STANDARD FIELD QUALITY PLAN

Item	Civil works for site Packages
Applicability	POWERGRID PROJECTS
Date of Issue	03.08.2020
Validity	Till next revision

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REV.	04

S. No.	Description of Activity	Items to be Checked	Tests/Checks to be done	Ref. documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting authority in POWERGRID
					Agency	Extent		
1.	**Earth Work (site leveling)**							
		1. Mandatory testing for filling						
			1. Proctor compaction test for maximum dry density	IS:2720(part-7) & Specification	Contractor from Powergrid approved Lab.	One sample per 25000 Cum. or part thereof for each type & source of filling material.	100% review of lab test results	Site In charge
			2. Optimum Moisture Content	do	Contractor/ From Powergrid approved Lab.	do	do	do
		2. Field Compaction Test	1. Field dry density & Moisture content test for each layer of compaction.	IS:2720 (part-29), & POWERGRID Specification	Contractor Field lab./ Powergrid approved Lab.	One sample for every 2500 sqm. or part thereof for compacted soil for each compacted layer.	do	do
2.	**Civil works**							
	A. Materials	**1. Cement**	1. Brand approval	Cement of approved brands according to the COV in POWERGRID web site may be procured and validity of BIS license to be ensured.	Contractor	As proposed by Contractor	Any new brand cement proposed by Contractor shall be assessed by RHQ-FQA and approved by Regional Head. After approval, details shall be forwarded to CC-FQA/QA&I for uploading in COV.	RHQ-FQA
			2. Physical tests	As per document at Annexure-I of this FQP	Contractor Samples to be taken jointly with POWERGRID and tested at POWERGRID	Review of 100% MTC's and one sample for every week number of manufacturer.	100% review of lab test results Test results shall be sent by the Lab by E mail directly to POWERGRID. Further, hard	Site in charge

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					accepted lab.		Copy of Test Certificate shall also be sent by the Lab directly to POWERGRID by Postal Address.	
			3. Chemical Tests. Chemical composition of Cement	-do-	Contractor to submit MTC	Review of all MTC	100% review of MTC results	Site In charge
		2.a) Reinforcement Steel	1. Source approval	- May be procured from producers directly or through authorized dealers who can produce MTC from producers with traceability. Refer COV in POWERGRID web site, for List of producer's steel and validity of BIS license to be ensured.	Contractor	As proposed by contractor	Material shall be supplied from Producers / authorized dealers.	Site in charge.
			2. Physical and Chemical analysis test	As per Annexure-2 of this FQP	Contractor to submit MTC.	Review of 100% MTC One sample* / 100 MT / Manufacturer shall be jointly sealed by POWERGRID and tested at POWERGRID approved Lab	-100% review of MTC, 1) Review of lab test results. Test results shall be sent by the Lab by E mail directly to POWERGRID. Further, hard Copy	Site In charge

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						*Note: All sizes of 10 mm and above shall be taken for testing in every 100 MT. If the total quantity requirement is less than 5 MT, MTC shall be reviewed; no testing is required.	of Test Certificate shall also be sent by the Lab directly to POWERGRID by Postal Address. 2) Unit weight of three samples to be witnessed. # #	Site Engineer
	# # Three samples of each size of Reinforcement steel (all sizes of 10mm & above) out of 100MT steel Lot need to be physically weight at site in presence of POWERGRID to ascertain their acceptance as per technical specification. The weighted samples at site may be kept under custody for three months for further examination by any auditing authority (if required).							
		2. b) Structural steel. For roof truss, door & window frames, boundary wall, gates, grills, railings gratings & rolling shutter etc.	Source to be proposed by contractor.	POWERGRID Specification	Contractor	As proposed by contractor	To verify documents.	Site In charge
			1. Visual & Dimensional check for damages, rusting & pitting, welding, primer coating, painting/ galvanizing as applicable.	POWERGRID specification and approved drawing	Contractor	100%	random	Site Engineer
			2. Physical properties a) Structural steel (except tubular pipes)	IS:2062 POWERGRID specification and approved drawing	Contractor	a) 1 sample per 20 MT or part thereof for tensile and bend test of each size. Samples to be tested in POWERGRID accepted	Review of lab. test results by POWERGRID.	Site In charge

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					Agency	Extent		
			b) Steel Tubular pipes	IS:2062 POWERGRID specification and approved drawing	Contractor	Lab. If the quantity is less than 5 MT no testing is required. b) 1 sample per 8 MT or part thereof for tensile and bend test of each size. Samples to be tested in POWERGRID accepted lab. If the quantity is less than 3 MT no testing is required.	Review of lab. test results by POWERGRID.	Site In charge
		3. Coarse Aggregates	1. Source approval	Source meeting POWERGRID Specification	Contractor	Proposed by the Contractor, indicating the location of the quarry and based on the test results of Joint samples tested in POWERGRID accepted lab.	To review the proposal based on the documents	Site In-charge. Once approved, the particular quarry shall be used for all the running contracts under various Packages.
			2. Physical tests	As per document at Annexure-3 of this FQP	Contractor	One sample per 200 cum or part thereof, samples to be tested by Contractor in POWERGRID accepted Lab.	100% review of test results.	Site Engineer

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		4. Fine aggregate	1. Source approval	Source meeting POWERGRID Specification	Contractor	Proposed by Contractor, indicating the location of the quarry and based on the results of Joint samples tested in POWERGRID accepted lab.	To review the proposal based on the documents.	Site In-charge. Once approved, the particular source shall be used for all the running contracts under various Packages.
			2. Physical test	As per Annexure-4 of this FQP	Contractor	One sample per 200 cum or part thereof, samples to be tested by contractor in POWERGRID accepted Lab.		Site Engineer
		5. Water	1. Cleanliness	POWERGRID Specification (Water shall be fresh and clean)	Contractor	100% visual check at Field	Verification at random	Site Engineer
			2. PH Value	- do -	Contractor	One sample per source	100% review of the test results Ph value not less than 6	Site Engineer
		6. Design Mix - Concrete mix proportion (Applicable for Design Mix)	Ratio of mix proportion	Approval of Design Mix submitted by contractor based on inputs furnished by POWERGRID as per Annexure- 9 of this FQP.	-do-	-do-	-do-	Site In charge In consultation with Regional engineering department.

