



Bharat Heavy Electricals Limited

(A Government of India Undertaking)

Power Sector – Eastern Region

Plot No. 9/1, Block-DJ, Salt Lake City,
Kolkata – 700 091 (INDIA)

Phone no. 033 - 2321 1691

Fax : 033 - 2321 1960

Web : www.jantermanter.com / www.bhel.com

TENDER CHANGE NOTE 01 (TCN – 01) DT:04-05-2007

WITH REFERENCE TO THE NIT, PUBLISHED IN THE WEB SITES FOR PROVIDING FIELD QUALITY ASSURANCE SERVICES FOR CIVIL, STRUCTURAL, TG, BOILER & PIPING, ELECTRICAL AND C&I WORKS AND SAFETY SERVICES FOR 1X250 MW UNIT # 3 AT BUDGE-BUDGE PROJECT, CESC, WEST BENGAL., FOLLOWING CHANGES MAY PLEASE BE NOTED AND COMPLIED WHILE SUBMITTING THE OFFER FOR THE SUBJECT JOB.

REF: TENDER DOCUMENT NO - PSER:SCT:BDG-Q742:07

01. Clarification on pre-bid discussion.
02. Sample quality plan

BIDDERS TO NOTE THAT TCN-01 WILL FORM PART OF TERMS & CONDITION OF TENDER DOCUMENT.

ALL OTHER TERMS & CONDITIONS OF THE TENDER REMAIN UNCHANGED.

BIDDERS ARE REQUESTED TO SUBMIT OFFER BY DUE DATE.

SR MANAGER (SCT)

CLARIFICATIONS OF PRE-BID DISCUSSION ON 26/04/2007 AT PSER ,HQ, KOLKATA FOR PROVIDING FIELD QUALITY ASSURANCE SERVICES FOR CIVIL, STRUCTURAL, TG, BOILER & PIPING, ELECTRICAL AND C&I WORKS AND SAFETY SERVICES FOR CESC – BUDGE BUDGE PROJECT (1x 250 MW) – EXTENSION UNIT – 3.

(TENDER NO - PSER:SCT:BDG-Q742:07)

Page 1 of 1

SI no	Description/ tender clause no	Tender clause	Bidder's queries	Clarifications by BHEL
A. NIT & VOL-I				
A.1	NIT, Annexure –II Sl. No. 8.0 & 9.3	Proposed deployment plan for subject job	Description remains same. Please clarify.	SI No. 8 shall be read as:- “Proposed deployment plan of T & Ps for subject job “ SI No. 9.3 of shall be read as:- “Proposed deployment plan of manpower for subject job”
A.2	VOL-I, Annexure-H, Sl. No. 14	Valid Income Tax clearance certificate	Under GOI Notification , this is not required	AGREED
A.3	Sample Field quality plan			Attached with this TCN
B. VOL-II				
B.1	CLAUSE 3.0 CATEGORY : “f”	•Qualified Safety Officer -26 Man-months	Does it imply that an extra man is to be deployed for one month only?	shall be read as: •Qualified Safety Officer-25 Man-months
B.2	CLAUSE 19.0 CATEGORY : “f”	In case Contractor deploys the manpower beyond the period specified in the Contract, BHEL will have no obligation to accept the crane and reserves the right	The word “crane” may be a typographical error —	In case Contractor deploys the manpower beyond the period specified in the Contract, BHEL will have no obligation to accept the same and reserves the right
B3	CLAUSE 7.0 Gr.-a,b,c,d,e	Max age in any case should not be more than 35 years.	—	Shall be read as: Max age in any case should not be more than 40 years.
B4	Clause No. 5.9, 5.9(a), 5.9(b), 13.4	For witnessing of testing outside the project site, in Kolkata or else where.....	Visit to Kolkata needs review.	Provision for making additional payment towards witnessing the testing in Kolkata is not applicable for this contract and is withdrawn. As such, Clause No. 5.9, 5.9(a), 5.9(b), 13.4 and other sections of the tender should be read accordingly.
C. VOL-III				
C1	VOL-III, Rate Schedule, GROUP f: (SAFETY) QTY Column	26	Does it imply that an extra man is to be deployed for one month only?	Shall be read as 25 instead of 26

QUALITY PLAN FOR INSTALLATION

**POWER HOUSE STRUCTURAL STEEL WORKS
(ERECTION)**

**MEJIA TPS EXTN. (UNIT 5 & 6)
2 x 250 MW**



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR EASTERN REGION**

**DOC. NO. QPE-CL-04-52
REV. NO. R00**

QUALITY PLAN FOR INSTALLATION

POWER HOUSE STRUCTURAL STEEL WORKS (ERECTION)

MEJIA TPS EXTN. (UNITS 5 & 6) (2 x 250 MW)

PREPARED BY	SR MANAGER/QLY, PSER	APPROVED BY	HEAD / QLY, PSER
DOCUMENT NO.	QPE - CL - 04-52		
ORIGINAL DATE OF ISSUE	20.08.2004		
REVISION NO. & DATE	R00 / 20.08.2004		
COPY NO.			
ISSUED TO			
DATE OF ISSUE			
CONTROLLED / INFORMATION COPY			
ISSUED BY (SIGNATURE & DESIGNATION)			



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR EASTERN REGION



PSER

CONTENTS

DOC. NO. : QPE-CL-04-52

REV. NO. : R00

SHEET 1 / 1 SHEETS

<u>S.NO.</u>	<u>DESCRIPTION</u>	<u>NO. OF SHEETS</u>
1.	STATUS OF AMENDMENTS	1
2.	AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK	1
3.	STATEMENT OF CHECKS FOR ERECTION	14
	i) Raw Materials	
	ii) Marking and Cutting	
	iii) Forming	
	iv) Fit up	
	v) Pre-heating	
	vi) Welding	
	vii) Non destructive Testing	
	viii) Clearing and Painting	
	ix) Foundation Checks	
	x) Roof truss Pre-assembly & Erection	
	xi) Welding & NDE	
4.	Annexure (I & II)	4
5.	Table A1 to A6	8
6.	WPS	2
7.	Documents referred in Quality Plan	1
8.	LOGSHEET L-00 TO L-12	16



PSER

STATUS OF AMENDMENTS

DOC. NO. : QPE-CL-04-52

REV. NO. : R00

SHEET 1 / 1 SHEETS

SL. NO.	REFERENCE OF SHEETS AMENDED	AMENDMENT NO. & DATE	REMARKS
---------	-----------------------------	----------------------	---------

-NIL -



PSER

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

Classification of checks

Symbol	Description	Inspection agency	Clearing agency
A	Critical	Customer & BHEL	Customer & BHEL
B	Major	Customer & BHEL	Customer & BHEL
C	Minor	Customer & BHEL	Task performer & Customer

Legend :

Customer
QAE

DVC
Quality Assurance Engineer

Note :

1. Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
2. QAE is also authorised to carry out surveillance in any of the "B" and "C" category of checks at his discretion.
3. In case of non-conformity, before accepting , BHEL shall ensure dispositioning and the same shall be reflected in Logsheets/protocols.



PSER

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

BHEL'S INTERNAL REFERENCE

Classification of checks

Symbol	Description	Inspection agency	Clearing agency
A	Critical	Task performer & surveillance by QAE (if available)	HOS
B	Major	Task performer	HOS
C	Minor	Task performer	Task performer

Legend : HOS Head of Section
 QAE Quality Assurance Engineer

Note :

4. Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
5. QAE is also authorised to carry out surveillance in any of the "B" and "C" category of checks at his discretion.
6. In case of non-conformity, before accepting , clearing agency shall ensure dispositioning and the same shall be reflected in Logsheets/protocols.



PSER

STATEMENT OF CHECKS

DOC. NO. : QPE-CL-04-52

REV. NO. : R00

SHEET 1 / 14 SHEETS

Capacity / Type : 2 x 250 MW

System : Power House Structural Steel Works

Sub-system : -----

Area : Erection

NOTES :

1. For checks where logsheets are not called for, suitable records should be maintained in the form of logsheets / protocols.
2. As an evidence of having carried out the work satisfactorily, a general purpose logsheet, L-00 shall be maintained for all the checks.
3. Drawing / Contract requirements shall apply over and above the checks given.
4. Abbreviations used in the column 'Type of check' are:

R : Record verification

M: Measurement

V : Visual

P : Physical

T : Test



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 2 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
1.0	RAW MATERIALS							
1.1	Ensure that the raw materials (including Stainless steel) is as per the specification	T/R		B	Test / Test certificates, Drawing, IS2062, 8500, 808, 3502	100%		
1.2	Ensure that the raw material is free from defects like cracks, seams, laps, lamination and pitting NOTE: 1. UT on all plates >25mm thickness In the absence of correlation with TCs test shall be carried out on the materials as per specification.	V R/T		B A	 ASTM-A435	100% 100%		
2.0	MARKING AND CUTTING							
2.1	Ensure that the marking are done as per the requirement	V / M	Steel Tape	B	Drawing & Annexure-II	100%		
2.2	Check that the marking are done by punching at convenient intervals	V	Steel Tape	B	Annexure-II	100%		
2.3	Ensure that the raw materials are cut by using suitable method	V		B	Annexure-II	100%		
2.4	Ensure that the cut edges are properly cleared/dressed before taking up fabrication	V		B	Drawing	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 3 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
2.5	Check that the raw materials after cutting are identified with part number.	V		B	Drawing	100%		
3.0	FORMING (If applicable)							
3.1	Ensure that forming is done using proper tooling free from damages.	V		C	Drawing	100%		
4.0	FIT UP:							
4.1	Ensure proper fit up before welding	M	Measuring Tape	B	Drawing	100%	Protocol	
4.2	Check that the gap is minimum for all fillet welds (max. gap 2 mm)	M	Measuring Tape	B	Drawing	100%	Protocol	
4.3	Ensure that the butt weld joints are properly aligned and the offset is not to exceed 10% of the thickness of the thinner part of the joint. Maximum permitted value is 3.2 mm.	M	Measuring Tape	B	Drawing	100%	Protocol	
4.4	Ensure match markings are punched for all trial assembled components.	M	Measuring Tape	B	Drawing	100%	Protocol	



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 4 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
5.0	PREHEATING:							
5.1	Ensure pre heating is carried out wherever applicable. (using appropriate method)	V	Thermal chalk	B	Annexure-II	100%	Protocol	
5.2	Ensure that the preheating temperature is uniform prior to start of welding as well as during the welding.	V	Thermal chalk	B	Annexure-II	100%	Site Log	
6.0	WELDING:							
6.1	Ensure that the qualified welders and qualified welding procedures are used for all welding.	T/R		A	Welding Manual, WPS, IS817 & ASME SEC. IX	100%	Site Log	
6.2	Ensure that the welding consumables are as per WPS.	R		A	Welding Manual, WPS, IS817 & ASME SEC. IX	100%	Site Log	
6.3	Ensure proper edge preparation wherever required.	V	Bevel protractor	B	Drawing	100%	Site Log	
6.4	Ensure proper sequence of welding.	V		B	WPS	100%		
6.5	Check that the temporary attachment welded are removed and ground & painted	V		B		100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 5 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
6.6	Check and ensure that the overlap/excess weld metal is removed by grinding and painted.	V		B		100%		
6.7	Check the measurement of parts after welding for the correctness of dimension & matching.	M	Measuring Tape	B	Drawing	100%	Protocol	
7.0	NON DESTRUCTIVE TESTING:							
7.1	Carry out RT/UT/LPI as applicable	T	Testing equipment	A	Drawing , Annexure-I & NDE Manual	As per Annexure-I	protocol	
8.0	CLEANING AND PAINTING:							
8.1	Ensure that the surface are cleaned and painted as specified	V		B	Specification	100%		
8.2	Ensure that the following markings are done							
	a)Assemblies designation	V		C	Drawing	100%		
	b)Part Number	V		C	Drawing	100%		
	c)Any other important identifications	V		C	Drawing	100%		
8.3	Ensure Dry Film Thickness of paint is as per specification Note : All tolerances during fabrication should be as per Annexure-II	M		B	Specification	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 6 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
9.0	FOUNDATION CHECKS:							
9.1	Ensure availability of permanent Bench Mark.	V		B		100%		
9.2	Check the foundations are cast as per requirement and with proper positioning of foundation bolts/ inserts as per drg.	M	Measuring Tape	B	Drawing	100%	L-01	
9.3	Check the orientation of the foundation.	V		C	Drawing	100%		
9.4	Check the top level of foundation pedestals with respect to permanent benchmark.	M	Dumpy Level	B	Drawing & Annexure-I	100%	L-02	
9.5	Check the centre to centre distance of column foundation pedestals with respect to the reference axis.	M	Measuring Tape/ Theodolite	B	Drawing & Annexure-I	100%	L-03	
9.6	Check the diagonals between column foundation pedestals.	M	Measuring Tape	B	Drawing & Annexure-I	100%	L-04	
9.7	Check the pitch distance of foundation bolts on both axis and diagonals.	M	Measuring Tape	B	Drawing & Annexure-I	100%	L-05	
10.0	COLUMN PRE-ASSEMBLY CHECKS:							
10.1	Ensure cleaning of Base plate and HSFG bolt area	V		C		100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS

SUB-SYSTEM : STRUCTURE

AREA : ERECTION

SHEET 7 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
10.2	Check individual column pieces for identification. Match mark column No., length, camber, sweep & condition of the column joints.	M	Measuring Tape	A	Drawing & Annexure-I	100%	L-06	
10.3	Ensure columns are pre-assembled as per match marks and centre line already punched on the column pieces and respective splice plates wherever applicable. Note: 1. Interchanging of column pieces and turning of column by 180 degree is not permitted. 2. Splice plates are to be positioned as per shop match marks and placing them upside down turning by 180 degree shall be totally avoided. 3. For Pre-assembly of columns use only correct size black bolts.	V		B	Drawing & Annexure-I	100%	L-06	
10.4	Check camber, sweep, match mark and total length after trial assembly of columns. Note: thickness of packer plates shall be decided based on total length of columns and the top level of corresponding foundation.	M	Measuring Tape	B	Drawing & Annexure-I	100%	L-07	



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 8 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
11.0	ROOF TRUSS PREASSEMBLY CHECKS BETWEEN ROWS							
11.1	Ensure roof trusses are pre-assembled as per match mark and C.G line punched on top and bottom angles.	V		B	Drawing & Annexure-I	100%		
11.2	Check the following							
	a) Camber	M	Measuring Tape	B	Drawing & Annexure-I	100%	L-08	
	b) Sweep	M	Measuring Tape	B	Drawing & Annexure-I	100%	L-08	
	c) Alignment of CG line punch mark and the match mark given on the top & bottom angles, permitted deviation in C.G line matching is ± 5 mm)	M	Measuring Tape	B	Drawing & Annexure-I	100%		
	d) Horizontal level of assembled roof truss with water level with respect to centre line punch mark on end gusset plate face permitted deviation is ± 5 mm	M	Measuring Tape	B	Drawing & Annexure-I	100%		
	e) Total length of assembled roof truss between faces of end gusset plates at top & bottom (Permitted deviation is ± 5 mm.	M	Measuring Tape	B	Drawing & Annexure-I	100%		
	f) End plates are aligned and in one plane on both the ends.	M	Measuring Tape	B	Drawing & Annexure-I	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS

SUB-SYSTEM : STRUCTURE

AREA : ERECTION

SHEET 9 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
11.3	Ensure the following during welding of roof truss. a) Proper fit up b) Qualified welders are engaged and qualified procedures are employed c) Recommended welding consumables and methods are employed. d) LPI on finished welds 100% for butt welds and 10% for fillet welds. Butt Welds : 1. Radiography : Spot radiography shall be carried out on 100 % joints in Tension zone and 10% joints in Compression zone. Minimum 300 mm length shall be spot radiographed. When radiography is not possible, Ultrasonic test shall be carried out after grinding the surface 2. Ultrasonic Test : 10 % of all other Butt welds shall be subject to spot radiography test and the entire balance butt weld for Ultrasonic test	M / V T / R T / R T / R	Measuring Tape	B B A B	Drawing Drawing, Welding Manual & Annexure-I Drawing & Annexure-I Drawing & Annexure-I	100% 100% 100% 100%		Class of check `A` Acceptance standard as per NDE Manual.



