

FIELD QUALITY PLAN for CIVIL WORKS (EXCEPT PILING WORK)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT



BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S ENGINEER

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-U-QA-300001-PSE, REV. NO. : 2



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

**BHEL DOC. NO. : QPE-MTE-660-CL-01
REV No.: 2**

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for

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(EXCEPT PILING WORK)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

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PREPARED BY	 DE/QLY, BHEL, PSER	APPROVED BY	 HEAD / QLQ, BHEL, PSER
FQP NO.		QPE-MTE-660-CL-01	
ORIGINAL DATE OF ISSUE		20/07/2017	
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ISSUED BY (SIGNATURE & DESIGNATION)		DE/QLY, BHEL, PSER	



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SHEET 1 / 1 SHEETS

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*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract



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SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	A, Dated 20/07/2017	Document prepared as per Technical Specifications of BIFPCL
02	Sl. No. A.01 in Sheet 02 of 'Statement of Checks'	1, Dated 15/09/2017	Revised as per comment dated 12/09/2017 from BIFPCL / OE
03	Sl. No. A.02 in Sheet 02 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
04	Sl. No. B.07A, B.07B, B.07C in Sheet 02 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
05	Sl. No. C.01 in Sheet 03 of 'Statement of Checks'		1. Review of physical & compositional requirement added 2. quantum of check changed
06	Sl. No. C.05 in Sheet 04 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
07	Sl. No. D.03 in Sheet 04 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
08	Sl. No. D.05B in Sheet 04 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
09	Sl. No. D.08 in Sheet 05 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
10	Sl. No. D.09F in Sheet 06 of 'Statement of Checks'		Quantum of check changed & remarks added.
11	Sl. No. E.01 in Sheet 06 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
12	Sl. No. G.01 in Sheet 08 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
13	Sl. No. H.01C, H.01D, H.03C & H.03D in Sheet 10 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
14	Sl. No. L.06C in Sheet 13 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
15	Sl. No. Q.03A in Sheet 16 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
16	Sl. No. Q.03A in Sheet 16, Q.04A in Sheet 17 & Q.05A in Sheet 19 of 'Statement of Checks'		Revised as per comment dated 12/09/2017 from BIFPCL / OE
17	Annex-II		Revised as per comment dated 12/09/2017 from BIFPCL / OE
18	AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION	2, Dated 15/11/2017	Revised as per comment dated 14/11/2017 from BIFPCL / OE
19	Sl. No. B.07C in Sheet 2, B.07D in Sheet 3 & M.03 in Sheet 13 of 'Statement of Checks'		



AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

2



Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:
Product nonconformities: BHEL Engineering Centre.
Process/System nonconformities: Head (Quality): BHEL, PS ER.
2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.
3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.
4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.
5. Concerned agencies shall ensure that instruments having valid calibration are only used for measurements.
6. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.
7. Only authorised persons with proper safety gears to enter construction area



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SHEET 01 / 19 SHEETS

STATEMENT OF CHECKS

Capacity / Type : 660MW

System : CIVIL WORKS

Sub-system : CIVIL WORKS (EXCEPT PILING WORK)

Area : CONSTRUCTION & TESTING

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:

R – Record Verification

V – Visual Check

P – Physical Check

M – Measurement

T – Test

MTC – Manufacturers Test Certificate

SR – Site Register



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SHEET 02 / 19 SHEETS

SYSTEM: CIVIL WORKS

SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)

AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
A GENERAL REQUIREMENTS								
A.01	Ensure availability of requisite laboratory set up and equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of owner / OE. 	P & R	-	A	Once prior to start of work and thereof monthly	- Technical Specifications & Drawing -The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use. 	SR	-Functioning of laboratory equipment in proper working condition to be verified on monthly basis. -calibration of MMRs shall be done by approved lab and the report shall be submitted to owner/ OE. 
A.02	Sampling for testing of building materials for concrete mix design etc.	P		A	Once per each source & each grade of concrete	- do -	Joint Protocol 	
A.03	Ensure availability of following - a) approved drawing b) approved Design mix of concrete	P	-	A	100% for each structure & each grade of concrete	ACI 211.1-97 (Design Mix of Concrete) & ACI 318-14 OR BS EN 206:2013A1:2016 (Acceptance criteria for fresh & hardened concrete)	-	Concrete Mix design to done as per ACI 211.1-97 and in line with the requirements of approved drawing,
B EARTH WORK (EXCAVATION, BACKFILLING, LEVELLING, GRADING & COMPACTION)								
B.01	Identification of disposal points for excavated material	P	-	B	Before start of excavation	The Conditions of Contract	Joint Protocol	
B.02	Nature, type of soil / rock before and during excavations	V	As required & agreed	B	Random in each shift	Owner's Tech. Specifications & Drawing	SR	
B.03	Initial ground level before start of excavations	M	As required & agreed	B	100%	Drawing, BS 6031:2009	SR	
B.04	Final shape and Dimensions of excavations.	M	As required & agreed	B	Random in each shift	Drawing, BS 6031:2009	SR	
B.05	Final excavation levels	M	As required & agreed	B	100%	Drawing, BS 6031:2009	SR	
B.06	Side slope of final excavation	M	As required & agreed	C	100%	Drawing, BS 6031:2009	SR	
B.07	EXCAVATION IN HARD ROCK - IF REQUIRED							
B.07A	Receipt, Storage, accountability of Explosive	P	As required	 A	Randomly once in a week	Bangladesh Explosive Act and any other statutory requirement	SR	OWNER approved specialist blasting agency shall be deployed at site for trial blasts, design blasts, blast vibration monitoring etc. Seismographs shall be deployed at site for monitoring of blast operation vibrations.
B.07B	Execution of Blasting Operation	P	As required	 A	Random in each shift	Approved Method, BS 6031:2009 & BS 5607:1998	SR	
B.07C	Submission of Blasting report to EIC	P	As required	 C	Each blast	-	Report	



