



National Vocational Certificate Level 2 in Industrial Electrician

Competency Standard

Version 1

December 2014



Qualification Code: 0713E&E08

National Vocational & Technical Training Commission

5th Floor, Evacuee Trust Complex

Sector F-5/1, Islamabad

Tel: +92 51 904404

Fax: +92 51 904404

Email: info@navttc.org

Author:

Engr. Ghazanfar Abbas (Senior Manager Curriculum – PVTC), Mr. Jamil Akhtar (Instructor - VTI Bhalwal)

Reviewed by:

Mr. Muhammad Mahmood Javaid (Technical & Vocational Educationist VTI Mamukanjan) , Mr. Muhammad Aslam (Assistant Manager Saigol group of companies) , Mr. Muhammad Waqas (Electrical Engineer Shahaen Solar Company Lahore) , Mr. Muhammad Aamir (Assistant Manager Electrical Punjab Industrial Estates Lahore)

Layout and Design by:

Ms. Maria Arif (Freelance Consultant)

Date of approval by NCRC:

29th -30th October 2014

Date of Notification:

10th December 2014, vide notification no F.2-1/2013-DD(VT)

This curriculum has been produced by the National Vocational & Technical Training Commission (NAVTTCC) with the technical assistance of TVET Reform Support Programme, which is funded by the European Union, the Embassy of the Kingdom of the Netherlands, Federal Republic of Germany and the Royal Norwegian Embassy. The Programme has been commissioned by the German Federal Ministry for Economic Cooperation and Development and is being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Table of Contents

Competency Standards

A	Maintain workplace safety	04
B	Apply continuing professional development	05
C	Perform preventive maintenance as part of electrical operations	06
D	Perform corrective maintenance as part of electrical operations	07
E	Test electrical and electronic parameters	08
F	Install three-phase wiring	09
G	Perform distribution of electrical supply	10
H	Use and maintain electrical tools and equipment	11

Documents, policies, guidelines	12
--	---------

Tools and Equipment	12
----------------------------	---------

Consumables	15
--------------------	---------

Competency Standards: Industrial Electrician (Assistant) - Level 2

Competency Standard A: Maintain workplace safety

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Follow safe work procedures; apply tools and equipment safety measures; and follow workplace emergency procedures.

Competency Unit	Performance Criteria	Knowledge and Understanding
A1: Follow safe work procedures	P1- Organise and arrange duties, tools, equipment materials and work area P2- Use and store PPE P3- Perform tasks in a safe manner	K1- Company safety SOP/policy; Housekeeping practices; Factors that may influence safety at the workplace, such as anger and stress K2- Types of personal protective equipment K3- Safety signs and symbols; Isolation and lockout procedures
A2: Apply tools & equipment safety measures	P1- Check earthing for safety of equipment P2- Store tooling and equipment securely	K1- Method of earthing and its effects on safety K2- Storage and stacking methods of tools & equipment
A3: Follow workplace emergency procedures	P1- Follow safe workplace procedures for dealing with accidents, fires and emergencies within scope of responsibility	K- Scope of responsibility; First aid procedures; Fire safety and fire fighting procedures; Risk control measures

Competency Standard B: Apply continuing professional development

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Identify professional development needs; develop professional knowledge, skills and attitudes, and maintain professional proficiency.

Competency Unit	Performance Criteria	Knowledge and Understanding
B1: Identify professional development needs	P1- Discuss professional development needs P2- Identify professional development programmes	K1- Reasons for professional development K2- Access to programmes; Career guidance
B2- Develop professional knowledge, skills and attitudes	P1- Participate in training programmes P2- Document training outcome	K1- Outcomes and relevance of training K2- Report and portfolio writing
B3- Maintain professional proficiency	P1- Identify and use self-study sources P2- Implement self-study plan P3- Professional qualification upgradation	K1- Research methods; Access to sources K2- Planning your career K3- Research methods; Access to sources

Competency Standard C: Perform preventive maintenance as part of electrical operations

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Plan and prepare for preventive maintenance; perform routine inspections; carry out preventive maintenance; and complete work.

