse Uncrushed

Aggregate type: fine Uncrushed

Free-water/cement ratio Table 2 (Fig 4) = 0.48

Slump Specified (30 – 60 mm)

Maximum aggregate size Specified 20 mm

Free- water content Table 3 180 kg /m^3.

Cement content C3 180/ 0.48 = 375 Kg / m^3

Relative density of aggregate 2.6 Known/assumed

Concrete density Fig 5 2360 Kg/m3

Total aggregate content C4 2360 – 180 – 375 = 1805 kg / m^3.

Grading of fine aggregate percentage passing 600μm sieve 70%

Proportion of fine aggregate Fig 6 30%

Fine aggregate content 0.30 * 1805 = 540 kg / m^3

Coarse aggregate content 1805 – 540 = 1265 kg / m^3

Quantities per m3:

Cement (kg)	Water (kg)	Fine aggregate (kg)	Coarse aggregate (kg)
375	180	540	1265

B.2 Tables and charts for mix design:

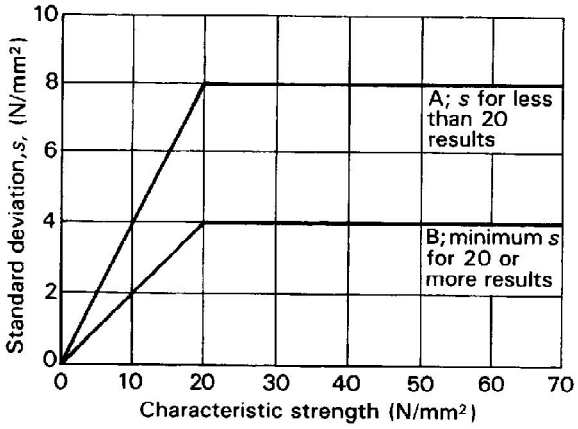

Figure 3
Relationship between standard deviation and characteristic strength

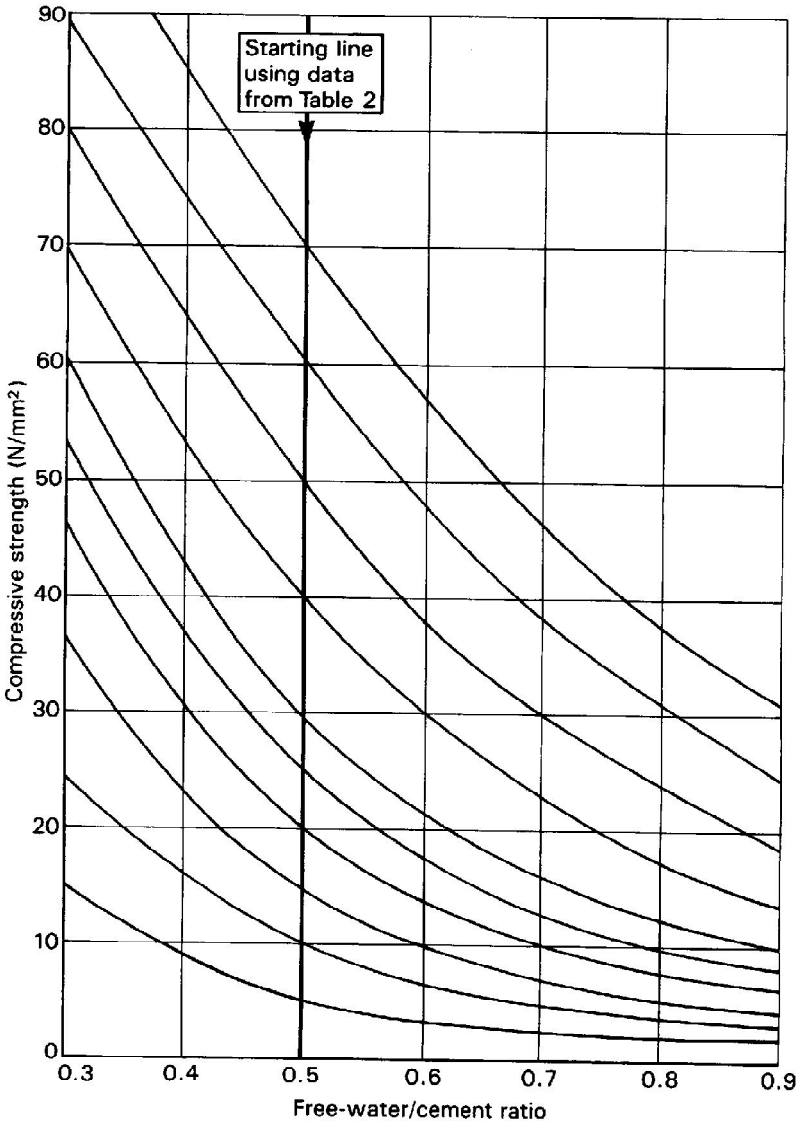

Figure 4
Relationship between compressive strength and free-water/cement ratio

Table 2 Approximate compressive strengths (N/mm^2) of concrete mixes made with a free-water/cement ratio of 0.5

Cement strength class	Type of coarse aggregate	Compressive strengths (N/mm^2) Age (days) 3	7	28	91
42.5	Uncrushed	22	30	42	49
	Crushed	27	36	49	56
52.5	Uncrushed	29	37	48	54
	Crushed	34	43	55	61

Throughout this publication concrete strength is expressed in the units N/mm^2.
$1\ N/mm^2 = 1\ MN/m^2 = 1\ MPa$. (N = newton; Pa = pascal.)

Table 3 Approximate free-water contents (kg/m^3) required to give various levels of workability

Slump (mm)		0–10	10–30	30–60	60–180
Vebe time (s)		>12	6–12	3–6	0–3
Maximum size of aggregate (mm)	Type of aggregate				
10	Uncrushed	150	180	205	225
	Crushed	180	205	230	250
20	Uncrushed	135	160	180	195
	Crushed	170	190	210	225
40	Uncrushed	115	140	160	175
	Crushed	155	175	190	205

Note: When coarse and fine aggregates of different types are used, the free-water content is estimated by the expression:

$$\tfrac{2}{3} W_f + \tfrac{1}{3} W_c$$

where W_f = free-water content appropriate to type of fine aggregate
and W_c = free-water content approporiate to type of coarse aggregate.

