Criteria for Production Control of Ready Mix Concrete *for* RMC Capability Certification

under

Ready Mix Concrete (RMC) Plant Certification Scheme (QCI)

Building Materials & Technology Promotion Council
Ministry of Housing & Urban Poverty Alleviation
Government of India
New Delhi

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The current status of each page and the history of change of the Criteria for RMC Production Control are set out below.

Part	No. of Pages	Page Numbers	Page Status

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Core 5A, First Floor, India Habitat Centre
Lodhi Road, New Delhi 110003, INDIA
Tel: +91-11-24636705, 24638096, 24638097; Fax: +91-11-24642849
E-mail: bmtpc@del2.vsnl.net.in; info@bmtpc.org
Website: www.bmtpc.org

FOREWORD

Concrete, due to its versatility and durability is the world's most widely used construction materials. With increased focus on infrastructure and housing activities, use of concrete in various forms is increasing day by day. For sustainability of RCC construction, proper quality of desired grade and optimum performance of concrete is of paramount importance. Ready Mixed Concrete that is batched in a controlled environment at a central plant instead of being mixed on the job site is always a better option. Starting from early nineties, RMC industry has grown from the second half of the nineties to the present state, when it has spread to the two and three tier cities also.

With the rapid growth of the industry, the challenge of maintaining desired quality and standard of RMC plants have also increased. Realizing this challenge, Ready Mixed Concrete Plant Manufacture's Associations (RMCMA) took initiative to evolve a system of audit themselves and developed a detailed check list, based on international practices and relevant Indian Standards for audit.

To give the auditing an independent identity, RMCMA has now joined hands with Quality Council of India, who has taken responsibility to operate the certification of RMC plants. BMTPC has also joined hands with QCI & RMCMA to prepare the Criteria for Production Control of RMC Plant of Ready Mixed Concrete. The document ***Criteria of Production Control of Ready Mixed Concrete for RMC Capability Certificate*** has been prepared with wide consultation of members of Technical Committee representing user agencies, like CPWD, Airport Authority of India, Ministry of Road Transport & Highway, DMRC & National Highway Authority of India; R&D labs like NCCBM, CBRI; other experts and the industry represented by RMCMA; will form the basis of auditing of plants for the Certification Scheme.

I place on record my deep appreciation towards the members of the Technical Committees under the Chairmanship of Dr. A.K. Mullick, constituted for the purpose, for bringing out a very hands-on document for Capability Certification, keeping in view the requirements of users departments, status of the industry and technical requirements based on relevant National Standards. I also sincerely thank Shri Anil Jauhri, C.E.O., National Accreditation Board for Certification Bodies, Quality Council of India for reposing confidence in BMTPC for this imperative initiative, which I am sure would go a long way in improving the overall quality of concrete construction in the Country.

Dr. Shailesh Kr. Agrawal
Executive Director

PREFACE

Starting from the first commercial Ready Mixed Concrete plant set up in 1992 in Pune, growth of RMC plants picked up in the last decade. Since then the number of RMC plants in India are growing rapidly. Faster speed and improved quality of concrete have been the two major demands of housing and infrastructure sectors – the two important focus areas of planning in the country. Over the years the RMC industry has expanded beyond metropolitan cities to smaller cities and towns. Currently, it is estimated that India produces around 35-40 million m^3 of concrete annually from around 1000 RMC facilities spread over the country. The projected growth of RMC plants is expected to be over 7% in the next 5 years. Many of the RMC plants in India are modern computerized batching plants with automated controls. But all the plants are not properly equipped to produce the desired quality of concrete.

The spread of RMC facilities in urban areas has brought in its wake certain challenges. The most important being the capability of plants to deliver the concrete of desired quality to the consumer. RMC is a mixture of cement, supplementary cementations materials, aggregates, water and admixtures in certain defined proportions. The quality of the finished product depends upon a lot of factors including capability of a plant in terms of machineries, plants, technical man power and adoption of proper quality assurance system. This highlights the need of developing a framework of quality parameters for RMC.

Ready Mixed Concrete Manufactures' Association (RMCMA) India, established in March 2002, has been striving hard to bring the Indian RMC industry at par with the industry in advanced countries. They initiated a self regulatory framework for Quality of RMC. After studying various models / systems across the world, RMCMA launched an indigenous scheme in 2008. It was based on best practices in the industry and the requirements in relevant National Standards. A checklist, devised by RMCMA for the purpose was used by auditors for auditing the plants for certification purpose. In view of the rapid growth of the industry and huge scope of future expansion, RMCMA approached Quality Council of India (QCI) to initiate an independent third party National Certification Programme for RMC plants. For spearheading the programme, QCI had set up three committees, namely the Steering Committee, Technical Committee and Certification Committee. In the proposed certification pogramme, RMC plants will be audited by certifying agencies accredited by the National Accreditation Board of Certifying Bodies (NABCB) under the QCI. The certification will be based on the criteria developed by the Technical and Certification Committees, duly approved by the Steering Committee.

A Technical Committee with Building Materials and Technology Promotion Council, Ministry of Housing and Urban Poverty Alleviation, Government of India, working as Technical Secretariat has developed this Criteria for auditing for Certifying the RMC plants under the Scheme.

This document provides detailed criteria of plant, machineries, testing facilities, control on the properties of concrete ingredients and the final product, technical manpower, etc; which any RMC plant, irrespective of their size and capacity, must fulfill to qualify for the certification. The document is divided in two parts - Section A highlighting the requirements for production control of ready-mixed concrete and Section B comprising of a comprehensive Check List and detailed information on various features of the production facility in tabular format.

This document should be read in conjuncture with a separate document on the certification procedure for RMC plants as developed by the Certification Committee and duly approved by the Steering Committee.

COMMITTEE COMPOSITION

Steering Committee for RMC Certification Programme

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Shri Jose Kurian	Delhi Tourism & Transportation Development Ltd., New Delhi
Members	**Representing**
Shri A.K. Garg Shri Manu Amitabh (Alternate)	Central Public Works Department, New Delhi
Shri S.K. Mohiddin	Ministry of Water Resources, New Delhi
Maj. Gen. R.K. Mattu Brig Rajesh Tyagi (Alternate)	Military Engineer Services, New Delhi
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Shri Vijay Kulkarni	Quality Council of India, New Delhi
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Shri Ramesh Joshi	Ultratech Cement Ltd., Mumbai
Shri Ganesh Kaskar	Prism Cement Ltd., Mumbai
Member-Secretary	
Shri Anil Jauhri	Quality Council of India, New Delhi

COMMITTEE COMPOSITION

Technical Committee for RMC Plant Certification Programme

Chairman	
Dr. A.K. Mullick	In Personal Capacity Flat No110, Pocket A4 Konark Apartment , Kalkaji Extension New Delhi- 110 019
Members	**Representing**
Shri. M. Ravishankar	RMCMA, Mumbai
Shri Rajiv Goel	Airports Authority of India, New Delhi
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Shri V.K. Pareek	Delhi Metro Rail Corporation Ltd., New Delhi
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Shri Mahendra Raj	Mahendra Raj Consultants Pvt. Ltd., New Delhi
Dr. Shailesh Kr. Agrawal	Building Materials & Technology Promotion Council, New Delhi
Member-Secretary	
Shri J.K. Prasad	Building Materials & Technology Promotion Council, New Delhi

CONTENTS

SECTION A

(REQUIREMENTS FOR PRODUCTION CONTROL OF READY MIXED CONCRETE)

1 SCOPE

1.1. The document includes Requirements for the Production Control of Ready-mixed Concrete. The criteria follow the provisions in various Indian Standards on cement, concrete and other material ingredients. The criteria shall be applicable to jobs following specifications of Bureau of Indian Standards as also those of the Indian Roads Congress and Indian Railways Standards.

1.2. The document includes requirements on:

- Resource management
  - Plant and equipment
  - Laboratory
  - Key personnel
- Control on quality of incoming materials
- Concrete mix design
- Production and delivery
- Control on process control equipment and maintenance
- Complaints
- Feedback.

1.3 The requirements cover batching and mixing plants supplying ready-mixed concrete on commercial basis or for captive consumption or for part captive and part commercial consumption.

1.4 The requirements completely exclude operations such as placing, compaction, finishing and curing of concrete, which usually come under the jurisdiction of the contractor/builder. However, with a view to produce quality concrete, proper co-ordination between the teams of concrete producer and those of contractor/builder is necessary.

1.5 This document shall be read along with a companion document developed by the Certification Committee. The requirements in this document and the accompanying Check List as well as those given in the Certification Committee document shall be followed during the audit of ready-mixed concrete facility.

1.6 This criteria for production control of ready mixed concrete shall be used for auditing and providing “RMC Capability Certification”. In addition, the Company/organization can also obtain “RMC 9000 Plus Certification” based on the implementation of Quality Management Systems as per ISO 9001. However, for obtaining the latter, it is imperative that the concerned plants of the Company/organization covered under the scheme are certified under the RMC Capability Certification.

1.7 This document is divided into two parts. While Section A describes the requirements, Section B provides a Comprehensive Check List which shall be used by persons undertaking either internal or external audit.

2 DEFINITIONS

For the purpose of this document, the following definitions shall generally apply. For other definitions, reference shall be made to IS 4845 and IS 6461.

2. 1 Back Weigh Systems

Materials' weighing systems where the weigh hoppers remain permanently charged and the required weight is determined by the reduction in weight of the contents of the hopper.

2.2 Batch Code

The unique code, if used, which can be applied to each concrete contained on the batch instruction, and which identifies a unique set of batch data.