Competency Unit	Performance Criteria	Knowledge and Understanding
C1: Plan and prepare for preventive maintenance	P1- Identify and obtain safety and other regulatory requirements for maintenance P2- Interpret circuit diagrams P3- Identify and select tools and equipment	K1- Safety requirements; Specifications; Hazard identification K2- Drawings and symbols specifications K3- Tools and equipment and calibration thereof
C2: Perform routine Inspection	P1- Check for safety hazards P2- Carry out procedures for routine checks P3- Document results	K1- Inspection requirements K2- Maintenance of electrical instruments and equipment K3- Types of common faults of wiring; Load balance; Safety precautions K4- Test and preventive reports
C3: Carry out preventive maintenance	P1- Perform basic measurements tests P2- Perform minor adjustments and calibrations P3- Replace worn out or damaged parts	K1- Measurement and calculation of electrical parameters K2- Basic operation of appliance and settings to adjust performance K3- Communication skills
C4: Complete work	P1- Complete work related documents and procedures P2- Perform final quality inspection P3- Clean up and store tools, equipment and materials	K1- Importance of documentation; Customer care procedures and techniques K2- Importance of quality; handing over to client K3- Waste disposal procedures; Care of tools and equipment

Competency Standard D: Perform corrective maintenance as part of electrical operations

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Plan and prepare for corrective maintenance; perform troubleshooting; carry out corrective maintenance procedures; and complete work.

Competency Unit	Performance Criteria	Knowledge and Understanding
D1: Plan and prepare for corrective maintenance	P1- Identify and obtain safety and other regulatory requirements for maintenance P2- Interpret circuit diagrams P3- Identify and select tools and equipment	K1- Safety requirements; Specifications; Hazard identification K2- Drawings and symbols specifications K3- Tools and equipment and calibration thereof
D2: Perform troubleshooting	P1- Check for safety hazards P2- Carry out diagnostic procedures P3- Identify faulty parts and/or equipment P4- Analyse system fault	K1- Troubleshooting requirements K2- Identification of electrical faults by checking shape, size and colour of components and parts; Measurement of electrical parameters; Safety precautions K3- Methods of fault identification in electrical components K4- System operations in an electrical environment
D3: Carry out corrective maintenance procedures	P1- Dismantle faulty parts or components P2- Replace or repair faulty parts or components P3- Perform commissioning	K1- Dismantling procedures K2- Replacing and repairing procedures K3- Electrical load management; commissioning procedures
D4: Complete work	P1- Complete work related documents and procedures P2- Perform final quality inspection P3- Clean up and store tools, equipment and materials	K1- Importance of documentation; Customer care procedures and techniques K2- Importance of quality; handing over to client K3- Waste disposal procedures; Care of tools and equipment

Competency Standard E: Test electrical and electronic parameters

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Perform testing; diagnose faults; and remove faults.

Competency Unit	Performance Criteria	Knowledge and Understanding
E1: Perform Testing	P1- Conduct visual inspection P2- Implement testing procedures	K1- Damage identification in terms of cracks, disorder in shape and structure, broken parts K2- Process of different tests; Electrical parameters
E2: Diagnose fault	P1- Interpret test results P2- Implement troubleshooting procedures and identify fault	K1- Interpretation of drawings and circuit diagrams K2- Troubleshooting procedures; Electrical and electronic parameters
E3: Remove faults	P1- Repair or replace component parts P2- Carry out operational testing	K1- Interpretation of drawings and circuit diagrams; product knowledge K2- Product knowledge; Testing procedures and equipment

Competency Standard F: Install three-phase wiring

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Plan wiring layout; lay cable; perform wiring test; and complete work.

Competency Unit	Performance Criteria	Knowledge and Understanding
F1: Plan wiring layout	P1- Follow wiring layout P2- Measure distance to connection points P3- Estimate material P4- Prepare tools, equipment and materials	K1- Interpretation of drawings, symbols, cable number according to load, and colour coding K2- Measuring of units and conversion K3- Quality of different conductor and insulator types K4- Application of tools, equipment and materials
F2: Lay cables	P1- Prepare installation of cable P2- Install conduit, GI pipes, PVC pipes and/or ducts P3- Pull-in cables P4- Connect cables P5- Connect fixtures	K1- Chiselling, ducting, PVC and GI pipe wiring procedures K2- Properties of materials K3- Application of cables and tools K4- Types of joints K5- Types and purpose of fixtures
F3: Perform wiring test	P1- Inspect wiring and distribution board P2- Conduct tests P3- Document test results	K1- Importance of continuity and factors of loose fittings K2- Application of equipment and tools used for testing; Importance of earthing, voltage level, short circuit, phase sequence, installation test etc. K3- Importance of documenting compliance & noncompliance of test results and subsequent steps to be taken
F4: Complete work	P1- Complete work related documents and procedures P2- Perform final quality inspection P3- Clean up and store tools, equipment and materials	K1- Importance of documentation; Customer care procedures and techniques K2- Importance of quality; handing over to client K3- Waste disposal procedures; Care of tools and equipment

Competency Standard G: Perform distribution of electrical supply

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: review electrical load schedule, set distribution priority, monitor electrical load.