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SHEET 03 / 19 SHEETS

SYSTEM: CIVIL WORKS

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AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS	
1	2	3	4	5	6	7	8	9	
B.07D	Excavation in Hard Rock (Blasting Prohibited)	P	As required	A	100%	Drawing, Owner's Tech. Specifications BS 6031:2009	SR		
B.08	Checks for suitability of borrow fill material	T	As required	A	As Per Annex-II	Annex -II & Drawing	SR / Lab Report	The parameters should not be worse than the parameter of the existing soil in plant area	
B.09	Standard proctor Test of fill material before fill	T	As required	A	As Per Annex-II	Annex -II & Drawing	SR / Lab Report		
B.10	Moisture content of fill material before compaction	T	As required	A	As Per Annex-II	Annex -II & Drawing	SR / Lab Report		
B.11	Dry density by core cutter method OR Dry density in place by sand displacement method	T	As required	A	As Per Annex-II	Annex -II & Drawing	SR / Lab Report		
B.12	Relative density (Density Index)	T	As required	A	As Per Annex-II	Annex -II & Drawing	SR / Lab Report		
B.13	Dry Density by proctor needle penetration	T	As required	A	As Per Annex-II	Annex -II & Drawing	SR / Lab Report		
B.14	Checking of level after compaction	M	Auto level / Total station	B	100%	Drawing	PROTOCOL		
C	RAW MATERIALS FOR CONCRETE								
C.01	Tests on Cement : A. Review of MTC for both physical & compositional requirement (Type of cement with clinker composition for Bogue's compounds viz. C3S, C2S, C3A, C4AF) B. Field Tests - i) Consistency of cement & Initial and final setting time ii) Compressive strength - 3 days & 7 days iii) Fineness iv) Sulphate Resistance (if applicable)	1	R & T	Vicat Needle, Compressive Testing Machine, Cube Mould, Vibrator, Curing chambers, Weighing Devices	A	for each batch or per month whichever is earlier 1	A) Drawing, Mix Design, ASTM C150M - 16 & ASTM C1157M - 11 B-i) ASTM C191M B-ii) ASTM C109/C109M B-iii) ASTM C 430M-08(2015) B-iv) ASTM C452M	MTC & SR	To be sourced from BIFPCL / OE approved supplier. Each consignment of cement shall be duly correlated with manufacturers TC
C.02	Tests on Fine Aggregate (Sand)	T	As required	A	As per Annex-I	Mix Design, BS EN 12620:2002+A1:2008 / ASTM C 33M-16E1	PROTOCOL / Lab. Report	To be sourced from BIFPCL / OE approved supplier. Each size of aggregate shall be separately stored & the material shall be handled in a manner that will prevent contamination & intermixing.	
C.03	Tests on Coarse Aggregates	T	As required	A	As per Annex-I	Mix Design, BS EN 12620:2002+A1:2008 / ASTM C 33M-16E1	PROTOCOL / Lab. Report		

Date: 28-Nov-2017

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SHEET 04 / 19 SHEETS

SYSTEM: CIVIL WORKS

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1	2	3	4	5	6	7	8	9
C.04	Admixtures (Type & suitability)	R	-	B	Each batch of supply	Mix Design, ASTM C1017M-13E1 (high-slump concrete producing admixtures), ASTM C 494M-16 (Water-reducing, Accelerating, Retarding admixtures) & ASTM C1582M – 11 (Chloride-Induced Corrosion Inhibit admixture)	MTC & SR	- To be sourced from BIFPCL / OE approved supplier & Review of MTC at site - Trial mix to be made using the cement, aggregates and admixture using the mixture proportions, batching sequence and other physical conditions proposed for the specific work (refer D.01)
C.05	Construction Water	1 R / T	-	B	Once per month	ASTM C1602M – 12 OR BS EN 1008:2002	Test Report	Test for pH shall be done weekly at site. 1

D CONCRETING (MIXING, CONVEYING, PLACEMENT, COMPACTION, CURING & TESTING)

D.01	Trial Mix (Trial mixes of each mix design to ascertain the workability and cube strength)	P	-	A	One for each mix proportion	ACI 211.1-91 (2009) & ACI 318-14 OR BS EN 206:2013+A1:2016 (Acceptance criteria for fresh & hardened concrete)	SR / Lab. Report	1. Concrete Mix Design by ACI 211.1-91 2. Slump test of fresh concrete & compressive strength test at 7 days & 28 days to be done.
D.02	Mixing of concrete	V	Calibrated batching plant	A	100%	ASTM C94M – 16b	Batching plant ticket / slip	Batching plant to be calibrated at the time of starting and subsequently once in three months or in event of major repair. Provision of online printer is mandatory
D.03	Temperature control of concrete & mix adjustment/batch correction	V	As required	A	100%	Owner's Technical Specifications, Designed mix., drawing & ACI 318-14 OR BS EN 206:2013+A1:2016	SR	Temperature control check of concrete shall be for mass concreting & hot weather concreting.
D.04	Arrangement for transportation of concrete.	V	As required	C	100%	-	SR & Checklist	As per approved construction methodology
D.05	TESTS ON FRESH CONCRETE :							
D.05A	Review of grade of Concrete (at pouring point)	R	-	C	Each truck	Drawing & ACI 318-14 OR BS EN 206:2013+A1:2016	SR	Review batching plant ticket / slip
D.05B	Slump Test (at pouring point)	T	Slump Test Apparatus	B	As required 1	BS EN 12350-2 or ASTM C 143/C 143M-15A	SR	


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1	2	3	4	5	6	7	8	9
D.05C	Sampling for compressive strength (at pouring point)	P	Cube / Cylinder moulds	B	As per Table 17 of BS EN 206:2013+A1:2016	ASTM C 31M-15AE1, BS EN 206:2013+A1:2016	SR	Min. of 6 cubes for each sample. 3 specimen shall be tested at 7 days remaining 3 shall be for 28 days
D.05D	Workability time (at batching plant & pouring point)	T	Slump Test Apparatus	B	First truck each day	BS EN 12350-2 or ASTM C 143/C 143M-15A	SR	Check for Change of slump from Batching plant to site
D.06	Placement of concrete.	P & M	Measuring tape / Auto level	C	100%	ACI 318-14 OR BS EN 206:2013+A1:2016	SR & Checklist	As per approved construction methodology
D.07	Compacting of concrete.	P	As required	C	Random in each shift	ACI 318-14 OR BS EN 206:2013+A1:2016	SR & Checklist	As per approved construction methodology
D.08	Curing of concrete.	P	As required	C	Random in each shift	ACI 308R - 16 1	SR & Checklist	As per approved construction methodology. If used, curing compound shall comply with ASTM C309
D.09	Tests / Checks on hardened concrete :							
D.09A	Visual inspection of concrete surface of foundations just after removal of shuttering	V	-	B	100%	Owner's Tech. Specification & Drawing	SR & Checklist	
D.09B	Dimensional check on finished structures	M	Measuring tape / Auto level	B	100%	Owner's Tech. Specification & Drawing	SR	
D.09C	Pulse velocity test through concrete of Top deck of TG & other vibrating equipment (viz. BFP, ID fan, FD fan, PA fan etc.)	R	As required	A	100% for top deck of major equipment only	ASTM C 597-16 OR equivalent European Standard	Test Report & SR	BIFPCL/ OE approved agency to be deployed for test
D.09D	Embedment of inserts in concrete shall be checked for gap if any using hammer for all major equipment foundations	T	Hammer	B	100% for major equipment foundations	No hollow sound	SR	
D.09E	Workmanship and dimensions of precast concrete members	M	As required	B	100%	BS EN 13369:2013 OR equivalent American Standard	SR	