2.3 Batch Data

The quantities of each constituent material in the batch.

2.4 Batch Instructions

The summary of information from an enquiry presented in a form that identifies materials and concrete requirements together with any job specific requirements. The batch instruction is the output of the contract review process, ie the contract quality plan.

2.5 Company/Organization

In these Regulations the terms 'company' "organization" are used synonymously with the term 'producer' of concrete

2.6 Regulation compliance

The requirement within these Regulations shall generally comply with provisions of Indian Standards IS 456. IS 4926, and relevant standards of the India Roads Congress and Indian Railways Standard specifications. These shall be limited to the relevant requirements set out in the Standards, except when otherwise agreed between the producer and the purchaser.

2.7. Concrete Mix Design

This relates to Initial Testing of Concrete set out within IS 456 and IS 4926 and is the act of determining the characteristics, in respect of fresh and hardened concrete, of a particular combination of materials across a range of cementitious contents in order to be able to provide concrete of the specified characteristics.

2.8. Basis of supply

The basis of supply shall be the cubic metre of fully compacted fresh concrete determined in accordance with IS 1199.

2.9 Specifier / User

In these Regulations the term "specifier / user" is used synonymously with the term 'purchaser' and "customer"

2.10 Ready Mixed Concrete

Concrete produced from a concrete batching plant for onward dispatch and use in a plastic state.

2.11 Commercial Plant

A concrete batching plant set up for the purpose of supply of RMC to customers who require this for their construction.

2.12 Dedicated/Captive Plant

A Concrete Batching Plant which has been set up for the sole purpose to supply RMC to a dedicated project site.

2.13 Dedicated (Captive)-cum-Commercial Plant

A Concrete Batching Plant which has been set up for the purpose to supply RMC to a dedicated project site and also supplies RMC to outside customers who require this for their construction.

3 RESOURCE MANAGEMENT

3.1 General Information

3.1.1 The company/organization shall provide information about the resources deployed in formats specified in:

- Table 1 (General Information of Ready-mixed Concrete Facility) (see section B)
- Table 2 (General Information on Production Facilities) (see section B)
- Table 3 (General Information on Material Handling) (see section B)

For the formats of these tables refer Section B.

3.2. Plant, Equipment and other Utilities

3.2.1 The company shall provide and maintain necessary infrastructure of plant and equipment (hardware and software), supporting services and associated utilities essential to produce quality concrete. The requirements for Plant and Equipment and associated utilities are divided into following main and sub-areas:

3.2.1.1 *Material storage and handling*

Cement, Supplementary Cementitious Materials (e.g. fly ash, GGBS, silica fume, etc), Aggregates, Water, Chemical Admixtures. These requirements shall be verified with the help of Check List items at 3.2.1.1 in Section B.

3.2.1.2 *Batching and mixing control equipment*

Scales, Weigh batchers, Batching devices for water, Dispensers for liquid admixtures, Accuracy of plant batcher, Batching system, System requirements, recorders, Central mixer and maintenance. These requirements shall be verified with the help of Check List items at 3.2.1.2 in Section B.

3.2.1.3 *Delivery fleet inspection*

Built-up on mixer drum and blades, mixer blade wear, charging hopper, discharge opening, hopper and chute, speed of agitation, water tank, meter and pump system, inspection record of truck mixer, summary of inspection record. These requirements shall be verified with the help of Check List items at 3.2.1.3 in Section B.

3.2.2 The Check List requirements conform to the provisions made in IS 4926 and other Indian Standards such as IS 456, IS 383, IS 3812, IS 9103, etc.

3.2.3 The Company/organization shall ensure that the Plant and equipment and other utilities in their facility are in accordance with the provisions in the Check List included in Section B.

3.3 Laboratory

3.3.1 The provision of concrete testing laboratory for carrying out the following minimum tests is considered essential for achieving the objective of producing quality concrete on a consistent basis.

Aggregates

Sampling (in accordance with IS 2430)
Moisture content (in accordance with IS 2386-Part III)
Bulk density (in accordance with IS 2386-Part III)
Sieve analysis (in accordance with IS 2386-Part-I)

Concrete

Slump (in accordance with IS 1199)
Unit weight (in accordance with IS 1199)
Strength (in accordance with IS 516)

3.3.2 In case the Company/organization has more than one RMC facility in a city, it shall be permitted to share the facility of compression testing machine for carrying out compressive strength test conforming to provisions in IS 516. However, Company/organization shall ensure that due care is taken in transferring samples of cubes with proper precautions and identification for standard curing at 28 days in the Company's central laboratory.

3.3.3 The Company/organization shall ensure that the minimum testing equipment is available, identified and are maintained properly. Refer Table 4 Section B for essential testing equipment to be made available in the laboratory. These shall be verified with the help of Check List items at 3.3 in Section B.

3.3.4 The physical and chemical properties of cement, supplementary cementitious materials, chemical admixtures, and water being used in production shall be monitored on a regular basis as per the frequencies defined in this document. This shall be done by insisting on test certificates from the manufacturers for the materials received and also by carrying out the tests in NABL-accredited labs at periodic intervals at frequencies defined in this document. These certificates shall be kept on records in the laboratory.

3.3.5 In case the physical and chemical properties of the incoming materials do not conform to the specified values of relevant Indian Standards, the materials shall be rejected, identified and removed from the plant to prevent their unintended use or delivery. For the control of non-conforming items, the Check List items 6.2 in Section B shall be referred.

3.3.6 The Company/organization shall ensure that the testing facility in their lab shall conform to the requirements of the Check List items included at 3.3 in Section B.

3.4 Key Personnel

3.4.1 The company/organization shall ensure that the key personnel involved in all quality-related operations are competent, adequately qualified and trained.

3.4.2 The competency and skills of key personnel managing and testing quality shall be identified and documented. Basic knowledge in concrete technology and testing shall be essential.

3.4.3 Quality Control In-charge handling a single or a cluster of contiguous plants shall have Degree in Civil Engineering /Diploma in Civil Engineering with minimum 3 years of relevant experience.

3.4.4 Lab Technicians shall have experience in sampling and testing of Materials and Concrete as per relevant Indian Standards. Certificate from any certified training programme agreed shall be preferred.

3.4.5 Gaps in knowledge shall be identified and training of personnel shall be carried out to narrow the gap.

3.4.6 The efforts made by the organization/company in training (internal and external) the key personnel handling quality shall be documented. Gaps in training shall be identified and corrective action shall be taken.

3.4.7 Check List on key personnel is included at 3.4 in Section B.

4. CONTROLS ON THE QUALITY OF INCOMING MATERIALS

4.1 The company/organization shall demonstrate that it follows a well-defined system in controlling the quality of all ingredients of concrete.

4.2 Sources of Materials:

The company/organization shall keep a list of sources of all incoming materials in the plant in the format included in *Table* 5 in Section B. The list shall be dated and any change in source of materials shall be traceable from the revisions to the list. The list shall be displayed at a prominent location in the plant. This shall be verified with the help of Check List items at 4 in Section B.

4.3 Quality of Incoming Materials

4.3.1 *Cement*

Cement used in production shall conform to the relevant Indian Standard. Cement being a compulsory Bureau of Indian Standard certified commodity, the company/organization shall obtain test certificates on the physical and chemical properties of the material from the manufacturer for each consignment received to ensure conformity with relevant Indian Standard specifications and keep the certificates on record. In addition, with a view to cross check the manufacturers' test results, samples from first consignment of a particular brand shall be tested from NABL-accredited lab. Periodic validation of the manufacturers' test results shall be carried out by testing the physical and chemical properties of cement in NABL-accredited lab at least once in a year. This shall be verified with the help of Check List item at 4 in Section B.

4.3.2 *Fly ash*

Fly ash used in production shall conform to the requirements of IS 3812 (Part 1 & 2). Test certificate from the producer on the physical and chemical properties of the material shall be obtained for each consignment received to ensure conformity with Indian Standard specifications and the same shall be kept on records. With a view to have a check on the quality of the material, it shall be tested for physical and chemical properties on a regular basis as per the frequencies defined within this document and confirmation to BIS conformity requirements from a NABL-accredited lab at least once in six months or when there is a change in the source. This shall be verified with the help of Check List items at 3 in Section B.

4.3.3 *Ground-granulated Blast-furnace Slag (GGBS)*

The GGBS used shall conform to the requirements of IS 12089 and BS 6699. Test certificate from the producer on the physical and chemical properties of the material shall be obtained for each consignment received to ensure conformity with Indian Standard Specifications and the same shall be kept on records. With a view to have a check on the quality of the material, it shall be tested for physical and chemical properties on a regular basis as per the frequencies defined within this document and confirmation to Indian Standard conformity requirements from a NABL-accredited lab at least once in six months or when there is a change in the source. This shall be verified with the help of Check List items at 4 in Section B.

4.3.4 *Silica Fume*

Silica fume shall conform to the requirements of IS 15388. Test certificate from the producer on the physical and chemical properties of the material shall be obtained for each consignment received to ensure conformity with Indian Standard Specifications and the same shall be kept on records. With a view to have a check on the quality of the material, it shall be tested for physical and chemical properties on a regular basis as per the frequencies defined within this document and confirmation to Indian Standard conformity requirements from a NABL-accredited lab at least once in six months or when there is a change in the source. This shall be verified with the help of Check List items at 4 in Section B.

