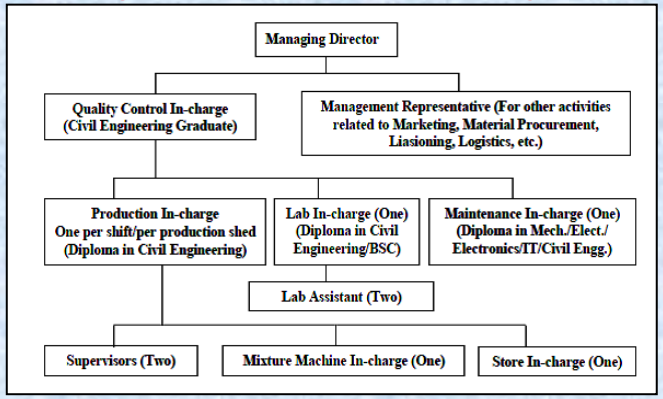
1.0 सामान्य / General

Quality Assurance Plan in manufacturing of PSC Sleepers insists on documentation of all processes in the suggested formats and defines the tasks and responsibilities of persons involved with adequate quality control in the form of inputs and outputs.

PSC Sleepers are the 2nd most costly track component after rails with longest surviving track component, say 40-50 years of designed life. About 1 Cr sleepers are procured on Indian Railways, giving peace of mind to P.Way Engineers since its introduction.

2.0 विनिर्माण फर्म का संगठन चार्ट / Organisation Chart of Manufacturing Firm



The manufacturing firm of PSC Sleepers shall have a RDSO approved QAP and shall obtain the requisite ISO certificate (ISO: 9001-2008) showing clearly the name of certifying agency & date of validity of certificate. The Internal Quality Audit of plant shall be done by firm at frequency at least once a year.

3.0 पूर्व-तनावयुक्त प्ररूप स्लीपर के लिए विशिष्टता और आरेखण / Specification & Drawings for Pre-tensioned Type Sleeper

For 60 Kg UIC Rails	15 Days Characteristic Strength of Concrete	Minimum 55 N/mm^2
	Designed Load at Rail Seat	147.15 KN
	Length of Sleeper	2750 mm
	Slope at Rail Seat	1 in 20
	Weight of Sleeper (Standard)	281.217 kg
Pretensioned PSC Sleeper for BG & MG [IRS: T-39 (2016)]		RT-2495 for 52 kg rail
Pretensioned PSC Sleeper for BG & MG [IRS: T-39 (2016)]		RT-2496 for 60 kg rail
Pretensioned PSC Sleeper for Turnout for BG & MG [IRS: T-45 (Nov 2016, 3rd Rev.)]		RT-4865 for turnout 1 in 8.5, 60 kg rail RT-4218 for turnout 1 in 12, 60 kg rail RT-4732 for turnout 1 in 12, 52 kg rail
Spheroidal Graphite Cast Iron (SGCI) Inserts [IRS: T-46 (1996)]		RT-381

4.0 संदर्भ के लिए आवश्यक दस्तावेज / Documents required for reference

The following documents as approved by RDSO are referred for development of QAP:

- Schedule of Technical Requirement (STR-2016)
- IRS: T-39 (2016)
- IRS: T-45 (Nov 2016, 3rd Rev.) and
- IRS: T-46 (1996)

5.0 संबद्ध व्यक्तियों के कार्य और जिम्मेदारियां / Tasks and responsibilities of persons involved

5.1 Role of the Officials

RDSO:

a) approval of QAP and organizing PSC Sleeper training for Zonal Railway officials; **b)** initial development of plant; **c)** during development of special type of sleepers; **d)** periodical oversight inspections; **e)** approval of quarry of aggregates; **f)** approval of layout plan; **g)** approval of Mix Design; **h)** approval of steam curing cycle; **i)** product inspection.

Zonal Railways:

- Procurement of raw materials
- Inspection of raw materials
- In-process quality check
- Product inspection & testing

Note: For this purpose, specific AIE & SSE are assigned duties at Concrete sleeper plants.

Quality Control Supervisor:

- Maintain a material control program in accordance with schedule outlined.
- Compensate for free moisture in aggregate, & compensate for effects of admixtures on concrete mixes.
- Control all requisites for concrete mixes and determine their acceptability.
- Ensure stressing operations conforming to specified procedures for PSC sleepers.
- Inspection of dimensions for portions of bulkheads, strand, reinforcement, voids and other integral items.
- Inspect the finished product for dimensional accuracy and appearance.

