

DACUM Panel

1. Mr. Ramesh Adhikari, Technician, Energy Prabardhan, Gangabu-7, Kathmandu
2. Mr. Anil Adhikari, Technician, Energy Prabardhan, Gangabu-7, Kathmandu
3. Mr. Suman Giri, Technician, CRC Nepal, Sitapaila, Kathmandu
4. Mr. Rinzi Sherpa, Technician, CRC Nepal, Sitapaila, Kathmandu
5. Mr. Bijaya Gurung, Technician, Hydro Energy Concern, Samakhushi, Kathmandu
6. Mr. Dinesh Shrestha, Technician, Lumbini Engineering & Hydropower, Sowyambhu, Kathmandu
7. Mr. Alish Shrestha, Technician, Lumbini Engineering & Hydropower, Sowyambhu, Kathmandu
8. Mr. Shiva Prasad Sedhain, Technician, Housing & Hydro Services P. Ltd., Lalitpur
9. Mr. Prakash Dahal, Technician, CRC Nepal, Sitapaila, Kathmandu

DACUM Coordinator

Mr. Tulsi K.C., Sr. Skill Testing Officer, NSTB

DACUM Facilitator

Mr. Suresh Maharjan, Skill Testing Officer, NSTB

Mr. Prem Chandra Pokhrel, Skill Testing Officer, NSTB

Verification Panel

1. Mr. Tej Narayan Thakur, MD, Tej Energy Solution Nepal (P), Ltd., Pepsicola, KTM
2. Mr. Satish Niraula, Manager, Barah Engineering Inst. of Technology (P) Ltd., Balkhu, KTM
3. Mr. Prem Tamrakar, MD, Appropriate Engineering, Kalikanagar, Butwal
4. Mr. Bijaya Gurung, Engineer, Hydro Energy Concern, Samakhushi, KTM
5. Mr. Suman Giri, Engineer, Center for Resource Conservation Nepal (P) Ltd., Kalanki, KTM
6. Mr. Raj Kumar Chaulagain, MD, Magi Engineering Solution, Bhaktapur
7. Mr. Raju Raj Bajracharya, Engineer, Center for Appropriate Tech. Nepal, Baneshwor, KTM
8. Mr. Narendra Bajracharya, Engineer, Housing & Services, Natol, Lalitpur

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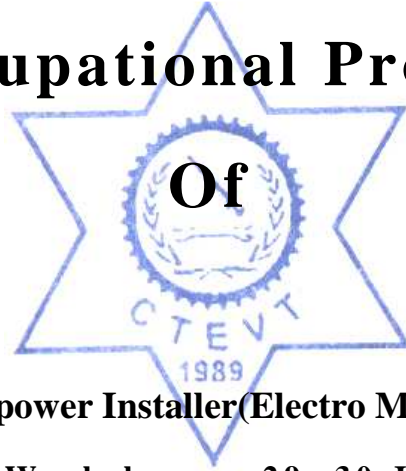
Mr. Suresh Maharjan, Skill Testing Officer, NSTB

Mr. Prem Chandra Pokhrel, Skill Testing Officer, NSTB

Technical Sub-Committee

1. Prof. Dr. Jagan Nath Shrestha, Coordinator, Renewable Energy
2. Dr. Kul Bahadur Basnet, Member, Director, NSTB, Bhaktapur
3. Prof. Dr. Triratna Bajracharya, Member, Center for Energy Studies, I.O.E., Pulchowk, Lalitpur
4. Mr. Krishna Bahadur Nakarmi, Member, UTSS, Kathmandu
5. Mr. Ashok Shrestha, Member, Road Department, Heavy Equipment Division, Kathmandu
6. Mr. Krishna Prasad Devkota, Member, NMHDA, Kathmandu
7. Mr. Madhu Sudhan Adhikari, Member, AEPC/NRREP, Kathmandu
8. Mr. Tulsi K.C., Member, Sr. Skill Testing Officer, NSTB, Bhaktapur
9. Mr. Prem Chandra Pokhrel, Skill Testing Officer, NSTB
10. Mr. Yam Bhandari, Member Secretary, Renewable Energy, NSTB

