

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From



NAME OF FIRM:

OFFICE ADDRESS:

WORK ADDRESS:

MODEL
QUALITY ASSURANCE PROGRAMME
FOR
MANUFACTURING
OF
PRESTRESSED MONOBLOCK CONCRETE
SLEEPERS (PRE-TENSIONED TYPE)

Specifications: IRS: T-39 (Aug-2011)

IRS: T-45 (May-1996)

IRS:T-46(1985)

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COMPANY PROFILE

- **Brief about formation and history to be given.**
- **Range of product being manufactured or manufactured in the past may be given.** For example:
 1. Gauge 52 Kg/60 Kg MBC Sleepers (**RT-2495 & RT-2496**).
 2. Slack Gauge Sleepers (**RT-4170, RT-4171, RT-4172 & RT-4173**).
 3. Bridge Approach Sleepers (**RT-4088, RT-4089-RT-4097**).
 4. Level Crossing Sleepers (**RT-4148 & RT-4148A**).
 5. 1 in 12 Points and Crossing Sleepers (**RT-4218 & RT-4732**).
 6. 1 in 8.5 Points Crossing Sleepers (**RT-4865**).
 7. Derailing Switch Sleepers (**RT-6068**).
 8. Diamond Crossing Sleepers (Without Slip, Single Slip & Double Slip) (**RT-5362, RT-5363 & RT- 5364**).
 9. Rex Lock Sleepers (Special Fastening of Rex Lock provided by Escorts India Ltd..) (**A4-97-EQ41-5**).
- **Brief about organization & its structure may be given**
- **Brief about raw material and their approved sources may be given**

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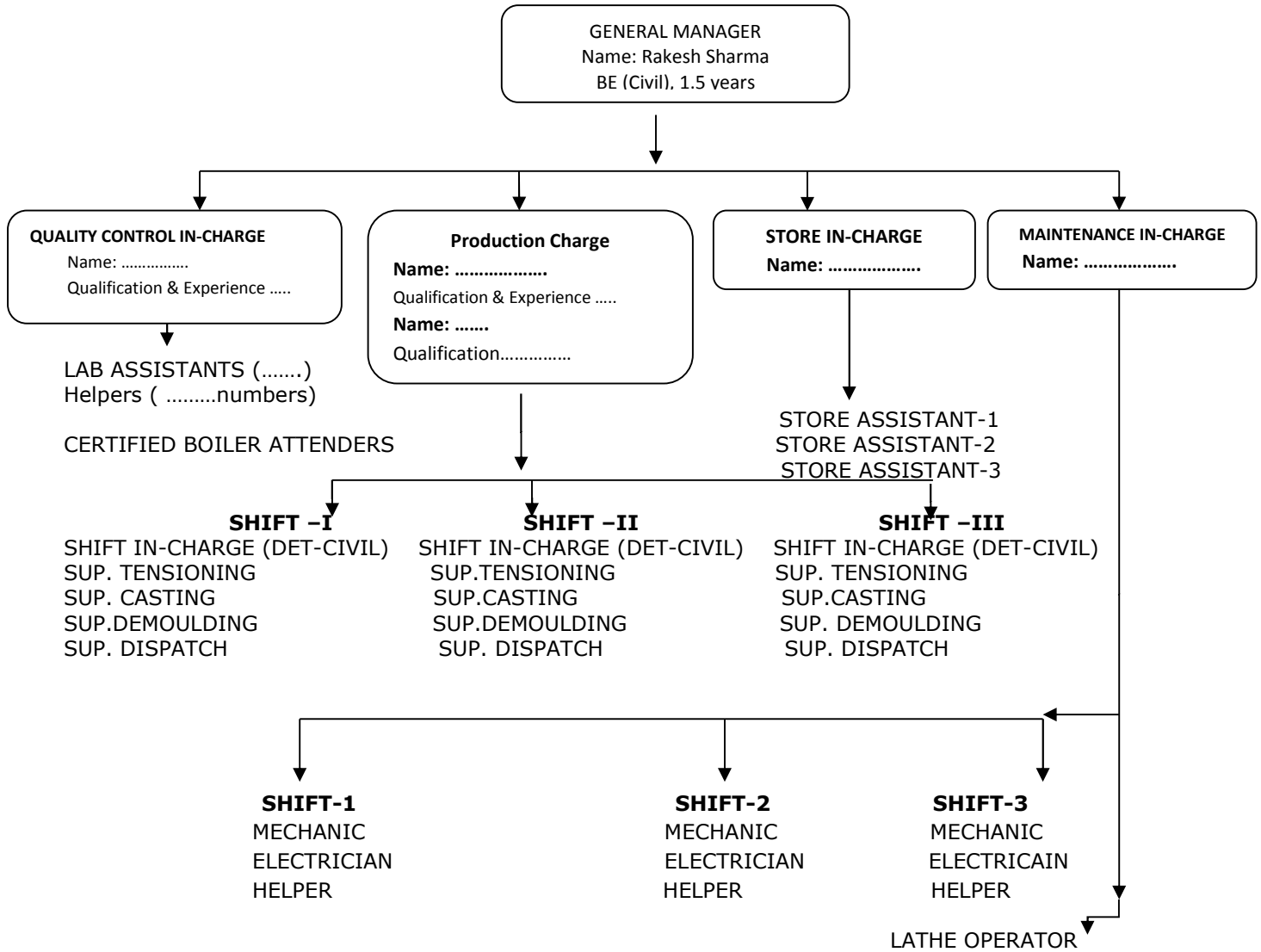
QUALITY POLICY AND QUALITY OBJECTIVES

1. is committed to achieve customer satisfaction of highest order by adhering quality parameters and schedule of customer strictly.
2. To become competitive through technical up-gradation and waste minimization.
3. To create a Team Spirit by continuous interaction with employees.
4. To be sensitive for all environmental concerns by developing greenery throughout the plant.

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ORGANISATION STRUCTURE



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LAYOUT PLAN

*LAYOUT PLAN SHOULD BE ATTACHED
ALL THE LOCATION SHALL BE MARKED BY WAY OF NUMBERING
AND CLEARLY IDENTIFIED.*

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SCOPE

The scope of QAP for production of different type of sleepers should be mentioned. Typical example has been tabulated below:

S N.	Type of Sleeper	Concrete Grade	Drawing No.
1	BG- Mainline	M-55	RT-2496
2	BG-Special Sleeper (Level Crossing)	M-55	RT-4148
3	BG- SEJ	M-55	RT-4149
4	BG- Guard Rail Straight	M-55	RT-4088
5	BG- Guard Rail Flared	M-55	RT-4089-4097
6	BG- Special Sleeper (Wider Gauge)	M-55	RT- 4170 to 4173
7	BG- Special Sleeper (Wider Gauge)	M-55	RT- 4183 to 4186
8	25 Ton Axle Load- Main Line	M-60	RT-7008
9	25 Ton Axle Load- SEJ	M-60	RT-8224
10	25 Ton Axle Load- Level Crossing	M-60	RT-8225
11	25 Ton Axle Load- Guard Rail Straight	M-60	RT-8228
12	25 Ton Axle Load- Guard Rail Flared	M-60	RT-8229 to 8237

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AVAILABLE INFRASTRUCTURE

SL No.	Description	Capacity Existing	As per STR
1	Cement Godown Area		
2	HTS Storage		
3	SICI Insert & PVC Dowel Godown		
4	Steam Curing Capacity		
5	Water Curing Tanks		
6	Stacking Area of Sleepers		
7	Sleeper Testing Area		
8	Testing Laboratory		
9	Office of Inspecting Official		
10	Rest House for Inspecting Official Including Bedroom & Toilet		
11	Turnout Assembly Yard		

Any deviation from STR should be clearly stated here.

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List of Laboratory Equipments

S. N.	Requirement of STR	Availability	Number	Model/Make
1	Compression Testing Machine, 2000KN capacity, motorized with digital interface for real time recording of testing results. The system should have sufficient memory to store data of one year production with reporting facility in hard copy as per format mutually agreed.	1 NOS.		
2	Flexural Beam (Tension) testing machine with loading jacks, 30 KN capacities. The machine is capable of digital display and recording of data during testing with auto logging of time & date of testing. Data storage & retrieval capability should be for one year production.	1 NOS.		
3	Motorized pumping unit with 500 KN cap. 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. The digital display of the load applied should be visible to observer simultaneously along with observation of crack. The data can be recorded in computer with automatic data and time record with Batch no. and other detail for traceability of record.	1 NOS.		
4	15 cm cubes moulds confirming to IS:516	50 NOS.		

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5	Beam moulds (10X10X50) cm size	2 NOS.		
6	Slump Tester/ Vee Bee Testing Machine	1 NOS.		
7	Electronic balance with 1gm least count (10/20 Kg. capacity) including weights.	1 NOS.		
8	Blain's air permeability apparatus	1 NOS.		
9	Vicat apparatus with dash pot and various needles	1 NOS.		
10	Stop Watch	1 NOS.		
11	Le Chatelier mould for soundness test of cement	1 NOS.		
12	Steel trowels for mixing cement paste	2 NOS.		
13	Cement mortar cube casting machine with motor and time switch complete	1 NOS.		
14	7.06 cm (50cm sqr.) mortar cube moulds	06 NOS.		
15	Metallic scoop , pan type container and china tray etc.	02 SET		
16	Aggregate impact testing machine	1 NOS.		
17	Aggregate crushing testing machine	1 NOS.		
18	Aggregate abrasion testing machine	1 NOS.		
19	Electric thermostatic oven with display of temp	1 NOS.		
20	Set of IS Sieves 40 mm and below up to 75 micron	1 NOS.		
21	Automatic electric sieve shaker	1 NOS.		

