NUCLEAR POWER CORPORATION OF INDIA LIMITED
(A Govt. of India Enterprises)
KAKRAPAR ATOMIC POWER PROJECT-3&4

No.KAPP-3&4/QA/10000/2010/S-101 18.01.2011

Subject: Approval of CIVIL ENGINEERING TEST FECILITIES for testing of materials for construction of KAPP-3&4.

Ref: Letter No: CGPIT/KAPP/239/2010 Dated 20.10.2010.

In continuation with the visit of team of NPCIL Engineers to assess the Testing facilities at C.G.P. Institute of Technology, Bardoli on 14.12.2010, approval with conditions below is hereby granted recognizing the Civil Engineering Laboratory/facilities at the Institute for testing requirements during construction of KAPP 3&4.

1. To carry out tests as per enclosed list (Annexure-1) for all the infrastructure and EPC work of KAPP-3&4.

2. To carry out the test as per enclosed list (Annexure-1) for Main Plant works of KAPP -3&4 in presence of NPCIL official or his authorized representatives.

3. Approval is for two year from the date of issue of this letter and is extendable based on the audit/assessment of performance and re-inspection of Laboratory by NPCIL Team after two year.

It is suggested to obtain NABL/NPL accreditation at the earliest. This is for information please.

Encl: Annexure-1 (7 Pages)

Your's faithfully,

(S.B.Kulkarni) 18/1/2011.
SO/G (QA)

Dr. Jatin A. Desai,
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Bardoli – Mahuva Road, Tapi- 394350

CC: 1. ACE(C)
2. Team Members: i. Sh M Kotaiah ACE (C-MP) ii. Sh S B Kulkarni SO/G QA
iii. Sh D N Chauhan SO/F(C) iv. Sh M B Kaisare SO/E QA

CC: PD/CCE for kind information please.

Chhotubhai Gopalbhai Patel Institute of Technology

Maliba Campus Bardoli-Gujarat

(Approved by AICTE & affiliated to GTU)

Tarsadia Civil Engg. Testing & Consultancy Services

List of tests which can be carried out-all units

Sr. No	DESCRIPTION OF TEST	Ref. IS CODE
1	**COARSE AGGREGATE** 1 Grading or Mechanical Analysis 2 Impact test 3 Soundness(5 Cycles) 4 Loss Angeles abrasion test 5 Alkali reactivity 6 Crushing value 7 Specific gravity and water absorption 8 Flakiness index 9 Elongation Index 10 Bulk Density	IS : 2386 (Part I to VIII), IS:383 IS: 5640
2	**FINE AGGREGATE** 1 Bulk Density 2 Soundness 3 Alkali reactivity 4 Slit Content 5 Fineness modulus	IS : 2386 (Part I to VIII) IS:383
3	**CEMENT** 1 Consistency test 2 Initial and final setting time 3 Soundness test by a. Le- chatlier b. Autoclave 4 Compressive Strength 5 Specific Gravity 6 Fineness test a) Sieving b) Air permeability	IS : 4031

4	**CONCRETE** 1 Concrete mix design with cubes only. i. concrete mix design with Flexure strength test ii. concrete mix design of presteressed beam iii. mass concrete mix Design 2 Compressive strength of concrete by casting and Preparing cubes & Cylinders 3 Permeability of cement concrete or cement mortar cubes 4 Concrete beam for flexural strength of given concrete mix 5 Additional cement testing for mix design 6 Workability by compaction factor, slump, flow table tests 7 Concrete block abrasion test 8 Split tensile test 9 Modulus of elasticity	IS :1199 IS:516 IS : 456 IS: 10262
5	**Non Destructive test: Concrete** 1 Rebound hammer test 2 Ultrasonic pulse velocity test	IS: 13311-Part(1&2)
6	**Concrete Pipes**	IS: 3597
7	**Water** 1 Drinking purpose 2 Suitability for construction purpose	IS: 10500 IS: 456
3	**STEEL** 1 Tensile test including yield stress elongation 2 Young's Modulus of Elasticity 3 Bend test for M.S. & for steel 4 Chemical tests	IS:1786 IS 1599 IS:808 IS:2062 IS:1977 IS:1730 IS:1732