Occupational Profile



Micro Hydropower Installer (Electro Mechanical), L-2

(DACUM Workshop on 29- 30 June 2014)

(Customized DACUM on 5 July 2014)

(Technical Sub Committee Meeting on 30-31 July 2014)



Council For Technical Education and Vocational Training

NATIONAL SKILL TESTING BOARD

Madyapur Thimi 17, Sanothimi, Bhaktapur

Nepal

(NSTB approval date)

DUTIES and TASKS

A. Assemble Turbine

| | | | | | | | | | | | |
|--------------------------------|------------|-----------|-------------------------|------------|-----------|------------------|------------|-----------|----------------------------|------------|-----------|
| A1. Collect Turbine Components | | | A2. Fix Turbine Housing | | | A3. Fix Runner | | | A4. Fix Flow Control Valve | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 3 | 1 | 3 | 2 | 1 | 3 | 3 | 1 | 3 | 3 | 1 |
| A5. Fix Hand Wheel Regulator | | | A6. Fix Manifold | | | A7. Align Nozzle | | | A8. Fix Guide Vanes | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 2 | 1 | 3 | 2 | 1 | 3 | 3 | 1 | 3 | 2 | 1 |
| A9. Fix Jet Deflector | | | | | | | | | | | |
| Task rating | | | | | | | | | | | |
| Importance | Difficulty | Frequency | | | | | | | | | |
| 3 | 3 | 1 | | | | | | | | | |

B. Install Mechanical Components

| | | | | | | | | | | | |
|-------------------------|------------|-----------|-----------------------|------------|-----------|---------------------------|------------|-----------|----------------------|------------|-----------|
| B1. Fix Base Frame | | | B2. Set Turbine | | | B3. Fix Adaptor | | | B4. Fix Main Valve | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 3 | 1 | 3 | 3 | 1 | 3 | 2 | 1 | 3 | 2 | 1 |
| B5. Set Expansion Joint | | | B6. Connect Bend Pipe | | | B7. Connect Penstock Pipe | | | B8. Fix Ballast Tank | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 3 | 1 | 3 | 2 | 1 | 3 | 1 | 3 | 3 | 1 | 1 |

C. Install Mechanical Transmission System

| | | | | | | | | | | | |
|--------------------|------------|-----------|----------------------|------------|-----------|------------------|------------|-----------|----------------|------------|-----------|
| C1. Set Pulley | | | C2. Set Coupling | | | C3. Set Gear Box | | | C4. Align Belt | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 3 | 1 | 3 | 3 | 1 | 3 | 3 | 1 | 3 | 3 | 1 |
| C5. Set Line Shaft | | | C6. Set Safety Guard | | | | | | | | |
| Task rating | | | Task rating | | | | | | | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | | | | | | |
| 3 | 3 | 1 | 3 | 1 | 1 | | | | | | |

D. Install Electrical Components

| | | | | | | | | | | | |
|----------------------------|------------|-----------|----------------------------------|------------|-----------|-------------------------|------------|-----------|------------------------------|------------|-----------|
| D1. Set Generator | | | D2. Set Electrical Control Panel | | | D3. Connect Power Cable | | | D4. Connect Governing System | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 3 | 1 | 3 | 2 | 1 | 3 | 2 | 1 | 3 | 3 | 1 |
| D5. Connect Ballast Heater | | | D6. Perform Power House Wiring | | | D7. Set Transformer | | | D8. Set Dropout Fuse | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 2 | 1 | 3 | 2 | 1 | 3 | 3 | 1 | 3 | 2 | 1 |
| D9. Set Isolator | | | D10. Install Lightning Arrester | | | D11. Install Earthing | | | D12. Install Energy Meter | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 2 | 1 | 3 | 3 | 1 | 3 | 3 | 1 | 3 | 2 | 1 |

E. Install Transmission and Distribution Line Works

| | | | | | | | | | | | |
|------------------|------------|-----------|---------------------|------------|-----------|--------------------|------------|-----------|------------------------|------------|-----------|
| E1. Observe Site | | | E2. Conduct Meeting | | | E3. Set Line Route | | | E4. Erect Pole | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 1 | 3 | 2 | 1 |
| E5. Set D-Iron | | | E6. Set Cross Arm | | | E7. Set Insulator | | | E8. Fix ACSR Conductor | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 3 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 1 |

