Checklist for Ready Mix Concrete Certification

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
4.	**Concrete making Materials**				
4.2	**Cement** – Cements used for concrete shall conform to the requirements of relevant Indian Standards and requirements of IS 456. Type and grade of cements used since last audit shall be reported.				
4.3	**Mineral Admixtures** —Mineral Admixtures shall Conform to IS 456. Types of mineral admixtures used shall be reported since last audit.				
4.4	**Aggregates** — Aggregates used for concrete shall be in accordance with the requirements of IS 456. Types of coarse and fine aggregate used shall be reported since last audit. Unless otherwise agreed testing frequencies for aggregates shall be as given in Annex B.				
4.5	**Chemical Admixtures** Chemical admixtures shall be as perIS 456.Types of chemical admixtures used shall be reported since last audit.				
4.1	Where materials are used which are not covered by the provisions of the relevant Indian Standard, there should be satisfactory data on their suitability and assurance of quality control. Records and details of performance of such materials should be maintained. Account should be taken of possible interactions and compatibility between materials used. Also, prior permission of the purchaser shall beobtained before use of such materials.				
4.6	**Water** 4.6.1 Water used shall be in accordance with the requirements of IS 456. The source of water to be reported.Unless otherwise agreed, the minimum testing frequencies for water shall be as given below: a) ***Mains Water—*** Water samples are taken from all sources of supply and tested for pH, chloride ion content, sulfate content and any other parameters in accordance with IS 456. The initial test rate shall be weekly until six results are obtained. Three monthly samples shall then be taken and compared against the average of the original six. Significant deviation shall require further investigation. b) ***Non mains Water—A*** sample shall be taken annually for routine records however if the Chloride ion content is above 0.01 percent then the interval of testing shall be reduced to 3 monthly. 4.6.2 The use of re-cycled water is encouraged as long as concrete of satisfactory performance can be produced and steps are taken to monitor the buildup of chlorides in any recirculated water and that any subsequent adjustments to the mix design are made to ensure that any overall limit on chloride contents is satisfied. The addition of any recycled water shall be monitored and controlled to meet these requirements.The percentage of recycled water used and compliance to chloride content to be reported. 4.6.3 The total amount of water added to the mix shall be recorded in the production record. The water content of concrete shall be regulated				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	by controlling its workability or by measuring and adjusting the moisture contents of its constituent materials. The producer's production staff and truck-mixer drivers shall be made aware of the appropriate responses to variations in concrete consistence of a particular mix caused by normal variations in aggregate moisture content or grading. Identification and traceability of each raw material shall be maintained and checked. Note:1) If necessary, the water may be treated suitably to ensure its compliance with the requirements of IS 456.				
9	**Production and Delivery**				
9.1	**Plant and Equipment**				
9.1.1	**Materials Storage and Handling**				
9.1.1.1	***9.1.1.1 Cement*** Separate storage for different types and grades of cement shall be provided. Containers may be used to store cements of different types provided these are emptied before loading a fresh cement. Bins or silos shall be weatherproof and permit free flow and efficient discharge of the cement. Each silo or compartment of a silo shall be completely separate and fitted with a filter or alternative method of dust control. Each filter or dust control system shall be of sufficient size to allow delivery of cement to be maintained at a specified pressure, and shall be properly maintained to prevent undue emission of cement dust and prevent interference with weighing accuracy by buildup of pressure. Cement shall be stored and stacked in bags and shall be kept free from the possibility of any dampness or moisture coming in contact with them and where cement can be stored and retrieved without undue damage to the bags. Sign boards shall be displayed indicating different types of cements and best before use date. The cement is to be used in the order it is delivered (See also IS 4082). In case, the cement remains in storage for more than 3 months, the cement shall be retested before use and shall be rejected if it fails to conform to any of the requirements given in the relevant Indian Standard.				
9.1.1.2	***Dry pulverized fuel ash and other mineral admixtures***				
	Suitable separate arrangement for storage of pulverized fuel ash, silica fume, metakeolin, rice husk ash, ground granulated blast furnace slag such as for cement, shall be provided, in the plants utilizing these materials. There shall be dedicated silos for pulverized fuel ash and for ground granulated blast furnace slag.				
	All the silos shall be labeled and the records of storage of different types/grades of cement or different types of mineral admixtures, shall be maintained.				
9.1.1.3	***Aggregates (coarse and fine)***				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	Stockpiles shall be free draining and arranged to avoid contamination and to prevent intermingling with adjacent material. The bin should have hard floor to avoid contamination with the soil/water. The travel area for the vehicles for handling of aggregates should also be having a hard base to avoid contamination during scooping.				
	Handling procedures for loading and unloading aggregates shall be such as to reduce segregation to a minimum.				
	Provision shall be made for separate storage for each nominal size and type of aggregate and the method of loading of storage bins shall be such as to prevent intermingling of different sizes and types.				
	Fine aggregate shall be stacked in a place where loss due to the effect of wind is minimum (See also IS 4082 and IS 456). The aggregates may be kept covered to avoid loss or contamination.				
	For coarse aggregates, water may be sprinkled to avoid mixing and loss due to effect of wind.				
	Note: 1) In case the conveyance system is used it shall be designed in such a way that the material being conveyed is adequately protected against contamination.				
9.1.1.4	***Water***				
	An adequate supply shall be provided and when stored on the plant such storage facilities shall be designed to minimize the risks of contamination The water tank may be cleaned regularly to avoid the deposition of any sediments, algae formation or foreign materials.				
9.1.1.5	***Chemical admixtures***				
	Tanks or drums containing liquid admixtures shall be clearly labelled for identification purposeand shelf life shall be clearly indicated. They shall be stored in such a way to avoid damage, contamination or the effects of prolonged exposure to sunlight (if applicable). 4.5.3 Admixtures should be stored in a manner that prevents degradation of the product and consumed within the time period indicated by the admixture supplier. Any vessel containing an admixture in the plant or taken to site by the producer shall be clearly marked as to its content. 4.5.4 When offering or delivering a mix to a purchaser it should be indicated if such a mix contains an admixture or combination of admixtures or not. The admixtures may be identified generically and should be declared on the delivery ticket. 4.5.5 The amount of admixture added to a mix shall be recorded in the production record. In special circumstances, if necessary, additional dose of admixture may be added at project site to regain the workability of concrete with the mutual agreement between the producer and the purchaser.				
	Agitation shall be provided for liquid admixtures, which are not stable solutions.				
