SCHEDULE OF TECHNICAL REQUIREMENT (~~2022~~) (2023) FOR MANUFACTURE OF PSC SLEEPER

DETAILED INFORMATION

1.0 Name of Sleeper Plant:

a) Location :
b) Railway :
c) Nearby Railway Station :
d) Nearby Main Station :
e) Distance from Main & Nearby Station :
f) Telephone / Fax No.
g) Address :
   i) Office:
   ii) Factory :
h) Details of Production :
   i) Main Line Sleepers
   ii) 1 in 8½, Turnout Sleepers
   iii) 1 in 12, Turnout Sleepers
   iv) Wider Sleeper
i) Whether Plant is approved for manufacturing any other type of sleeper:

2.0 Method of manufacture (Long line, Stress bench etc.):

3.0 Contract details:

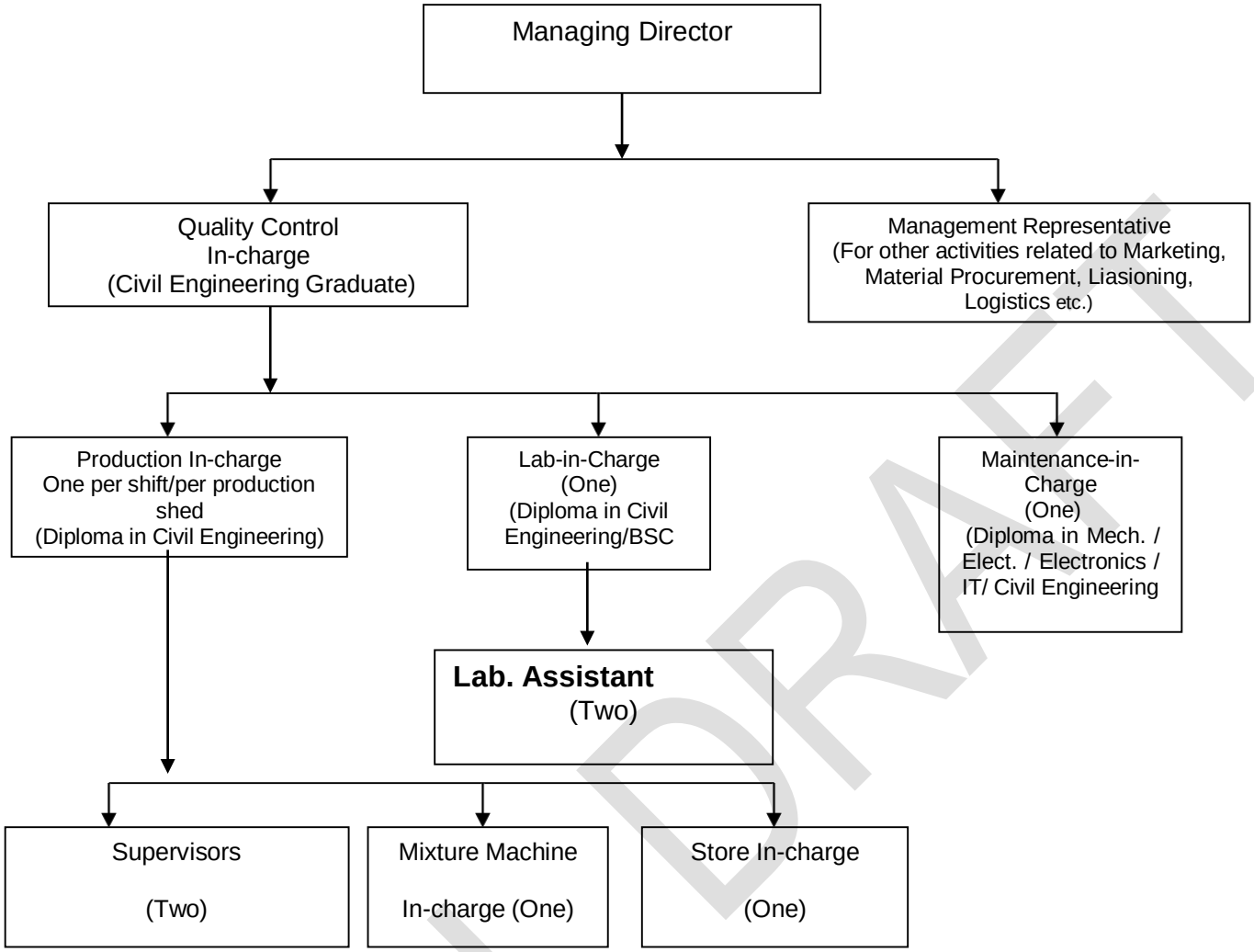
S.No.	C. A. No.	Railway	Type of sleepers	Quantity	Delivery date

4.0 QUALITY ASSURANCE PLAN & ISO CERTIFICATION:

S No	Item	Remarks
4.0.1	QAP Approved by RDSO (Yes / No)	
4.0.2	Date of approval of QAP by RDSO	
4.0.3	Remarks about implementation of QAP	
4.0.4	Whether Plant is having ISO: 9001-2015 (Yes / No)	
4.0.5	ISO Certifying agency & Date of validity of ISO certificate	
4.0.6	Whether Internal Quality Audit of plant is done by the firm at a frequency of at least once a year.	

5.0 ORGANISATION STRUCTURE:

Typical organization structure chart of a Concrete Sleeper Plant is as given below -



5.1 Minimum Level of Technical Supervision:

1. Overall Quality Control In-charge: At least One Graduate Engineer with Civil Engineering degree.
2. Shift In-charge for Production:
   (a) Minimum one supervisors with diploma in civil engineering for each shift per each casting shed.
   (b) Minimum one diploma engineer of mechanical/ electrical / electronic / IT /civil for maintenance of equipments.
3. Quality Control Supervisor for Laboratory and testing: Minimum one supervisor with Diploma in Civil Engg./ BSc .
4. Supervisors & Mixture Machine In-charge should be suitably qualified and their competency shall be certified by the overall Quality Control In-charge of the plant.

5.2 DETAILS FOR LEVEL OF SUPERVISION:

SNo.	Item	Name	Qualification	Experience
5.2.1	Nos. of Engineers			
5.2.2	Nos. of Technical Supervisors			
5.2.3	Name of separate Quality Control Supervisor for Laboratory			
5.2.4	Reason for any deficiency in manpower and planning of compliance.			