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 10 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.1	Ensure foundation bolts are free from damages and foundation bolt pocket is free from debris and foreign materials.	V		B		100%		
12.2	Ensure cleaning of packer plates and that they are free from undulations and burrs.	P		B		100%		
12.3	Ensure thickness of packer plates does not exceed specified value.	M	Measuring Tape	B	Drawing & Annexure-I	100%		
12.4	Ensure maximum contact between the top surface of packer plate and bottom surface of the column base plate and also packer to foundation top.	V		B	Drawing	100%		
12.5	Ensure proper orientation of column.	V		B	Drawing	100%		
12.6	Ensure that centre line of base plate coincides with foundations pedestal axis (both in X and Y axis)	V		B		100%		
12.7	Ensure first pieces of all columns are erected and aligned.	M	Measuring Tape & Plumb bob	A		100%		
12.8	Ensure the stub welded on the columns for connecting girder are in the same elevation. Note :variation in level leads to mismatching of bolt holes.	M	Measuring Tape	B	Drawing	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 11 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.9	Ensure the erection of horizontal beams/girders and vertical bracing (use correct size HSFG/HT bolts and follow the tightening procedure). Note: Site to decide about the horizontal beams/vertical bracings not to be erected for the movement of Cranes or any erection equipment. The left out members shall be erected at the appropriate time	M		A	Drawing & Annexure-I	100%		
12.10	Check verticality of first piece columns after erection of the respective connecting adjacent columns.	M	Plump bob / Theodolite	A	Drawing & Annexure-I	100%		
12.11	Ensure proper tightening of foundation bolts with lock nuts.	V		B	Drawing	100%		
12.12	Ensure locking of all packer plates by tack welding.	V		C		100%		
12.13	Ensure grouting up to the base plate bottom after ensuring verticality of columns and cure (Cube test to be carried out)	M / V	Compressive Testing m/c	B		100%	L-09	
12.14	Ensure erection of second pieces of all columns.	V		C	Drawing & Annexure-I	100%		
12.15	Ensure erection of interconnecting members.	V		C	Drawing	100%		
12.16	Ensure tightness of bolts (HSFG/HT bolts as the case may be)	M	Torque Wrench	B	Annexure-I	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS

SUB-SYSTEM : STRUCTURE

AREA : ERECTION

SHEET 12 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.17	Check verticality of 1 st and 2 nd pieces after the erection of Connecting pieces. Note: The same method shall be followed for further pieces erection	M	Plump bob	A	Drawing & Annexure-I	100%	L-09	
12.18	Check the verticality of total erected column	M	Plump bob/ Theodolite	A	Drawing & Annexure-I	100%	L-10	
12.19	Check and ensure the following during Crane girder erection wherever applicable							
	a) Bracket top level on the column are aligned with water level (Tolerance 5mm Max)	M	Water Level	A	Drawing & Annexure-I	100%		
	b) Check top flange level of crane girder are aligned with water level (Tolerance 5 mm Max.)	M	Water Level	A	Drawing & Annexure-I	100%	L-11	
	c) Check web axis of crane girder in a row and aligned (tolerance on web axis shift in a row 3m Max.)	M	Water Level	A	Drawing	100%		
	d) Centre to Centre distance girders Tolerance ± 5 mm	M	Measuring Tape	A	Drawing	100%	L-12	



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-04-52

REV. NO. R00

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 13 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.20	Ensure the following during the erection of roof trusses							
	a) Proper handling to avoid damage & distortion to assembled trusses.	V		C		100%		
	b) Alignment of bolt holes between columns and truss gussets.	V		C	Drawing	100%		
	c) Slope of truss as per drawing.	M	Spirit Level / Water Level	B	Drawing	100%		
	d) tightness of bolts.	M	Torque Wrench	B	Annexure-I	100%		
	e) truss to truss connecting members including purlins	V		C	Drawing	100%		
12.21	HSFG bolts tightening							
	a) Ensure HSFG bolts are tightened by calibrated torque wrenches.	M		B		100%		
	b) Check the tightness of HSFG bolts using calibrated torque wrench.	M	Torque Wrench	B	Drawing	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPE-CL-040

REV. NO. R02

**SYSTEM : POWER HOUSE STRUCTURAL
STEEL WORKS****SUB-SYSTEM : STRUCTURE****AREA : ERECTION**

SHEET 14 / 14 SHEETS

S.NO.	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
13.0	WELDING & NDE							
	a) Ensure qualified welders are engaged & qualified procedures are employed.	T / R		A	Welding Manual / NDE Manual / WPS	100%		
	b) Ensure recommended welding consumable and methods are employed.	T / R		A	Welding Manual / NDE Manual / WPS	100%		
	c) Ensure recommended NDE Checks are carried out.	T	NDE Test Equipment	A	Welding Manual / NDE Manual / WPS	100%		



PSER

DOCUMENTS REFERRED IN QUALITY PLAN

DOC. NO. : QPX-CL-04-52

REV. NO. : R00

SHEET 1 / 1 SHEETS

Sl. No.	Reference Document	Issuing Authority
1	Drawings	PEM, New Delhi
2	WPS	Trichy
3	Welding Manual	PS-NR
4	NDE Manual	PS-NR
5	IS 817, IS 7215, IS 12843, IS 1852, IS 2062	Bureau of India Standards (BIS)
6.	ASME : Sec IX	
7.	ASTM A 435	
8.	Other codes relevant to raw material, consumables and works	

Annexure - I

Doc. No. QPE-CL-04-52

Rev. No. R00

Sheet No. 1 of 3

POWER HOUSE STRUCTURE - ERECTION TOLERANCES

I	FOUNDATION	TOLERANCES
1.	Column pedestal top level	- 25 mm + 15 mm
2.	Dimension between individual column pedestal (adjacent)	1 mm per meter max. + 5 mm
3.	Adjacent column pedestal diagonal difference	1 mm per meter max. + 10 mm
4.	Foundation bolt pitch difference	+ 3 mm
5.	Foundation bolt diagonal difference	+ / - 5 mm
6.	Foundation bolt projection above nut	+ 15 mm min.
7.	Grouting gap	70 mm (Max.)

Note: Tolerance on thickness of grouting should not be allowed on negative side. The minimum thickness of grouting shall be thickness of grouting shown in the drawing.

II	COLUMNS	TOLERANCES
1.	Individual column piece camber	1 mm per meter Max. 10 mm
2.	Individual column piece sweep	1 mm per meter Max. 10 mm
3.	Total length after pre-assembly	± 15 mm
4.	Camber for the length of the column	1 mm per meter Max. 15 mm
5.	Sweep for the total length of column	1 mm per meter Max. 15 mm
6.	Out of verticality of the column	1 mm per meter max. 25 mm
7.	Elevation of column at reference level	5 mm Max.

Annexure - I

Doc. No. QPE-CL-04-52

Rev. No. R00

Sheet No. 2 of 3

III	TRUSS COLLAR BEAMS OF PURLINS	TOLERANCES
1.	Deviation in level of supporting joint of trusses	+ 5 mm
2.	Deviation of upper chord (in the middle of span) from vertical plane running through center of support.	1/250 of structure height
3.	Deflection of straight section of compression chord from the plane of truss, collar beam or girder.	1/1500 of span but not more than 10 mm.
4.	Deviation of distance between purling.	5 mm
5.	Crane Girder center to center spacing	+ 5 mm
6.	Crane Girder bracket top level	+ 5 mm
7.	Crane girder top flange level	+ 5 mm

IV	GENERAL	TOLERANCES
1.	Tolerance on platform level	+ 5mm
2.	Other requirement shall be as per drawings	As per Drawing
3.	HT Bolts - Normal tightening	Normal tightening
4.	HSFG BOLTS : Cross checked by calibrated torque wrench.	calibrated torque wrench

Annexure - I

Doc. No. QPE-CL-04-52

Rev. No. R00

Sheet No. 3 of 3

V POWER HOUSE STRUCTURE - NDE REQUIREMENTS FOR COLUMNS, CRANE GIRDER FRAME BEAMS TRUSS ETC. COVERING ALL THE STRUCTURES UNDER THE CONTRACT

1.0 FLAME CUT EDGES

Flame out edges for thickness over 50mm - 100% LPI to be done. However for thickness 63 mm and above only 100% MPI shall be done on the flame cut edges.

2.0 BUTT WELDS

2.1 100 % LPI for root run after back gouging

2.2 100% Radiographic testing (RT) on tension zone welds and 10% RT on compression zone welds of crane & bunker girder shall be carried out. Where RT is not possible. Ultrasonic test shall be carried out after grinding the surface.

2.3 10% Radiographic Test (Minimum) & Ultrasonic test for the entire balance butt weld shall be carried out for all structures except structures covered under Sl. No. 2.2

3.0 FILLET WELDS

3.1 Each weld shall be checked for size and visual defects.

3.2 10% weld length on tension members shall be subjected to LPI examination.

3.3 Where the thickness of both the members is greater than 25 mm, LPI shall be done on entire weld length.

3.4 On all other fillet welds, LPI shall be done on minimum 5% of total weld length at random with minimum 300 mm at a particular location.

4.0 COLUMNS:BASE/TOP

100 % LPI

5.0 COAL BUNKERS

100 % NDT of all butt welds and all critical fillet welds are to be done.

Apart from manufacturer's TC of structural materials, site may organise sample test of steel material at established laboratory during various stages of project activities as per decision of BHEL engineers.

Adequate number of safe platforms and easy approach both from bunker floor as well as from feeder floor are to be provided for inspection of fit-up and welding of joints.

Annexure - II

Doc. No. QPE-CL-04-52

Rev. No. R00

Sheet No. 1 of 1

1.0	REQUIREMENT OF PREHEATING		
	Thickness of thickest part at the point of welding	Other than low hydrogen welding electrodes	Low hydrogen electrodes / submerged arc welding
	Upto 20 mm (including)	None	None
	Over 20 mm to 40 mm (including)	65° C	20° C
	Over 40 mm to 63 mm (including)	110° C	66° C
	Over 63 mm	150° C	110° C
2.0	CUTTING TOLERANCES AND DIMENSIONAL VARIATIONS DURING FABRICATION		AS PER TABLE A1
3.0	TOLARABLE DEVIATIONS OF FARICATED MEMBERS FROM GEOMENTRICAL SHAPE		AS PER TABLE A2
4.0	DEVIATIONS		
4.1	ACCEPTABLE DEVIATIONS IN AS FARICATED STEEL STRUCTURES		AS PER TABLE A3
4.2	SPECIFICATION FOR PERMISSIBLE DEVIATION IN BOLT HOLES.		AS PER TABLE A4
4.3	SPECIFICATION FOR PERMISSIBLE DEVIATION OF STRUCTURAL STEEL.		AS PER TABLE A5
4.4	MAXIMUM PERMISSIBLE TOLERANCES IN ERECTED STEEL STRUCTURES.		AS PER TABLE A6

TABLE - A1

Tolerable Deviation from designed linear dimensions in mm in the part & processed for fabrication.

Sl. No.	Characteristic	Deviation/Tolerances in mm					
		1.5 m & below	1.5 m to 2.5 m	2.5 m to 4.5 m	4.5 m to 9.0 m	9.0 m to 15 m	15 m & above
1.	a) Deviation in length and width, of part cut out by :						
	i) Manual gas cutting	2.5	3.0	3.5	4.0	4.5	5.0
	ii) Gas cutting by automatic and semi-automatic machines	1.5	2.0	2.5	3.0	3.5	4.0
	iii) Shear or saw cutting	1.5	2.0	2.5	3.0	3.5	4.0
	iv) Parts machined by edge-planning or milling machines	0.5	1.0	1.5	2.0	2.5	3.0
	b) Difference in diagonal lengths of sheet parts:						
	i) For butt welding	4.0	4.0	4.0	5.0	6.0	6.0
	ii) For lap welding	5.0	5.0	5.0	8.0	10.0	10.0
	c) Deviation in distances between hole centers, formed as per:						
	i) Marking of extreme ones	2.0	2.0	2.5	3.0	3.5	4.0
	ii) Marking of adjacent ones	1.5	1.5	1.5	1.5	1.5	1.5
2.	Deviation in the dimensions of dispatch members after finishing :						
	a) When assembled upon assembly benches as per marking.	3.0	4.0	5.0	7.0	10.0	15.0
	b) When assembled In the Jig and other devices fastening with fixtures,	2.0	2.0	3.0	5.0	7.0	10.0
	c) Dimensions (length and breath) between milled surface (after finishing)	0.5	1.0	1.5	2.0	2.5	3.0
3.	Distance between groups of erection holes (in finished members)						
	a) Formed during machining of separate parts installed when assembling as per marking.	3.0	4.0	5.0	7.0	10.0	15.0
	b) Formed during machining of parts, installed when assembling with the help of fixtures.	2.0	2.0	3.0	5.0	7.0	10.0
	c) Drilled with the help of templates in finished members.	0.5	1.0	1.5	2.0	2.5	4.0

TABLE A.2

Tolerable deviations of fabricated member from designed geometrical shape

S. No.	Characteristic	Deviation	Remarks
1.	Curvature of assembly Parts		
	a) Gap between a sheet and a steel rule face over 1 m length	1.5 mm	
	b) Gap between a taut string and vertex face of an angle flange or web of channel and joist.	0.001 L, but not greater than 10 mm	L - length of member
2.	Deviation of edge line steel sheet parts from theoretical profile:		
	a) During butt and toe welding.	2 mm	
	b) During lap welding	5 mm	
3.	Deviation of radius of the bend:		
	a) Clearance between template and the surface of rolled sheet flange or face of cold bend profile.	2 mm	Template length (1.5 m along the curve)
	b) Clearance between template and the surface of rolled sheet flange or face of hot bend profile	3 mm	-do-
	c) Ellipticity (difference of diameters) in space sheet structures.	0.005D	D-diameter of circumference
	d) Ellipticity (difference of diameters) in erection joints	0.003D	-do-
4.	Deformation of dispatch members:		
	a) Inclination of flanges with the web:		
	i) at Junction point	0.005b	b-width of flange
	ii) at other places	0.01b	b-width of flange
	b) Transverse bending of flanges:		
	i) at junction with members	0.005b	b- width of flange
	ii) at other places	0.01b	b-width of flange
	c) Warping of the web		
		0.003h	h-depth of the member
	d) Sag of member		
	L/750 but not more than 15mm	L-length of the member	
5.	Other Deviations:		
	a) Shifting of axes or riveting / bolting lines for lattice structures from theoretical eccentricity.	3.0 mm	
	b) Inclination of the milled surface from designed position.	1/1500	

TABLE-A.3

Acceptance Deviations in as fabricates steel structures.

Sl. No.	Characteristic	Deviation / Tolerance
1.	COLUMNS	
a)	Deviation in length 'L' measured distance from bottom surface of the column footings, to the group of holes for trusses, fasteners, collar beams, purlins and other elements to be connected to column.	
	When L is under 10 m	± 10 mm
	When L is over 10 m	± 15 mm
b)	Deviation in distance 'L' from bottom surface of the column footing to the top of crane brackets.	
	When L is under 10 m	± 5 mm
	when L is over 10 m	± 10 mm
c)	Deviation in distance from bearing surface of the bracket to the first fastener of the element to the connected to column.	± 1 mm
d)	Deviation in distance between any group of holes for connection of bracings to column.	± 2 mm
e)	Sag of column element (curvature)	1/1000 of length element but not more
f)	Difference in web depth of column	
	i) At splice joint	± 2 mm
	ii) At any other location	± 10 mm
g)	Deviation in distance from supporting surface of milled end of the despatch element of column to the clear or heating plate or column to the cleat or seating plate for fastening of collar beams, purlins, girders. etc. (Fish plates, brackets)	± 3 mm
2.	TRUSSES	
a)	Deviation in span 'L' of the truss between end erection holes in gussets of supporting units or between external planes of supporting gussets or angles when trusses are resting on brackets or supports:	
	When L is under 25 m	± 7 mm
	When L is over 25 m	1/2500 but not more than 10 mm
b)	b) Deviation in distance between the centres of holes or webs of angles for fastening bracing, purlins, monitors etc	± 3 mm
c)	Deviation in distance between the first row of erection holes and the bearing surface at cleat or seating plate.	± 1 mm
d)	Distance between holes for fasteners to top and bottom chords of trusses on supports.	± 3 mm
e)	Sag of separate elements between node points.	1/1500 of length of element but not more than 10 mm.

