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Requirements of Ordinary Portland Cement as per IS 269-2015

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The ordinary Portland cement shall be classified into the following categories:

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| a) Ordinary Portland Cement, 33 Grade | : OPC 33 |
| b) Ordinary Portland Cement, 43 Grade | : OPC 43 |
| c) Ordinary Portland Cement, 53 Grade | : OPC 53 |
| d) Ordinary Portland Cement, 43 Sleeper Grade | : OPC 43S |
| e) Ordinary Portland Cement, 53 Sleeper Grade | : OPC 53S |

The physical and chemical requirements of various cements is tabulated overleaf. The cement may be rejected, if it does not comply with any of these requirements. Cement remaining in bulk storage at the factory, prior to shipment, for more than six months, or cement in bags, in local storage such as, in the hands of vendor for more than 03 months after completion of tests, shall be re-tested before use.

The net quantity of cement per bag shall be 50 kg unless otherwise specified. Each bag of cement shall be legibly and indelibly marked with the following:

- Manufacturer's name and its trademark, if any
- Name and designation of Ordinary Portland Cement
- Net quantity in Kg
- Words 'Use No Hooks' on the bags
- Batch/control unit no. in terms of week, month and year of packing
- Best before date (i.e. 3 months from date of packing)
- Need for testing of cement more than 3 months old to check conformity before its use
- Address of manufacturer

DISCLAIMER

The information contained in this pamphlet does not supersede any existing provisions laid down in RDSO & Railway Board instructions. This document is not statutory & instructions given in it are for the purpose of guidance only.

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SN	Material / Test	Method of Test, Ref to	OPC 33	OPC 43	OPC 43S	OPC 53	OPC 53S	
1	PHYSICAL TESTS (Table 3 of IS 269:2015)							
A	Fineness, m ² /kg, <i>Min</i>	IS 4031 (Part 2)	225	225	370	225	370	
B	Soundness:							
	a) By Le-Chatelier Method, mm, <i>Max</i>	IS 4031 (Part 3)	10	10	5	10	5	
	b) By Autoclave Test Method, percent, <i>Max</i>		0.8	0.8	0.8	0.8	0.8	
Note: In the event of cements failing to comply with any one or both the requirements of soundness as specified, further tests in respect of each failure shall be made as described in IS 4031 (Part 3), from another portion of the same sample after aeration. The aeration shall be done by spreading out the sample to a depth of 75mm at a relative humidity of 50 to 80 percent of a total period of 7 days. The expansion of cements so aerated shall be not more than 5mm and 0.6 percent when tested by Le-Chatelier method and autoclave test respectively. For OPC 43S and OPC 53S, the requirement of soundness of unaerated cement shall be maximum expansion of 5 mm when tested by Le-Chatelier method.								
C	Setting time:							
	a) Initial, minutes, <i>Min</i>	IS 4031 (Part 5)	30	30	60	30	60	
	b) Final, minutes, <i>Max</i>		600	600	600	600	600	
Note: If cement exhibits false set, the ratio of final penetration measured after 5 min of completion of mixing period to the initial penetration measured exactly after 20 second of completion of mixing period, expressed as percent, shall be not less than 50. In the event of cement exhibiting false set, the initial and final setting time of cement when tested by the method described in IS 4031 (Part 5) after breaking the false set, shall conform to the values given above.								
D	Compressive Strength, MPa (N/mm²):							
	a) 72 ± 1 h, <i>Min</i>	IS 4031 (Part 6)	16	23	23	27	27	
	b) 168 ± 2 h, <i>Min</i>		22	33	37.5	37	37.5	
	c) 672 ± 4 h,		<i>Min</i>	33	43	43	53	53
<i>Max</i>			48	58	-	-	-	
E	Transverse Strength (optional)	IS 4031 (Part 8)	Mutually agreed to between the purchaser and the supplier at the time of placing the order					
2	CHEMICAL TESTS (Table 2 of IS 269:2015)							
A	Ratio of percentage of lime to percentages of Silica, Alumina and Iron Oxide, when calculated by the formula: $\frac{\text{CaO} - 0.7 \text{SO}_3}{2.8 \text{SiO}_2 + 1.2 \text{Al}_2\text{O}_3 + 0.65 \text{Fe}_2\text{O}_3}$	IS 4032	0.66	0.66	0.80	0.80	0.80	
B	Ratio of percentage of Alumina to that of Iron Oxide, <i>Min</i>		0.66	0.66	0.66	0.66	0.66	
C	Insoluble residue, percent by mass,		<i>Max</i>	5.0	5.0	2.0	5.0	2.0
			<i>Min</i>	-	-	-	-	-
D	Magnesia, percent by mass, <i>Max</i>		6.0	6.0	5.0	6.0	5.0	
E	Total Sulphur content calculated as Sulphuric Anhydride (SO ₃), percent by mass, <i>Max</i>		3.5	3.5	3.5	3.5	3.5	
F	Loss of ignition, percent by mass, <i>Max</i>		5.0	5.0	4.0	4.0	4.0	
G	Chloride content, percent by mass, , <i>Max</i>		0.1	0.1	0.1	0.1	0.1	
			0.05*	0.05*	0.05*	0.05*	0.05*	
			* (for prestressed structures)					
H	Alkali content expressed as Sodium oxide (Na ₂ O+ 0.658 K ₂ O)	< 0.6%						
	Note: On large and important jobs where concrete is likely to be exposed to humid or wetting action, it is advisable that the aggregate to be tested for alkali aggregate reaction. In the case of reactive aggregates, the use of cement with alkali content below 0.6 percent expressed as sodium oxide (Na ₂ O+ 0.658 K ₂ O), is recommended.							
I	Tricalcium aluminate content (C ₃ A) [C ₃ A = 2.65 (Al ₂ O ₃)-1.69 (Fe ₂ O ₃)], percent by mass, <i>Max</i>	IS 4032	-	-	10.0	-	10.0	
J	Tricalcium silicate (C ₃ S) [C ₃ S=4.07(Ca)-7.6(SiO ₂)-6.72(Al ₂ O ₃)-1.43(Fe ₂ O ₃)-2.85(SO ₃), percent by mass, <i>Min</i>		-	-	45.0	-	45.0	