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22	Proving rings of 2000 KN, 500 KN, and 100 KN capacity	1 NOS.		
23	1.5 Volt AVO meter	1 NOS.		
24	Glass cylinders and Beakers 50-500 cc capacity	01 SET		
25	Miscellaneous measuring gadgets like steel tape, Vernier , filler gauge etc.	02 SET		
26	Inspection gauges for dimension checking of sleepers with digital display of parameters as approved by RDSO.	02 SET MECHENICAL GAUGE		
27	Master gauge for checking inspection gauge	01 SET		
28	Magnifying glass	01 NOS.		
29	Level table steel for checking gauges	01 NOS.		
30	pH meter & TDS meter (Digital)	01 NOS.		

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LIST OF MACHINERY

S.N	REQUIREMENT OF STR	Availability,	number	&Model/Make
1	Concrete Mixer along with Automatic Batching plant using Micro-processor based Weigh Batchter, Pneumatically operated aggregate bins, water meter and automatic cement feeding capacity of concrete 5 cm/hr. It is capable of keeping digital record of ingredients used in batch wise and data storage capacity for one year production with print out facility	1 NOS.		
2	Dead weights for calibration of weigh batcher	1000 kg		
3	Water measuring cans or automatic water meter	01 SET		
4	High frequency 9000 RPM ($\pm 4\%$) 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. The vibrator should have recording facility for recording date and time of each operation. RPM should be digitally displayed during operation.	16 NOS.		
5	Low voltage high-speed converter	2 NOS.		
6	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. Rail seat area should also be made with adequate measures to ensure proper rail seat slope and surface finish.	300 NOS (Completed) 200 NOS. (Under Fabrication)		
7	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	1 NOS.		

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	statutory authority should be ensured.			
8	Cup wire brush type or any suitable type sanders	3 NOS.	-	
9	Air blower for cleaning moulds	1 NOS.	-	
10	Portable heavy-duty grinder	06 NOS.		
11	Electric welding Arc cutting m/c for HTS cutting at de-molding/ Abrasive disc cutter.	5 NOS.		
12	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 NOS.		
13	Wire baskets, Phowrahs crowbars and shovels	1 NOS.	-	
14	Concrete Bucket for carrying and pouring concrete in moulds by bottom controlled discharge on Monorail Hoists. Movement should be Motorized and operator Controlled.	1 NOS.		
15	Wedges & barrels	7500 NOS.		
16	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. The data of time vs temp. Covering complete casting line should be digitally displayed and stored. The system should have sufficient memory to store at least one year's data with facility to take out print shift wise.	18 NOS.		
17	Mould oil application brushes or spraying device	10 NOS.	-	
18	Diesel electric generator with suitable capacity (160 KVA)	1 NOS.		
19	Platform type balance (cap.-500 kgs)	1 SET	-	
20	Drilling machine	1 NOS.		

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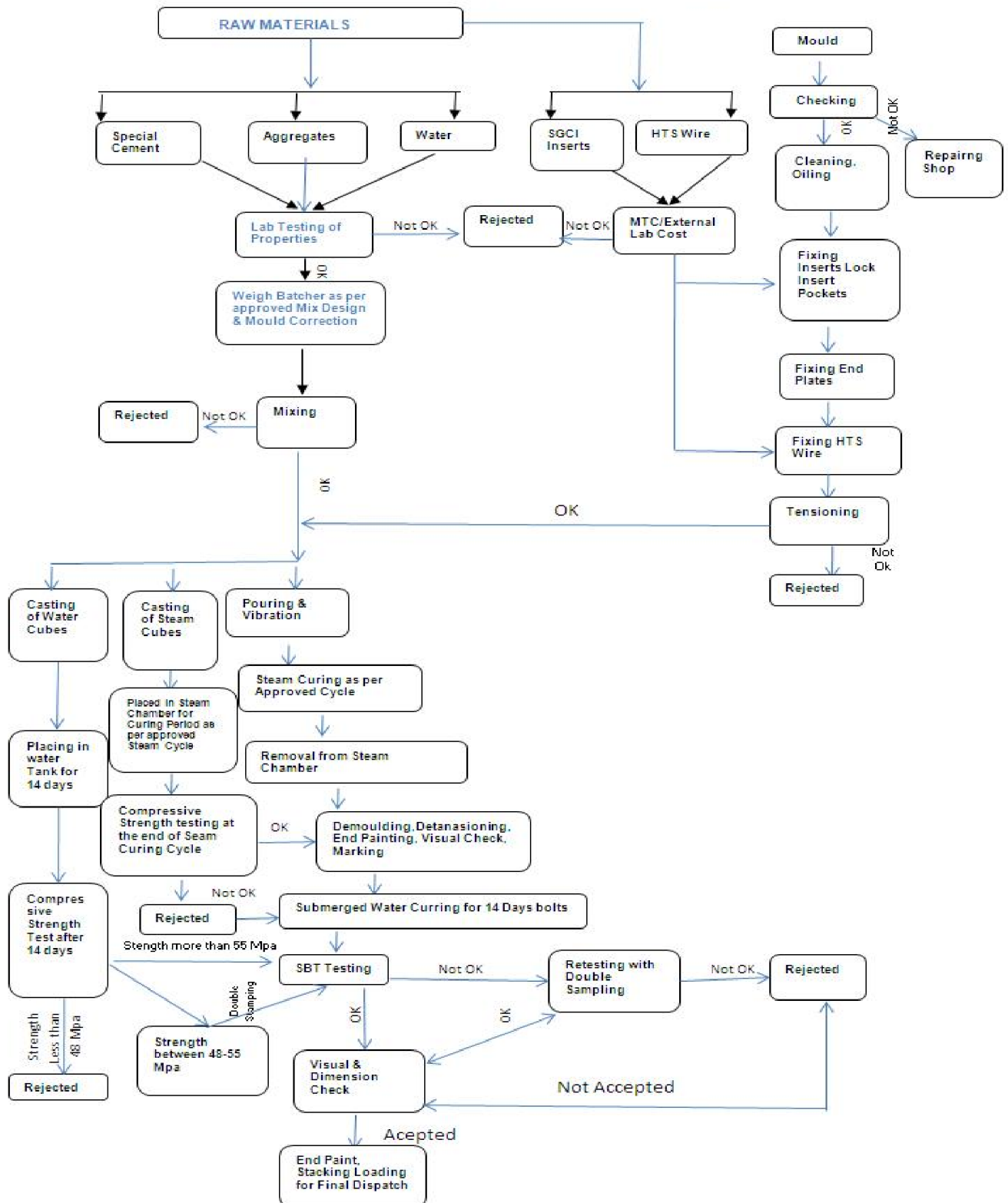
21	Double Acting Hydraulic jacks 500KN capacity.	02 NOS.		
22	Overhead wire rope hoist 2T capacity , Electrically driven, travelling on 1 Beam section for Demoulding	1 NOS.		
23	Tachometer 10000 RPM capacity.	1 NOS.		
24	Trolley for transportation of finished sleepers.	1 NOS.		
25	Workshop equipments			
	Lathe Machine			
	Tower drilling machine	1 NOS.		
	AG-7 Angle Grinder	1 NOS.		
	Electric Welding Set	1 NOS.		
	Gas cutting set	1 NOS.		

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FLOW CHART FOR MANUFACTURING OF CONCRETE SLEEPER



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	Mix Design parameters:		
1	Mix Design Proportions	M-55	M-60
	Cement		
	Coarse aggregates, CA ₁		
	Coarse aggregates, CA ₂		
	Fine aggregates		
	Water		
	A/C Ratio		
	W/C Ratio		
	Sand : CA ₁ : CA ₂ ratio		
2	Source of raw materials		
2.1	Cement (Brand name)		
	Location of cement plant		
2.2	Quarry name for CA ₁		
	Distance of quarry from the plant		
2.3	Quarry name for CA ₂		
	Distance of quarry from the plant		
2.4	Source name of Fine aggregates,		
	Distance of source from the plant		
2.5	Water source		
	pH value of water		

NOTE:

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1. In case of change of source of cement, mix design is to be rechecked & reviewed before use.
 2. In case of change of aggregates source, aggregates to be tested from external lab and mix design is to be reviewed before use.

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MOULD MAINTENANCE & REPAIR

1. Every Bench is having unique number starting from 1 to
2. Every Mould is having unique number designating as XY where X is bench number and Y can be A,B,C & D
3. Every end plate is having unique number ranging from 1 to
4. Every bench is having a maintenance history card as per format given in annexure **A**
5. Every mould is having a maintenance history card as per format given in annexure **B**
6. Every end plate is having a maintenance history card as per format given in annexure **C**
7. Moulds, bench & end plates are checked at least once in a month and conditions are reported in form register in format as per annexure **D**
8. Templates are used to check section at end, rail seat & centre as per following drawing.

