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Castle High Alumina Cement technical specification

Castle High Alumina Cement (HAC) is manufactured to comply fully with the requirements of BS915 : Part 2 : 1972 (1983) High Alumina Cements.

The manufacturing process of Castle High Alumina Cement clinker resembles that of a metallurgical foundry and the cement is based on calcium aluminates rather than the calcium silicate basis of Castle Ordinary Portland Cement. This fundamental difference to Portland cements confers upon Castle HAC properties which makes it suitable for a variety of special applications. It may also be used with Castle OPC in carefully controlled proportions for rapid setting applications. The setting properties of Castle HAC are similar to Castle OPC but the strength development is rapid.

Applications

It is vital that Castle High Alumina Cement is not used for structural purposes.

However, it may be used in the following applications:

- Rapid strength gain concretes and mortars allowing fast stripping of formwork within six to twenty-four hours.
- Heat resistant and refractory concretes.
- Cold weather concreting where the heat released in the rapid hardening process allows concreting to take place in conditions as low as -10°C.
- Concretes subject to severe chemical attack such as agricultural environments, food industry flooring and drainage systems.
- Mixed with Portland cements, Castle HAC produces rapid setting concretes and mortars for non-structural applications such as sealing leaks or temporary repairs. Careful selection of proportions is necessary in this application to avoid flash set.

Quality

Castle HAC is produced using carefully selected limestone and bauxite. The clinker produced in the kiln, which is similar to a metallurgical smelting furnace, is then ground in a conventional cement mill to produce Castle HAC to BS915 : Part 2 : 1972 (1983). Strict quality control at each stage of the manufacturing process helps to ensure that a consistent final product is obtained.

Technical information on the quality of Castle HAC is available on request from Castle's Technical Helpline on 0845 722 7853. Such information includes data on fineness, chemical composition, strength, setting time and soundness.

Properties

Strength

Very high early strength is a fundamental characteristic of Castle HAC. Typical mortar compressive strengths (BS4550) are as follows:

24 hours	minimum 42N/mm ²
3 days	minimum 49N/mm ²

Physical properties

Bulk density	1140kg/m ³
Specific gravity	3.2 – 3.3

Hydraulic properties

Setting time BS915 : Part 2 : 1972 (1983)

	Specification	Typical
Initial (minutes)	Min 120/Max 360	230
Final (minutes)	Max Initial + 120	260

Concrete mix design

Concrete mix design needs to be varied to suit individual circumstances. However, as a general guide cement contents should be at least 400kg/m³ and total water/cement ratio should not exceed 0.40. It is important to ensure adequate curing during the initial hardening stage. This may be achieved by spraying with cold water during the 6 to 24 hour period after placing or by the use of a curing membrane, wet sacking or impervious polythene sheeting to prevent water loss.

The following is a guide to the setting characteristics of mixtures

1 part Castle High Alumina Cement 3 parts Castle Ordinary Portland Cement	– Rapid set
1 part Castle High Alumina Cement 2 parts Castle Ordinary Portland Cement	– Very rapid set
1 part Castle High Alumina Cement 1.5 parts Castle Ordinary Portland Cement	– Instant set

Placing and compaction

Mortars and concretes based on Castle HAC alone can be mixed, placed and compacted using normal techniques for Portland cement mortars and concretes. Mixtures of Castle HAC and Castle OPC will set at a rate depending on the particular mix. Special placing and compacting techniques may be required in these cases.

It is strongly recommended that trial mixes are carried out to determine proportions for the desired setting characteristics.

Admixtures and extenders

Admixtures which are compatible with Castle Portland cements are normally equally compatible with Castle HAC. It is recommended however that trial mixes are carried out to determine optimum properties.

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