6.0 LAYOUT PLAN:

S No.	Item	Remarks
6.0.1	Owner Ship of land/ Lease Agreement with Railway.	
6.0.2	Notarized copy of agreement	
6.0.3	Remarks about deficiency , if any	
6.0.4	Whether Layout plan is fully with in land owned by plant and there is no unauthorized construction on railway property.	
6.0.5	Whether Layout plan is approved if yes then details of approving authority & reference	

6.1 **LAYOUT REQUIREMENT:**

S.No.	Item	Minimum Requirement	Existing	Remarks
6.1.1	Cement Godown	Min. covered godown area = 400 sq.m. (Storage as per IS:4082- 1996)		
6.1.2	HTS Storage	Minimum area of covered godown with EOT for handling of HTS wire coils= 100 Sqm.		
6.1.3	Insert Godown	Minimum Area of covered godown = 100 sqm.		
6.1.4	Steam curing chambers	Minimum no. of chamber = (0.65*N/32) rounded off to next whole number, where 'N' is the proposed daily production capacity. Chambers shall be vertical type with continuous digital temperature recording facility connected with storage of data with servo control automatic steam control arrangement. CSPs having present arrangement of Horizontal steam chamber may continue with existing arrangement.		
6.1.5	Submerged water curing tanks	Minimum Submerged water curing capacity required (In no of sleeper) = (0.65 to 0.75)*N Where, 'N' is monthly production capacity. Capacity of one tank should be maximum 3 days production. Tank should have minimum 30 cm free board.		
6.1.6	Stacking Area for finished sleeper	Minimum 2 month capacity. Maximum layers of sleepers in one stack should be 25. Minimum area=0.08*N sqm. Where N is monthly production capacity.		
6.1.7	Laboratory	**General :** Approximately 40 sqm **Sleeper testing area:** Approx. 30 sqm. The laboratory and sleeper testing area should be illuminated should have 100% power backup. The laboratory shall be provided with adequate air conditioners for temperature and humidity control.		
6.1.8	Inspecting Officials office	Minimum 14 sqm. Fully furnished with adequate communication facilities (Fax, Telephone, Computer with net connectivity etc)		
6.1.9	Rest House	Minimum two room sets fully furnished with attached toilet and other amenities including cooking facility. Min. area 25 sqm.		
6.1.10	Platform for turnout sleepers	At least two platforms of 70mx6m with gantry arrangement for handling for inspection of two sets at a time.		

7.0 Minimum requirement of Plant and Machinery for Concrete Sleeper Plant: Production Line

S. No.	Particulars	Qty.
7.1	**General**	
7.1.1	Concrete mixer along with Automatic Batching Plant using Microprocessor based Weigh Batcher, Pneumatically operated Aggregate Bins, Water meter and automatic Cement feeding, Capacity of Concrete 5m^3/hr. It should be capable of keeping digital record of ingredients used batch wise & data storage capability for one year production and should be capable of providing output in hard copy also.	1 no.
7.1.2	Standard weights of 50 Kg or highest permissible denomination totaling 50kg & Small denominations capable of measurement to the least count of 1 kg for calibration of weigh batcher	1000 Kg
7.1.3	Water measuring cans or automatic water meter for calibration of water meter	1,2,5,10&20 liters
7.1.4	Concrete sleeper Mould should be made with plate thickness 6/8mm 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. *Minimum for a monthly production capacity of 5000 nos assuming one shiftper day (For higher production capacity no of mould required for daily production plus 20 % for maintenance purpose.)	240 nos.*
7.1.5	Laser based continuous profile measurement system for checking critical dimensions of PSC sleeper	As per production requirement
7.1.6	Steam Boiler, Coal /oil fired/electrically operated capacity of 1000 kg/hr, complete with Valves, mountings and Chimney. The key parameters of boiler such as steam pressure should be displayed. The boiler & its operators certification from statutory authority should be ensured.	1 no.
7.1.7	Double Acting Hydraulic Jacks 1000KN Capacity	4 nos.
7.1.8	Concrete Bucket for carrying and pouring concrete in moulds by bottom controlled discharge on Monorail Hoist, Movement should be motorized and operator controlled.	1 no.
7.1.9	High Frequency 9000 RPM (+/-4%) Vibrator arrangement bottom fixing type. For PSC line sleepers and Turnout sleepers, vibrators of min 2.0KW 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. Fixing arrangement of Vibrator to the bottom of moulds should be effective enough to transfer the vibrations.	16 nos.
7.1.10	Tachometer 10000 RPM capacity	2nos
7.1.11	High Frequency Converter for Vibrators	2 nos.

7.1.12	Vibrating Table for Cubes 15X 15 X 15, table 1mX 1m	1 no.
7.1.13	Electric Welding Arc Cutting M/c for HTS cutting at de-molding/ Abrasive disc cutter.	2 nos.
7.1.14	Trolley for transportation of Finished Sleeper	10 nos.
7.1.15	Overhead Wire Rope Hoist 2 T capacity, Electrically driven, traveling on I BeamSection, One each for demoulding and curing tank	2 nos.
7.1.16	Overhead Wire Rope Hoist for Steam Curing Chambers 3 T capacity, traveling on IBeam Section (Excluding the structure)	2 nos.
7.1.17	MS Gantry Crane electrically driven with Overhead Wire Rope Hoist 4/5 T capacity for Loading of sleepers and for putting sleepers in water curing tanks.	2 nos.
7.1.18	Diesel Generating Set for 125KVA	1 no.
7.1.19	Workshop Equipments • Lathe Machine • Tower Drilling Machine • AG-7 Angle Grinder • Electric Welding Set • Gas cutting Set • Misc. tools and dies • Misc. measuring tapes, scales	At least oneeach.
7.2	**For Production by Stress Bench Method**	
7.2.1	Steel Stress Benches made of channel and with Jack Anchoring Pockets, for holding 4 sleeper moulds. Design of stress bench should be such so as to have minimum distortion on account of service stresses. *For a monthly production capacity of 5000 nos BG Line sleepers assuming one shift per day however it may be increased in the multiples of the required production capacity.	60 nos.*
7.2.2	Hydraulically operated Pre-Stress Equipment with motorized unit, for 500KN jacks along with Pressure Gauges / pressure transducer with digital display and auto cut arrangement. The data should be displayed on monitor and should be stored for future analysis of past six months data.	2 Sets
7.2.3	Roller and Roller Stand	As per requirement
7.2.4	Trolleys for Transportation of stress benches	6 nos.
7.2.5	Steam curing chamber of adequate size and capacity to hold not more than eight benches containing four moulds each. Provision should be made for perforated pipes of adequate dia., in the steam chamber, for uniform distribution of steam along with provision of thermocouple at ~~both~~ the inlet end of pipe in the steam chamber. The steam curing should be with servo controlled valve with steam regulation with auto cut off arrangement following the steam curing cycle. The thermometers should be provided at both ends of steam chamber with digital display. The data of time v/s temperature in each chamber should be digitally displayed and stored and system should have sufficient memory to store at least on year's data with facility to take out print shift wise.	