4.3.5 *Chemical Admixture*

The chemical admixtures used shall conform to the requirements of IS 9103. Test certificate from the producer on the physical and chemical properties of the material shall be obtained for each consignment received to ensure conformity with Indian Standard Specifications and the same shall be kept on records. With a view to have a check on the quality of the material, it shall be tested on a regular basis as per the frequencies defined within this document and confirmation from a NABL-accredited lab at least once in six months or when there is a change in the source. Special attention shall be given to ensure that there is no compatibility issue between the cement and admixture used. This shall be verified with the help of Check List items at 4 in Section B.

4.3.6 ***Water***

Water used for mixing of concrete shall be free from deleterious materials for steel and concrete and shall conform to the requirements of IS 456. The frequency of testing water shall be as specified in IS 4926. This shall be verified with the help of Check List items at 4 in Section B.

4.3.7 ***Aggregates***

The fine and coarse aggregates shall conform to the requirements of IS 383. The minimum tests on aggregates specified under section 3.3.1 above shall be carried out in the plant lab of the company/organization at the frequency specified in IS 4926. Other tests on aggregates shall be carried out in NABL-accredited lab at frequencies specified in IS 4926. Fresh tests shall be carried out if there is a change in the source of materials. Special care shall be taken to ensure that the moisture contents of aggregates are evaluated on a daily basis and appropriate corrections, if any, shall be carried out in production so that the specified water-binder ratios are maintained. This shall be verified with the help of Check List items at 4 in Section B.

4.3.8 The verification and testing frequencies of cement, SCMs, water and chemical admixtures shall be as per the Check List items at 4 and *Table 6A and 6B* in Section B.

5 CONCRETE MIX DESIGN

5.1. IS 4926 specifies two types of mixes, namely, designed mixes and prescribed mixes.

5.2 In case of prescribed mix, the company/organization shall supply concrete as per the mix details prescribed by the customers. In case of designed mixes, the Company/organization shall have in-house capability to design concrete mixes by adopting any rational method of mix proportioning. For companies/organizations having multiple plants in contiguous areas, it shall suffice to have concrete mix design capability at company's central laboratory in the area. However, the company/organization shall demonstrate that mixes so designed are correctly transferred to the designated plants and that the local plant personnel have the capability to convert the designed mixes into appropriate batches for production, with minor adjustments to match the yield of concrete.

5.3. Any testing to support the design mix shall be done by NABL accreditated laboratory.

5.4. In accordance with IS 4926, when the purchaser orders a designed mix, he shall provide all relevant information to the producer in a specified format which is reproduced in *Table* 7 for ready reference. The producer will take cognizance of the supplied information while designing the mixes and shall get the final mixes approved by the purchaser.

5.5. The company/organization shall also have the ability to convert both prescribed and designed mixes into batches for production. The minimum data on designed and/or prescribed mixes shall be kept on records in the format specified in *Table* 8. The compliance to mix design shall be verified with the help of Check List items 5 in Section B.

6 PRODUCTION AND DELIVERY

6.1. The company/organization shall provide evidence that materials and quantities batched are in accordance with the order placed and the approved mix design. This shall be verified with the help of Check List items at 6.1 in Section B shall be referred for the purpose.

6.2. To verify this, the auditor shall choose any five customer orders as received by the company/organization during the past three months. In case sales order data are not available readily in the plant, the same shall be obtained from regional/ head office by fax/e-mail for checking. The auditor shall demand the relevant records (usually stored in computers in the form of autographic records) and the same shall be carefully cross checked with the order data.

6.3. Identification and Traceability: The company/organization shall have an established procedure to identify all products from reception (raw materials) throughout production and to delivery (fresh concrete). This shall be verified with the help of Check List items included at 6.1 in Section B.

6.4. Control of non-conforming items: During the production and delivery of concrete, the company/organization shall take essential steps to prevent the unintentional use of non-conforming items. To ensure this, the company/organization shall have appropriate systems and procedures. The Check List items included at 6.2 in Section B highlights requirements which shall be verified. For the control of the final product, the frequency of testing of fresh and hardened concrete is included in *Table 9.*

7 CONTROL OF PROCESS CONTROL EQUIPMENT AND MAINTENANCE

7.1 In addition to ensuring control on the quality of all input materials and in carrying out appropriate mix design the company/organization shall exercise strict control on the production process. With continuous use, many of the control parameters are likely to exceed the permissible limits. Therefore, there is a need to keep all plant and equipment in good working condition by carrying out routine maintenance regularly.

7.2 The Company/organization shall demonstrate that routine maintenance of storage, handling, batching, mixing and transporting equipment is carried out in a planned manner. Also, they shall demonstrate that regular calibration of weighing equipment is carried out at desired frequency specified by IS 4926.

7.3 The Company / organization shall carry out maintenance/calibration checks for different components of plant and equipment at frequencies specified in Table 10 at frequent specified in Table 11 and keep a record of the same.

7.4. Check List items at 7 in Section B shall be used for the auditing of provisions in this section.

8 COMPLAINTS

8.1. The company/organization shall have established procedures to receive and resolve complaints. It shall nominate a Nodal Officer for the purpose. The name and contact details of the Nodal Officer shall be displayed on the Company/organization's web site and concerned plants. The Nodal Officer shall maintain a Complaint Register which shall be updated regularly. It shall demonstrate that the complaints are investigated properly, the root cause(s) identified and recorded, and finally resolved to the satisfaction of the customers. The company/organization shall also prove that a systematic review of the complaints is carried by its management on a periodic basis and correctives actions initiated as a part of continual improvement.

8.2. The auditors shall use the Check List items at 8 in Section B for auditing in this area.

9. FEEDBACK

9.1 The company/organization shall have an established procedure for obtaining feedback from a cross section of its customers on a regular basis. The feed backs shall be analyzed quickly and corrective actions, if any, shall be initiated after a thorough review of the feedback. The Nodal Officer shall be responsible for keeping records of the customer feedback and action taken. This shall be verified with the help of Check List at 9 in Section B.

10 REFERENCES

Standards of Bureau of Indian Standards, Indian Roads Congress, etc.

i. IS 456: 2000, Plain and Reinforced Concrete- Code of Practice (Third Revision), (Reaffirmed 2005)

ii. IS 9103:1999, Concrete Admixtures- Specifications (First Revision), (Reaffirmed 2004).

iii. IS 4926: 2003, Ready-Mixed Concrete- Code of Practice (Second Revision), 2003.

iv. IS 2430: 1986, Methods for Sampling of Aggregates for Concrete (First Revision),(Reaffirmed 2005).

v. IS 2386 (Part 1):1963, Methods of Test for Aggregates for Concrete, Part 1: Particle Size and Shape, (Reaffirmed 2007).

vi. IS 2386 (Part 3): 1963, Methods for Test for Aggregates for Concrete, Part 3: Specific Gravity, Density, Voids, Absorption and Bulking, (Reaffirmed 2007).

vii. IS 1199: 1959, Methods of Sampling and Analysis of Concrete, (Reaffirmed 2004).

viii. IS 516: 1959, Method of Test for Strength of Concrete, (Reaffirmed 2004).

ix. IS. 383 :1970 Coarse and Fine Aggregates From Natural Sources for Concrete

x. IS 3812 (Part 1 & 2) : 2003 Pulverised Fuel Ash:
   a. Part 1 For use on pozzolana in Cement, Cement Materials and Concrete
   b. Part 2 For use on Admixture in Cement Materials and Concrete

xi. IS 12089 :1987, Granulated Slag for the manufacture of Portland slag cement.

xii. IS 15388 : 2003, Silica Fume

xiii. IRC 112: 2011 Code of Practice for Concrete Road bridges, Indian Roads Congress, New Delhi.

xiv. MORT&H, Specifications for Road and Bridge Works, 2001 (Fourth Revision), Ministry of Road Transport and Highways, New Delhi.

xv. IRST 89 – 1993 Pretensioned prestressed concrete sleeper for Broad gauge and meter gauge

xvi. IRST 45 – 1996 Pretensioned prestressed concrete sleeper for turnout for broad gauge and meter gauge

SECTION B

CHECK LIST

(TO BE READ WITH CORRESPONDING CLAUSE OF SECTION A)

3 RESOURCE MANAGEMENT (Clause 3 of Section A)

3.2 Plant, Equipment & Other Utilities (Clause 3.2 of Section A)

3.2.1.1 Material Storage and Handling (Clause 3.2.1.1 of Section A)

Cementitious Materials

	Cement	*YES*	*NO*	*Auditor's Observation if any*
1	Are silos/bins and the cement feeding area weatherproof?	☐	☐	
2	When cement is supplied in bags, is the storage facility weatherproof, damp-proof, well ventilated and reasonably free from dust?	☐	☐	
3	When cement is supplied in bulk, is there reasonably dust-free flow of cement into silo and further from silo to the mixer, indicating thereby that the loading and handling system permits free flow and efficient discharge of cement?	☐	☐	
4	When cement is supplied in bags, does the bag splitting unit and pneumatic pump/vertical screw conveyor permit reasonably dust-free flow of cement into silos and further from silo to the mixer?	☐	☐	
5	Where storage is provided for different types of cement, is the storage sufficiently isolated to prevent intermingling or contamination?	☐	☐	
6	Are there sign boards to indicate storage of different types of cement?	☐	☐	

	Supplementary Cementitous Materials (SCMs) [e.g. fly ash, GGBS, silica fume, high reactive metakaolin, etc.]	*YES*	*NO*	*Auditor's Observation if any*
7	Is there a separate storage system for different types of SCMs?	☐	☐	
8	Are silo/bag storage system for SCMs weatherproof?	☐	☐	
9	Is the SCM loading and handling system permitting reasonably dust-free flow of the material into silos and then further from silos to the weighter? Are adequate precautions taken to ensure that correct quantity is introduced in the mixer without any loss?	☐	☐	
10	Are there sign boards to indicate storage of different types of cementitious materials?	☐	☐	
11	Is there a proper system to identify, storage and disposal of the rejected materials?	☐	☐	