TABLE A.3

S. No	Characteristic	Deviation/ Tolerance
3.	BEAMS	
	a) Deviation in span L of beams between bend erection holes, outer Surfaces of end plates:	
	When L is under 25 m	± 10 mm
	When T is over 25 m	$\pm 1/2500$ Length but not more than 15 mm
	b) Deviation in the height of beam as measured from the bearing surface to the top of upper flange.	± 3 mm
	c) Deviation in distance between the group of holes for fastening of purlins, monitors, bracings, bracing grids etc.	± 3 mm
	d) Sag (curvature) of the girder despatch member	1/1000 length but not more than 15 mm
4.	ELEMENTS OF FRAMEWORK BRACINGS, PURLINS ETC.	
	a) Deviation in distance between end erection holes, determining the span of element.	± 13 mm
	b) Sag of despatch members	1/1000 length but not more than 15 mm
	c) Deviation in distance between the groups of erection holes of the element.	± 3 mm
	d) Gratings, Stair / Railings, ladders etc.	± 12 mm
5.	SHOP ASSEMBLY (Before DESPATCH FOR ERECTION)	
	a) Columns weighing more than 20 T	Every first and further every fourth set of identical structure to be put for control assembly,
	b) Roof trusses of 30 m or more span	
	c) Crane girders with span more than 18 m	Number of erection bolts shall be at least 30% of the total No. of holes.
	d) Bunkers	

TABLE-A.4

Acceptable Deviation in Holes for Bolts

S.No,	Characteristic	Deviation	Tolerance No. of deviation in each group
1,	a) Deviation of dia of holes for rivet and bolts		
	Upto 16 mm	+ 1 mm	No limit
	Over 16 mm	+ 1.5 mm	
	b) Deviations of dia of turned and fitted bolts: Nominal dia of bolts and holes	Upper limit: +0.125 mm Lower limit: 0.00	No limit
2.	Ovalness (difference between the greatest and lesser dia)		
	Upto 16 mm hole dia	+ 1 mm	No limit
	Over 16 mm hole dia	+ 1.5 mm	
3.	Deformity in size greater than 1.5 mm and cracks in the edge of holes.	Not permitted	
4.	Misalignment of holes in separate plates in the joints:		
	i) Upto 1 mm		Upto 50%
	ii) From 1 to 1.5 mm		Upto 10%
NOTE : Burrs in holes shall be removed, the depth and width of countersunk hole shall not deviate from the standard by more than 1.5 mm.			

Table A 5

Permissible Fabrication Deviation of Structural Steel

S No.	Type of Structures and Constructions	Name of Deviations	Value of Deviation (Tolerance)
1.	Column	Assembly Fits	
		a) Base plate and column	0.1 mm
		b) Frame Joints	2.0 mm
		c) Web and flange	1.5 mm
		d) Web & stiffeners	1.5 mm
		e) Flange & stiffeners Intermediate stiffeners & Bearing stiffeners:	1.5 mm
		f) Cap plate & column	0.1 mm
		g) Crane girder seat	0.1 mm
	h) Beam brackets	2.0 mm	
2.	Beams	(c), (d), (e) of S.No.1 above	1.5 mm
3.	Crane Girders	(c), (d), (e) of S.No.1 above and knife edge supports	0.1 mm
4.	Bunkers & Hoppers		
	a)	Ring beam and Wall	1.5 mm
	b)	Stiffeners and walls	1.5 mm
	c)	Stiffeners and ring beams	1.5 mm
	d)	Deflection of straight section of compression c -rd from the plane of truss, collar beam or girder	1/1500 of span but not more than 10mm
5.	Purlin	Deviation in distance between purlins.	5 mm

TABLE -A6**Maximum Permissible & Tolerances in Erected Steel Structures**

Sl. No.	Description	Tolerance
1	Erected steel columns:	
	i) Deviation of column axis at foundation top level with respect to true axis:	
	a) in longitudinal direction	± 5 mm
	b) in lateral direction	± 5 mm
	ii) Deviation in the level of bearing surface of columns at foundation top with respect to true level	± 5 mm
	iii) Out of plumbness (verticality) of column axis from true vertical axis, as measured at column top:	
	a) For columns without any special requirements:	
	1) upto and including 30 m height	± H/1000 or ± 25 mm whichever is less
	2) over 30 m height	± H/1200 or ± 35 mm whichever is less
	b) For column with special requirements like cranes or such similar requirements:	
	1) Upto and including 30 m height	± H/1000 or ± 20 mm whichever is less
	2) Over 30 m height	± H/1500 or ± 25 mm whichever is less
	iv) Deviation in straightness in longitudinal and transverse of column at any point along the height.	± H/1500 or ± 10 mm whichever is less
	v) Difference in the erected positions of adjacent pairs of columns along length or across width of building prior to connecting trusses/ beams with respect to true distance.	± 5 mm
	vi) Deviation in any bearing or seating level with respect to true level.	± 5 mm
	vii) Deviation in difference in bearing levels of a member on adjacent pair of columns both across and along the building.	± 5 mm
	NOTE	
	1. Tolerance specified under iii (a) and iii (b) should be read in conjunction with iv and v.	
	2. 'H' is the column height in mm.	

TABLE- 6 (Contd.)

S. No.	Description	Tolerance
2.0	Erected Steel trusses	
	i) Shift, at the centre of span of top chord member with respect to the vertical plane passing through the centre of bottom chord.	$\pm 1/250$ of height of truss in mm at centre of span or ± 15 mm Whichever is less
	ii) Lateral shift of top chord of truss at the centre of span from the vertical plane passing through the centre of supports of the truss	$\pm 1/1500$ of span of truss in mm or 10 mm whichever is less
	iii) Lateral shift in location of truss from its true axis in plan	± 10 mm
	iv) Lateral shift in location of purlin From true position	± 5 mm
	v) Deviation in difference or bearing levels of trusses from the true difference.	$\pm 1/1200$ of span of truss in mm or ± 20 mm whichever is less
3.	Erected Crane Girder and Rails	
	i) Shift in the centre line of crane rail with respect to centre line of web crane girder.	$\pm \{(\text{Web thk in mm}) + 2\text{mm}\} / 2$
	ii) Shift in plan of alignment of crane rail with respect to true axis of crane rail at any point,	± 5 mm
	iii) Deviation in crane track gauge with respect to the gauges	
	a) For track gauge up to and including 15 mm	+ 5 mm
	b) For track gauge more than 15 m	$\pm (5 + 0.25(S-15))$ mm subject to a maximum of ± 10 mm, where S in meters is true track gauge.
	iv) Deviation in the crane rail level at any point from true level	± 10 mm
	v) Difference in levels between crane track rails at:	
	a) Supports of crane girders	15 mm
	b) mid span of crane girders	20 mm
	vi) Relative shift of crane rail surface at a joint in plan and elevation.	2 mm subject to grinding of surfaces for smooth transition



PSER

RECORDED OF QUALITY CHECKS

SHEET NO. OF QPI	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	CHECKED BY SIGN. & DATE	ACCEPTED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in “Format of Record” column.

		SYSTEM	SUB-SYSTEM	AREA	DOC. NO. QPE-CL-04-52
PROJECT					REV. NO. R00
UNIT NO.					LOG SHEET NO. L-00
RATING					SHEET / SHEETS



PSER

INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

QUALITY CERTIFICATE OF CIVIL FOUNDATIONS

Project : Foundation for :
Unit No. : BHEL input
Customer : Date Reference :
Sub-contractor : Main Construction
Drawing No. :

Construction period : From :..... to Handed over to BHEL by sub-contractor
Status : Complete / Incomplete on (Date)

Certified that the above foundation has been constructed as IS 456. It is declared fit for erection work of based on the following details :

1. Foundation cast -- As per IS
2. Shuttering and re-enforcement As per construction Drawing
3. Test for strength of concrete As per IS 456
Results Acceptable / Not Acceptable
4. Curing time days.
5. Dimensions, sizes position of inserts and pockets, verticality, level, etc. have been checked, logged and found OK.
6. Details of defects detected visually / by NDE, pre-disposed non-conformances and corrective action are enclosed. (Reference : Annexure-I)

			NAME	SIG. / DATE	DOC. NO. QPE-CL-04-52
PROJECT		CHECKED BY			REV. NO. R00
UNIT NO.		ACCEPTED BY			LOGSHEET NO. L-01
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



PSER

INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

FOUNDATION - POWER HOUSE STRUCTURE
COLUMN PEDESTALS SPACING

All dimensions are in mm.

Column No.		Spacing	
From	To	Drawing	Actual

Column No.		Spacing	
From	To	Drawing	Actual

PROJECT	CHECKED BY	NAME	SIG. / DATE	DOC. NO. QPE-CL-04-52
UNIT NO.	ACCEPTED BY			REV. NO. R00
RATING	CUSTOMER			LOGSHEET NO. L-03
				SHEET 1 / 1 SHEETS



PSER

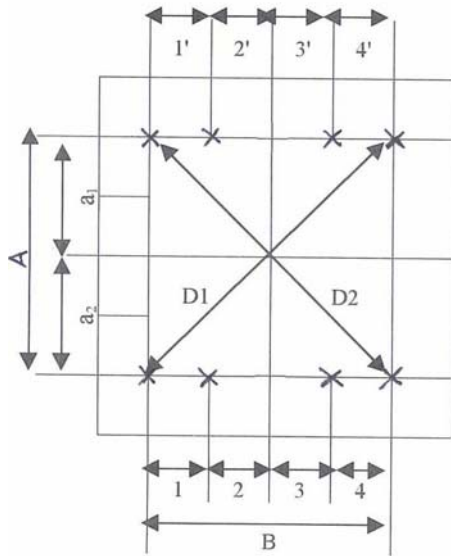
INSTRUMENT REG. NO.

DATE OF INSPECTION

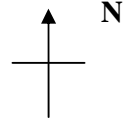
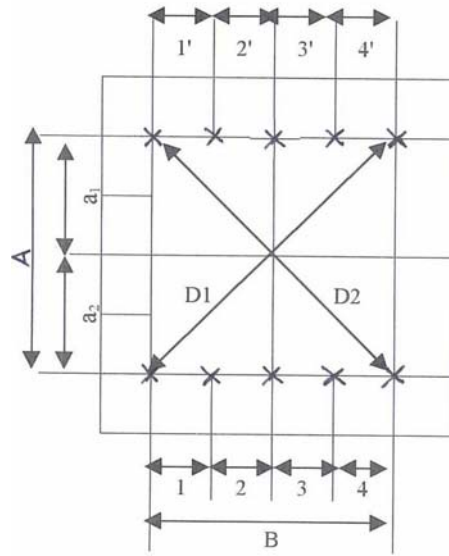
DRAWING / DOCUMENT REF.

PITCH DISTANCE OF FOUNDATION BOLTS & DIAGONALS

TYPE - I



TYPE - II



TYPE - I

Column No.	A	B	a ₁	a ₂	1	2	3	4	1'	2'	3'	4'	D1	D2
As per drawing														

TYPE - II

Column No.	A	B	a ₁	a ₂	1	2	3	4	1'	2'	3'	4'	D1	D2
As per drawing														

								NAME	SIG. / DATE	DOC. NO. QPE-CL-04-52				
PROJECT								CHECKED BY		REV. NO. R00				
UNIT NO.								ACCEPTED BY		LOGSHEET NO. L-05				
RATING								CUSTOMER		SHEET 1 / 4 SHEETS				



PSER

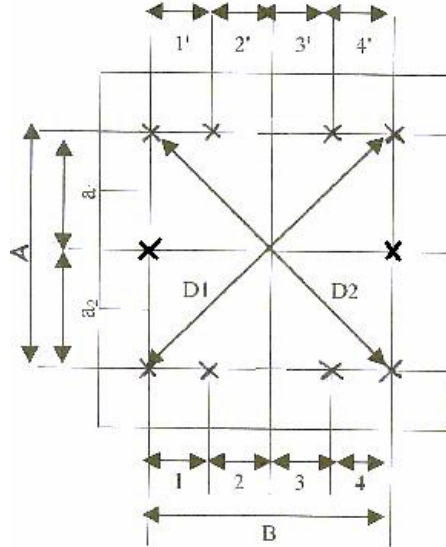
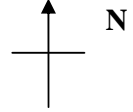
INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

PITCH DISTANCE OF FOUNDATION BOLTS & DIAGONALS

TYPE - III



Column No.	A	B	a ₁	a ₂	1	2	3	4	1'	2'	3'	4'	D1	D2
As per drawing														

PROJECT		CHECKED BY												REV. NO. R00
UNIT NO.		ACCEPTED BY												LOGSHEET NO. L-05
RATING		CUSTOMER												SHEET 2 / 4 SHEETS



PSER

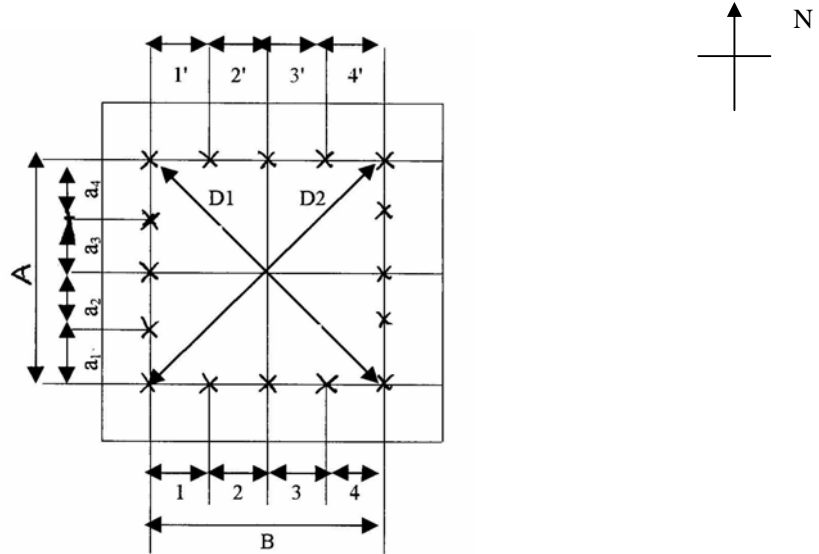
INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

PITCH DISTANCE OF FOUNDATION BOLTS & DIAGONALS

Type IV



Type - IV

Column No.	A	B	a ₁	a ₂	a ₃	a ₄	1	2	3	4	1'	2'	3'	4'	D1	D2
As per drawing																

			NAME	SIG. / DATE	DOC. NO. QPE-CL-04-52
PROJECT		CHECKED BY			REV. NO. R00
UNIT NO.		ACCEPTED BY			LOGSHEET NO. L-05
RATING		CUSTOMER			SHEET 3 / 4 SHEETS



PSER

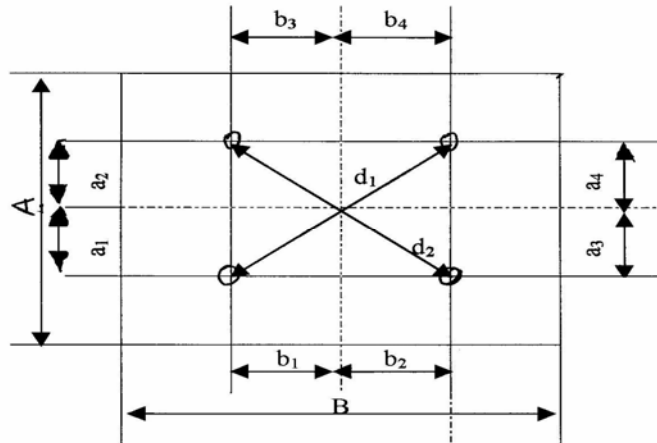
INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

PITCH DISTANCE OF FOUNDATION BOLTS & DIAGONALS

Type - V



Type-V

Column No.	A	B	a ₁	a ₂	a ₃	a ₄	b ₁	b ₂	b ₃	b ₄	d ₁	d ₂

PROJECT	CHECKED BY	NAME	SIG. / DATE	DOC. NO. QPE-CL-04-52
UNIT NO.	ACCEPTED BY			REV. NO. R00
RATING	CUSTOMER			LOGSHEET NO. L-05
				SHEET 4 / 4 SHEETS



PSER

INSTRUMENT REG. NO./TAG NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

CAMBER, SWEEP AND LENGTH OF COLUMN PIECES



INDIVIDUAL PIECE TOLERANCE : 1mm / M Max. 10 mm

Column No.	Camber			Sweep			Length
Piece No.	T	M	B	T	M	B	

T – Top of the Piece

M – Middle of the Piece

B – Bottom of the Piece

			NAME	SIG./DATE	DOC. NO. QPE-CL-04-52
PROJECT		CHECKED BY			REV. NO. R 00
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-06
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



PSER

INSTRUMENT REG. NO./TAG NO.