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1	2	3	4	5	6	7	8	9
D.09F	Type test on precast concrete members 	T	as required	A	1 no for every 1000 nos. or part thereof for each type 	BS EN 13369:2013 OR equivalent American Standard	SR	- When the design of a product has been approved by owner / OE, type-test is not required. - for other products, rebound hammer test / flexural strength test to be done.
D.10	JOINTS IN CONCRETE							
D.10A	Joint material - bitumen impregnated fibre board, PVC/Copper water stops, Sealing compound, Expanded polystyrene board, Hydrophilic strip, Acrylic polymer etc.	R	-	A	Each batch of delivery at site	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of co-related MTC
D.10B	Acceptance of installation	V	-	B	100%	Drawing	SR	
D.11	EMBEDDED Parts (INCLUDING RAILS & ANCHOR BOLTS)							
D.11A	Material	R	-	A	Each lot of delivery at site	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of co-related MTC - for shop fabricated parts, MDCC shall be review
D.11B	Fabrication Checks (if site fabricated) - cutting, bending, forming, welding, final dimension & primer painting	V & M	Measuring tape	B	100%	Owner's Tech. Specifications & Drawing	SR	
D.11C	Position / alignment / levels of embedded parts / bolts / pipe sleeves / rails / PVC pipes / etc.	V & M	Measuring tape / Auto level	B	100%	Drawing	SR	for shop fabricated parts, MDCC shall be reviewed
E	REINFORCEMENT BARS							
E.01	Review of MTC for Mechanical, Physical and Chemical Properties for each lot 	R	-	A	Each lot of supply	BS 4449:2005+A2:2009 & drawing	MTC & SR	To be sourced from BIFPCL / OE approved supplier & Review of MTC at site
E.02	Visual inspection of steel (freedom from cracks, surface flaws, Lamination & rust)	P	As required	B	Random in each shift	BS 4449:2005+A2:2009 & drawing	SR	1. To be checked at site. 2. Steel should be free from excessive rust. 3. To be stored on concrete slippers without touching the earth and as per Technical Specs.
E.03	Bar bending schedule with necessary lap, Spacers & Chairs	R	As required	B	100%	Drawing & BS 8666:2005/ ACI 315-99 & ACI 307 (for chimney)	BBS	
E.04	Bending of bars, cutting tolerance	V	As required	C	100%	Drawing & BBS	SR	



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1	2	3	4	5	6	7	8	9
E.05	Acceptance - Cover, spacing of bars, spacers and chairs after the reinforcement cage is put inside the formwork	V & M	As required	B	100%	Drawing	SR	

F FORM WORK & STAGING

F.01	Materials and accessories	V	-	B	ANNEX-III	ACI 347R-14 OR Equivalent European Standard	SR	
F.02	Soundness of staging, shuttering and scaffolding including application of mould oil / release agent	R	-	B	ANNEX-III	ACI 347R-14 OR Equivalent European Standard	SR	Review of method statement. * For TG deck, the form work & staging to be vetted by BIFPCL/OE approved third party
F.03	Acceptance of formwork before start of concreting	V & P	As required	B	ANNEX-III	Method statement	SR	
F.04	SPECIAL CHECKS FOR SLIP-FORM SHUTTERING							
F.04A	Review of Slipform System Design.	R	-	A	Before Commencement of work	ACI 347R-14 OR Equivalent European Standard	Report	- The design is to be vetted by a BIFPCL / OE approved third party -Submission of vetted design to BIFPCL / OE for review
F.04B	Review of method statement for Positions and arrangement of Jack rods, proposed method for concrete curing and protection and Proposed arrangement for continuous readings	R	-	A	Before Commencement of work	Owners Technical Specifications, BS EN 12810 & BS EN 12811	Method Statement	Submission to BIFPCL / OE for review
F.04C	Acceptance of the Slipform shutters before start of concreting	V & P	As required	B	100%	Slip Form Design & Method statement	SR	* Customer Hold Point
F.04D	Check for All type of openings, Chases, Fixing of Blocks and similar built-up features	V & M	As required	B	100%	Drawing & ACI 307	SR	
F.04E	Checks for Temporary Lightening protection & Aircraft warning lights during construction	V & P	As required	A	Once prior to start of work and thereof weekly	as per approved methodology	SR	
F.04F	Check for Sliding Operation	P	As required	C	Six hourly intervals	Owner's Technical Specifications, ACI 307 & Clause No. 7.2 of BS EN 206	SR	



