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# Castle Ordinary Portland Cement technical specification

Castle Ordinary Portland Cement (OPC) is manufactured to comply with the requirements of BS EN 197-1 : 2000 type CEM I Portland cement strength class 42,5N.

Castle OPC is recommended as a general purpose cement for use in concretes, mortars, renders, screed and grouts.

## Applications

Ordinary Portland cement is the most commonly used cement for a wide range of applications. These applications cover dry-lean mixes through general purpose ready-mix, to high strength pre-cast and pre-stressed concretes.

Castle OPC is suitable for use with a wide range of additives and admixtures to extend the properties and uses of concretes. In ground conditions requiring increased resistance to chemical attack Castle SRPC, manufactured to comply with BS4027 : 1996, is recommended to give improved durability (see Castle Sulfate-resisting Portland Cement). Castle OPC may be used in a wide range of mortars. For mortars for use in brick and block laying and in renders, Castle Multicem, manufactured to comply with BS EN 197-1 : 2000 or Castle Masonry Cement, manufactured to comply with BS5224 : 1995, may give enhanced performance in some circumstances (see Castle Multicem and Castle Masonry Cement).

## Quality

Castle OPC is produced using carefully selected raw materials. Strict quality control throughout each stage of the manufacturing process ensures that a consistent final product is achieved.

Each Castle OPC is CE marked under the European Union system of conformity evaluation which provides independent third party certification of product conformity. It confirms that in addition to applying a system of factory production control (defined in BS EN 197-2 : 2000), independent sampling and testing of the cement has confirmed conformity with all the requirements of BS EN 197-1 (see Quality Assurance).

Technical information on the quality of Castle OPC is available to customers on request from Castle's Technical Helpline on 0845 722 7853. Reports of tests providing data on fineness, setting times, soundness, chemical composition including alkali levels and compressive strengths of mortar prisms, are available on a weekly basis.

## Strength

Optimum performance in terms of strength and durability is achieved in concrete when the water/cement ratio is kept as low as possible, consistent with ensuring satisfactory placing and thorough compaction.

Other factors affecting strength include conditions of curing as well as the individual properties of the constituent materials and their proportions in the mix.

The potential strength of any Portland cement based product will only be best developed under saturated conditions. Loss of any water to the surroundings should be guarded against and for a period of at least seven days precautions should be taken to keep the concrete moist and to prevent premature drying. The rate of strength development will depend on ambient conditions and the initial temperature of the mix. As a general rule, concrete should be placed within the range of 10°C to 30°C. In cold weather, freshly poured concrete should be protected against frost to avoid damage. At higher temperatures there is increased risk of loss of water by evaporation, cracking caused by thermal stresses and reduced ultimate strength.

## Concrete mix design

Concrete mix design needs to be varied to suit individual circumstances. The following table gives a guide towards producing durable concrete.

### Mixes for durable concrete

Conditions of exposure	Minimum cement content (kg/m <sup>3</sup> )	Maximum free water/cement ratio
<b>Mild</b>		
Concrete surfaces protected against weather or aggressive conditions	220	0.80
<b>Moderate</b>		
Concrete surfaces sheltered from severe rain or freezing whilst wet Concrete subject to condensation Concrete surfaces continuously under non-aggressive water Concrete in contact with non-aggressive soil	275	0.65
<b>Severe</b>		
Concrete surfaces exposed to severe rain, alternate wetting and drying or occasional freezing or severe condensation	300	0.60
<b>Very severe</b>		
Concrete surfaces occasionally exposed to sea water spray, de-icing salts (directly or indirectly), corrosive fumes or severe freezing conditions whilst wet	325	0.55
<b>Most severe/abrasive</b>		
Concrete surfaces frequently exposed to sea water spray or de-icing salts Concrete surfaces exposed to abrasive action, e.g. machinery, vehicles or water carrying solids	350	0.50
<b>Notes:</b> Recommendations are for unreinforced concrete made using 20mm aggregate. Where the concrete contains reinforcing steel increase requirements by one grade. Where the concrete is to be subjected to freezing and thawing conditions whilst wet, or is to be exposed to de-icing salts, controlled air-entrainment should be used.		

## Castle OPC in mortars

Castle OPC is suitable for use in a wide variety of mortars for floor screeds, jointing of brick and blockwork and renders for internal and external applications. Performance of mortars will depend on the properties of the sand, mix design and site practice. Technical advice on the use of Castle OPC in mortars is available on request from Castle's Technical Helpline on 0845 722 7853.

## Admixtures and extenders

Admixtures such as air entraining agents and workability aids, extenders such as ground granulated blastfurnace slag and Castle BS EN 450 Fly Ash, are compatible with Castle OPC. It is recommended that trial mixes are carried out to determine optimum proportion.

### For further information please contact:

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