6.0 पर्याप्त गुणवत्ता नियंत्रण / Adequate Quality Control

6.1 In the form of Inputs

6.1.1 Min. Requirement of Layout as per STR

Cement Godown Area	Min. covered area = 400 sqm (storage as per IS 4082-1967)
HTS Storage	Min. area of covered godown with EOT for handling of HTS wire = 100 Sqm.
SGCI Insert & PVC Dowel Godown	Min. area of covered godown = 100 sqm.
Steam Curing Chambers	Min. no. of chamber = (0.65*N/32) rounded off to next whole number, where 'N' is the proposed daily production capacity.
Water Curing Tanks	Min. Submerged water curing capacity required (In no of sleeper) = (0.65 to 0.75)*N, where 'N' is monthly production capacity. Tank should have minimum 30 cm free board.
Stacking Area of Sleepers	Min. area=0.08*N sqm. Where N is monthly production capacity. Minimum 2 month capacity. Maximum layers of sleepers in one stack should be 25.
Laboratory	Sleeper Testing Area: Approx. 30 sqm. General: Approximately 40 sqm
Office of Inspecting Official	Min. 14 sqm. Fully furnished with adequate communication facilities (Fax, Telephone etc)
Rest House for Inspecting Official	Min. area 25 sqm. Min. two room sets fully furnished with attached toilet and other amenities i/c cooking facility.
Turnout Assembly Yard	At least two platforms of 70 m x 6m with gantry arrangement for handling for inspection of two sets at a time.

6.1.2 Min. Requirement of Plant and Machinery as per STR

Concrete mixer along with Automatic Batching Plant using Microprocessor based Weigh Batcher, Pneumatically operated Aggregate Bins, Water meter and automatic Cement feeding, Capacity of	1 No.

Concrete 5 m^3/hr.	
Dead weights for calibration of weigh batcher	1000kg
Water measuring cans or automatic water meter (1,2,5,10 & 20 LITRES)	01 Set
High frequency 9000 RPM (±4%) Vibrator, bottom fixing type for PSC Line Sleepers & Turn Out Sleepers. Vibrators of min. 1.0 KW & 1.5 KW capacity are to be used.	16Nos.
Low voltage high-speed converter	2 Nos.
Concrete Sleeper Moulds should be made with plate thickness 6/8 mm with suitable stiffening arrangement to avoid in service distortion of moulds. Rail seat area & end plates are to be made with 10 mm thick steel plate. *Minimum for a monthly production capacity of 5000 Nos. assuming one shift per day)	240 Nos.*
Steam boiler coal/oil fired/electrically operated capacity 1500kg/hr, complete with valves, mountings and Chimney. The key parameters of boiler such as steam pressure should be displayed. The boiler & its operator's certification from statutory authority should be ensured.	1 No.
Steam curing chamber of adequate size and capacity to hold not more than 08 benches containing 04 moulds each.	For min. no. of steam chambers, refer Para 6.1.1 above.
Cup wire brush type or any suitable type sanders	3 Nos.
Air blower for cleaning moulds	1 No.
Portable heavy-duty grinder	6 Nos.
Electric welding Arc cutting m/c for HTS cutting at de-molding/ Abrasive disc cutter.	5 Nos.
MS Gantry crane electrically driven with overhead wire rope Hoist 4/5 capacity for loading of sleepers and for putting sleepers in water curing tanks.	1 No.
Wire baskets, Phowrahs crowbars and shovels	1 No. Each
Concrete Bucket for carrying and pouring concrete in moulds by bottom controlled discharge on Monorail Hoists. Movement should be Motorized and operator Controlled.	1 No.
Wedges & barrels	7500 Nos.
The steam curing should be regulated through servo controlled valve with auto cut off arrangement and regulation of steam to maintain the temperature as per steam curing cycle.	18 Nos.
Mould oil application brushes or spraying device	10 No.
Diesel electric generator with suitable capacity (160 KVA)	1 No.
Platform type balance (cap.-500 kgs)	1 Set
Drilling machine	1 No.
Double Acting Hydraulic jacks 500KN capacity.	2 Nos.
Overhead wire rope hoist 2T capacity , Electrically driven, travelling on 1 Beam section for De-molding	1 No.
Tachometer 10000 RPM capacity. Minimum Nos. should be available with Concrete Sleeper Plant.	2 Nos.
Trolley for transportation of finished sleepers.	1 No.
Workshop equipments	1 No.
Lathe Machine	1 No.
Tower drilling machine	1 No.
AG-7 Angle Grinder	1 No.
Electric Welding Set	1 No.
Gas cutting set	1 No.