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1	2	3	4	5	6	7	8	9
F.04G	Checking of wall faces for finishing & appearance	V	-	C	-do-	Owners Technical Specifications & ACI 307	SR	Random 10% Surveillance check by BIFPCL/OE
F.04H	Progress Height	M	Measuring tape	B	-do-	Drawing	L-01	
F.04I	Centre line in relation to the centres at the base	M	Plumb	B	-do-	drawing, Tolerance as per ACI 307	L-01	
F.04J	Diameter	M	Measuring tape	B	-do-	-do-	L-01	
F.04K	Wall thickness	M	Measuring tape	B	-do-	-do-	L-01	
F.04L	Twist	M	Plumb / Laser Beam	B	-do-	-do-	L-01	
F.04M	Correction of level w.r.t. bench mark	M	Totalstation & water level	B	At every internal platform level	drawing	L-02	
G	MASONRY WORK							
G.01	Test on Clay Bricks - Dimensions , shape, compressive strength, water absorption, warpage, efflorescence.	M & T	As required	A	At least ten individual brick shall be selected for lots of 100000 bricks or part thereof, 1	BS EN 771-1:2011+A1:2015 or a> ASTM C 62-13A (STANDARD SPECIFICATION FOR BUILDING CLAY BRICKS) & b> ASTM C 67-16 (STANDARD TEST METHODS FOR SAMPLING AND TESTING BRICK)	SR	For larger lots, five additional specimens shall be selected from each additional 500000 brick or fraction thereof
G.02	Test on AAC masonry units - Dimensions , shape, compressive strength, dry bulk density, drying shrinkage, % of flyash content (if used).	R & M	As required	A	One Sample for 30,000 nos. or part thereof	BS EN 771-4:2011+A1:2015 OR a> ASTM C 1691-11 (Standard Specification for Unreinforced Autoclaved Aerated Concrete Masonry Units) & b> ASTM C 1693-11 (Standard Specification for Autoclaved Aerated Concrete)	SR	- to be sourced from BIFPCL/OE approved manufacturer - Only dimensional checks shall be done at site as per column '6'. - for other tests results, Manufacturer TC shall be reviewed


BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO-PSE
REVISION QUANTITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP NO.: MAITREE-00-U-QA-300001-PSE

BHEL Doc. No. : QPE-MTE-660-CL-01

REV.NO.: 2

SHEET 09 / 19 SHEETS

SYSTEM: CIVIL WORKS

SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)

AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
G.03	Tests on Mortar -							
G.03A	Tests on Mortar aggregates	T	As required	A	Once every 50m ³ or part thereof	ASTM C 144-11 (Standard Specification for Aggregate for Masonry Mortar)	SR	
G.03B	Compressive strength	T	As required	A	random in each shift	ASTM C 109M-16A (Standard Test Method for Compressive Strength of Hydraulic Cement Mortars)	SR	
G.04	Masonry construction - Workmanship, verticality and alignment	V	As required	B	As per Standard	TMS 602-08 / ACI 530.1-08 / ASCE 6-08	SR	
G.05	Curing of masonry construction	V	As required	C	100%	Owner's Tech. specifications, drawings and agreed methodology	SR	
G.06	PLASTERING							
G.06A	Tests on aggregates for plaster	T	As required	A	Once every 50m ³ or part thereof	ASTM C C897 – 15 (Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters)	SR	
G.06B	Thickness, finishing of plaster & trueness of plastering system	T	As required	A	random in each shift	ASTM C 926-17 (STANDARD SPECIFICATION FOR APPLICATION OF PORTLAND CEMENT-BASED PLASTER)	SR	
G.06C	Curing of plaster	V	As required	C	100%	Owner's Tech. specifications, drawings and agreed methodology	SR	
G.07	Galvanized wire netting for plastering	R	-	B	100%	Drawing & ASTM C 1032-14	SR	BIFPCL/OE approved source & Review of MTC
G.08	DAMP PROOF COURSE							
G.08A	Material - Hot bitumen and water proofing materials etc. (for checks on concrete for DPC, relevant points of this FQP to be referred)	R	-	A	Each batch of delivery at site	Drawing & BS 6398:1983	SR	BIFPCL/OE approved source & Review of MTC
G.08B	Acceptance of damp proof course	V	-	B	100%	Drawing	SR	



BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO-PSE/REC/QUANT/1018N
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP NO.: MAITREE-00-U-QA-300001-PSE
BHEL Doc. No. : QPE-MTE-660-CL-01

REV.NO.: 2

SHEET 10 / 19 SHEETS

SYSTEM: CIVIL WORKS

SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)

AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
H	PAINTING & FINISHING							
H.01	PAINTING SYSTEM - CONCRETE WORKS AND PLASTERED MASONRY SURFACES							
H.01A	Materials and accessories- Hot Bitumen, Bituminous Paint, Oil Bound, Acrylic Emulsion, Epoxy Chemical Resistant, Oil Resistant Paint etc.	R	-	A	Each batch of delivery at site	Drawing / Paint Schedule & relevant European or American Standards	SR	BIFPCL/OE approved source & Review of MTC
H.01B	Surface preparation	V		B	Random in each shift	Drawing / Paint Schedule & Paint manufacturer's recommendation	SR	
H.01C	Primer application	V & M	As required	 B	100%	Drawing / Paint Schedule & Paint manufacturer's recommendation	SR	10% Random surveillance checks by BIFPCL / OE
H.01D	Final Paint application & acceptance of painted surfaces	V & M	As required	 A	100%	Drawing / Paint Schedule	SR	
H.02	STONE GRIT PLASTER / GRANULAR TEXTURED FINISH							
H.02A	Materials and accessories	R	-	A	100%	Drawing & Owner's Tech. Specifications	SR	- BIFPCL / OE approved source - Review of MTC ('MTC shall contain all the parameters specified in the technical specifications)
H.02B	Thickness & finishing of plaster	P	As required	B	100%	Drawing & Manufacturer's recommendations	SR	
H.03	PAINTING SYSTEM - STEEL WORKS (OTHER THAN STRUCTURAL STEEL WORKS)							
H.03A	Materials and accessories- Oil Bound, Acrylic Emulsion, Chemical Resistant, Oil Resistant Paint etc.	R	-	A	Each batch of delivery at site	Drawing / Paint Schedule & relevant European or American Standards	SR	BIFPCL/OE approved source & Review of MTC
H.03B	Surface preparation	V		B	Random in each shift	Drawing / Paint Schedule & Paint manufacturer's recommendation	SR	
H.03C	Primer application	V & M	As required	 B	100%	Drawing / Paint Schedule & Paint manufacturer's recommendation	SR	10% Random surveillance checks by BIFPCL / OE
H.03D	Final Paint application & acceptance of painted surfaces	V & M	As required	 A	100%	Drawing / Paint Schedule	SR	



BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO-PSEN/REC/QUANT/1018
FOR
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FQP NO.: MAITREE-00-U-QA-300001-PSE
BHEL Doc. No. : QPE-MTE-660-CL-01