7.2.6	Pneumatic/Hydraulically operated tensioning gun with upto 2 KN load capacity or similar mechanized arrangement, for initial pulling of individual HTS strands so as to ensure uniform pulling of HTS strands.	02 nos.
7.2.7	~~Rubber lining~~ fixture for Insert pocket with rubber lining for ~~proper fixing of~~ holding the insert in fixed position in the mould and for easy demoulding & prevention of slurry leakage.	As per nos. of moulds
7.3	**For Production by long line method**	
7.3.1	End support embedded in ground with device permitting transfer of pre stress	As per design
7.3.2	Tensioning gun with digital pressure gauge, automatic cut off device and automatic elongation & force recording arrangement along with digital display and logging of data on computer with data storage & retrieval for at least six month.	02 nos
7.3.3	Casting bed with moulds. No of moulds should be 10 % more than required for daily production capacity.	As per design
7.3.4	Tarpaulin hoods for covering casting beds for steam curing. With proper drainage arrangement.	For each casting line
7.3.5	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 temperature covering complete casting line should be digitally displayed and stored. The system should have sufficient memory to store at least on year's data with facility to take out print shift wise.	For each casting line

8.0 Laboratory Equipments:

S. No	Equipment	Quantity
8.0.1	Compression Testing Machine, 2000KN capacity, motorized with 2 nos. of pressure gauges (2000KN & 500KN) 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 no.
8.0.2	Flexural Beam (Tension) Testing Machine with loading Jacks, 30 KN capacity. The machine should be capable of digital display and recording of data during testing with auto logging off time & date of testing. Data storage & retrieval capability should be for one year production.	1 no.
8.0.3	Motorized pumping unit with 1000KN capacity jacks, 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 shall be recorded in computer with automatic date and time record with Batch no. and other details for traceability of record.	1 no.
8.0.4	15 cm cubes moulds confirming to IS:516	50 nos.
8.0.5	Beam moulds 10 x 10 x 50 cm size	2nos.
8.0.6	Slump Tester/Vee Bee Testing Machine	1 no.
8.0.7	Compaction Factor test Apparatus	1 no.
8.0.8	Electronic balance with 1gm least count (10 / 20 Kg. capacity) including weights.	1 no.

8.0.9	Blain's air permeability apparatus	1 no.
8.0.10	Vicat apparatus with dash pot and various needles	1 no.
8.0.11	Stop watch	1 no.
8.0.12	Le Chatelier mould for soundness test of cement	1 no.
8.0.13	Steel trowels for mixing cement paste	2nos.
8.0.14	Cement mortar cube casting machine with motor and time switch complete	1no.
8.0.15	7.06 cm (50 cm^2)mortar cube moulds	2nos.
8.0.16	Metallic scoop, pan type container and china tray etc	2 sets
8.0.17	Aggregate Impact testing machine	1no.
8.0.18	Aggregate crushing testing machine	1no.
8.0.19	Aggregate Abrasion testing machine	1no.
8.0.20	Electric thermostatic oven with display of temperature	1no.
8.0.21	Set of IS Sieves 40 mm and below up to 75 micron	1no.
8.0.22	Automatic electric sieve shaker	1no.
8.0.23	Proving rings of 2000 KN,1000 KN, 500 KN, and 100 KN capacity	1 each
8.0.24	1.5 Volt AVO meter	1no.
8.0.25	Glass cylinders and Beakers 50 - 500 cc capacity	1 set
8.0.26	Miscellaneous measuring gadgets like steel tape, Vernier, filler gauge etc.	2 sets
8.0.27	Inspection gauges for dimension checking of sleepers with digital display of parameters as approved by RDSO. (Optional)	2 sets
8.0.28	Master gauges for checking inspection gauges	1 set
8.0.29	Magnifying glass	1no.
8.0.30	Level table steel for checking gauges	1no.
8.0.31	pH meter & TDS meter (Digital)	1no.
8.0.32	Elongation and Flakiness Index Gauges	1 each

9.0 Requirement of IP based CCTV camera and sensors

9.1 IP based CCTV camera monitoring system for remote monitoring of sleeper production in CSPs of Zonal Railways. The live feed from these cameras installed at various critical locations (as given in the table below) shall be provided to concerned Zonal Railways and RDSO.

9.2 Installation of Sensors to automatically measure and record various parameters of design mix such as w/c ratio, moisture content of aggregates etc. production process such as stressing, vibration, curing, etc. and testing parameters such as cube strength, SBT test etc. and to automatically transmit these parameters to Zonal headquarter continuously.

9.3 Minimum requirement of IP based CCT camera and sensors

S. No.	ITEM	Minimum Requirement		REMARKS
		CAMERA	SENSORS	
A	**STORAGE OF RAW MATERIALS**			
1	Cement Godown	2	-	-
2	HTS Storage Area	1	-	Only 1 camera can be provided if HTS storage & Insert storage area are at same location and can be covered by one camera properly.
3	Insert Storage Area	1	-	
4	Coarse Aggregate Storage Area	1	-	Only 1 camera can be provided if CA & FA storage area are at same location and can be covered by one camera properly.
5	Fine Aggregate Storage Area	1	-	
6	Admixture Storage Area	1	-	
B	**CONCRETE PRODUCTION**			Sensor based mechanism system should be provided to remotely record and report weight of every ingredient of concrete in each batch of concrete.
1	Batching Plant Operator	1	-	-
2	Coarse Aggregate CA-1	1	1	Only 1 camera can be provided if CA & FA storage bins can be covered by one camera properly. One Sensor each for testing moisture content in each storage bin.
3	Coarse Aggregate CA-2	1	1	
4	Fine Aggregate (FA)	1	1	
5	Mixing of Concrete and output	1	-	-
C	**SLEEPER PRODUCTION**			
1	Production line for concreting	4	1	It should adequately cover the Sleeper casting, Mould preparation and HTS wire threading activities. One sensor for bench counting
2	Extension of HTS wires	1	1	One sensor for measuring extension of HTS wires
3	Application of Load for stressing of HTS Strands	1	-	-
4	Compaction of concrete / Vibration		1	One sensor per vibrator to measure RPM of vibrator and time of vibration.
5	Casting of concrete cubes / vibrating table	1	1	-
D	**CURING**			
1	Steam Curing Chamber	2	1	Minimum 2 cameras for covering entire steam curing area. One Sensor per Chamber to be provided. Temperature of steam curing and steam characteristics to be measured and to be captured in the overall system being used at the centralized