	Aggregates	YES	NO	*Auditor's Observation if any*
12	Are there adequate provisions for separate storage for each size and type of aggregates so as to prevent mixing of different sizes and types?	☐	☐	
13	Are there sign boards to indicate different sizes of aggregates?	☐	☐	
14	Are adequate precautions taken during unloading and building of stockpiles of aggregates so as to prevent harmful segregation and breakage?	☐	☐	
15	Are adequate precautions taken to prevent intermixing of aggregates with dust, mud, soil and other deleterious materials?	☐	☐	
16	Are adequate precautions taken to prevent contamination of different sizes and types of aggregates with each other?	☐	☐	
17	Are the conveyance systems designed in such a way that the materials being conveyed is adequately protected against contamination, to avoid either degradation of the materials or any element which may adversely affect the properties of the material within the concrete produced?	☐	☐	
18	If temperature controlled concrete is being produced are provisions in place to control the temperature of the aggregates?	☐	☐	
19	Are provisions in previous two questions (17 and 18) effectively maintained and working?	☐	☐	
20	Is there a proper system to identify, storage and disposal of the rejected materials?	☐	☐	

	Water	YES	NO	*Auditor's Observation if any*
21	Is there adequate storage of water to satisfy the day-to-day needs?	☐	☐	
22	Has the water storage facility been protected to minimize the risk of contamination of deleterious substances?	☐	☐	
23	Are records available providing evidence that control on the temperature of water is exercised when producing temperature controlled concrete?	☐	☐	
24	When recycled water is being used are systems in place and in operation to accurately measure the use of water and to ensure the performance of the produced concrete (mainly strength and workability) is not adversely affected by its use?	☐	☐	

	Chemical Admixtures	YES	NO	*Auditor's Observation if any*
25	Are chemical admixtures stored properly to avoid contamination and degradation on exposure to direct sunlight?	☐	☐	
26	Is there a provision for providing (manually or automatically) agitation to liquid admixtures that are not stable solutions?	☐	☐	
27	Is the storage and handling system adequately protected to prevent freezing of admixtures during winter season?	☐	☐	
28	Are adequate precautions taken to use admixtures before expiry date?	☐	☐	
29	Does each container of admixture legibly marked with supplier's information (*Clause 10.1 of IS 9103*)?	☐	☐	
30	Does additional printed information provided by supplier *(clause 10.2 of IS 9103)* available with the RMC facility?	☐	☐	
31	Is there a proper system to identify, storage and disposal of the rejected materials established?	☐	☐	

3.2.1.2 Batching and Mixing control equipment (Clause 3.2.1.2 of Section A)

Scales

		YES	NO	*Auditor's Observation if any*
32	For all types of batching systems, is the *batch operator* able to read the load indicating devices from his normal position?	☐	☐	
33	Have the weigh scales preset in increments not exceeding 5 kg or less each for cement and mineral admixtures, 10 kg or less for aggregates and 2 kg or less for water? (*Clause E-1 (c) of Annex E of IS 4926*)	☐	☐	
34	For continuous mixer plants, has the calibration been done in increments not exceeding 10 kg/m^3 each for cement and mineral admixtures, 25 kg/m^3 for aggregates and 10 lit/m^3 for water? (*Cl. E-1 (d) of Annex IS 4926*)	☐	☐	
35	Do the digital read-outs have a scale increment not exceeding 2 kg each for cement and mineral admixtures, 10 kg for aggregate and 1 kg for water? (*Clause E-1 (e) of Annex E of IS 4926*)	☐	☐	
36	Do records show that at least 500 *kg* of suitable calibrated and stamped test weights have been used for checking accuracy of scales?	☐	☐	
37	Does a systematic recheck of scales carried out frequently (at least once every 3 months for electrical/ load cell system)? (*Clause E-1 (j) of Annex E of IS 4926*)	☐	☐	
38	Is systematic recheck of scales carried out over its working range at scale increments not exceeding 20 kg for cement, mineral admixture and water, 50 kg for aggregates and 1 kg for chemical admixtures?	☐	☐	
39	Is prompt recalibration done and correction carried out if non-compliance is indicated in the 3-month rechecking?	☐	☐	
40	Is a systematic record of scale check and calibration of weighting and measuring system available?	☐	☐	
41	Are adequate permanent facilities provided for the application of test weights to the weighing hopper or system? (*Clause E-1 (j) of Annex E of IS 4926*).	☐	☐	
42	Have the load cells been protected to avoid ingress of moisture?	☐	☐	
43	Are the personnel involved in the work of calibration of weighing equipments competent and adequately trained? (*Clause E-1 (p) of Annex E of IS 4926*)	☐	☐	

Weigh Batchers

		YES	NO	*Auditor's Observation if any*
44	Do the hoppers for weighing cement, aggregates, and also water and admixtures (if measured by weight) consist of suitable containers freely suspended from a load cell(s) or other weigh mechanism, and are they equipped with necessary charging and discharging mechanisms?	☐	☐	
45	Are the scales and weigh hoppers used for cement and other cementitious materials independent of scales and weigh hoppers used for non-cementitious ingredients?	☐	☐	
46	In cumulative weighing of cementitious materials, is the Portland cement weighed before the supplementary cementitious materials?	☐	☐	
47	Are the hoppers capable of receiving maximum rated load without contact of the weighed material with the charging mechanism?	☐	☐	
48	Are cement batchers provided with dust seal between charging mechanism and hopper, installed in such a way as not to affect weighing accuracy?	☐	☐	
49	Are weigh hoppers adequately vented to permit escape of air without emission of cement dust?	☐	☐	
50	Are hoppers self-cleaning and fitted with means to assure complete discharge?	☐	☐	
51	Is the hopper charging mechanism capable of stopping flow of material within batching tolerances specified and preventing loss of material when closed?	☐	☐	
52	Are vibrators or other equipment installed in such a way as not to affect accuracy of weighing?	☐	☐	
53	Is wind/weather protection sufficient to prevent interference with weighing accuracy?	☐	☐	
54	Does the process of weighing and discharge into the mixer happen without loss of materials?	☐	☐	

Batching devices for water

		YES	*NO*	*Auditor' observation if any*
55	Are water meters/weigh batchers equipped with a cut-off device capable of stopping the flow within the tolerances specified ?	☐	☐	
56	If measured volumetrically, is water meter equipped with a volume-setting device capable of being set to increments at least as small as 1 liter or a register capable of being read to, 1 liter or both?	☐	☐	
57	Is the system capable of providing an indication, visible to the batch *operator*, of the volume/weight batched at any point in the metering/weighing operation?	☐	☐	

Dispenser for liquid admixtures (*Clause 9.1.2 and 9.1.3 of IS 4926*)

		YES	NO	*Auditor' observation if any*
58	Are adequate provisions in place to ensure that chemical admixtures are added to concrete in correct dosages?	☐	☐	
59	Where more than one admixture is used does the system allow for the accurate measurement and timely discharge of the admixtures into the mixer without any loss?	☐	☐	
60	If more than one admixture is being used through a single dispenser without flushing of the dispenser with water after each cycle, do the plant personnel ascertain that the admixtures in actual use are compatible with each other and that the mixing of admixtures prior to introduction in to the concrete is not detrimental?	☐	☐	
61	When using a single dispenser, if the admixtures are not compatible with each other, is the dispenser flushed with water after each cycle?	☐	☐	
62	Are the pipes carrying admixture free from leakage and are they properly calved to prevent backflow or siphoning so as to ensure that the measured amount is discharged?	☐	☐	
63	Is each dispenser of liquid admixture provided with an accurately calibrated container (if measured by volume) in which the admixture can be collected when it is desired to check the accuracy of measurement?	☐	☐	
64	Do the admixture dispensers have scale increments which enable materials to be batched within a tolerance of 3% of the scale reading?	☐	☐	

Accuracy for Plant batcher (*Clause E-1 of Annex E IS 4926*)

{Note: For weighed ingredients, accuracy of batching shall be determined by comparison between the desired weight (as indicated by the batch operator and corrected for aggregate moisture, if required) and the actual scale reading.}

		YES	*NO*	*Auditor's observations if any*
65	The accuracy, sensitivity and arrangement of weighing devices shall be such as to enable the materials to be batched within the following tolerances (Refer Table 9): *Cement and mineral admixtures*: Within ± 2 percent of the quantity of constituents being measured *Aggregate, chemical admixture and water*: Within ± 3 percent of the quantity of constituent being measured	☐ ☐	☐ ☐	
66	Is there an appropriate system of finding aggregate moisture either manually or automatically to provide aggregate of fairly consistent moisture content to the batcher and to detect changes in the moisture content of aggregate?	☐	☐	
67	Are appropriate procedures followed for adjustment of aggregate batch weights for changes in their moisture content?	☐	☐	

Batching systems *

		YES	NO	*Auditor's observations if any*
68	Does the charging gate or valve ensure that it cannot be opened until the scale has returned to zero balance within ± 0.3% of the scale capacity?	☐	☐	
69	Does the charging gate or valve ensure that it cannot be opened if the discharge mechanism is open?	☐	☐	
70	Does the discharge mechanism ensure that it cannot be actuated if the charging gate or valve is open?	☐	☐	
71	Does the discharge mechanism ensure that it cannot be actuated until the weight of material is within the tolerance specified?	☐	☐	

*Definitions and requirements of component individual batched controls

Batching controls are the part of the batching equipment that provides means for operating the batching device for an individual material. They may be mechanical, hydraulic, pneumatic, electrical, etc. or a combination of these means. A batching system is a combination of batching devices and batching controls necessary for the accurate and consistent batching of concrete ingredients in the desired proportions. Normally, a batching system would include batching devices and controls for cementitious materials, aggregates, water, and admixtures.