Competency Unit	Performance Criteria	Knowledge and Understanding
G1: Review electrical load schedule	P1- Check layout plan P2- Perform load scheduling P3- Check input & output voltages P4- Check voltage drops	K1- Interpretation of drawings, symbols, cable number, colour coding and electrical load schedule K2- Maintenance of input and output voltages K3- Methods of calculation of voltage drops, overloading and load balance
G2: Set distribution priority	P1- Review distribution priority plan P2- Reschedule electrical load as per distribution priority	K1- Interpretation of distribution priority plan K2- Methods of rescheduling of electrical loads
G3: Monitor electrical load	P1- Monitor electrical load (current) P2- Monitor power consumption (energy) P3- Monitor voltage drops P4- Perform logout/tag out	K1- Methods of current measurement (Amperes) K2- Methods of energy measurement in (KWH) K3- Methods of voltage drop measurement (Volt) K4- Methods of log out / tag out and labelling

Competency Standard H: Use and maintain electrical tools and equipment

Overview: This competency standard is intended for those who carry out electrical operations. People holding credit for this competency standard are able to: Use electrical tools and equipment; maintain electrical tools, equipment and instruments; maintain batteries; and calibrate measuring equipment.

Competency Unit	Performance Criteria	Knowledge and Understanding
H1: Use electrical tools and equipment	P1- Identify and select tools, equipment and instruments P2- Demonstrate safe use of tools, equipment and instruments	K1- Purpose of electrical tools, equipment and instruments K2- Use of electrical tools, equipment and instruments
H2: Maintain electrical tools, equipment and instruments	P1- Describe preventive maintenance procedures P2- Maintain and/or replace tool insulation P3- Clean and store electrical tools, equipment and instruments	K1- Preventive maintenance; Types of maintenance schedules or programmes for: - Tools - Equipment - Instruments - Machinery - Facilities K2- Types of insulation and reports K3- Storage requirements
H3: Maintain batteries	P1- Determine state of charge P2- Maintain electrolyte level P3- Charge batteries P4- Determine gravity of electrolyte	K1- Types of batteries K2- Role of electrolyte K3- Charging procedures K4- Use of hydrometer
H4: Calibrate measuring instruments	P1- Check calibration of measuring instruments P2- Document and interpret calibration procedure P3- Calibrate measuring instrument	K1- Types and methods of calibration K2- Types of calibration reports K3- Types and methods of calibration

Documents, policies, guidelines:

- International Labour Organisation (ILO) Standards on Occupational Health and Safety
- Pakistan Electricity Act, 1910 and subsequent amendments
- Institute of Electrical and Electronics Engineers Standards Association (IEEE-SA)
- Industry code of practice

Tools and Equipment:

No.	Description	Quantity
1	Personal protective equipment	
2	Tools and equipment for cable works	
3	Hand tools and Powered handheld machine tools	
4	AC & DC motors	
5	AVO meter	
6	Cable / wire gauge	
7	Cable cutter	
8	Cable knife	
9	Circuit boards	
10	Combination plier (set) electrically insulated	

11	Drill	
12	Earth continuity conductor	
13	Earth tester	
14	Earthing rod	
15	Generator	
16	Gloves	
17	Goggles	
18	Grinder	
19	Growler	
20	Hack saw	
21	Hand saw	
22	Helmet	
23	Holesaw	
24	Hydro meter	
25	IR temperature gun	
26	L scale	
27	Lug punch	
28	LUX meter	
29	Magnetic conductor	
30	Mega meter	

31	Micrometer	
32	Multi-meter	
33	Overall combination	
34	Phase sequence meter	
35	RPM meter	
36	Safety belt	
37	Set of nose pliers	
38	Set of screw drivers	
39	Shoes	
40	Thimble press plier	
41	Transformer	
42	Vernier caliper	
43	Welding plant	

Consumables:

No.	Description	Quantity
1	Cable 3 / .029"	As Required
2	Cable 7 / .029"	As Required
3	Cable 1 / .036"	As Required
4	Cable 23 / .0076"	As Required
5	Cable 40 / .0076"	As Required
6	Switch Single Way	As Required
7	Switch Two Way	As Required
8	Push Button	As Required
9	Bulb Holder Piano Type	As Required
10	Bulb Holder Button Type	As Required
11	Ceiling Rose	As Required
12	Fan Dimmer	As Required
13	Socket Two Pin	As Required
14	Socket Three Pin	As Required
15	Light Plug	As Required
16	Power Plug	As Required
17	PVC Pipe	As Required

18	PVC Elbow	As Required
19	PVC Band	As Required
20	Junction Box	As Required
21	Fan Box	As Required
22	Rawal Plug	As Required
23	Pipe Saddle	As Required
24	Cable Saddle	As Required
25	Board 4 x 4	As Required
26	Board 7 x 4	As Required
27	Board 8 x 10	As Required
28	TV Pin	As Required
29	Telephone Pin	As Required
30	Insulation Tape	As Required
31	PVC Duct Plain 3/4"	As Required
32	PVC Duct Slotted 1"	As Required
33	PVC Duct Plain 3/4"	As Required
34	PVC Duct Slotted 1"	As Required
35	Fuse Piano Type	As Required
36	Main Switch	As Required

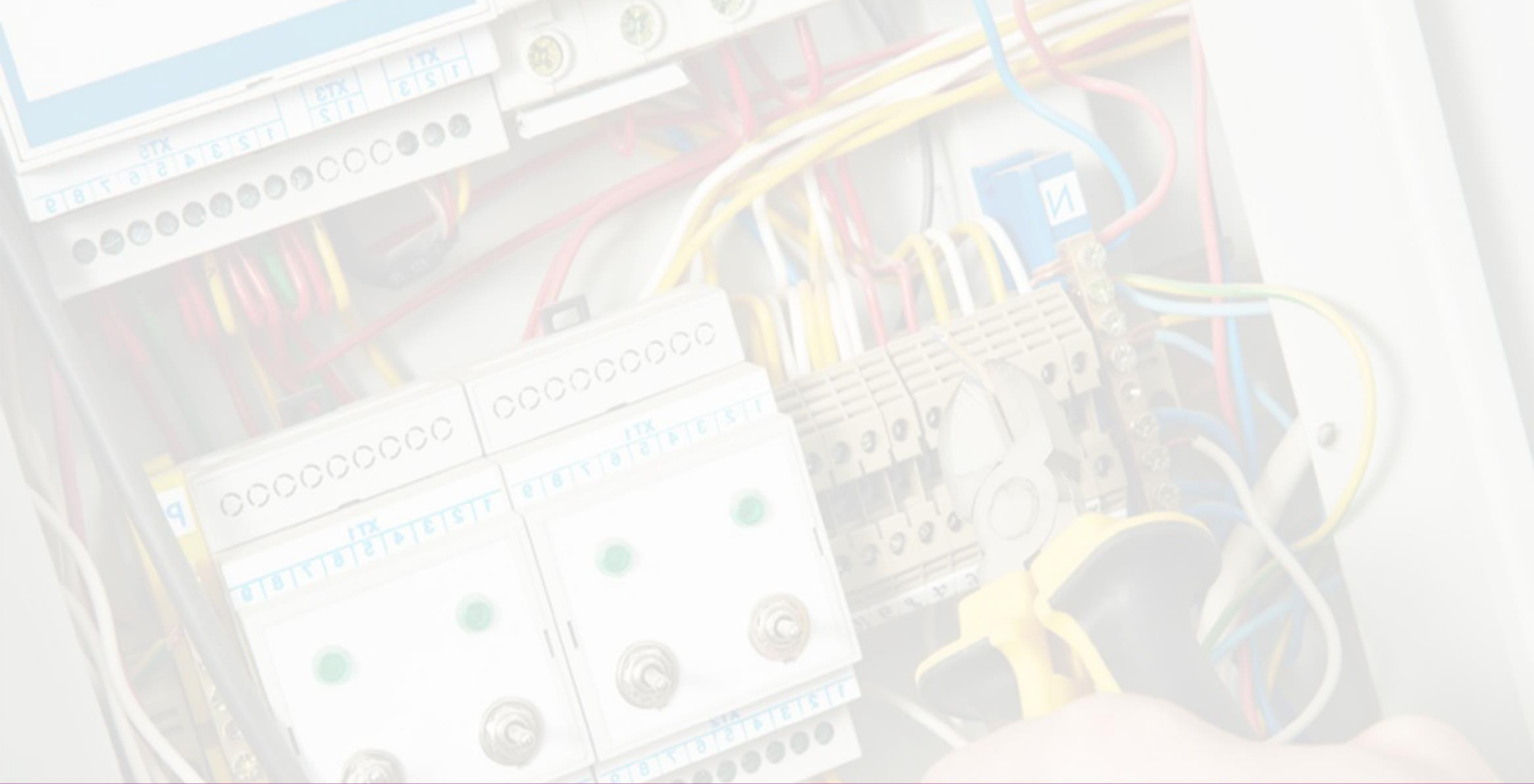
37	Breaker Single Pole	As Required
38	Breaker Double Pole	As Required
39	Volt meter Panel	As Required
40	Ampere Meter Panel	As Required
41	DB Box	As Required
42	DB Switch	As Required
43	PG Connector	As Required
44	Neutral Terminal	As Required
45	Screw (Different Sizes)	As Required
46	Steel Nail (Different Sizes)	As Required
47	Blub 100 Watt	As Required
48	Bulb 200 Watt	As Required
49	Nut Bolt (Different Sizes)	As Required
50	Electric Bell	As Required
51	Two Pin Shoe	As Required
52	Three Pin Shoe	As Required
53	Cable Tube Connection	As Required
54	Tube Rod	As Required
55	Choke 20w, 40w	As Required