				location.
2	Water Curing	4	-	Minimum 4 cameras for covering entire water curing area.
3	De-tensioning and de-moulding area	2	-	Only 1 camera can be provided if both operations are at same location and can be covered by one camera properly.
E	**TESTING LABORATORY**			
1	Concrete Cube Testing	1	1	Only 1 camera can be provided if Concrete Cube Testing and Beam Testing are done at same location and can be covered by one camera properly.
2	Beam Testing	1	1	
3	Static Bending Test	1	1	-
4	Testing of various ingredients of concrete viz. Fine Aggregate, Coarse Aggregate, Cement Water, Admixture etc.	1	-	Should cover entire lab activities.
F	**TURNOUT ASSEMBLY AREA**	2	-	-
				-
G	**STACKING AREA**	4	-	-
				-
H	**OTHERS**	2	-	Entrance/Exit etc.
Note: The IP based CCTV cameras should be of high resolution and sensors should be of high sensitivity.				

CERTIFICATE

1. This is to certify that the information submitted in Paras 1 to 9 above is correct.

2. Testing of raw material shall be carried out as per relevant specifications, the details of raw material used is as given in as Annexure-I.

3. Record shall be maintained as per periodicity mentioned in annexure-II and on formats mentioned therein.

SIGNATURE OF PROPRIETOR

NAME & SEAL

Annexure-I

1.0 Raw material details & Source of raw materials

S No.	Items	Remarks
1.0.1	Cement (Brand name)	
	Location of cement plant	
1.0.2	HTS wire (BIS approved source)	
	Validity of BIS approval	
1.0.3	6 mm MS Bar (confirming to IS: 2265)	
1.0.4	Quarry name for CA1	
	Distance of quarry from the plant	
1.0.5	Quarry name for CA2	
	Distance of quarry from the plant	
1.0.6	Source name of Fine aggregate	
	Distance of source from the plant	
1.0.7	SGCI Inserts Source	
1.0.8	HDPE Dowel Source	
1.0.9	Water source	
	Quality and quantity	
1.0.10	Details of Admixture being used	

2.0 Characteristics of raw materials:

2.1 **Coarse Aggregate** (as per test report submitted at the time of approval of mix design)

S No.	Item	Coarse aggregates, CA1	Coarse aggregates, CA2
2.1.1	Specific gravity		
2.1.2	Impact Value		
2.1.3	Abrasion Value		
2.1.4	Crushing Value		
2.1.5	Combined Flakiness & Elongation Index		
2.1.6	Water absorption		

2.2 **Fine Aggregate** (as per test report submitted at the time of approval of mix design)

S No.	Item	Fine aggregate river sand	Fine aggregate crushed stone
2.2.1	Specific gravity		
2.2.2	Silt content		
2.2.3	Deleterious materials		
2.2.4	Zone		
2.2.5	Water absorption		

2.3 High Tensile Steel

S No.	Item	Remarks
2.3.1	Conforming to IS: 6006 specification	
2.3.2	Type (Plain, Strand): Nominal diameter	
2.3.3	Breaking Load & Elongation	
2.3.4	0.2% Proof Stress	
2.3.5	Young Modulus	

2.4 Water

S No.	Item	Remarks
2.4.1	Testing agency (Copy to be enclosed)	
2.4.2	pH value =	
2.4.2	Chloride content (mg/lit) =	
2.4.2	Sulphate content (mg/lit) =	
2.4.2	Inorganic Solids (mg/lit) =	
2.4.2	Organic Solids (mg/lit) =	
2.4.2	Suspended Solids (mg/lit) =	

2.5 SGCI Inserts

S No.	Items	Remarks
2.5.1	Name of Suppliers	
2.5.2	Cross check Heat nos. with IC issued by purchaser / Inspection authority	
2.5.3	BHN value =	
2.5.4	Phosphorous content (%) =	
2.5.5	Condition of storage in general	

2.6 6 mm M S Bar

S No.	Item	Remarks
2.6.1	Conforming to IS: 226	
2.6.2	Nominal diameter	
2.6.3	Breaking Load & Elongation	
2.6.4	Yielding stress	

2.7 Admixture

S No.	Items	Remarks
2.7.1	Conforming to IS:	
2.7.2	Properties	

Annexure-II

MAINTENANCE OF RECORDS AND DOCUMENTATION :

Following records shall be maintained for scrutiny at future dates.

1.0 Inventory of Raw materials:

1.1 Aggregates:

a) Coarse Aggregate (CA_1) 20 to 10 mm
b) Coarse Aggregate (CA_2) 10 mm and down.
c) Fine Aggregate (River Sand & Crushed Stone sand)

Details of Receipt, Source, Date of receipt, Truck Nos., Quantity, Balance, Remarks about quality and signature.

1.2 H.T.S. (IS: 6006) :

Date of Receipt, Truck No., Nos. of Coils, Serial No. of each coil, Source (Name of the firm), Details of test certificate, quantity, shift-wise consumption, balance and remarks whether test certificate is OK. Each lot shall bear a lot number and it should be mentioned in the production register to correlate, which HTS used in which sleeper.

1.3 Special Cement (IS 269):

Date of receipt, Source, quantity, Shift-wise consumption, balance, whether Test Certificate received, Details of Lab Tests done at site, Consistency, Initial & Final setting time, Fineness and 7 days mortar cube strength. Each lot shall bear a lot number and it should be mentioned in the production register to correlate which cement used in which sleeper.

1.4 Inserts (IRS: T- 46) :

Date of Receipt, Truck No., Quantity, Source (Name of manufacturer), Consumption, Balance etc shall be recorded. Each lot shall bear a lot number and it should be mentioned in the production register to correlate which insert used in which sleeper.

1.5 Admixture (IS 9103):

Date of receipt, Source & conformance to IS codes, quantity, Shift-wise consumption, balance, whether Test Certificate received shall be recorded. Each lot shall bear a lot number and it should be mentioned in the production register to correlate with production of PSC sleepers.

2.0 Production Records:

2.1 Production Register: Batch Nos., Nos. Cast in each shift, cumulative production, Bench Nos., Cubes and sleeper testing details, Summary of Rejected and Usable sleepers shall be recorded in the printed register Daily production register shall be maintained for each design of sleepers separately (As per format no. XIV).

2.2 Tension Register: (As per format no. XII).

2.3 Steam Curing Records: (As per format no. XIII).

3.0 Testing Records:

a) Sieve analysis with combined granulometric analysis of aggregates. (As per format no. VI).
b) Combined Flakiness and Elongation indices test. (As per format no. VII).
c) Moisture content and modified (adjusted) quantities. (As per format no. V).
d) Records of Moulds and Benches and repairs.

e) Details of Pressure Gauges, Proving Rings and calibration of Pressure gauges.
f) Steam curing and Release cube testing.
g) Dimensional checking. (As per format no. XV).
h) Proforma for individual batch production records.
i) Proforma for monthly progress Report.
j) Standard deviation and characteristic strength of
   ii) Release cubes.
   iii) 15 days water cured cubes.
   iv) Sleeper cracking loads / Rail Seat bottom and center top.
k) Dispatch Register.

4.0 Statistical Analysis & Report to RDSO:

Statistical analysis along with calculations shall be submitted to RDSO every month in Format-XVII. The statistical analysis should be carried out for following parameters –

i) Release cube strength
ii) 15 days water cured cube strength
iii) Flexural Beam strength
iv) SBT results

Similar analysis shall be carried out for each month and a consolidated report shall be submitted for a given financial year.

5.0 Calibration records:

The record shall be maintained as per Format-IX, X & XI for calibration of weigh batcher, Water meter, SBT machine, Concrete cube test machine, cement mortar cube testing machine, Beam testing machine and tensioning jacks. The schedule is given in Para 6.0 below.

6.0 CALIBRATION SCHEDULE:

Calibration of all the pressure gauges shall be done in the plant itself. Calibration of proving ring should be got done from a Govt. approved test house or a National Test House. The frequencies of all the pressure gauges and equipments are as follows:-

S. N.	Equipment	Frequency (For Normal PSC sleeper)	Frequency (For Turnout sleeper)
1	15 cm concrete cube testing machine (2000 KNCapacity)	As per Annexure-I of IRS/T-39	As per Annexure-I of IRS/T-39
2	Cement mortar cube testing machine (500 KNCapacity)		
3	Sleeper static Bend Test machine sleepers (1000 KN Capacity)		
4	Pre tensioning Jacks (500 KN capacity for single mould bench) & (1000 KN Capacity for twin mould bench)		
5	Pre- tensioning Jacks (1000 KN Capacity)		
6	Pre- tensioning Load cell		
7	Concrete beam testing machine (100 KN Capacity)		
8	Aggregate weigh batcher		
9	Cement Weighing Equipment		
10	Water Meter		
11	Admixture Dispenser		
12	Master gauges for checking correctness of dimensions measuring gauges.		
13	Dimension checking gauges.		
14	Proving Rings (All the Four-2000 KN, 1000 KN,500 KN, 100 KN)		
15	Weights & measures		
16	Tachometer		

Note :-

1) The items referred at S. Nos. 1 to 7 above should be calibrated by proving ring the sleeper plant itself.
2) The items referred at S. Nos. 8 & 9 should be calibrated by the dead weights and item at S. No. ~~9~~ 10 by measuring cans that should be available in the plant.
3) The proving ring should be calibrated from a reputed organization like the IITs, NCCBM or NPL etc.
4) The record of calibration of the all the above equipments should be maintained in a manner that previous record can be easily connected.
5) The calibration can be done more frequently at the discretion of the inspecting Official.

This is to certify that the information given as above is correct and If the information is found to be false then the firm will accept the action taken by Railway.

SIGNATURE OF PROPRIETER

NAME

SEAL

Annexure III

FORMATS

This section contains different formats of recording results of various testing /measurements prescribed. The firm should have sufficient no of serially numbered Registers printed for each format at all times. The formats should only be filled up by the minimum authority mentioned in QAP. The relevant pages of registers pertaining to production of sleepers being inspected must be scrutinized and signed by Railway official responsible for inspecting the sleepers. In addition to following formats Registers required as per contract condition including Site order register, Officer's Inspection Register and Over Sight Inspection compliance Register should be promptly filled up and presented to Railway Officials during inspection.

Format -I

SPECIFIC SURFACE OF SPECIAL CEMENT

WITH THE HELP OF BLAINE'S AIR PERMEABILITY APPARATUS

[IS: 4031 (Part-II) -1999]

Date:

Consignment of Cement = _____

Room Temperature =_____ ^{0}C

Weight of Sample taken =_____ gms.

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

Specific surface of the standard cement (Fs) =_____ cm^2 /gm

S. No.	Liquid falling time of sample cement	Average Time (T)	Remarks
1.			
2.			
3.			

Specific Surface of sample Cement (Fm) = Fs x $\sqrt{\frac{T}{Ts}}$ cm^2 / gm

=_____ cm^2/gm

∴ Specific Surface =_____ cm^2/gm

> 3700 cm^2 / gm. OK / < 3700 cm^2 / gm. NOT OK

Signature of Railway Inspector
Name
Designation

Signature of Lab In charge
Name

Countersigned by AEN/XEN/CSP
Name
Designation

Format -II

NORMAL CONSISTENCY OF
SPECIAL CEMENT FOR INITIAL AND FINAL SETTING TIME

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

Date:

Consignment of Cement : _____

Room Temperature :_____ºC

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 Railway Inspector
Name
Designation

Signature of Lab In charge
Name

Countersigned by AEN/XEN/CSP
Name
Designation

Format -III

INITIAL AND FINAL SETTING OF SPECIAL CEMENT

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

Date:

Consignment of Cement **=** _____

Room Temperature **=**_____ ^{o}C

i. 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
2.				
3.				is_____minutes.
4.				
5.				> 60 minutes OK
6.				
7.				< 60 minutes NOT OK
8.				

9.				
10				Final Setting Time
11				
12				is_____minutes.
13				
14				< 600 minutes OK
15				
16				> 600 minutes NOT OK
17				
18				
19				
20				

Initial Setting Time =_____minutes

Final Setting Time =_____minutes

Signature of Railway Inspector
Name
Designation

Signature of Lab In charge
Name

Countersigned by AEN/XEN/CSP
Name
Designation

Format -IV

7 DAYS COMPRESSIVE STRENGTH OF

CEMENT MORTAR CUBES WITH STANDARD SAND

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

&

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

Date:

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

Consignment of Cement: _____

Room Temperature :_____ºC

ii.
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.