S N.	Type of Sleeper	Sleeper Drawing	Mould Drawing
1	BG- Mainline	RT-2496	
2	BG-Special Sleeper (Level Crossing)	RT-4148	
3	BG- SEJ	RT-4149	
4	BG- Guard Rail Straight	RT-4088	
5	BG- Guard Rail Flared	RT-4089-4097	
6	BG- Special Sleeper (Wider Gauge)	RT- 4170 to 4173	
7	BG- Special Sleeper (Wider Gauge)	RT- 4183 to 4186	
8	25 Ton Axle Load- Main Line	RT-7008	
9	25 Ton Axle Load- SEJ	RT-8224	
10	25 Ton Axle Load- Level Crossing	RT-8225	
11	25 Ton Axle Load- Guard Rail Straight	RT-8228	
12	25 Ton Axle Load- Guard Rail Flared	RT-8229 to 8237	

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9. Insert pockets are checked with the help of jig as per drawing number
 - 10.** Rail seat slope is checked with the help of gauge as per drawing number
 11. The templates, jigs and gauge are checked at every 6 months and date of checking is painted on templates, jigs and gauge.
 12. End Plates are checked with the help of templates as per drawing number
 13. Forman is responsible for repair and maintenance of bench, mould and end plates. He is also responsible for checking of templates, jigs & gauge.
 14. Production supervisor is having responsibility to use good condition bench, mould & end plate.

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RAW MATERIAL

1. CEMENT

- a) Cement as per mix design is procured.
- b) In case of brand of cement is changed, mix design is reviewed before it is used.
- c) Cement conforming to BIS:12269:2013 (as well as IRS-T-40) shall be used.
- d) For every consignment it is ensured that test certificates of concern manufacturing week is received.
- e) Cement is stored in go-down week wise in such a way that FIFO principle can be followed.
- f) Cement is stacked in go-down in not more than 10 layers.
- g) Cement stacks are placed at least 60 cm away from wall.
- h) Cement of 3 month old is not accepted.
- i) Set cement bags are rejected after entering the number in register.
- j) Cement go-down is checked by Plant supervisor every month.
- k) Register is maintained as per format given in Annexure –C
- l) For storage of cement IS: 4082 is followed.
- m) Before use it is ensured that cement is tested in lab for fineness, consistency, initial setting time and final setting time.
- n) Cement not suitable for production is removed immediately from plant and the same is entered in cement register.

2. AGGREGATE

- a) Aggregate as per mix design is procured.
- b) Aggregate shall conform to BIS:383
- c) In case of aggregate source is changed the aggregates are tested from external lab and mix design is reviewed before use.
- d) The aggregates are checked for physical tests (Impact value, crushing value, abrasion value, flakiness index, elongation index) at every consignment or weekly whichever is earlier.

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- e) The aggregates are checked for grading at every consignment or weekly whichever is earlier.
- f) The aggregates are tested from external lab at every year for all tests including soundness and alkali aggregate reaction.
- g) The aggregates are checked for moisture before start of every shift. During rainy season, the frequency is as per requirement.

3. **WATER**

- a) Water is taken from approved source.
- b) Water shall confirm to BIS:456
- c) In case of change in source, the water is tested from external lab.
- d) Water samples are tested monthly for TDS & pH value.
- e) Water sample is tested every year from external lab for suitability.
- f) Standard solution of known pH & TDS are available for calibration of equipment.

4. **HTS WIRE**

- a) HTS wire from approved BIS suppliers is used.
- b) HTS wire shall confirm to BIS:6006
- c) On receiving it is checked and ensure that proper wrapping, tag and seal are available and details are as given in Inspection Certificate.
- d) Records are maintained in a format as per Annexure-D
- e) HTS wire is stored in water proof area.
- f) In case HTS wire is not as per requirement, the same is advised to Zonal Railway official to take further decision.

5. **SGCI INSERT**

- a) SGCI inserts are procured from approved sources as per Master list of Approved Vendors of QAC Directorate of RDSO.
- b) On receiving it is ensured that IC and test certificates are available.
- c) SGCI insert are stored in covered shed
- d) 10 % of SGCI insert are checked with approved gauge and hammer testing before use.
- e) Records are maintained in format as per Annexure-D

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LAB TESTING OF RAW MATERIAL

1. CEMENT

S. N	Characteristic check	Specification reference	Acceptance norms	Frequency	Format of record (Register Number)
1	Fineness	IS: 4031 (Pt.-2)-1988 IS:12269-87 (Amd-6) cl.no. 5.1	3700 cm ² /gm	As Per Format	Format-I
2	Normal Consistency	IS:4031 (Pt.- 4)-1988 cl.no. 5.1	Needle reading 5 to 7 mm from bottom	As Per Format	Format-II
3	IST	IS: 4031 (Pt.-5)-1988 IS:12269-87 (Amd-6) cl.no. 5.3	60 minutes	As Per Format	Format-III
4	FST	IS: 4031 (Pt.-5)-1988 IS:12269-87 (Amd-6) cl.no. 5.3	600 minutes	As Per Format	Format-III
5	7 days Mortar cube strength	IS: 4031 (Pt.-6)-1988 IS:12269-87 (Amd-6) cl.no. 5.4	Not < 37.5 MPa	As Per Format	Format-IV
6	Soundness	IS:4031 (Pt.- 3)-1988 IS:12269-87 (Amd-6) cl.no. 5.2	Not > 5.0 mm	As Per Format	Format-IV

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2. AGGREGATES

S.N	Characteristic check	Specification reference	Acceptance norms	Frequency	Format of record
1	Impact Value	IS: 2386 (Pt.-IV) IS:383-3.4	< 30%	Yearly for each source.	Format-VIII
2	Abrasion Value	IS: 2386 (Pt.-IV) IS:383-3.5	< 30%	Yearly for each source.	Format-VIII
3	Crushing value	IS: 2386 (Pt.-IV) IS:383-3.3	< 30%	Yearly for each source.	Format-VIII
4	Flakiness index	IS: 2386 (Pt.-I) IRS-T39-3.3.1	< 30%	Weekly	Format-VII
5	Elongation index	IS: 2386 (Pt.-I) IRS-T39-3.3.1	< 30%	Weekly	Format-VII
6	Individual grading of Course Aggregates	As per Appendix 'A' of IS: 383	Should be as per Table-2 of IS: 383-1970	Weekly	Format-VI
7	Individual grading of Fine aggregates	As per Appendix 'A' of IS: 383	Zone-I	Weekly	Format-VI
8	Combined grading	Is : 383-1970	Should be in limit	Weekly	Format-VI
9	Particle finer than 75 u size in fine aggregates	-do- ,Table-1 (cl-3.2.1)	< 3 %	Weekly	Format-VI
10	Absorbed moisture content	IRS: T-39-3.4.3	Calculate moisture adjustment in Mix design	Daily, before each shift	Format-V

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11	Potential Reactivates	IS: 2386 (Pt.-VII) IRS-T39-3.3.4	Aggregate should be innocuous in nature	Yearly	
12	Soundness	IS: 2386 (Pt.-V) IRS-T39-3.3.2	shall pass sodium or magnesium sulphate accelerated soundness test	Yearly	
13	Deleterious material	IS: 2386 (Pt.-II) IRS-T39-3.3.3	Maximum limit of deleterious material in aggregates should conform to IS: 383	Yearly	

The yearly test is carried out from external lab and apart from three test (at S. N. 11,12 & 13), all other tests mentioned from S.N. 1 to 10 are conducted.

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MANUFACTURING PROCESS :-

..... is manufacturing PSC sleeper by stress bench method. In this method a steel structure is fabricated by using channels to hold moulds in a straight line is called bench. The benches should be properly designed and to be fabricated carefully. The bench should have capacity to hold 3-4 moulds for Main line sleepers and 2-4 moulds for turnout sleepers. We have adopted the merry-go-round system in which bench will be carried to each operation section on roller path.

1. MOULD PREPARATION :-

Moulds are cleaned by using wire cup sander or wire brush. All dirt and any old concrete materials is removed. After cleaning, good quality mould oil is to be applied to moulds to prevent concrete sticking to mould surface and for easy demoulding operation.

Precaution:-

- a) Mould, insert pocket, mould-end, mould collar, end plate, and end plate holes cleaning to be done properly with the help of air blower and wire brush.
- b) Mould releasing agent is applied on mould and end plates. All minor gaps are filled with putty. .
- c) End plate are fitted after proper oiling.

2. INSERT FIXING :-

Dimensionally accepted inserts are used for production. Proper greasing is done in the insert pocket before insert pin fixing to avoid sleeper damage and insert hole clogging. Fixing of oversize inserts in the pocket forcibly is avoided to prevent damage to mould, insert pocket as well as sleeper at the time of demoulding. At the same time under sized inserts is also not used to prevent slurry leakage through the insert pocket.

Precaution:-

- a) Inserts have been fitted properly i.e. these should not be fitted forcibly.
- b) Mould releasing agent/Grease is not applied on the stem of SGCI insert as it may lead to segregation of concrete with insert during demoulding.

3. WIRE PLACING AND FIXING OF WEDGES AND BARRELS :-

Wire is passed through end plates. Care should be taken to avoid any overlapping/cross-pass. After placing the wire grips are to be fixed at anchor end first. Then grips are fixed at tension end.

Precaution:-

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- a) HTS wire to be cut as per bench length to avoid excess use.
- b) During wire insertion, cross pulling must be avoided.
- c) It shall be ensured that after placing of wire, alignment of mould is parallel to alignment of wires.