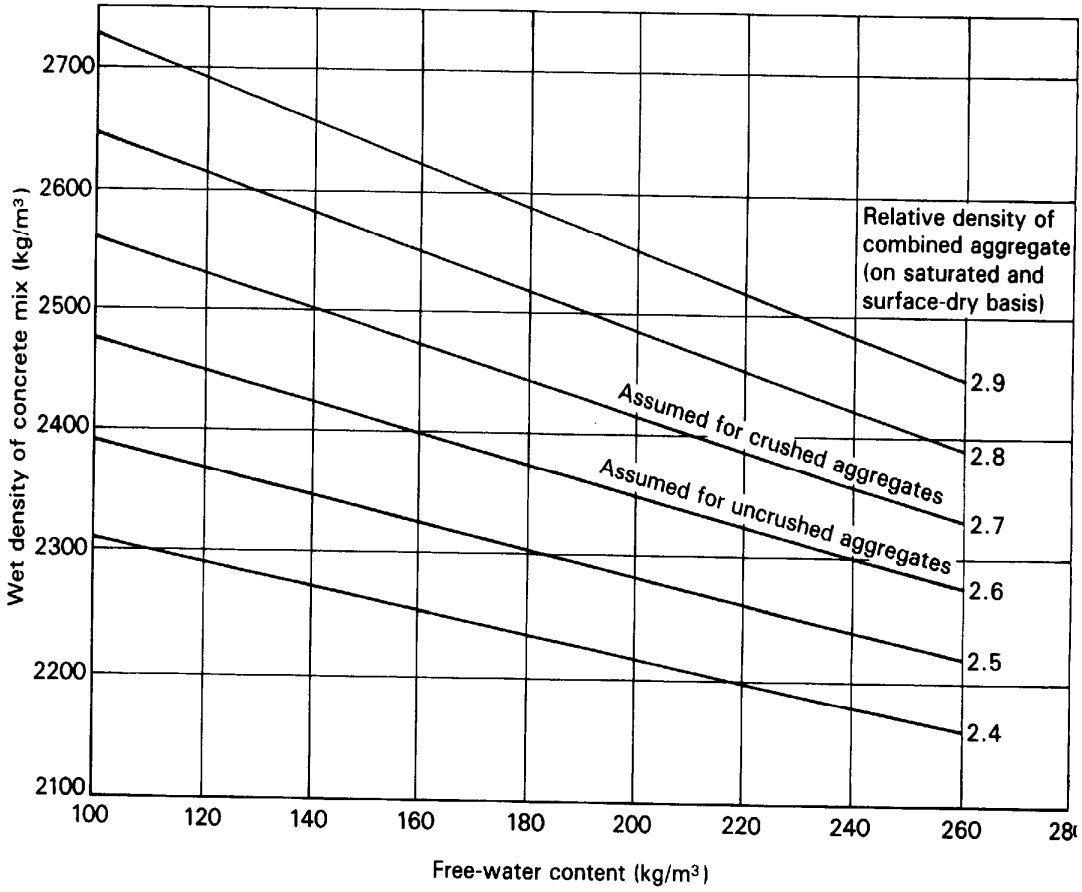

Figure 5 Estimated wet density of fully compacted concrete

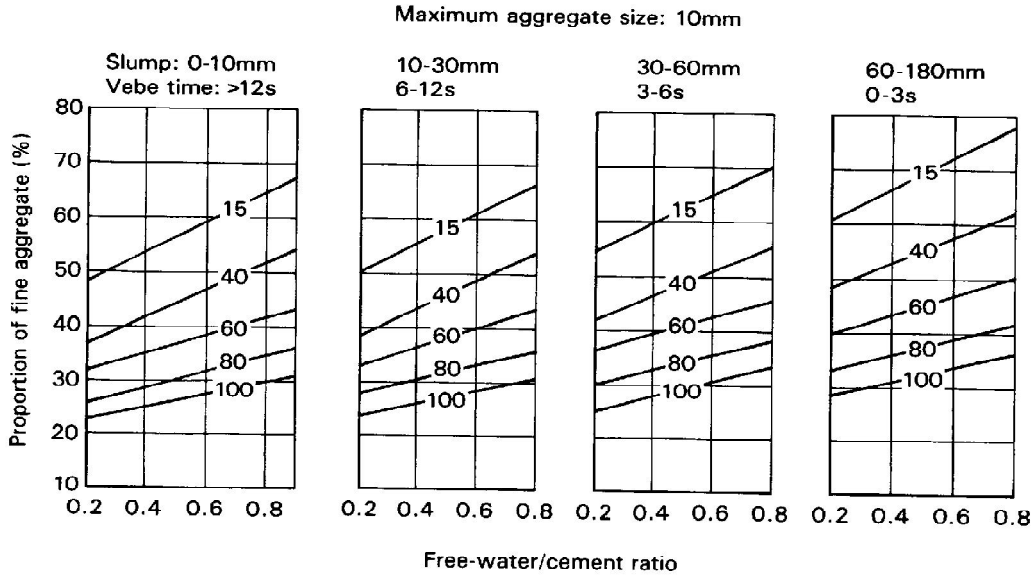

Figure 6 Recommended proportions of fine aggregate according to percentage passing a 600 μm sieve