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

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

=_____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								
2								< 37.5 N/mm^2 NOT OK
3								> 37.5 N/mm^2 OK.
4								

B: Soundness of cement

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

Signature of Railway Inspector
Name
Designation

Signature of Lab In charge
Name

Countersigned by AEN/XEN/CSP
Name
Designation

FORMAT -V

MOISTURE ANALYSIS [IS: 383-2016]

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.				

W/C Ratio =

A/C Ratio =

If aggregates are wet, moisture content in coarse and fine aggregate is to be accounted for, so as to have total water as per approved mix design.

Signature of Railway Inspector
Name
Designation

Signature of Lab In charge
Name

Countersigned by AEN/XEN/CSP
Name
Designation

FORMAT -VI

COMBINED GRANULOMETRIC CURVE (M55/M60) [IS: 383-2016]

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			Combined Passing %	Grading Range
Sieve Size	Wt. Retained grams	Cum. Wt. Retained	Cum. % retained	% Passing	Wt. Retained	Cum. Wt. Retained	Cum. % retained	% Passing	Wt. Retained	Cum. Wt. Retained	Cum. % retained	% Passing	CA_1 %	CA_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 µ																	

Signature of Railway Inspector **Name** **Designation**	**Signature of Lab In charge** **Name**
Countersigned by AEN/XEN/CSP **Name** **Designation**	

Format –VII

A. COMBINED FLAKINESS AND ELONGATION INDEX OF 20 MM AGGREGATE (IS: 383, 2016, CL:5.3) & (IS:2386, PART-1)

IS SIEVE		FLAKINESS INDEX		ELONGATION INDEX	
Passing through 20 Sieve(mm)	Retained on IS Sieve(mm)	Wt. of sample taken (At least 200 pieces) (A)	Weight of passed material on thickness gauge (B)	Wt. Retained material on Thickness gauge (C)=A-B	Wt. of Retained material on gauge (D)
20	16				
16	12.5				
12.5	10				
TOTAL					
Combined Flakiness and Elongation Index=[{B/A}+{D/C}]x100 %					
Combined Flakiness and Elongation Index					<40% (ok)

B. **COMBINED FLAKINESS AND ELONGATION INDEX OF 10 MM AGGREGATE (IS: 383, 2016, CL:5.3) & (IS:2386, PART-1)**

IS SIEVE		FLAKINESS INDEX		ELONGATION INDEX	
Passing through 20 Sieve(mm)	Retained on IS Sieve(mm)	Wt. of sample taken (At least 200 pieces) (A)	Weight of passed material on thickness gauge (B)	Wt. Retained material on Thickness gauge (C)=A-B	Wt. Retained material on gauge (D)
12.5	10				
10	6.3				
TOTAL					
Combined Flakiness and Elongation Index=[{B/A}+{D/C}]x100 %					
Combined Flakiness and Elongation Index					<40% (ok)

As per IRS-T-39 the above result of combined flakiness and elongation Index is less than 40 %.

Signature of Railway Inspector
Name
Designation

Signature of Lab In charge
Name

Countersigned by
AEN/XEN/CSPName
Designation

Format –VIII

A: DETERMINATION OF CRUSHING VALUE [IS :2386 (Part –IV) – 1963]

Aggregate crushing value = (B/A) x 100

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)

Note: 1. For aggregates passing through 20mm sieve, 3.35mm sieve size for separating finer to be used.

2. For aggregates passing through 10mm sieve, 1.70mm sieve size for separating finer to be used.

B: DETERMINATION OF IMPACT VALUE [IS: 2386 (Part-IV) -1963]

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) -1963]

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)

Signature of Railway Inspector
Name
Designation

Signature of Lab In charge
Name

Signature by AEN/XEN/CSP
Name
Designation

FORMAT - IX

PROFORMA FOR CALIBRATION OF MACHINES / EQUIPMENTS AT CONCRETE SLEEPER PLANT [IS: 516]

Calibration – I

Calibration of Weigh batcher by Standard Dead Weight

Date Time Next due on

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							

Signature of Railway Inspector
Name
Designation

Signature of Quality control In charge
Name

Signature of AEN/XEN/CSP
Name
Designation

FORMAT - X

Calibration – II

Calibration of Water meter

Date Time Next Due on

S. No.	Actual water content (in liters)	Observed water content (in liters)			Average Observed water content (in liters)	Error	% Variation	Remarks
		1	2	3				
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Signature of Railway Inspector
Name
Designation

Signature of Quality control In charge
Name

Signature of AEN/XEN/CSP
Name
Designation

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. No.	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 Railway Inspector
Name
Designation

Signature of Quality control In charge
Name

Signature of AEN/XEN/CSP
Name
Designation

TENSION REGISTER ***Format –XII (A)***

[IS: 6006 - 2014]
For Stress Bench method

Batch No. : Shift: Date of Cast: No. of Cast:

S. No.	Bench No.	Length of Wire (Bench) mm	Total cross section al area of HTS wire mm2	Young's Modulus of the Lot KN/ mm2	Initial Reading (KN)	Elongation in mm								Measured Elongation (B-A) (mm)	Pre-stressing force based on measured elongation from 50KN *P=E{(B-A)*a}/L	Total prestress force= (P+50)KN (Not less than486KN)	Remarks
						Reading at 2x25 KN (A) (mm)				Final reading at 2 x 243 KN (B) (mm)							
						Left Side		Right Side		Left Side		Right Side					
						U	L	U	L	U	L	U	L				

*P=E{(B-A)*a}/L,
where P(KN), = pre stressing force (from 50KN to final pre stressing value),
(B-A)(mm),=measured elongation
a(mm2), = total cross sectional area of HTW wires
L (mm) = effective wire length (from wedge to wedge clear length),
E(KN/mm2)= Young's modulus (lot wise/IC wise)

Note: 1. Breakage or slippage of HTS wire, if any shall be recorded.
2. Values of 'A' & 'B' shall be based on the respective sleeper drawings

Signature of Railway Inspector
Name
Designation

Signature of Shift Production In charge
Name

Counter signed by AEN/XEN/CSP
Name
Designation

TENSION REGISTER ***Format –XII (B)***

[IS: 6006 - 2014]
For Long Line Method

No. of Cast: Batch No. : Batch: Shift: Date of Cast:

Line no.	HTS wire no.	Length of Wire (Bed) mm	Cross sectional area of HTS wire mm2	Young's Modulus of the Lot KN/ mm2	Initial Reading (KN)	Elongation in mm		Measured Elongation (mm) (B-A)	Pre-stressing force based on measured elongation *P=E{(B-A)*a}/L	Total prestress force= (P+3)KN (Not less than27KN)	Remarks
						Reading at 3 KN (A) (mm)	Final reading at 27 KN (B) (cm)				