Responsibility: - Responsibility of all these three operation will be of shift supervisor

Super Check :- By Shift Incharge /Production Incharge/Q.C.In-charge

4. STRESSING OF WIRE:-

- a. Before starting of tensioning operation it is checked that machine is in working conditions and calibration is valid.
- b. Before starting, design elongation is calculated based on the young modulus & cross sectional area given in manufacturing test certificate.
- c. Tensioning Machine is started only after completion of hand-tensioning and equalize all the four stress-bolts.
- d. Graphite powder is used in Barrel-wedges before use.
- e. Tensioning-guard is to be used during tensioning.
- f. Initial tension of 3KN to each wire (total 54 KN, 27 KN from both side) is to be given to MBG sleeper with drawing number RT-2496 to remove sag or overlapping etc. For other drawings detail is given in Annexure-E.
- g. After giving the initial tension, the elongation is measured at 4 points.
- h. Then the wires are further stressed for 27 KN for MBG line sleeper to drawing number RT-2496(total 486 KN, 243 from each side). For other sleepers, details are given in Annexure E).
- i. The auto cut facility is available and tensioning is stopped at desired load.
- j. After completion, elongation at 4 points is again measured.
- k. The average elongation is compared with design elongation. If difference is more than 5%, GM is informed who takes the decision in writing after informing Railway Official.
- l. The points where elongation is to be measured, have been identified with paint mark.

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- m. The records are maintained in format given in annexure **Format-XII** In case of digital storage of data, printout is taken and filed after cross verification by shift in charge.
- n. The data is taken out monthly basis and backup is created and given to Railway Authority.
- o. Responsibility of correct tensioning operation and record keeping is of Tensioning supervisor.

5. BATCH MIXING:-

- Mixing is done in high speed pan mixer.
- Feeding of mix proportions after moisture adjustment is done at least once for each shift. During monsoon this is done as per requirement. The feeding is done by lab in-charge only.
- Mixing time is also pre-fed based on trial during mix design.
- For Each shift mixing of concrete as per approved mix design, pouring of concrete and compaction of concrete takes place.
- Before any starting of batch mix, batching plant operator ensures that calibration of plant is correct and valid.
- Before any starting of batch mix, batching plant operator ensures that batching proportion incorporating moisture correction has been received.
- The format of batching proportion for concreting will be as per format V.
- The lab in charge shall ensure that cement and aggregate being used have been tested in lab
- Any deviation in mix proportion other than moisture correction shall be done by GM after recording the reason.
- The batching records for each batch shall be maintained in a format given in **Annexure-F**. The backup of digital records shall be taken monthly and handed over to Railway Authorities.

6. CONCRETE PLACING

- After batch mixing the concrete is transported in a bucket and poured in moulds by bottom controlled discharge on Monorail Hoists. Movement is motorized and operator Controlled.
- Concreting is done in at least three layers.

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- c. Before pouring, the shift supervisor shall ensure that 2 hours have not been passed since stressing of wire. If 2 hours have been passed then GM should take decision after recording the same.
- d. Vibration is ensured with the help of 8 vibrators bottom mounted having RPM as $9000 \pm 4\%$. RPM is digitally displayed at the location. It is also cross checked with tachometer every week. Vibrator is started only after pouring of first layer.
- e. Smooth contact of vibrator with Rail seat plate is ensured by regular cleaning of top plate of vibrator.
- f. In case the RPM is not within limit, the vibrator is immediately removed for repair and replaced with working vibrator.
- g. Vibration is done for 2-4 minutes. In case of vibration time is more than 4 minutes GM decides after recording the same.
- h. Records of vibration is maintained in digital form in format given in **Annexure-G**. The backup of digital records is submitted to Zonal Railway monthly.
- i. Troweling is done to remove the projection beyond 5 mm. The top of surface is kept rough.
- j. Cubes are cast for each batch and placed in steam chamber along with bench. For every chamber one cube is cast. The marking of cubes is XDDMM(X is the number of chamber, DD is date & MM is month)
- k. Cubes are cast @ 3 per batch randomly and same are kept in water curing tank for 14 days. The marking is XY where X is serial number ranging from 1 to 3 and Y is batch number.

7. STEAM CURING

- a) After a last bench is cast for a particular steam chamber, the operator starts the steam curing system.
- b) The steam curing cycle shall be as approved by Railway authority. The approved curing cycle shall be displayed in lab as well as near steam chambers.
- c) Benches are placed in chamber with hoist. Utmost care is taken to ensure that is no damage to sleeper which is cast recently.
- d) Steam curing cycle is fully automatic with servo controlled valve. The pre steaming period is fixed as 120 min or IST of cement whichever is higher.
- e) The increasing temperature gradient has been kept at 20°C/hr . Maximum temperature has been kept as 70°C .
- f) The soaking period at maximum temperature has been kept as 4 hours.

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- g) After soaking period, the temperature is made to ambient temperature with smooth temperature gradient.
- h) The data of time vs temperature in graphical form is taken and kept as record.
- i) The digital data of time vs temperature is stored and backup is made and handed over to zonal railway monthly.
- j) Temperature is cross checked with external thermometer for at least one chamber at three different time.
- k) In case of steam curing chart is not as per approved one, the GM decides after recording the reasons.
- l) The **responsibility** of working of boiler is of boiler attendant. The **responsibility** of recording of data is of lab in-charge. The **responsibility** of effectiveness of system is of shift supervisor.
- m) GM can modify the steam curing for different type of sleeper only after permission from Railway Authority and incorporating the same in QAP.
- n) Record of steam curing is maintained as per format XVIII.

8. DEMOULDING AND TRANSFER OF PRE STRESS :-

1. After steam curing cycle, cubes from each chamber will be tested for concrete strength.
2. If the strength comes out to be 40 MPa, sleepers are assumed ready for transfer of pre-stress. In case of strength is less than 40 MPa, GM will take decision after recording the reason.
3. Benches are removed from chamber for demoulding operation.
4. De-stressing of bench is carried out by diagonally loosening of stress bolt.
5. Cutting of HTS wire is carried by electrodes.
6. De-moulding of sleeper is done by demoulding tackle to avoid damage to sleeper.
7. Holes of insert are cleaned.
8. Batch number marking is being done by paint with the help of stencil as per drawing number RT-2496.
9. Surface defects and visual check are carried out. Any defective sleeper is removed and marked as per drawing RT-2496. Random sleepers are also checked for dimensional accuracy.

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10. First coat of end paint is applied and sleeper will be shifted to curing tanks for water curing.

11. Responsibility for testing is of lab incharge. Responsibility of demoulding is of shift incharge.

9. INSPECTION AND TESTING OF SLEEPERS :-

1. After curing period of 14 days 3 cubes for the particular batch is taken out.
2. Sleepers are tested for compressive strength.
3. For M-55 & M-60 Grade Concrete: **To be done in the presence of Railway Official**
 - a) Wherever minimum strength of the three cubes is 55N/sq.mm and above for M55 & 60 N/sq.mm and above for M60 – One sleeper per lot
 - b) For M-55 Grade: - Wherever average strength of the three cubes is less than 55 N/sq.mm but up to 48 N/sq. mm – Two sleepers per lot.
For M-60 Grade: - Wherever average strength of the three cubes is less than 60 N/sq.mm but up to 55 N/sq. mm – Two sleepers per lot.
 - c) In case, 15 days average strength of concrete in three cubes for a lot is less than 48 N/sq mm for M55 Grade and 55 N/sqmm for M60 Grade, the lot shall be rejected and no testing for moment of resistance or moment of failure will be conducted
4. Static Bend Test: **To be done in the presence of Railway Official**

All the sleepers which are selected for static bend test are tested for center bottom and rail seat test. For acceptance of batch every sleeper should pass the test. The acceptance values are given in table. In case of any failure, retesting is done with double the sample size and every sleeper should pass the test.

SLEEPER	CENTER TOP (KN)	RAIL SEAT BOTTOM	
		CRACKING (KN)	FAILURE (KN)
BG Line Sleeper to RT-2496	60	230	370

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5. Moment of failure test is conducted after production of every 2500 sleepers. In case the value is less than acceptance value, Railway Authority takes the decision.
6. For other sleepers, the value shall be as per drawings or as approved by Railway Authorities.
7. Records of cube test & SBT tests are entered in production register (**Format-XIV**) The backup of digital records are submitted to Railway Authority every month.
8. After passing of static bend tests all the sleepers are particular batch are taken out for offering for dimension check. All the sleepers are checked for critical dimensions. Defective sleepers are removed and marked as per drawing RT-2466 or Rt-2416 as the case may be.
9. After removing defective sleepers, sleepers are offered to Railway Authorities. Railway Authorities check 1% of lot for General Dimension and 10% of lot for critical dimension and 100% dimension between outer inserts. The records are maintained in **Format-XV**
10. After dimension, each and every sleeper is checked for FTC (Fit for track circuiting) in a manner prescribed in annexure V of IRS T-39. All passed sleepers shall be marked as per drawing RT-2466.
11. In case of defective sleepers are noticed, and then rechecking is done and again offered for sample check as mentioned above.
12. Once the inspection by Railway Authority is satisfactory, sleepers are stacked over wooded sleepers. The sleepers are loaded on rake/truck with the help of gantry crane.

Responsibility:-Despatch Supervisor.

Super check:-By Q.C.In-Charge

DISPATCH

1. Before dispatch it is ensured that marking with stencil has been done on all sleepers as per drawing number RT-2466.
2. It is ensured that all rejected material has been removed and is not mixed with passed sleepers.

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-
3. It is ensured that dispatch lot has been passed by inspecting official after conducting tests and visual and dimension checks.
 4. It is ensured that sleepers are laid with wooden blocks as separator.
 5. It is ensured that all the loading is done in day time under close supervision to avoid and damage to edges.
 6. It is ensured that dispatch is being done to consignee as given in inspection certificate.