9.1.2	**Batching Plants and Batching Equipment**				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	Hoppers for weighing cement, mineral admixtures, aggregates and water and chemical admixture (if measured by mass) shall consist of suitable containers freely suspended from a scale or other suitable load measuring device and equipped with a suitable discharging mechanism.				
	The method of control of the loading mechanism shall be such that, as the quantity required in the weighing hopper is approached, the material may be added at a controllable rate and shut off precisely within the weighing tolerances specified in Annex E.				
	The weighing hoppers for cement, mineral admixtures aggregate shall be capable of receiving their rated load, without the weighed material coming into contact with the loading mechanism.				
	Where the rated capacity of a batching plant mixing cycle is less than 1.0 m^3, additional precautions shall be taken to ensure that the correct numbers of batches are loaded into the truck mixer.Actual loading of a truck mixer shall be checked to verify the correct number of loads as per capacity of mixing cycle.				
	The weighing hoppers shall be constructed so as to discharge efficiently and prevent the buildup of materials.This may be verified physically.				
	A tare adjustment, up to 10 percent of the nominal capacity of the weigh scale, shall be provided on the weighing mechanism so that the scale can be adjusted to zero at least once each day.				
	Dust seals shall be provided on cement hoppers between the loading mechanism and the weigh hopper, and shall be fitted so as to prevent the emission of cement dust and not to affect weighing accuracy.				
	The hopper shall be vented to permit escape of air without emission of cement dust.				
	Vibrators or other attachments, where fitted, shall not affect the accuracy of weighing.				
	There shall be sufficient protection to cement and aggregate weigh hoppers and weighing mechanisms to prevent interference with weighing accuracy by weather conditions or external build-up of materials.				
	Where chemical admixture dispensers are used, there shall be separate dispensers for each type of generic admixture being used.They shall be capable of measurement within the tolerances in Annex E and a calibrated container or weigh scales shall be provided to check the accuracy of measurement at least once a month.				
	Where a continuous mixer with ribbon loading is used, the batching procedure specified by the manufacturer of the plant shall be followed.				
	Each control on the batching console and weigh-dial or display shall be clearly labelled with its function and where concerned with the batching of materials, the material type.				
	When more than one type or grade of cement is being used, the weighing device and discharge screw or other parts of the transfer system shall be empty before changing from one type of cement to another.				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	When pulverized fuel ash and other mineral admixtures are batched through the cement weigh system, the weighing device and discharge screw or other parts of the transfer system shall be empty when the weighing system has returned to zero reading or completed the batch.				
	Where a backweigh system is utilized to weigh materials a system shall be in place so as to preventmaterials being loaded during the process of weighing.				
9.1.3	*Measurement of Materials*				
	Cement and mineral admixture materials shall be measured by mass in a hopper or compartment separate from those used for other materials and on a scale of appropriate sensitivity, measurement being taken from a zero reading.				
	Aggregates shall be measured by mass, allowance being made for the free moisture content of the aggregates.				
	The added water shall be measured by volume or by mass.				
	Any liquid chemical admixture (or paste) shall be measured by volume or by mass and any solid admixture by mass.				
	When weighing materials, any build up in the hopper during the day must be tared out or allowed for in the batch weights.				
	After measurement all materials shall be discharged into the mixer without loss.				
	The plant operator shall be provided with a clear display of the quantities of materials to be batched for each mix and batch size and with information identifying the display to be selected for each designed and prescribed mix to be produced.				
	For digital readouts the numerals shall be readily discernible from the operating position.				
	Fully automatic production systems shall be fitted with control equipment to allow the correct operation of the plant to be monitored during weighing and batching.				
	Automatic control systems on batching plants shall not commence batching until all hoppers have been emptied and/or tared and the scales zeroed unless such systems are designed to take account of buildup in their programming.				
	All scales shall be tested and calibrated as per Annex E.				
9.1.4	Mixing				
9.1.4.1	Washing out water				
	Before loading concrete materials or mixed concrete into either a stationary mixer or truck mixer any water retained in the mixing drum for washing out purposes shall be completely discharged.				
9.1.4.2	Stationary or central mixers				
	Stationary mixers shall not be loaded in excess of the manufacturer's rated capacity.				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	The mixing time shall be measured from the time all the materials required for the batch, including water, are in the drum of the mixer. The mixing time shall not be less than that recommended by the manufacturer.				
	Where a continuous mixing plant is used the complete mixing time shall be sufficient to ensure that the concrete is of the required uniformity.				
9.1.4.3	Truck Mixers				
	When a truck mixer is used for the partial or complete mixing of concrete, mixing shall be considered to commence from the moment when all the material required for the batch, including water, are in the rotating drum of the mixer.				
	Truck mixers or agitators shall not be loaded in excess of the manufacturer's rated capacity.				
	In order to produce a satisfactory mix, and where there is no data available to establish different period and speed of revolutions, mixing shall continue for not less than 60 revolutions of the truck mixer drum at a rate of not less than 7 revolutions/min				
	All completely truck mixed concrete shall be visually inspected for uniformity prior to leaving the plant.				
	When a truck mixer or agitator is used for transporting concrete which has been mixed before leaving the plant, the concrete shall be agitated during transit and re-mixed at the site for at least 2 min so that the concrete is of the required uniformity.				
	If necessary, re-dosing of admixture at site may bepermitted. Admixture for this purpose shall be carried to the site in a special container and added after measurement. Same admixtureshall be used as used in the concrete batching plant. Then the concrete shall be remixed in the truck mixer.				
9.1.4.4	*Conditions of mixers*				
	Stationary and truck mixers shall be maintained in an efficient and clean condition with no appreciable buildup of hardened concrete or cement in the mixing drum, on the mixing blades, or on the loading hopper or discharge chutes.				
	When, due to wear the height or depth of the mixing blades or paddles is less than two-thirds of the original, the blade or paddles shall be renewed or replaced and record of the same shall be kept.				
9.1.5	Notwithstanding the requirements regarding mixing prescribed in the relevant clauses of this standard, it shall be ensured that stationary or central mixers and truck mixers shall be complying with performance criteria of mixing efficiency test as per IS 4634. Mixing efficiency test frequency shall be maintained at least once in a year and record shall be maintained.				
9.2	**Plant Safety and Maintenance**				
	At all times, all guardrails and machinery guards shall be fixed securely in position and walkways kept clean and tidy with clear access.				