DUTIES and TASKS

| | | | | | | | | |
|------------------|------------|-----------|---------------------------|------------|-----------|------------------------------------|------------|-----------|
| E9. Fix Stay Set | | | E10. Fix Distribution Box | | | E11. Connect Service wire with MCB | | |
| Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 3 | 2 | 1 | 3 | 1 | 1 |

F. Inspect Performance of Electro Mechanical Components

| | | | | | | | | | | | |
|-------------------------------------|------------|-----------|----------------------------|------------|-----------|--------------------------------------|------------|-----------|-----------------------------|------------|-----------|
| F1. Inspect Penstock Pipe | | | F2. Inspect Turbine | | | F3. Inspect Ballast Tank | | | F4. Inspect Air vent Pipe | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 |
| F5. Inspect Pressure Gauge | | | F6. Inspect Penstock Valve | | | F7. Inspect Flow Control Valve | | | F8. Inspect Expansion Joint | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 |
| F9. Inspect Power House Wiring | | | F10. Inspect Pole | | | F11. Inspect Service wire Connection | | | F12. Inspect Generator | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 |
| F13. Inspect ELC Board/ Main Switch | | | F14. Inspect Transformer | | | F15. Inspect DB Box | | | F16. Inspect Energy Meter | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 | 3 | 1 | 1 |

G. Perform Testing & Commissioning

| | | | | | | | | | | | |
|-------------------------------------|------------|-----------|--------------------------------------|------------|-----------|---------------------------------------------|------------|-----------|------------------------------|------------|-----------|
| G1. Ensure test of Civil Components | | | G2. Measure Head | | | G3. Measure Water Discharge | | | G4. Measure Earth Resistance | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 1 | 3 | 1 | 1 | 3 | 2 | 2 | 3 | 1 | 1 |
| G5. Perform Leakage Test | | | G6. Run Electro Mechanical Equipment | | | G7. Measure Current/ Voltage/ Frequency | | | G8. Measure Power | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 |
| G9. Measure Power Factor | | | G10. Measure RPM | | | G11. Prepare Installation Completion Report | | | | | |
| Task rating | | | Task rating | | | Task rating | | | | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | | | |
| 3 | 1 | 1 | 3 | 1 | 1 | 3 | 3 | 1 | | | |

H. Perform Repair & Maintenance Works

| | | | | | | | | | | | |
|-----------------------------|------------|-----------|---------------------------------------|------------|-----------|-----------------------|------------|-----------|-----------------------------|------------|-----------|
| H1. Perform Cleaning | | | H2. Perform Lubrication | | | H3. Prevent Leakage | | | H4. Replace Turbine Bearing | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 2 | 1 | 3 | 3 | 1 | 3 | 2 | 1 | 3 | 3 | 3 | 1 |
| H5. Replace Ballast Heater | | | H6. Replace Mother Board | | | H7. Replace Thyristor | | | H8. Replace Panel Meter | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 2 | 1 | 3 | 1 | 1 | 3 | 2 | 1 | 3 | 1 | 1 |
| H9. Replace Generator Diode | | | F10. Replace Safety Switching Devices | | | | | | | | |
| Task Rating | | | Task rating | | | | | | | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | | | | | | |
| 3 | 3 | 1 | 3 | 2 | 1 | | | | | | |

DUTIES and TASKS

I. Perform Communication

| | | | | | | | | | | | |
|----------------------------------------|------------|-----------|--------------------------------------------|------------|-----------|--------------------------------------------------|------------|-----------|----------------------------|------------|-----------|
| I1. Communicate with client/ owner | | | I2. Communicate with consultant/contractor | | | I3. Communicate with senior/junior | | | I4. Communicate with peers | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 1 | 3 | 3 | 1 | 3 | 3 | 1 | 3 | 3 | 1 | 3 |
| I5. Communicate with engineer/overseer | | | I6. Communicate with civil technician | | | I7. Communicate with concern office/stake holder | | | | | |
| Task rating | | | Task rating | | | Task rating | | | | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | | | |
| 3 | 1 | 3 | 3 | 1 | 3 | 3 | 1 | 3 | | | |