Responsibility: -Despatch Supervisor

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CALIBRATION OF EQUIPMENTS

The frequency of calibration of equipment and machinery has been given below:

S. N.	Name of Equipment	Specification reference	Frequency	Format of record (Register No.)
1	Aggregate Weigh Batcher	IRS: T-39,Annexure-1	Once every week or after casting 2000 sleepers, whichever is earlier.	Calibration-I
2	Cement Weighing Equipment	-do-	-do-	In Register assigned by the plant.
3	Water Meter	-do-	-do-	Calibration-II
4	Dimension Checking Gauges	-do-	Once every 15 days or after inspecting 5000 sleepers, whichever is earlier.	In Register assigned by the plant.
5	Pre-tensioning Jacks (500 KN capacity)	-do-	Once a month or after casting 5000 sleepers, whichever is earlier.	Calibration-III
6	Pre-tensioning Load Cell	-do-	-do-	Calibration-IV
7	15 cm Concrete Cube Testing machine (2000 KN capacity)	-do-	<i>Once in 3 months</i>	Calibration-V
8	Sleeper Static Bend Test machine (650 KN capacity)	-do-	Once in 3 months or after testing 250 sleepers, whichever is earlier.	Calibration-VI
9	Cement Mortar Cube Testing machine (500 KN capacity)	-do-	Once in 6 months	Calibration-VII
10	Concrete Beam Testing Machine (100 KN capacity)	-do-	Once in 6 months	Calibration-VIII
11	Master Gauges for checking correctness of dimensions measuring gauges	-do-	Once in 6 months	In Register assigned by the plant.

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- Proving Rings
 12 (2000 KN,1000KN, -do- Once in 18 months -do-
 500 KN and 100 KN)

The summary of calibration record is prepared and maintained in Lab in a format given below

S. N.	Name of Instruments	Make	Periodicity	Last calibration Certificate No. / Reference	Agency	Date	Next due date of calibration	Format of record (Register No.)
(1)	(2)	(3)	(3)	(4)	(4)	(5)	(6)	(7)
1	Aggregate Weigh Batcher							
2	Cement Weighing Equipment							
3	Water Meter							
4	Dimension Checking Gauges							
5	Pre-tensioning Jacks (500 KN capacity)							
6	Pre-tensioning Load Cell							
7	15 cm Concrete Cube Testing machine (2000 KN capacity)							
8	Sleeper Static Bend Test machine (500 KN capacity)							
9	Cement Mortar Cube Testing machine (500 KN capacity)							
10	Concrete Beam Testing Machine (100 KN capacity)							
11	Master Gauges for checking correctness of dimensions measuring gauges							
12	Proving Rings (2000 KN, 500 KN and 100 KN)							

NOTE: THE PROCEDURE OF CALIBRATION AND ACCEPTANCE CRITERIA IS DISPLAYED NEAR THE EQUIPMENT.

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Format -I

Date:

SPECIFIC SURFACE OF SPECIAL CEMENT**WITH THE HELP OF BLAINE'S AIR PERMEABILITY APPARATUS**

[IS: 4031 (Part-II) -1988]

Consignment of Cement = _____

Room Temperature = _____ °C

Weight of Sample taken = _____ gms.

Liquid falling time of standard cement (Ts) = _____ Seconds

Specific surface of the standard cement (Fs) = _____ cm²/gm

S. No.	Liquid falling time of sample cement	Average Time (T)	Remarks

$$\text{Specific Surface of sample Cement (Fm)} = F_s \times \sqrt{\frac{T}{T_s}} \text{ cm}^2/\text{gm}$$

$$= \text{_____ cm}^2/\text{gm}$$

∴ Specific Surface = _____ cm²/gm> 3700 cm²/ gm. OK / < 3700 cm²/ gm. NOT OK

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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Format -II**Date:****NORMAL CONSISTENCY OF****SPECIAL CEMENT FOR INITIAL AND FINAL SETTING TIME**

[IS: 4031(Part-IV) -1988]

Consignment of Cement : _____

Room Temperature : _____ °C

Weight of Sample taken = _____ gms

S. No.	% of Water added	Volume of Water added in ml.	Time of adding water	Reading Time	Needle reading in mm from bottom of the mould	Normal consistency % (Minimum)	Remarks
1.							Needle reading between 5 to 7 mm from bottom of the mould indicates Normal Consistency.
2.							
3.							
4.							

∴ Normal Consistency = _____ %

Quantity of water to be added for making paste of special cement for determination of initial and final setting time is 85 % of the normal consistency.

∴ Quantity of water to be added = 85 % of _____ ml = _____ ml.

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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Date:

Format -III**INITIAL AND FINAL SETTING OF SPECIAL CEMENT**

[IS: 4031 (Part-V) -1988]

Consignment of Cement = _____
 Room Temperature = _____ °C
 Weight of sample taken = _____ gms
 Normal consistency = _____ %
 Quantity of water added = _____ ml
 Time of adding water = _____ minutes
 Mould ready for needling at = _____

S. No.	Reading Time at	Reading of needle from bottom of the mould in mm	Spot of needle for final setting time	Remarks
1				Initial Setting Time is ----- minutes.
2				
3				
4				
5				> 60 minutes OK < 60 minutes NOT OK
6				
7				
8				
9				Final Setting Time is ----- minutes.
10				
11				
12				
13				> 600 minutes OK < 600 minutes NOT OK
14				
15				
16				
17				
18				
19				
20				

Initial Setting Time = _____ minutes :

Whether any modification is required for steaming curing cycle (Y/N).....

Final Setting Time = _____ minutes

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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Date:

Format -IV

**7 DAYS COMPRESSIVE STRENGTH OF
CEMENT MORTAR CUBES WITH STANDARD SAND**

[IS: 4031(Part - 6) -1988]

&

SOUNDNESS OF CEMENT [IS: 4031 (Part-3)-1988]

A: 7 Days Compressive Strength of Cement Mortar Cubes with Standard Cement

Consignment of Cement :

Room Temperature :°C

Normal Consistency (P) : % (See Normal Consistency test)

(i) Standard sand = 600 gms.

(3 parts, one part of each grade)

(ii) Cement 1 part = 200 gms.

Total = 800 gms.

∴ Water required for the preparation of mortar cubes in ml.

$$= \frac{(P + 3) \times \text{total weight of sample}}{4}$$

$$= \frac{(P + 3) \times 800}{4}$$

$$= \text{..... ml}$$

S. No.	Mortar cube casting		Mortar cube testing		Load In KN	Strength in N/mm ²	Minimum Strength in N/mm ²	Remarks
	Date	Time	Date	Time				
1								< 37.5 N/mm ² NOT OK > 37.5 N/mm ² OK.
2								
3								
4								

B: Soundness of cement

Expansion of Le Chatelier apparatus needles: ----- (not more than 5 mm)

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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FORMAT -V**MOISTURE ANALYSIS**

[IS: 383-1970]

Date**Shift**

S. No.	Description	Units	CA ₁	CA ₂	FA	Remarks
A.	Wt. of wet Sample	gms.				
B.	Wt. of dried Sample	gms				
C.	Wt. of Moisture Sample (A - B)	%				
D.	Moisture = C x 100/B	%				
E.	Absorption	%				
F.	Free Moisture = (D - E)	%				
G.	Batch wt. (Dry)	Kgs.				
H.	Free Moisture = G x F/100	Kgs.				
	Adjusted wt. = (G + H)	Kgs.				
	Wt. Adopted	Kgs.				

I. Water content as per approved mix design:

J. Adjusted water content after correction:

W/C Ratio =

A/C Ratio =

If aggregates are wet, absorption is to be deducted. Similarly if aggregates are dry, absorption is to be added.

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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COMBINED GRANULOMETRIC CURVE (M60)**FORMAT -VI****Date****Time****Next Due on**

	Wt. of CA ₁ (20 mm) = gms.				Wt. of CA ₂ (10 mm) = gms.				Wt. of FA (Sand) = gms.				Combined Passing			Co mbi ned Pas sing %	Grad ing Ran ge
Siev e Size	Wt. Retai ned gram s	Cum. Wt. Retaine d	% retain ed	% Pass ing	Wt. Retai ned	Cum. Wt. Retai ned	% retain ed	% Passi ng	Wt. Retai ned	Cum. Wt. Retai ned	% retain ed	% Passi ng	C A ₁ %	C A ₂ %	FA %		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
20 mm																	
10 mm																	
4.75 mm																	
2.36 mm																	
1.18 mm																	
600 μ																	
300 μ																	
150																	

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μ																	
75 μ																	

Signature of Railway Official
Name
Designation

Signature of Lab In-charge
Name
Designation

Countersigned by AEN/XEN/CSP
Name:
Designation

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FORMAT -VII**A: DETERMINATION OF FLAKINESS INDEX** [IS: 2386 (Part-I) -1970]**SAMPLE TAKEN : COARSE AGGREGATE**

Retained on I.S. sieve in (mm)	Weight of consisting at least 200 nos. (gm)	Gauge Width (mm)	Weight of aggregate in each fraction in passing through thickness gauge (gm)	Remarks
1	2	3	4	5
	W ₁ =		w ₁ =	
	W ₂ =		w ₂ =	
	W ₃ =		w ₃ =	
	Total W =		w =	

Flakiness Index = $w / W \times 100 =$ $\times 100 =$ %

As per IRS: T -39 if the above result of flakiness index is less than 30%, it is considered satisfactory.