	All plant and equipment shall be maintained in a clean and efficient				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	working condition and regular, routine maintenance checks shall be carried out as detailed in Annex F.				
	Check lists, including weekly, monthly and quarterly routines, shall be prepared to cover general storage, handling, batching, mixing and transporting plant, as well as the routine maintenance recommended by manufacturers for specific items of equipment.				
	The name and/or position of the person responsible for ensuring that the maintenance schedules are carried out shall be included on each checklist and a provision made for their signature.				
	The supplier shall provide suitable communications system between batching plants, transit mixers and the delivery site so as to ensure the compliance of service criteria agreed to with the purchaser/user.				
9.3	**Environmental Considerations**				
	The design, management and operation of a ready-mixed concrete plant should be with due regard for the environment. The broad criteria given in 9.3.1 to 9.3.10 should be borne in mind when establishing a readymixed concrete plant (where in the following the term minimize is used it is understood to mean to reduce to the lowest realistic level using technologies which are proven, reasonable and economic).				
9.3.1	***External Appearance***				
	The producer should endeavor to ensure that plant operations are landscaped and screened from the surrounding industrial, commercial, residential or rural community so that impact on the environment is minimized.				
9.3.2	***Plant, Office Buildings and Staff Facilities***				
	The producer shall ensure that plant buildings are suitably maintained, kept clean and that all required records are appropriately kept.				
9.3.3	***Traffic Control and Cleanliness***				
	The producer should ensure that traffic routes will be chosen to avoid sensitive areas where practicable and to minimize fuel consumption. Vehicles should be maintained in a clean condition and action should be taken to minimize the incidence of concrete spillage on public highways.				
9.3.4	***Plant Safety***				
	The producer shall provide working conditions which have regard to the health and safety of employees. Records on the training programmes on safety measures shall be maintained.Any mishappening/accidents shall be recorded.				
9.3.5	***Air Pollution***				
	The producer should utilize appropriate technology to prevent or minimize dust emissions in line with local or national regulations.Records of such compliances shall be maintained.				
9.3.6	***Noise and Vibration***				
	The producer should take steps to ensure that plant and vehicle noise are minimized through plant design, the use of appropriate technology				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	and the location of the plant.				
9.3.7	***Water Management***				
	The producer should take action to improve effluent quality where necessary and reduce volumes of discharge. He should aim to minimize water usage and wastage and to meet national and local regulations concerning effluent discharges.				
9.3.8	**Fuel, Oil and Chemical Spillage**				
	The producer should take appropriate measures to prevent pollution of surrounding surface and groundwaters from accidental effluent discharges and fuel, oil or chemical spillage.				
9.3.9	***Waste Management***				
	The producer should introduce processes and working practices that minimize the production of waste. Where waste cannot be avoided, to provide environmentally sound treatment and disposal, or find markets for its use as a resource. Appropriate record shall be maintained.				
9.3.10	***Training***				
	The producer should undertake to train employees to be aware of the responsibility to the environment, he should give a high priority to site care and good housekeeping and to encourage participation in the local community. Record of training shall be maintained.				
9.4	**Delivery Ticket**				
	Immediately before discharging the concrete at the point of delivery, the producer or his representative shall provide the purchaser with a preprinted delivery ticket for each delivery of concrete on which is printed, stamped or written the minimum information detailed in Annex G				
	The delivery ticket will form the basis of invoicing.				
5	**General Requirements**				
5.1	**Basis of Supply**				
5.1.2	5.1.2 All concrete will be supplied and invoiced in terms of cubic meters (full or part) of compacted fresh concrete. All proportioning is to be carried out by mass except water and admixture, which may be measured by volume.(The volume of concrete shall be calculated by actual mass and unit weight of concrete)				
5.2	**Transport of Concrete**				
5.2.1.1	The ready mixed concrete shall be transported from the mixer to the point of placing as rapidly as practicable. Concrete shall be placed as soon as possible after delivery, as close as possible to its final position to avoid rehandling. If required by the purchaser, the producer can utilize admixtures to slow doesn't the rate of workability lose. However, this does not remove the need for the purchaser to place the concrete as rapidly as possible. The purchaser should plan his arrangements so as to enable a full load of concrete to be discharged within 30 min of arrival on site.				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
5.2.1.2	5.2.1.2 Concrete shall be transported in a truck-mixer unless the purchaser agrees to the use of non-agitating vehicles. When non-agitating vehicles are used, the mixed concrete shall be protected from gain or loss of water.The records of use of non-agitating vehicle and reasons thereof shall be maintained.				
5.2.2.1	5.2.2.1The concrete shall be discharged from the truck-mixer within 2 h of the time of loading. However, a longer period may be permitted if retarding admixtures are used or in coolhumid weather or when chilled concrete is produced.The records of the transportation time longer duration than 2 hours shall be maintained. (Note: The time of loading shall start from adding the mixing water to the dry mix of cement and aggregate or of adding the cement to the wet aggregate whichever is applicable.)				
5.3	Ready-mixed concrete plant shall have test facilities at its premises to carry out routine tests as per the requirement of the standard.				
6	**Sampling and Testing of Ready-Mixed Concrete**				
6.1	**Point and Time of Sampling** For the assessment of compliance of ready-mixedconcrete, the point and time of sampling shall be, a) at discharge from the producer's delivery vehicle or from mixer to the site or b) when delivered into the purchaser's vehicle. It is critical that the sampling procedure and equipment used enables as representative a sample as possible to be taken of the quantity of concrete delivered (see Annex C). The sampling may be carried out jointly by thepurchaser and the supplier with its frequency mutually agreed upon. However, it will not absolve the supplier of his responsibility from supplying concrete as per the requirements given in this standard or otherwise agreed to where so permitted in the standard.The competency of quality control personnel to be verified with respect to method of sampling and test performed.				
6.2	**Workability** 6.2.1 The test for acceptance is to be performed upon the producer's delivery vehicle discharge on site or upon discharge into the purchaser's vehicle. If discharge from the producers' vehicle is delayed on site due to lack of preparedness on behalf of the purchaser then the responsibility passes to the purchaser after a delay of more than 30 min. The workability shall be within the following limits on the specified value as appropriate: Slump: $\pm$ 25 mm or $\pm$ 1/3 of the specified value, whichever is less. Compacting factor : $\pm$ 0.03, where the specified value is 0.90 or greater, $\pm$ 0.04, where the specified value is less than 0.90 but more than 0.80, and $\pm$ 0.05, where the specified value				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	is 0.80 or less. The above tests shall be done based on the mutual agreement between purchaser and supplier.				