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					Agency	Extent		
	B. Concreting							
		1.Workability (For concreting not less than 1:3 : 6)	Slump test	Range 25-75mm refer document at Annexure -5 of this FQP.	Contractor	Minimum 02 sample per day / concrete mixer	20% check at random	Site Engr.
		2.Concrete Strength (For R.C.C.)	Cubes Compressive Strength	As per Annexure-5 of this FQP.	Contractor Casting of cubes at site. Cubes to be tested for 28 days strength at /POWERGRID Lab/At site (if testing machine installed by contractor is duly calibrated by NABL Lab.)/POWERGRID approved Lab. Cubes at 100% location are to be taken in presence of POWERGRID officials.	**Nominal Mix** One sample of 3 cubes for every 20 cum or part thereof for each day of concreting and 28 days compressive strength shall be tested. **Design Mix** Sampling for concrete strength should be one set of 3 nos. of cubes for every 20 cum or part thereof for each day of concreting and 28 days compressive strength shall be tested. However, In case of concrete supplied by RMC, one set of 3 nos. of cubes	Normally testing shall be carried out at the POWERGRID in-house cube testing facility. Alternatively, samples shall be tested at cube testing facility installed by contractor at POWERGRID premises, in the witness of POWERGRID. Lastly, POWERGRID approved Labs, in this case, test results shall be sent by the Lab, by E-mail directly to POWERGRID; further, hard copy of Test Certificate shall also be sent by the Lab directly to POWERGRID by Postal Address. **NOTE: The efforts shall be made to carry out 100% cube testing in the in-house cube**	Site Engineer. All cubes shall be tested at In-house testing facilities. However, in case of breakdown of CTM or other force majeure conditions, cubes may be tested at approved TPL. Out of testing on 10% samples to be witnessed at TPL by POWERGRID Site Engineer

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						for every 50 cum or part thereof for each day of concreting and 28 days compressive strength shall be tested.	**testing facility.** Further, POWERGRID to witness testing on 20% samples and also to review 100& test results.	and at least 5% samples at random, shall be witnessed by Site In-charge. In-case of Site/ POWERGRID Lab, 100% witness by POWERGRID Representative.

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	c)Back filling	Watering & Ramming for compaction	a) Visual	POWERGRID Spec	Contractor	100%	Random	Site Engineer
			b) Compaction	POWERGRID Spec	Contractor	Back filling is to be done by watering and ramming for desired compaction(to be ascertained by site in charge)	100%	Site In charge
3.	Brick Masonry							
		a) Clay Bricks	1.Dimensional tolerance	POWERGRID Specification/ enclosed Annexure-6	Contractor (samples to be taken jointly and tested in POWERGRID accepted lab)	Enclosed Annexure -6	Review 100% of test results	Site In charge
			2.Compressive strength	POWERGRID Specification / enclosed Annexure-6	-Do-	-Do-	-do-	Site In charge
			3.Water Absorption	POWERGRID Specification / enclosed Annexure-6	-Do-	-Do-	-do-	Site In charge
			4.Efflorescence	POWERGRID Specification/ enclosed Annexure-6	-Do-	-Do-	-do-	Site In charge

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		b) Fly Ash Bricks	1.Dimensional tolerance	POWERGRID Specification/ enclosed Annexure 6	Contractor (samples to be taken jointly and tested in POWERGRID accepted lab)	Enclosed Annexure 6	Review 100% of test results	Site Engineer
			2.Compressive strength	POWERGRID Specification/ enclosed Annexure 6	-Do-	-Do-	-do-	Site Engineer
			3.Water Absorption	POWERGRID Specification/ enclosed Annexure 6	-Do-	-Do-	-do-	Site Engineer
			4.Efflorescence	POWERGRID Specification/ enclosed Annexure 6	-Do-	-Do-	-do-	Site Engineer
		c) Concrete Masonary (Concrete Blocks)	Tests as per IS:2185	Tests as per IS:2185	Contractor	Sampling as per IS:2185	random	Site Engineer
4.	**Stone for Masonry**							
		Stone	1.Compressive Strength	IS: 1121 (Part-I) & CPWD Specification clause 7.1 Stone with round surface shall not be used	Contractor (samples to be taken jointly and tested in POWERGRID accepted lab)	One sample pre source	random	Site In charge
			2. Water Absorption	IS: 1124-1974 & CPWD Specification clause 7.1 Stone with round surface shall not be used	Contractor (samples to be taken jointly and tested in POWERGRID accepted lab)	One sample pre source	random	Site In charge

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5.	**Tiles for Floorings & walls**	1.Glazed tiles 2.Vitrified Tiles	1.Water Absorption 2.Crazing Test 3.Impact Test Strength	IS: 15622 & POWERGRID Specification	Samples to be taken jointly and tested in POWERGRID accepted lab	One test for every 10000 nos. or part thereof for each type and size from a single manufacturer. (Minimum quantity of material for carrying out test is 3000 nos.)	100% review of the test results.	Site In charge.
6.	**Finishing materials of building**	**Type / quality /class of finishing building material**	Physical verification of Different items as per specification	POWERGRID Specification	Contractor	100%	MTC/Manufacturer catalogue To be reviewed.	Site In charge.
7.	**Timber**							
		1.Timber for Door & Window Frame	1. Moisture content .	IS: 287 & CPWD Specification	Samples to be taken jointly and tested	One sample per cu. m or part thereof (No testing required below 1 cum.)	100% review of the test results.	Site In charge.
		2. Flush Door shutters (factory made)	1.End Immersion Test 2. Knife Test 3.Glue Adhesion Test	POWERGRID Specification	Samples to be taken jointly and tested in POWERGRID accepted lab	One sample for every 100 shutters or part thereof. (Mini. qty. of shutters for carrying out the test shall be 26 nos.)	100% review of the test results.	Site In charge.
8.	**Aluminum Door& window sections**	**Anodic/Powder coating**	Coating	IS:5523 POWERGRID specification, approved drawings and CPWD	Contractor	One sample for every 200 Kgs or part thereof. (Mini. Qty. required for testing is 100 Kgs.)	100% review of the test results	Site Engineer

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				specification				
S. No.	**Description of Activity**	**Items to be Checked**	**Tests/Checks to be done**	**Ref. documents**	**Check/Testing**		**Counter Check/Test by POWERGRID**	**Accepting authority in POWERGRID**
					Agency	**Extent**		
9.	**G.S. Barbed Wire**	G.S. Barbed Wire	1. Visual Check 2. Dimensions, Weight & Size.	IS: 278, POWERGRID specification & CPWD specification. Refer Annexure-7 of this FQP.	Contractor Contractor	100% As per sampling plan at Annexure-7	Random Random	Site Engineer Site Engineer
			3. Tensile test, zinc coating test and ductility test	IS: 278, POWERGRID specification & CPWD specification. (Refer Annexure-7 of this FQP)	Manufacturer's MTC / Third Party lab	As per sampling plan at Annexure-7	Review of manufacturer's/TPL test certificates	Site Engineer
10.	**Road (WBM/WMM layers)**							
	Material	**A. Coarse Aggregates**	1.Source approval	Source with materials meeting POWERGRID Specification	Contractor	Proposed by the Contractor, indicating the location of the quarry and based on the test results of Joint samples tested in POWERGRID accepted lab.	To review the proposal based on the documents	Site In charge
			2.Physical tests	As per document at Annexure-8 of this FQP	Samples to be taken jointly and tested in POWERGRID approved lab.	One sample per 200 cum or part thereof per source. (Mini. Qty. required for testing is 100 cu. M.)	100% review of lab test results	Site In charge

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					Agency	Extent		
		B)Stone Screening						
			1.Source approval	Source with materials meeting POWERGRID Specification	Contractor	Proposed by the Contractor, indicating the location of the quarry and based on the test results of Joint samples tested in POWERGRID accepted lab.	To review the proposal based on the documents	Site In charge
			2. Gradation	As per document at Annexure-8 of this FQP	Samples to be taken jointly and tested in POWERGRID accepted lab.	One sample per 100 cum or part thereof. (Mini. Qty. required for testing is 50 cu. M.)	100% review of lab test results	Site In charge
		C)Binding Material	Plasticity index	As per document at Annexure-8 of this FQP	Contractor	One sample per lot of 50 cum. Or part thereof. (Mini. Qty. required for testing is 25 cum.)	100% review of lab test results	Site In charge
		D) Laying of sub base Course	Physical check	As per CPWD spec clause 17.7.2	Contractor	100%	Random	Site Engineer
		E) Laying of base Course	Physical check	As per CPWD spec clause 17.8.1	Contractor	100%	Random	Site Engineer

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11.	NDT/Core Tests	UPV and Rebound Hammer /Core	UPV and Rebound Hammer /Core	Refer POWERGRID's Standard procedure for Testing/Assessment of compressive strength of casted Concrete				Regional Head
12	Pile foundations	REFER SFQP OF SWICH YARD PILE WORK – DOCUMENT NO. C/QA&I/SFQP/SCW-PILE						
13	Stores	Storing of Cement, RF Steel & other construction materials	Visual and physical check	POWERGRID specification	Contractor	100%	Random	Site Engineer

Corporate Field Quality Assurance
Power Grid, Gurugram

Annexure-1(Sheet 01 of 03)

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR CEMENT

ORDINARY PORTLAND CEMENT

S. No.	Name of the test	Ordinary Portland Cement 33 grade *as per IS 269: 2015*	Ordinary Portland Cement 43 grade *as per IS 269: 2015*	Ordinary Portland Cement 53 grade *as per IS 269: 2015*	Remarks
a)	**Physical tests**				To be conducted in POWERGRID approved Lab
(i)	Fineness	Specific surface area shall not be less than 225 sq.m. per Kg. or 2250 cm2 per gm.	Specific surface area shall not be less than 225 sq.m. per Kg or 2250 cm2 per gm.	Specific surface area shall not be less than 225 sq.m. per Kg or 2250 cm2 per gm.	Blaine's air permeability method as per IS 4031 (Part-2):1999, Reaffirmed 2013
(ii)	Compressive strength	72 ± 1 hour : Not less than 16 Mpa (16 N/mm2) 168 ± 2 hour : Not less than 22 Mpa (22 N/mm2) 672 ± 4 hour : Not less than 33 Mpa (33 N/mm2), *Not more than 48Mpa (48N/mm2)*	72 ± 1 hour : Not less than 23 Mpa (23 N/mm^2) 168 ± 2 hour : Not less than 33Mpa (33 N/mm^2) 672 ± 4 hour : Not less than 43 Mpa (43 N/mm^2), *Not more than 58Mpa (58N/mm2)*	72 ± 1 hour : Not less than 27Mpa (27 N/mm^2) 168 ± 1 hour : Not less than 37Mpa (37 N/mm^2) 672 ± 1 hour : Not less than 53 Mpa (53 N/mm^2)	As per IS 4031 (Part-6): 1988, Reaffirmed 2014
(iii)	Initial & Final setting time	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes	As per IS 4031 (Part-5): 1988 Reaffirmed 2014. -do-
iv)	Soundness	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test.	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test.	Le Chatlier and Autoclave test as per IS 4031 (Part-3): 1988, Reaffirmed 2014.

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S. No.	Name of the test	Ordinary Portland Cement 33 grade *as per IS 269: 2015*	Ordinary Portland Cement 43 grade *as per IS 269: 2015*	Ordinary Portland Cement 53 grade *as per IS 269: 2015*	Remarks
b)	**Chemical composition tests**				Review of MTC only
		a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.66 to 1.02%	a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.66 to 1.02%	a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.80 to 1.02%	
		b) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	a) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	a) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	
		c) Insoluble residue, percentage by mass Max. 5.00%	c) Insoluble residue, percentage by mass Max. 5.00%	c) Insoluble residue, percentage by mass Max. 5.00%	
		d) Magnesia percentage by mass Max. 6%	d) Magnesia percentage by mass Max. 6%	d) Magnesia percentage by mass Max. 6%	
		e) Total ulphur content calculated as sulphuric anhydride (SO_3), percentage by mass not more than 3.5%.	e) Total ulphur content calculated as sulpuric anhydride (SO_3), percentage by mass not more than 3.5%.	e) Total ulphur content calculated as sulpuric anhydride (SO_3), percentage by mass not more than 3.5%.	
		f) Total loss on ignition shall not be more than 5 percent	f) Total loss on ignition shall not be more than 5 percent	f) Total loss on ignition shall not be more than 4 ~~5~~ percent	
		g) Chloride content, percent by mass, max 0.1%	*g) Chloride content, percent by mass, max 0.1%*	*g) Chloride content, percent by mass, max 0.1%*	

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S. No.	Name of the test			Remarks
2.	**PORTLAND POZZOLANA CEMENT AS PER IS 1489 (Part 1):2005**			
a)	**Physical tests**	i) Fineness	Specific surface area shall not be less than 300 sq.m. per Kg. or 3000 Cm^2 per gm.	To be conducted in POWERGRID approved Lab
		ii) Compressive strength	a) 72 ± 1 hour : Not less than 16 Mpa (16 N/mm^2) b) 168 ± 2 hour : Not less than 22 Mpa (22 N/mm^2) c) 672 ± 4 hour : Not less than 33 Mpa (33 N/mm^2)	
		iii) Initial & Final setting time	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes	
		iv) Soundness	Un aerated cement shall not have an expansion of more than 10mm Le chatlier test and 0.8% by Autoclave test as per IS 4031 (Part-3)	
b)	**Chemical composition tests**			
		a) Magnesia percentage by mass Max. 6%		Review of MTC only
		b) *Insoluble residue, percent by mass, (a) Maximum {x + 4 (100-x)/100} (b) Minimum 0.6x, where x is the declared % of fly ash in the given Portland pozzolana cement.*		-do-
		c) Total ulphur content calculated as sulpuric anhydride (SO_3), percentage by mass not more than 3.5		-do-
		d) Total loss on ignition shall not be more than 5 percent		
		e) Chloride content, percent by mass, max 0.1%		

Annexure-2

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR REINFORCEMENT STEEL

AS PER IS 1786-2008 (Reaffirmed 2013), Amendment No. - 1

S. No.	Name of the test	Fe 415	Fe 500	Fe 500D
i)	**Chemical analysis test**			
	Carbon	**0.30 Percent Maximum**	**0.30 Percent Maximum**	**0.25 Percent Maximum**
	Sulphur	**0.060 Percent Maximum**	**0.055 Percent Maximum**	**0.040 Percent Maximum**
	Phosphorus	**0.060 Percent Maximum**	**0.055 Percent Maximum**	**0.040 Percent Maximum**
	Sulphur & Phosphorus	**0.11 Percent Maximum**	**0.105 Percent Maximum**	**0.075 Percent Maximum**
	Carbon Equivalent	**0.42 percent Maximum**	**0.42 percent Maximum**	**0.42 percent Maximum**
ii)	**Physical tests**			
	a) Tensile Strength/Yield stress ratio,	*≥1.10, but tensile strength not less than 485.0 N/mm^2*	*≥1.08, but tensile strength not less than 545.0 N/mm^2*	*≥1.10, but tensile strength not less than 565.0 N/mm^2*
	b) 0.2% of proof stress/Yield stress Minimum, N/mm ^{2}	415	500	500
	c) Elongation percent , Minimum	14.5	12	16
	d) *Total elongation at maximum force, percent, Minimum*	--	--	*5*
	e) Unit weight, Kg/m on sample sent for third party lab	As per IS 1786	As per IS 1786	As per IS 1786
iii)	**Bend & Rebend tests**	Pass	Pass	Pass

Annexure-3

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR COARSE AGGREGATES AS PER IS 383:2016

3.	**Coarse Aggregates**										
i)	Physical Tests										
	a) Determination of particles size	a. IS Sieve Designation	**%age passing for Single-Sized Aggregate of nominal size**					**Percentage Passing for graded Aggregate of nominal size**			
			40 mm	**20 mm**	**16 mm**	**12.5 mm**	**10 mm**	**40 mm**	**20 mm**	**16 mm**	**12.5 mm**
		63 mm	100	-	-	-	-	-	-	-	-
		40 mm	85 to 100	100	-	-	-	90 to 100	100	-	-
		20 mm	0 to 20	85 to 100	100	-	-	30 to 70	90 to 100	100	100
		16 mm	-	-	85 to 100	100	-	-	-	90-100	-
		12.5 mm	-	-	-	85 to 100	100	-	-	-	90 to 100
		10 mm	0 to 5	0 to 20	0 to 30	0 to 45	85 to 100	10 to 35	25 to 55	30 to 70	40 to 85
		4.75 mm	-	0 to 5	0 to 5	0 to 10	0 to 20	0 to 5	0 to 10	0 to 10	0 to 10
		2.36 mm	-	-	-	-	0 to 5	-	-	-	-
	b. Combined Flakiness and Elongation index		Not to exceed 40%								
	c. Crushing Value		Not to exceed 30%								
	d. Presence of deleterious material		*Total presence of deleterious materials not to exceed 5% for uncrushed, 2% for crushed and manufactured coarse aggregates as per Annexure- 3A.*								
	e. Hardness		Abrasion value not more than 50%, Impact value not more than 45%								
	f. Soundness test (for concrete work subject to frost action)		Not to exceed 12% when tested with sodium sulphate and 18% when tested with magnesium sulphate								

Deleterious Substance	***Percentage by Mass, Max***		
	Uncrushed	*Crushed*	*Manufactured*
a) Coal and lignite	*1.0*	*1.0*	*1.0*
b) Clay lumps	*1.0*	*1.0*	*1.0*
c) Materials finer than 75 micron	*1.0*	*1.0*	*1.0*
d) Soft fragments	*3.0*	*--*	*3.0*
e) Shale	*--*	*--*	*--*
f) Total of percentages of all deleterious materials (except mica) including S. No. a) to e) for uncrushed and crushed aggregates	*5.0*	*2.0*	*2.0*

Annexure-4

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR FINE AGGREGATES AS PER IS 383

4.	**Fine aggregates**				
i)	Physical Tests	**IS Sieve Designation**	**Percentage passing for**		
	a) Determination of particle size		**F.A. Zone I**	**F.A. Zone II**	**F.A. Zone III**
		10 mm	100	100	100
		4.75 mm	90-100	90-100	90-100
		2.36 mm	60-95	75-100	85-100
		1.18 mm	30-70	55-90	75-100
		600 microns	15-34	35-59	60-79
		300 microns	5 to 20	8 to 30	12 to 40
		150* microns	0-10	0-10	**0-10**
	b) Presence of deleterious material	***Total presence of deleterious materials not to exceed 5% for uncrushed & 2% for crushed/Mixed and manufactured fine aggregates as per Annexure- 4A.***			
	c) Soundness Applicable to concrete work subject to frost action	10% when tested with sodium sulphate and 15% when tested with magnesium sulphate			

*For crushed stone sands, the permissible limit on 150 micron IS Sieve is increased to 20 percent.

Annexure-4A

Deleterious Substance	***Percentage by Mass, Max***		
	Uncrushed	*Crushed/Mixed*	*Manufactured*
a) Coal and lignite	*1.0*	*1.0*	*1.0*
b) Clay lumps	*1.0*	*1.0*	*1.0*
c) Materials finer than 75 micron	*3.0*	*15.0 (for crushed sand)* *12.0 (for mixed sand)*	*10.0*
d) Soft fragments	*--*	*--*	*--*
e) Shale	*1.0*	*--*	*1.0*
f) Total of percentages of all deleterious materials (except mica) including S. No. a) to e) for uncrushed aggregates and a) & b) for crushed/mixed and manufactured aggregates	*5.0*	*2.0*	*2.0*

Annexure-5

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR CONCRETE WORK

1)	**Concrete**	a) Workability	Slump shall be recorded by slump cone method and it shall between 25-75 mm depending upon workability requirement as per IS 456: 2000.
		b) Compressive strength	**For nominal (volumetric) concrete mixes compressive strength for 1:1.5:3 (Cement : Fine aggregates : Coarse aggregates) concrete 28 days strength shall be min 265Kg/cm^2 and for 1:2:4 (Cement: Fine Aggregate: Coarse Aggregate) nominal mix concrete 28 days strength shall be min 210Kg/cm^2.**

Notes:

1) **ACCEPTANCE CRITERIA BASED ON 28 DAYS COMPRESSIVE STRENGTHS FOR NOMINAL MIX CONCRETE:** ***As per clause 5.4.10.4 of CPWD Specifications, Volume 1***

(a) The average of the strength of three specimen be accepted as the compressive strength of the concrete provided the strength of any individual cube shall neither be less than 70% nor higher than 130% of the specified strength.

(b) If the strength of any individual cube exceeds more than 30% of specified strength, it will be restricted to 130% only for computation of strength.

(c) If the actual average strength of accepted sample is equal to or higher than specified strength up to 30% then strength of the concrete shall be considered in order and the concrete shall be accepted at full rates.

(d) If the actual average strength of accepted sample is less than specified strength but not less than 70% of the specified strength, the concrete may be accepted after reconfirmation by NDT/Core test on the location portion represented by the cube samples in line with approved Standard testing procedure of POWERGRID.

(e) If the actual average strength of accepted sample is less than 70% of specified strength, the Engineer-in-Charge shall reject the defective portion of work represented by sample and nothing shall be paid for the rejected work. Remedial measures necessary to retain the structure shall be taken at the risk and cost of contractor. If, however the Engineer-in-Charge so desires, he may order additional tests to be carried out to ascertain if the structure can be retained. All the charges in connection with these additional tests shall be borne by the contractor.

2) 53 Grade cement shall be used after obtaining specific approval of the Engineer in charge.

3) Portland slag cement conforming to IS 455: 2015 may be used as per Technical Specification.

4) All Design Mix concrete shall be as per IS 456: 2000, reaffirmed 2016

5) *ACCEPTANCE CRITERIA BASED ON 28 DAYS COMPRESSIVE STRENGTHS FOR DESIGN MIX CONCRETE: As per Table-11, Amendment No. 4 of IS 456: 2000 as given below: Note sheet reference no. CC/FQA/CLA/MIX dated 08/12/16 approved by Competent Authority.*

Specified Grade	***Case No.***	***Sampling***	***Acceptance Criteria for Mix Design as per Is 456:2000***	***Remarks***
M15 and above	*A 1.*	*Mean of Group of 4 non-overlapping consecutive test results.*	*Shall greater than or equal to fck+0.825 x established standard deviation (rounded off to nearest 0.5 N/sq. mm)** *Or fck + 3 N/sq. mm, whichever is greater*	
	A 2.	*Individual test result out of A 1.*	*Greater than or equal (fck-3) N/ sq.mm*	*Out of four non- overlapping consecutive test results, one individual test result only.*
	B 1.	*Group of non-overlapping consecutive if test results are less than 4*	*fck + 4, N/sq.mm, minimum*	
	B 2.	*Individual test result out of B 1.*	*fck - 2, N/sq.mm, minimum*	*Out of less than four non-overlapping consecutive test results, one individual test result only.*
	C 1	*When number of sample is only one.*	*fck + 4, N/sq.mm, minimum*	

** Established value of standard deviation shall be determined based on Note of Table-11 of IS 456*

6) *The test results of the sample shall be the average of the strength of the three specimens. The individual variation shall not be more than ± 15% of the average.*

Annexure- 6

(Sheet 01 of 02)

SAMPLING PLAN FOR BRICK-WORK

Scale of sampling and permissible number of defectives for visual and dimensional characteristics.

No of Bricks in the lot	For characteristics specified for individual bricks		For Dimensional characteristics for group of 20 bricks- No of bricks to be selected
	No of bricks to be selected	Permissible no of defective in the sample.	
(1)	(2)	(3)	(4)
2001-10000	20	1	40
10001-35000	32	2	60
35001-50000	50	3	80

Note : For a particular work where less then 5000 nos. of bricks are to be used, only visual checks are to be done.

Scale of sampling for physical characteristics

Lot size	Sampling size for compressive strength water absorption and efflorescence	Permissible No of defectives for efflorescence
(1)	(2)	(3)
2001-10000	5	0
10001-35000	10	0
35001-50000	15	1

STANDARD FIELD QUALITY PLAN

Item	Civil works for site Packages
Applicability	POWERGRID PROJECTS
Date of Issue	03.08.2020
Validity	Till next revision

SFQP No.	DOC No.C/FQA/SFQP/SITE-CIVIL-2012
REV.	04

Annexure- 6

(Sheet 02 0f 02)

ACCEPTABLE CRITERIA FOR BRICK WOR1) Dimensional Tolerances: The dimensions of modular/ Non modular bricks when tested shall be within the following limits per 20 bricks.

S.No	DESCRIPTION	MODULAR BRICKS	NON-MODULAR BRICKS
1	LENGTH	372 t0o 388 cm (380± 8 cm)	432 to 468 cm (450 ± 18)
2	WIDTH	176 to 184 cm (180± cm)	213 to 231cm (222± 9)
3	HEIGHT	176 to 184 cm (180± 4 cm)	134 to 146 cm (140 ± 6)

2) Compressive strength: the bricks shall have a minimum average compressive strength as specified in POWERGRID specification. The compressive strength of any individual brick tested shall not fall below the min. average compressive strength specified for the corresponding class of brick by more than 20%. In case compressive strength of any individual brick tested exceeds the upper limit specified for the corresponding class of bricks, the same shall be limited to upper limit of the class as specified for the purpose of calculating the average compressive strength.

3) Water absorption: The average water absorption of bricks shall not be more than 20% by weight.

4) Efflorescence: The rating of efflorescence of bricks shall not be more than moderate.

Annexure- 7

TESTING FOR GLAZED/VITRIFIED TILES

Sl.No.	Frequency of testing	Minimum quantity of material for carrying out Test
1.	One test for every10000 nos. or part thereof for each type and size from a single manufacturer.	5000nos. (no testing need be done if total number tiles of all the types of all sizes from all manufacturers used in a work is less than 5000)

TABLE – I : SAMPLING FREQUENCY FOR BARDED WIRE

S.No.	NUMBER OF REELS IN THE LOT	NO. OF REELS TO BE SELECTED FOR SAMPLING
1.	UPTO 25	3
2.	26 TO 50	4
3.	51 TO 150	5
4.	151 TO 300	7
5.	301 AND ABOVE	10

TABLE – II : ACCEPTABLE TENSILE PROPERTIES AS PER IS 278

S. NO.	SIZE OF LINE WIRE (MM)	TENSILE STRENGTH OF LINE WIRE N/SQ.MM	MINIMUM BREAKING LOAD OF COMPLETED BARBED WIRE (KN)
1.	2.50	390 TO 590	3.7
2.	2.24	390 TO 590	3.0