REV.NO.: 2

SHEET 11 / 19 SHEETS

SYSTEM: CIVIL WORKS

SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)

AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
I GROUTING								
I.01	Material	R	-	A	Each batch of delivery	ASTM C 1107M-14a : Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)	SR	- BIFPCL/OE approved source - Review of MTC - Compressive strength test at 1 day & 3 days to be done from each batch prior to start of grout
I.02	Mixing, placement, application and grout pressure (if required)	P	As required	B	Random in each shift	Manufacturer recommended procedure	SR	
I.03	Compressive strength	T		A	Random in each shift	Drawing	SR	Compressive strength test at 3 days, 7 days & 28 days to be done.
I.04	Acceptance of the grouts	V		B	Each grout section	Drawing	SR	
J PERMANENTLY COLOUR COATED METAL DECK SHEET & METAL CLADDING								
J.01	Material	R	-	A	Each lot of delivery	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MDCC
J.02	Storage	V	-	C	Once in a week	Manufacturer's recommendations	SR	Prevention of distortion / blemishing / water staining.
J.03	Finishing and acceptance (Installation, lap alignment & workmanship).	M	As required	B	100%	Drawing	SR	
K INSULATION WORK								
K.01	Material - Insulation material, galvanised wire net, aluminium foil, fasteners	R	-	A	Each lot of delivery	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MDCC for Insulation & MTC for other materials
K.02	Acceptance of each type of installation	V & M	As required	B	100%	Drawing	SR	



BHARAT HEAVY ELECTRICALS LIMITED
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SHEET 12 / 19 SHEETS

SYSTEM: CIVIL WORKS		SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)					AREA: CONSTRUCTION	
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
L	DOOR, WINDOWS, LOUVERS, GLAZING FENCING & FALSE CEILING							
L.01	STEEL & FIRE DOORS							
L.01A	Source of supply	R	Review of MTC & additionally review of approved drawing in case of fire proof doors	A	Each type of door	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - The Fire proof door drawing proposed for supply should have been tested and approved by CSIR-CBRI Roorkee or HBRI, Bangladesh or any other vetting agency approved by BIFPCL/OE for the similar dimensions & similar fire rating.
L.01B	Receipt inspection (Dimensions & Finish) - Door & accessories	V & M	As required	B	100%	Drawing	SR	
L.01C	Fixing (Finishing and acceptance)	V	As required	B	100%	Drawing	SR	
L.02	ANODISED ALUMINIUM WORKS							
L.02A	Material - Aluminium sections & accessories	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC
L.02B	fabrication (Dimensions & Finish) - Door & accessories	V & M	As required	B	100%	Drawing	SR	
L.02C	Fixing (Finishing and acceptance)	V & M	As required	B	100%	Drawing	SR	
L.03	STEEL WINDOW, LOUVERS, GRILL / ROLLING SHUTTERS							
L.03A	Material (including accessories)	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC
L.03B	Receipt inspection (Dimensions & Finish) - including accessories	V & M	As required	B	100%	Drawing	SR	
L.03C	Fixing (Finishing and acceptance)	V & M	As required	B	100%	Drawing	SR	

Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of its responsibility as specified in the Contract.

Bharat Heavy Electricals Limited PS:ER, KOLKATA		Tender No. PSE/PS/2019/1018 FOR CIVIL WORKS (STATEMENT OF CHECKS)						FQP No.: MAITREE-00-U-QA-300001-PSE BHEL Doc. No. : QPE-MTE-660-CL-01 REV.NO.: 2 SHEET 13 / 19 SHEETS	
SYSTEM: CIVIL WORKS		SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)						AREA: CONSTRUCTION	
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS	
1	2	3	4	5	6	7	8	9	
L.04 GLAZING (GLASS, POLY CARBONATE SHEET - SINGLE WALL & MULTI WALL, PVC SHEET ETC.)									
L.04A	Material	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC	
L.04B	Installation finishing and acceptance	V & M	As required	B	100%	Drawing	SR		
L.05	FENCING & GATES								
L.05A	Material (including accessories)	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC	
L.05B	Installation finishing and acceptance	V & M	As required	B	100%	Drawing	SR		
L.06	FALSE CEILING								
L.06A	Materials (gypsum glass, glass fibre membrane, fibre board acoustical tiles, metal false ceiling panels support system etc.)	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC	
L.06B	Installation finishing and acceptance	V & M	As required	B	100%	Drawing	SR		
L.06C	Acceptance of erected supporting rail / hangers	P	As required	B	100%	Drawing	SR		
M WATER PROOFING (INCLUDING ROOF TREATMENT)									
M.01	Methodology for the application of water proofing system	R	-	A	Before start of work	Owner's Tech. Specifications & Drawing	Method Statement	- BIFPCL / OE approved source - Review of methodology	
M.02	Material	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	MTC shall contain all the parameters specified in the technical specifications	
M.03	Acceptance of water proofing work	V & M	As required	A	100%	Drawing & approved method statement	SR		
N FLOOR FINISHES AND ALLIED WORKS (Cement Concrete Flooring, Tiles, Interlocking Blocks, Kota Stone, Granite, Marble, Metallic / non-metallic hardener, Acid / alkali and oil resistant high built seamless epoxy finish & Rubber Flooring)									
N.01	Materials	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC ('MTC shall contain all the parameters specified in the technical specifications)	



BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO-PSEN010018
REVISION QUANTITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP NO.: MAITREE-00-U-QA-300001-PSE
BHEL Doc. No. : QPE-MTE-660-CL-01

REV.NO.: 2

SHEET 14 / 19 SHEETS

SYSTEM: CIVIL WORKS

SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)

AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
N.02	Finishing and acceptance	V & M	As required	B	100%	Drawing	SR	Experienced workers to be deployed & work to be done as per recommendation of manufacturer.
O WATER SUPPLY / SANITARY INSTALLATIONS (Water supply fittings and fixtures; Sand cast iron / cast iron pipes; Sanitary fittings and fixtures; RCC Pipes & Water Storage Tanks)								
O.01	Materials	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC ('MTC shall contain all the parameters specified in the technical specifications)
O.02	Finishing and acceptance	V & M	As required	B	100%	Drawing	SR	Experienced workers to be deployed.
P OTHER SPECIAL ITEMS								
P.01	BITUMEN LAYER FOR TANK FOUNDATION							
P.01A	Material (Grade of bitumen)	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC ('MTC shall contain all the parameters specified in the technical specifications)
P.01B	Acceptance and workmanship	V & M	As required	B	100%	Drawing	SR	
P.02	COMPOSITE ALUMINIUM PANELS AND STRUCTURAL GLAZING							
P.02A	Material (Type of aluminium panels / structural glazing / fasteners and fixtures / silicon sealant)	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC ('MTC shall contain all the parameters specified in the technical specifications)
P.02B	Acceptance and workmanship	V & M	As required	B	100%	Drawing	SR	Experienced workers to be deployed.



BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO-PSE
REVISION QUANTITY PLAN
FOR
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BHEL Doc. No. : QPE-MTE-660-CL-01

REV.NO.: 2

SHEET 15 / 19 SHEETS

SYSTEM: CIVIL WORKS

SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)

AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
P.03	Pressure Release Valves							
P.03A	Material	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source - Review of MTC ('MTC shall contain all the parameters specified in the technical specifications)
P.03B	Acceptance and workmanship	V & M	As required	B	100%	Drawing	SR	Experienced workers to be deployed.
P.04	ANTI WEED TREATMENT							
P.04A	Anti-weed treatment materials	R	-	A	Each Lot of supply	Owner's Tech. Specifications & Drawing	SR	- BIFPCL / OE approved source & Agency - Review of MTC
P.04B	Execution of treatment	P	As required	B	Random check for each treatment	Drawing	SR	
Q	ROAD WORKS							
Q.01	CONSTRUCTION OF SUB-GRADE AND EARTHEN/HARD SHOULDERS							
Q.01A	Modified proctor Test	T	As required	A	As Per Annex-II	Annex -II, Owner's Tech. Specifications & Drawing	SR / Lab Report	
Q.01B	Moisture content of fill before compaction	T	As required	A	As Per Annex-II	Annex -II, Owner's Tech. Specifications & Drawing	SR / Lab Report	
Q.01C	Dry density by core cutter method ---- OR---- Dry density in place by sand displacement method	T	As required	A	As Per Annex-II	Annex -II, Owner's Tech. Specifications & Drawing	SR / Lab Report	
Q.01D	CBR Test	T	As required	A	As Per Annex-II	Annex -II, Owner's Tech. Specifications & Drawing	SR / Lab Report	
Q.01E	Grade Line and cross section	P & M	As required	B	One in every 500 SQM area	Owner's Tech. Specifications & Drawing	SR	
Q.02	WATER BOUND MACADAM (NON-BITUMINOUS) FOR BASE COURSE AND SUB-BASE COURSE							
Q.02A	Aggregate Impact value	T	Aggregate Impact value Test Apparatus	A	One test per 200 m ³ of Test aggregate	AASHTO Guide for Design of Pavement Structure / Owner's Technical Specifications	SR / Lab Report	


BHARAT HEAVY ELECTRICALS LIMITED
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BHEL Doc. No. : QPE-MTE-660-CL-01
REV.NO.: 2**SHEET 16 / 19 SHEETS****SYSTEM: CIVIL WORKS****SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)****AREA: CONSTRUCTION**

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
Q.02B	Grading	T	Set of AASHTO Sieves	B	One test per 100 m3 of aggregate	AASHTO Guide for Design of Pavement Structure / Owner's Technical Specifications	SR / Lab Report	
Q.02C	Flakiness index and elongation index	T	Flakiness test gauge	B	One test per 200m3 of aggregate	-do-	SR / Lab Report	
Q.02D	Atterberg Limits of binding material	T	Atterberg limits determination apparatus	A	One test per 25m3 of binding material	-do-	SR / Lab Report	
Q.02E	Atterberg Limits of portion of aggregate passing 425 micron sieve	T	Atterberg limits determination apparatus	A	One test per 100m3 of aggregate	-do-	SR / Lab Report	
Q.02F	Camber, surface, slope	T	As required / agreed	B	One in every 500 m2 area	Drawing	SR / Lab Report	
Q.03	BITUMINOUS MACADAM FOR BASE AND BINDER COURSE							
Q.03A	Quality of binder	T / MTC 1	Penetrometer with St. needle	A	No. of samples per Lot & tests as per AASHTO Guideline as applicable	AASHTO Guide for Design of Pavement Structure / Owner's Technical Specifications	SR / Lab Report	
Q.03B	Aggregate Impact Value / Los angeles abrasion value	T	Aggregate Impact Value Test apparatus	A	Once per source	-do-	SR / Lab Report	
Q.03C	Flakiness Index and elongation index of aggregates	T	Flakiness test gauge	B	One test per 50 cum of aggregate	-do-	SR / Lab Report	
Q.03D	Stripping value of aggregate (Immersion tray test)	T	As required / agreed	B	Initially one set of 3 representative specimen per source, and on every change of source.	-do-	SR / Lab Report	


BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO-PSE/REC/QUANT/1018
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BHEL Doc. No. : QPE-MTE-660-CL-01
REV.NO.: 2**SHEET 17 / 19 SHEETS****SYSTEM: CIVIL WORKS****SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)****AREA: CONSTRUCTION**

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
Q.03E	Water sensitivity of mix	T	As required / agreed	A	Initially one set of 3 representative specimen per source, and on every change of source.	-do-	SR / Lab Report	
Q.03F	Grading of aggregates	T	Set of AASHTO Sieves	B	Two test per day per plant both on individual constituents and mixed aggregate from dryer	-do-	SR / Lab Report	
Q.03G	Water absorption of aggregate	T	As required / agreed	A	Initially one set of 3 representative specimen per source, and on every change of source.	-do-	SR / Lab Report	
Q.03H	Soundness (Magnesium and Sodium Sulphate)	T	As required as per IS:2386	A	Once per source by each method and on every change of source	-do-	SR / Lab Report	
Q.03I	Percentage of fractured faces	T	As required / agreed	B	When gravel is used one test per 50m ³ of aggregates	-do-	SR / Lab Report	
Q.03J	Binder content and aggregate grading	T	Bitumen extractor	A	Periodic, subject to a min of two tests per day per plant	-do-	SR / Lab Report	
Q.03K	Control of Temperature of binder and aggregate for mixing and of the mix at the time of laying and rolling	T	Thermometer	B	At regular close intervals	-do-	SR / Lab Report	
Q.03L	Rate of spread of mixed materials	T	As required / agreed	B	Regular control through checks of layer thickness	-do-	SR / Lab Report	
Q.03M	Density of compacted Layer	T	As required / agreed	A	One test per 250 m ² of area	-do-	SR / Lab Report	
Q.04	BITUMINOUS SURFACING - OPEN GRADED PREMIX CARPET AND SEAL COAT							
Q.04A	Quality of binder	T / MTC 1	Penetrometer with St. needle	A	No. of samples per Lot & tests as per AASHTO Guideline as applicable	AASHTO Guide for Design of Pavement Structure / Owner's Technical Specifications	SR / Lab Report	


