

Annexes

Annex 1: List of Tools and Other Materials Needed for Installation of an MHP scheme

Particulars	Required		Checked date	Tick when packed	Remarks
	Yes	No			
<u>Mechanical</u>					
Spanner sets (ring and open)					
Slide wrench					
Screwdriver sets (Philips and plain)					
Hammer					
Pipe wrench					
File set (round and flat)					
Steel ruler					
Measuring tape (30m)					
Levels (spirit & string)					
Hand drill machine					
Small bench vice					
Vice grip					
Allen key set					
Punches for making holes					
Grease gun					
Bearing puller					
Wire brush					
Hacksaw					
Emery paper (different grades)					
Paint brush					
Differential chain					
Dreep pin					
Square					
Portable welding machine					
<u>Electrical</u>					
Common pliers					
Nose pliers					
Wire cutter					
Line tester					
Safety belt for climbing poles					
Gas solder					
Crimping tool					
Wire puller					
Multi-meter					
Frequency meter					
Vibration meter					
Insulation tester					

Annex I Cont.....

Annexes

Particulars	Required		Checked date	Tick when packed	Remarks
	Yes	No			
<u>Civil</u>					
Tri squares					
Crowbar					
String					
Mason's trowel					
Shovel					
Hammer					
Spirit level					
Chisel					
Pick					
Boring rods					
Abney level					
Theodolite					
Plumb bob					
Dynamite					
<u>Other Materials</u>					
Cement (quantity needed)					
Sealing materials					
Doors, windows					
Corrugated iron sheets					
Lintels					
Fuses (different sizes)					
Ballast heaters (if not available with ELC)					

Annex 2: Record Sheet for Performance Tests for MHP Turbine and Generator

S. No.		Turbine type: Controller type: Rated output:			_____ Micro hydro Project Efficiency/Output test results				Date: Test done by: Page _____ of _____			
		Load (kW)	Voltage, V (volts)			Current, I (amps)	Turbine opening (%)	Flow (l/s)	Turbine Speed (rpm)	Net head (m)	Power Output (kW) ($N_x I_x + V_y x I_y + V_b x I_b$)	Overall Efficiency
			R	Y	B	R	Y	B				
1												
2												
3												
4												
5												
6												
7												

Remarks:

Annex 3: A Sample Form for Handing Over and Taking Over an MMHP Plant (Completion Certificate)

To be completed by the authorised representative of the installer

A. General Information

Plant Name: Rated Capacity (kW):

Stream Name: VDC:..... District:

Plant Location (describe):

.....

Owner's Name: Lead Person:

(Recipient)

B. Completion of Civil Works

Weir constructed Yes/No Type: Length (m):

Distance between weir and intake mouth (m):

Intake type: Size:(m)

Canal type: X-Section: Length (m):

Are length sections of different types? Yes/No. Description and length:

.....

Design flow (l/s):

Control gate type and size:

Desilting basins No.:Size:

Construction types:Locations:

Flushing Systems: Yes / No. Number: Construction type:

Spillways: Number Construction type:

Gate provided? Yes / No Gate type and size:

Forebay size (L x W x H, m)

Trash rack type and size

Flush gate type and size

Spillway type and size

Desilting basin attached? Yes / No Type and size

Penstock gate provided? Yes / No Type and size

Penstock Material Type Diameter(m)

Length Flanged pieces (No.) Thickness Vent pipe? Yes / No

Expansion Joints (No.) Type

Bends (No.) Type, description

Gross Head (m) Net Head (m)

Valve Provided? Yes / No Type

Manufacturer (name and address)

Powerhouse size (L x W x H) Construction type

Roof type Doors No. Windows No.

Tailrace type Length

Civil works completed satisfactorily? Yes/No

Any leakage, earth movement from or around any of the civil works? Yes/No

If yes, describe

Other problems during commissioning of civil works (describe):

.....

To what extent were they overcome?

.....

Test Results for Civil Construction

Flow measured in canal? Yes/No Flow (l/s)

Pressure gauge installed in penstock? Yes / No Pressure at full flow (kg/cm²)

Weir performing satisfactorily? Yes/No If no, what needs to be done

.....

Settling basins performing satisfactorily? Yes / No If no, what needs to be done

.....