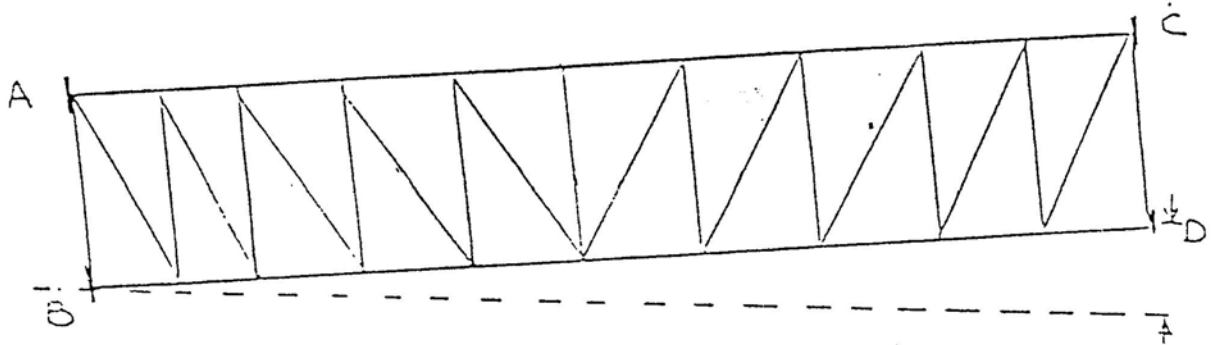
DATE OF INSPECTION

DRAWING / DOCUMENT REF.

ROOF TRUSS PRE – ASSEMBLY

A & C – End plate at top angle side.

B & D – End plate at bottom angle side.



SLOPE at “D”

Slope actual	
As Per Drawing	

CAMBER AND SWEEP

LOCATION						
CHAMBER						
SWEEP						

Match Mark : Indicate OK if it is correct and if any deviation inform through SAR.

Location			
Match Mark			

TOTAL LENGTH

As Per Drawing	Measured	Difference	Tolerance
			± 5 mm

			NAME	SIG./DATE	DOC. NO. QPE-CL- 04-52
PROJECT		CHECKED BY			REV. NO. R 00
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-08
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO./TAG NO.

DATE OF INSPECTION

PSER

DRAWING / DOCUMENT REF.

COLUMN VERTICALITY MEASUREMENT

(Note :To be checked with theodolite and cross checked with plumb bob.)

(All Measurements in mm)

Column No.	Inclined to wards				Column No.	Inclined towards				
	Location	Left	Right	Front		Rear	Location	Left	Right	Front

(Tolerance 1 mm / Meter Max. 25 mm)

PROJECT		CHECKED BY		NAME	SIG./DATE	DOC. NO. QPE-CL-04-52
UNIT NO.		ACCEPTED BY				REV. NO. R 00
RATING		CUSTOMER				LOG SHEET NO. L-10
						SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO./TAG NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

CRANE GIRDER

Crane girder bracket top level				Crane girder top flange level			
Column No.	Level	Column No.	Level	Column No.	Level	Column No.	Level

Tolerance Max. 5 mm

All Dimension in mm.

			NAME	SIG./DATE	DOC. NO. QPE-CL-04-52
PROJECT		CHECKED BY			REV. NO. R 00
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-11
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



PSER

INSTRUMENT REG. NO./TAG NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

CRANE GIRDER CENTER TO CENTER SPACING

Tolerances : ± 5 mm

All dimensions in mm.

Location	Measured Length	Deviation

Location	Measured Length	Deviation

			NAME	SIG./DATE	DOC. NO. QPE-CL-04-52
PROJECT		CHECKED BY			REV. NO. R 00
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-12
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

QUALITY PLAN FOR INSTALLATION

BOILER

**STRUCTURES
(Erection)**

FOR

**MEJIA TPS EXTN. (UNITS 5 & 6)
2 x 250 MW**

(M/s. Damodar Valley Corporation)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR EASTERN REGION**

**DOC. NO. : QPE-BR-04-55
REV. NO. : R00**

**QUALITY PLAN FOR
INSTALLATION**

**BOILER
STRUCTURES**

(Erection)

**MEJIA TPS EXTN. (UNITS 5 & 6)
2 x 250 MW**

(M/s. Damodar Valley Corporation)

PREPARED BY	SR MANAGER/QLY,PSER	APPROVED BY	HEAD/QLY, PSER
DOCUMENT NO.	QPE-BR-04-55		
ORIGINAL DATE OF ISSUE	20.08.2004		
REVISION NO. & DATE	R00Dt. 20.08.2004		
COPY NO.			
ISSUED TO			
DATE OF ISSUE			
CONTROLLED / INFORMATION COPY			
ISSUED BY (SIGNATURE & DESIGNATION)			



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR EASTERN REGION**



PSER

CONTENTS

DOC. NO. : QPE-BR-04-55

REV. NO. : R00

SHEET 1 / 1 SHEET

	<u>Description</u>	<u>No. of Sheets</u>
*	Status of amendments	01
*	Authorisation for different categories of checks	01
*	Quality Plan for Installation of BOILER STRUCTURES (Erection) for MEJIA TPS EXTN. (UNIT 5 & 6) 2 x 250 MW (M/s. Damodar Valley Corporation)	
*	Statement of checks	06
*	Documents referred in Quality Plan	01
*	Log Sheets : L-00 to L-08	13
*	Feedback on Quality Plan for Installation	01

* * * * *



PSER

STATUS OF AMENDMENTS

DOC. NO. : QPE-BR-04-55

REV. NO. : R00

SHEET 1 / 1 SHEET

<u>Sl.No.</u>	<u>Reference of Sheet(s) Amended</u>	<u>Amendment No. & Date</u>	<u>Remarks</u>
---------------	--	-------------------------------------	----------------

- NIL -



PSER

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

FOR BHEL'S INTERNAL REFERENCE

Classification of checks

Symbol	Description	Inspection agency	Clearing agency
A	Critical	Task performer & surveillance by QAE (if available)	HOS
B	Major	Task performer	HOS
C	Minor	Task performer	Task performer

Legend :

HOS	Head of Section of BHEL
QAE	Quality Assurance Engineer of BHEL

Note :

- Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
- QAE is also authorised to carry out surveillance in any of the "B" and "C" category of checks at his discretion.
- In case of non-conformity, before accepting , clearing agency shall ensure dispositioning and the same shall be reflected in Logsheets/protocols.



PSER

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

<u>Classification of checks</u>		Checking Authority	Accepting Authority
Symbol	Description		
A	Critical	Customer & BHEL	Customer & BHEL
B	Major	Customer & BHEL	Customer & BHEL
C	Minor	BHEL	BHEL
Legend Customer :		M/S DVC	
<p>Note :</p> <ul style="list-style-type: none">Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.DVC shall witness "A" category checks. He is also authorised to carry out surveillance in any of the "B" and "C" category of checks at his discretion.In case of non-conformity BHEL shall ensure dispositioning before accepting and the same shall be reflected in Logsheets/protocols.			



PSER

STATEMENT OF CHECKS

DOC. NO. : QPE-BR-04-55

REV. NO. : R00

SHEET 1 / 6 SHEETS

Capacity / Type : **2 x 250 MW**

System : **BOILER**

Sub-System : **STRUCTURES**

Area : **ERECTION**

- * For checks where log sheets are not called for, suitable records shall be maintained in the form of log book / protocols.
- * As an evidence of having carried out the work satisfactorily, a general-purpose log sheet L-00 shall be maintained for all the checks.
- * Abbreviations used in the column "Type of Check" are:
 - R : Record Verification
 - M : Measurement
 - V : Visual
 - T : Test



STATEMENT OF CHECKS

DOC.NO.: QPE-BR-04-55

REV.NO.: R00

SHEET 2 / 6 SHEETS

SYSTEM : BOILER

SUB-SYSTEM : STRUCTURES

AREA : ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS	QUANTUM/FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
FOUNDATION :								
1.	Availability of identified & protected permanent benchmark.	V		B	100%	Relevant Drawing		
2.	Elevation of top of foundation pedestals w.r.t. permanent bench mark.	M	Dumpy level / Water level / Tape	A	100%	- do -	L - 01	
3.	Disposition of foundation pedestals w.r.t. longitudinal axis of boiler and reference axis.	M	Tape	A	100%	- do -	L - 02	
4.	Spacing between the foundation pedestals.	M	Tape	B	100%	- do -	L - 02	
5.	Diagonals of the main column foundation pedestals.	M	Tape	B	100%	- do -	L - 03	
6.	Pitch distance of foundation pedestal bolts on both the axes and its diagonals.	M	Tape	C	100%	- do -	L - 04	
STRUCTURES :								
1.	Pre-assembly of columns before erection, wherever applicable.	V/M	Tape / Piano wire / Water level	B	100%	- do -		
2.	Individual column piece camber and sweep (Tolerance : 1 mm / M ; 10 mm max.).	M	- do -	B	100%	- do -		



STATEMENT OF CHECKS

DOC.NO.: QPE-BR-04-55

REV.NO.: R00

SHEET 3 / 6 SHEETS

SYSTEM : BOILER

SUB-SYSTEM : STRUCTURES

AREA : ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS	QUANTUM/FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
3.	Camber and sweep for assembled columns (Tolerance : 1 mm / M ; 18 mm max.) .	M	Tape / Piano wire / Water level	B	100%	Relevant Drawing		
4.	Total length of column before erection (Tolerance : ± 15 mm) .	M	Tape	B	100%	- do -		
5.	Orientation of columns. Check for match mark, elevation mark, column No., splice size etc.	V		B	100%	- do -		
6.	Ensure matching of centre line of base plate with pedestal axes.	V		B	100%	- do -		
7.	Elevation of column at 1 metre level with reference to bench mark (Tolerance : ± 5 mm) .	M	Water level / Tape	B	100%	- do -		
8.	Alignment of first piece of column with horizontal beams and vertical bracings (Tolerance : Position w.r.t. reference axis : ± 5 mm ; elevation : ± 5 mm) .	M	Theodolite / Tape / Plumb bob	B	100%	- do -	L-06	
9.	Completion of boxes with main brace level members (MBL).	V				- do -		
10.	Grouting gap below the column base (Max. 70 mm) .	M	Tape	B	100%	- do -		
11.	Verification of test certificates and batch certificates of grout material.	V		A	100%	Work Instruction for Grouting		



STATEMENT OF CHECKS

DOC.NO.: QPE-BR-04-55

REV.NO.: R00

SHEET 4 / 6 SHEETS

SYSTEM : BOILER

SUB-SYSTEM : STRUCTURES

AREA : ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS	QUANTUM/FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
12.	Grouting of column bases.	V/R/ T		A	100%	Drawing / Grout Manufacturer's Recommendation	L - 05	
13.	Alignment of columns at every stage of erection.	M	Theodolite / Tape / Plumb bob	B	100%	Drawing	L - 06	
14.	Tightening of HSFG bolts between column joints, horizontal beams and vertical bracings.	M	Bolt Tension Calibrator / Torque wrench	B	100%	- do -		
15.	Camber and sweep of the individual ceiling girder pieces (Tolerance : 1 mm / M, max. 5 mm).	M	Piano wire / Tape / Water level	B	100%	- do -		
16.	Camber, sweep, diagonal & overall length of ceiling girder before and after welding (Tolerance: 1 mm / M, Max. 15 mm).	M	- do -	B	100%	- do -		
17.	Check for Girder Pin connection	V		B	100%	-do-		
18.	Alignment of ceiling girders.	M	Tape / Plumb bob / Water level	A	100%	- do -	L - 07	
19.	Tightening of HSFG bolts between ceiling girders and welded beams (WBs).	M	Bolt Tension Calibrator / Torque wrench	B	100%	- do -		



STATEMENT OF CHECKS

DOC.NO.: QPE-BR-04-55

REV.NO.: R00

SHEET 5 / 6 SHEETS

SYSTEM : BOILER

SUB-SYSTEM : STRUCTURES

AREA : ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS	QUANTUM/FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
20.	Verticality of columns before and after ceiling girder erection, at every 5M and at column erection joints. (Tolerance : 1 mm /M ; or 25 mm whichever is less)	M	Theodolite / Plumb bob / Tape	A	100%	Relevant Drawing	L - 06	
21.	Centre line of ceiling girders marked w.r.t. the longitudinal axis of boiler transferred from ground level to top. (Tolerance : +/- 5 mm)	M	Theodolite / Tape	A	100%	- do -	L - 07	
22.	Check for welding completion of MBL	V		A	100%	-do-		
23.	Readiness of structure for drum erection.	V		A	100%	- do -	L - 08	
24.	Ensure completion of stair case with hand rails up to drum level	V		B	100%	-do-		
25.	Clearance of milestone activity.	V		A	100%			
26.	Verticality of all main columns (wherever possible) immediately after drum lifting and compare with previous values.	M	Theodolite / Plumb bob / Tape	A	100%	- do -	L - 06	
27.	Removal of temporary supports.	V		C	100%			



STATEMENT OF CHECKS

DOC.NO.: QPE-BR-04-55

REV.NO.: R00

SHEET 6 / 6 SHEETS

SYSTEM : BOILER

SUB-SYSTEM : STRUCTURES

AREA : COMMISSIONING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1.	WELDING & NDE : Qualification of welders.	V/R		A	100%	Welding Manual		
2.	Availability of approved WPS, Heat Treatment Schedule, Erection Manual, Storage Manual, Calibration test certificates of instruments used.	R		A	100%			
3.	Pre heating of weld joints.	V/M	Time Temperature Recorder / Thermal Chalk	B	As per Reference Document	Drawing / Heat Treatment Manual		
4.	Adoption of correct procedure, approved electrodes and methods.	V/R		B	100%	Drawing / Welding Manual / Heat Treatment Manual		
5.	NDE of site welds.	V/T		B	100%	NDE Manual		
7.	Stress relieving of Ceiling Girder	R		B	100%	Heat Treatment Manual		
8	CLEANING AND PAINTING:							
8.1	Ensure that the surface are cleaned and painted as specified	V		C	100%	Drawing		
8.2	Ensure that the following markings are done a)Assemblies designation b)Part Number c)Any other important identifications	V		C	100%	Drawing		
8.3	Ensure Dry Film Thickness of paint is as per specification	M		B	100%	Specification		



PSER

**DOCUMENTS REFERRED IN
QUALITY PLAN**

DOC. NO. : **QPE-BR-04-55**

REV. NO. : **R00**

SHEET **1 / 1** SHEET

Sl. No.	Reference Document	Issuing Authority
1.	Welding Manual	BHEL, PSER, KOLKATA
2.	NDE Manual	BHEL, PSER, KOLKATA
3.	Heat Treatment Manual	BHEL, PSER, KOLKATA
4.	Work Instructions for Grouting	BHEL, PSER, KOLKATA



PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF QPI	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	DOC. NO. : QPE-BR-04-55
PROJECT					REV. NO. : R00
UNIT NO.					LOG SHEET NO. : L-00
RATING					SHEET 1 / 1 SHEET



INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT
REF.**BOILER FOUNDATIONS TOP OF PEDESTAL**

Top elevation of pedestals as per drawing _____ mm

Tolerance : * - 20 mm

All dimensions are in mm

Sl, No.	Pedestal Designation	Top Elevation	Sl. No.	Pedestal Designation	Top Elevation
1	S1L		16	S6R	
2	S2L		17	S7R	
3	S3L		18	S8R	
4	S4L		19	S9R	
5	S5L		20	S10R	
6	S6L		21	S11	
7	S7L		22	S12	
8	S8L		23	S13	
9	S9L		24	S14	
10	S10L		25	S15	
11	S1R		26	S16	
12	S2R		27	S17L	
13	S3R		28	S18L	
14	S4R		29	S17R	
15	S5R		30	S18R	

* Positive tolerance or top of pedestals to be chipped off so that thickness of grouting as shown in relevant drawing can be provided.