6.3	**Specified Strength** – 28 days compressive strength shall be as per IS 456. (Frequency of testing – one sample for every 50m^3 of production or every 50 batches or as per purchaser requirement whichever is the greater frequency. Three test specimen shall be made up for each sample for testing.				
6.4	**Additional Compliance Criteria** Any additional compliance criteria shall be declared to the producer by the purchaser prior to supply and shall be mutually agreed upon in terms of definition, tolerance, frequency of assessment, method of test and significance of result.				
6.5	**Non-Compliance** The action to be taken in case of non-compliance shall be declared and mutually agreed upon. Records of such non compliances shall be kept.				
7	**Information to be supplied by the Purchaser**				
7.1	The purchaser shall provide to the producer the details of the concrete mix or mixes required by him and all pertinent information on the use of the concrete and the specified requirements. Prior to supply taking place, it is recommended that a meeting is held between the purchaser and the producer. Its objective to clarify operational matters, such as notice to be given prior to delivery, delivery rate, the name and contact detailsof the purchaser's authorized representative who will coordinate deliveries, any requirements for additional services such as pumping, on site testing or training, etc. Records of such meetings outcome shall be kept.				
7.2	**Designed Mixes** Where the purchaser specifies a designed mix to be supplied it is essential that all relevant information is conveyed to the producer.				
7.3	**Prescribed Mixes** The concrete mix shall be specified by its constituent materials and the properties or quantities of those constituents to produce a concrete with the required performance. The assessment of the mix proportions shall form an essential part of the compliance requirements. The purchaser shall provide the producer with all the pertinent information on the use of the concrete and the specified requirements. In order to assess this, the format given in Annex D may be followed with suitable modifications as applicable to the prescribed mixes. The data regarding assessment of such mixes shall be maintained.				
8	**Information to be supplied by the Producer**				
8.1	8.1 When requested, the producer shall provide the purchaser with the following information before any concrete is supplied: a) Nature and source of each constituent material, b) Source of supply of cement, and c) Proposed proportions or quantity of each constituent/m^3 of fresh				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	concrete.				
8.2	When requested, the producer shall provide the purchaser the following information on admixtures: a) Generic type(s) of the main active constituent(s) in the admixture; b) Whether or not the admixture contains chlorides and if so, the chloride content of the admixture expressed as a percentage of chloride ion by mass of admixture; c) Where more than one admixture is used, confirmation of their compatibility; and Record of such informationshall be maintained.				
10	**Quality Control**				
10.1.1	***Control of Purchased Material Quality***				
	A control system shall be operated to provide assurance that all materials purchased for and used in the production of concrete conform to the Indian Standards agreed with the material supplier and the requirements of the producer's mix design methodology and quality control procedures. This may include visual checks, sampling and testing, certification from material suppliers and information from material suppliers.				
10.1.3	***Mix Design and Mix Design Modification***				
	The producer shall maintain a record of all mix designs and modifications carried on the plant.				
10.1.4	***Plant Maintenance***				
	The producer shall be able to demonstrate that a documented plant maintenance procedure is in place. Regular plant inspections should be carried out with faults reported and rectified				
10.1.5	***Transfer and Weighing Equipment***				
	The producer shall be able to demonstrate that a documented calibration procedure is in place. Calibration records should contain details of any corrective action required, the date of the next calibration, confirmation that any required corrective action has taken place and the signature of the designated manager for that plant.				
	The producer shall also maintain a daily production record for that plant, including details of which customers were supplied, which mixes were supplied and which delivery dockets were dispatched.				
	There should be a record of what materials were used for that day's production including water and admixture.				
	The use of electro-mechanical weighing and metering systems, that is, load cells, flow meters, magmeters, etc., is preferable over purely mechanical systems, that is, knife edge and lever systems.				
10.2.1	***Production Control***				
10.2.1.1	The production of concrete at each plant shall be systematically controlled. This is to ensure that all the concrete supplied shall be in accordance with these requirements and with the specification that has				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	formed the basis of the agreement between the producer and purchaser.				
10.2.1.2	Each load of mixed concrete shall be inspected before dispatch and prior to discharge.				
	Alternatively systems may be incorporated into the plant or truck mixer to allow the correlation of a particular parameter to concrete workability (thus removing the need to visually inspect at the plant) as long as the producer documents the validity of such a system in the form of a method statement or procedure.Record of any such system/correlations adopted by the producers to be maintained.				
10.2.1.3	The workability of the concrete shall be controlled on a continuous basis during production and any corrective action necessary taken.				
10.2.1.4	For each load, written, printed or graphical records shall be made of the mass of the materials batched, the estimated slump, the total amount of water added to the load, the delivery ticket number for that load, and the time the concrete was loaded into the truck.				
10.2.2	***Product Control***				
10.2.2.1	Concrete mixes shall be randomly sampled and tested for workability, and where appropriate, plastic density, temperature and air content. Where significant variations from target values are detected, corrective action shall be taken.				
10.2.2.2	It is important to maintain the water-cement/cementitious materials ratio constant at its correct value.				
	The amount of added water shall be adjusted to compensate for any observed variations in the moisture contents in the aggregates.				
	Suitable adjustments should also be made in masses of the aggregates due to this variation (see IS 456).				
10.2.2.3	When the assessment of moisture content is carried out continuously using a suitable instrument a system shall be provided to indicate the necessary changes in added water for changes in moisture content.				
10.3.1	Mix performance The producer shall be responsible for ensuring that suitable control procedures are in place to ensure the following.				
10.3.1.1	***Designed mixes***				
	A quality control system shall be operated to control the strength of designed mixes to the levels required in accordance with 3.4 and 3.8 of IS 4926:2003 and shall be based on random tests of mixes which form the major proportion of production.				
	The system shall include continuous analysis of results from cube tests to compare actual with target values together with procedures for modifying mix proportions to correct for observed differences. Compressive strength testing shall be carried out using a machine that meets the requirements of IS 14858.				
10.3.1.2	***Prescribed mixes***				
	Periodic and systematic checks shall be made to ensure that the cementitious material contents of prescribed mixes comply with their				

