3 CEMENTITIOUS MATERIALS

3.1 GENERAL

3.1.1 Scope

1 This Part covers the requirements for the testing and use of cement in structural concrete.

2 Related Sections and Parts are as follows:

Part 6 Property Requirements

3.1.2 References

1 The following standards are referred to in this Part:

ASTM C10/C10M....Standard Specification for Natural Cement
ASTM C91/C91M....Standard Specification for Masonry Cement
ASTM C114.....Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C115/C115M Standard Test Method for Fineness of Portland Cement by the Turbidimeter
ASTM C150/C150M Standard Specification for Portland Cement
ASTM C183.....Standard Practice for sampling and the amount of testing of Hydraulic cement
ASTM C188.....Test method for density of Hydraulic cement
ASTM C186.....Test method for heat of hydration of Hydraulic cement
ASTM C204.....Test method for fineness of Hydraulic cement by air permeability
ASTM C348.....Test method for flexural strength of Hydraulic cement mortar
ASTM C349.....Test method for compressive strength of Hydraulic cement mortar using portion of prism broken in flexure
ASTM C430.....Test method for fineness of Hydraulic cement by the 45mm (No.325)
ASTM C595.....Standard specification for blended Hydraulic cement
ASTM C618.....Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C845.....Specification for Expansive Hydraulic cement
ASTM C989 .....Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1157.....Standard performance specification for Hydraulic cement
ASTM C1240 .....Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1328.....Specification for plastic cement (Stucco)
ASTM C1329.....Specification for Mortar cement

BS 146.....Portland blast furnace cement
BS 1370.....Low heat Portland cement

BS 4027.....Sulphate-resisting Portland cement

EN 196, ...Methods of testing cement

EN 197, ...Cement

EN 197-1, ...Cement - Part 1: Composition, specifications and conformity criteria for common cements.

EN 450 .....Fly ash for concrete.

EN 13263 .....Silica fume for concrete.

EN 15167 .....Ground granulated blast furnace slag for use in concrete, mortar and grout

3.1.3 Terms and Definitions:

1 Cementitious Materials: Portland cement in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, silica fume and Metakaolin; subject to compliance with requirements of this specification.

2 PC: shall mean Portland cement or CEM I.

3 FA or PFA: shall mean fly ash or pulverised fuel ash.

4 GGBS: shall mean ground granulated blast furnace slag.

3.2 SOURCE APPROVAL

1 The Contractor shall submit to the Engineer for approval full details of the proposed source of cement. These sources of cement supply shall be regularly and thoroughly investigated to ensure that the quality of the material supply is satisfactory and that it does not deteriorate during the performance of the project.

2 The cement source shall not be changed without the Engineer's acceptance.

3 The Contractor shall supply the Engineer with the manufacturer’s test certificates certifying that the cement is in compliance with the relevant standards.

4 For imported cement the manufacturer’s test certificates shall be provided with each consignment. The Contractor shall submit to the Engineer the date of manufacture and proof that the specifications have been complied with, certified by an independent agency in the country of origin.

5 Cement manufacturers shall label their packaging and delivery documents and shall provide, where applicable, information on the packing/dispatch date, storage conditions and the storage period appropriate to maintaining the activity of any reducing agent and to keeping the content of soluble chromium (VI) below the 2 ppm limit. The Engineer has the right to test the cement for presence of chromium at the contractor’s expense.

3.3 SAMPLING

1 The methods of obtaining samples of cement for testing shall be carried out as described in EN 196 or ASTM C183

3.4 QUALITY AND TESTING

1 The cementitious material shall fully comply with the relevant standard(s) from the following list:

ASTM C150 ..... Standard specification for Portland cement

ASTM C595 ..... Standard specification for blended Hydraulic cement

ASTM C618 ..... Standard specification for coal fly ash and raw natural pozzolan for use in concrete

ASTM C989 ..... Standard specification for ground granulated blastfurnace slag for use in concrete and mortars

ASTM C1157 ..... Standard performance specification for Hydraulic cement

ASTM C1240 ..... Standard specification for silica fume used in cementitious mixtures

BS 146..... Portland-blast furnace cement

BS 1370..... Low heat Portland cement

BS 4027..... Sulphate-resisting Portland cement

EN 197-1, ... minimum grade 42.5

EN 450 ..... Fly ash for concrete.

EN 15167 ..... Ground granulated blast furnace slag for use in concrete, mortar and grout

EN 13263 ..... Silica fume for concrete.

Relevant GSO

2 The water-soluble chromium (VI) content shall not exceed 2ppm (0,0002%) by total dry weight of cementitious materials.

3.5 DELIVERY, STORAGE AND HANDLING

1 Cement shall be delivered to the Site in sealed and branded bags, or in the manufacturer's containers, bearing the manufacturer's name, cement type and date of manufacture, in batches not exceeding 100 tons.

2 Cement shall be stored at the site in such a manner, as to prevent its deterioration, intrusion of moisture and foreign matter. It must be kept dry at all times. Immediately upon arrival at the Site the Contractor shall store the cement in

(a) bins or silos designed for the purpose. It shall be tight and provide for free movement to discharge opening, or

(b) dry, weather tight and properly ventilated structures with floors raised a minimum of 450 mm above the ground with adequate provision to prevent absorption of moisture.

3 All storage facilities shall be subject to the approval of the Engineer, and shall be such as to permit easy access for inspection and identification. Prolonged storage of cement at site is to be avoided.

4 For bagged cement, each consignment of cement shall be kept separately, and the Contractor shall use the consignments in the order in which they are received.