Annexure-8
Page 1 of 2

PHYSICAL, REQUIREMENT OF COARSE AGGREGATE

S. No.	Type of Construction.	Type of W.B.M.	Test Method	Requirements
1.	Sub-base	Los Angeles Abrasion Value or Aggregate Impact value	IS:2386(Part.IV) IS:2386 (Part IV) IS:5640***	60% max. *50% max
2.	Base	a) Los Angeles Abrasion Value or Aggregate Impact value b) Flakiness Index	IS:2386(Part IV) IS:2386 (Part IV) IS:5640*** IS:2386 (PartI)	50% max. *40% max **15% max
3.	Surface Course	a) Los Angeles Abrasion Value or Aggregate Impact value b) Flakiness Index	IS:2386(Part IV) IS:2386 (Part IV) IS:2386 (Part I)	40% max. 30% max 15% max
4	Binding Material	Plasticity index	IS :2720 (Part V)	Less than 6

* Aggregates may satisfy requirements of either of the two tests

** The requirements of flakiness index shall be enforced only in case of crushed/broken stone and crushed slag.

***Aggregates like brick metal, kankar and laterite which get softened in presence of water, shall be tested for impact value under wet conditions in accordance with IS:5640.

GRADING REQUIREMENTS OF COARSE AGGREGATE FOR W.B.M

Grading No.	Size Range	Sieve designation	% by weight passing the sieve
1	90mm to 45mm (Suitable for sub base courses of compacted layer of not less than 90mm thickness).	125mm 90mm 63mm 45mm 22.4mm	100 90-100 25-60 0-15 0-5
2.	63mm to 45mm	90mm 63mm 53mm 45mm 22.4mm	100 90-100 25-75 0-15 0-5
3.	53mm to 22.4mm	63mm 53mm 45mm 22.4mm 11.2mm	100 95-100 65-90 0-10 0-5
4	Screening		
	A) 13.2 mm	13.2 mm 11.2 mm 5.6 mm 180 micron	100 95-100 15-35 0-10
	B) 11.2 mm	11.2 mm 5.6 mm 180 micron	100 90-100 15-35

STANDARD FIELD QUALITY PLAN

Item	Civil works for site Packages
Applicability	POWERGRID PROJECTS
Date of Issue	03.08.2020
Validity	Till next revision

SFQP No.	DOC No.C/FQA/SFQP/SITE-CIVIL-2012
REV.	04

General Notes:

1) This FQP has been prepared for smaller works awarded by the regions. In case of larger works such as Township, buildings etc., this FQP shall hold good, however, the testing frequency of cement, reinforcement steel, Coarse aggregate, Fine aggregates shall be as per Switchyard Civil works SFQP.
2) This standard Field Quality Plan is not to limit the supervisory checks which are otherwise required to be carried out during execution of work as per drawings/Technical specifications etc.
3) Contractor shall be responsible for implementing/documenting the SFQP. Documents shall be handed over by the contractor to POWERGRID after the completion of the work.
4) Project incharge means over all incharge of work. Site in-charge means in-charge of the line. Site engineer means in -charge of the section.

   Site Engineer's responsibility may be allocated to Site JE, with the approval of Regional Head, only in such cases where, Site Engineer is not in position.
5) In case of deviation the approving authority will be one step above the officer designated for acceptance in this quality plan subject to minimum level of Line incharge.
6) Acceptance criteria and permissible limits for tests are indicated in the Annexures. However for further details/tests POWERGRID specification and latest relevant Indian standards shall be referred.
7) Tests as mentioned in this FQP shall generally be followed. However E.I.C. reserves the right to order additional tests wherever required necessary at the cost of the agency.
8) All counter checks/tests by POWERGRID shall be carried out by POWERGRID's officials' at least at the level of Site Engineer.
9) The authorized dealer of reinforcement steel means the dealer whose names are listed in the steel producer's web site or certified by the producers.
10) Accepting Authority for testing Laboratory shall be Regional Head.
11) **READYMIX CONCRETE (RMC) IS ACCEPTABLE FOR USE. HOWEVER, SITE INCHARGE SHALL APPROVE THE SOURCE OF MATERIALS TO BE USED FOR RMC .The documentation to be maintained shall be as per IS 4926:2003, Reaffirmed 2012 i.e.**

    i) Information to be supplied by the purchaser (clause 7)

    ii) Information to be supplied by the producer (clause 8)

    iii) Sampling for concrete strength should be one set of 3 nos. of cubes for every 50 cum or part thereof for each day of concreting and 28 days compressive strength shall be tested in line with IS 456:2000, Reaffirmed 2016.

12) Epoxy coating on reinforcement steel wherever required shall be done as per IS 13620:1993, Reaffirmed 2015.

13) Cement is to be used in the order; it is delivered (i.e. First in First Out). In case the cement remains in storage for more than 3 months, the cement shall be retested before use and shall be rejected, if it fails to conform to any of the requirements given in the relevant Indian Standard. Cement shall be packed in bags and stored in accordance with the provisions in IS 4082:1996, Reaffirmed 2003.

14) If e-mail facility is not available in POWERGRID approved Lab, report may be collected directly by POWERGRID/ Speed Post / Registered Post / UPC.

15) In case any Laboratory refuses to allow POWERGRID representative for witnessing the test, same shall be taken in writing and approval by Regional Head.