			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-01
RATING		CUSTOMER			SHEET 1 / 1 SHEET



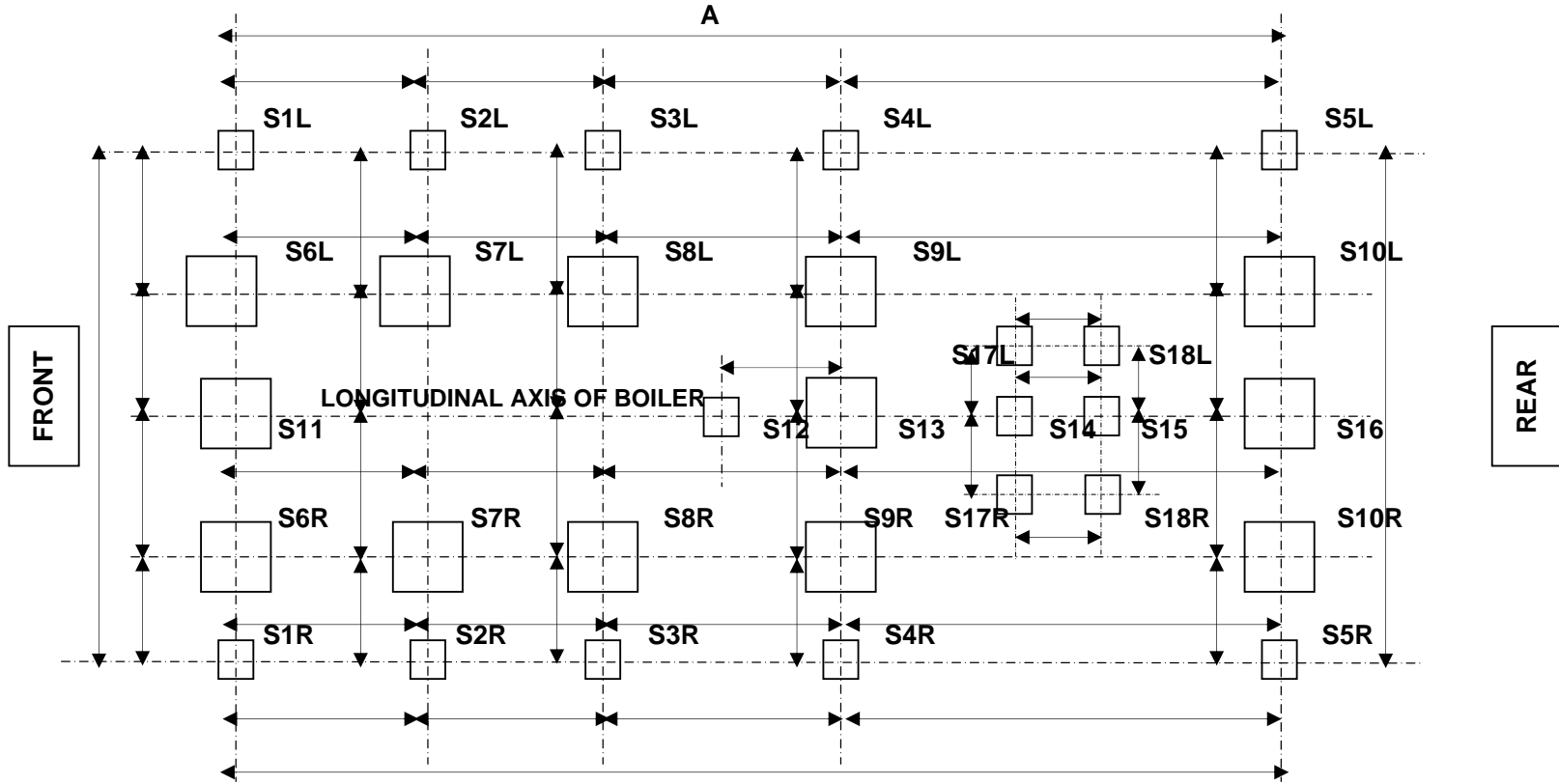
PSER

INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT NO.

BOILER COLUMN FOUNDATION PEDESTALS - SPACING



			NAME	SIGNATURE / DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV. NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-02
RATING		CUSTOMER			SHEET 1 / 2 SHEETS



INSTRUMENT REGN.NO.	
DATE OF INSPECTION	
DRAWING / DOCUMENT REF.	

BOILER COLUMN FOUNDATION PEDESTALS - SPACING

Sl.No.	Spacing Between	As per drawing	Actual	Sl.No.	Spacing Between	As per drawing	Actual
1	S1L & S2L			29	S5L & S10L		
2	S2L & S3L			30	S6L & BA		
3	S3L & S4L			31	S7L & BA		
4	S4L & S5L			32	S8L & BA		
5	S6L & S7L			33	S9L & BA		
6	S7L & S8L			34	S17L & BA		
7	S8L & S9L			35	S18L & BA		
8	S9L & S10L			36	S10L & BA		
9	S11 & S12			37	BA & S6R		
10	S12 & S13			38	BA & S7R		
11	S13 & S14			39	BA & S8R		
12	S14 & S15			40	BA & S9R		
13	S15 & S16			41	BA & S17R		
14	S17L & S18L			42	BA & S18R		
15	S1R & S2R			43	BA & S10R		
16	S2R & S3R			44	S6R & S1R		
17	S3R & S4R			45	S7R & S2R		
18	S4R & S5R			46	S8R & S3R		
19	S5R & S6R			47	S9R & S4R		
20	S6R & S7R			48	S10R & S5R		
21	S7R & S8R			49	S1L & S5L		
22	S8R & S9R			50	S1R & S5R		
23	S9R & S10R			51	S1L & S1R		
24	S17R & S18R			52	S5L & S5R		
25	S1L & S6L						
26	S2L & S7L						
27	S3L & S8L						
28	S4L & S9L						

Tolerances:

1. Between adjacent foundation pedestals centres: **1 mm / M, ± 5 mm max.**
2. Spacing between first and last row of foundation: **1 mm / M, ± 15 mm max.**

All dimensions are in mm.

			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-02
RATING		CUSTOMER			SHEET 2 / 2 SHEETS

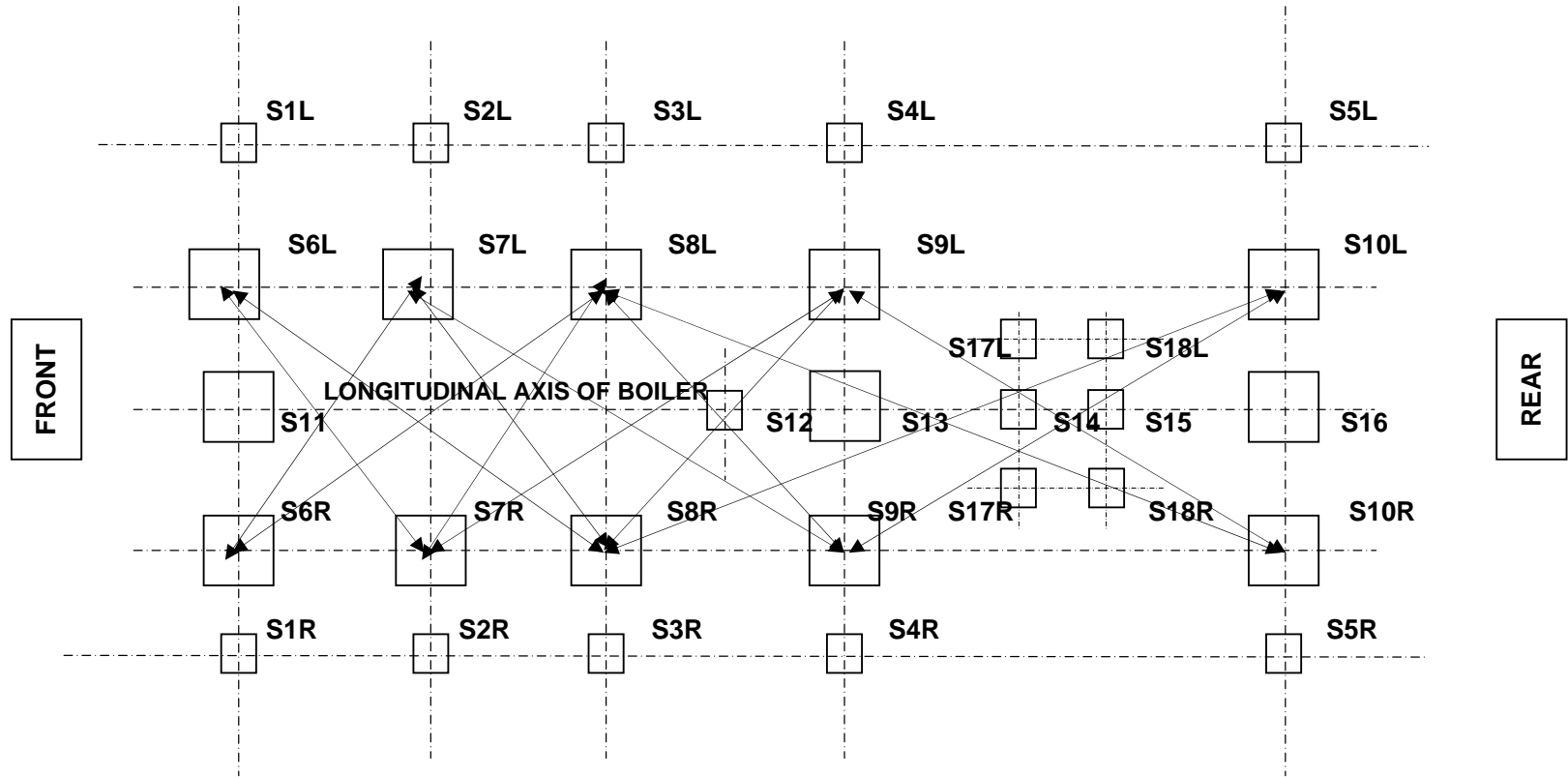


INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT NO.

DIAGONAL CHECK BETWEEN MAIN COLUMN FOUNDATION PEDESTALS



			NAME	SIGNATURE / DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV. NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-03
RATING		CUSTOMER			SHEET 1 / 2 SHEETS



INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT
REF.**DIAGONAL CHECK BETWEEN MAIN COLUMN FOUNDATION PEDESTALS**

Sl.No.	Diagonal between	Measurement	Difference	Sl.No.	Diagonal between	Measurement	Difference
1	S6L & S7R			11	S7L & S9R		
2	S6R & S7L			12	S7R & S9L		
3	S7L & S8R			13	S8L & S10R		
4	S7R & S8L			14	S8R & S10L		
5	S8L & S9R						
6	S8R & S9L						
7	S9L & S10R						
8	S9R & S10L						
9	S6L & S8R						
10	S6R & S8L						

Tolerances :

1. Adjacent columns pedestal diagonal difference : **1 mm / M, 10 mm (max.)**
2. Cumulative difference : **1 mm / M, 25 mm (max.)**

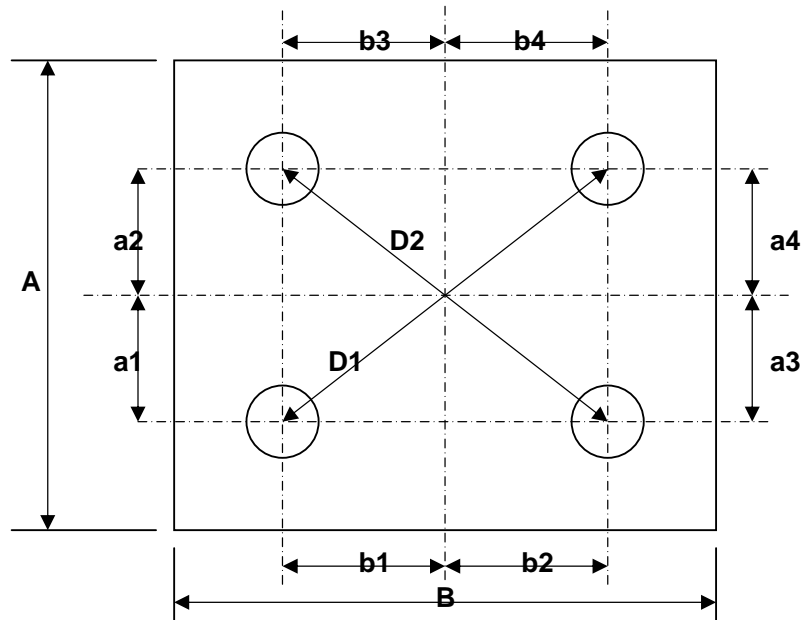
All dimensions are in mm.

			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-03
RATING		CUSTOMER			SHEET 2 / 2 SHEETS



INSTRUMENT REGN.NO.	
DATE OF INSPECTION	
DRAWING / DOCUMENT REF.	

PITCH DISTANCE OF FOUNDATION BOLTS AND DIAGONALS



AS PER DRAWING												
PEDESTAL DESIGNATION	A	B	a1	a2	a3	a4	b1	b2	b3	b4	D1	D2
	L											
	R											
	L											
	R											
	L											
	R											
	L											
	R											
	L											
	R											

Tolerances: 1. Pitch Distances : ± 3 mm

All dimensions are in mm

2. Diagonal Difference : 5 mm max.

			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-04
RATING		CUSTOMER			SHEET 1 / 1 SHEET



INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT
REF.**GROUTING OF COLUMN BASES****(Note : for ready mix grout, write `N.A'. for entries which are not applicable)**

1. Column Numbers :
2. Grout Material Specification :
3. Ratio of proportion of grout mix :
4. Whether any additives added : Yes / No
If yes, details :
5. Date of grouting :
6. Whether test cubes have been taken : Yes / No
If yes, test results :
7. Remarks :

The following column bases _____ are cleared for further erection after _____ days of curing.

			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-05
RATING		CUSTOMER			SHEET 1 / 1 SHEET

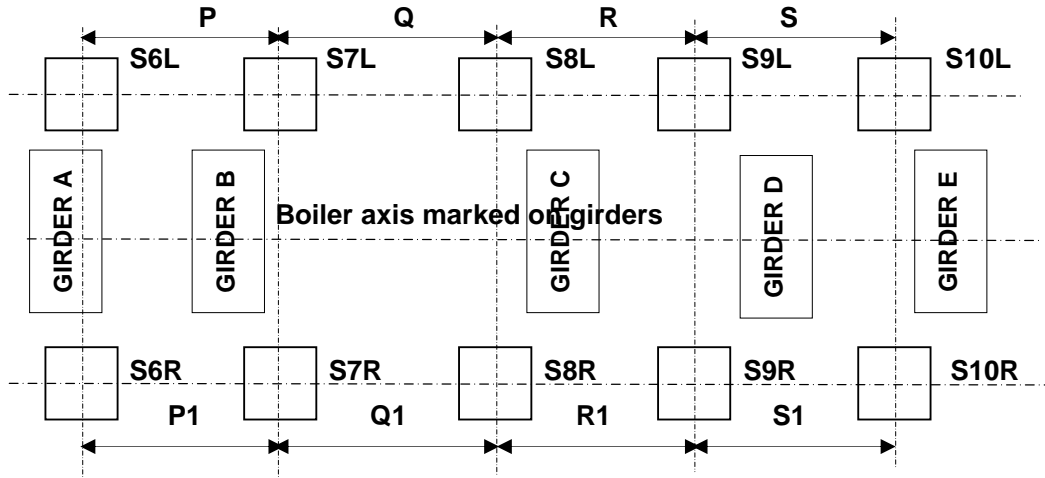


INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

CEILING STRUCTURES ALIGNMENT



SPACING BETWEEN CEILING GIRDERS:

Tolerance : ± 5 mm Max.