*P=E{(B-A)*a}/L, where, P= pre stressing force(KN), (B-A)=measured elongation (mm),
a= total cross sectional area of HTW wires(mm2),
L= effective wire length for entire length of bed(from wedge to wedge clear length)(Meter.)
E= Young's modulus (lot wise/IC wise)

Note: **1. Breakage or slippage of HTS wire, if any shall be recorded.**
2. Values of 'A' & 'B' shall be based on the respective sleeper drawings

Signature of Railway Inspector
Name
Designation

Signature of Shift Production In charge
Name

Counter signed by AEN/XEN/CSP
Name
Designation

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	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature	Temperature
07.00												
07.30												
08.00												
08.30												
09.00												
09.30												
10.00												

10.30												
11.00												
11.30												
12.00												
12.30												
13.00												
13.30												
14.00												
14.30												
15.00												
15.30												
16.00												
16.30												

Signature of Railway Inspector
Name
Designation

Signature of Shift Production In charge
Name

Counter signed by AEN/XEN/CSP
Name
Designation

Format-XIV

PRODUCTION REGISTER

On Date	
Monthly Production	
Cumulative	

Batch No. : **Date of Casting :** **Shift :**

Steam Chamber No.	{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	{10}
Bench No.										
Time of L.B.C										

RELEASE CUBE STRENGTH (STEAM CURED) to be tested by Lab in charge and Railway Supervisor.

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

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 IC NO week no

HTS Source IC NO Heat No/s

SGCI Insert Source IC NO Heat No

HDPE Dowel Source IC NO Batch no

REJECTION DETAILS OF SLEEPERS I.C. No. : DATE OF ISSUE :

Total Rejected

No of sleepers passed as usables

Signature of Railway Inspector
Name
Designation

Signature of Shift Production In charge
Name

Signature of AEN/XEN/CSP
Name
Designation

Signature of Quality Control In charge
Designation

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		FTC	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																	

Nos. of Rejected =_____, Nos. of Usable =_____, Nos. of MF tested =_____

Note: 1. It should be ensured that the rejected (Red Marked) and MF tested (Yellow Marked) sleepers should not be dispatched.

2. AEN/XEN to do Dimension check as and when possible.

Signature of Railway Inspector
Name
Designation

Signature of Shift Production In charge
Name

Signature of AEN/XEN/CSP
NameDesignation

Signature of Quality Control In charge
Designation

Format -XVI

SGCI Insert : DIMENSIONAL & WEIGHT CHECK LIST

Description: SGCI insert to RDSO/T-381 Alt.9 (or latest alteration) & specification IRS/T-46 (latest version)

SGCI Supplier:_____

Gauge Employed: Gauge and fixtures conforming to RDSO/T-454 Alt.9

IC no. and date (As issued by Purchaser/Inspecting authority)

S. No.	Heat No.	Pattern No.	Jig			Length of head 75±1	Thickness of stem 20/25+2/-1	Hole dia 22+1/-0	Width of head 67+1/-0.5	Top radius	Gating position	Square gauge	Wt in Kg. 1.55-3%	Soundness through hammer test
			G	G1	G2									

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 to be adhered to.

Signature of Railway Inspector
Name
Designation

Signature of Quality Control In charge
Designation

Signature of AEN/XEN/CSP
Name
Designation

Format –XVI A

SGCI Insert : DIMENSIONAL & WEIGHT CHECK LIST

Description: SGCI insert to RDSO/T-6901 Alt.5 (or latest alteration) & specification IRS/T-46 (1996) (latest version)

SGCI Supplier:_____

Gauge Employed: Gauge and fixtures conforming to RDSO/T-6943 Alt.3 IC no. and date (As issued by purchaser/Inspecting authority)

S. No.	Heat No.	Pattern No.	Jig			Length of head 76 +1/-0.5	Thickness of stem 25/35 +2/-1	Hole dia 23+0.5/-0	Width of head 71+1/-0.5	Top radius	Gating position	Square gauge	Wt in Kg. 1.484-3%	Soundness through hammer test
			G	G1	G2									

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 to be adhered to.

Signature of Railway Inspector
Name
Designation

Signature of Quality Control In charge
Designation

Signature of AEN/XEN/CSP
Name
Designation

Format -XVII

STATISTICAL ANALYSIS OF CONCRETE STRENGTH AND STATIC BENDING STRENGTH TEST ON PSC SLEEPERS

SLEEPERS FOR THE PERIOD: FROM_____TO _____

i) NAME OF THE FIRM_____ LOCATION OF PLANT _____ RAILWAY_____

ii) TYPE OF SLEEPERS (MBC, TURNOUT & OTHER) TO DRG. NO RDSO/T – 2496 OR Drg. No. _____

ii. Mix design approved by RDSO Vide letter----------

iii. Compliance of last Over site inspection pending if any----------

iv. Last inspection of Railway official on----------

A. CUBE STRENGTH :

Batch No. From _____ To_____	No. of Cube s	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 i.e. 55/ 60 (N/mm^2)	No. of batches		Remarks
		Max	Min						Double Testing	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)

Format – XVII Contd..

C. STATIC BENDING STRENGTH TEST 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		Up to 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, Turnout and other sleepers.

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)

Signature of Railway Inspector
Name
Designation

Signature of Quality Control In charge
Designation

Signature of AEN/XEN/CSP
Name
Designation

Counter Signature of Dy.CE/CSP/HQ
Name

Format -XVIII

YEARLY STATISTICAL ANALYSIS
OF
CONCRETE STRENGTH AND STATIC BENDING STRENGTH TEST 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 -2496 or Drg. No. _____

Month	Concrete Strength Water cured					SBT(Rail Seat)				MF			
	Nos. of cubes	Max	Min	CS	CV	Max	Min	CS	CV	Max	Min	CS	CV
April													
May													
June													
July													
Aug													
Sep													
Oct													
Nov													
Dec													
Jan													
Feb													
Mar													

Signature of Railway Inspector
Name
Designation

Signature of Quality Control In charge
Designation

Signature of AEN/XEN/CSP
Name
Designation

Counter Signature of Dy.CE/CSP/HQ
Name

Format -XIX

HTS Inspection Summary

Source: **BIS approval validity:**

IC No. **Date of supply:**

Sl. No.	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	

Note

1. Item 1-5 are to be recorded from the Tests conducted at HTS factory and recorded in Original IC.
2. Item 6 is to be recorded from the Manufacturer's test certificate.
3. Item 7-10 are to be tested at CSP.