16) *Standard marking of ISI mark along with license number (Seven digit no., represented as CM/L-----) should be verified for construction materials and test certificate submitted for review*

17) *The mix design shall be made in line with standard format (Annexure 9) for required grade of concrete and approval of mix design shall be done in consultation with Regional engineering department.*

18) *Tolerance of cement weight shall be governed by clause no. 10.1.1 of IS 269:2015 for OPC and by clause no. 10.1.1 of IS 1489 (Part 1):2015 for PPC.*

19) *Digital Photographs during concreting, erection and stringing for each location shall be taken and kept in record for future reference by high resolution GPS enabled camera.*

20) *All the charges in connection with NDT/ Core tests shall be borne by the contractor.*

21) The preference shall be given to batching/RMC plants approved by Quality Council of India.

22) *The cube testing in in-house Cube testing machine shall be carried out by POWERGRID employee not directly associated with construction activities. The employees associated with O&M works should be preferred for carried out cube test.*

Annexure-9

CONCRETE MIX PROPORTIONING-MIX DESIGN

S. No.	Design Stipulations	Specified Criteria for Mix Proportion
A 1.	CONCRETE DETAILS: Grade of Concrete (M 20 to M 60- 28 days compressive Strength of 150mm cubes)	M20 ☐ M25 ☐ M30 ☐ M35 ☐ M40 ☐
2.	Type of Concrete- Structural Classification	PCC ☐ RCC ☐ PSC ☐ Others ☐
3.	Placing Conditions of Concrete (Structural Elements)	Building ☐ TL Pile ☐ S/S Pile ☐ S/S Structure ☐ Road ☐
B 4.	MIX DESIGN LIMITS:* Max. Water-Cement Ratio (W/C)- Optional	0.30 ☐ 0.35 ☐ 0.40 ☐ 0.45 ☐ 0.50 ☐ Others ☐
5.	Min Cement Content- Optional- Kg/m3*	300 ☐ 320 ☐ 340 ☐ 360 ☐ 380 ☐ Others ☐
C 6.	EXPOSURE CONDITIONS:@ Type of Environmental Exposure	Mild ☐ Mod. ☐ Severe ☐ V. Severe ☐ Extreme ☐
7.	Whether Expossed to Sulphate attack from Soil, Water & Containment.	Yes ☐ No ☐ Not Known ☐
8.	Whether Expossed to Chloride attack from Soil, Water & Containment.	Yes ☐ No ☐ Not Known ☐

D 9.	CONCRETE INGREDIENTS: Source of Water for Construction	Ground ☐ River ☐ Pond ☐ Others ☐
10.	Type of Cement & Strength Grade.	OPC Gr.33 ☐ OPC Gr.43 ☐ OPC Gr.53 ☐ PPC BFS ☐ PPC FAB ☐ PSC ☐
11.	Brand, Batch No./Week/Year of Cement(Test Certificate to be sent to Lab)	☐ ☐
12.	Cementitous Materials Proposed for Improvement of Density & Permeability.	Microsilica/ Silica Fume ☐ Slag ☐ Fly Ash ☐ Other Pozzolona ☐
13.	FRESH CONCRETE Properties: Desired Slump of Concrete (mm)#	25-55 ☐ 25-75 ☐ 100-150 ☐ Others ☐
14.	QUALITY CONTROL AT SITE: Degree of Quality Control at Project Site (For Standard Deviation)	V.Good ☐ Good ☐ Fair ☐ Std.Lab. ☐
15.	Max. Size of Coarse Aggregate (MSA)-mm	63 ☐ 40 ☐ 20 ☐ 12.5 ☐ 4.75 ☐ Other ☐
16.	Source of Coarse Aggregate	Name of Quarry Location
17.	Type of Fine Aggregate	River Sand ☐ Crushed Sand ☐ Others Specify ☐
18.	Source of Fine Aggregate (Sand)	Name of Quarry Location

19.	Admixture proposed to be Used (Batch MTC to be Submitted to Lab)	Brand Name: Batch No.:
20.	Type of Compaction Equipment	Plate Vibrator ☐ Needle Vibrator ☐ Vibro Hyd. Pressure ☐ Piling Concrete ☐
21.	Type of Concrete Placement Facility at Project	Manual Lift ☐ Hudraulic Bucket ☐ Concrete Pump ☐
22	Maximum/Minimum temp. envisaged during placing of concrete	

* Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size- Reinforced Concrete

	Minimum cement content Kg/m3	Maximum free water cement ration	Minimum grade of concrete
	300	0.55	M20
	300	0.5	M25
	320	0.45	M30
	340	0.45	M35
	360	0.4	M40

Slump Value as per SFQP;

i. For Switchyard civil works – 25 to 75mm
ii. For Switchyard pile foundations- 150-180mm
iii. For Transmission line open cast foundations- 25 to 75mm
iv. For Transmission line pile foundations- 150-180mm

@EXPOSURE CONDITIONS

ENVIRONMENT	EXPOSURE CONDITIONS
MILD	• Concrete surfaces protected against weather or aggressive
MODERATE	• Concrete exposed to condensation and rain • Concrete continuously under water • Concrete surfaces sheltered from rain or freezing whilst wet • Concrete in contact or buried under non-aggressive soil/ground water
SEVERE	• Concrete surfaces exposed to severe rain, alternate wetting and drying or occasional freezing whilst wet or severe condensation • Concrete completely immersed in sea water • Concrete exposed to coastal environment
VERY SEVERE	• Concrete surfaces exposed to sea water spray, corrosive fumes or severe freezing conditions whilst wet. • Concrete in contact with or buried under aggressive subsoil/ ground water
EXTREME	• Surface of members in tidal zone, Members in direct contact with liquid/solid aggressive chemicals