BHARAT HEAVY ELECTRICALS LIMITED
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SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
Q.04B	Aggregate Impact Value / Los angeles abrasion value	T	Aggregate Impact Value Test apparatus	A	Once per source	-do-	SR / Lab Report	
Q.04C	Flakiness Index and elongation index of aggregates	T	Flakiness test gauge	B	One test per 50 cum of aggregate	-do-	SR / Lab Report	
Q.04D	Stripping value of aggregate (Immersion tray test)	T	As required	B	Initially one set of 3 representative specimen per source, and on every change of source.	-do-	SR / Lab Report	
Q.04E	Water absorption test	T	As required	A	Initially one set of 3 representative specimen per source, and on every change of source.	-do-	SR / Lab Report	
Q.04F	Water sensitivity of mix	T	As required	A	Initially one set of 3 representative specimen per source, and on every change of source.	-do-	SR / Lab Report	
Q.04G	Grading of aggregates	T	Set of Sieves	B	One test per 25 m ³ of aggregates	-do-	SR / Lab Report	
Q.04H	Soundness (Magnesium and Sodium Sulphate)	T	As required	A	Once per source by each method and on every change of source	-do-	SR / Lab Report	
Q.04I	Polished stone value	T	As required as per BS:812(Part 114)	B	as per BS:812(Part 114)	BS:812(Part 114)	SR / Lab Report	
Q.04J	Temperature of binder at application	M	Thermometer	B	At regular close intervals	AASHTO Guide for Design of Pavement Structure / Owner's Technical Specifications	SR / Lab Report	
Q.04K	Binder content	T	Bitumen extractor	A	One test per 500 cum& not less than two tests per day	-do-	SR / Lab Report	



BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO-PSE
REVISION QUANTITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP NO.: MAITREE-00-U-QA-300001-PSE
BHEL Doc. No. : QPE-MTE-660-CL-01

REV.NO.: 2

SHEET 19 / 19 SHEETS

SYSTEM: CIVIL WORKS

SUB-SYSTEM: CIVIL WORKS (EXCEPT PILING WORK)

AREA: CONSTRUCTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	2	3	4	5	6	7	8	9
Q.04L	Rate of spread of materials	T	As required	B	One test per 500 cum and not less than 2 tests per day	AASHTO Guide for Design of Pavement Structure / Owner's Technical Specifications	SR / Lab Report	
Q.04M	Percentage of fractured faces	T	As required	A	When gravel is used one test per 50cum of aggregates	-do-	SR / Lab Report	
Q.05	TACK COAT/ PRIME COAT/ FOG COAT							
Q.05A	Quality of binder	T / MTC 1	Penetrometer with Standard needle	A	No. of samples per Lot & tests as per AASHTO Guideline as applicable	AASHTO Guide for Design of Pavement Structure / Owner's Technical Specifications	SR / Lab Report	
Q.05B	Temperature of binder at application	M	Thermometer	B	At regular close intervals	-do-	SR / Lab Report	
Q.05C	Rate of spread of binder	T	As required	B	One test per 500 m3 and not less than 2 tests per day	-do-	SR / Lab Report	
Q.06	RCC PAVEMENTS : Concrete - Material, Mix design, Trial Mixes, Production, Transportation, Placement, Compaction, Curing, Test on green concrete, Test on hardened concrete etc.					Refer clause no. C, D & E of this FQP for concrete Works		
Q.07	ALIGNMENT, LEVEL, SURFACE REGULARITY AND RECTIFICATION							
Q.07A	Horizontal alignment, Surface levels and Surface regularity	V & M	As required	B	Drawing	Owner's Tech. Specifications & Drawing	SR / Lab Report	
Q.07B	Rectification	V	As required	B	Each rectification	Owner's Tech. Specifications & Drawing	SR / Lab Report	

Frequency of testing the aggregates shall be at least as follows:

Test Type	Coarse Aggregate	Fine Aggregate	Remarks
Grading of each aggregate	Daily	Daily	
Grading of combined aggregates	Daily	Daily	
Specific gravity	7 days	7 days	
Magnesium sulphate soundness	30 days	-	Should be as per the requirement of design mix, subject to variation within the limit as specified in BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1
Clay, silt and dust content	Daily	Daily	
Shape (elongation and flakiness)	Twice a week	-	
Los Angeles abrasion	Initially only & on change of source	Initially only & on change of source	
Moisture content	2 days	Daily	
Drying shrinkage	Initially only & on change of source	Initially only & on change of source	
Organic impurities	30 days	30 days	

Frequency of Sampling & Testing of Soil and Sand for Backfilling & Grading:

SL No.	Nature of Test / Characteristics		Method of Test	No. of samples & Frequency of Test	Remarks
I	Suitability of Fill Materials				
	(a) Grain size Analysis	ASTM D 6913-04(2009)E1	Once per each type of source or change of source	Test for soil and sand	
	(b) Liquid limit and Plastic Limit	ASTM D 4318-10E1	Once per each type of source or change of source	Test for soil	
	(c) Shrinkage Limit	ASTM D4943-08	Once per each type of source or change of source	The frequency of Test shall be increased depending on type of soil.	
	(d) Free swell Index	ASTM D4546 - 14			
	(e)	Chemical Analysis	Once per each type of source or change of source	Test for soil and sand	
	i) Organic matter	ASTM D 2974-14			
	ii) Calcium Carbonate	ASTM D 4373-14			
	iii) PH	ASTM D 4972-13			
	iv) Total soluble sulphate	ASTM C 1580-15			
II.	Standard Proctor Test	ASTM D 698-12E2	One in every 5000m ³ 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	ASTM D 2216-10 OR ASTM D 4944-11	One in every 5000m ³ for each type, each layer and each source of fill materials	Test for soil	