Signature of Railway Inspector
Name
Designation

Signature of Quality Control In charge
Designation

Signature of AEN/XEN/CSP
Name
Designation

Format -XX

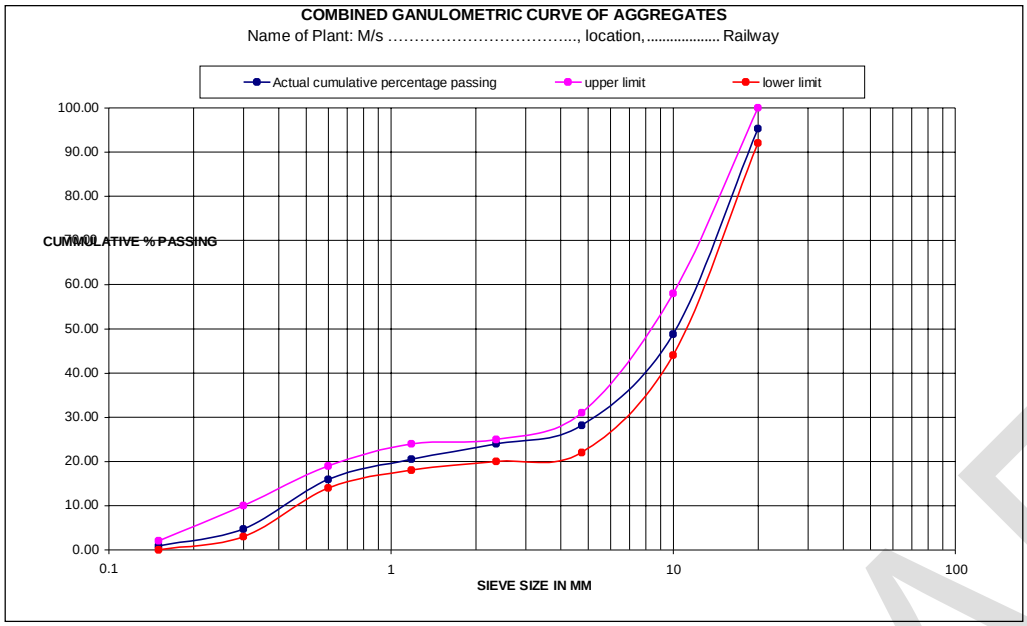
Details of Mix Design

	Mix Design parameters :		
1	Mix Design ⟶	M-55	M-60
	RDSO Authority of approval		
	Date of approval		
	Cement	Kg	Kg
	Coarse aggregates, CA_1	Kg	Kg
	Coarse aggregates, CA_2	Kg	Kg
	Fine aggregates	Kg	Kg
	Admixture	kg	kg
	Water	Liters	Liters
	A/C Ratio		
	W/C Ratio		
	Sand : CA_1 : CA_2 ratio		

11.0 Granulometric limits for combined aggregates:

To be prepared for each Design mix separately as below:

Sieve Size	%Limits (lower – higher)	Limits % passing.
20 mm	…. - …..	…..
10 mm	…. - …..	…..
4.75 mm	…. - …..	…..
2.36 mm	…. - …..	…..
1.18 mm	…. - …..	…..
0.60 mm	…. - …..	…..
0.30 mm	…. - …..	…..
0.15 mm	…. - …..	…..



12.0 Steam Curing Cycle: The steam curing cycle for winter season and summer seasons, if varies may be given separately.

The following cycle is approved as follows:

1.	Pre steaming	=	…. hrs. [> IST of cement]
2.	Rise in temperature	=	…. hrs.
3.	Constant Temp.	=	…. hrs.
4.	Cooling time	=	…. hrs.
			- - - - - -
	Total	=	….. hrs.

13.0 Submerged water curing: …. days.

14 / 21 days compressive strength on the basis of 40 nos. of submerged water cubes & 40 nos. of steam cured cube analysis is found …… N/mm^2 and ……. N/mm^2 respectively.

14.0 Statistical Analysis of Steam cured and water cured cubes: following details shall be submitted -

S. No.	R	M	SD	CS	CV	Remarks
1	Steam cured cubes					
2	Submerged water cured cubes					

Statistical analysis is done to assess the variation in test results. This analysis contains standard deviation, range of maximum & minimum, coefficient of variation (CV). By knowing the standard deviation, one can obtain characteristic value of corresponding item. Statistical analysis brings out overall health of the concrete sleeper plants. If the testing for working out statistical analysis is not done correctly the basic purpose of doing this whole exercise would be defeated.

Formulae are given below to calculate the mean value, standard deviation & coefficient of variation.

SAMPLE CALCULATION OF STATISTICAL ANALYSIS

S. No.	Compressive Strength (x) in N/mm^2	Frequency (f)		F*x	ABS(X- X_{mean})	f * ABS(x-x_{mean})^2	Remarks
1	52.00	1	I	52.00	5.82	33.87	
2	53.33	2	II	106.66	4.49	40.32	1) Nos. of observations,
3	55.56	2	II	111.12	2.26	10.22	N = 40 nos.
4	56.00	3	III	168.00	1.82	9.94	
5	56.89	2	II	113.78	0.93	1.73	2) Mean, X_{mean} = f*x / N
6	57.33	5	IIIII	286.65	0.49	1.20	= 2312.91 / 40
7	57.78	6	IIIIII	346.68	0.04	0.00	= 57.82 N/mm^2
8	58.22	2	II	116.44	0.40	0.32	3) Standard Deviation
9	58.67	6	IIIIII	352.02	0.85	4.34	SD = SQRT{f * ABS(x-x_{mean})^2 /N}
10	59.56	4	IIII	238.24	1.74	12.11	=1.9598
11	60.00	4	IIII	140.00	2.18	19.00	
12	60.44	3	III	181.32	2.62	20.59	4) Characteristic Strength, CS
13							F_{ck} = (X_{mean} – 1.96 * SD)
14							5) Coefficient of Variation,
15							Cv = (SD x 100) / X_{mean}
16							
17							6) Range = 8.44 N/mm^2
18							(from 52.00 to 60.44)
19							
20							
21							

22							
23							
24							
25							
..							
..							
	Total	40		2312.91		153.64	

Signature of Railway
InspectorName
Designation

Signature of Quality Control In charge
Designation

Signature of AEN/XEN/CSP
Name
Designation