B: DETERMINATION OF ELONGATION INDEX

Retained on I.S. sieve in (mm)	Weight of fraction consisting at least 200 nos. (gm)	Gauge length size (mm)	Weight of aggregate in each fraction retained on corresponding Gauge length (mm)	Remarks
1	2	3	4	5
	W ₁ =		w ₁ =	
	W ₂ =		w ₂ =	
	W ₃ =		w ₃ =	
	Total W =		w =	

Elongation Index = $w / W \times 100 =$ $\times 100 =$ %

As per IRS: T -39 if the above result of Elongation index is less than 30%, it is considered satisfactory.

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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FORMAT –VIII**A: DETERMINATION OF CRUSHING VALUE [IS: 2386 (Part-IV) -1970]**

Aggregate crushing value= (B/A) x100.....

Where, B= Weight of fraction passing appropriate sieve.....

A= Weight of surface dry sample, when carried out as per provision of para 2.4 IS:2386(Pt. IV).....

B: DETERMINATION OF IMPACT VALUE [IS: 2386 (Part-IV) -1970]

Aggregate crushing value= (B/A) x100.....

Where, B= Weight of fraction passing 2.36mm IS sieve.....

A= Weight of oven dry sample, when carried out as per provision of para: 4.4 IS:2386(Pt. IV).....

C: DETERMINATION OF ABRASION VALUE [IS: 2386 (Part-IV) -1970]

Aggregate crushing value= (B/A) x100.....

Where, B= Weight of fraction passing 1.7mm IS sieve.....

A= Weight of oven dry sample, when carried out as per provision of para: 5.2 of IS:2386(Pt. IV).....

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FORMAT - IX

PROFORMA FOR CALIBRATION OF MACHINES / EQUIPMENTS AT CONCRETE SLEEPER PLANT**Calibration – I****Calibration of Weigh batcher/Cement load Cell by Standard Dead Weight**

S. No.	Dead load (Kg)	Observed load			Average observed load	Error	% Variation	Remarks
		1	2	3				
1	50							
2	100							
3	150							
4	200							
5	250							
6	300							
7	350							
8	400							
9	450							
10	500							

FORMAT - X

Calibration – II**Calibration of Water meter**

S. No.	Actual water content (in litres)	Observed water content (in litres)			Average Observed water content (in litres)	Error	% Variation	Remarks
		1	2	3				
1	5							
2	10							
3	15							
4	20							
5	25							
6	30							
7	35							
8	40							
9	45							
10	50							

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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FORMAT – XI**Calibration – III to VIII**

**Calibration of Static Bend Testing Machine, Concrete Cube Testing Machine,
Tensioning Jacks and Cement Mortar Cube Testing Machine**

PROVING RING NO..... Date of Calibration Valid up to.....

Calibration of M/c Date & Time..... Next Due.....

Name of machine / equipment :									
S. N.	Proving Ring Deflection Reading	Actual load	Observed load			Average observed load	Error	% Variation	Remarks
			1	2	3				
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

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Format -XII**TENSION REGISTER**
Batch No. : _____ **Shift :** _____ **Date of Cast :** _____ **No. of Cast :** _____

S. No.	Bench No.	Length of Wire (Bench) mm	Total Cross Sectional Area of HTS Wire mm ²	Young's Modulus of the lot KN/ mm ²	Initial reading	Elongation in mm								Measured Elongation (B-A) (mm)	Prestraining force Based on Measured Elongation from 50KN	Total Prestress Force = (P+50)KN (Note Less then 486KN)	Remarks
						Reading at 2x25 KN (A} (mm)				Final reading 2x243KN (B) (mm)							
						Left Side		Right Side		Left Side		Right Side					
						U	L	U	L	U	L	U	L				
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

$*P=E[(B-A)*a]/L$	Where P(KN)=Prestressing forced (from 50KN to final Prestressing Value)
(B-A)(mm)=Measured Elongation	a(mm ²)= Total Cross Sectional Area of HTS Wire mm ²
L(mm)=Effective Wire Length (from wedge clear Length)	E(KN/mm ²)= Young's Modulus (Lot Wise / IC wise)
Note : Breakage or slippage of HTS wire, if any shall be recorded.	

Signature of Shift-incharge	Signature of Railway Inspector	Countersigned by AEN/XEN

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STEAM CURING REGISTER**Format -XIII**

Name of Plant: _____

Name of Boiler Attendant: _____

Batch No. _____

Shift : 1 _____

Date: _____

Shift : 2 _____

Shift : 3 _____

Shift: Day / Night

Chamber No.	1	2	3	4	5	6	7	8	9	10	11	12
No. of Bench												
Last Bench Cast at												
Cube No.												
Time	Temperat ure	Temperat ure	Temperat ure	Temperat ure	Temperat ure	Temperat ure	Temperat ure	Temperat ure	Temperatur e	Temperat ure	Temperat ure	Temperat ure
07.00												
07.30												
08.00												
08.30												
09.00												
09.30												
10.00												
10.30												
11.00												
11.30												
12.00												
12.30												

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

13.00												
13.30												
14.00												
14.30												
15.00												
15.30												
16.00												
16.30												
17.00												
17.30												
18.00												
18.30												
19.00												
19.30												
20.00												
20.30												
21.00												
21.30												
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22.30												
23.00												
23.30												
24.00												
00.30												
01.00												

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

01:30												
02:00												
02:30												
03:00												
03:30												
04:00												
04:30												
05:00												
05:30												
06:00												
06:30												

Signature of Lab In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

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PRODUCTION REGISTER

Format-XIV

On Date	
Monthly Production	
Cumulative	

Batch No. :	Date of Casting :				Shift :					
Steam Chamber No.										
Bench No.										
Time of L.B.C										

RELEASE CUBE STRENGTH (STEAM CURED)

Cube No.	Date of Testing	Time (in Hrs.)	Age (in Hrs.)	Weight (in Kgs)	Load (in KN)	N/mm ²	Remarks

WATER CUBE STRENGTH (WATER CURING)

Cube No.	Date of Testing	Time (in Hrs.)	Age (in days)	Weight (in Kgs)	Load (in KN)	N/mm ²	Remarks

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FLEXURAL STRENGTH

Beam No.	Date of Testing	Age (in days)	Load (in KN)	Strength (in N/mm ²)	Remarks

STATIC BENDING TEST

Sleeper No.	Date of Testing	CENTRE		MR		MF		Remarks	Initial
		Top	Bottom	I	II	I	II		
		(KN)	(KN)	(KN)	(KN)	(KN)	(KN)		

Cement Source		Week No.	
Cement MTC No.		Cement Test register S.N.	
HTS Source		IC Number & Heat No.	
SGCI insert		IC No./Heat No.	
HDPE Dowel		IC No./Batch No.	
Moisture Slip No.		Batching Slip No.	
Tensioning Reference		Steam Curing Reference	

Total Rejected		No. of Sleepers passed as usables	
REJECTION DETAILS OF SLEEPERS			
IC No.:		DATE OF ISSUE:	

Signature of QA In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
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Format -XV

DIMENSION REGISTER

Date of Casting : _____

No. of Cast : _____

Batch No. : _____

Offered for inspection : _____

Nos. of useable sleepers : _____

Date for inspection : _____

Sleeper No.	Outer Gauge	Rail Seat		Toe Gap				Surface defects	Height Gauge			Slope		Wind Gauge		FT C	Remarks
		Firm side	RT side	Firm side		RT side			End	Rail Seat	Centre	Firm side	RT side	Firm side	RT side		
				Outer	Inner	Outer	Inner										
1A																	
1B																	
1C																	
1D																	
2A																	
2B																	
2C																	
2D																	
3A																	
3B																	
3C																	

It should be ensured that the rejected (Red Marked) and MF tested (Yellow Marked) sleepers should not be dispatch.

Nos. of Rejected =

Nos. of Usable =

Nos. of MF tested =

Signature of QA In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

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DIMENSIONAL & WEIGHT CHECK LIST OF INSERT**Format –XVI**

Description: SGCI insert to RDSO/T-6901 & specification IRS/T-46 (1996)

SGCI Supplier:

RDSO Approval of supplier valid up to _____

Gauge Employed: Gauge and fixtures conforming to _____

Heat Number :

Pattern No:

IC number:

Total Number of supply:

S N	Heat No.	Pattern No.	Jig			Length of head	Thickness of stem	Hole dia	Width of head	Top radius	Gating position	Square gauge	Wt in Kg.
			G	G 1	G 2								
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													

No. of Inserts Checked _____. No. of Inserts passed _____.

No. of Inserts rejected _____. Rejection Rate :

Note:

1. Railway Inspector will check 1% inserts on random basis.
2. AEN/XEN will check at least 20 inserts, once in 2 weeks on random basis. He will also ensure that tests prescribed for Rly inspectors are being conducted.
3. Other Instructions contained in Board's letter no. 98/Tk-II/22/11/17/Pt. Policy, dtd.11.08.2003 are adhered to.

Signature of QA In-charge	Signature of Railway Inspector	Countersigned by AEN/XEN

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
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Format – XVII(STATISTICAL)

SLEEPERS FOR THE PERIOD: FROM _____ TO _____

i) NAME OF THE FIRM _____ LOCATION OF PLANT _____ RAILWAY _____

ii) TYPE OF SLEEPERS (MBC) TO DRG. NO RDSO/T-7008, RDSO/T-8228, RDSO/T-8224, RDSO/T-8225, RDSO/T-8229-8237.

A. CUBE STRENGTH:

Batch No. From _____ To _____	No. of Cubes	Range N/mm ²	Mean Value N/mm ²	Standard Deviation SD (N/mm ²)	Characteristic value (N/mm ²)	Coefficient of variation CV (%)	No. of observations below the minimum specified values 60 (N/mm ²)	No. of batches Double Testing	Remarks
		Max Min						More than double testing	

Steam cube

(Release
strength)

Water cube

(15 days
strength)**B. FLEXURAL STRENGTH OF CONCRETE BEAM:**

S. No.	Batch No.	Load (P) (KN)	Flexural strength (N/mm ²)
--------	-----------	---------------	--

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Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

C. STATIC BEND RESULTS UPTO CRACKING LOAD OF MBC, TURNOUT, OTHER SLEEPER. :

Description	Batch No.	No. of sleepers tested	Range (KN)	Mean value (KN)	Standard Deviation (KN)	Characteristic Strength (KN)	Coefficient of variation %	No. of observations below the min. specified values	No. of sleepers & No. of batches		Upto date No. of sleepers	
			Min	Max					Sleeper	Batch	Sleeper	Batch
Center												
top												
Rail												
Seat												
Bottom												

D. CONCRETE MIX DESIGN USED DURING THE PERIOD: FROM _____ To _____

(A) A/C Ratio _____ (B) W/C ratio _____ (C) Mix Proportion CA-I: ____ % CA-II ____ %, FA ____ %

E. SOURCE OF CEMENT USED DURING THE PERIOD:

F. MEASURES TAKEN TO IMPROVE UPON THE DEFICIENCIES OBSERVED IN ABOVE TEST:

Note: 1. Separate analysis shall be submitted for MBC..

2. The analysis should be for one calendar month.

3. Indicate change of source of raw materials, water etc, if any furnish a photocopy of their test report (s).

Asst. Inspecting Engineer
Signature, Date & Seal

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

FORMAT -XVIII

**YEARLY STATISTICAL ANALYSIS
OF CONCRETE STRENGTH AND STATIC BENDING STRENGTH OF PSC SLEEPERS**

SLEEPERS FOR THE PERIOD: FROM _____ TO _____

- a) Name of The Firm : _____
b) Location of Plant : _____
c) Railway : _____
d) Type of Sleepers (MBC, Turnout & Other) To Drg. No RDSO/T -7008 RDSO/T-8228, RDSO/T-8224, RDSO/T-8225, RDSO/T-8229-8237.

Month												
	Nos. of cubes	Max	Nos. of cubes	Max	Min	Mean	Min	Mean	Nos. of cubes	Max	Min	Mean
April												
May												
June												
July												
Aug												
Sep												
Oct												
Nov												
Dec												
Jan												
Feb												
Mar												

AIE/AXEN/CSP

XEN/CSP/TSO

Dy. CE/TS

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

Format -XIX

HTS Inspection Summary

Source:

BIS approval validity:

IC No.

Date of supply:

Quantity:

Heat Number:

Coil Number:

Tag Number:

S.N.	Description					
1	Lay length					
2	Weight/meter					
3	Breaking load					
4	% elongation					
5	0.2% proof stress					
6	Sulphur & phosphorus content					
7	Coil dia					
8	Packing condition					
9	Sealing of coils					
10	Any sign of rusting of HTS wires					
11	Young Modulus					
12	Cross Sectional Area					

Note:

- Item 1-5, 11 & 12 are to be recorded from the Tests Conducted at HTS factory and recorded in original IC.
- Item 6 is to be recorded from the Manufacturer's test certificate.
- Item 7-10 are to be tested at CSP.

Signature of Store-In-Charge	Signature of Railway Inspector	Countersigned by AEN/XEN

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

Annexure-A

Maintenance History card for Bench/Mould/End Plates

Bench Number/Mould Number/End Plate Number:

[illegible]

Signature of Production In-charge
Name

Signature of Foreman
Name

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

Annexure-B**Mould Checking Register****Date of Checking**

			MOULD NUMBER					
S.N.	Parameters	Requirement						
1	Full Length	2750 ± 3						
2	Outer Length - Insert to Insert	1921 + 1.5						
3	Between Rail Seat	162 + 1.5						
4	Centre of Mould to centre of Rail Seat	880.5 ± 0						
5	Centre of Rail Seat to Mould End	494.5 ± 0						
6	Centre of Mould to Side (Flat Surface)	150 mm ± 0						
7	End of Mould (either straight Position)	50 mm ± 0						
8	End Height	235 + 4.5 , -3						
9	Centre Height	180 +4.5 , -3						
10	Rail Seat Height	210.25 ± 0						
11	Slope gauge	.08 mm						
12	End Plate Height	40 mm						

Remarks

Signature of Production in-charge

Signature of Foreman/Supervisor

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

Bench Checking Register

Date of Checking

S. N.	Parameters	Requirement	Bench Number					
1	Length	11300 MM						
2	Width inside bench	500 MM						
3	Distance between fixed end of first channel	240MM						
4	Distance between first channel & second channel	2500 MM						
5	Distance between second channel & third channel	325 MM						
6	Distance between third channel & fourth channel	2500 MM						
7	Distance between fourth channel & fifth channel	325 MM						
8	Distance between fifth channel & six channel	2500 MM						
9	Distance between six channel & seven channel	325 MM						
10	Distance between seven channel & eight channel	2500 MM						
11	Distance between eight channel & nine channel	200 MM						
12	Distance between lifting hook	8000 MM						
13	Distance between liftng hook to fixed end	1650 MM						
14	Distance between liftng hook to free end	1650 MM						
15	Jack height (L)	170 MM						
16	Jack Height (R)	170 MM						
17	Jack Length (L)	285 MM						
18	Jack Length (R)	285 MM						
19	End Box Stand length (L)	900 MM						
20	End Box Stand length (R)	900 MM						

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

21	10mm thickness tie plate on channel	120 x 190 mm						
22	10 mm thickness tie	270x90x20 mm						
23	Distance between Jack & end box stand	60 MM						
24	Free End box hole position	As per gauge						
25	Fixed End box hole position	As per gauge						
26	Dab bolt and nut position	OK/NOT OK						
27	Visual inspection welding check	OK/NOT OK						
28	Visual inspection fresh material used/ not used	OK/NOT OK						
29	Main Channel (ISMC 300)	OK/NOT OK						
30	Bottom Channel (ICMS 100)	OK/NOT OK						
31	Rail below lifting hook	OK/NOT OK						
32	Height of Rail below lifting hook	75 mm						

Remarks

Signature of Production in-charge

Signature of foreman/Supervisor

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

END PLATE CHECKING REGISTER
DAYE OF CHECKING

<u>S.N</u>	<u>PARAMETERS</u>	<u>END PLATE NUMBER</u>							
1	Whether Size is ok (Y/N)								
2	Whether position of holes are correct (Y/N)								
3	Whether there is any Bending(Y/N)								
4	Whether elongated holes(Y/N)								

Remarks

Signature of Production in-charge
Name

Signature of foreman/supervisor
Name

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

Annexure-C
Cement Register

INCOMING MATERIAL							USED MATERIAL					
Date	Chalan No.	No. of Bags	Make	Week	MTC No.	Cumulative	Date	Make	Week	Consumption	Balance	Signature/Re marks

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

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ISO 9001-2008		Effective From

Annexure-D

Stock Register

[illegible]

Signature of General Manager

Signature of Storeman/Inventory In-charge

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

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Annexure-E

Detail of Initial & Final Tension to be given to each tendon

S N.	Drawing No.	Initial Tension	Final Tension
1	RT-2496	3 KN/each wire	27KN/each wire
2	RT-4148	3 KN/each wire	27KN/each wire
3	RT-4149	3 KN/each wire	27KN/each wire
4	RT-4088	3 KN/each wire	27KN/each wire
5	RT-4089-4097	3 KN/each wire	27KN/each wire
6	RT- 4170 to 4173	3 KN/each wire	27KN/each wire
7	RT- 4183 to 4186	3 KN/each wire	27KN/each wire
8	RT-7008	3 KN/each wire	29KN/each wire
9	RT-8224	3 KN/each wire	29KN/each wire
10	RT-8225	3 KN/each wire	29KN/each wire
11	RT-8228	3 KN/each wire	29KN/each wire
12	RT-8229 to 8237	3 KN/each wire	29KN/each wire

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

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Annexure-F

Batching proportion for concreting

Batch Number:

Date:

Shift:

[illegible]

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Quality Control In-Charge	Production In-charge	General Manager/Plant

Document No.	NAME OF FIRM	QAP for PSC Sleepers
ISO 9001-2008		Effective From

Annexure G**Vibration Speed Record**

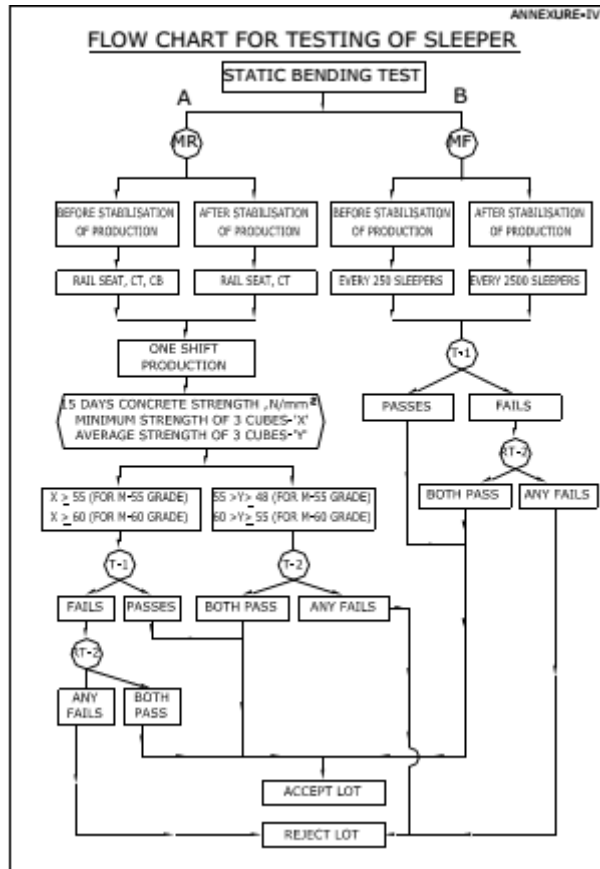
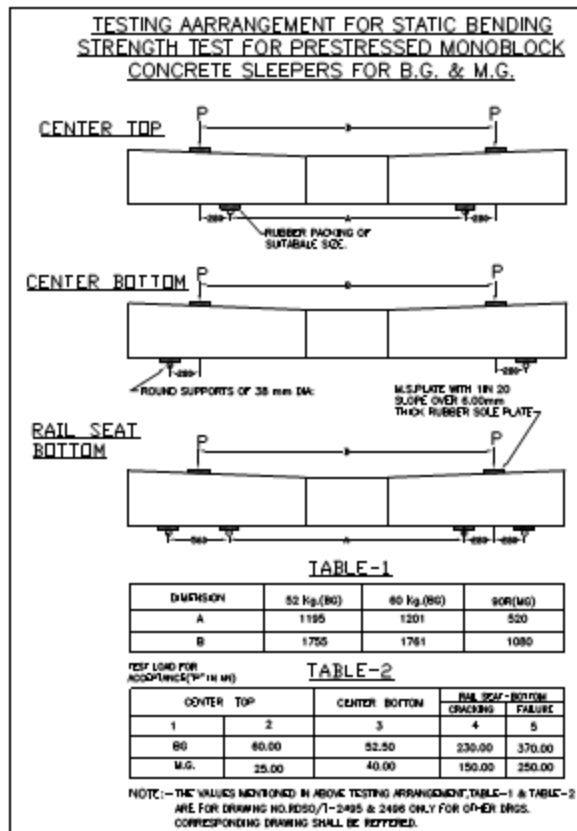
Batch Number : **Date:** **Shift:**

S.N.	Time	Bench No.	V-1 (RPM)	V-2 (RPM)	V-3 (RPM)	V-4 (RPM)	V-5 (RPM)	V-6 (RPM)	V-7 (RPM)	V-8 (RPM)

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant

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METHOD OF TESTING & FLOW CHART AS PER ANNEXURE III & IV of IRS T-39



NOTE:

1. All dimensions are in millimeters.
2. The load "P" will be applied at centre line of Rail Seat through pressure distributing M.S. Plate with 1 in 20 slope and size 130X25mm for 52kg rail and 145x25mm for 60kg rail, covering the full width of sleeper.
3. One rail seat bottom shall be tested at a time. It shall be ensured that the other end is not restrained in upward direction. The rate of loading is 30-40KN per minute.
4. Cracks shall not appear up to the load mentioned in column 2, 3 & 4 of table II when retained for one minute.
5. A coat of lime wash shall be applied on the sleeper surface before testing.

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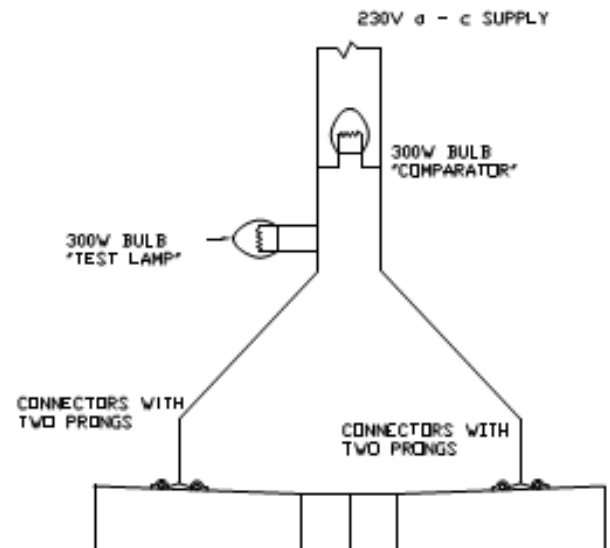
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PROCEDURE FOR CHECKING FITNESS OF CONCRETE SLEEPERS ON TRACK CIRCUITED STRENGTH (AT THE TIME OF INSPECTION IN THE CONCRETE SLEEPER MANUFACTURER'S PREMISES)

1. All the sleepers shall be tested.
2. The sleeper shall be checked for electrical resistance at 230 volts AC supply. The circuitry to be followed will be shown in sketch at Annexure-V (Contd.).
3. The 230 volts AC supply will be passed through a not less than 300 W test lamp in series with the pairs of inserts being tested. For the sake of comparison, another comparator bulb of the same wattage directly connected to the 230 volts AC supply will be fitted alongside.
4. Since the testing is being done at a higher voltage, removal of the rust layer by grinding shall not be necessary.
5. Resistance will be checked against 2 rail seats.
6. If the test lamp emits light dimmer than the comparator lamp in the sleeper, the sleeper shall be accepted and marked „FTC“ (Fit for Track circuit). If it emits light with the same brightness as the comparator lamp, the sleeper will be rejected and marked „NFTC“ (Not fit for track circuit). In case the test lamp does not emit light at all, it indicates that the circuitry is defective and should be rechecked.
7. In the event of doubts regarding comparison of brightness, such sleepers will not be marked. They will be retested with 1.5 V Avometer and marked for fitness, if found fit with 200 ohms resistance.
8. The „NFTC“ marked sleepers should be stacked separately. The FTC/NFTC marking shall be done on top of sleepers in middle portion, as shown on Drawing No.RDSO/T-2466.
9. As the testing is done at higher voltage, all precautions such as use of gloves in the hands, insulated boots and insulated chairs for operator and other necessary precautions shall be taken for the safety purpose.

ANNEXURE-V (CONTD.)

ELECTRICAL CIRCUIT FOR TESTING CONCRETE SLEEPER IN PLANT



NOTE:

1. THE CONNECTORS SHALL HAVE TWO PRONGS EACH SO THAT BOTH INSERTS AT A RAILSEAT ARE TESTED AT A TIME.
2. NECESSARY PRECAUTIONS FOR WORKERS SAFETY SHALL BE TAKEN.

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LIST OF IRS & BIS CODES REFERRED TO
(Up-to-date version of Codes/Specifications with latest amendments/correction slips shall be followed)

S.No.	IRS/BIS No. & Year	Description
1	IS: 12269 - 1987 with amendment No.6 of June 2000	Specification for 53-S grade cement for manufacture of concrete sleepers
2	IS: 1343 - 1980	Code of Practice for Pre-stressed Concrete
3	IS:383 - 1999	Specification for coarse and fine aggregates from natural sources for concrete (Second Revision)
4	IS:456 - 2000	Code of practice for plain and reinforced concrete (Fourth Revision)
5	IS:516 - 1959	Method of test for strength of concrete with amendment No.2
6	IS: 650 - 1991	Specification for standard sand for testing of cement (First Revision with amendment No.3)
7	IS:1785 - 1983 Pt.I	Specification for plain hard drawn steel wire for prestressed concrete Part.I Cold drawn stress relieved wire (Second Revision with amendment No.1)
8	IS: 2386 - 1963 Pt. I – VIII	Methods of tests for aggregate for concrete
9	IS: 2430 - 1996	Methods for sampling of aggregate for concrete
10	IS:2514 - 1963	Specification for concrete vibrating table
11	IS:3536 - 1999	Methods of sampling hydraulic cements (First Revision)
12	IS:4031 - 1999 Pt.I-XVI	Methods of physical tests for hydraulic cement
13	Part II - 1999	Determination of fineness by specific surface by blaine air permeability method (First Revision)
14	Part III - 1988	Determination of soundness (First Revision)
15	Part IV - 1988	Determination of consistency of standard cement paste (First Revision)
16	Part V - 1988	Determination of initial and final setting times (First Revision)
17	Part VI - 1988	Determination of compressive strength of hydraulic cement (other than masonry cement) (First Revision)
18	Part XIV - 1989	Determination of false set
19	IS:4032 - 1985	Methods of chemical analysis of hydraulic cement (First Revision)
20	IS:6006 - 1983	Specification for uncoated stress relieved strand for pre-stressed concrete (First Revision) with amendment No.2
21	IS:9103 - 1999	Specification for Admixtures for concrete
22	IS: 10262 - 2009	Concrete Mix Proportioning - Guidelines
23	IRS: T-46 1996	Specification for Spheroidal Graphite Cast Iron inserts
24	STR	Schedule of Technical Requirement as applicable from time to time.

Prepared By	Checked By	Approved By
Quality Control In-Charge	Production In-charge	General Manager/Plant