4	**BRICKS (Burnt clay & flyash)** 1 Compressive Strength 2 Water Absorption 3 Efflorescence Tests 4 Dimension and tolerance (Modular) 5 Suitability of soil for Manufacturing bricks with burning at three temp 6 For additional three temp.	IS : 3495 IS : 1077
5	**HOLLOW BRICKS** 1 Water absorption 2 Compressive strength 3 Breaking strength	IS:1077
4	**BUILDING STONE** 1 Preparation of test specimen from rubble by cutting 2 Compressive Strength of prepared test specimen 3 Shear strength of prepared test specimen (for six specimen) 4 Transverse strength of prepared test and specimen (for six Specimen) 5 Weathering Test 6 Durability Test 7 Specimen Gravity(apparent) and water absorption 8 Specimen Gravity (true)	IS :1706 IS :4121 IS: 4122 IS :4348 IS: 5218
5	**LIME** 1 Consistency 2 Fineness test 3 Initial & final setting time 4 Soundness 5 Compressive strength 6 Transverse strength 7 Determination of best proportion of lime/sand/flyash for mortar 8 Determination of best proportion of lime/surkhi/sand mortar with surkhi 9 Calcination of lime stone 10 Slacking of quick lime to product lime	IS:1514 IS: 1624 IS :1635 IS :6932 (Part 1-11)

6	**Complete chemical analysis of Engg. Materials like cement , stone, pozzolona, soil, lime etc** 1 Part analysis i. percent loss ii. percent silica iii. percentage of ferric oxide iv. Percentage Aluminum oxide v. Percent Sulphate vi. Percent Calcium oxide vii. Percent Magnesium oxide 2 Complete chemical analysis of water 3 Complete chemical analysis of soil extract 4 Part analysis of water i. Sulphate ii. Conductivity iii. Total soluble salts iv. Ph value v. Carbonate & Bi- Carbonate vi. Chloride vii. Sodium & potassium viii. Turbidity ix. Slit content x. Calcium xi. Magnesium 5 Preparation charges for soil extract or analysis of soil extract 6 Organic Impurity test (IS:2386-Part-1 1962) of sand 7 Organic matter of soil 8 Acid resistance of mortar as per IS 4456 part1 a. Mix of readymade sample b. For preparing mould 9 Acid resistance for bricks and tiles 10 Alkali reactivity test of fine aggregate 11 Alkali reactivity test of coarse aggregate 12 % $CaCO_3$ by titration & quantity checking of H_2O_2	IS : 4032 IS : 269 IS : 8112 IS : 12269 IS : 435 IS : 1489 (Part I& II) IS 13025

	13 Determination of lime content in soil 14 Determination of available Cao from burnt lime 15 Base exchange capacity of soil 16 72 hours water absorption for FRP/ PVC Material 17 Determination of cement In hardened cement concrete 18 Determination of cement content hardened cement concrete 19 % carbon in coal/coal ash / flyash etc. 20 Testing of alkalis in cement 21 Determination of free lime content in cement 22 Determination of cement content hardened cement concrete 23 % carbon in coal/coal ash / flyash etc. 24 Testing of alkalis in cement 25 Determination of free lime content in cement	
7	**POZZOLANA MATERIAL** 1 Fineness by sieving 2 Fineness by Blain's air permeability 3 Lime reactivity 4 Compressive strength 5 Suitability of soil for surkhi for three temperature 6 For every additional temp. 7 Determination of best proportion of cement/surkhi/sand/ mortar 8 Determination of best proportion of cement/ pozzolona/ gravel/ mortar 9 Specific gravity of pozzolona	IS : 1727
8	**TILES** 1 Water absorption 2 Transverse strength 3 Abrasion test 4 Dimension and tolerance 5 Flexural strength of canal lining block tiles 6 Flatness of the tiles surface (For 6 Nos. tiles) 7 Determination of perpendicularity (6 Nos. of tiles) 8 Determination of strength of cement concrete flooring tiles (For 6 Nos. of tiles)	IS:1237 IS:13801 IS:777 IS:13754 IS:13756 IS:13753 IS:13755