Weigh Batcher Controls (Cementitious materials and aggregates must be batched by weight; water and admixtures may be batched in a weigh batcher or by volume)

Automatic Control – When actuated by a single starting signal, an automatic weigh-batcher control shall start the weighing operation of cementitious materials, aggregate, water, or admixture, and stop the flow automatically when the designated weight has been reached.

System requirements

		YES	*NO*	*Auditor's observations if any*
72	Are all batching equipment activated by a single starting mechanism, except that a separate starting mechanism permitting volumetric batching of water and/or admixture not batched at the time of weighing the other ingredients?	☐	☐	
73	May the discharge of any weighed ingredient in the system not start unless batching controls for all weigh batchers have been cleared of the previous batch, with scales returning to zero tolerance, and until all weighed ingredients have been weighed within the required tolerances?	☐	☐	
74	Are Volumetric admixture dispenser controls (if any) interlocked with volumetric water batching controls or the controls of at least one weigh batcher to prevent the discharge of both admixture and the interlocked ingredient(s) unless both the admixture dispenser and the interlocked batching device(s) have been cleared of the previous batch?	☐	☐	

Recorders

Devices that provide a permanent record of the quantity of cementitious materials, aggregate, water or admixture measured into a particular batch of concrete.

Devices

		Cementitious	Aggregate	Water	Admixture
75	Does graphical chart recorder provide indication of material being weighed/ measured and register scale readings within ± 2 percent of total scale capacity?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
	OR				
76	Does digital recorder provides a printed record of material being weighed/ measured and reproduce the scale reading within ± 1 percent of scale and accuracy for cement, admixtures and water and ± 3% for aggregates?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐

Recorders

		Cementitious	Aggregate	Water	Admixture
77	Properly protected, that is, provided with effective security to prevent tampering with records	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
78	Provide traceability of the particular batch with the corresponding delivery ticket.	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
79	Register empty balance or tare to within 0.3% of scale capacity for weighed ingredients.	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
80	Register the quantity of ingredients batched.	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐

Central Mixer

		YES	*NO*	*Auditor's observation if any*
81	Is the mixer capable of producing uniform concrete within the time specified in the operational manual of manufacturer (*Clause 9.1.4.2 of IS 4926*[3])?	☐	☐	
82	In automated plants, is the mixer equipped with a timing device that will not permit the batch to be discharged before the pre-determined mixing time has elapsed?	☐	☐	
83	Is the central mixer maintained in an efficient and clean condition?	☐	☐	
84	Are the mixer drum and the mixer blades clean from appreciable accumulation of hardened concrete?	☐	☐	

Maintenance

		YES	NO	*Auditor's observation if any*
85	Does the organization establish and implement procedures for maintenance of plants equipments and facilities?	☐	☐	
86	Does the organization replace the mixer blades and arms immediately if it is found that there is excessive wear of the same?	☐	☐	
87	Are the blades of central mixer free of excessive wear? The wear of mixer blade shall be checked at the point of maximum drum diameter nearest to the drum head. [The blade is considered excessively worn if height of the blade at this point, measured from the drum shell, is less than 2/3rd of the original radial height (*Clause 9.1.4.4 of IS 4926*)]	☐	☐	
88	Does the organization ensure that proper upkeep and cleanliness are maintained in the plant?	☐	☐	
89	Does the company take correction and corrective actions in case of detected anomalies?	☐	☐	

3.2.1.3 Delivery Fleet inspection (Clause 3.2.1.3 of Section A)

It is the responsibility of RMC producer to ensure that each truck mixer is inspected to confirm compliance with various requirements given in this section. The RMC facility shall maintain a register of such inspection in the suggested format, and this shall be made available to the external auditor. During the audit, at least 10% of the truck mixers from the register shall be audited.

		YES	*NO*	*Auditor's observation if any*
90	Are the truck mixers maintained in an efficient and clean condition?	☐	☐	
91	Are the mixer drum and the mixer blades free from appreciable accumulation of concrete?	☐	☐	

Mixer blades wear

The wear of mixer blade shall be checked at the point of maximum drum diameter nearest to the drum head. The blade is considered excessively worn if height of the blade at this point, measured from the drum shell, is less than 2/3rd of the original radial height.

		YES	*NO*	*Auditor's observation if any*
92	Are the blades free of excessive wear?	☐	☐	

Charging hopper

		YES	*NO*	*Auditor's observation if any*
93	Is the surface of charging hopper clean and smooth?	☐	☐	
94	Is the charging hopper free from appreciable accumulation of concrete?	☐	☐	

Discharging opening, hopper and chute

		YES	*NO*	*Auditor's observation if any*
95	Is the surface of discharging opening, hopper and chute clean and smooth?	☐	☐	
96	Are the discharging opening, hopper and chute free from appreciable accumulation of concrete?	☐	☐	

Speed of agitation

		YES	*NO*	*Auditor's observation if any*
97	Is the agitating mixer capable of operating at a maximum speed of 14 rpm?	☐	☐	

Water tank, meter and pump system

		YES	*NO*	*Auditor's observation if any*
98	Is the gauge/meter on water tank fitted to the truck mixer clean and legibly graduated?	☐	☐	
99	Is the water pump / injection system in good working condition?	☐	☐	
100	Does the water meter calibration record show variation beyond 2%?	☐	☐	

Inspection record of truck mixer

Company: City:

Truck No._____ Rated Capacity: _____

Name of manufacturer and make:_____

Date of previous inspection: _____

Date of current inspection: _____

Inspection record of Truck Mixers: (For the use of RMC producer)

(Each truck mixer's inspection to be entered in a separate column; add more columns if needed)

Items in Check List	*Truck mixer 1*	*Truck mixer 2*	*Truck mixer 3*
Are the truck mixers maintained in an efficient and clean condition?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Are the mixer drum and the mixer blades free from appreciable accumulation of concrete?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Are the blades free of excessive wear?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Is the surface of charging hopper clean and smooth?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Is the charging hopper free from appreciable accumulation of concrete?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Is the surface of discharging opening, hopper and chute clean and smooth?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Are the discharging opening, hopper and chute free from appreciable accumulation of concrete?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Is the agitating mixer capable of operating at maximum a speed of 14 rpm?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Is the gauge/meter on water tank fitted to the truck mixer clean and legibly graduated?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Is the water pump / injection system in good working condition?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Does the water meter calibration record show variation beyond 2%?	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐

Summary of Inspection record of truck mixer (for the use of auditor only)

Sr No.	Truck No.	Date of previous inspection by producer	Name of Manufacturer and make	Rated Capacity	Date of Inspection	Compliance
101						Yes ☐ No ☐
102						Yes ☐ No ☐
103						Yes ☐ No ☐
104						Yes ☐ No ☐
105						Yes ☐ No ☐
106						Yes ☐ No ☐
107						Yes ☐ No ☐
108						Yes ☐ No ☐
109						Yes ☐ No ☐

Total no. of truck mixers available for use:

Total number of trucks inspected by producer _____

No. of truck mixers checked and found acceptable:

3.3 Laboratory (Clause 3.3 of Section A)

General

		YES	*NO*	*Auditor's observation if any*
110	Are, the following minimum testing facilities, available at RMC plant? Aggregates Sampling (conforming to IS 2430) ☐ Moisture content (conforming to IS 2386-PartIII) ☐ Bulk density (conforming to IS 2386-Part III) ☐ Sieve analysis (conforming to IS 2386-Part-I) ☐ Concrete Slump (conforming to IS 1199) ☐ Unit weight (conforming to IS 1199) ☐ Strength (conforming to IS 516)* ☐ * If CTM facility is shared between more than one lab of the Company/organization, mention the location of CTM			
111	Are the minimum testing equipments mentioned in Table 4 of Section B available in the lab attached to RMC facility?	☐	☐	
112	In case any one or more of the minimum testing facilities are not available in the laboratory attached to RMC plant, is the Company/organization getting these done in the Central Lab of the Company? If yes, mention the minimum tests done in central lab of the Company/organization. 1 2	☐	☐	
113	Are testing equipments duly identified and labeled?	☐	☐	
114	Are the equipments used for different tests in conformity with the requirements specified in different codes?	☐	☐	
115	If the answer to the question in item 114 is 'No', mention the major shortcomings in tests (add separate sheet, if necessary) 1) 2) 3) 4)	☐	☐	
116	Are the tools and equipment used for carrying various tests maintained in neat and clean condition?	☐	☐	
117	If the Company/organization is getting the compressive strength test done on CTM located in its central lab at the nearby location, are the cube samples transferred with proper precautions and identification for standard curing in the central lab?	☐	☐	

		YES	*NO*	*Auditor's observation if any*
118	Does the curing tank have the facility of maintaining temperature of curing water at 27 ± 2 ^{0}C (*as per IS 1199*)?	☐	☐	
119	Is the laboratory mixer kept in clean condition?	☐	☐	
120	Is there appreciable built-up of materials on mixer blades or inside face of mixer?	☐	☐	
121	Are the testing equipment calibrated at the frequencies specified in *Table* 4?	☐	☐	
122	Are documented testing procedures available in the laboratory?	☐	☐	
123	Are the documented testing procedures displayed in laboratory for the guidance of operators/supervisors?	☐	☐	
124	Are the testing procedures given in relevant codes or equipment manufacturer's manual followed meticulously in day-to-day practice?	☐	☐	
125	Are original or certified copies of relevant codes (hard/soft format) available in the laboratory in the current revision status ?	☐	☐	