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
IV.	Modified Proctor Test	ASTM D 1557-12E1	One in every 2000m ³ for each type, each layer and each source of fill materials	Test for soil
V	Degree of compaction of fill			
	a) Dry density by core cutter method OR b) Dry density inplace by sand displacement methods	a) ASTM D 2937-17 b) ASTM D 1556M-15E1	I. For foundation filling one for every ten foundations for each compacted layer for location of important and heavily loaded foundations. II. For grading & area filling, one for every 5000 m ² area for each compacted layer. III. For road work: One in every 500 m ² area for each compacted layer. * One Test consists of 3 nos sample.	Test for soil
	c) Relative density Index	ASTM D 4253 and D 4254	-do-	Test for sand
	d) Dry Density by proctor needle-penetration.	ASTM D 698-12E2	Random checks to be carried out for each compacted layer in addition to tests mentioned under V (a) above.	Test for soil.
	e) Permeability Test.	ASTM D2434	Random checks	Test for soil
	f) CBR	ASTM D1883	One in every 5000m ³ for each type and each source of fill materials or every 1000m linear length of road, whichever earlier	For Road Subbase course only

Frequency of Checks on Formwork:

Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
a) Staging (Durability, strength & soundness of staging, joints. adequacy of its foundation and specific level).	Visual / Measurement	Each member / structure	Any staging intended for use shall be approved by the BHEL Engineer & BIFPCL/OE for its durability and strength. After erection of staging, BHEL Engineer & BIFPCL/OE shall check the soundness of the staging as a whole, its joints, adequacy of its foundation and the specific levels.
b) Shuttering			
i) Materials (as per ACI 347R or equivalent European standard)	Visual	Random	Forms shall be constructed from waterproof plywood. Plywood lining for forms shall be of timber, which is resin bonded and water repellent Form work materials shall be strictly as per specifications and approval of the BHEL & BIFPCL/OE. Materials for form work shall be unwrapped, thoroughly clean and without broken or damaged edges.
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.



PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	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	FQP. NO.: QPE-MTE-660-CL-01
PROJECT					REV. NO. : 2
UNIT NO.					LOG SHEET NO. L-00
RATING					PAGE 1 OF 1

Date: 26-Nov-2017

प्रौद्योगिकी एवं विज्ञान
*Approval doesn't absolve the EPC
contractor of its responsibility as
specified in the Contract

PSER

INSTRUMENT REG. NO. TENDER NO-PSER:SCT:KLN-C1910:18

DATE OF INSPECTION

TIME

DRAWING / DOC. REF.

DAILY MEASUREMENT OF VERTICALITY OF CHIMNEY

ELEVATION : SHUTTER LEVEL / CONCRETE LEVEL

INNER RADIUS (AS PER DRAWING) SHELL THICKNESS (AS PER DRAWING)

YODE NO	INNER RADIUS	THICKNESS OF SHELL	DEVIATION (W.R.T. DRG.) OF RADIUS / WALL	YODE NO	INNER RADIUS	THICKNESS OF SHELL	DEVIATION (W.R.T. DRG.) OF RADIUS / WALL	VERTICALITY / TWIST MEASUREMENT
1			29					CENTRE
2			30					
3			31					
4			32					
5			33					
6			34					
7			35					
8			36					
9			37					
10			38					
11			39					TWIST (T1)
12			40					
13			41					
14			42					
15			43					
16			44					
17			45					
18			46					
19			47					
20			48					TWIST (T2)
21			49					
22			50					
23			51					
24			52					
25			53					
26			54					
27			55					
28			56					
				NAME		SIG. / DATE		FQP NO. : QPE:RKL:250:CL:01
PROJECT		CHECKED BY						REV. NO. : A
UNIT NO.		ACCEPTED BY						LOG SHEET NO. L-01
RATING		CUSTOMER						SHEET 1 / 1 SHEETS

Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract



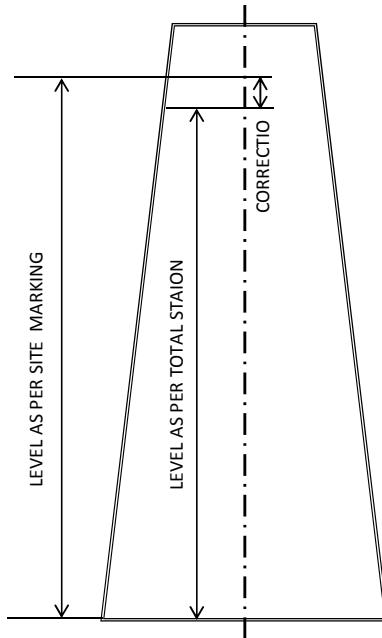
PSER

INSTRUMENT REG. NO. TENDER NO-PSER:SCT:KLN-C1910:18

DATE OF INSPECTION

TIME

DRAWING / DOC. REF.

PERIODICAL CORRECTION OF LEVEL OF CHIMNEY

MASUREMENT AT YOKE NO. :

BENCH MARK 1 (STATION POINT) :

BENCH MARK 2 (BACK SIGHT POINT) :

S		S	
E		E	
RL		RL	

MACHINE RL (L_M) :TARGET LEVEL ON YOKE NO. AS PER SITE MARKING (L_T) :RL OF TARGET ON YOKE NO. AS PER TS READING (L_R) :ACTUAL RL OF TARGET ($L_A = L_R - L_M$) *: CORRECTION OF HEIGHT ($L_A - L_T$) :

* ACTUAL RL TO BE TRANSFERRED IN OTHER YOKES WITH WATER LEVEN

			NAME	SIG. / DATE	FQP NO. : QPE-MTE-660-CL-01
PROJECT		CHECKED BY			REV. NO. : A
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-02
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO./TAG NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

PROTOCOL

			NAME	SIGNATURE & DATE	FQP. NO.: QPE-MTE-660-CL-01
PROJECT		INSPECTED BY			REV.NO.: 2
UNIT NO.		CLEARED BY			PROTOCOL
RATING		CUSTOMER			PAGE: