



TABLE OF CONTENT

1
A. MECHANICAL & PIPELINE 7
1.0 CARBON STEEL PIPES 7
1.1 PIPE CARBON STEEL TO INDIAN STANDARDS 7
1.2 PIPE & TUBULARS TO A.P.I. STANDARDS 8
1.3 PIPE/TUBE CS (SEAMLESS) TO ASTM STANDARDS 9
1.4 PIPE CARBON STEEL (WELDED) TO ASTM STANDARDS 9
2.0 VALVES 10
2.1 GLOBE VALVES 10
2.2 CHECK VALVES 10
2.3 PLUG VALVES 11
2.4 BALL VALVES 11
3.0 TEE 12
3.1 FLOW TEE 12
3.2 SPLIT TEE 12
4.0 FLANGES 13
5.0 FITTINGS 13
6.0 PIG LAUNCHERS/ RECEIVERS/ PIG SIGNALERS 14
7.0 LONG RADIUS BENDS 15
8.0 CLEAN AGENT SYSTEM 15
9.0 INSULATING JOINTS 16
10.0 GASKETS 16
11.0 FASTENERS 16
12.0 WELDING ELECTRODES FOR PIPELINE/PIPING WORK 17
13.0 STRAINERS 17
14.0 COLD APPLIED TAPES 17
15.0 HEAT SHRINKABLE SLEEVE/ FIBREGLAS REINFORCED SLEEVE 17
16.0 STUD BOLTS WITH NUTS 17
17.0 WARNING MAT 17



18.0 HDPE PIPES/DUCT..... 18

19.0 DRY GAS FILTER & FILTER SEPERATOR..... 18

20.0 FILTER ELEMENT 19

21.0 NDT AGENCY 19

22.0 Cold Applied Tapes..... 19

23.0 PUR Coating 19

24.0 Casing End Closure 19

25.0 Casing Insulators 19

26.0 FIRE FIGHTING EQUIPMENT 20

 26.1 FIRE EXTINGUISHERS 20

 26.2 FIRE HYDRANTS, MONITORS, DELUGE VALVE, NOZZLES ... 20

 26.3 RRL Hose 20

 26.4 HOSES 21

B. CIVIL AND STRUCTURAL 22

C. ELECTRICAL..... 27

 1.0 AIR CONDITIONER..... 27

 2.0 BATTERIES (LEAD ACID)..... 27

 3.0 BATTERIES (NICKEL CADMIUM)..... 28

 4.0 BATTERY CHARGER/DC-DC CONVERTER..... 28

 5.0 CABLE – FIRE ALARM & COMMUNICATION CABLES 28

 6.0 CABLE – HT(XLPE) 28

 7.0 CABLE – LT / MV POWER AND CONTROL..... 29

 8.0 CABLE – GLAND 29

 9.0 CABLE – LUGS & TERMINAL BLOCKS 30

 10.0 CABLE – TRAY 30

 11.0 CABLE TERMINATION AND JOINTING KIT..... 30

 12.0 CEILING/EXHAUST/PEDESTAL FANS & CIRCULATORS 30

 13.0 CONTRACTORS – AC POWER..... 31

 14.0 CONTROL TRANSFORMER 31

 15.0 GAS GENERATOR/DIESEL GENERATOR SET..... 31

 16.0 FLAME PROOF LDB’S/ JB’S/CONTROL STATION/ SWITCHES..... 32

 17.0 HIGH MAST 32



18.0	HIGH VOLTAGE PCC/ MCC PANELS	33
19.0	INDICATING LAMPS	33
20.0	INDICATING METERS	33
21.0	LIGHTING FIXTURES	34
22.0	LIGHTING FIXTURES – FLAMEPROOF	34
23.0	MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB	34
24.0	MOULDED CASE CIRCUIT BREAKER (MCCBS)	35
25.0	PROTECTION RELAYS	35
26.0	LOW/MEDIUM VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB	36
27.0	PUSH BUTTONS	36
28.0	SWITCHES-CONTROL	37
29.0	SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET	37
30.0	SWITCH SOCKET OUTLETS (INDUSTRIAL)	37
31.0	SOLAR POWER SYSTEM MODULES	37
32.0	SOLAR PCU/CHARGE CONTROLLER	38
33.0	TERMINALS BLOCKS	38
34.0	DISTRIBUTION TRANSFORMERS	38
35.0	UPS SYSTEM AND INVERTER	39
36.0	GI-OCTAGONAL POLE	39
37.0	ELECTRICAL MOTORS	39
38.0	ELECTRICAL PROCESS HEATER	40
39.0	CATHODIC PROTECTION AGENCIES/CONTRACTOR/ VENDERS	40
40.0	BACKUP AGENCY FOR INTERFERENCE SURVEY & MITIGATION	40
41.0	PERMANENT REFERENCE CELL	41
42.0	CP CABLES	41
43.0	CP SACRIFICIAL ANODES	41
44.0	CP PORTABLE /PERMANENT REFERENCE CELL	42
45.0	CPTR (AC OPERATED)	42
46.0	PIN BRAZING / THERMITWELD	42
47.0	CP SURGE DIVERTER/SPARK GAP ARRESTOR (EX-D)	42



48.0 CP SOLID STATE POLARISATION CELL. 42

49.0 PETROLEUM COKE BREEZE: 43

50.0 CP ANODE (MMO TYPE): 43

51.0 HEAT SHRINK CAP FOR CP ANODE 43

52.0 ER- PROBE (EXTERNAL CORROSION) ER- PROBE & CORROSION COUPON ASSEMBLY..... 43

53.0 HEAT SHRINK CAP FOR ANODE TO CABLE JOINT 43

54.0 MMO WIRE ANODES (WITH FACTORY PRE-PACKED COKE BREEZE) 44

55.0 MMO WIRE ANODES (WITHOUT FACTORY PRE-PACKED COKE BREEZE) 44

56.0 MMO TUBULAR/ STRIP/ RIBBON ANODES..... 44

D. INSTRUMENTATION 45

1.0 PRESSURE GAUGES 45

2.0 TEMPERATURE GAUGES..... 45

3.0 TEMPERATURE ELEMENTS INCLUDING SKIN TYPE..... 46

4.0 POSITIVE DISPLACEMENT FLOW METERS..... 46

5.0 TURBINE FLOW METER..... 46

6.0 ELECTRONIC VOLUME CORRECTOR..... 47

7.0 ORIFICES (METER RUN, FLOW CONDITIONER, ORIFICE PLATE AND ASSEMBLY) 47

8.0 ULTRASONIC FLOW METERS 47

9.0 MASS FLOW METERS 47

10.0 FIELD INSTRUMENTS (P, DP, F, L, T)..... 48

11.0 LEVEL GAUGES/ LEVEL INSTRUMENTS..... 48

12.0 PRESSURE REGULATOR AND SLAM SHUT VALVE..... 48

13.0 PRESSURE SAFETY VALVES..... 49

14.0 CONTROL PANEL & ACCESSORIES 49

15.0 JUNCTION BOXES AND CABLES GLANDS 50

16.0 CONTROL AND SIGNAL CABLES 50

17.0 GAS DETECTION SYSTEM 50

18.0 MOV ACTUATOR: 51



19.0 PNEUMATIC ACTUATOR (SOLENOID OPERATED ON-OFF TYPE) ... 51

20.0 SOLENOID VALVES 51

21.0 ELECTRO – HYDRAULIC ACTUATOR..... 51

22.0 GAS OVER OIL ACTUATOR..... 52

23.0 OFC..... 52

24.0 FLOW CONTROL VALVES 52

25.0 FLOW COMPUTERS..... 53

26.0 INDICATORS & CONTROLLERS 53

27.0 BARRIERS 53

28.0 GAS CHROMATOGRAPH 53

29.0 I/P CONVERTERS 53

30.0 SS FITTINGS, INSTRUMENT VALVES & MANIFOLDS..... 54

 30.1 FOR CNG WORK:..... 54

 30.2 EXCEPT CNG WORK: 54

31.0 SS TUBES..... 54

 31.1 FOR CNG WORK:..... 54

 31.2 EXCEPT CNG WORK: 54

E. SHOP & FIELD PAINTING 55

 1.0 INDIAN VENDORS 55

 2.0 FOREIGN VENDORS FOR OVERSEAS PRODUCTS 55

F. FOR PE & LMC WORK (GI/CU) 57

 1.0 MDPE FITTINGS & MDPE VALVES 57

 2.0 GI PIPE..... 57

 3.0 CASTING GI FITTINGS 57

 4.0 FORGED GI FITTING (FOR HIGH RISE SEGMENT)..... 57

 5.0 COPPER TUBES & FITTINGS..... 58

 6.0 BRASS FITTINGS 58

 7.0 BRASS VALVES 58

 8.0 BRASS FITTINGS 58

 9.0 STEEL RE-INFORCED RUBBER HOSE (TYPE-4)..... 58

 10.0 CORRUGATED FLEXIBLE METAL HOSES (ANACONDA)..... 58

**A. MECHANICAL & PIPELINE****1.0 CARBON STEEL PIPES****1.1 PIPE CARBON STEEL TO INDIAN STANDARDS**

- a. A.S.T. Pipes Pvt. Ltd. (AST Group)
- b. Advance Steel Tube Ltd.
- c. Apl Apollo Tubes Ltd. (Er. Bihar Tubes Ltd.
- d. Asian Mills Pvt. Ltd.
- e. Asrani Tubes Limited
- f. Dadu Pipes (P) Ltd.
- g. Essar Steel Limited(Er Hazira Pipes Mill)
- h. Gaurang Products Pvt Ltd. (Ast Group)
- i. Goodluck Steel Tubes Ltd.
- j. Hi-Tech Pipes Limited
- k. Indus Tube Limited
- l. Jindal Industries Ltd
- m. Jindal Pipes Ltd.
- n. Jindal Saw Ltd (Kosi Works)
- o. Jotindra Steel & Tube Ltd
- p. Lalit Pipes And Pipes Ltd.
- q. Maharashtra Seamless Ltd.
- r. Man Industries (India) Ltd. – Pithampur
- s. Man Industries (India) Ltd. Anjar
- t. Mukat Tanks & Vessels Ltd.
- u. Nezone Tubes Limited
- v. North Eastern Tubes Limited
- w. Pratibha Industries Limited
- x. Pratibha Pipes & Structural Ltd.
- y. Psl Ltd (Chennai)
- z. Psl Ltd (V1, V2 & NC)
- aa. Rama Steel Tubes Ltd.
- bb. Ratnamani Metals And Tubes Ltd.
- cc. Ravindra Tubes Limited



- dd. Samshi Pipe Industries Limited
- ee. Surya Roshni Ltd.
- ff. Swastik Pipes Ltd.
- gg. Utkarsh Tubes & Pipes Ltd. (Formly Bmw)
- hh. Welspun Corp. Limited (Dahej)
- ii. Zenith Birla (India) Limited

1.2 PIPE & TUBULARS TO A.P.I. STANDARDS

- a. Arcelormittal Tubular Products Roman Sa, Romania
- b. Bhel (Trichy),India
- c. Dalmine Spa (Enquiry To Tenaris),Uae
- d. Eewkorea Co. Ltd (Germany), Korea
- e. Eew Korea Co. Ltd. (Korea), Korea
- f. Eisenbau Kramer Gmbh, Germany
- g. Hyundai Rb Co. Ltd. South Korea
- h. Ilva Lamiere E Tubi Srl (Enq To Ilva Spa, Italy
- i. Inox Tech. Spa, Italy
- j. ISMT Ltd. Ahmedngr, India
- k. TATA Steel, India
- l. PSL
- m. Jindal Pipes Ltd., India
- n. Jindal Saw Ltd. (Kosi Works), India
- o. Jindal Saw Ltd. (Nashik Works), India
- p. Lalit Pipes And Pipes Ltd. India
- q. Maharashtra Seamless Ltd., India
- r. Man Industries (I) Ltd. (Pithampur), India
- s. Mukat Tanks & Vessels Ltd., India
- t. Pratibha Industries Limited, India
- u. Ratnamani Metals And Tubes Ltd., India
- v. Siderca S.A.I.C (Enquiry Totenaris), Uae
- w. Sumitomo Metal Ind. Ltd., India
- x. Surya Roshni Ltd., India
- y. Swastik Pipes Ltd, India
- z. Tata Steel Uk Limited (Formerly C702)
- aa. Tubos De Acero De Mexico Sa (Enq. Tenaris), Uae



- bb. Tubos Reunidos Sa Spain
- cc. Umran Steel Pipe Inc (Turkey), Turkey
- dd. Valcovny Trub Chomutov, Czech Republic
- ee. Vallourec And Mannesmann Tubes, France
- ff. Welspun Corp Limited (Dahej), India

1.3 PIPE/TUBE CS (SEAMLESS) TO ASTM STANDARDS

- a. Arcelormittal Tubular Products Roman Sa, Romania
- b. Bhel (Trichy), India
- c. Changshu Seamless Steel Tube Co. Ltd., China
- d. Dalmine Spa (Enquiry To Tenaris, Uae
- e. Heavy Metals & Tubes Limited (Mehsana), India
- f. Ismt Ltd. Ahmedngr, India
- g. Ismt Ltd. Baramati India
- h. Jfe Steel Corporation, Uae
- i. Jindal Sdaw Ltd (Nashik Works) India
- j. Klt Automotive And Tubular Products Ltd., India
- k. Mahalaxmi Seamless Limited, India
- l. Maharashtra Seamless Ltd, India
- m. Products Tubulares S.A.U, Spain
- n. Ratnadeep Metal Tubes Ltd., India
- o. Staineest Tubes Pvt Ltd., India
- p. Sumitomo Metal Ind. Ltd., India
- q. Tubos Reunidos Sa Spain
- r. Valcovny Trub Chomutov, Czech Republic
- s. Vallourec Andmannesmann Tubes France
- t. Yangzhou Chengde Steel Pipe Co. Ltd Dubai (UAE)

1.4 PIPE CARBON STEEL (WELDED) TO ASTM STANDARDS

- a. Eew Korea Co. Ltd. (Germany), Korea
- b. Eew Korea Co. Ltd. (Korea), Korea
- c. Eisenbau Kramer Gmbh, Germany
- d. Hyundai Rb Co. Ltd., South Korea
- e. Inox Tech. Spa, Italy
- f. Jindal Saw Ltd (Kosi Works), India
- g. Lalit Pipes and Pipes Ltd., India



- h. Man Industries (I) Ltd.(Pithampur), India
- i. Man Industries (India) Ltd. Anjar, India
- j. Mukat Tanks & Vessels Ltd., India
- k. Ratnamani Metals And Tubes Ltd., India
- l. Sumitomo Metal India Ltd., India
- m. Tata Steel Uk Limited

2.0 VALVES

2.1 GLOBE VALVES

- a. BDK (New Delhi)
- b. Datre Corpn (Calcutta)
- c. KSB Pumps (New Delhi)
- d. L&T (New Delhi)
- e. Neco Schuber & Salzer Ltd. (New Delhi)
- f. Niton Valve (Mumbai)
- g. Ornate Valves (Mumbai)
- h. Panchavati Valves (Mumbai)
- i. AV Valves Ltd.
- j. BHEL (Trichy), India
- k. Econo Valves Pvt Ltd, India
- l. Fouress Engg (I) Ltd (Aurangabad)
- m. Guru Industrial Valves Pvt Ltd
- n. Leader Valves Ltd, India
- o. NSSL Ltd. (Neco Schubert & Salzerltd)
- p. Oswal Industries Ltd, India
- q. Petrochemical Engineering Enterprises, India
- r. Sakhi Engineers Pvt Ltd
- s. Shalimar Valves Pvt Ltd
- t. Steel Strong Valves India Pvt Ltd, India
- u. Petro Valves Pvt. Limited, Ahmedabad
- v. Hawa Engineers Limited, Ahmedabad

2.2 CHECK VALVES

- a. Advance Valves Pvt. Ltd., Noida
- b. Aksons & Mechanical Enterprises, Mumbai
- c. Larsen & Toubro Limited (Audco India Limited, Chennai)



- d. AV valves Ltd., Agra
- e. BDK engineering India Ltd., Hubli
- f. BHEL, OFE&OE Group, New Delhi
- g. Datre Coroportion Limited, Calcutta
- h. Leader Valves Ltd., Jalandhar
- i. Neco schubert & Salzer Ltd., New Delhi
- j. Niton Valves Industries (P) Ltd., Mumbai
- k. Precision Engg. Co., Mumbai
- l. Econo Valves Pvt Ltd, India
- m. Fouress Engg (I) Ltd (Aurangabad)
- n. KSB Pumps Ltd (Coimbatore), India
- o. NSSL Ltd. (Neco Schubert & Salzer Ltd)
- p. Oswal Industries Ltd, India
- q. Panchvati Valves & Flanges Pvt Ltd, India
- r. Petrochemical Engineering Enterprises, India
- s. Sakhi Engineers Pvt Ltd
- t. Shalimar Valves Pvt Ltd
- u. Steel Strong Valves India Pvt Ltd, India

2.3 PLUG VALVES

- a. Breda Energia Sesto Industria Spa, Italy
- b. Fisher Sanmar Ltd., Chennai
- c. Larsen & Toubro Ltd., New Delhi
- d. Nordstrom Valves, USA
- e. Serck Audco Valves, UK
- f. Sumitomo Corporation India Pvt. Ltd., New Delhi
- g. Z Corporation, Korea
- h. Hawa Valves (India) Pvt. Ltd., Mumbai
- i. Steel Strong Valves India Pvt. Ltd., Navi Mumbai
- j. Econo Valves
- k. Flow-Serve PTE (Mfr. SERCK), India

2.4 BALL VALVES

- a. Hawa Valves (India) Pvt. Ltd, Navi Mumbai
- b. Larsen & Toubro, Delhi
- c. Microfinish Valves Pvt. Ltd., Noida



- d. Oswal Industries Ltd., Gandhi nagar
- e. Virgo Engineers Ltd., Delhi
- f. Boteli Valve Group Co. Ltd., China
- g. Cameron (Malaysia) SDN BHD, Malaysia
- h. Dafram S.P.A., Italy
- i. Fangyuan Valve Group Co. Ltd., China
- j. Franz Schuck GmbH, Germany
- k. O.M.S. Saleri (Italy)
- l. Pibi Viesse S.P.A (Italy)
- m. Nuovo Pignone (Italy)
- n. Perar S.P.A (Italy)
- o. Pietro Fiorentini (Italy)
- p. Cooper Cameron Valv Italy SRL-FRM, Italy
- q. Petrol Valves SRL
- r. Tormene Gas Technology S.P.A (VALVITALIA)
- s. Petro Valves Pvt. Limited, Ahmedabad

3.0 TEE

3.1 FLOW TEE

- a. Coprosider SPA, Italy
- b. GEA Energy System India Limited, Chennai
- c. Multitex Filtration
- d. Pipeline Engineering, UK
- e. Scomark Engg. Limited (U.K.)
- f. Skeltonhall Limited, Engaland(U.K.)
- g. Technospecial SPA, Italy
- h. Tectubi SPA, Italy
- i. RMA Germany
- j. Pipefit Engineers Pvt. Ltd.
- k. Vee Kay Vikram & Co.

3.2 SPLIT TEE

- a. IPSCO, Canda
- b. TD Willamsons, USA
- c. Plant-Tech Power Technical Services Pvt Ltd
- d. Teemans, UK



- e. Vee Kay Vikram & CO.

4.0 FLANGES

- a. Aditya Forge Ltd., Vadodara
- b. Amforge Industries Ltd., Mumbai
- c. CD Engineering Co., Ghaziabad
- d. Echjay Forgings Pvt. Ltd. (Bombay), Mumbai
- e. Echjay Industries Ltd., Rajkot
- f. Forge & Forge Pvt. Ltd., Rajkot
- g. Golden Iron & Steel Works, New Delhi
- h. JK Forgings, New Delhi
- i. Metal Forgings Pvt. Ltd., Mumbai
- j. Perfect Marketings Pvt. Ltd., New Delhi
- k. Sky Forge, Faridabad
- l. S&G, Faridabad
- m. Chaudhry Hammer Works Ltd, India
- n. JAV Forgings (P) Ltd, India
- o. Kunj Forgings Pvt Ltd, India
- p. MS Fittings
- q. R.N. Gupta & Co. Ltd, India
- r. R.P. Engineering Pvt Ltd, India
- s. Sanghvi Forgings & Engineering Ltd
- t. Shri Ganesh Forgings Ltd., India
- u. Uma Shankar Khandelwal & Co., India
- v. Sawan Engineers, Baroda
- w. Stewarts & Lloyds of India Ltd., Kolkata
- x. Engineering Services Enterprises
- y. Pipefit Engineers Pvt. Ltd.
- z. Jindal Forging
- aa. Vivial Forges

5.0 FITTINGS

- a. Commercial Supplying Agency, Mumbai
- b. Dee Development Engineers Ltd.
- c. Eby Industries, Mumbai
- d. Flash Forge Pvt. Ltd., Vishakhapatnam



- e. Gujarat Infra Pipes Pvt. Ltd., Vadodara
- f. M.S. Fittings Mfg. Co. Pvt. Ltd., Kolkata
- g. Stewarts & Lloyds of India Ltd., Kolkata
- h. Teekay Tubes Pvt. Ltd., Mumbai
- i. Pipe Fit, Baroda
- j. Sky Forge, Faridabad
- k. S&G, Faridabad
- l. Sawan Engineers, Baroda
- m. Eby Fasteners, India
- n. Leader Valves Ltd, India
- o. R.N. Gupta & Co. Ltd, India
- p. Exten Engg Pvt Ltd
- q. Sivananda Pipe & Fittings Ltd
- r. Jindal Forging
- s. Vivial Forges
- t. PK Tubes Rajasthan
- u. CSA Fitting
- v. Gujarat Infrapipes pvt ltd, Vadodara
- w. KS Pipes Fitting Pvt Ltd, Palwal
- x. Tube Bend, Kolkata

6.0 PIG LAUNCHERS/ RECEIVERS/ PIG SIGNALERS

- a. Bassi Luigi Fittings B.V., Holland
- b. BRAUN STAHL PIPE TEC, GERMANY
- c. FORAIN, ITALY
- d. Fluidel SRL, ITALY
- e. RMA Maschinen- und, GERMANY
- f. Siiritec Nigi, Itlay
- g. SCHUCK ARMATUREN, GERMANY
- h. T.D. Williamson Inc., USA
- i. Tectubi SPA, Italy
- j. Taylor Forge Engineering System INC, USA
- k. Tormene Americana S.A. (Argentina)
- l. Tormene Gas Technology S.p.A., Italy



- m. PIPELINE ENGINEERING, UNITED KINGDOM
- n. Krohne, Oil & Gas BV, Drive Houston,
- o. Multitex Filtration Engrs. Ltd, New Delhi
- p. BGR ENERGY SYSTEMS LIMITED New Delhi
- q. Glapwell Contracting Services Ltd. UK
- r. FULGOSI GIOVANNI S.n.c di Corrado & C, ITALY
- s. VEEKAY VIKRAM & CO, GUJRAT
- t. GBM S.R.L, ITALY
- u. Cardew Ltd., Alexeander
- v. Forain S.R.L.
- w. GD Engineering, India
- x. Pipeline Engineering, UK
- y. Siirtec Nigi SPA
- z. Control Plus
- aa. Oswal Infrastructure

7.0 LONG RADIUS BENDS

- a. Jindal Saw Ltd. (Kosi Works), India
- b. PSL Limited (Gandhidham – Mfrg), India
- c. BHEL, Trichy, Tamilnadu
- d. Welspun, Gujarat
- e. Sawan
- f. Gujarat Infra
- g. P K Tubes
- h. DEE Development
- i. Pipefit Engineers Pvt. Ltd.

8.0 CLEAN AGENT SYSTEM

- a. ADN Fire Safety Pvt Ltd (Vashi East, Thane)
- b. Chetan Corporation (Ahmedabad)
- c. Chetan Engineers (Ahmedabad)
- d. Mx Systems International Pvt. Ltd. (Mumbai)
- e. New Fire Engineers (P) Ltd (Sil Vassa)
- f. Nitin Fire Protection Industries Ltd (New Bombay)
- g. Nohmi Bosai (India) Private Limited
- h. Tyco Fire & Security India Pvt. Ltd (Bangalore)



- i. Vimal Fire Controls Pvt Ltd (Vadodara)

9.0 INSULATING JOINTS

- a. IGP Engineers
- b. V K Vikram
- c. Advance Electronics
- d. Nupros INC

10.0 GASKETS

- a. IGP Engineers (P) Ltd., Madras
- b. Madras Industrial Products, Madras
- c. Dikson & Company, Bombay
- d. Banco Products (P) Ltd., Vadodara
- e. Goodrich Gaskets Pvt Ltd
- f. Starflex Sealing India Pvt Ltd, India
- g. Teekay Meta Flex Pvt Ltd
- h. UNIKLINGER Ltd
- i. HEM Engg. Corp.
- j. Unique Industrial Packing Pvt. Ltd.

11.0 FASTENERS

- a. Nireka Engg. Co. (P) Ltd., Calcutta
- b. Precision Taps & Dies, Bombay
- c. AEP Company, Vithal Udyoug Nagar
- d. Fix Fit Fasteners, Calcutta
- e. Precision Engg. Industries, Baroda
- f. Echjay Forgings Pvt. Ltd., Bombay
- g. Capital Industries, Bombay
- h. Boltmaster India Pvt Ltd, India
- i. Deepak Fasteners Limited, India
- j. Fasteners & Allied Products Pvt Ltd, India
- k. Hardwin Fasteners Pvt Ltd, India
- l. J.J. Industries, India
- m. Multi Fasteners Pvt Ltd, India
- n. Nexo Industries, India
- o. Pacific Forging & Fasteners Pvt Ltd, India



- p. Pioneer Nuts & Bolts Pvt Ltd, India
- q. Precision Auto Engineers, India
- r. President Engineering Works, India
- s. Sandeep Engineering Works, India
- t. Syndicate Engineering Industries, India

12.0 WELDING ELECTRODES FOR PIPELINE/PIPING WORK

- a. For Mainline – Lincoln/ Bohler make
- b. For Terminal – For root pass –Lincoln/ Bohler make
For other passes – Lincoln, D&H or equivalent makeLincon

13.0 STRAINERS

- a. Bombay Chemical Equipments
- b. Gujarat Auto filed
- c. Multitex Filtration Engineering Limited
- d. Grand Prix Engineering Limited

14.0 COLD APPLIED TAPES

- a. Denso GmbH
- b. Raychem

15.0 HEAT SHRINKABLE SLEEVE/ FIBREGLAS REINFORCED SLEEVE

- a. Covalence - Seal For Life India Pvt. Ltd. (Formerly Covalence Raychem- Berry Plastics Corporation)
- b. Canussa-CPS

16.0 STUD BOLTS WITH NUTS

- a. Multi Thread Fasteners, Baroda
- b. Darukhanwala
- c. Precision Engineers, Baroda
- d. Unbrako
- e. TVC

17.0 WARNING MAT

- a. Sparco Multiplast Pvt. Ltd., Ahmedabad
- b. Singhal Industries , Ahemdabad
- c. Puja Packing, Mumbai



- d. Bina Enterprises, Mumbai
- e. Shree Vijay Wire & Cable Industries

18.0 HDPE PIPES/DUCT

- a. Climax Synthetics (P) Ltd., Vadodra
- b. Indian Poly Pipes, Calcutta
- c. Jain Irrigation Systems Ltd., Jalgaon
- d. Kirti Industries (India) Ltd., Indore
- e. Ori Plast Limited, Calcutta
- f. Phoel Industries Limited, Delhi
- g. Sangir Plastics (P) Ltd., Mumbai
- h. Veekay Plast, Jaipur
- i. Kisan Irrigation
- j. Dutron Polymers Ltd.
- k. Manikya Plastichem (P) Ltd
- l. Himalyan Pipe Industries

19.0 DRY GAS FILTER & FILTER SEPERATOR

- a. Grand Prix Fab (Pvt.) Ltd. (New Delhi)
- b. Perry Equipment, USA
- c. Faudi Filter, Germany
- d. Forain S.r.l., Italy
- e. ABB, Faridabad
- f. Burgess Manning, USA
- g. Multitex Filtration Engineers India
- h. Triveni Plenty Engg. Ltd. (New Delhi)
- i. Siirtec International Contractor S.P.A (Italy)
- j. Flashpoint, Pune india
- k. Filtration Engineers (I) Pvt Ltd, India
- l. Gujarat Otofilt, India
- m. Tormene Gas Technology
- n. Ultrafilter (India) Pvt Ltd, India
- o. Ravi Techno Systems Pvt Ltd, India
- p. Siirtec Nigi S.P.A
- q. Filtan Filter Anlagenbau GmbH
- r. Fairley Arlon BV



- s. PECO Facet
- t. EPE Epenstenner GMBH
- u. Filtrex srl
- v. Petromar Engineered Soln
- w. Plenty Filter
- x. Eurofiltec
- y. PTI Technologies Inc

20.0 FILTER ELEMENT

- a. Peco – Facet
- b. Velcon
- c. Pall – Filterite
- d. Burgress Manning

21.0 NDT AGENCY

- a. NDT Services, Ahmedabad
- b. GEECY Industrial Services Pvt. Ltd., Mumbai
- c. Corrosion Control Services, Mumbai
- d. Perfect Metal Testing & Inspection Agency, Calcutta
- e. Inter Ocean Shipping Co., New Delhi
- f. RTD, Mumbai
- g. Sievert, Mumbai
- h. X-Tech, Vizag
- i. Industrial X Ray and Allied Radiographers (I) Pvt. Ltd.

22.0 Cold Applied Tapes

- a. Denso GmbH
- b. Polyken (Berry Plastics Corporation)

23.0 PUR Coating

- a. Powercrete (Berry Plastics Corporation)

24.0 Casing End Closure

- a. Raci, Italy
- b. Raychem RPG Limited

25.0 Casing Insulators

- a. Raci, Italy



- b. Raychem RPG Limited
- c. VeekayVikram

26.0 FIRE FIGHTING EQUIPMENT

26.1 FIRE EXTINGUISHERS

- a. Avon Services (Production & Agencies) Pvt. Ltd., Bombay
- b. Kooverji Devshi & Co., Bombay
- c. Reliable (Fire Protection) India Ltd., Bombay
- d. Zenith Fire Services, Bombay
- e. Safex Fire Services, Bombay
- f. Brij Basi Hi
- g. tech Udyog
- h. Bharat Engg Works, India
- i. Gunnebo India Ltd
- j. Nitin Fire Protection Industries Ltd, India
- k. Supremex Equipments, India
- l. Vimal Fire Controls Pvt Ltd., India

26.2 FIRE HYDRANTS, MONITORS, DELUGE VALVE, NOZZLES

- a. Zenith
- b. Minimax
- c. Newage
- d. HD Fire
- e. Vijay Fire
- f. Asco Strumech Pvt Ltd, India
- g. Brij Basi Hi
- h. tech Udyog
- i. Gunnebo India Ltd
- j. Nitin Fire Protection Pvt Ltd
- k. Shah Bhogilal Jethamal & Brothers
- l. Venus Pumps & Engineering Works

26.3 RRL Hose

- a. Jayshree
- b. Newage

**26.4 HOSES**

- a. Ashit Sales Corporation, Bombay
- b. Royal India Corporation, Bombay
- c. Gayatri Industrial Corporation
- d. Simplex Rubber Products Ltd., Ahmedabad
- e. Zaverchand Marketing Pvt. Ltd., Baroda
- f. Presidency Rubber Mill, Calcutta
- g. The Cosmopolite, Calcutta
- h. Simplex Rubber Products, Thane

NOTE:

- 1) For procuring bought out items from vendors other than those listed above, the same may be acceptable subject to the following: -
 - a) The vendor/ supplier of bought out item(s) is a manufacturer/ supplier of said item(s) for intended services and the sizes being offered is in their regular manufacturing supply range.
 - b) The vendor / supplier should not be in the Holiday list of CLIENT / VCS / other PSU.
 - c) Should have supplied at least one single random length (i.e. 5.5 meters to 6.5 meters) for item assorted pipes / tubes and for other items, which are to be supplied in quantity on number-basis (other than assorted pipes / tubes) minimum 01 (One) number of same or higher in terms of size and rating as required for intended services. The bidder should enclose documentary evidences i.e. PO copies, Inspection Certificate etc. for the above, along with their bids.
- 2) For any other item(s) for which the vendor list is not provided, bidders can supply those item(s) from vendors/ suppliers who have earlier supplied same item(s) for the intended services in earlier projects and the item(s) offered is in their regular manufacturing/ supply range. The bidder is not required to enclose documentary evidences (PO copies, Inspection Certificate etc.) along with their offer, however in case of successful bidder, these documents shall require to be submitted by them within 30 days from date of Placement of Order for approval to CLIENT / VCS.
- 3) The details of vendors indicated in this list are based on the information available with VCS, Contractor shall verify capabilities of each vendor for producing the required quantity with. PMC does not guarantee any responsibility on the performance of the vendor. It is the contractor's responsibility to verify the correct status of vendor and quality control of each parties and also to expedite the material in time.

**B. CIVIL AND STRUCTURAL**

Sr. No.	Items/ Name of Products	Make/ Brands/ Manufactures
1.	Reinforcement Steel	TATA, SAIL, RINL, JSW.
2.	Cement	Ambuja, ACC, JK, Grasim, Ultratech, Birla, L&T, Cement Corporation of India
3.	Structural Steel	TATA, SAIL, RINL, IISCO, ESSAR
4.	Structural Steel Tubes ISI Marked	TATA, JINDAL, SURYA
5.	Mineral wool for thermal insulation of ceilings (Under deck insulation)	Rock wool (india) Ltd. Minwool Rock Fibres Ltd., Lloyd Insulation.
6.	Synthetic Enamel Paint (1st quality only)	ICI Paint (Dulux), Asian Paint (Apolite), Berger Paints (Luxol). Goodlass Nerolac Paints (Nerolac), Jenson & Nicholson Paints Ltd (Borolac)
7.	G.I SHEET	ESSAR, JSW, SAIL
8.	Sheeting Screw	Corroshield, Buildex,
9.	Chemical for Antitermite treatment	DE- NOCIL Bombay, Pest Control of India, Trishul
10.	Factory made Panelled Door shutter	Century; Godrej ; M/s Hindustan Housing factory Ltd., New Delhi ; M/s Delhi Construction Eqp, Sadar Bazar, Delhi ; M/s Joinery manufacturing Co., Calcutta;
11.	PVC Panel Door (Solid Core)	Rajshri Plastiwood Limited, Sintex, Hindopan, Marino
12.	Pressed steel door frames/ cupboard and window frames (manufacturers)	M/s SAIL, M/s TATA
13.	Pressed steel door frames/ cupboard and window frames (fabricators)	M/s Loyal safe works Mayapuri, N/Delhi M/s Multiwyn Industrial Corpn Calcutta M/s Metal Window Corpn N/Delhi M/s Chhabra Steel Udyog, 260 Sadar Bazar, Meerut Cantt. M/s Delite safe works, Rani Jhansi Road, N/Delhi
14.	Steel Windows, Ventilators (as per IS- 1038 of 1983) & frames pressed steel door/window	M/S Multiwyn Industrial Corpn, Calcutta ; M/S Metal Window Corp, N/ Delhi ; M/S Chhabra Steel Udyog 260, Sadar Bazar, Meerut Cantt ; Agent steel MFG Pvt Ltd, Ahmedabad ; Godrej ;
15.	AI Section for AI Door/ Window/ Partitions	Hindalco, Ajit India, Jindal
16.	AluminumI Door/ Window/ Glazing Fabricated and	M/s Alumilite Pvt Ltd, M/s Ajit India Pvt Ltd, M/s Ramniklal S Raste Agra, Argent Industries, M/s Aluminium Tech Industries, I-2249 DSIDC Narela,



**LIST OF RECOMMENDED VENDORS FOR
BOUGHT OUT ITEMS**

**DOC NO: VCS-00-00-VL-0001
Rev No : 05**

ENERGISING QUALITY

	Anodized	Delhi, M/s VR Associates, GH-14/242 Paschim Vihar, Delhi
17.	Aluminium door and windows Fittings	M/s Elite Enterprises C/6 Shalimar Hardware 133, Jarg Mahal, Dhobitalao Mumbai 400002. M/s Mohan Metal Industries 178/2-A, Bhole Nath Nagar, Shahadara, Delhi 110032. Mepro, Argent New Delhi, Classic, New Delhi. Jindal, Argent New Delhi, Golden Industries Pvt. Ltd. ECIE
18.	Aluminium Grill	Alu Grill, Arihant Aluminium Corporation, Decogrille
19.	Door Closer	Everite, Golden, Gandhi,
20.	Floor Spring	Prabhat, Everite
21.	Plywood for general purpose (IS-303)	National Plywood Inds Pvt Ltd, S Fancy lane, 8th floor, Calcutta-700001, Merino Plywood, Archid Ply, Ply, Swastik, Universal, Century, Greenply, National.
22.	Pre laminated Particle board	Kitply, Bhutan board, Ecoboard, Novapan, Archid ply, Merinova, Merino
23.	Laminated Sheets	Formica, Merino Lam, Greenlam, National, Century
24.	Modular Partitions	Godrej, Blowplast
25.	False Ceiling (Mineral Fibre Board)	Armstrong, Daiken, Luxalon, Llyods, Gypboard, Trac, Aerolite
26.	Aluminium False Ceiling	Lloyds, Armstrong, Luxlon, Trac
27.	Flooring Tiles (Mosaic / Terrazzo / PCC) (1st quality only)	Kajaria Ceramics, NITCO, Royal Tiles, Gem Tiles, Hindustan Tiles, M/S National Tiles & Industries, Ultra Tiles
28.	Glazed Ceramic Tiles, Non-Skid (Floor/Wall), (1st quality only)	Kajaria, Somany, NITCO. Murudeshwar Ceramic Ltd (Navin Diamond tile), Johnson (Marbonite),
29.	Vitrified/ Designer Vitrified Tiles (1st quality only)	Asian, Marbonite (Johnson), Kerrogres (Kajaria), NITCO, Orient
30.	PVC Tiles/Flooring (IS 3461) (1st quality only)	Marblex Tiles, Krishna Tiles, Polyfin, Armstrong, Wonder floor.
31.	False Flooring	Godrej or equivalent
32.	Glass Mosaic Tiles (1st quality only)	Paladio, Coral, Accura, Bisazza, Italia, Mridul.
33.	Designer Paver Tiles/ Interlocking tiles ISI marked/ Grass-jointed Tiles. (1st quality only)	Pavit, Ultra, Hindustan, Eurocon, Vyara, National Tiles, Gem, Unistone, Konkrete, Unitile
34.	Wall care Putty for Base preparation (1st quality only)	Birla Wall care putty, Berger, Jenson & Nicholson, JK White



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Rev No : 05**

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35.	White Cement (1st quality only)	Birla, JK
36.	Cement based Paints (1st quality only)	Super Snowcem, Duracem, Super Acrocem.
37.	Dry Distemper / Oil bound Distemper (1st quality only)	Goodlass Nerolac Paint, Shalimar Paint, Jenson & Nicholson, Asian Paint, Berger. ICI Dulux
38.	Acrylic Washable Distemper (1st quality only)	Asian, Berger, ICI Dulux, Jenson & Nicholson, Nerolac, Shalimar, Garware & Goodlass
39.	Plastic Emulsion Paint (1st quality only)	Asian, Berger, ICI, Nerolac, Jenson & Nicholson, Shalimar, Garware & Goodlass
40.	Exterior Acrylic Emulsion (1st quality only)	ICI (Weathercoat), Excel (Nerolac), Apex (Asian), Berger, Jenson & Nicholson, Shalimar, Garware & Goodlass
41.	Polymer based Paint	STP, CICO
42.	Textured Paint / Wall Tile (1st quality only)	Unitile, Heritage, Spectrum, Iokos, Acropaints, Asian
43.	Flexible board for Expansion joint	STP or equivalent
44.	Grout	Shrinkomp, Fosroc, Fairmate
45.	Integral water proofing compound	STP, Pidilite, Fosroc, CICO, Sika.
46.	Concrete Admixture	Pidilite, Fosroc, CICO, Sika.
47.	Water proofing for cementations surface IS-2645	Acrocrete & Acrocote, CICO, Fosroc, STP
48.	Bituminous Product	M/s Faridabad Spinning & Woolen Mills Pvt Ltd, 837, SP Mukherjee Marg Delhi, M/s STP Ltd (Formerly Shalimar Tar Products) M/s Bitufelt Pvt Ltd 123/377 Fazalm Ganj Kanpur 208012, Texas, Texas India Ltd, Multiplas
49.	Hardeners	Ironite, Ferrok, Hardonate
50.	Construction Chemicals	Choksey, CICO, Forsroc, Sika
51.	Stainless Steel Cladding	Jindal
52.	Punch Tape Concertina Coil	Global Technocrat, S.G. Engineers Delhi
53.	Stainless Steel Railing	Jindal
54.	FRP/ HDPE Garbage Bins	Sintex, Swift, Nutech, Sheetal
55.	Sanitary ware	Neycer Kermag (standard), Hindustan Sanitary Ware (1st quality), Parryware (superfine), Cera (1st quality), Classica (1st / standard)



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Rev No : 05**

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56.	WC seat cover ISI Marked	Parryware, Neycer Kermag (standard), Hindustan Sanitary Ware (Ist quality), Cera (Ist quality), Classica (Ist / standard)
57.	PVC Flushing Cistern IS: 774-1984 (ISI Certified)	Parryware, Hindustan Sanitary Wares, Cera.
58.	Faucets & Taps, Stop Valves & Pillar Taps, Surgical basin mixer, Shower rose etc.	Gem, Parko, Parryware, HSW, Jaquar
59.	Kitchen Stainless Steel Sink	Diamond, Nirali, Neel Kanth, Jayna
60.	Looking Mirror	Saint Gobain, Modi Float, Triveni Float Glass, Crown, Atul.
61.	Readymade Bathroom Cabinets	Commander Gratings (I) Pvt Ltd, Gratolite Cabinet, A- 4 Sector VIII Noida-202701, Alpina, Cera.
62.	Float Valve	Leader, Bombay Metal & Alloy Co, Bombay superflow.
63.	SGSW Pipes (IS-651) ISI Marked	Perfect Agra, Devraj Ind Gaziabad, Buran, RK, Prince,
64.	CI (Centrifugally Cast) Pipes for sewage disposal ISI marked	NICCO, SRIF, A-1 Singhal Casting Co Agra, Jindal Saw, Kesoram, NECO
65.	PVC rain water/sewage pipes (IS-4985)	Reliance, Finolex, Supreme, Kisan, Prince, Hindustan Plastic & machine corporation, Polypack industries (P) Ltd.
66.	HDPE Water storage tanks (Rotational Moulded)	Sintex, Swift, Nutech, Sheetal
67.	Cast Iron Pipes and Fittings	Hindustan Engineering Products Company Calcutta, S.L.C., Standard approved manufacturers of any other brand of fittings having ISI marking, RIF, BIS
68.	RCC Pipes	Indian Hume Pipe Company, Delhi / Allahabad / Chandigarh / Lucknow; Hindustan Pressure Pipes, Kolhapur; Dhare Concrete Products, Pune or any other approved manufacturer conforming B.I.S. Standard
69.	Brass Fittings	Leader Engineering Works, Jalandhar; L & K Mathura; Luster Sanitary, Jalandhar; Annapurna Metal Works, Calcutta; Neta Metal Works, Jalandhar
70.	C.P. Fittings	Ego Metal Works, Ballabgarh; Jaquar Industries, Delhi; Soma Plumbing Fixtures Limited, Calcutta; Gem Sanitary Appliances Pvt. Ltd., Delhi; Essco Sanitations, Delhi.
71.	Stone Ware (Salt-Glazed) Pipes	Hind Ceramics Limited, Orissa; Ceramic Industries Limited, Sambalpur; Shrikamakshi Agencies, Madras; Binary Udyog Pvt. Limited, Howrah; Tirumati Moulds Limited, Nagpur.
72.	Asbestos Cement Pipes and Fittings	Ganga Asbestos Limited, U.P.; Hyderabad Asbestos Cement Products Limited; J.K. Super Pipe Industries, Nanded; Konark Cement and Asbestos Limited, Orissa; Maharashtra Asbestos Limited, Bombay.



List of Recommended Vender/Suppliers of Major Bought-Out Items: Unless otherwise specifically mentioned in the Schedule of Items, Contractor has to use materials as listed below, of only these brand names/Company's names, which are mentioned in the RECOMMENDED list for structural items thereon.

Sl. No.	Items/Name of Products	Makes/Brands/Manufactures
1	Structural Steel	SAIL / TATA / RINL / IISCO / ESSAR / ISPAT
2	Structural Steel Tubes ISI Marked	TATA / JINDAL / SURYA / SWASTIK
3	Synthetic Enamel Paint 1st Quality only	ICI Paint (Deluxe), Asian Paint (Apolite), Shalimar Paint (Superlac), Goodlass, Nerolac Paint (Nerolac), Berger Paints

Any materials not fully specified in these specifications and which may be offered for use in the works shall be subject to approval of Engineer, without which it shall not be used anywhere in the construction works.

**C. ELECTRICAL****LIST OF SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS****1.0 AIR CONDITIONER**

- a. Blue Star
- b. O General.
- c. Daikin.
- d. Carrier
- e. Hitachi.
- f. LG.
- g. Lloyds
- h. Mitsubishi
- i. Panasonic
- j. Sharp
- k. Samsung.
- l. Blue star.
- m. Haier.
- n. Voltas.
- o. Videocon.

2.0 BATTERIES (LEAD ACID)

- a. Amco Batteries Ltd.
- b. Exide Industries Ltd.
- c. HBL Power System Ltd.
- d. Amara Raja Batteries Ltd.
- e. Su-Kam Power Systems Ltd.
- f. Base Corporation Ltd.
- g. Okaya Power Ltd.
- h. Southern Batteries Pvt Ltd.
- i. True Power International Ltd.
- j. Evolute Solutions Pvt Ltd.
- k. Greenvision Technologies Pvt Ltd.
- l. Artheon Electronics Ltd.

**3.0 BATTERIES (NICKEL CADMIUM)**

- a. Amco Saft Batteries Ltd.
- b. HBL Power Systems Ltd.

4.0 BATTERY CHARGER/DC-DC CONVERTER

- a. Amara Raja Power System(P)Ltd.
- b. BCH.
- c. Chhabi Electricals Pvt. Ltd..
- d. Caldyne Automatics Limited.
- e. HBL Nife Power Systems Ltd..
- f. Universal Instrument Mfg. Co Pvt Ltd.
- g. Hitachi HI-REL Power Electronics P. Ltd
- h. Mass-Tech Controls Pvt Ltd
- i. Dubas Engineering Pvt Ltd
- j. Chloride Power Systems & Solutions Ltd
- k. Synergee
- l. Enertech
- m. Vertiv

5.0 CABLE – FIRE ALARM & COMMUNICATION CABLES

- a. Cords Cable Industries Ltd.
- b. CMI.
- c. Delton cables Ltd.
- d. ELKAY Telelinks.
- e. KEI Industries Ltd.
- f. Elkay Telelinks

6.0 CABLE – HT(XLPE)

- a. Universal Cable Ltd.
- b. KEI Industries Ltd.
- c. Industrial Cables.
- d. NICCO Corporation Ltd.
- e. Uniflex.



- f. Polycab.
- g. Torrent cables Ltd.

7.0 CABLE – LT / MV POWER AND CONTROL

- a. Cords Cable Industries Ltd.
- b. Universal Cable Ltd.
- c. KEI Industries Ltd.
- d. Havells.
- e. Delton.
- f. Elkay Telelinks.
- g. Evershine Electricals.
- h. Ecko.
- i. Ravin.
- j. Rallison.
- k. Suyog.
- l. Netco.
- m. Uniflex.
- n. Paramount.
- o. Gloster.
- p. Associated cables Pvt Ltd.
- q. CMI.
- r. Gemscab.
- s. Industrial cables.
- t. NICCO.
- u. Polycab.
- v. Torrent.

8.0 CABLE – GLAND

- a. Baliga.
- b. Comet.
- c. Flexpro.
- d. Flameproof.
- e. FCG.
- f. Electro Werke.



- g. Dowels.
- h. CCI.
- i. Sudhir Switchgear
- j. Keyson Techno Equipments,

9.0 CABLE – LUGS & TERMINAL BLOCKS

- a. Dowels.
- b. Jainson.
- c. Sharma Electrical
- d. Punitam
- e. Yamuna Powers
- f. Rapid Manufacturer
- g. Varun Controls.

10.0 CABLE – TRAY

- a. Ercon Composites.
- b. Yamuna Power & Infrastructure Ltd.
- c. MEM
- d. Bharti
- e. Profab.
- f. Ratan.
- g. Slotco.

11.0 CABLE TERMINATION AND JOINTING KIT

- a. CCI.
- b. Raychem.
- c. M-Seal.

12.0 CEILING/EXHAUST/PEDESTAL FANS & CIRCULATORS

- a. Bajaj Electricals Ltd.
- b. Crompton Greaves Ltd.
- c. Khaitan Electricals Ltd.
- d. Havell's.



- e. Philips
- f. Usha
- g. Orient

13.0 CONTRACTORS – AC POWER

- a. Andrew Yule.
- b. ABB.
- c. BHEL.
- d. C&S.
- e. Havell's.
- f. L&T.
- g. Schneider.
- h. Siemens Ltd.
- i. Telemecanique.
- j. GE India Industrial

14.0 CONTROL TRANSFORMER

- a. AE.
- b. Indushree.
- c. Intra Vidyut.
- d. Kalpa Electricals.
- e. Transpower Industries Ltd.
- f. Siemens.

15.0 GAS GENERATOR/DIESEL GENERATOR SET

- a. Sterling and Wilson.
- b. Jackson Limited.
- c. Sudhir Gensets.
- d. Power Engineering (India) Pvt Ltd.
- e. Prasha Technologies Limited.
- f. Kumar Generator house.
- g. Ashok Leyland Ltd.
- h. Powerica Limited.



- i. Supernova Engineers Limited.
- j. Bhaskar Power Products (P) Ltd.
- k. Caterpillar India (P) Ltd.
- l. Cummins India Ltd.
- m. Escorts Ltd.
- n. Greaves Cotton Ltd.
- o. Kirloskar Ltd.
- p. Mahindra & Mahindra Ltd.
- q. Honda.
- r. Perkins.
- s. Eicher.
- t. Tata Motors.
- u. Ashok Leyland.

16.0 FLAME PROOF LDB'S/ JB'S/CONTROL STATION/ SWITCHES

- a. FCG.
- b. Sudhir switchgears.
- c. Prompt Engineering Works
- d. Flame Proof equipments pvt. Ltd.
- e. Baliga Lighting Equipments Pvt. Ltd.
- f. Flexpro Electricals Pvt. Ltd.
- g. Exprotecta, Beroda.
- h. FFLP Control Gears.
- i. Sterling.
- j. Kaysons Techno Equipment
- k. Bajaj
- l. Phoenix Contact

17.0 HIGH MAST

- a. Bajaj Electricals Limited.
- b. Crompton Greaves Limited.
- c. Philips India Limited.
- d. Surya Roshani.
- e. Transrail

**18.0 HIGH VOLTAGE PCC/ MCC PANELS**

- a. BHEL.
- b. Control and Switchgear.
- c. Siemens.
- d. Tricolite Electrical Industries.
- e. Schneider.
- f. CGL.
- g. L&T.
- h. ABB.

19.0 INDICATING LAMPS

- a. Alstom Ltd.
- b. BCH.
- c. L&T Ltd.
- d. Siemens Ltd.
- e. Vaishno Electricals.
- f. Technik
- g. ABB

20.0 INDICATING METERS

- a. L&T
- b. ABB.
- c. AMCO.
- d. AE
- e. Alstom Ltd. (EE).
- f. Conzerv/Schneider
- g. Elecon Measurement Pvt. Ltd.
- h. HPL Electric & Power Pvt. Ltd.
- i. MECO Instruments Ltd.
- j. Minilec.
- k. Rishabh Instruments Pvt. Ltd.
- l. Trinity energy system.



- m. Kaycee.
- n. Salzer.
- o. Trinity
- p. Secure Meters Limited

21.0 LIGHTING FIXTURES

- a. GE Lighting Pvt. Ltd.
- b. Bajaj Electricals Ltd.
- c. Crompton Greaves Ltd.
- d. Philips India Ltd.
- e. Havells
- f. Wipro
- g. Osram
- h. Siska
- i. Halonix
- j. Surya
- k. Polycab
- l. Kawlity Photonix

22.0 LIGHTING FIXTURES – FLAMEPROOF

- a. Bajaj Electricals Ltd.
- b. Baliga Lighting Equipment Pvt. Ltd.
- c. Crompton Greaves Ltd.
- d. CEAG Flameproof Controlgear Pvt. Ltd.
- e. Flexpro Electricals Pvt. Ltd.
- f. Philips India Ltd.
- g. Sudhir Switchgears Pvt. Ltd.
- h. FCG.

23.0 MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB

- a. ABB.
- b. Hagger.
- c. Havell's India Ltd.
- d. Indo Asian Fusegear Ltd.



- e. Legrand.
- f. MDS Switchgear Ltd.
- g. Schneider.
- h. Siemens Ltd..
- i. HPL.
- j. L & T
- k. Siemens

24.0 MOULDED CASE CIRCUIT BREAKER (MCCBS)

- l. ABB.
- m. Andrew Yule.
- n. Larsen & Toubro.
- o. Schneider.
- p. Siemens.
- q. Control and Switchgear.
- r. Indo Asian,
- s. Hager.
- t. Merlin Gerin.
- u. Havell's India Ltd
- v. General Electric

25.0 PROTECTION RELAYS

- a. BCH.
- b. L&T Ltd.
- c. Siemens Ltd.
- d. Tele-mechanique & Controls (India) Ltd.
- e. Eaton
- f. Alsthom
- g. ABB
- h. Ashida
- i. Novatek Electronics
- j. Cantronics
- k. Control & Switchgear
- l. Frick Electronics
- m. Indian Technologies



- n. Rao Electromechanical
- o. Kudam Corporation

26.0 LOW/MEDIUM VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB

- a. ABB.
- b. BCH.
- c. BHEL.
- d. C & S.
- e. Elecmech Switchgear & Instrumentation.
- f. KMG ATOZ.
- g. L&T.
- h. Pyrotech Electronics Pvt. Ltd.
- i. Risha Control Engineers Pvt. Ltd.
- j. UDKAM PROCESS EQUIPMENT INDIA PVT. LTD
- k. Tricolite Electrical Industries.
- l. Unilec Engineers Ltd.
- m. Vidyut Control India Pvt. Ltd.
- n. Control and Schematic.
- o. Zenith Engineering.
- p. Schneider Electric,
- q. AEG,
- r. HAVELL'S,
- s. MDS
- t. Synergee

27.0 PUSH BUTTONS

- a. BCH.
- b. Alstom Ltd.
- c. L&T.
- d. Siemens Ltd.
- e. Tele-Menchanique & Controls (India) Ltd.
- f. Vaishno Electricals.

**28.0 SWITCHES-CONTROL**

- a. BCH.
- b. Easum Reyrolle Relays & Devices Ltd.
- c. Alstom.
- d. Kaycee Industries Ltd..
- e. L&T.
- f. Siemens Ltd.

29.0 SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET

- a. Anchor Electronics & Electricals Pvt. Ltd.
- b. Kingal Electricals Pvt. Ltd.
- c. North-West Switchgear Ltd.
- d. Schneider
- e. Havells
- f. Cona
- g. Orient
- h. Panasonic

30.0 SWITCH SOCKET OUTLETS (INDUSTRIAL)

- a. Alstom Ltd.
- b. Best & Crompton Engineering Ltd.
- c. BCH.
- d. Crompton Greaves Ltd.
- e. Essen Engineering Company Pvt. Ltd.

31.0 SOLAR POWER SYSTEM MODULES

- a. Tata Power Solar Systems Ltd
- b. REIL,
- c. CEIL,
- d. HBL Power.
- e. Vikram Solar.
- f. Waaree Solar.
- g. Solar Semiconductor.
- h. Sonali.
- i. Mundra Solar
- j. Vikram Solar



- k. Bharat Electronics Limited
- l. Waaree
- m. Lumipex
- n. Independent Qualitative Accessories
- o. Statcon Energy
- p. Volks Energy
- q. Green Engineering

32.0 SOLAR PCU/CHARGE CONTROLLER

- a. Statcon Energy
- b. Enertech UPS Pvt Ltd
- c. Consul Nowatt
- d. OPS India
- e. Schneider
- f. Delta Electronics
- g. ABB Ltd
- h. KACO
- i. SMA
- j. HBP Power
- k. Universal Instrument

33.0 TERMINALS BLOCKS

- a. Connectwell.
- b. Controls & Switchgear Co. Ltd.
- c. Elmex Controls Pvt. Ltd.
- d. Essen Engineering Co. Pvt. Ltd.
- e. Phoenix Contact

34.0 DISTRIBUTION TRANSFORMERS

- a. ABB.
- b. Andrew Yule.
- c. Areva.
- d. BHEL.
- e. Bharat Bijlee
- f. Crompton Greaves.



- g. EMCO Ltd.
- h. Intra Vidyut.
- i. Indushree.
- j. Indcoil
- k. Kirloskar.
- l. Skippers Electricals.
- m. Transformers & Rectifiers (I) Ltd.
- n. Voltamp.

35.0 UPS SYSTEM AND INVERTER

- a. DB Power.
- b. Keltron.
- c. Hi-Rel/HITACHI.
- d. Dubas.
- e. Toshiba Corporation.
- f. Fuzi Electric Co Ltd.
- g. Emerson.
- h. Synergy System.
- i. Eaton.
- j. Enertech

36.0 GI-OCTAGONAL POLE

- a. Bajaj.
- b. Transrail.
- c. Wipro.
- d. K.L. Industries.

37.0 ELECTRICAL MOTORS

- a. Siemens.
- b. Crompton Greaves.
- c. Kirloskar.
- d. BHEL.
- e. Bharat Bijlee.
- f. Hindustan motors.
- g. Alstom.
- h. Texmo.



- i. GE India.
- j. National Motors.
- k. ABB.

38.0 ELECTRICAL PROCESS HEATER

- a. Escorts Limited, Faridabad, Haryana.
- b. Spherehot / Kanti Lal Chuni Lal & Sons Appliances Pvt Ltd.Surat.
- c. Kerone, Bhayander(E), Thane – 401105.
- d. Excel Heaters, Andheri (West), Mumbai - 400 053, India.
- e. Nirmal Industrial Controls Pvt. Ltd., Mulund(W), Mumbai - 400 080.

39.0 CATHODIC PROTECTION AGENCIES/CONTRACTOR/ VENDERS

- a. CALTECH Engineering Service.
- b. Universal Corrosion Prevention India.
- c. Cathodic Technology Limited.
- d. Cathodic Control Company Pvt. Ltd.
- e. CORRTECH International Pvt Ltd.
- f. MITCORR Cathodic Protection Pvt Ltd.
- g. Underground Pipeline & NDTs Pvt. Ltd.
- h. JG Corrosion Solution.
- i. Mercury Cathodic Protection Service.
- j. UNDTs Corrosion Service.
- k. SARK EPC Projects Pvt. Ltd.

40.0 BACKUP AGENCY FOR INTERFERENCE SURVEY & MITIGATION

- a. PLE Germany
- b. Vendor Velde
- c. Nippon Japan
- d. SSS India CIPL / interference survey.
- e. Balslev Denmark, .
- f. SSS Germany
- g. Jef Techno Slutions Pvt. Ltd.
- h. SARK EPC Projects Pvt. Ltd.

**41.0 PERMANENT REFERENCE CELL**

- a. PERMACELL/ HARCO (USA)
- b. CORRTECH (ZULU), INDIA
- c. TINKER RASOR, USA
- d. SILVION, UK

42.0 CP CABLES

- a. Brooks Cables.
- b. Nicco Corporation Ltd.
- c. CCI Ltd.
- d. Delton Cables Ltd.
- e. KEI Industries.
- f. Torrent Cables.
- g. Universal cables.
- h. Victor Cables.
- i. Associated Flexible & Wires Pvt Ltd.
- j. Asain Cables (RPG Cables).
- k. Fort Gloster (Gloster Cables Ltd).
- l. Finolex Cable.
- m. Rediant Cables.
- n. NETCO Cables Pvt Ltd.
- o. Havells Ltd.

43.0 CP SACRIFICIAL ANODES

- a. Scientific Metals Engineers Pvt. Ltd., Karaikudi
- b. PSL Holding Pvt. Ltd., Mumbai.
- c. Cathodic Controls, Bangalore.
- d. BHEL, Bhopal.
- e. Nippon Corrosion, Japan.
- f. AFIC, KSA.
- g. Platt Bros. and Company, USA
- h. Wilson Walton International.
- i. Impalloy International.
- j. Corrpro International.
- k. HOCKWAY, UK
- l. NAKABOHITEC, Japan .



- m. Cortech International
- n. Titanor Component
- o. Shakti Metals, Ahmedabad
- p. Shakti Enterprises, Ahmedabad

44.0 CP PORTABLE /PERMANENT REFERENCE CELL

- a. M/S PERMACELL/HARCO, USA
- b. M/S BORIN MANUFACTURER, USA
- c. M/S M.C.MILLER, USA
- d. M/S TINKER RASOR

45.0 CPTR (AC OPERATED)

- a. Canara Electric
- b. CATHODIC CONTROL COMPANY PVT LTD.
- c. Kriston Systems

46.0 PIN BRAZING / THERMITWELD

- a. SAFETRACK, SWEDEN
- b. CadWeld
- c. BAC, UK
- d. ERICO, USA
- e. THERMOWELD, USA
- f. ERICO, EUROPE

47.0 CP SURGE DIVERTER/SPARK GAP ARRESTOR (EX-D)

- a. Dhen,
- b. OBO
- c. Corrpro system
- d. Sohne
- e. Dairyland

48.0 CP SOLID STATE POLARISATION CELL.

- a. Dairyland
- b. Metricorr
- c. Rustol
- d. Dhen
- e. Kriston Systems

**49.0 PETROLEUM COKE BREEZE:**

- a. M/S LORESCO, USA
- b. M/S ASBURY, USA
- c. M/S GOA CARBON, GOA
- d. M/S INDIA CARBON, CALCUTTA
- e. M/S PETROCARBON & CHEMICAL COMPANY, HALDIA

50.0 CP ANODE (MMO TYPE):

- a. Corrttech
- b. Scientific Metal Engineers Karaikudi
- c. Titanor Component Ltd., Goa, India.
- d. Denora Permelic S.P.A (Italy). .
- e. Oronzio De Nora S.A. Ingano Switzerland
- f. CER Anode Technologies International USA
- g. ACTEL, UK
- h. ELTECH System Corporation, Texas
- i. MAGNETO-CHEMIE, Netherlands
- j. MATCOR (USA)

51.0 HEAT SHRINK CAP FOR CP ANODE

- a. MATCOR (USA) To Cable Joint
- b. Seal For Life

**52.0 ER- PROBE (EXTERNAL CORROSION) ER- PROBE & CORROSION
COUPON ASSEMBLY**

- a. Rose Corrosion Services UK
- b. Metal Samples, USA. .
- c. Roharbak Cosasco USA
- d. Caproco UK
- e. Emetricorr, Denmark

53.0 HEAT SHRINK CAP FOR ANODE TO CABLE JOINT

- a. Raychem, USA
- b. Matcor (USA)

**54.0 MMO WIRE ANODES (WITH FACTORY PRE-PACKED COKE BREEZE)**

- a. Matcor (USA)
- b. Covalence (USA)
- c. Berry Plastics (USA) – (Seal for Life Industries)

55.0 MMO WIRE ANODES (WITHOUT FACTORY PRE-PACKED COKE BREEZE)

- a. GROUPPO DENORA, GOA, INDIA
- b. CERANODE TECHNOLOGIES, USA
- c. TELPRO, USA

56.0 MMO TUBULAR/ STRIP/ RIBBON ANODES

- a. GROUPPO DENORA, GOA, INDIA
- b. ORANZIO DE NORA, ITALY
- c. MAGNETOCHEMIE, HOLLAND
- d. ACTEL LTD., U.K.
- e. ELTECH SYSTEMS CORPORATION, USA
- f. CERANODE TECHNOLOGIES, USA
- g. MATCOR (USA)

Note: -

For any other brought out item(s) for which the vendor list is not provided in the tender , bidders can supply those item(s) from vendors/ suppliers who have earlier supplied similar item(s) for the intended services in earlier Oil and Gas projects and the item(s) offered is in their regular manufacturing/ supply range.

- 1) The vendor/supplier should not be in the Holiday list of OWNER/ CONSULTANT/other PSU
- 2) The bidder is not required to enclose documentary evidences (PO copies, Inspection & Completion with satisfactory working certificates etc.) along with their offer, however in case of successful bidder, these documents shall required to be submitted by them within 30 days from date of Placement of Order for approval to OWNER / CONSULTANT.

**D. INSTRUMENTATION****LIST OF RECOMMENDED VENDER/SUPPLIERS OF MAJOR BOUGHT-
OUT ITEMS****1.0 PRESSURE GAUGES**

- a. AN Instruments Pvt Ltd
- b. Badotherm Process Instruments B.V.
- c. Baumer Bourdon Haenni S.A.S
- d. British Rototherm Co Ltd
- e. Budenberg Gauge Co Ltd
- f. Dresser Inc
- g. Forbes Marshall (Hyd) Pvt Ltd
- h. General Instrument Consortium
- i. H. Guru Instruments (South India) Pvt Ltd
- j. Manometer (India) Pvt Ltd
- k. Nagano Keiki Seisakusho Ltd
- l. Hirlekar Precision, India
- m. Waaree Instruments Ltd
- n. Walchandnagar Industries Ltd (Tiwac Divn)
- o. Wika Alexander Wiegand & Co GmbH
- p. Wika Instruments India Pvt Ltd
- q. Ashcroft India Pvt Ltd.

2.0 TEMPERATURE GAUGES

- a. AN Instruments Pvt Ltd.
- b. Badotherm Process Instruments B.V.
- c. Bourdon Haenni S.A.
- d. Dresser Inc.
- e. General Instruments Consortium
- f. H. Guru Instruments (South India) Pvt Ltd
- g. Nagano Keiki Seisakusho Ltd
- h. Solartron ISA
- i. Walchandnagar Industries Ltd (Tiwac Divn)
- j. Wika Alexander Wiegand & Co GmbH



- k. Wika Instruments India Pvt Ltd
- l. Pyro Electric, Goa
- m. Ashcroft India Pvt Ltd.

3.0 TEMPERATURE ELEMENTS INCLUDING SKIN TYPE

- a. ABB Automation Ltd
- b. Altop Industries Ltd
- c. Bourdon Haenni S.A.
- d. Detriv Instrumentation & Electronics Ltd
- e. General Instruments Consortium
- f. Japan Thermowell Co Ltd
- g. Tecnomatic S.P.A
- h. Tempsen Instrument India Ltd
- i. Thermo Electric Co. Inc.
- j. Thermo-Couple Products Co
- k. Thermo-Electra B.V.
- l. Wika Alexander Wiegand & Co GmbH
- m. Altop Industries Ltd., Baroda
- n. Nagman Sensors (Pvt.) Ltd.
- o. Pyro Electric, Goa

4.0 POSITIVE DISPLACEMENT FLOW METERS

- a. RMG (Germany)
- b. Elster Instromet
- c. Romet
- d. Dresser
- e. Itron
- f. FMG
- g. Common
- h. Metreg
- i. Raychem RPG
- j. Vemmtec

5.0 TURBINE FLOW METER

- a. Daniel
- b. Elster Instromet



- c. Itron
- d. RMG
- e. Rockwin

6.0 ELECTRONIC VOLUME CORRECTOR

- a. Elgas
- b. Itron
- c. Plum
- d. Pietro Fiorentini

7.0 ORIFICES (METER RUN, FLOW CONDITIONER, ORIFICE PLATE AND ASSEMBLY)

- a. Emerson
- b. FMC, USA
- c. Pietro Fiorentini S.P.A (Italy)
- d. Canalta Controls, Canada

8.0 ULTRASONIC FLOW METERS

- a. Daniel (USA)
- b. RMG (Germany)
- c. Instromet International (Belgium)
- d. Sick Maihak, Germany
- e. FMC, Germany

9.0 MASS FLOW METERS

- a. Daniel Measurement & Control Asia Pacific
- b. Endress + Hauser Instruments International
- c. FMC Measurements Solutions
- d. Heinrichs Messtechnik GMBH
- e. Rheonik MessGerate GMBH

**10.0 FIELD INSTRUMENTS (P, DP, F, L, T)**

- a. ABB Ltd
- b. Honeywell
- c. Fuji Electric Instruments Co Ltd
- d. Yokogawa
- e. Invensys India Pvt.Ltd

11.0 LEVEL GAUGES/ LEVEL INSTRUMENTS

- a. Bliss Anand
- b. Chemtrols
- c. V-Automat
- d. Levcon
- e. Nivo Controls
- f. Sbeletro Mechanicals
- g. TRAC

12.0 PRESSURE REGULATOR AND SLAM SHUT VALVE

- a. Pietro Fiorentini S.P.A. (Italy)
- b. Emerson
- c. RMG-Regel Messtechnik (Germany)
- d. Mokveld Valves BV (Netherlands)
- e. Schlumberger (USA)
- f. Gorter Controls B V (Netherlands)
- g. Instromet International NV
- h. Nirmal Industrial Controls Pvt Ltd. (up to 6" size only)
- i. ESME Valves Ltd
- j. Kaye & Macdonald Inc.
- k. Nuovo Pignone S.P.A (Italy) (GE Oil Co.)
- l. Richards Industries (Formerly Treloar)
- m. Samson AG Mess-und Regeltechnik
- n. Tormene Gas Technology
- o. Dresser Inc, USA (upto 8" size, 300# class only)

**13.0 PRESSURE SAFETY VALVES**

- a. Keystone Valves (India) Pvt. Ltd.
- b. Larson & Toubro Ltd.
- c. Lesser GmbH & Co KG
- d. Mekaster Engg Ltd..
- e. Tyco Sanmar Ltd. (New Delhi)
- f. Anderson Greenwood Crosby
- g. BHEL (Trichy)
- h. Curtiss Wright Flow Control Corporation
- i. Dresser Inc.
- j. Fukui Seisakusho Co. Ltd
- k. Nakakita Seisakusho Co Ltd
- l. Nuovo Pignone S.P.A (Italy) (GE Oil co)
- m. Parcol S.P.A
- n. Safety Systems UK Ltd
- o. Tai Milano S.P.A
- p. Weir Valves & Controls France
- q. Bliss Anand Pvt Ltd.

14.0 CONTROL PANEL & ACCESSORIES

- a. Keltron Controls Ltd., Kerala
- b. Elechmec Corporation Ltd., Mumbai
- c. Industrial Controls & Appliances Pvt. Ltd.,
- d. Alstom System Ltd., Noida
- e. Emerson Process Management (I) Pvt. Ltd.
- f. ABB Instruments Ltd., New Delhi
- g. Larsen & Toubro Ltd.
- h. Control & Automation, New Delhi
- i. GE Fanuc Systems Pvt. Ltd., New Delhi
- j. Rockwell Automation (I) Ltd., Ghaziabad
- k. Honeywell Automation Ltd.
- l. Rittal
- m. Pyrotech Elcronics Pvt Ltd.
- n. Positronics Pvt Ltd.
- o. Electronics Corporation of India Ltd.

**15.0 JUNCTION BOXES AND CABLES GLANDS**

- a. Ex-Protecta
- b. Flameproof Control Gears
- c. Baliga
- d. Flexpro Electricals

16.0 CONTROL AND SIGNAL CABLES

- a. Associated Cables
- b. Brook
- c. Associated Flexibles & Wires (Pvt) Ltd
- d. Universal Cables Ltd,India
- e. Delton Cables Ltd, India
- f. KEI Industries Ltd INDIA
- g. CMI Limited
- h. Cords Cable Industries Ltd, India
- i. Elkay Telelinks (P) Ltd., India
- j. Udey Pyrocables Pvt Ltd, India
- k. Goyolene Fibres (I) Pvt Ltd, India
- l. Netco Cable Industries Pvt Ltd, India
- m. Nicco Corporation Ltd, India
- n. Paramount Communications Ltd, India
- o. Polycab Wires Pvt Ltd, India
- p. Radiant Cables Pvt Ltd, India
- q. Reliance Engineers Ltd., India
- r. Suyog Electricals Ltd, India
- s. Thermo Cables Ltd

17.0 GAS DETECTION SYSTEM

- a. Crowcon Detection Instruments Ltd
- b. Detection Instruments (I) Pvt Ltd
- c. Detector Electronics Corporation
- d. Drager Safety AG & Co. KGAA
- e. General Monitors Ireland Ltd
- f. Mine Safety Appliances Company



- g. MSA – Mines Safety Appliances(India) Ltd
- h. Industrial Scientific Oldham France S.A.
- i. Riken Keiki Co Ltd
- j. Simrad Optronics Icare
- k. Honeywell Analytics
- l. Net Safety Monitoring Inc.
- m. Simtronics SAS

18.0 MOV ACTUATOR:

- a. Rotork- UK, USA & INDIA
- b. Limitorque
- c. Auma- India
- d. Biffi- Italy

19.0 PNEUMATIC ACTUATOR (SOLENOID OPERATED ON-OFF TYPE)

- a. Metso Automation
- b. Tyco
- c. Samson Controls
- d. L&T
- e. Emerson
- f. Fisher
- g. Masoneilan Process Control
- h. Instrumentation Limited (IL)-Palghat
- i. Micro Finish
- j. Rotex

20.0 SOLENOID VALVES

- a. Avcon
- b. Festo

21.0 ELECTRO – HYDRAULIC ACTUATOR

- a. Avcon Rotork controls (Deutchland Gmbh)
- b. Biffi Italia Srl
- c. Ledeen (Italy)
- d. Virgo Valves and Controls ltd.-India
- e. Limittorque



- f. Reineke
- g. Voith
- h. Bettis
- i. Rotork- UK, USA & INDIA
- j. Rotex
- k. Schuck Group

22.0 GAS OVER OIL ACTUATOR

- l. Biffi Italia Srl,
- m. Ledeen(Italy)
- n. Virgo Valves & Control ltd.-India,
- o. Voith,
- p. Bettis,
- q. Rotork-UK, USA, India,
- r. Rotex,
- s. Schuck Group,
- t. Valve Italia.

23.0 OFC

Manufacture/ Procurement, Testing and supply of suitable OFC Joint closures including all necessary accessories of any of the following make:

- a. Raychem
- b. 3M
- c. Siemens
- d. Any other make from the approved vendor list of client with supporting paper.

24.0 FLOW CONTROL VALVES

- e. Fouress Engg. (New Delhi)
- f. Fisher Xomox (New Delhi)
- g. MIL Control Ltd. (Noida)
- h. KOSO India Pvt ltd
- i. Samson Control (Thane)
- j. Dresser Valves India Pvt Ltd.
- k. Fisher Controls
- l. Valvitalia Italy



- m. CCI Valve technology
- n. Flowserve Pvt Ltd.
- o. Metso Singapore Pvt Ltd.
- p. Instrumentation Ltd Palghat
- q. Dresser Inc. USA

25.0 FLOW COMPUTERS

- r. Emerson
- s. Instromet International (Belgium)
- t. FMC Measurement Solutions (UK)
- u. RMG (Germany)
- v. OMNI Flow Computers Inc.
- w. Thermo Fisher, USA

26.0 INDICATORS & CONTROLLERS

- x. Yokogawa
- y. Eurotherm Chessel
- z. Honeywell
- aa. Emerson

27.0 BARRIERS

- bb. MTL
- cc. STHAL
- dd. P&F
- ee. Phoenix

28.0 GAS CHROMATOGRAPH

- ff. ABB
- gg. Emerson
- hh. Instromet International, NV
- ii. RMG Regal+Messtechnik GmbH
- jj. Yokogawa

29.0 I/P CONVERTERS

- kk. ABB
- ll. Emerson
- mm. IMI Watson Smith Ltd.
- nn. Moore Controls Ltd



- oo. Shreyas Instruments Pvt Ltd, India
- pp. Thermo Brandt Instruments

30.0 SS FITTINGS, INSTRUMENT VALVES & MANIFOLDS

30.1 FOR CNG WORK:

- qq. DK-LOK
- rr. Swagelok Co.
- ss. Parker

30.2 EXCEPT CNG WORK:

- a. Swagelok Co.
- b. Parker
- c. Aura INC.
- d. HOKE
- e. Excelsior Engineering works
- f. Swastik Engineering works India
- g. Comfit and valves pvt ltd
- h. Arya craft and engineering Pvt ltd
- i. DK lok

31.0 SS TUBES

31.1 FOR CNG WORK:

- a. Swagelok Co.
- b. Parker
- c. Sandvik

31.2 EXCEPT CNG WORK:

- a. Swagelok Co.
- b. Parker
- c. Sandvik
- d. Heavy metal and tube limited
- e. Nuclear fuel complex India
- f. Scorodite
- g. Ratnamani Metals and Tubes
- h. Jindal Saw

**E. SHOP & FIELD PAINTING****LIST OF RECOMMENDED VENDER/SUPPLIERS OF MAJOR BOUGHT-
OUT ITEMS****1.0 INDIAN VENDORS**

- a. Asian Paints (I) Ltd.
- b. Berger Paints Ltd.
- c. Goodlass Nerlolac Paints Ltd.
- d. Jenson And Nicholson Paint Ltd & chokuGu Jenson & Nicholson Ltd.
- e. Shalimar Paints Ltd.
- f. Sigma Coating, Mumabai
- g. CDC Carboline Ltd.
- h. Premier Products Ltd.
- i. Coromandel Paints & Chemicals Ltd.
- j. Anupam Enterprises
- k. Grand Polycoats
- l. Bombay Paints Ltd.
- m. Vanaprabha Esters & Glycer, Mumbai
- n. Sunil Paints and Varnishes Pvt. Ltd.
- o. Courtaulds Coating & Sealants India (Pvt.) Ltd.
- p. Mark-chem Incorporated, Mumbai (for phosphating chemicals only)
- q. VCM Polyurethane Paint (for polyurethane Paint only)

2.0 FOREIGN VENDORS FOR OVERSEAS PRODUCTS

- a. Sigma Coating, Singapore
- b. Ameron, USA
- c. Kansai Paint, Japan
- d. Hempel Paint, USA
- e. Valspar Corporation, USA
- f. Courtaulds Coating, UK.

**Notes:**

1. Bidder can select equipment of two different makes, selected from this VENDOR LIST and mention the same in the checklist for technical evaluation attached with the tender. The offered bid must include filled datasheet indicating make, model, size, rating of offered instrument/ equipment duly supported by sizing calculation of offered equipment (wherever applicable).
2. Vendors who have already supplied above equipment in other terminals of client, shall also be considered qualified for this tender provided the supplied equipment are commissioned and running successfully and they have not been put on holiday.
3. Equipment / Instruments of any make which is offered by one bidder and acceptable to client shall be accepted for other bidder also. After placement of order, on request of the successful bidder list of other qualified makes for a particular item (for which successful bidder wants to change the vendor) shall be provided.
4. Bidder shall take prior approval of the make / model no of the offered item and it shall be from the list given above. However additional vendors will be considered in exceptional cases, provided they have supplied for similar application to reputed gas transmission/distribution companies, in quantities at least half the numbers being supplied for this tender, and working satisfactorily for minimum 6 months. Documentary evidence substantiating above shall be submitted for taking approval.

**F. FOR PE & LMC WORK (GI/CU)****1.0 MDPE FITTINGS & MDPE VALVES**

- a. Aliaxis,
- b. George Fischer,
- c. Al-Aziz,
- d. Kimplas,
- e. Banides,
- f. Agru,
- g. Friatech,
- h. Plasson

2.0 GI PIPE

- a. Swastik Pipe Ltd.
- b. Jindal Industries Ltd.
- c. Vishal Pipes Ltd.
- d. Indus Tubes Ltd
- e. Advance steel Tubes Ltd.
- f. Good Luck Tubes Ltd.
- g. Surya Roshni Limited
- h. APL Apollo Tubes Limited
- i. Jindal Pipes Limited
- j. RK Steel Manufacturing Company Private Limited
- k. PSL Tubes Limited

3.0 CASTING GI FITTINGS

- a. Sarin Industries Ltd.
- b. Jupiter Metal Industries Ltd.
- c. Jainsons Industries Ltd.
- d. Jinan Meide Casting Co. Ltd.
- e. Green Malleable Pvt. Ltd.

4.0 FORGED GI FITTING (FOR HIGH RISE SEGMENT)

- a. Jainsons Industries
- b. B.M. Meters Pvt. Ltd.

**5.0 COPPER TUBES & FITTINGS**

- a. Jay Banas Mehta Tubes Limited- Trade Mark "MEXFLOW"
- b. Rajco metal (Tubes & Fittings)
- c. Paras Industries
- d. MERCURE METAL & ALLOYS PVT LTD

6.0 BRASS FITTINGS

- a. Chandan Enterprises
- b. Paras Industries Ltd.