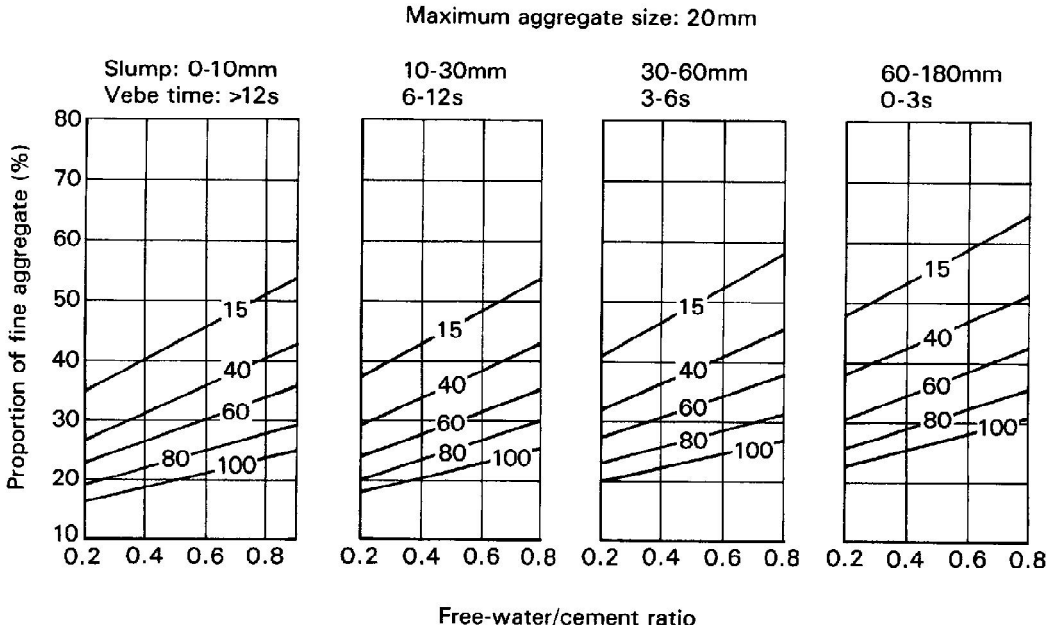

Figure 6 (continued)

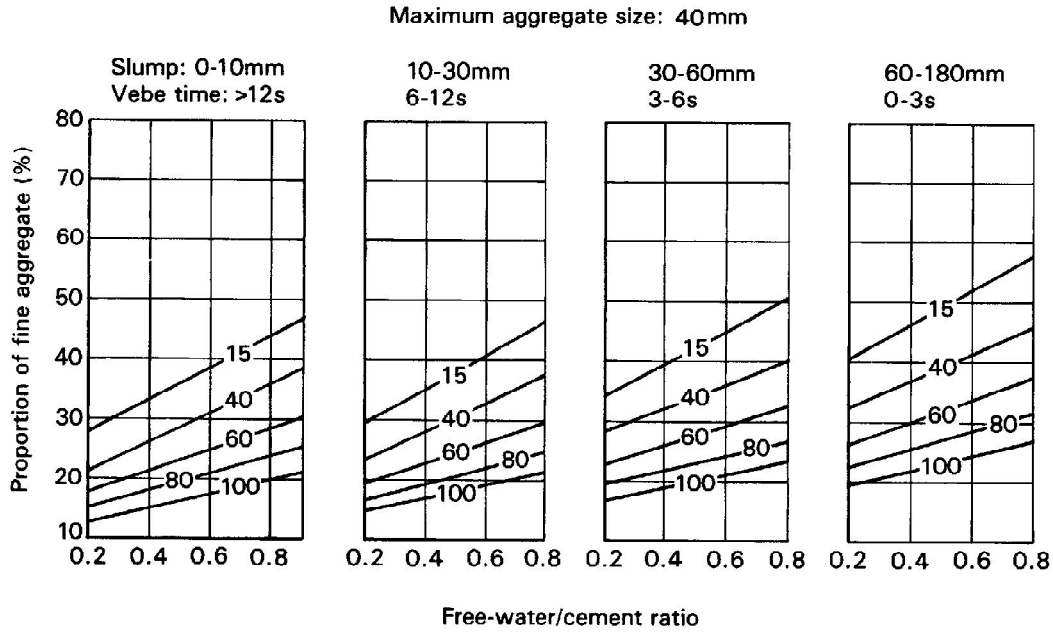

Figure 6 (continued)

B.3: Pictures

Aggregate components

Super plasticizer (SP901

Crush Machine **Sieves**

Cubes Specimens(0.0, 0.4, 0.8, 1.2, 1.5) SP

Cubes Specimens (0.4, 0.8) (SP) cement reduction

Absorption Cubes

Cubes preparation