6.1.3 Laboratory Equipments as per STR

Compression Testing Machine, 2000 KN capacity, motorized with digital interface for real time recording of testing results.	1 No.
Flexural Beam (Tension) testing machine with loading jacks, 30 KN capacities.	1 No.
Motorized pumping unit with 500 KN capacity Jacks (for BG man line sleepers) and 750 KN capacity jacks (for 25 Ton axle load sleepers), pressure gauge, rubber tubes and test frame complete for sleeper testing.	1 No.
15 cm cubes moulds confirming to IS:516	50 Nos.
Beam moulds (10X10X50) cm size	2 Nos.
Slump Tester/ Vee Bee Testing Machine	1 No.
Electronic balance with 1gm least count (10/ 20 Kg. capacity) including weights.	1 No.
Blain's air permeability apparatus	1 No.
Vicat apparatus with dash pot and various Needles	1 No.
Stop Watch	1 No.
Le-Chatelier mould for soundness test of Cement	1 No.
Steel trowels for mixing cement paste	2 Nos.
Cement mortar cube casting machine with motor and time switch complete	1 No.
7.06 cm (50cm^2) mortar cube moulds	6 Nos.
Metallic scoop , pan type container, china tray etc.	2 Sets
Aggregate impact testing machine	1 No.
Aggregate crushing testing machine	1 No.
Aggregate abrasion testing machine	1 No.
Electric thermostatic oven with display of Temp	1 No.
Set of IS Sieves 40 mm and below up to 75 micron	1 No.
Automatic electric sieve shaker	1 No.
Proving rings of 2000 KN, 500 KN, and 100 KN capacity.	1 No.
1.5 Volt AVO meter	1 No.
Glass cylinders and Beakers 50-500 cc Capacity	1 Set
Miscellaneous measuring gadgets like steel tape, Vernier , filler gauge etc.	2 Sets
Inspection gauges for dimension checking of sleepers with digital display of parameters as approved by RDSO.	2 Sets Mechanical Gauge
Master gauge for checking inspection Gauge	1 No.
Magnifying glass	1 No.
Level table steel for checking gauges	1 No.
pH meter & TDS meter (Digital)	1 No.

6.1.4 Quality Check on Basic Raw Material

Item	Source	Inspecting Authority	Procurement Authority
Fine and coarse aggregates	Local but grading fitting within approved granulometric curve	Zonal Railway	Plant Owner
Cement (IS:269-2015) 53-S Grade	BIS approved plant. Railway approved quality	Zonal Railway	Railway Board
HTS (IS: 6006)	BIS approved firms	Zonal Railway	Plant Owner
SGCI Inserts	RDSO approved firms	RITES	Plant owner
Water	As per BIS 456 specification	Zonal Railway	Plant Owner

6.1.5 Lab Testing of Raw Material

Characteristic Check	Acceptance Norms	Frequency	Format of Record
Cement			
Fineness	> 3700 cm2/gm	As per Format	Format-I
Normal Consistency	Needle reading 5 to 7 mm from bottom of mould	As per Format	Format-II
Initial Setting Time	60 minutes	As per Format	Format-III
Final Setting Time	600 minutes	As per Format	Format-III
7 Days Mortar cube strength	Not < 37.5 MPa	As per Format	Format-IV
Soundness	Not > 5.0 mm	As per Format	Format-IV
Aggregates			
Impact value, Abrasion value &Crushing value	< 30%	Yearly for each source	Format-VIII
Flakiness	< 30%	Weekly	Format-