Clause No. (IS 4926:2003)	Clause/Criteria	Complied	Not Complied	Not Applicable	Remarks (R)
	mix descriptions.				
10.3.3	***Complaints***				
	The producer shall have a procedure in place to enable the diagnosis and correction of faults identified from complaints.				
12	**TRAINING**				
12.1	All personnel concerned with production, delivery and the function of the producer's quality system shall have received training appropriate to the duties they perform. Records of such trainings shall be maintained.				
12.2	The testing of materials, proportioning of mixes and the production of concrete together with all its control testing shall be under the overall supervision of an experienced concrete technologist.				
12.3	Operator who have received proper instructions on the equipment in use and who are able to comply with the required accuracy of batching shall produce concrete.				
13	**DOCUMENTS and RECORDS**				
	Producer to make a quality manual and keep authenticated copy of all relevant Indian Standards. Work instructions, process control chart, applicable forms, formats, shall be made and maintained. All applicable regulations like environmental laws, ownership documents, factory licence etc. and, factory location map, factory lay out to be made available and auditor shall report the same. Records shall be maintained by the producer to provide confirmation of the quality and quantity of concrete produced. The records shall be retained for the purposes of these requirements for a period of at least one year or till the next audit, whichever comes later...				
	They shall cover the following aspects: a) Production and delivery: 1) Batching instructions, 2) Batching records, 3) Delivery tickets, and 4) Equipment calibration and plant maintenance. b) Materials and production control: 1) Concrete production and materials purchase, usage and stocks, and 2) Certificates or test results for materials. c) Production quality control: Control test results				