J. Develop Professionalism

| | | | | | | | | | | | |
|-------------------------------------|------------|-----------|-----------------------------|------------|-----------|-----------------------------|------------|-----------|----------------------|------------|-----------|
| J1. Participate in workshop/seminar | | | J2. Attend training | | | J3. Visit related site | | | J4. Work with expert | | |
| Task rating | | | Task rating | | | Task rating | | | Task rating | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency |
| 3 | 2 | 1 | 3 | 2 | 1 | 3 | 2 | 1 | 3 | 1 | 2 |
| J5. Read articles/books/newspaper | | | J6. Visit related web sites | | | J7. Read Completion reports | | | | | |
| Task rating | | | Task rating | | | Task rating | | | | | |
| Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | Importance | Difficulty | Frequency | | | |
| 3 | 1 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | | | |

Note: Duty I and J are not for testing purpose.

Rating options:

1= Low

2= Medium

3= High

Additional Information for Job Title

| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| <p>Worker traits</p> <ul style="list-style-type: none"> • Honest • Convincing Power • Polite • Efficient • Punctual • Helpful • Sincere • Tactful • Social • Healthy • Hard Working • Confidential • Decisive • Co-operative • Confident | <p>Entry Requirements</p> <ul style="list-style-type: none"> • Literate with 1 year (600+800 hrs OJT) Training <p style="text-align: center;">Or</p> <ul style="list-style-type: none"> • As per NSTB rules <p>Performance as well as written test will be conducted</p> | <p>Career Path</p> <p>Micro Hydropower Installer (Electro Mechanical), L- 3</p> |
| <p>Related Technical Knowledge</p> <ul style="list-style-type: none"> • Basic electrical Fundamental • Basic Mechanical Fundamental • Generator and its types • Transformer and its types • Transformer connection • Conductor/cable wire and its types • Cable termination • D-iron/Insulator and its types • Pole and its types • Governor and its types • Heater and its types • Earthing and its types • Lightning Arrestors • Uses and types of Earth resistance tester • Uses of Megger meter • Stay Set and its types • Use of power analyzer meter • Types & uses of measuring instrument • Use of Tools and equipment • Installation process of electro-mechanical components • Alignment, Tolerance, Torque, • Turbine and its types • Mechanism of turbines • Deflector and guide vane mechanism • Types of drive system • Belt Tensioning • Types of Expansion joint • Pipe and its types • Types of valve • Flow Measurement and its types • Types of Head measurement system • Basic Engineering Drawing • Micro Hydropower Technology • Handling technique of Instrument • Technique of group Formation and mobilization • types and sizes of nut-bolt/washer/gasket • Estimating and Costing • Power Output calculation • Safety precaution and hazards • Safety Indicator • Use and Types of Lubricant • Use of personal protective equipments (PPE) • Protective/Switching devices • Weight Handling • Read Contour map • High Voltage Transmission • Low Voltage Distribution | <p>Tools/Equipment</p> <ul style="list-style-type: none"> • Different Wrench Set • Different Screw driver Set • Sprit Level • Pipe Level • Thread, Plum Bob • Different Pliers • Clamp on meter • Allen Key set • Ladder • Wire puller • Bearing Puller • Wire Cutter • Phase Tester • Cable Shoe Clamp (Crimping Tools) • RPM Meter (Tachometer) • Hammer • File Set • Spring Balance • Multi meter • Crow Bar (Galls) • Peak • Trowel • Shovel • Chisel • Grease Gun • Oil Can • Measuring Tape • Safety Gloves • Safety Belt • Safety Shoe • Safety Helmet • Safety Goggle • First Aid Box • Apron • Megger Meter • Global Positioning System (GPS) • Magnetic Compass • Scissor • Marking Scriber • Center Punch • Hack saw Frame set • Hand Drill Machine • Back Square • Table Vice • Portable Welding Machine • Dial Gauge • Caliper • Steel Scale • Brush • Test Commission Format | |