5 The Contractor shall keep records of the various consignments of cement in store, giving quantities received and used, and the sections of the work in which the cement has been used, on a daily basis and make a weekly return to the Engineer accordingly. Cement used in the Works shall be free flowing and free from lumps.

6 In no case shall bagged cement be stored in stacks more than eight bags high.

7 A free passage of at least 1 m shall be left between the cement and the side walls of the structure.

8 Different types of cement shall be kept in clearly marked separate storage facilities.

9 Cement delivered to Site in drums or bags by the supplier or manufacturer shall be stored in the drums or bags until used in the Works.

10 Any cement in drums or bags which have been opened shall be used immediately.

11 Cement that has partially or fully caked in storage will not be permitted in work and shall be immediately removed from the storage area. Any bag or package or sample of cement which has been damaged, or rebagged or in any way has deteriorated shall be rejected either as an individual bag or package or as the whole consignment in which such bag, package or sample is contained, as advised by the Engineer.

12 Where Site limitations preclude the storage of cement on Site, cement shall be stored at a central location and shall be delivered daily as required to specific job sites.

13 The Contractor shall provide weighing machines which shall be kept permanently in each shed for checking the weight of the bags or barrels of cement. The weighing machines shall be calibrated by an independent agency. The Engineer shall have access at all times to the cement storage sheds.

14 During transport and storage the cement shall be fully protected from all weather elements.

15 Any consignment of cement not used within two months from the date of manufacture and cement which in the opinion of the Engineer is of doubtful quality shall not be used in the Works until it has been retested and test result sheets showing that it complies in all respects with the specification and relevant standards have been delivered to the Engineer.

16 Cement stored for longer than 28 days shall be tested for “loss on ignition" prior to use to check for deterioration, and any cement which fails the test shall not be used in the works.

APPENDIX A:

Guidance of CEMENT Plant Inspection – Checklist (non-compulsary)

CEMENT PLANT INSPECTION CHECKLIST

New Approval ☐ Renewal ☐ Regular Inspection ☐

1.0GENERAL INFORMATION OF PLANT

1.1 Company Name :

1.2 Inspection Date : AM / PM

1.3 Plant Location :

1.4 Plant No/s :

1.5 Plant Manufacturer :

1.6 Plant ID No. :

OPC	☐	SRC	☐	white	☐	GGBS	☐

1.7 Approval Certificate No :

1.8 Contact a Plant :

2.0 GENERAL CONDITION

2.1 Factory Certifications .

NAME OF CERTIFICATE	VALIDITY		NOTES	
	Issue	Valid		
A. ISO 9001,14001,18001				
B. ISO 17025				
C. Environment Assessment Certificate				
D. Cement Association Membership			Ass. Name	.....
F. Other Association Membership			Ass. Name	.....

2.2 Factory Conditions .

A.	Appearance of Gates , boundary and main sign board .	Yes ☐ No ☐
B.	Hard and stable surface for Access	Yes ☐ No ☐
C.	Drainage System for Water	Yes ☐ No ☐
D.	Sign Board for Define Separate Production Area.	Yes ☐ No ☐

2.3 Plant Conditions.

A. Type of processing line	Dry ☐	Wet☐	
B. Concrete Floor Under Production Line	Yes ☐	No ☐	
C. Floors Clean Under Production Line	Yes ☐	No ☐	
D. Permanent storage silos for each product	Yes ☐	No ☐	
E. Distinctive and special colour for each product area "principally packing area ".	Yes ☐	No ☐	

3. MATERIAL STORAGE AND HANDLING

3.1 Raw Materials such as (lime stone , sand , clay, ……) from quarry or imported

3.1.1 Storage Yard of Raw Materials

A. Hard And Stable Surface Under Raw Materials	Yes ☐	No ☐	
B. Board Clarify Type of Materials	Yes ☐	No ☐	
C. Separation Between Different Size and Type	Yes ☐	No ☐	

3.1.2 Handling of Raw Materials

A. Cover for Conveyer Belts	Yes ☐	No ☐	
B. Cover Store for Screening Raw Materials After Primary Crushing	Yes ☐	No ☐	

3.2 Clicker :

3.2.1 Storage Yard of clinker

A. Hard And Stable Surface Under clinker

B. Temporary shaded yard for huge quantity more Than ……..ton, that considered as strategic stock

4. Laboratory

4.1 Records for raw materials .

Required Tests as manufacturing Standard mentioned	Was Test Performed?		Frequency of Tests			Comments of Inspection
			D	W	M	
a. Chemical components	Yes ☐	No ☐				
b. Physical components	Yes ☐	No ☐				

c. status of the kiln	Yes ☐	No☐				
d. status of the grinding mill	Yes ☐	No☐				
e. Complying of old custome certificate	Comply ☐		Non Comply ☐			

4.2 Specimens testing at inspection time

ITEMS	CASE		COMMENTS
a. Temperature in silos of final products	Yes ☐	No ☐	
b. Temperature in silos of clinker	Yes ☐	No ☐	
c.	Yes ☐	No ☐	

4.3 Laboratory equipment calibration

EQUIPMENT	CASE		COMMENTS
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	
	Yes ☐	No ☐	

5. Archive

Archiving of Sampling	Yes ☐	No ☐	
Archiving of Results	Yes ☐	No ☐	
Archiving of quality control chart	Yes ☐	No ☐	

6. Recommendation

7. Plant representative information		
Name of representative	:	
Contract number	:	
Signature	:	

8. Inspector team	
Inspected by	Signature

END OF PART