ANNEX A

LIST OF REFERRED INDIAN SANDARDS

IS No.	Title
269:2015	Ordinary Portland cement – Specification (sixth revision)
383:2016	Coarse and fine aggregates for concrete – Specification (third revision)
455:2015	Portland slag cement – Specification (fifth revision)
456:2000	Plain and reinforced concrete – Code of practice (fourth revision)
1199:1959	Methods of sampling and analysis of concrete
1489:Pt.1:2015	Portland pozzolana cement – Specification Part 1 Fly ash Based (fourth revision)
1489:Pt.2:2015	Portland pozzolana cement – Specification Part 2 Calcined clay Based (fourth revision)
4082:1996	Recommendation on stacking and storage of construc ion materials and components at site (second revision)
4634:1991	Methods for testing performance of batch-type concrete mixers (first revision)
8142:1976	Methods of test for determining setting time of concrete by penetration resistance
14858:2000	Compression testing machine used for testing of concrete and mortar – Requirements
15388:2003	Specification for silica fume
16714:2018	Grounded granulated blast furnace slag for use in cement, mortar and concrete – Specification

ANNEX B

(Clauses **4.4** *and* ***4.6.1*****)**

MATERIALS TESTING REQUIREMENTS

B-1 AGGREGATES

Aggregates shall be tested at a minimum frequency indicated by the high or low test rates given below:

Minimum Test Frequencies

Sl No.	**Aggregate Property/ Parameter**	**Type of Aggregate**	**Assessment of typical properties and High Test Rate**	**Normal Monitoring and Low test rate**	**Requirement for Normal Monitoring and Low Test Rate**	**Complied (C)**	**Non-complied (NC)**	**Remarks**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**			
i.	Grading	Sand/fine	Weekly	Monthly	Last 8 results conform to IS 383 or representative values			
		Coarse	Weekly	Monthly				
ii.	Specific gravity a)Oven dry b)Saturated surface dry c)Apparent	All types	 Weekly Weekly Weekly	 3 monthly 3 monthly 3 monthly	Last 4 results ± 0.04			
iii.	Water Absorption	All types	Weekly	3 monthly	Last 4 results ± 0.04 percent			
iv.	Fines (silt) content	Sand	Weekly	Monthly	Last 10 results < 75 percent Maximum allowed			
		Coarse	Monthly	3 Monthly				
v.	Aggregate Impact Value	Coarse	As specified	As specified	---			
vi.	Aggregate crushing value /10% Fines	Coarse	Yearly	Yearly	---			
vii.	Aggregate Abrasion Value (Los Angeles Method)	Coarse	--	Yearly/Source change	--			
viii.	Combined Flakiness and Elongation Index	Coarse	2 Weekly	6 Monthly	Last 3 results conform to standards			
ix.	Soundness	Fine and Coarse	--	Yearly/Source change	--			
x.	Chloride Content	All types	Weekly	6 Monthly	Last 3 results <0.01 percent			
xi.	Potential Alkali Aggregate Reactivity including Petrography	Fine and Coarse	--	5 Yearly/Source change	--			
xii.	Petrographic Description (General)	All types	--	5 yearly	--			

Note: 1) For parameters i), ii), iii, iv), v), and viii)the firm should have test facility in-house and for rest of the parameters firm can have arrangements from OSL.