Location	As per drawing	Actual	Location	As per drawing	Actual
P			P1		
Q			Q1		
R			R1		
S			S1		

All dimensions are in mm

			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-07
RATING		CUSTOMER			SHEET 1 / 2 SHEETS



INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT
REF.**CEILING STRUCTURES ALIGNMENT****DIAGONAL DIFFERENCE BETWEEN ADJACENT CEILING GIRDERS**

Tolerance : 25 mm Max.

Between Girders	D1	D2	D1~D2
A & B			
B & C			
C & D			
D & E			

CEILING GIRDER C. L. VARIATION W.R.T. BOILER AXIS :

Tolerance : 12 mm Max.

All dimensions are in mm

Girder Designation	Variation w.r.t. boiler axis	
	Towards Left	Towards Right
Girder – A		
Girder – B		
Girder – C		
Girder – D		
Girder – E		

			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-07
RATING		CUSTOMER			SHEET 2 / 2 SHEETS



INSTRUMENT REGN.NO.

DATE OF INSPECTION

DRAWING / DOCUMENT
REF.

**JOINT INSPECTION PROTOCOL FOR COMPLETION OF STRUCTURE
PRIOR TO DRUM ERECTION**

SI.No.	Activity	Observation			
1	Completion and verification of all log sheets / records of erection.				
2	Erection completion of : a) All columns b) Horizontal beams between columns c) Vertical bracings and tie members d) Horizontal bracing on all main brace levels (MBLs) e) Ceiling girders, welded beams (WBs), rolled beams (RBs) required for drum lifting & ceiling bracings.				
3.	Welding completion				
4.	NDE completion				
5.	Heat treatment completion				
6.	Completion of HSFG bolts tightening				
7.	Remarks :				
Boiler supporting structure is cleared for drum erection.					
			NAME	SIGNATURE & DATE	DOC. NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-08
RATING		CUSTOMER			SHEET 1 / 2 SHEET



INSTRUMENT REGN.NO.		
DATE OF INSPECTION		
DRAWING / DOCUMENT REF.		

MINIMUM STRUCTURES REQUIREMENT FOR DRUM ERECTION
(LIST OF REVAMPED PG - MA UNDER PG - 35 & 36)

<u>Sl.No.</u>	<u>MA</u>	<u>Description</u>
01	010	Boiler Foundation Materials
02	110	Main Columns Left
03	120	Main Columns Right
04	130	Main Columns Middle
05	140	Auxiliary Columns Left
06	150	Auxiliary Columns Right
07	190	Girder Pin Connections
08	210	Ceiling Girder (fabricated)
09	220	Ceiling - Rolled shapes @
10	230	Ceiling Bracing
11	310	Horizontal Bracing I MBL
12	320	Horizontal Bracing II MBL
13	330	Horizontal Bracing III MBL
14	340	Horizontal Bracing IV MBL
15	350	Horizontal Bracing V MBL
16	360	Horizontal Bracing VI MBL
17	380	Landing Platforms *
18	390	Drum Floor *
19	441	Horizontal Beams - Lower
20	443	Horizontal Beams - Upper
21	511	Front Bracing - Lower
22	513	Front Bracing - Upper
23	521	Side Bracing - Lower
24	523	Side Bracing - Upper
25	531	Rear Bracing - Lower
26	533	Rear Bracing - Upper
27	610	Boiler Roof Structure *
28	611	Boiler Roof Sheeting *
29	700	Fasteners
30	811	Floor grills & Guard Plate *
31	820	Misc. stairs *
32	851	Hand Rails and Posts *

@ - Rolled shapes which are required for drum lifting are to be erected and others as and when requirement arises.

* - These items are not mandatory for drum lift, but may be important from statutory regulation, operation / erection and health / safety point of views.

NOTE: For details refer applicable PGMA List

			NAME	SIGNATURE & DATE	DOC.NO.: QPE-BR-04-55
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-08
RATING		CUSTOMER			SHEET 2 / 2 SHEETS

QUALITY PLAN FOR INSTALLATION

**CIVIL WORKS
(ERECTION)**

**MEJIA TPS EXTN. (UNITS 5 & 6)
(2 x 250 MW)**



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR EASTERN REGION**

**DOC. NO. QPE-CL-04-51
REV. NO. R00**

QUALITY PLAN FOR INSTALLATION

CIVIL WORKS (ERECTION)

MEJIA TPS EXTN. (UNITS 5 & 6) (2 x 250 MW)

PREPARED BY	SR MANAGER/QLY, PSER	APPROVED BY	(HEAD / QLY, PSER
DOCUMENT NO.	QPE - CL -04-51		
ORIGINAL DATE OF ISSUE	20.08..2004		
REVISION NO. & DATE	R00 / 20.08.2004		
COPY NO.			
ISSUED TO			
DATE OF ISSUE			
CONTROLLED / INFORMATION COPY			
ISSUED BY (SIGNATURE & DESIGNATION)			



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR EASTERN REGION



PSER

CONTENTS

DOC. NO. : QPE-CL- 04-51

REV. NO. : R00

SHEET 1 / 1 SHEETS

<u>S.NO.</u>	<u>DESCRIPTION</u>	<u>NO. OF SHEETS</u>
1.	STATUS OF AMENDMENTS	1
2.	AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK	1
3.	STATEMENT OF CHECKS FOR ERECTION	24
	i) Test Laboratory Establishment	
	ii) Bricks	
	iii) Earth Work	
	iv) Cement	
	v) Fine Aggregate (Sand)	
	vi) Course Aggregate	
	vii) Reinforcing Steel	
	viii) Water	
	ix) Form Work (Shuttering)	
	x) Plant & Machinery	
	xi) Embedded Parts	
	xii) Concreting	
	xiii) Testing	
	xiv) Water Retaining Structure	
	xv) Water Supply	
	xvi) Drainage and Sanitation	
	xvii) Flooring and Finishing Works	
	xviii) Weathering Course	
	xix) Bitumen Top	
	xx) Plastering	
	xxi) Suspended Ceiling	
	xxii) Bought out Items	
	xxiii) Roof Decking	
	xxiv) Records	
	xxv) Wall Cladding Work	
4.	ANNEXURES (I TO VI)	12
5.	LOGSHEET L-00 TO L-05	6
6.	DOCUMENTS REFERRED IN QUALITY PLAN	1



PSER

STATUS OF AMENDMENTS

DOC. NO. : QPE-CL- 04-51

REV. NO. : R00

SHEET 1 / 1 SHEETS

SL. NO.	REFERENCE OF SHEETS AMENDED	AMENDMENT NO. & DATE	REMARKS
- NIL -			



PSER

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

FOR BHEL'S INTERNAL REFERENCE

Classification of checks

Symbol	Description	Inspection agency	Clearing agency
A	Critical	Task performer & surveillance by QAE (if available)	HOS
B	Major	Task performer	HOS
C	Minor	Task performer	Task performer

Legend :

HOS	Head of Section of BHEL
QAE	Quality Assurance Engineer of BHEL

Note :


- Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
- QAE is also authorised to carry out surveillance in any of the "B" and "C" category of checks at his discretion.
- In case of non-conformity, before accepting , clearing agency shall ensure dispositioning and the same shall be reflected in Logsheets/protocols.



PSER

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK

<u>Classification of checks</u>		Checking Authority	Accepting Authority
Symbol	Description		
A	Critical	Customer & BHEL	Customer & BHEL
B	Major	Customer & BHEL	Customer & BHEL
C	Minor	BHEL	BHEL
Legend Customer : M/S DVC			
<p>Note :</p> <ul style="list-style-type: none">• Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.• DVC shall witness "A" category checks. He is also authorised to carry out surveillance in any of the "B" and "C" category of checks at his discretion.• In case of non-conformity BHEL shall ensure dispositioning before accepting and the same shall be reflected in Logsheets/protocols.			

	<h2>STATEMENT OF CHECKS</h2>	DOC. NO. : QPE-CL- 04-51
		REV. NO. : R00
		SHEET 1 / 24 SHEETS
Capacity / Type :	2 X 250 MW	
System :	Civil	
Sub-system :	-----	
Area :	Erection	
<p>NOTES :</p> <ol style="list-style-type: none"> 1. For checks where logsheets are not called for, suitable records should be maintained in the form of logsheets / protocols. 2. As an evidence of having carried out the work satisfactorily, a general purpose logsheet, L-00 shall be maintained for all the checks. 3. Drawing / Contract requirements shall apply over and above the checks given. 4. Abbreviations used in the column 'Type of check' are: <ul style="list-style-type: none"> R : Record verification M: Measurement V : Visual P : Physical T : Test 		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : TEST EQUIPMENT

AREA : ERECTION

SHEET 2 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
1.0	Test Laboratory Establishment : Ensure that test laboratory is established at site sufficiently before commencement of civil work. (List of equipment as per Annexure-I)	V		B	Annexure-I	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : TEST EQUIPMENT****AREA : ERECTION**

SHEET 3 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
2.0	BRICKS :							
2.1	Ensure that the bricks are free from cracks, warpage and of uniform colour.	V		B	IS1077	For every 10000 nos. or part thereof		
2.2	Ensure clear ringing sound is heard on being struck	P		B	IS1077	For every 10000 nos. or part thereof		
2.3	Check for the dimension	M	Steel Tape	B		For every 10000 nos. or part thereof		
2.4	Ensure that the following tests are conducted : - Compressive strength & water absorption	M	Compressive Strength Testing machine	A	IS1077	For every 10000 nos. or part thereof		
2.5	Check for soundness	P	Weigh balance, Oven	B		For every 10000 nos. or part thereof		
2.6	Check for efflorescence	V		B		For every 10000 nos. or part thereof		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : TEST EQUIPMENT

AREA : ERECTION

SHEET 4 / 24 SHEETS

S.NO	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
3.0	EARTH WORK (Excavation, Filling, Compaction) :				Annexure-II	As per Annexure-II		
	1. Ensure that the material is as per standard :							
	a) Proctor Density & Optimum moisture content (Standard Proctor Test)	M	Oven, Weigh balance	A	IS 2720 IRC-37	As per Annexure-II		Protocol
	b) Relative Density Index	M	Oven, Weigh balance	A	IS 2720 IRC-37	As per Annexure-II		Protocol
	II. Degree of Compaction of fill.							
	a) Dry Density by Core Cutter Method / Sand Displacement Method	M	As per IS 2720	A	IS 2720	As per Annexure-II		Protocol
	b) Moisture Content of Fill before Compaction	M	As per IS 2720	A	IS 2720	As per Annexure-II		Protocol
	c) Dry Density by Proctor Needle Penetration	M	As per IS 2720	A	IS 2720	As per Annexure-II		Protocol



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : TEST EQUIPMENT****AREA : ERECTION**

SHEET 5 / 24 SHEETS

S.NO	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
4.0	CEMENT :				Annexure-III			
4.1	Ensure the following tests are conducted for conformity with requirement for strength and quality				Test Certificate IS269, IS455, IS4031, IS1489-1	One sample from each lot received from store		
	a) Consistency of cement	M	Vicat Needle	A				L-01
	b) Initial and final setting time	M	Vicat Needle	A				L-02
	c) Compressive strength - 3days & 7 days	M	Compressive Testing Machine, Cube Mould, Vibrator, Curing chambers, Standard Sand	A				Protocol
4.2	Ensure that material is stored properly to avoid deterioration due to moisture and contamination by various impurities							
	a) Covered storage is provided	V / P		B		100%		
	b) Material is stored on raised platform	V / P		B		100%		
	c) Not more than 10 bags are stacked on one heap with proper access for inspection	V / P		B		100%		
	d) Cement shall be stacked consignment wise, type & grade wise for clear identification	V / P		B		100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX-CL- 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : TEST EQUIPMENT

AREA : ERECTION

SHEET 6 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
5.0	FINE AGGREGATE (SAND) :				Annexure-III			
5.1	Ensure that the following tests are conducted for each source of supply and check the material is as per standards (for mix design) a) Silt & Clay content b) Sieve analysis (Particle size and shape) c) Bulking of sand d) Specific gravity, density, voids & absorption e) Moisture content f) Dleterious materials g) Petrographic examination h) Soundness i) Reaction with Alkali : Mortar making properties.	M	Measuring jar Weigh balance Sieve set, oven	B	Test certificate IS383, IS515, IS2386	As per Annexure- III	Protocol	
5.2	Conduct tests and ensure that the material is as per standards before use at site a) Silt & Clay content b) Sieve analysis c) Bulking of sand	M	Oven Sieve set Weigh balance	B	Test certificate IS383, IS515, IS2386	As per Annexure-III	Protocol L-03	



PSER

STATEMENT OF CHECKS

DOC. NO. QPX-CL-04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : TEST EQUIPMENT****AREA : ERECTION**

SHEET 7 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
6.0	COARSE AGGREGATE : (Stone metal / Gravel)				Annexure-III			
6.1	Conduct the following tests and ensure that the material is as per standards (for Mix design)		Sieve set weigh balance, Oven, Jar & necessary chemicals	B	Test certificate, IS383, IS515, IS2386	As per Annexure-III	Protocol L-04	
	a) Sieve Analysis (Particle Size and Shape)	M						
	b) Moisture content	M						
	c) Specofoc gravity	M						
	d) Crushing Strength	M						
	e) Bulk density	M						
	f) Absorption value, Abration value & Impact Value	M						
	g) Voids	M / V						
	h) Soundness	Lab Test						
	i) Reaction with Alkali	Lab Test						
	j) Petrographic examination	V / P						
	k) Deleterious materials	Lab Test						
	l) Temperature Cycle test	Lab Test						
	m) Flakiness	Lab Test						



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : TEST EQUIPMENT****AREA : ERECTION**

SHEET 8 / 24 SHEETS

S.NO	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
7.0	REINFORCING STEEL							
7.1	Conduct following chemical and mechanical tests wherever required and ensure that the material is as per standards : a) Chemical analysis including chromium and other corrosion resistant element b) Tensile strength, Proof stress, Elongation c) Bend Test	R	Verification of Test Certificate	A	IS1786, IS432 IS1566 & Drawing	Each Lot / Batch	Test Certificate	
7.2	Verify the following : a) Surface characteristics like free from cracks, Surface flaws, Imperfect edge, Lamination & Rough jogged. b) Dimension c) Proper identificatin for Corrosion Resistant Steel (CRS)	V M V	Screw Gauge	B B B		Random Random Random	Protocol Protocol	
7.3	Ensure fabrication is done as per details given in drawings and bar bending schedules	M	Measuring Tape	B	Annexure-III Drawing & IS2502	100%		
7.4	Ensure that the joints and crossing bars are tied properly with right gauge wire.	P		C	Drawing	100 %		
7.5	Ensure lapping of bars, wherever necessary	P		B	Drawing & IS456	100%		

SYSTEM : CIVIL WORKS		SUB-SYSTEM : STEEL		AREA : ERECTION			SHEET 9 / 24 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
7.6	Check for placement of reinforcement bar The bar bending schedule with necessary hooks, laps, covers spacers & chairs shall be 100%. Check for all concreting before start of work.	M	Measurement Tape	C	Drawing	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : WATER****AREA : ERECTION**

SHEET 10 / 24 SHEETS

S.NO	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
8.0	WATER : (Customer Input)							
8.1	Ensure that water from all source is potable as per the standard before use	Testing		B	Annexure-III, Test certificate	Once a month per source		
8.2	Conduct test for neutralisation of water	M	Indicator	B	Annexure-III, IS 3025 & IS456	Once a month per source	Site logbook	
8.3	Check and ascertain limits of solids	M	Lab Test	B	Annexure-III, IS 3025 & IS456	Once a month per source	Site logbook	
8.4	Conduct test for PH value	M	PH Meter	B	Annexure-III, IS456	Once a month per source	Site logbook	



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : BRICKS

AREA : ERECTION

SHEET 11 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
9.0	FORM WORK (SHUTTERING) :							
9.1	Ensure the form work is as per contract specifications and drawings	P / V		B	Annexure-III	100%		
9.2	Check for the following :							
a)	Cleanliness, Damage and warpage	V		B		100%		
b)	Ensure internal dimension of box forms and distances between internal surfaces of shuttering of walls.	M	Measuring Tape	B	Drawing	100%		
c)	Ensure horizontality before and after placement of reinforcement	M	Spirit Level, plumb bob	B	Drawing	100%		
d)	Staging	R / V / P		B	Drawing/ Design	100%		
e)	Ensure the following :							
(i)	Soundness of material	M/ V	Hammer	C	Drawing	100%		
(ii)	Proper joining bracing	V		C	Drawing	100%		
(iii)	Proper support	V		C	Drawing	100%		
(iv)	Verticality of side shuttering before and after reinforcement	M	Plumb bob	C	Drawing	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : FORM WORK