7.0 BRASS VALVES

- a. Universal srl, Italy
- b. Tiemme Raccorderie Sede, Italy
- c. Enolgas Bonimu s.a.s., Italy
- d. Fratelli Fortis s.r.l, Italy
- e. Giacomo Climbrio, Italy
- f. Parker Hannifin S.P.A., USA
- g. Singapore Valve & Amp; Fittings Pte Limited, Singapore /Bengaluru
- h. Rubinetterie Utensilerie Bonomi (RUB), Italy
- i. Zhegiang Valogin Technology Co. Ltd., China,
- j. Ningbo Zhiqing Industrial Co. Ltd., China,
- k. Zhegiang Dunan Valve Co. Ltd.,
- l. Ningbo Huaping, China.

8.0 BRASS FITTINGS

- a. Chandan Enterprises
- b. Paras Industries Ltd.
- c. Chokhawala Distributors – Brass Adaptor.

9.0 STEEL RE-INFORCED RUBBER HOSE (TYPE-4)

- a. Super Seal Flexible Hose Ltd.
- b. Suraksha Products Pvt. Ltd.
- c. Vansh Industries
- d. T & L Gases

10.0 CORRUGATED FLEXIBLE METAL HOSES (ANACONDA)

- a. KPC Flex Tubes
- b. Vestas Hose Division



- c. Alpha Flexi Tubes
- d. Chandan Enterprises

Note:

1. Vendor may procure material from any of approved vendors listed.
2. For equipment/components other than the above, vendor shall submit past track record for the proposed sub-vendors and obtain written approval from Owner / Consultant before placing order.
3. In case of exigencies like long delivery periods from approved vendors, the contractor shall list down the proposed suppliers/vendors for such items and submit the same for owner review/approval along with necessary documents/PTR.
4. Non-acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication. If equipment is sourced from outside India, vendor shall obtain prior approval for make of equipment before placement of order.

Above mentioned vendor list is tentative and further addition/deletion may be done as per discretion of Owner/VCS.

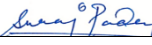





Energising Quality

VCS Quality Services Pvt Ltd

STANDARD SPECIFICATION FOR MEDIUM AND HIGH VOLTAGE CABLES

VCS – SS – EL - 4007

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
02	25.02.2022				
01	16.10.2019	MG	VV	AD	SK
00	05.07.2017	MG	RD	AD	SK

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed

REVISION RECORD						
Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MG	RD	AD	SK	Issued for use as Standard
01	16.10.2019	MG	VV	AD	SK	New revision system updated
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ABBREVIATION

BIS/IS:	Bureau of Indian standards
IEC:	International Electro-Technical Commission
BS:	British Standards
IEEE:	Institute of Electrical and Electronics Engineers
NEMA:	National Electrical Manufacturers Association
OISD:	Oil Industries Safety Directorate
CCE:	Chief Controller of Explosive
DGMS:	Director General Mines Safety
IE Rules:	Indian Electricity Rules
CPRI	Central Power Research Institute
PVC	Polyvinyl chloride
XLPE	Cross Linked Poly Ethylene

CONTENTS

1.0	SCOPE	5
2.0	REFERENCE DOCUMENTS	5
3.0	DEFINITIONS	6
4.0	MATERIALS	6
5.0	DESIGN	7
6.0	FABRICATION	9
7.0	INSPECTION AND TESTING	9
8.0	MARKING, PACKING AND SHIPMENT	11
9.0	SPARES & ACCESSORIES	12

1.0 SCOPE

This Specification along with Data Sheets covers requirements for design, manufacture, testing at works and supply of Flame Retardant PVC/XLPE cables and cable jointing / terminating accessories for medium and high voltage systems.

2.0 REFERENCE DOCUMENTS

2.1 The cables and cables jointing & terminating accessories shall comply with the latest edition of the following standards as applicable:

IS: 1554:	PVC insulated (heavy duty) electric cables.
IS: 7098:	cross linked polyethylene insulated PVC sheath
IS: 8130:	Conductors for insulated electric cables and flexible cords
IS: 5831:	PVC insulation and sheath of electric cables
IS: 3975: 10810 (Part 41)	Mild steel wires, strips and tapes for armoring of cables Methods of testing cables: Mass of zinc coating on steel armor.
IS: 209:	Specification of zinc
IS: 3961:	Recommended current ratings for cables: part-2 PVC Insulated and PVC sheathed heavy duty cables.
IS: 10418:	Drums for electric cables
IS: 10462(Pt-1):	Fictitious calculation method for determination of dimension of protective coverings of cables: part – I electrometric and thermoplastic insulated cables.
IS: 10810(Pt-58):	Oxygen index test
IS: 10810(Pt-61):	Flame retardant test
IS: 10810(Pt-62):	fire resistance test bunched cables.
IS: 13573:	Joints and termination for polymeric cables for working voltages from 6.6 KV up to and including 33 KV.
IEC: 60332-3:	Test on electric cables under fire conditions
IEC: 60502:	Extruded solid dielectric insulated power cables for rated Voltages from 1 KV up to 30 KV.
IEC: 60540&60540A:	Test methods for insulation and sheaths of electric Cables.
ASTM: D2863:	Standard method of test for flammability of plastics using oxygen index method.

ICEA S-61-402:	Thermoplastic insulated wire and cable for transmission and Distribution of electrical energy
NEMA-WCS:	Distribution of electrical energy
ICEA. S-66-S24:	Cross-linked thermosetting polyethylene insulated wire
NEMA-WC7:	Cable for transmission of electrical energy.

2.2 The cables and accessories shall also conform to the provisions of Indian electricity rules and other statutory regulations as applicable.

2.3 In case of any contradiction between various referred Standard/Specification/Data sheet and statutory regulations, the following order of priority shall govern:

- a. Statutory regulations
- b. Data Sheets
- c. Job specifications
- d. Standard specification
- e. Codes and standards

3.0 DEFINITIONS

3.1 For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

OWNER / COMPANY	OWNER of the particular Project (Project Specific).
CONSULTANT	The party which is doing engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
BIDDER / SUPPLIER / VENDOR	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.

4.0 MATERIALS

4.1 PVC CABLES

4.1.1 The core insulation shall be with PVC compound applied over the conductor by Extrusion and shall conform to the requirements of type 'A' compound as per IS: 5831.

4.2 XLPE CABLES

4.2.1 The core insulation shall be with cross linked polyethylene insulating compound dry cured, applied by extrusion it shall be free from voids and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions.

5.0 DESIGN

5.1 PVC CABLES

- 5.1.1 All power/control cables for use on medium voltage systems shall be heavy-duty type, 650/1100 V grade with aluminum / copper conductor, PVC insulated, inner-sheathed, armored and overall PVC sheathed unless specified otherwise in Data Sheet.
- 5.1.2 The conductors shall be solid for conductor of nominal area up to and including 6mm² and stranded beyond 6mm². Conductors of nominal area less than 16 mm² shall be circular only. Conductors of nominal area 16 mm² and above may be circular or shaped as per IS 8130. Cables with reduced neutral conductor shall have sizes as per Table 1 of IS 1554 (Part-1).
- 5.1.3 The core insulation shall be with PVC compound applied over the conductor by extrusion and shall conform to the requirements of type 'A' compound as per IS: 5831. The thickness of insulation and the tolerance on thickness of insulation shall be as per Table 2 of IS: 1554 (Part-1). Control cables having 6 cores and above shall be identified with prominent and indelible numerals on the outer surface of the insulation. Color of the numbers shall contrast with the color of insulation with a spacing of maximum 50 mm between two consecutive numbers. Color coding for cables up to 5 cores shall be as per Indian Standards.
- 5.1.4 The inner sheath shall be applied over the laid-up cores by extrusion and shall be of PVC conforming to the requirements of Type ST-1 PVC compound as per IS: 5831. The minimum thickness of inner sheath shall be as per IS: 1554 (Part-1). Single core cables shall have no inner sheath.
- 5.1.5 If armoring is specified for multicore cables in the Data Sheet, the same shall be by single round galvanized steel wires where the calculated diameter below armoring does not exceed 13 mm and by galvanized steel strips. where this dimension is greater than 13 mm. Requirement and methods of tests for armor material and uniformity of galvanization shall be as per IS - 3975 and IS -10810 (Part 41). The dimensions of Armor shall be as per method (b) of IS - 1554 (Part -1). If armoring is specified for single core cables in the Data Sheet, the same shall be with H4 grade hard drawn aluminum round wire of 2.5 mm diameter.
- 5.1.6 For mining cables, the size and type of armor shall be such that the combined conductance of armor shall be equivalent to 75 percent of the conductance of the largest conductor of the cable.
- 5.1.7 The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound conforming to the requirements of type ST-I compound as per IS 5831. The minimum and average thickness of outer sheath for unarmored cables and minimum thickness of outer sheath for armored cables shall be as per IS:1554 (Part-I).
- 5.1.8 If Heat Resisting PVC cables are specified in the Data Sheet, the following shall be the requirements:
- a. It shall be possible to continuously operate the cable at a maximum conductor temperature of 85°C. PVC compounds used for HR PVC cables shall be as follows:

- i. Conductor insulation Type C
- ii. Inner sheath Type ST 2
- iii. Outer sheath Type ST 2

5.2 XLPE CABLES

- 5.2.1 Power cables for 3.3kV up to and including 33kV systems shall be aluminum/copper conductor, XLPE insulated, sheathed, armored and overall PVC sheathed.
- 5.2.2 The conductors shall be stranded and compacted circular for all cables.
- 5.2.3 All cables rated 3.8/6.6kv and above shall be provided with both conductor screening and insulation screening. The conductor shall be provided with non-metallic extruded semi conducting screen.
- 5.2.4 The core insulation shall be with cross linked polyethylene insulating compound dry cured, applied by extrusion it shall be free from voids and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions. It shall conform to the properties given in Table-I of IS 7098-(Part 2).
- 5.2.5 The insulation screen shall consist of non metallic extruded semi conducting compound in combination with a non magnetic metallic copper screen. Unless specified otherwise, the copper screen for all the three cores together shall be capable of carrying the single line to ground fault current value and the duration specified in the Data Sheet.
- 5.2.6 The conductor screen, XLPE insulation and insulation screen shall all be extruded in one operation by 'Triple Extrusion' process to ensure perfect bonding between the layers. The core identification shall be by colored strips or by printed numerals.
- 5.2.7 The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST 2 compound of IS: 5831. The extruded inner sheath shall be of uniform thickness. In case of single core cables, there shall be extruded inner sheath between insulation metallic screen and armoring.
- 5.2.8 For multicore cables, the armoring shall be by galvanized steel strips as per method (b) of IS7098 (Part-2). If armoring is specified for single core cables in the Data Sheet, the same shall be with H4 grade hard drawn aluminum round wire of 2.5 mm diameter.
- 5.2.9 The outer sheath of the cables shall be applied by extrusion over the armoring and shall be of PVC compound conforming to the requirements of Type ST 2 compound of IS: 5831. The minimum and average thickness of outer sheath for unarmored cables and minimum thickness of outer sheath for armored cables shall be as per IS: 7098 (Part-2)
- 5.2.10 The thickness of the insulation, inner sheath shall be governed by values given in IS: 7098 (Part -2).
- 5.2.11 Where specified, 1100V grade power cables shall also be XLPE insulated and shall meet the requirement specified in IS-7098 (Part-1).

6.0 FABRICATION

- 6.1** The cables shall be suitable for laying in trays, trenches, ducts, and conduits and for underground-buried installation with uncontrolled backfill and possibility of flooding by water and chemicals.
- 6.2** Outer sheath of all PVC and XLPE cables shall be black in color and the minimum value of oxygen index shall be 29 at $27 + 2$ ° C. In addition suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack.
- 6.3** All cables covered in this Specification shall be flame retardant (FR) unless specified otherwise in the Data Sheet. The outer sheath of PVC and XLPE cables shall possess flame propagation properties meeting requirements as per IS-10810 (Part-62) category AF.
- 6.4** Sequential marking of the length of the cable in meters shall be provided on the outer sheath at every one meter. The embossing /engraving shall be legible and indelible.
- 6.5** The overall diameter of the cables shall be strictly as per the values declared by the manufacturer in the technical information subject to a maximum tolerance of ± 2 mm, up to overall diameter of 60mm and ± 3 mm for beyond 60mm.
- 6.6** PVC / Rubber end caps shall be supplied free of cost for each drum with a minimum of eight per thousand meter length. In addition, ends of the cables shall be properly sealed with caps to avoid ingress of water during transportation and storage.
- 6.7** The cables used in installations under, the jurisdiction of Director General of Mines and Safety (DGMS) shall be of copper conductor only, and shall have valid DGMS approvals for the specified locations. The word "Mining Cable" shall be embossed /engraved on the cable outer sheath as per the applicable Indian Standards.

7.0 INSPECTION AND TESTING

- 7.1** The cables shall be tested and inspected at the manufacturer's works. All the materials employed in the manufacture of the cable shall be subjected, both before and after manufacture, to examination, testing and approval by Consultant /Owner Manufacturer shall furnish all necessary information concerning supply to Consultant/ Owner's inspectors. The inspector shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all its stages and he will have the power to reject any material, which appears to him to be of unsuitable description or of unsatisfactory quality. The Vendor shall give at least 2 weeks advance notice to the Purchaser, regarding the date of testing to enable him or his representative to witness the tests.

7.2 CABLES

- 7.2.1** After completion of manufacture of cables and prior to dispatch, the cables shall be subjected to type, routine, acceptance and special tests as detailed below. Consultant/Owner reserves the right to witness all tests with sufficient advance notice from Vendor. The test reports for all cables shall be got approved from the Engineer before dispatch of the cables.