2) High and low test rate is to be declared by the firm.

3) The auditor shall mention whether low test rate or high test rate is followed. If low test rate is followed, whether conditions as given in column 6 have been complied or not.

Annex C - Sampling of Concrete

(Clause 6.1)

	Annex C (Clause 6.1)	Sampling Of Concrete	Complied	Not Complied	Not Applicable	Remarks
		After the truck-mixer has re-mixed its delivery on site allow at least the first one-third of a m^3 of concrete to be discharged prior to taking any samples. Take at least 4 incremental samples from the remainder of the load avoiding sampling the last cubic metre of concrete. Thoroughly re-mix this composite sample either on a mixing tray or in the sampling bucket and proceed with the required testing.				

Annex D
(Clause 7.2 and 7.3.1)
CONCRETE MIX INFORMATION TO BE SUPPLIED BY THE PURCHASER

RMC:

Contractor:

Site:

MIX CODE						
Grade of concrete						
Specified Minimum Cement Content (kg/m^3)						
Specified Maximum Cement content (kg/m3)						
Specified Maximum Free Water -Cement Ratio						
Nominal Maximum Aggregate Size						
Cement Type and Grade (if preferred)						
Mineral Additives (Pulverized fuel ash/Slag/Others) (Kg/m^3)						
Target Workability at Site						
Maximum Temperature of Concrete at the Time of Placing, if required						
Method of Placing						
Any Other Requirements (Early strength, air content, chemical admixtures etc.)						
Concrete Testing (Frequency)						
Material's Testing (any non routine requirements)						
Alternatives to be Offered: YES/NO						
Method of Curing to be Used by Contractor						
Quantity (m^3)						
Any other important information, such as exposure condition, class of sulphate resistance etc.						

NOTE—Additional proforma for further information may be used, such as for specific test rates to be achieved for concrete or rawmaterials, exact method statements of the contractors proposed site practice.

Annex E
(Clause 9.1.2 & 9.1.3)

	Calibration and Weighing Equipment Accuracy	**C**	**NC**	**NA**	**Remarks**
E-1	E-1 The following limits shall apply to all ready-mixed concrete plants: a) The accuracy, sensitivity and arrangement of the weighing devices shall be such as to enable the materials to be batched within the following tolerances: i) Cement, mineral admixtures: Within ± 2 percent of the quantity of constituent being measured ii) Aggregate, chemical admixtures and water: Within ± 3 percent of the quantity of the constituent being measured				
	b) Analogue scales shall have scale increments not exceeding 5 kg for cement and mineral admixtures, 25 kg for aggregate and 2 kg for water.				
	c) Preset controls shall be calibrated in increment not exceeding 5 kg for cement and mineral admixtures, 10 kg for aggregate and 2 kg for water.				
	d) For continuous mixer plants calibration shall be in increments not exceeding 10kg/m^3 for cement and mineral admixtures, 25kg/m^3 for aggregates and 10 l/m^3 for water.				
	e) Digital readouts shall have a scale increment not exceeding 2 kg for cement and mineral admixtures, 10kg for aggregate and 1lfor water.				
	f) At the time of installation, or reconditioning, the accuracy of the indicated mass at any point on the scale shall be within 0.25 percent of the full scale reading.				
	g) At any other time during operation the accuracy shall be within 0.50 percent of the full scale reading				
	h) Chemical Admixture dispensers shall have scale increments not exceeding: ***Range of scale in*** kg or Litre ***Scale increment in*** kgor Litre 0.1 -0.5 — 0.01 0.5- 1.0 — 0.02 1.0- 10.0 — 0.2 more than 10.0 — 0.4				
	j) All weighing and measuring equipment shall be tested and calibrated over its full working range at the following intervals: i) Mechanical/ knife : At least once edge every two months systems ii) Electrical/ load cell :At least once systems every three months Adequate and identified facilities shall be provided for the application of the test loads.				
	k) In the case of batch weighing systems testing and calibration shall be based on the applicable test loads to the weigh hoppers.				
	l) Checks on continuous weigh systems shall be based on comparison of preset quantities with those actually produced				
	m) To achieve the required accuracy of calibration, a minimum of 500 kg of stamped weights are required, except that for low capacity scales an acceptable limit on the total mass of calibration				

	Calibration and Weighing Equipment Accuracy	C	NC	NA	Remarks
	weights would be 20 percent of the scale capacity. The stamp weights may be properly stored and handled to prevent any corrosion or damage to them.				
	n) When calibration of weighing equipment is carried out all personnel involved should be competent and fully trained, the procedures should be fully documented, and special attention should be paid to the health and safety aspects of the procedure. Competency and training of the concerned personnel shall be verified.				