All flushing systems performing satisfactorily? Yes / No

If no, what needs to be done

.....
 Forebay and its accessories performing satisfactorily? Yes / No

If no, describe problem and solution

.....
 Penstock and its accessories performing satisfactorily? Yes / No

If no, describe problem and solution

C. Installation of Electro-mechanical Equipment

Turbine type Rotor dia. (m) Rated capacity (kW)

Rated speed (rpm) Runaway speed (rpm)

Bearing type Size Manufacturer

Test Results (Turbine)

Is turbine properly installed? Yes/No If no, describe problem and remedy.....

.....
 Was rated speed achieved? Yes/No If no, suggest remedy

Was rated power achieved? Yes/No If no, describe problems and remedies.

.....
 Any other problems? Yes / No Describe and suggest remedies

Generator

Type Single/three phase. Rated kVA Rated speed (rpm)

Rated voltage (volts)..... AVR? Yes/No Type.....

Manufacturer and country

Generator properly installed? Yes/No If no, describe problem and remedy

.....
 ELC provided? Yes / No Type Manufacturer and Country

Coupling/pulley sizes speed ratio.....

Belt types and sizes.....

Power transmission type (if different)

Control Panel instruments and number provided (details)

.....

Main switch type..... Fuses, type and no.

Over-voltage cutout..... Over-current cutout

Earthing system (describe)

All instruments and indicators working properly? Yes / No

If no, describe problem and remedy

Test results (Generator)

Was rated electrical power achieved? Yes / No If no, describe problem and solution

.....

ELC tested and operated? Yes / No MCB/MCCB operated & tested? Yes/No

Whole circuit tested within powerhouse? Yes / No

If no, explain problem and remedy

.....

Any misalignment? Yes / No If yes, describe

Any vibration? Yes / No If yes, describe

Any high temperature? Yes / No If yes, describe

Any loose belts? Yes / No If yes, describe

Endurance test done? Yes /No Duration (hrs.)

If no, describe problem and remedy

.....

Any problem during earthing continuity checks for generator, ELC, control panel? Yes / No

If yes, describe problem and remedy

.....

Is frequency meter installed Yes / No If yes, frequency range (Hz)

Describe problem with frequency (if any) and remedy

D. Transmission Line Installation

Main transmission line length (m) Wiring system single/three phase, three/four wires

Poles, No. Type Size (L x W x H)

Wire size Manufacturer

Lightning arresters, No. Type

Branch transmission/distribution lines, No.

	(i)	(ii)	(iii)
Lengths of each branch

Wire sizes
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Single/three phase
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Lightning arresters: No. Poles, No. Insulators, No.

Test Results

Have all wires been inspected/tested for proper installation including joining, continuity and resistance, sagging, etc.? Yes/No Describe problems (if any) and remedies

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Have any other problems been noticed with wires, poles, nearby trees, buildings, or other? Yes/No Describe problem(s) and remedy (if any)

.....

E. Training

Training conducted for prospective operators and managers during Installation and Commissioning? Yes / No If no, describe problem and remedy/If yes, give details

.....

Additional training conducted during the first supervised operational phase? Yes / No

If no, describe problem and remedy/If yes, give details

.....

Describe the overall assessment of training, have personnel gained satisfactory expertise?

.....

Level of expertise gained (tick)

Person Name	Satisfactory	Acceptable	Low	Negligible
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Manager
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Operator 1

Operator 2

Operator 3

Describe reasons for low or negligible gains and suggest remedy.....

F. Overall Certificate of Satisfactory Completion of all Aspects of Installation Process

Certified that all the aspects of the Installation process have been completed satisfactorily in accordance with the agreed specifications. All the defects and problems encountered during the commissioning phase have been removed and no problem is anticipated in future. This certificate applies to the following completed components.

Completed Components	Signature by Installer	Signature by Recipient
Civil works		
Electro-mechanical Equipment		
Transmission Lines		
Commissioning & Testing		
Training		

Certified further that all the relevant documents — including operations and maintenance manual, drawings, specifications (e.g., for bearings), maps/sketches, and feasibility/survey report; have been provided to the owner/manager/authorised recipient.

.....

Signed by *owner, authorised community representative*

Date:

Name, Position, and Address

.....

*1 (Signed by Authorised Representative of Installers) Date:

Name, Position, and Address.....

.....

*1 Note. If different aspects have been completed by different installers (e.g., civil works, transmission lines) then they should all sign separately on a modified form.

Participating Countries of the Hindu Kush-Himalayan Region



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Bhutan



India



Nepal



Bangladesh



China



Myanmar



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