AREA : ERECTION

SHEET 12 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
9.3	Form work material are as per the specification and approved	P / V		B	Drawing	100%		
9.4	Check that there is no loss of liquid through joints	P / V		B		100 %		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : PLANT & MACHINERY

AREA : ERECTION

SHEET 13 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
10.0	PLANT & MACHINERY :	V / P		A		100%		
10.1	Ensure availability of the following : a) Concrete Mixer b) Vibrators of adequate capacity c) Weigh batches & batching plant d) Lighting e) Air compressor f) Pumps g) Jack hammer (if required) h) Transit mixer i) Generator j) Winches k) Cranes l) Escavator, Power roller, plate compactor							



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : BRICKS

AREA : ERECTION

SHEET 14 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
11.0	EMBEDDED PARTS :							
11.1	Ensure the following : a) Position and level of embedded parts	M	Dumpy level, Measuring Tape	A	Drawings	100%		
	b) Position, depth and size of bolt holes	M	Measuring Tape	A	Drawings			
	c) Suitable pipe sleeves have been provided for bolt holes before concreting	M	Measuring Tape	A	Drawings			
	d) All necessary steps like welding of lug to reinforcement are done to keep the embedded parts undisturbed during the process of concreting	V		B	Drawings			
11.2	Ensure length, diameter and verticality of embedded bolts	M	Plumb bob, Measuring Tape	A	Drawings			
11.3	Ensure that sufficient length of bolts protruding above finished floor level to accommodate equipment (Base frame)	M	Measuring Tape	A	Drawings			
11.4	Ensure that the threads of foundation bolts are adequately projected.	V		A	Drawings			



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : CONCRETING

AREA : ERECTION

SHEET 15 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.0	CONCRETING :							
12.1	Ensure the following :				Annexure-III			
	a) Preliminary tests sre conducted for determining design mix for required strength	Test		A	Test certificate IS456, IS1199	As per Annexure-III	L-05	
	b) Cement water and aggregate content as per mix design (W-C ratio and cement content)	M	Volume/weigh batching	A	Test certificate IS456, IS1199	As per Annexure-III	Protocol	
12.2	Ensure the continuous concreting and the quantity of constituents measured by weigh batching	P		B	IS456	100%		
12.3	Ensure that all mesuring equipment are maintained in a clean servicable condition and their accuracy checked periodically.	V / R		B	Test certificate	100%		
12.4	Ensure the following : Workability of the concrete checked at frequent intervals by Slump Cone test or Completion Factor Test.	M	Slump Cone	B	IS456, IS2386 Part III IS1199 Annexure-IV	As per Annexure-III	L-05	
12.5	Ensure the following :							
	a) The reinforcement rods are clean and free from rust, paint, oil and other coatings.	V		B		100%		
	b) The reinforcement are placed correctly in position with adequate separators before pouring concrete.	P / M		B	Drawings	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : CONCRETING****AREA : ERECTION**

SHEET 16 / 24 SHEETS

S.NO	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.6	Check and ensure the following :							
	a) Area to be concreted is clean and free from debris and any extraneous matter of water logging	V		B		100%		
	b) Water stopper or seals are introduced wherever required	P		B	Drawing	100%		
	c) Old concrete surfaces are chopped, cleande with wire brush, wetted and coat of cement slurry applied before layingnew concrete	P		A		100%		
	d) The temperature of concrete does not exceed 25° C for major equipment foundation, use ice proportionally to maintain temperature	M	Thermometer	B	IS456	100%		
	e) Stripping time of formwork is strictly regulated as follows in normal circumstances (where temperature is above 20° C) and where ordinary cement is used.	M / P	Thermometer	B	IS456	100%		
	i) Wall columns & vertical sides of beams : 24 to 48 hours							
	ii) Slab (props left under) : 3 days							
	iii) Beams soffits (props left under) : 7 days							
	iv) Removal of props to slabs span less than 4.5m : 7 days							
	v) Removal of props to slabs spanning over 4.5m : 14 days							
	vi) Removal of props to beams and arches : 14 days							
	Spanning upto 6 m							



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : CONCRETING****AREA : ERECTION**

SHEET 17 / 24 SHEETS

S.NO	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.7	f) Removal of props to beams and arches spanning over 6m : 21 days Note : Where rapid hardening cement is used the stripping time in respect of items ii and vi of above be regulated at 3/7 of the corresponding periods stated for ordinary cement with the approval of customer.							
	g) Adequate cover is provided between reinforcement and shuttering	M		B	Drawing	100%		
	Ensure the following : a) Concrete is transported/ placed and compacted before expiry of initial setting time of cement and not disturbed subsequently	P		B		100%		
	b) Concrete is placed in even layers in quick succession, each of which is compacted before placing next layer and no cold joints are formed.	P		B		100%		
	c) Curing of concrete is carried out for a minimum of 7 days from the date of placing of concrete. Curing is started not later than 10 to 12 hours after termination of concreting in normal weather and in hot and windy weather within 2 to 3 hours.	P		B		100%		
12.8	Ensure following for pile works prior to concreting : Chipping of pile head as per pile cap requirement	P		A		100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : TESTING****AREA : ERECTION**

SHEET 18 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
13.0	TESTING :							
13.1	Ensure that adequate number of test specimen (Cubes) are taken from mixed concrete and kept properly identified for purpose of testing as per specifications/standards (min. 3 nos. for 7 days and 3 nos. for 28 days)	Lab Test		A	IS456, IS2911			
13.2	Ensure that concrete cubes are tested and recorded at specified period of curing as per standards	Lab Test	Compressive Test Machine	A	Annexure-V IS516, IS2911	Annexure-III	L-05	
13.3	Ensure that test results of concrete cubes are examined to verify the specified grade of concrete as required			A	Test results IS516, IS2911	100%		
13.4	Load Test on Structures (If required by Customer's engineer)	Load Test		A	IS456		Protocol	
13.5	Rebound Hammer Test (If required by Customer's engineers) or any other non-destructive tests	P		A	IS13311-II		Protocol	



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : ERECTION			SHEET 19 / 24 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
14.0	WATER RETAINING STRUCTURE :							
14.1	Ensure that water fill test is conducted as Leak test for neutralizing sump and piping.	V		A	Drawing	100%	Protocol	
14.2	Ensure construction joints are as per drawings and specification	V		A	Drawing	100%		
15.0	WATER SUPPLY :							
15.1	Check properly alignment level and grades of each laid length	M	Measuring Tape, Levelling instrument	B	Drawing	100%	Protocol	
15.2	Ensure proper jointing of RCC pipes and curing of joints for minimum of 10 days	P		C	Drawing	100%		
15.3	Ensure that the water supply lines are subjected to Hyd. Test.	M	Pressure Gauge	B	Drawing	100%	Protocol	
16.0	DRAINAGE AND SANITATION :							
16.1	Check for alignment and slope	M	Levelling instrument	B	Drawing	100%	Protocol	
16.2	Ensure proper jointing of each length	P		B	Drawing	100%		
16.3	Ensure that water fill test is conducted to identify water leakage in joints for RCC non-pressure pipes.	V		C	Drawing	100%	Protocol	
16.4	Ensure that all pipe i.e. fittings and fixtures are as per relevant code and as per drawing.			B	Drawing	100%		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : MISCELLANEOUS****AREA : ERECTION**

SHEET 20 / 24 SHEETS

S.NO	CHARACTERISTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
17.0	FLOORING AND FINISHING WORKS :							
17.1	Check for levels and slope	M	Dumpy Level	B	Drawing	100%		
17.2	Ensure that the floors are chipped prior to commencement of actual finishing work.	V		C		100%		
17.3	Ensure that the cement concrete floors are cured minimum for 7 days	V		C		100%		
17.4	Ensure that the tiled finished floors are polished as per the requirement of customer	V		B		100%		
18.0	WEATHERING COURSE :							
18.1	Check for slope	M	Dumpy Level	B	Drawing	100%		
18.2	Check for joint finishing	V		B	Drawing	100%		
19.0	BITUMEN TOP :							
19.1	Check for proper laying of Bitumen top	V		B	Drawing	100%		
20.0	PLASTERING :							
20.1	Ensure that the plastering of brick walls shall be of min. 19 mm thick for outside and 13 mm for inside	V / M	Steel Tape	B	Drawing	Random Test	Protocol	



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : MISCELLANEOUS****AREA : ERECTION**

SHEET 21 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
20.2	Ensure that the plastering of concrete ceiling is as specified.	M	Steel Tape	B	Drawing	100%	Protocol	
20.3	Ensure that the curing of plastering surfaces are carried out for 7 days (min.)	V		B		100%		
21.0	SUSPENDED CEILING :							
21.1	Ensure that the false ceing is done as per drawing / specification	M / V	Steel Tape	B	Drawing, IS8183	100%	Protocol	
21.2	Ensure that as per requirement resin mineral wool is packed in black polythene and laid on top of Ceiling panels.	V		B	Drawing, IS8183	100%		
21.3	Ensure density of resinbonded mineral wool	M		B		Sample Test		
22.0	BOUGHT OUT ITEMS :							
22.1	Check the bought out items are as per Technical specification / IS codes before use.	Verifi- cation		B	Annexure-VI	100%		
23.0	Roof Decking :							
	a) Sheets approved of samples by engineer in-charge. - Review of T/C - Dimension Check including thickness, depth of valley centre to centre distance of valley	M	Measuring Tape	B	Drawing	Sample Test		



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : MISCELLANEOUS

AREA : ERECTION

SHEET 22 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
24.0	- Check phosphating on both sides as per IS 3618 class B	V	Steel Tape, Dumpy Level, Theodolite	B	IS 3618	Sample Test		
	- Check one coat of chlorinated rubber paints as per Technical Specification.	V		B		Sample Test		
	b) Fixing of Decking Seats Appearance, Water Tightness, Check side end laps, Check conformity of Fixing as per approved design, Review of T/C for fasteners and Z spacers	V		B		100%		
	RECORDS : Prepare logsheets / Protocols as per drawing and record the following :	V / M		A	Drawing	100%		
a) Orientation with co-ordinates								
b) Elevation / levels								
c) Slope								
d) Pitch / Diagonals								
e) Spacing / Diagonals								



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS**SUB-SYSTEM : RECORDS****AREA : ERECTION**

SHEET 23 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
25.0	Wall Cladding Work :							
	a) INNER SHEETS			B	Drawing / Specification	100%		
	i) Approval of sample by Engineer In-charge							
	ii) Review of TC for physical & chemical properties.	R						
	iii) Dimensional conformities including thickness, Rib depth, cover width.	M	Measuring Tape					
	iv) Check for glaminizing weight of zinc coating	M	Weighing machine					
	v) Type of permanently colour coating and appearance	V						
	b) OUTER SKIN SHEETS			B	Drawing / Specification	100%		
	i) Approval of sample by Engineer In-charge	V						
	ii) Review of TC for physical & chemical properties	R						
	iii) Dimensional conformities including thickness, Rib depth, cover width.	M	Measuring Tape					
	iv) Check for Fluor Polymer Paint Coating Thickness	M	Magnetic Gauge					



PSER

STATEMENT OF CHECKS

DOC. NO. QPX - CL - 04-51

REV.NO. R 00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : RECORDS

AREA : ERECTION

SHEET 24 / 24 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
	c) Thermal Insulation Thickness, Thermal conductivity at 50°C, Density and review of TC for all test as per IS 8183	M / V		B		100%		
i)	Check positioning and location of laps.	M	Measuring Tape	B		100%		
ii)	Check alignment of sheets and fixing (Plumb & level)	M	Water level / Plumb					
iii)	Check End lap and Side lap fixing of other item	V						
iv)	Check location and spacing of fixing.	V/M	Measuring Tape					

Annexure - I

DOC. NO. QPE-CL-04-51

REV.NO. R00

SHEET No. 1 of 2

RECOMMENDED LABORATORY EQUIPMENTS / MEASURING DEVICES / INSTRUMENTS FOR CIVIL WORKS

Sl. No.	Broad Class	Nomenclature Description	Utility	Test Procedure	Code Ref.
1.	Routine Test Lab. Equipments	1.1 Vicat Apparatus	Cement Consistency & Penetration	Penetration of Standard needle	IS 5513
		1.2 Lechatelier's test Apparatus	Cement shrinkage	Size variation after curing of sample	IS 5514
		1.3 Mould (cement) (70.7X70.7X70.7 mm)	Cement Cubes	Cubes made of 1:3 cement Sand	IS 10086
		1.4 Cement Mortar Mould Vibrator	Cube Compaction	Vibration for fixed duration	IS 10078
		1.5 Concrete cube mould (150X150X150)mm	Concrete Cubes		IS 10086
		1.6 Compressive strength Testing Machine	Concrete Cube Test	Crushing strength of cube	IS 2505
		1.7 Concrete Slump cone	Workability check	Drop in cone height of concrete	IS 7320
		1.8 Concrete aggregate sieves	Sieve analysis	Sieving	IS 383
		1.9 Fine aggregate sieves	Sieve analysis	Sieving	IS 383
		1.10 Shieve shaker	Mechanical shieving		
		1.11 Aggregate impact Test Machine	Impact Value aggregate		IS 9377

Annexure - I

DOC. NO. QPE-CL-04-51

REV.NO. R00

SHEET No. 2 of 2

RECOMMENDED LABORATORY EQUIPMENTS / MEASURING DEVICES / INSTRUMENTS FOR CIVIL WORKS

Sl. No.	Broad Class	Nomenclature Description	Utility	Test Procedure	Code Ref.
2.	Dimensional & Allied Measuring Equipment	2.1 Theodolite & levelling Staff	Levelling, centre line marking & Verticality measurement	Measurement & Recording	
		2.2 Measuring Tape	Dimension		
3.	Process Control accessories	3.1 Oven	Material Drying for moisture for moisture control	Material to be kept for specific duration	
		3.2 Physical Balance	Weighing		
		3.3 P.H. Meter	Measuring PH value		IS 456, IS 2720
		3.4 Soil Compaction Testing Apparatus	Soil Compaction Testing		



PSER

DOCUMENTS REFERRED IN QUALITY PLAN

DOC. NO. : QPE - CL - 04-51

REV. NO. : R00

SHEET 1 / 1 SHEETS

Sl. No.	Reference Document	Issuing Authority
1	Drawings	PEM
2.	IS 269, 370, 383, 432, 455, 456, 515, 516, 1077, 1199, 1489-1, 1566, 1786, 2386 part 1 to 7, 2502, 2720, 2911, 3025, 3616, 4031, 4351, 5513, 5514, 7320, 8183, 9377, 10078, 10086, 13311 - II	Bureau of India Standards (BIS)

Annexure - II

DOC. NO. QPE-CL- 04-51

REV NO. R00

SHEET NO. 1 of 2

FREQUENCY OF SAMPLING AND TESTING

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks	
I	EARTH WORK				
	Suitability of Fill Materials				
	(a)	Grain size Analysis	1S:2720 (Part IV)	One in every 2000 Cu.m. for each type and each source of fill material subject to a minimum of two samples	Test for soil and sand
	(b)	Liquid limit and Plastic Limit	IS:2720 (Part V)		Test for soil
	(c)	Shrinkage Limit	IS:2720(Part VI)	One in every 5000 cu.m. for each type and each source of fill materials	The frequency of Test shall be increased depending on type of soil.
	(d)	Free swell Index	IS:2720 (Part XL)		
	(e)	Chemical Analysis	IS:2720 (Part 5)		
	(i)	Organic matter	Part XXII	One in every 5000 cu.m. for each type and each source of fill materials	Test for soil and sand
	(ii)	Calcium Carbonate	Part XXIII		
	(iii)	PH	Part XXVI		
(iv)	Total soluble sulphate	Part XXVII			
II.	Standard Proctor Test	IS:2720 (Part VII)	One in every 2000 cu.m. for each type, each layer and each source of fill materials	Test for soil for determining optimum moisture content, Dry Density etc.	
III	Moisture content of Fill before compaction	IS: 2720 (Part-II)		Test for soil	

Annexure - II

DOC. NO. QPE-CL-04-51

REV NO. R00

SHEET NO. 2 of 2

FREQUENCY OF SAMPLING AND TESTING

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
IV	Degree of compaction of fill			
	a) Dry density by core cutter method OR Dry density implace by sand displacement methods	IS:2720 (Part XXIX) IS:2720 (Part XXVIII)	i. For foundation filling one for every ten foundations for each compacted layer for location of important and heavily loaded foundations. ii. For each filling, one for every 1000 sq.m. area for each compacted layer.	Test for soil
	b) Relative density Index	IS:2720 (Part XIV)	-do- (I) & (ii)	Test for sand
	c) Dry Density by proctor needle-penetration.	Standard Practice	Random checks to be carried out for each compacted layer in addition to tests mentioned under IV (a) above.	Test for soil.
	d) Permeability Test .	Standard Practice	Random checks	.Test for soil

FREQUENCY OF SAMPLING AND TESTING

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
I	Coarse Aggregates			
	e) Particle size and shape	IS:2386 (Part 1)	One per 100 cu.m. or part thereof or change of source whichever is earlier	Result to be as per the requirement of design mix, subject to variations within the limits specified in relevant Indian Standards.
	f) Moisture content	IS:2386 (Part 3)	Once for each stack of 100 cu.m. or part thereof except during monsoon when this has to be done every day before starting of the work.	Accordingly water content of the concrete shall be adjusted.
	g) Specific gravity, density, voids, absorption.	IS:2386 (Part 3)	Once in 12 weeks or change of source, whichever is earlier.	These tests shall be carried out while establishing design mix and results to be intimated.
	h) Mechanical properties, crushing value, abrasion value and impact value.	IS:2386 (Part 4)	Same as 'c' above	Acceptance norms shall be as per IS:383.
	i) Soundness	IS:2386 (Part 5)	Same as 'c' above	Acceptance norms shall be as per per IS:383.
	j) Reaction with alkali	IS:2386(Part 7)	Same as 'c' above	These tests shall be carried out while establishing design mix and result to be intimated. Acceptance shall be as per IS:2386 (Part 7)
	k) Flakiness and petrographic examinations	IS:2386	This is to-be done once in 12 weeks and should be repeated in case the source is changed.	These tests shall be carried out while establishing design mix and result to be intimated.
	h) Deleterious materials	IS:2386(Part 2)	Same as 'c' above	Results should be within the limits as specified in relevant Indian Standard.