Annex F Routine Maintenance Checks for Plant and Equipment
(Clause 9.2)

	Annex F (Clause 9.2)	Routine Maintenance Checks for Plant and Equipment	C	NC	NA	REMARKS
	F1	Storage and Handling Equipment				
		Weekly Routine: a) Check area under plant for spillage and trace source. b) Clean-up yard, checking that all drains and traps are clear. c) Maintain settlement pits, recyclers and wash down areas in efficient working order. d) Check all storage bins and doors for efficient operation. e) Check conveyors, boom scrapers and bucket elevators for free running and wear, and adjust as necessary. f) Routine checks and servicing on loading shovels. g) Routine checks and servicing on compressors. h) Report any defects.				
	F2	Batching and Mixing Equipment				
	F2	Daily Routine: a) Adjust tare weights and clean weigh dials (if applicable). b) Ensure weighing hoppers empty properly. c) Washout central mixer drum or pan. Weekly Routine: a) Maintain all hoppers and doors in clean and efficient working order. b) Check central mixer blades, paddles or arms for wear and tightness and adjust as necessary. c) Remove any cement or concrete build up in the mixer. d) Shack out cement silo filter sock (if applicable) and maintain in efficient working order. e) Check dust seals on cement hoppers for wear. f) Clean knife edges or load cells on weighing equipments g) Check calibration of moisture meter if applicable. h) Check oil levels on airline lubricators. i) Drain water traps on air lines. j) Check rams and air lines for leaks. k) Check pipework for leaks and wear. l) Check wiring and electrical apparatus for correct operation and overheating. m) Routine greasing of bearings and gears. n) Routine checks and servicing on central mixers. o) Report any defects. Monthly Routine: a) Check calibration of all weigh scales. b) Check calibration of water meter. c) Check calibration of admixture dispenser. Quarterly Routine: a) Inspection and testing of all weigh scales over their complete operational range. b) Routine oil changes in gearboxes and oil baths.				
	F-3	Transporting Equipment – Mixer and Agitator Units				
		Daily Routine: Wash out truck mixer drum. Monthly Routine: a) Check mixer unit for blade wear.				

	Annex F (Clause 9.2)	Routine Maintenance Checks for Plant and Equipment	C	NC	NA	REMARKS
		b) Check operation of revolution counters, if fitted. c) Check calibration of truck mixer water meter. d) Report any defects. NOTE—The producers shall he responsible for maintaining all vehicle chassis in accordance with the relevant laws, if ready mixed concrete is to be transported on the public highways. Records of 20% or minimum two, whichever is higher shall be verified.				

Annex G

(Clause 9.4)

	Delivery Ticket Information	C	NC	NA	REMARKS
G-1	The following information shall be included in the delivery ticket to accompany the load to the purchaser: a) Name or number of the ready-mixed concrete depot. b) Serial number of the ticket. c) Date. d) Truck number. e) Name of the Purchaser. f) Name and location of site. g) Grade or mix description of the concrete. h) Specified target workability. i) Minimum cement content (if specified). j) Type of cement and grade (if specified). k) Maximum free water-cement ratio (if specified). l) Nominal maximum size of aggregate. p) Generic type or name of any chemical and mineral admixtures included. q) Quantity of concrete in m^3 r) Time of loading. s) Signature of the plant operator. t) A statement warning the purchaser of the precautions needed to be taken when working with cement and wet concrete.				
G-2	On site the following information will be added: a) Time of arrival on site. (The auditor should check time limit decided vis-a-vis actual time of delivery.) b) Time when discharge was completed. c) Any admixture added by the supplier to meet the specified workability. d) Any extra admixture added at the request of the purchaser of the concrete, or his representative, and his signature. e) Signature of the purchaser or his representative confirming discharge of the load.				

List of Testing Equipment for Laboratory attached to RMC Facility

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 2000kN capacity, conforming to IS 14858	One no.	Yearly IS 516		
3	Preparing concrete test specimens (IS 1199)	Cube moulds of size - 150mm x 150mmx150mm - 100mx100mmx 100mm	30 nos.	Yearly IS 10086		
4.	Sieve analysis of fine and coarse aggregates (IS 2386-Pt.1)	IS Test sieves for find and coarse aggregates - 40mm, 25mm, 20mm, 12.5mm, 10mm, 6.3mm, 4.75mm and lid+pan 10mm, 4.75mm, 2.36mm, 1.18mm, 600µm, 300µm, 150 µm, 75 µm, 45 µm, and lid+pan	One set for coarse and fine agg. each	Yearly IS 2386-Pt.1		
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-Pt.III		
7.	Elongation and Flakiness test	Elongation and Flakiness gauges				
8.	Silt content of sand	Graduated glass cylinder (500ml) for determining silt content	One no.			
9.	Specific gravity of aggregates	Pycnometer and density basket or Gas Jar for determining specific gravity of aggregates	One no	Yearly IS 2386-Pt.III		
10.	Other Accessories	Electronic weighing balance of adequate capacity with accuracy of 1g.	One	Yearly		
		Laboratory mixer (min 50 lit)	One			
		Hot air oven	One	Yearly IS 6365		
		Concrete compaction equipment (Travel vibrator/needle vibrator, tamping rods)	One	Yearly		
		Curing tank with provision to maintain $27\pm2^{o}C$ 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.

Wherever flexural strength is specified in addition to compressive strength, it is essential to 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.

The above list is an indicative list. However, it may be ensured that required test equipment/arrangement as per IS 4926 is available.