56	Tube Starter	As Required
57	Choke Patti Fitting	As Required
58	Winding Wire (Different Sizes)	As Required
59	Slat Paper (Different Sizes)	As Required
60	Cotton Tape	As Required
61	Sleeve (Different Sizes)	As Required
62	Varnish	As Required
63	Cable Three Core 40/ .0076	As Required
64	Cable Four Core 7/ .036	As Required
65	Cable Three Core 7/ .029	As Required
66	Connection Plate	As Required
67	Clutch Plate	As Required
68	Breaker Fitting Patti (Din Ray)	As Required
69	Relay 12V, 5A	As Required
70	Resistors (Different Types)	As Required
71	Transistor (Different Types)	As Required
72	LED	As Required
73	Diode	As Required
74	Rectifier Bridge	As Required

75	Carbon Brush	As Required
76	Battery 6v	As Required
77	Breaker Stripe	As Required
78	Flout Switch	As Required
79	Magnetic Connector	As Required
80	Cut Out	As Required
81	Breaker Cartridge Fuse	As Required
82	ON / OFF Push Button	As Required
83	Timer	As Required
84	Relay AC – 220V	As Required
85	Relay DC- 12V	As Required
86	Selector Switch Volt Meter	As Required
87	Selector Switch Ampere Meter	As Required
88	Emergency Switch	As Required
89	Soldering Wire	As Required
90	Paste	As Required
91	Light Indicator	As Required
92	Limit Switch (MEM Inter Locking)	As Required
93	Motor Driven Selector Switch (Water Tank)	As Required

94	Speaker	As Required
95	Acid	As Required
96	Hydro Metter	As Required
97	Multi Metter (Analogue / Digital)	As Required
98	Cam Starter (single phase & three phase)	As Required
99	Generator Switch	As Required
100	Star Delta Manual	As Required
101	Capacitor Different Size	As Required
102	Intercom Bell	As Required
103	Over Load Relay	As Required
104	Forward Reverse Switch	As Required
105	Tai Different Size	As Required
106	Magnetic Connector	As Required
107	Current Transformer	As Required
108	8 Pin type & 11 Pin type relay with base	As Required
109	Timer Circuit	As Required
110	Relay Circuit	As Required
111	Bobbin Transformer	As Required
112	Core Transformer	As Required

113	Coal	As Required
114	Calcium Carbonate	As Required
115	Petrol	As Required
116	Heat Sleeve Tube	As Required
117	Changer Over Switch	As Required
118	Timer 0-60 second	As Required
119	Time 1-6 minute	As Required
120	Baboon 1 ¼", 1 ½", 2", 2x3"	As Required
121	UPS Card	As Required



National Vocational & Technical Training Commission (NAVTTTC)

5th Floor Evacuee Trust Complex Sector F-5/1,
Islamabad.

T +92 51 904404

F +92 51 904404

E info@navttc.org

I <http://www.navttc.org/>