3.4 Key Personnel (Clause 3.4 of Section A)

		YES	*NO*	*Auditor's observation if any*
126	Are the production and quality control functions handled by separate and responsible persons/teams of employees on the permanent roll of the Company/organization?	☐	☐	
127	Does the Organization establish the competence map for key roles in the organizational chart affecting the product quality related with the following aspects? ❒ education ❒ operational skills ❒ specific knowledge	☐ ☐ ☐	☐ ☐ ☐	
128	Does the organization establish and implement systematic approach to evaluate people and identify gaps with the competence map?	☐	☐	
129	Does the organization provides internal/external training or does it take any other actions to meet the competence requirement for each key role?	☐	☐	
130	Does the Organization establish and deploy an approach for measuring the training activities effectiveness?	☐	☐	
131	Does the organization ensure that personnel are aware and clearly understand the relevance of their activities to achieve the quality objectives and the customer satisfaction?	☐	☐	
132	Does the organization keep appropriate records on the level of education, training, skills and experience of its personnel, including personnel dedicated to outsourced processes?	☐	☐	
133	Is the field technician duly trained in the taking samples and testing for slump and preparation of the test cubes?	☐	☐	
134	Are the truck drivers adequately trained to administer admixture in concrete during transit?	☐	☐	

4 Control on Quality of Incoming Materials (Clause 4 of Section A)

		YES	*NO*	*Auditor's observation if any*
135	Does the company/organization keep a dated record of sources of all materials in the format in *Table* 5?	☐	☐	
136	If there is a change in the source of materials is it traceable from the list in *Table* 5?	☐	☐	
137	While selecting the sources of materials, does the Company/organization provides with evidence that the BIS specified threshold limits for different ingredients are satisfied?	☐	☐	
138	Does the company/organization obtain and properly achieve test certificates on the key physical and chemical properties of cement, supplementary cementitious materials, and chemical admixtures from the manufacturers for each consignment?	☐	☐	
139	Does the Company/organization get the tests on key physical and chemical properties of the first consignment of cement done in NABL-accredited lab?	☐	☐	
140	Is periodic validation of cement manufacturer's test results carried out by testing the key physical and chemical properties of cement in NABL-accredited lab at least once in a year?	☐	☐	
141	Does the organization control the compatibility between the chemical/physical properties of all constituent raw materials in particular admixture and cementitious materials and provide evidence of record regarding such control	☐	☐	
142	Does the company/organization get the tests on key physical and chemical properties of the following ingredients done in NABL-accredited labs at least once in six month and maintain the records? • Fly ash • GGBS • Silica fume • Other SCM (Specify) • Water • Chemical admixture	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	

		YES	*NO*	*Auditor's observation if any*
143	Does the company/organization carry out the tests on following properties of aggregates r in its lab at the specified frequency?? • Sieve analysis (monthly) • Moisture content (daily) • Silt content of fine aggregates (monthly)	☐ ☐ ☐	☐ ☐ ☐	
144	Does the Company/organization get all other tests specified in IS 4926 (other than those in item 143) carried out in NABL-accredited lab at specified frequencies? (see *Table* 10-B)	☐	☐	
145	Does the company/organization analyze and make use of the various test data to ensure that all incoming materials conform to the BIS-specified threshold limits?	☐	☐	

5 Concrete Mix Design (Clause 5 of Section A)

		YES	*NO*	*Auditor's remarks, if any*
146	Does the Company/organization get the information in the format given in *Table* 8 from purchasers?	☐	☐	
147	Does the Company/organization take full cognizance of the purchaser-specified information while designing the concrete mixes?	☐	☐	
148	Does the Company/organization have the capability to carry out concrete mix design?	☐	☐	
149	Does the Company/organization take approval of the designed mixes from the purchaser?	☐	☐	
150	Does the Company/organization have the capability of converting the prescribed and designed mixes into batches for production?	☐	☐	
151	Does the Company/organization keep records of prescribed and designed mixes in the format specified in *Table* 7?	☐	☐	

6 Production and Delivery (Clause 6 of Section A)

The auditor shall choose any five customer orders as received by the company/organization during the past three months. He/she shall demand the relevant records (usually stored in computers in the form of autographic records) and the same shall be carefully cross checked with the order data and recorded in the following format.

Sr No.		*Properties*	*As ordered*	*As delivered*
152	Record 1	Grade of concrete		
		Slump, mm		
		Minimum/maximum cementitious content, if specified and Cement Type		
		Maximum water-binder ratio, if specified		
		Chemical admixture dosage, if specified		
153	Record 2	Grade of concrete		
		Slump, mm		
		Minimum/maximum cementitious content, if specified and Cement Type		
		Maximum water-binder ratio, if specified		
		Chemical admixture dosage, if specified		
154	Record 3	Grade of concrete		
		Slump, mm		
		Minimum/maximum cementitious content, if specified and Cement Type		
		Maximum water-binder ratio, if specified		
		Chem. admix. dosage, if specified		
155	Record 4	Grade of concrete		
		Slump, mm		
		Minimum/maximum cementitious content, if specified and Cement Type		
		Maximum water-binder ratio, if specified		
		Chemical admixture dosage, if specified		

Sr No.		*Properties*	*As ordered*	*As delivered*
156	Record 5	Grade of concrete		
		Slump, mm		
		Minimum/maximum cementitious content, if specified and Cement Type		
		Maximum water-binder ratio, if specified		
		Chemical admixture dosage, if specified		

6.1 Identification and Traceability (Clause 6.3 of Section A)

		YES	*NO*	*Auditor's observations If any*
157	Does the Company/Organization have established and deployed procedures to identify all the products from reception (raw materials) throughout the production until the delivery (fresh concrete) and return phases, correlating them with the documents describing their characteristics?	☐	☐	
158	Does the Delivery ticket (Challan) contains the following information regarding the Customer *(As per Annex G of IS 4926)*:			
	Name of the ready mixed concrete Company	☐	☐	
	Plant designation if Company operates more than one plant	☐	☐	
	Serial No. Of ticket	☐	☐	
	Delivery date	☐	☐	
	Truck No.	☐	☐	
	Name of the Purchaser	☐	☐	
	Name& location of the site	☐	☐	
159	Does the Delivery ticket (Challan) contains the following information regarding the Product *(As per Annex G of IS 4926)*:			
	Unique reference for the fabrication mix design	☐	☐	
	Grade of concrete or mix description of the concrete	☐	☐	
	Specified target workability at pour site	☐	☐	
	Minimum cement content (if specified)	☐	☐	
	Type of cement and grade (if specified)	☐	☐	
	Maximum free water-cement ratio	☐	☐	
	Nominal maximum size of aggregate	☐	☐	
	Generic type or name of chemical admixtures included	☐	☐	
	Generic type or name of mineral admixtures included	☐	☐	
	Quantity of concrete in m^3	☐	☐	
	Time of loading	☐	☐	
	Signature of authorized person	☐	☐	
	A statement warning the purchaser of the precautions needed to be taken when working with cement and wet concrete.	☐	☐	
	Any other item	☐	☐	
160	Does the Delivery ticket (Challan) contain the following information			

	regarding the Delivery?			
	time of arrival at site	☐	☐	
	time when discharge was completed	☐	☐	
	any admixture added by the customer to meet the specific workability	☐	☐	
	Any extra admixture added at request of the purchaser of the concrete, or his representative and his signature			
	Pour location			
	Is the Delivery Ticket (Challan) duly completed and undersigned by a relevant authority or by the customer on site?	☐	☐	

6.2 Control of Non Conforming Products (Clause 6.4 of Section A)

		YES	*NO*	*Auditor's observation if any*
161	Does the organization ensure that the materials which do not conform to BIS requirements are identified and controlled to prevent their unintended use or delivery?	☐	☐	
162	Are non-conforming materials rejected and not allowed to enter the plant?	☐	☐	
163	In case non-conformity is observed after materials have been accepted, are these materials kept separate and entries made in the register?	☐	☐	
164	Has the Company/organization authorized a person to take decisions on non-conforming materials and take corrective actions including making entries in the register?	☐	☐	
165	Does the company/organization follow the practice of analysing and reviewing the reasons leading to non-conformities and whether correct follow up actions taken?	☐	☐	

7 Control on Process Control Equipments and Measurements (Clause 7 of Section A)

		YES	*NO*	*Auditor's observation if any*
166	Does the company/organization carry out visual inspection of material storage facilities and major equipments at frequencies specified in Table 10?	☐	☐	
167	Does the organization plan and conduct the calibration of all equipment and testing facilities as established in Tables 4 and 10?	☐	☐	
168	Are the measuring and testing equipments (weighing balance, standard weights, sieves, proving ring of compression testing machine, etc.) regularly calibrated?	☐	☐	
169	Has the calibration of compression testing machine done by a competent authority at a frequency recommended by the manufacturer of testing machine and can this be verified from the records available in the laboratory	☐	☐	
170	Are the dimensions of cube moulds within the code-specified tolerances after repeated use?	☐	☐	
171	Does the organization keep proper records of the calibration?	☐	☐	
172	Does the organization promptly remove from the list of instruments those which are not suitable to execute controls?	☐	☐	