Annexure - III

DOC. NO. QPE-CL-04-51
REV NO. R00
SHEET NO. 2 of 5

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
II	FINE AGGREGATES / SAND			
	a) Particle size and shape.	IS:2386 (Part I)	One per 100 cu.m. or part thereof or change of source, whichever is earlier.	Should be as per the requirement of design mix, subject to variation within the limit as specified in relevant IS Codes.
	b) Specific gravity density voids, absorption and bulking.	IS:2386 (Part 3)	Once in 12 weeks or change of source whichever is earlier.	These tests will be carried out while establishing design mix and results To be intimated.
	c) Bulkage, moisture content (Routine test)	IS:2386 (Part 3)	To be done everyday before start of work.	Volume of sand and weight of water shall be adjusted as per bulkage and moisture content.
	d) Silt, clay deleterious materials, organic impurities.	IS:2386 (Part 2)	Once per source and to be repeated, if source is changed.	Acceptance norms shall be as per IS:383.
	e) Soundness and Petrographic examination.	IS:2386(Part 5&8)	Same as `b' above	Acceptance norms shall be as per IS:383.
	f) Mortar making properties.	IS:2386 (Part 6)	Same as `b' above	Acceptance norms shall be as per IS:383.
	g) Reaction with alkali.	IS:2386(Part 7)	Same as `b' above	Acceptance norms shall be as per IS:383 and IS:2386 (Part 7)

Annexure - I

DOC. NO. QPE - CL – 04-51
REV. NO. R00
SHEET NO. 3 OF 5

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
III	CEMENT			
	a. Setting time	IS:4031	One sample from each batch received from stores.	Acceptance norms shall be as per relevant Indian Standard.
	b. Compressive Strength c. Fineness	IS:4031	One sample from each batch received from stores.	Acceptance norms shall be as per relevant Indian Standard.
IV.	WATER			
	Harmful substances, pH value, initial setting time, compressive strength.	IS-3025, IS:4031 & IS:516	Once a month for each source	Acceptance norms shall be as per Cl.4.3 of IS:456 1978.
V.	CONCRETE			
	a) Workability (Slump and compaction factor).	IS: 1199	One sample every two hours from every mixing plant.	Acceptance norms shall be as per Cl.6.1 of IS:456 1978.
	b) Crushing Strength	IS:516	i) As per Cl. 14.2.2 of IS:456-1978 for initial period.	Acceptance criteria shall be as per Cl.15 of IS:456-1978.
			ii) One sample of six cubes per 150 cu.m. or part thereof for mass concrete for subsequent period.	A minimum of 3 (Part-7) specimens shall be tested for 28 days strength.
	c) Water cement ratio.	IS:1199	At random at the time of batching.	According to mix design.
	d) Cement Content	IS:1199	At random at the time of batching.	According to mix design.
	e) Water-tightness test (for water retaining Structures).	IS:370	Each tank or reservoir.	Acceptance criteria as per specification & relevant IS codes.
	f) Finished:- dimensions	Physical measurement	All structures	Acceptance as per Specifications.

Annexure - III

DOC. NO. QPX – CL- 04-51

REV. NO. R00

SHEET NO. 4 OF 5

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
VI.	FORM WORK			
	a) Staging (Durability, strength & soundness of staging, joints. adequacy of its foundation and specific level).	Visual / Measurement	Each member	Any staging intended for use shall be approved by the Engineer for its durability and strength.
				After erection of staging, nominated representatives of Engineer shall check the soundness of the staging as a whole, its joints, adequacy of its foundation and the specific levels.
	b) Shuttering			
	i) Materials	Visual	Random	Form work materials shall be strictly as per specifications and approval of the Engineer. Materials for form work shall be unwrapped, thoroughly clean and without broken or damaged edges either due to repetitive use or otherwise oiling of form work before concreting shall be resorted to.
	ii) Joints	Visual	Random	Joints shall be leak proof to avoid loss of liquid.
	iii) Dimensions and plumb	Physical. measurement	Each member and before every lift.	Tolerances as per Specifications.

Annexure - III

DOC. NO. QPE - CL – 04-51
 REV. NO. R00
 SHEET No. 5 of 5

SL. No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
VII.	REINFORCEMENT			
	a) Placement	Visual/ Measurement	each	The bar bending schedule with the necessary hooks, laps, covers, spacers and chairs shall be 100% checked for all concreting works before start of the work.
	b) Cutting tolerance	Physical measurement	Random	Tolerance shall be as per specification.
	c) Freedom from defects.	Visual	Random	Any of the bars selected for use shall be free from cracks, surface flaws, laminations and rough, jagged and imperfect edges.
	d) Tensile strength	Lab test		
VIII	EMBEDDED PARTS			
	a) Type of embedment	Visual/ Measurement	Each part	Type/Details as per drawings. Tolerance as per specification.
	b) Location	Physical/ Measurement	-do-	Detail as per drawings. Tolerance as per specification.

METHOD FOR DETERMINATION OF SLUMP OF CONCRETE

Slump test As per IS 1199

Objective : To determine the consistency of fresh concrete and to check the uniformity of concrete from batch to batch.

Test Procedure

1. Internal surface and mould should be cleaned thoroughly to make it free from moisture and any set concrete.
2. Place the mould on levelled metal plate.
3. The internal surface of the mould (cone) shall be thoroughly cleaned and free from superfluous moisture and any set concrete.
4. The mould shall be placed on a smooth, horizontal rigid and non-absorbent surface (such as carefully levelled metal plate)
5. Cone shall be filled in four layers, each approximately one Quarter of the height of the mould.
6. Each layer shall be tamped with 25 strokes of the rounded end of the tapping rod in such a manner that the strokes are uniformly distributed over the cross section of the mould and for the second and subsequent layers the rod to be penetrated into the underlying layers.
7. After the top layer has been rodded the concrete shall be struck off level with a trowel or tapping rod.
8. Leaked out mortar between the mould and the base plate is cleaned away.
9. The mould should be removed from the concrete immediately by raising it slowly and carefully in a vertical direction.
10. The slump shall be measured immediately. (The slump can be measured by keeping the tapping rod on the inverted mould and thus measuring the difference between the height of the mould and that of the highest point of the specimen being tested).

NOTE:-

- i) The test is to be carried out at a place free from vibration or shock and within two minutes of sampling.
- ii) Slump specimen which collapsed or sheared off laterally should be rejected and another test should be carried out.
- iii) Actual slump to be recorded in logsheet L-05

Annexure - V

DOC. NO. QPE - CL – 04-51
REV. NO. R00
SHEET NO. 1 of 1

METHOD FOR DETERMINING THE COMPRESSIVE STRENGTH OF CONCRETE CUBES

(IS 516)

a) Age Test :

The age shall be calculated from the time of the addition of the water to the dry ingredients.

The testing shall be carried out at the age of 7 days and 28 days.

b) Number of Specimens :

Three specimen from different batches.

c) Procedure :

Specimens stored in water shall be tested immediately on removal from the water, in testing machine. The load shall be applied without shock and increased continuously at the rate of approx. 140 kg/ cm²/min, Until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The maximum load applied to the specimen shall then be recorded.

d) Calculation :

Compressive Strength (kg / cm²) = Max. Load Applied / Cross-sectional area

BOUGHT OUT ITEMS

Check the following bought out items for their specifications / IS codes before use

- i. Teak wood
- ii. Grout Materials
- iii. Steel doors & Press steel door frames (IS 4351)
- iv. Steel glazed windows
- v. Glass for glazing of doors & windows & partition work
- vi. Aluminium partition, doors, windows (IS:1548)
- vii. Rolling shutters
- viii. Water proofing cement paint
- ix. Alkali / Acid resistant resin based epoxy paint
- x. Fire resistant paint
- xi. Anto-corrosive bituminastic paint
- xii. Acid resistance bricks
- xiii. Asbestos Mill board
- xiv. Asbestos rope
- xv. Mineral wool
- xvi. Vineertax
- xvii. Marine Terrazo flooring / Cement Concrete flooring (granolithic & ironite)
- xviii. Glazed / Ceramic / tiles flooring, wall cladding
- xix. Flexivynyle lining / PVC tiles
- xx. Heavy duty water proofing treatment on roof
- xxi. Under desk insulation & aluminium false ceiling materials
- xxii. Galvanised pipeline for water supply including fittings, C I pipes, RCC non-pressure pipes
- xxiii. Coarse aggregate
- xxiv. Fine aggregate
- xxv. Reinforcement
- xxvi. Cement

Note :-

- 1) Customer may witness the tests at manufacturers' premises or at laboratory as and when felt necessary.



PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF QPI	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	CHECKED BY SIGN. & DATE	ACCEPTED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	DOC. NO. QPE - CL - 04-51
PROJECT					REV. NO. R00
UNIT NO.					LOG SHEETNO. L-00
RATING					SHEET / SHEETS



PSEER

INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

CONSISTENCY OF CEMENT PASTE

This method is for determining the quantity of water required for preparing a cement paste of standard consistency. This can be performed by vicat apparatus.

Date of Testing

Reading recorded by analyst

Weight of sample _____ gms 500 gms for 80 mm diameter vicat
mould

Quantity of water _____ ml

Time of gauging _____ min. 3 to 5 min.

Penetration of plunger _____ mm 5 to 7 from bottom of the mould
of 10 mm diameter

Formula : $\frac{\text{Water added} \times 100}{\text{Weight of cement}}$

Consistency : _____ %

			NAME	SIG. / DATE	DOC. NO. QPE-CL- 04-51
PROJECT		CHECKED BY			REV. NO. R00
UNIT NO.		ACCEPTED BY			LOGSHEETNO. L-01
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



PSER

INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

INITIAL & FINAL SETTING TIMES OF CEMENT
(VICAT APPARATUS)

Date of testing

Weight of sample _____ gms
mould

500 gms for 80 mm diameter vicat

Quantity of water _____ ml

85% of standard consistency

i) Initial Setting Time :

Penetration of vicat needle of 1 mm²
mould

5 + 0.5 mm from the bottom of the

Initial Setting

min/sec

Total time from water addition to
proper penetration of the needle.

ii) Final Setting Time :

Final setting Time

min. / sec.

Total time from water addition to
failure of making outer impression of the
surface of the cement specimen.

iii) Specification :

Initial (mins.) Min 30 min.

Final (mins.) Max 600 min.

			NAME	SIG. / DATE	DOC. NO. QPE-CL- 04-51
PROJECT		CHECKED BY			REV. NO. R00
UNIT NO.		ACCEPTED BY			LOGSHEETNO. L-02
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



PSER

INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

**GRADING OF THE SAND
(FINE AGGREGATE)**

Date of testing

Weight of sample _____ gms

Type of Aggregate :

Sl. No.	Retained on IS Sieve No.	Weight Retained	Percentage Weight Retained	Cumulative % Weight Retained	Percentage Passing
1.	10 mm				
2.	4.74 mm				
3.	2.36 mm				
4.	1.18 mm				
5.	600 microns				
6.	300 microns				
7.	150 microns				
8.	75 microns				

GRADING ZONES OF FINE AGGREGATE (IS 383)

IS Sieve Designation	Percentage Passing for			
	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
10 mm	100	100	100	100
4.75 mm	90 - 100	90 - 100	90 - 100	95 - 100
2.36 mm	60 - 95	75 - 100	85 - 100	95 - 100
1.18 mm	30 - 70	55 - 90	75 - 100	90 - 100
600 microns	15 - 34	35 - 59	60 - 79	80 - 100
300 microns	5 - 20	8 - 30	12 - 40	15 - 50
150 microns	0 - 10	0 - 10	0 - 10	0 - 15

			NAME	SIG. / DATE	DOC. NO. QPE - CL - 04-51
PROJECT		CHECKED BY			REV. NO. R00
UNIT NO.		ACCEPTED BY			LOGSHEETNO. L-03
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



PSER

INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

SIEVE ANALYSIS**GRADING OF COARSE AGGREGATE**

Date of testing _____

Weight of sample _____ gms

Type of Aggregate : _____

Sl. No.	Retained on IS Sieve No.	Weight Retained	Percentage Weight Retained	Cumulative % Weight Retained	Percentage Passing
1.	10 mm				
2.	20 mm				
3.	16 mm				
4.	12.5 mm				
5.	10 mm				
6.	4.75 mm				
7.	2.36 mm				

GRADING ZONES OF FINE AGGREGATE (IS 383)

IS Sieve Designation	Percentage Passing for Graded Aggregate of Nominal size			
	40 mm	20 mm	16 mm	12.5 mm
10 mm	95 - 100	100	-	-
20 mm	30 - 70	95 - 100	100	100
16 mm	-	-	90 - 100	-
12.5 mm	-	-	-	90 - 100
10 mm	10 - 35	25 - 55	30 - 70	40 - 85
4.75 mm	0 - 5	0 - 10	0 - 10	0 - 10
2.36 mm	-	-	-	-

			NAME	SIG. / DATE	DOC. NO. QPE-CL- 04 -51
PROJECT		CHECKED BY			REV. NO. R00
UNIT NO.		ACCEPTED BY			LOGSHEETNO. L-04
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

FMT-QP-008 REV. 00



PSEER

INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

COMPRESSIVE STRENGTH OF CEMENT CONCRETE

Name of Agency :

Location / Structure :

Grade of Concrete Mix Proportion :

Sl. No.	Date of Casting	Cube Identification Mark	Slump (mm)	Concrete Quantity from which sampling done	Date of Testing	Age of Cube	Weight of Cube	Compression Strength / mm ²		Remarks
								Individual	Average	

						NAME	SIGNATURE / DATE	DOC. NO. QPE - CL - 04-51
PROJECT			CHECKED BY					REV. NO. R00
UNIT NO.			ACCEPTED BY					LOG SHEET NO. L-05
RATING			CUSTOMER					SHEET 1 / 1 SHEETS

FMT-QP-009 REV. 00