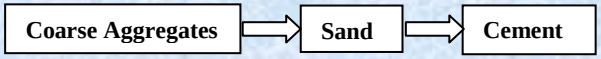
Index, Elongation Index			VII
Individual grading of Course Agg.	Should be as per Table-2 of IS:383-1970	Weekly	Format-VI
Individual grading of Fine Agg.	Should be as per Table-4 of IS:383-1970	Weekly	Format-VI
Combined grading	Should be in limit (as per approved mix design)	Weekly	Format-VI
Particle finer than 75µ size in fine agg.	< 3%	Weekly	Format-VI
Absorbed moisture content (Cl. 3.4.3 of IRS: T-39)	Calculate moisture adjustment in mix design	Daily, before each shift	Format-V
Potential reactivates (Cl. 3.3.4 of IRS: T-39)	Aggregate should be innocuous in nature	Yearly	-
Soundness (Cl. 3.3.2 of IRS: T-39)	Shall pass sodium or magnesium sulphate accelerated soundness test	Yearly	-
Deleterious material (Cl. 3.3.3 of IRS: T-39)	Should conform IS: 383 for max. limit	Yearly	-
The yearly test is carried out from external lab and apart from three tests (at S. N. 11, 12 &13), all other tests mentioned from S. N. 1 to 11 are conducted.			
Water [IS: 456, IRS: T-39,IRS: T-45]			
pH value	Not < 6 and not > 9	Yearly	-
SO_4, Chloride	< 500mg/l	Yearly	-
Quantity	Sufficient for concrete, steam and water curing	Daily	-
SGCI Insert [IRS: T-46, IS: 1500, IS: 228 (Pt.-3), RT-381]			
Source & Validity of RDSO approval for procurement	RDSO approved vendors Current validity of RDSO approval	Each consignment	-
Heat No. & IC for Stacking/ Storage	Check Heat No. & IC	Each consignment	-
Brinoll Hardness (BHN)	170-241 BHN	Each consignment	-
Chemical (Phosphorous)	Not > 0.12%	Each consignment	-
Physical Wt.	1.55 Kg (- 3%)	AIE to check 20 inserts on random basis & make entry in Register	-
2 kg Hammer test for soundness	1% inserts randomly by SE/Works		
Jig to Drg. No. RT-454 for Dimension	As per RDSO's latest specifications		
HTS Wire [IS: 6006]			
HTS wire	3mm x 3 ply	-	-
Suppliers	BIS approved	-	-
Admixture (Plasticizer)			
Super Plasticizer conforming to IS: 9103	As per approval of RDSO	-	-

6.2 In the form of Output

6.2.1 Manufacturing Process

Mixing of Concrete

- Approved Design mix of M-55 / M-60.
- Coarse aggregates CA1, CA2 and Sand to be stacked in separate bins.
- Cement should be stacked separately.
- Quantity of Water to be controlled with water meter.
- Provision of Digital weighing platform close to weigh batcher - to cross-check of weight of cement.
- Accurate amount of materials by weight only.
- After due adjustment of moisture contents.
- Fully Automatic weigh-batching plant.
- Clause no. 4.3.2 of IRS: T-39– February 2016, stipulates as – "Batching of different ingredients shall be done by weight only. A modern, mechanized, or automatic weigh batcher shall be used for weighing aggregates and cement. The weigh batcher shall have an accuracy of +/- 3%".
- The periodical calibration of weigh-batching plant
- Compensation of weight of aggregates for moisture content.
- PLC (Programme Logistic Control) for logging-in the data of pre-defined mix and then facility for locking it.
- Qualified operator - to be deputed to man the weigh-batcher.
- Materials to be automatically weigh-batched to feed the desired weight of ingredients CA1, CA2, sand and cement into hopper.
- The sequence of feed-



- All these are then poured in to the mixer.
- Initially, the ingredients are mixed **dry for about 20 to 30 seconds** and then measured quantity of water is fed into the mixer.
- Concrete Mix is prepared in high speed pan / turbine type mixers in **1.5 to 2 minutes**.

Preparation of Moulds

For manufacturing of PSC sleeper by stress bench method, a steel structure called bench (usually to hold 3-4 moulds for Main line sleepers) is fabricated by using channels to hold moulds in a straight line.

- Fabricated to accurate profile as per RDSO drgs.
- Use 6 to 8 mm or 10 mm MS plates. End plates must be of minimum 10 mm thickness.
- Proper cleaning and good quality oiling for easy de-moulding operation.
- Minimum nos. of moulds shall be 0.6 times of Daily production or 1.2 times the Shift production.
- Each mould needs to have proper marking as under :
  - RDSO Drg. No. RT-2466 / RT-4216,
  - Mould no. and corresponding Bench no.
  - Name of firm and Year of manufacture.
- Dimensionally accepted inserts to be fitted in insert pocket after proper greasing.
- Avoid Mould releasing agent/Grease on the stem of SGCI insert.
- No overlapping/cross-pass during wire placing. Wire grips are to be fixed at anchor end first and then to be fixed at tension end.