8 Complaints (Clause 8 of Section A)

		YES	*NO*	*Auditor's observation if any*
173	Does the Company/organization establish an approach for managing customer complaints?	☐	☐	
174	Does the Company/organization duly communicate such approach and verify that the customer is aware of it?	☐	☐	
175	Does the Company/organization has appointed a Nodal Officer to take care of complaints?	☐	☐	
176	Does the name and contact details of the Nodal Officer available to the purchaser easily?	☐	☐	
177	Does the Company/organization investigate the complaints properly and find out the root cause?	☐	☐	
178	Does the Company/organization resolve the complaint to the satisfaction of the customers?	☐	☐	
179	Does the Company/organization carry out the systematic review of the complaints on a periodic basis?	☐	☐	

9 Feedback (Clause 9 of Section A)

180	Does the organization obtain feedback from its major customers on regular basis?	☐	☐	
181	Does the organization carry out analysis of the feedback and take corrective actions?	☐	☐	
182	Does the Nodal Officer keep records of the customer feedback and the action taken on the feedback?	☐	☐	

Table 1: General Information of Ready Mixed Concrete Facility (3.1.1 of Section A)

Company Name	
Company Address (Register office) Tel. Fax e-mail	
Location of Plant	
Address of Plant Tel. Fax e-mail	
Personnel information • Plant-in-charge/Manager • QC personnel • Liaison personnel	 Name Telephone Name Telephone Name Telephone
Material Testing Facilities	Location and address Name of lab in-charge Telephone
Statutory Permissions*	1.Certificate from Pollution Control Board Yes ☐ No ☐ N.A. ☐ Expiry date: 2. Approval from factory inspector Yes ☐ No ☐ N.A. ☐ Expiry date: 3.Approval from Local Authorities (Municipal/Corporation/other) Yes ☐ No ☐ N.A. ☐ Expiry date:

* It is essential to attach photocopies of all relevant statutory permissions and certificates.

Table 2: General Information on Concrete Production Facilities (3.1.1 of Section A)

Name of Plant Manufacturer	
Type of Plant	
Plant's Rated capacity, m^3/hour	
Type of Mixer*	Rotating-drum type ☐ Power mixer ☐ Planetary Mixer ☐ Pan type ☐ Pan-type with agitator ☐ Single shaft ☐ Twin shaft ☐
Mixer batch size, m^3	
Storage Capacity	
Cement, tonnes	
Fly ash, tonnes	
Slag, tonnes	
Other cementitous material, tonnes	
Coarse aggregates, tonnes or m^3 10-mm 20-mm 40-mm	
Fine aggregates, tonnes or m^3 River sand Manufactured sand	
Crusher fines, tonnes or m^3	
Water, litres	
Chemical admixtures, litres	
Plasticiser Superplasticiser Retarder Any other	
Others	
**Brief description of recycling facility, if any	
Number of trucks with rated capacities	
Name of drum and truck manufacturer	1 2 3
**Additional information on Plant & Trucks, if any	

* Tick (√) in appropriate box. **Add extra sheets if essential

Table 3: General Information on Material Handling (3.1.1 of Section A)

Material	*Delivery to Plant*	*Storage*	*Storage to Weigher*
Cement	Bulk ☐ Bags ☐	Silo ☐ Godown ☐	Screw conveyor ☐ Air Slide ; Gravity ☐
Coarse aggregates	Trucks ☐	Star pattern ☐ In-line bins ☐ compartments ☐ Tall/pocket silos ☐	Conveyor ☐ Skip bucket ☐ Bucket conveyor ☐
Fine aggregates	Trucks ☐	Star pattern ☐ In-line bins ☐ compartments ☐ Tall/pocket silos ☐	Conveyor ☐ Skip bucket ☐ Bucket conveyor ☐
Fly ash	Bulk ☐ Bags ☐	Silo ☐ Bins ☐	Screw conveyor ☐ Manual ☐
Slag	Bulk ☐ Bags ☐	Silo ☐ Bins ☐	Screw conveyor ☐ Manual ☐
Micro silica	Bags ☐	Silo ☐ Godown ☐	Screw conveyor ☐ Manual ☐
Other cementitious material (specify)	Bags ☐	Silo ☐ Godown ☐	Screw conveyor ☐ Manual ☐
Water	Mun. mains ☐ Wells ☐ Ponds ☐	Underground/over-ground tank ☐	Pumping ☐ Gravity flow through pipe network ☐
Chemical admixtures(Liquid)	Drums ☐ Tankers ☐	Drums ☐ Tanks ☐	Dispenser ☐
Chemical admixture or additives	Bags ☐	Godown ☐	Manual ☐
Special arrangement for supplying temperature-controlled concrete, if used	Occasional use ☐ Not used ☐ Arrangement 1. Addition of ice slabs in mixing water tank ☐ 2. Addition of ice flakes in mixing drum ☐ 3. Chilling Plant ☐ 4. Combination of above (1/2/3) ☐		

* Tick (√) in appropriate box. If materials/ provisions not used, keep the boxes blank.

Table 4: List of Minimum Testing Equipment for Laboratory attached to RMC Facility (3.3 of Section A)

Sl. No.	*Relevant test and BIS Standard*	*Name of equipment*	*Minimum no. of units*	*Calibration frequency and relevant code*	*Whether calibration done as specified and records kept*	
					Yes	No
1.	Slump test (IS 1199-1959)	Slump cone test apparatus with all accessories such as base plate, tamping rod, etc.	2 sets	Yearly IS 1199	☐	☐
2. *	Compressive strength of concrete *(IS 516)	Compression Testing Machine with minimum 2000 kN capacity, conforming to IS 14858 *	One no.	Yearly IS 516	☐	☐
3.	Preparing concrete test specimens (IS 1199)	Cube moulds of size: • 150 mm x 150 mm x 150 mm • 100 mm x 100 mm x 100 mm	30 nos.	Yearly IS 10086	☐	☐
4.	Sieve analysis of fine and coarse aggregates (IS 2386- Part I)	IS Test sieves for fine and coarse aggregates • 40 mm, 25 mm, 20 mm, 12.5 mm, 10 mm, 6.3mm, 4.75 mm, and lid+pan • 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm, 150 µm, 75 µm, 45 µm and lid+pan	one set for coarse and fine agg. each	Yearly IS 2386 – Part I	☐	☐
5.#	Sampling of aggregates # (IS 2430)	Sieve shaker for fine aggregates #	One	Yearly	☐	☐
		Sample divider for sampling of aggregates #	One	Yearly	☐	☐
6.	Unit weight of concrete (IS 1199)	Bulk density pot for fresh concrete (10 lit)	one no.	Yearly IS 2386–Part III	☐	☐
7.	Aggregates Bulk density(IS 2386- Part III)	Bulk density pot for fine (3 or 5 lit) and coarse aggregates (7 or 10 lit)	one no each for coarse & fine agg.	Yearly IS 2386 – Part III	☐	☐
8.	Silt content of sand	Graduated glass cylinder (500 ml) for determining silt content	one no.	-	☐	☐
9.	Specific gravity of aggregates	Pyknometer and density basket or Gas Jar for determining specific gravity of aggregates (P.T.O)	one no.	Yearly IS 2386–Part III	☐	☐

(Continued from previous page))						
10.	Other accessories	Electronic weighing balance of adequate capacity with accuracy of 1 g.	One	Yearly	☐	☐
		Laboratory mixer (min 50 lit)	One	Man. specified	☐	☐
		Electric microwave oven (IS 11332)	One	Yearly IS 6365	☐	☐
		Concrete compaction equipments (Table vibrator / needle vibrator, tamping rods)	One	Yearly	☐	☐
		Curing tank with provision to maintain 27±2^{o} C temperature of water	One	-	☐	☐
		Shovels, trowels, flexible spatulas, meter, etc.	Sufficient nos.	-	☐	☐

Notes:

Alternatively, shaking of sieves done manually and sampling of aggregates done by quartering technique shall be permitted.

* In case the CTM lab is not available in the lab, concrete cubes shall be tested in the RMC Company/Organization's other lab in the same city, provided due care is taken to transfer the cubes with proper precaution and identification for standard curing for 28 days.

Wherever flexural strength is specified in addition to compressive strength, it is essential have nine nos. of beam moulds of 150x150x700mm size. It is also essential to have the facility of additional attachment for the CTM to carry out this test.