- 7.2.2 All routine tests, acceptance tests, type tests and additional type tests for improved fire performance shall be carried out as listed in IS:1554 (Part 1), and IS:1098 (Part 2) on PVC and XLPE insulated cables respectively.
- 7.2.3 The test requirements for PVC insulation and sheath of cables shall be as per latest revision of IS: 5831.
- 7.2.4 Test for Resistance to Ultra Violet Radiation: This test shall be carried out as per DIN 53387 or ATM-G-53 on outer sheath. The retention value of tensile strength and ultimate elongation after the test shall be minimum 60% of tensile strength and ultimate elongation before the test. Test certificates with respect to this test (not older than one year) from recognised testing laboratory to be furnished for review by Consultant before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by Vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided outer sheath remains same.
- 7.2.5 Acceptance tests as per IS-1554 (Part-I) and IS-7098 (Part-2) and the following special tests to be performed on the cables as per sampling plan. These tests are required to be witnessed by Consultant/owner before dispatch of cables.
- a. Accelerated water absorption test for insulation as per NEMA - WC - 5. (For PVC insulated cables) and as per NEMA WC - 7 (for XLPE insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by Consultant before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by Vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided type of insulation remains same.
 - b. Dielectric Retention Test: The dielectric strength of the cable insulation tested in accordance with NEMA WC - 5 at $75 \pm 1^\circ \text{C}$ shall not be less than 50 % of the original dielectric strength. (For PVC insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by Consultant before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by Vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly and once for each order.
 - c. Oxygen Index Test: The test shall be carried out as per ASTM D2863 or applicable Indian Standard specifications. Sampling to be done for every offered lot/size as per sampling plan.
 - d. Flammability Test: The test shall be carried out on finished cable as per IS - 10810 (part 61 & 62). Sampling for these tests is to be done randomly once for each order, provided outer sheath remains same. The acceptance criteria for tests conducted shall be as under.
 - i. Part-61-The cable meets the requirement if there is no visible damage on the test specimen within 300 mm from its upper end.

- ii. Part-62-The maximum extent of the charred portion measured on the test sample should not have reached a height exceeding 2.5 m above the bottom edge of the burner at the front of the ladder.
- e. Test for rodent and termite repulsion property: The Vendors shall furnish the test details to analyses the property by chemical method. Sampling to be done for every offered lot / size as per sampling plan.

7.3 CABLE ACCESSORIES

Type tests should have been carried out to prove the general qualities and design of a given type of termination / jointing system as, per IS-13573. The type test certificates from independent testing laboratory shall be submitted before dispatch.

8.0 MARKING, PACKING AND SHIPMENT

8.1 Cables shall be dispatched in non-returnable wooden or steel drums of suitable barrel diameter, securely battened, with the takeoff end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free from defects. Wood preservatives shall be applied to the entire drum. Ferrous parts used shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.

8.2 On the flange of the drum, necessary information such as project title, manufacturer's name, type size, voltage grade of cable, length of cable in meters, drum no, cable code, BIS certification mark, gross weight etc. shall be printed. An arrow shall be printed on the drum with suitable instructions to show the direction of rotation of the drum.

Unless otherwise specified, Cables shall be supplied in drum lengths as follows:

8.2.1 MV CABLES

- a. Multicore power cables up to 6mm² : 1000m
- b. Multicore power cables from 10mm² up to 300mm² : 500m
- c. Single core power cables up to 630 mm² : 1000m
- d. Control cables up to 61 cores : 1000m

8.2.2 HV POWER CABLES – UPTO 11KV (E) GRADE

- a. Three core cables up to 400 mm² : 500m
- b. Single core cables up to 400 mm² : 1000m
- c. Single core cables above 400 mm² and up to 630 mm² : 750m

8.2.3 HV POWER CABLES – ABOVE 11KV(E) GRADE AND UPTO 33KV(E)

- a. Three core cables up to 300 mm² grade : 350 m
- b. Single core cables up to 400 mm² : 1000m
- c. Single core cables above 400 mm² and up to 1000 mm² : 500m

8.2.4 A tolerance of plus or minus 3 % shall be permissible for each drum. However overall tolerance on each size of cable shall be limited to ±2%. Offers with short/non-standard

lengths are liable for rejection. If non-standard drum lengths are specified in the Data Sheet, the same shall be supplied.

9.0 SPARES & ACCESSORIES

9.1 The termination and straight through jointing kits for use on the systems shall be suitable for the type of cables offered as per this Specification.

9.2 The accessories shall be supplied in kit form. Each component of the kit shall carry the manufacturer's mark of origin.

9.3 The kit shall include all stress grading, insulating and sealing materials apart from conductor fittings and consumable items. An installation instruction sheet shall also be included in each kit.

9.4 The contents of the accessories kit including all consumable shall be suitable for storage without deterioration at a temperature of 45° C, with shelf life extending to more than 5 years.

9.5 TERMINATING KITS

9.5.1 The terminating kits shall be suitable for termination of the cables to an indoor switchgear or to a weatherproof cable box of an outdoor mounted transformer / motor. For outdoor terminations, weather shields/sealing ends any other accessories required shall also form part of the kit. The terminating kits shall be from one of the makes / types mentioned in the Data Sheet.

9.6 JOINTING KITS

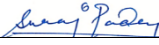



The straight through jointing kits shall be suitable for installation on overhead trays, concrete lined trenches, and ducts and for underground burial with uncontrolled backfill and possibility of flooding by water and chemicals. These shall have protection against any mechanical damage and suitably designed to be protected against rodent and termite attack. The inner sheath similar to that provided for cables shall be provided as part of straight through joint. The jointing kits shall be from one of the makes / types mentioned in the Data Sheet.



Energising Quality

VCS Quality Services Pvt Ltd

STANDARD SPECIFICATION FOR STATIONARY NICKEL CADMIUM BATTERIES VCS – SS – EL - 4009

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ABBREVIATION

BIS/IS	Bureau of Indian standards
IEC	International Electro-Technical Commission
BS	British Standards
IEEE	Institute of Electrical and Electronics Engineers
NEMA	National Electrical Manufacturers Association
OISD	Oil Industries Safety Directorate
CCE	Chief Controller of Explosive
DGMS	Director General Mines Safety
IE Rules	Indian Electricity Rules
CPRI	Central Power Research Institute
DC	Direct Current
Ah	Ampere hour
PVC	Poly Vinyl Chloride

CONTENTS

1.0 SCOPE5

2.0 REFERENCE DOCUMENTS.....5

3.0 DEFINITIONS5

4.0 MATERIALS6

5.0 DESIGN6

6.0 FABRICATION8

7.0 INSPECTION AND TESTING8

8.0 MARKING, PACKING AND SHIPMENT9

1.0 SCOPE

The intent of this Specification is to define the design, manufacture, testing & supply of stationary Nickel Cadmium batteries for DC power system /AC UPS application.

2.0 REFERENCE DOCUMENTS

2.1 The equipment shall comply with the requirements of the latest revision of the following Standards issued by BIS (Bureau of Indian Standards) unless otherwise specified.

IS-10918: Specification for Vented type Nickel Cadmium batteries

2.2 In case of imported equipment, Standards of the country of origin shall be applicable if these Standards are equivalent or more stringent than the applicable Indian Standards.

2.3 The equipment shall also conform to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country.

2.4 In case Indian Standards are not available for any equipment, Standards issued by IEC/ BS/ VDE/ IEEE/ NEMA or equivalent agency shall be applicable.

2.5 In case of any contradiction between various referred Standards/Specifications/Data Sheets and statutory regulations, the following order of priority shall govern:

- a. Statutory regulations.
- b. Data Sheets.
- c. Job Specification.
- d. Standard Specification.
- e. Codes and Standards.

3.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

OWNER / COMPANY	OWNER of the particular Project (Project Specific).
CONSULTANT	The party which is doing engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
BIDDER / SUPPLIER / VENDOR	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.

4.0 MATERIALS

- 4.1 The terminal posts shall be of nickel plated steel. The terminals shall be suitable for short circuit current and specified discharge current without damage to the cell as a result of terminal heating.
- 4.2 Stationary Nickel Cadmium cells shall be designed to withstand the mechanical stresses encountered during normal transportation and handling.

5.0 DESIGN

5.1 GENERAL REQUIREMENTS

- 5.1.1 The offered equipment shall be brand new with state-of-the-art technology and proven field track record. No prototype equipment shall to be offered.
- 5.1.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 10 years from the date of supply.
- 5.1.3 Vendor shall give a notice of at least one year to the end user of equipment before phasing out the product/ spares to enable the end user to place order for spares and services.

5.2 TECHNICAL REQUIREMENTS

- 5.2.1 The Nickel Cadmium cell/battery shall be suitable for float duty operation with a constant voltage permanently applied to its terminals which is sufficient to maintain it in a state close to full charge and shall be designed to supply load in the event of normal power supply failure. Type of plate construction for batteries shall be as per the Data Sheet.
- 5.2.2 The standard rated ampere hour capacity of the cell/ battery shall be at a reference temperature of 27°C, constant current discharge at 5 hours rate (C5) and an end cell voltage of 1.0 V/cell.
- 5.2.3 Ampere hour of the battery shall be selected based on the following:
 - a. Minimum site ambient temperature of 10°C or as defined in the Data Sheet.
 - b. Discharge duty cycle.
 - c. End cell voltage.
 - d. Ageing factor of 0.8
 - e. Design margin of 10%, if not defined in the Data Sheet
 - f. Capacity rating factor.

- 5.2.4 Number of cells and end cell voltage shall be decided by the Vendor on the basis of maximum permissible voltage to the load when batteries are float charged while feeding the Load and minimum DC system voltage. However the number of cells and end cell voltage shall be as per the Data Sheet, unless otherwise specified.
- 5.2.5 The battery shall be suitable. For being boost charged to fully charged condition from fully discharged condition within 10 hours, unless otherwise specified.
- Battery assembly shall be supplied dry and uncharged. Dry electrolyte and required quantity of electrolyte liquid with 10% extra shall be delivered with the battery in suitable non-returnable sealed containers, unless otherwise specified.
- 5.2.6 Each cell shall have a separate container. The cell container shall be of high strength alkali resistant material and designed to withstand mechanical stresses, shocks and vibrations. The cell container shall be translucent/transparent.
- 5.2.7 The terminal posts shall be of nickel plated steel. The terminals shall be suitable for short circuit current and specified discharge current without damage to the cell as a result of terminal heating.
- 5.2.8 Stationary Nickel Cadmium cells shall be designed to withstand the mechanical stresses encountered during normal transportation and handling.
- 5.2.9 Flame arrestor shall be mounted on the cell so that all the vented gases diffuse through the arrestor to the outside environment. The construction of the arrestor shall be such that hydrogen burning on the external surface of the arrestor shall not propagate back into the cell to cause explosion.
- 5.2.10 The following information shall be permanently marked on the cell.
- Nominal voltage
 - Name of manufacturer/model reference
 - Rated capacity in ampere hours (Ah) with End Cell Voltage
 - Voltage for float operation at 27°C with tolerance of $\pm 1\%$, Month and year of manufacture
 - Polarity Marking.
- 5.2.11 Each set of battery shall be supplied with all the accessories, including, but not limited to the following:
- Battery stands in formation as per Data Sheet. Mild steel stand pretreated and epoxy painted /PVC coated.
 - Inter cell, inter row and interbank connectors and end take offs. These shall be of tin plated copper/flexible-insulated copper cable.
 - Stand insulator.
 - Cell number plates, Lugs for cable termination, as required.
 - Other accessories and their quantity as per Data Sheet.

5.3 PERFORMANCE

Nickel Cadmium batteries shall have been type tested to meet the performance requirements for each design and Ah rating of cells as per Standards IS-10918.

6.0 FABRICATION

6.1 Flame arrestor shall be mounted on the cell so that all the vented gases diffuse through the arrestor to the outside environment. The construction of the arrestor shall be such that hydrogen burning on the external surface of the arrestor shall not propagate back into the cell to cause explosion.

6.2 Each cell shall have a separate container. The cell container shall be of high strength alkali resistant material and designed to withstand mechanical stresses, shocks and vibrations. The cell container shall be translucent/transparent.

7.0 INSPECTION AND TESTING

7.1 Batteries shall be subject to inspection by Consultant/Owner or by an agency authorized by the Owner to assess the progress of work. The manufacturer shall furnish all the necessary information concerning the supply to Consultant/Owner's representative.

7.2 Consultant/Owner's Representative shall be given free access in the works from time to time for stage wise inspection and progress reporting. Four weeks advance notice shall be given to witness the final routine tests and other tests as agreed upon.

7.3 Following tests shall be carried out as a minimum for each Ah rating of cells/battery:

a. Routine test

- i. Physical examination test.
- ii. Polarity and absence of short circuit.
- iii. Dimension, Mass and layout.
- iv. Marking and packing.

b. Acceptance test

- i. Marking and packing.
- ii. Verification of dimensions.
- iii. Test for Ah capacity
- iv. Test for voltage during discharge
- v. Internal resistance test.

c. Type test

- i. Verification of constructional requirement.
- ii. Test for voltage during discharge.
- iii. Test for Ah capacity.
- iv. Test for charge retention/loss of capacity if specified in the data sheet.
- v. Air pressure test.
- vi. Ampere hour and Watt-hour efficiency test.

-
- 7.4 Battery duty cycle test to meet the load cycle requirement shall also be performed at site after installation as part of commissioning unless otherwise defined in the Data Sheet.

8.0 MARKING, PACKING AND SHIPMENT

- 8.1 All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to finish. Crates/cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Centre of gravity', 'Weight', 'Owner's particulars', 'PO nos.' etc., shall be clearly marked on the package together with other details as per purchase order.
- 8.2 The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.