Tensioning Operation

- All strands to be pulled by hand before fixing wedges and barrels to avoid any differential slack or sag.
- Two jacks of 50/100 tonnes capacity shall be used for simultaneous pulling of all strands.

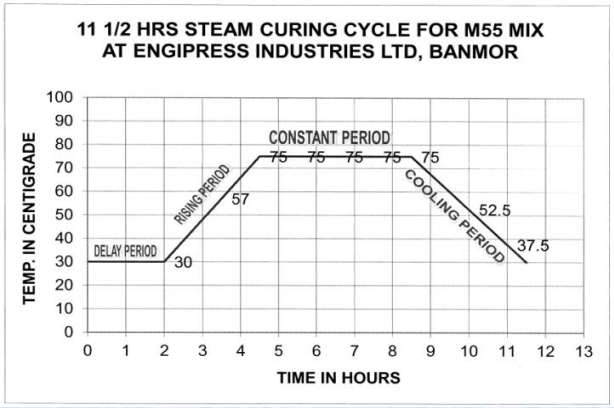
- In case of breakage of any strands during tensioning operation, full de-tensioning is done and re-tensioning done after replacing broken or slipped strands.
- Tensioning Register –
  - Bench no. / Line no.
  - Time of tensioning
  - Elongation at initial 50 kN and final force
- Strands are pulled simultaneously and load and extension is measured and recorded.
- In long line method, each wire is tensioned by desired load.
- Auto-cut provision
- Locking of HTS wires is done after achieving the required load.

Casting of Concrete

- Casting to be done with fresh concrete.
- Fallen or dry concrete needs to be discarded.
- Vibrators of minimum 9000 RPM to be fixed close to locations of rail seat to remove entrapped air.
- Indication of good preparation of moulds - No leakage of slurry through SGCI insert pockets and End plates
- Moulds always placed over wooden battens of 75 x 75 mm supports in bench for maximum advantage of vibration energy.

Steam Curing

- Steam curing cycle – as per approved steam-curing cycle (11½ hrs)* is shown in the graph.



- Rate of rise in temp. – not > 20°C per hour*.
- Recording of temperature – at interval of every half an hour.
- All steam chambers are fitted with Digital Thermal Sensor.
- Supply of steam – to begin after IST of the cement.
- 2 cubes to be put in each chamber for testing them for release strength.
- Max. Curing Temperature is to kept as 55 to 60 ^{0}C*.

***The value has been revised to (i) 10.5 to 12 hrs (ii) not > 15 ^{0}C/hr as per amendment approved by Railway Board and issuance of corrigendum from RDSO is under process.**

Submerged Water Curing

After de-tensioning, the sleepers shall be cured for further period of not less than 14 days (as per mix design) by submerging in water.

6.2.2 Inspection and Testing of Sleepers

Two nos. released cubes per chamber shall be kept for testing but testing should be done of one release cube per chamber only.

Main Line Sleepers

- Release cube testing: 2 nos. of each Steam Chamber – Compressive strength > 40 N/mm^2.
  De-moulding should be done only after released cube testing.
- Water cured cubes: 3 nos. of each Batch – Compressive strength > 55 N/mm^2
  Percentage of water cured cubes having characteristic strength value should not be less than 2.5% and co-efficient of variation shall not be more than 7%.
  a) Flexural Beam Test: > 5.2 N/mm^2 (Weekly)
  b) Centre top = 60 kN
  c) Centre bottom = 52.5 kN (only during development)
  d) Rail seat = 230 kN without cracking
  e) Moment of Failure = 370 kN
- Dimensions : 100% check
- Outer to Outer Gauge : with Go-NOGO Gauge
- Rail Seat : with Go-NOGO Gauge
- Rail Seat Slope: Feeler gauge (0.075 mm)
- Toe Gap : Three Pin gauge (8 ±1 mm)
- Wind Gap : Four Legs gauge (1.2 mm) – 10%
- Concavity/convexity : Four Legs gauge (0.8 mm) – 10%