Table 5: List of Sources of Incoming Approved Materials (4.2 of Section A)

(Valid as on date: DD/MM/YY)

Sr No.	Type of Ingredient	Source and brand name (if any)	Supplier' name and address	Acceptance criteria followed for approval	Remarks

Table 6-A: Verification and Testing Frequency of Cement, SCMs, Water and Chemical Admixtures (4.3.8 of Section A)

Sl. No	*Material*	*Verification*	*Scope*	*Frequency*
1.	Cement	• Delivery Documents • Manufacturer's test certificate for physical and chemical properties	• Verify that the goods delivered match the purchase order (type, brand name, week of manufacture). • In case the supply is by bulker, verify lock seal nos. and ensure that they tally with the nos. on Challan • Manufacturer's test certificate traceable to each consignment	• Each consignment
2.	Supplementary Cementitious Materials (SCMs) 1. Fly ash (IS 3812 (Part1) 2. Ground Granulated Blast Furnace Slag (IS 12089 and BS 6699) 3. Microsilica (IS 15388) 4. Metakaolin	• Delivery Documents • Manufacturer's test certificate on physical and chemical properties • Uniformity requirements as per relevant IS codes	• Verify that the goods delivered match the purchase order (type, brand name, week of manufacture) • Verify that each consignment has a manufacturer's test certificate confirming all physical and chemical properties and performance conform to requirements of relevant IS codes traceable to each consignment. • Verify all uniformity requirement tests as per relevant IS code done from NABL-accredited lab at specified frequencies.	• All tests on physical and chemical requirements and performance specified by relevant IS code essential before finalizing source • All Uniformity tests as per relevant IS code performed once in six months from NABL-accredited lab
3	Water	• Delivery documents	• Shall be tested for suitability for concrete making as per IS 456-2000 at frequencies specified by IS 4926 for mains and non-mains water.	• For non-mains water: Initially every week for first six weeks and then at 3-monthly internal • For mains water: Annual basis once all tests for source are satisfactory

Sl. No	*Material*	*Verification*	*Scope*	*Frequency*
4.	Chemical admixtures	• Delivery Documents • Manufacturer's test certificate for physical and chemical properties, uniformity requirements and compatibility	• Verify that the goods delivered match the purchase order (type, brand name, week of manufacture) • Verify that each consignment has a manufacturer's test certificate confirming all physical and chemical properties, performance, and compatibility with the cement conforming to requirements of IS 9103 and is traceable to each consignment • Verify all Uniformity requirement tests as per IS 4926 done from NABL-accredited lab at specified frequencies	• All tests specified by IS 9103 essential before finalizing source • All Uniformity tests as per IS 4926 performed once in six months from NABL-accredited lab. • Compatibility tests shall be conducted whenever there is change in combination of cement and admixture.

TABLE 6-B: Verification and Testing Frequency for Aggregates (4.3.8 of Section A)

Delivery documents

Delivery document shall be verified to check delivered aggregates match the purchase order and that their source is correct. Visual inspection shall be done to check normal appearance, shape, presence of excessive fines, impurities etc.

Testing frequencies

Aggregates shall be tested at a minimum frequency indicated below. The specified frequencies are in conformity with provisions in IS 4926 or stringent from the same.

Sl. No.	*Aggregate property/parameter*	*Type of aggregate*	*Frequency of Testing*	*Relevant IS Standard*
1.	Grading	Fine aggregate • Uncrushed • Crushed Coarse aggregate • Uncrushed • Crushed	Weekly	IS 383-1970
2.	Particle density • Oven dry • Saturated surface dry • Apparent	Both fine and coarse aggregates	3 monthly	IS 2386 (Part 3)
3.	Water absorption	Both fine and coarse aggregates	3 monthly	IS 2386 (Part 3)
4.	Bulk density • Loose • Compacted	Both fine and coarse aggregates	6 Monthly	IS 2386 (Part 3)
5.	Particles finer than 75 µm	Fine aggregate- • Uncrushed • Crushed	Weekly	IS 2386 (Part 1)
6.	Flakiness and Elongation indices	Coarse aggregates	6 monthly	IS 2386 (Part)
7.	Impact value	Coarse aggregate	Yearly or change in source	IS 2386 (Part 4)
8.	Crushing value	Coarse aggregate	Yearly or change in source	IS 2386 (Part 4)
9.	Abrasion value	Coarse aggregate	Yearly or change in source	IS 2386 (Part 4)

Sl. No.	*Aggregate property/parameter*	*Type of aggregate*	*Frequency of Testing*	*Relevant IS Standard*
10.	10% Fines	Coarse aggregate	Yearly or change in source	IS 2386 (Part 4)
11.	Petrographic examination	Both fine and coarse aggregates	Once in 5 years or change in source	IS 2386 (Part 8)
12.	Alkali-aggregate reactivity	Both fine and coarse aggregates	Yearly or change in source	IS 2386 (Part 7)
13	Soundness	Both fine and coarse aggregates	Yearly or change in source	IS 2386 (Part 5)
14	Chloride content	Both fine and coarse aggregates	Yearly or change in source	
15	Deleterious materials	Both fine and coarse aggregates	Yearly or change in source	IS 2386 (Part 2)

Table 7: Concrete mix information to be supplied by the purchaser (5.4 of Section A)

Name of RMC Producer: _____
Name of Client/Contractor:_____
Site: _____

Mix code					
Grade (Characteristic strength), N/mm^2					
Minimum cement content, kg/m^3 (if specified)					
Mineral additives, kg/m^3 (if specified) • Pulverized fuel ash • Slag • Silica fume • Others (mention type)					
Maximum free water-binder ratio (if specified)					
Nominal maximum aggregate size, mm					
Cement type and grade (if specified)					
Target workability at plant, (Slump, mm)					
Target workability at site, (Slump, mm)					
Maximum temperature of concrete at the time of placing (if specified)					
Class of sulphate resistance (if applicable)					
Exposure condition (if specified)					
Class of finish (if applicable)					
Total SO_3 in Concrete (if specified)					
Mix application					
Method of placing					
Any other requirements (if applicable) [early strength, workability retention, permeability testing, chloride content restriction, etc.)					
Concrete testing frequency					
Material testing (any non-routine requirement)					
Method of curing to be used					
Quantity (m^3)					

Source: Adapted from IS 4926

Table 8: Format for Mix Design (5.5 Section A)

1. Name of customer
2. Mix designed in RMC lab/NABL accredited lab
3. Date of mix design
4. Mix code, if any
5. Details of ingredients
    a. Grade of concrete :
    b. Specified workability at pour site :
    c. Maximum size of aggregate :
    d. Exposure class of IS 456, if specified :
    e. Minimum cementitious content, if specified :

TABLE 9: Production and Control of Final Product (6.4 of Section A)

Sl. No.	*Name of Material/Test*	*Frequency of testing*	*Relevant IS Standard*
1.	Fine Aggregate: a) Determination of Moisture content b) Water absorption	a) Moisture content on daily basis; twice in day during monsoon b) Weekly or change in source	IS 2386 (Part 3)
2.	Coarse aggregate a) Determination of Moisture content b) Water absorption	a) Moisture content on daily basis; twice in day during monsoon b) Weekly or change in source	IS 2386 (Part 3)
3.	Fresh Concrete a) Sampling (IS 4926 procedure) b) Slump test c) Density of fresh concrete d) Placing Temperature of the concrete #	a) Sampling: At least one sample for every 50 m^3 of production or every 50 batches whichever is of greater frequency b) At least one sample for every 50 m^3 of production or every 50 batches whichever is of greater frequency c) At least once in a day d) At least one sample for every 50 m^3 of production or every 50 batches whichever is of greater frequency	a) IS 4926 b) IS 1199 c) IS 1199 d) IS 1199
4	Hardened concrete a) Compressive strength * b) Density c) Flexural Strength#	a) At least one sample for every 50 m^3 b) Production or every 50 batches whichever is of greater frequency * c) When asked for	IS 516

Optional test

* One sample involves casting of 3 specimens of 150x150x150mm size, to be tested at 28 days. Additionally, samples shall be cast for testing at earlier or later ages (3, 7, 56, 90 days), depending upon the agreement between the producer and the customer.

Table 10: Control on Process Control Equipments and Frequency of Inspection and Calibration (7.3 of Section A)

Items	*Check for*	*Frequency*
Cementitious materials	Visual Inspection for weather-tightness and leaks	Weekly
Aggregate stockpile	Visual Inspection for segregation and contamination	Daily
Conveyor belts and rollers	Visual Inspection for wear and alignment	Weekly
Central mixer	Visual Inspection of blades and built up	Daily
Trucks	Visual Inspection of blades and built up	Weekly
Scale calibration for all weighing and measuring equipment	1.Mechanical/knife edge systems 2.Electrical/ load cell systems	Monthly Monthly
Water meters	Calibration	Monthly
Admixture dispensers	Calibration	Monthly
Gear boxes and oil baths	Oil change	Quarterly

Table 11 Tolerances in Measurement of different Constituent Materials (7.3 of Section A)

Constituent materials	*Tolerances (% of the quantity of the constituent material being measured)*	*Indian Standard*
Cement	± 2%	IS 4926:2003
Water	± 3%	IS 4926:2003
Aggregates	± 3%	IS 4926:2003
Mineral admixtures	± 2%	IS 4926:2003
Chemical admixtures	± 3%	IS 4926:2003
Moisture		IS 2386

About BMTPC

Vision

"BMTPC to be world class knowledge and demonstration hub for providing solutions to all with special focus on common man in the area of sustainable building materials, appropriate construction technologies & systems including disaster resistant construction."

Mission

"To work towards a comprehensive and integrated approach for promotion and transfer of potential, cost-effective, environment-friendly, disaster resistant building materials and technologies including locally available materials from lab to land for sustainable development of housing."

Objectives

- *Building Materials & Construction Technologies :* To promote development, standardisation, mechanisation and large scale field application of proven innovative and emerging building materials and technologies in the construction sector.
- *Capacity Building and Skill Development:* To work as a Training Resource Centre for capacity building and promotion of good construction practices to professionals, construction agencies, artisans and marketing of building technologies from lab to land.
- *Disaster Mitigation & Management :* To promote methodologies and technologies for natural disaster mitigation, vulnerability & risk reduction and retrofitting/ reconstruction of buildings and disaster resistant planning for human settlements.
- *Project Management & Consultancy:* To undertake project management and consultancy services including appraisal, monitoring and third party inspection of housing projects under the various Central/State Schemes.

Building Materials & Technology Promotion Council
Ministry of Housing & Urban Poverty Alleviation, Government of India
Core 5A, First Floor, India Habitat Centre
Lodhi Road, New Delhi 110003, INDIA
Tel: +91-11-24636705, 24638096, 24638097; Fax: +91-11-24642849
E-mail: bmtpc@del2.vsnl.net.in; info@bmtpc.org
Website: www.bmtpc.org