9	**A.C.SHEETS** 1 Transverse strength 2 Water absorption 3 Dimension & Tolerance 4 Impermeability	IS :2096 IS :5913
10	**FLUSH DOOR AND TIMBER (WOOD)** 1 End immersion test 2 Adhesion test 3 Moisture content(Wood) 4 Adhesion test (Dry & Wet of plywood) 5 Specific gravity of timber (wood) 6 Nail or screw pulling test 7 Density of wood 8 Anatomy of wood 9 Static bending test 10 Impact bending test 11 Compression parallel to grain i. Compression perpendicular to grain 12 Identification 13 Shear parallel to grain 14 Tension perpendicular to grain a. Tension parallel to grain 15 Brittleness- Impact (Izod & charphy test) 16 Torsion test	IS:1003 IS:2191 IS:2202 IS:3097 IS:3087 IS:1708(part 1-18)
11.	**Soil Testing**	
	a) Hydrometer analysis	IS:2720 (Part 2)
	b) Sieve Analysis	IS:2720 (Part 4)
	c) Silt Analysis	IS:2720 (Part 2)
	d) Atterberg's Limit	IS:2720 (Part 5)
	e) Specific Gravity	IS:2386 (Part 3)
	f) Shrinkage Limit	IS:2720 (Part 6)
	g) Light compaction (Proctor)	IS:2720 (Part 7),
	h) Heavy compaction (Modified Proctor)	IS:2720 (Part 8)
	i) Minimum and Maximum density ,Relative density(RD)	IS: 2720 (Pt 14)

	j) Swell Pressure	IS:2720 (Part 41)
	k) Free Swell	IS:2720 (Part 40)
	l) Unconfined compression test- shear strength	IS:2720 (Part 10)
	m) Laboratory Vane Shear test-shear strength	IS:2720 (Part 30)
	n) Permeability-granular soil –constant head	IS:2720 (Part 36)
	o) Permeability of cohesive soils–constant head & Falling head	IS:2720 (Part 17)
	p) Box shear –granular soil-shear strength	IS:2720 (Part 13),
	q) Consolidation	IS:2720 (Part 15) IS:2720 (Part 39)),
	r) triaxial shear test-CU,UU,CD	IS : 2720 (Part 12)
	s) Collection of undisturbed sample (Tube sampler):	IS: 10108, IS 8763
	t) Standard penetration test (SPT)	IS:2131, IS:9640
	u) Natural moisture content: Insitu dry density by sand replacement (100 mm Dia):	IS:2720 (Part 28)
	v) Collection of Undisturbed sample by core cutter (Incl.MDD & OMC):	IS 2720-(P-29)
	w) In situ dry density by water replacement (30cm dia ring inl. MDD & OMC):	IS 2720-(P-33)
	x) Hand Auguring in soils excluding gravel and hard murrum	IS 10042
	y) Plate Load Test on Soil	IS:1888
	z) Dynamic cone penetration test (Non return)	IS:4968 (Part - 1)
	aa) Dynamic cone penetration test (Return)	IS:4968 (Part - 1)
	bb) Static cone penetration test	IS:4968 (Part 3)
	cc) Footing load test	
	dd) Laboratory California Bearing Ratio Test	IS:2720 (Part 16)
	ee) Field California Bearing Ratio Test	IS: 2720-part-31
	ff) Methods of test for hardness of rock	IS :12608
	gg) laboratory determination of resistivity of rock specimen	IS: 14436
	hh) determination for direct shear strength of rock joints	IS: 12634
	ii) laboratory determination of water content, porosity, density and related properties of rock material	IS: 13030