Turnout Sleepers

- Release cube testing: 2 nos. of each Steam Chamber – Compressive strength > 50 N/mm^2
- Water cured cubes: 3 nos. of each Batch – Compressive strength > 60 N/mm2
  a) Flexural Beam Test: > 5.5 N/mm^2 (Weekly)
  b) Sleeper top = 65 kN
  c) Sleeper bottom = 85 kN
  d) Moment of Failure = 160 kN (Sleeper bottom)
- Dimensions : 100% check
- Centre line dimension along with X and Y dimensions: Format Booklet is to be filled up
- Assembly Dimensions: Format is to be filled up
- Rail Seat : with GO-NOGO Gauge
- Rail Seat Slope (Exit & Approach) : Feeler gauge
- Toe Gap : Three Pins gauge
- Wind Gap at Rail Seat : 1.2 mm (Max.) on width of 120 mm
- Camber (50 mm Block) : not > 5 mm

Static Bending Strength Test of PSC Sleepers

- Sleepers to be loaded gradually (30-40 KN/min) upto specified load* i.e. to be retained for 3 min. for observing cracks, if any (at least 15mm long from the tension edge of the sleeper i.e. visible to the naked eye).
- In case of 'Moment of Resistance' (MR) test, the sleeper deemed to have passed the test if it sustains the loads specified* without cracking.
- In case of 'Moment of failure' (MF) test, the sleeper deemed to have passed the test if it is able to take load beyond the specified test load*.

***The specified values of load as per para 5.3.7.3.1 & Annexure III of T-39 (Feb. 2016):**

Sleeper	Centre Top (KN)	Centre Bottom (KN)	Rail Seat Bottom	
			Cracking (KN)	Failure (KN)
BG	60	52.5	230	370
MG	25	40	150	250

Acceptance & Rejection Criteria of PSC Sleepers

All sleepers tested should pass all the acceptance tests for lot to be accepted. Depending on 15 day cube strength of the lot, the scale of testing for the lot shall be as follows:

Sleeper per lot	Strength of three cubes	Design Mix
One	Min. Strength 55 N/mm^2 & above	M55
	Min. Strength 60 N/ mm^2 & above	M60
Two	Av. Strength < 55 N/mm^2 but up to 48 N/ mm^2	M55
	Av. Strength < 60 N/ mm^2 but up to 55 N/ mm^2	M60
In case, 15 days average strength of concrete in three cubes for a lot is less than 48 N/mm^2 for M55 Grade and 55 N/mm^2 for M60 Grade, the lot shall be rejected and no testing for moment of resistance or moment of failure will be conducted.		

6.2.3 Dispatch

1. Before dispatch, ensure that marking with stencil done on all sleepers as per RT-2466.
2. Ensure that all rejected material removed and not mixed with passed sleepers.
3. Ensure that dispatch lot passed by inspecting official after conducting tests and visual and dimension checks.
4. Ensure that sleepers laid with wooden blocks as separator.
5. Ensure that all the loading done in day time under close supervision to avoid and damage to edges.
6. Ensure that dispatch being done to consignee as given in inspection certificate.

7.0 कैलिब्रेशन की अनुसूची / Schedule of Calibration

Equipment	Frequency
Aggregate Weigh Batcher	Once every week or after casting 2000 sleepers, whichever is earlier.
Cement Weighing Equipment & Water Meter	
Dimension Checking Gauges	Once every 15 days or after inspecting 5000 sleepers, whichever is earlier.
15 cm concrete cube testing machine (2000 KN capacity)	Once in 3 months
Sleeper Static Bend Test machine (500 KN capacity)	Once in 3 months or after testing 250 sleepers, whichever is earlier.
Pre-tensioning Jacks (500 KN capacity)	Once a month or after casting 5000 sleepers, whichever is earlier.
Pre-tensioning load cell	
Concrete Beam Testing Machine (1000 KN capacity)	Once in 6 months
Master gauges for checking correctness of dimension measuring gauges	
Cement mortar cube testing machine (500 KN capacity)	
Proving Rings (2000 KN, 500 KN and 100 KN)	Once in 18 months
Tachometer	Once in a year
Weights & Measures	By Weights & Measures Deptt. as per extent rules

8.0 प्रयुक्त प्रारूप और रजिस्टर / Formats and Registers used

Formats (F)

F – I [Ref. to IS: 4031 (Part – II)]	Specific Surface of Special Cement (Blaine's Air Permeability Apparatus) Specific Surface (Fineness) > 3700 cm^2 OK / < 3700 cm^2 NOT OK
F – II [Ref. to IS: 4031 (Part – III & IV)]	Normal Consistency of Special Cement For Initial And Final Setting Time. Needle reading between 5 to 7 mm from bottom of the mould indicates Normal Consistency.
F – III [Ref. to IS: 4031 (Part – V)]	Initial and Final Setting of Special Cement IST > 60 minutes OK < 60 minutes NOT OK FST > 600 minutes OK < 600 minutes NOT OK
F – IV [Ref. to IS: 4031 (Part – VI)],[Ref. to IS: 4031 (Part – III)]	7 Days Compressive Strength of Cement Mortar Cubes with Standard Sand < 37.5 N/mm^2 NOT OK > 37.5 M/mm^2 OK Soundness of Cement: Expansion of Le Chatelier apparatus needles – not > 5 mm
F– V [Ref. to IS: 383-1970]	Moisture Analysis. If aggregates are wet, absorption is to be deducted. Similarly if aggregates are dry, absorption is to be added.
F – VI	Combined Granulometric Curve (M60) for aggregates CA1 (20mm), CA2 (10mm) and FA (Sand) passing through sieve size 20mm, 10mm, 4.75mm, 2.36mm, 1.18mm, 600µ, 300µ, 150µ, 75µ to determine Combined Passing %.
F – VII [Ref. to IS: 2386 (Part-I)]	(Sample: Course Aggregate) A) Determination of Flakiness Index B) Determination of Elongation Index As per IRS: T -39 if the results of flakiness index and elongation index are less than 30%, it is considered satisfactory.
F – VIII [Ref. to IS: 2386 (Part-VI)]	A) Determination of Crushing Value (Weight of oven dry sample as per Para 2.4 of Code) B) Determination of Impact Value (Weight of oven dry sample as per Para 4.4 of Code) C) Determination of Abrasion Value (Weight of oven dry sample as per Para 5.2 of Code)
F – IX	Calibration of Weigh batcher/Cement load Cell by Standard Dead Weight
F – X	Calibration of Water meter
F – XI	Calibration of Static Bend Testing Machine, Concrete Cube Testing Machine, Tensioning Jacks and Cement Mortar Cube Testing Machine
F – XII [Ref. to IS: 6006]	Tensioning data logger report should be as per A) format XII(A) for Stress Bench Method B) format XII(B) for Long Line Method
F – XIII	Steam Curing Register
F – XIV	Production Register A) Steam Chamber/Bench B) Release Cube Strength (Steam Cured) C) Water Cube Strength (Water Curing) D) Flexural Strength E) Static Bending Test
F – XV	Dimension Register to check sleepers for rejection, use & MF test
F – XVI	Dimensional & Weight Check List of SGCI Insert
F – XVII	Statistical Analysis of Concrete Strength and Static Bending on PSC Sleepers for A) Cube Strength B) Flexural Strength of Concrete Beam C) Static Bend Results upto Cracking Load of MBC, Turnout, Other Sleeper D) Concrete Mix Design used during the period E) Source of Cement used during the period F) Measures taken to improve upon the Deficiencies Observed in above test
F – XVIII	Yearly Statistical Analysis of Concrete Strength and Static Bending Strength of PSC Sleepers
F – XIX	HTS Inspection Summary
F – XX	Details of Mix Design

Registers (R)

R – I	Maintenance History card for Bench/Mould/End Plates
R – II	Mould/ Bench/ End Plate Checking Register
R – III	Cement Register for Incoming/ Used material
R – IV	Stock Register for Cement, HTS Wire and Insert
R – V	Detail of Initial & Final Tension to be given to each tendon
R – VI	Batching proportion for concreting
R – VII	Vibration Speed Record

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कार्यालयीन प्रयोग हेतु
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सत्यमेव जयते

भारत सरकार – GOVERNMENT OF INDIA

रेल मंत्रालय – MINISTRY OF RAILWAYS

पीएससी स्लीपर के निर्माण हेतु गुणवत्ता आश्वासन योजना

QUALITY ASSURANCE PLANNING FOR MANUFACTURING OF PSC SLEEPERS



कैमटेक/सि/2017/क्यूए-पीएससी स्लीपर/1.0

CAMTECH/C/2017/QA-PSC Sleeper/1.0

अगस्त - 2017/ August – 2017

अअमासंRDS रेल अग्रदूत Transforming Railways

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यदि आप इस सन्दर्भ में कोई विचार और सुझाव देना चाहते हों तो कृपया हमें इस पते पर लिखें।

If you have any suggestion & comments on contents of the pamphlet, please write to: ***Joint Director (Civil), CAMTECH, Maharajpur, Gwalior (M.P) – 474 005***

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