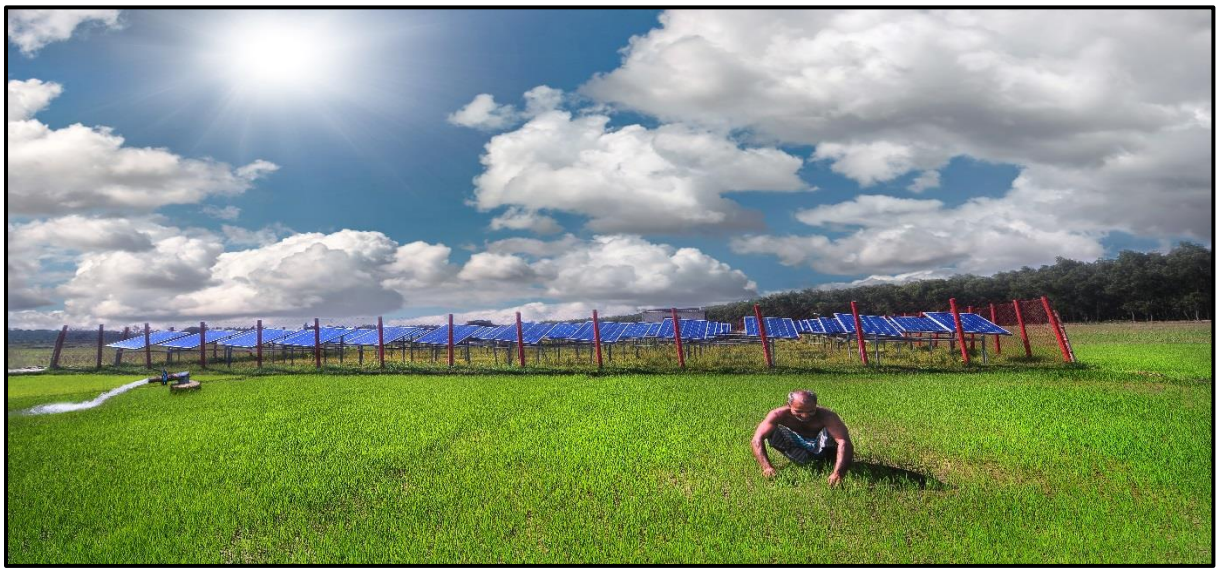
IDCOL Technical Standard for Solar Irrigation Pump (SIP) Projects



Scope of standardization:

- **Equipment standardization** :

  1. Pump & Motor
  2. PV panels
  3. Controller

- **Civil construction standardization:**

  1. Underground pipeline & header tank
  2. Pump house

- **Water Well standardization:**

  1. Technical standard
  2. Testing & development of water well

- **Warranty provisions**

Equipment standardization

1. Pump & Motor

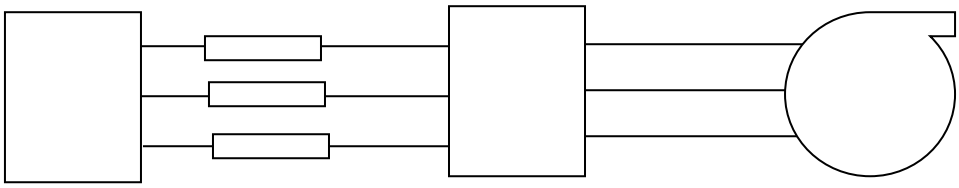
- The pump may be surface mounted/ submersible;
- Both AC & DC pumps are eligible;
- The impeller of the pump must not be non-metallic.
- Required minimum insulation of motor is "F" class.
- The motor power factor should be at least 0.8
- The minimum combined efficiency of pump-motor must be tested at pump's rated frequency (50/60) & evaluated against below mentioned benchmark.

Table 1

Capacity of pump (kW)	Minimum combined efficiency of pump & motor (%)
Up to 2.5	40.0
Above 2.5 kW-below 3 kW	42.5
From 3 kW-5 kW	45.5
Above 5 kW	47.5

- The relevant combined efficiency test should be conducted with a complete pumping system package (pump, motor & controller) with the name plate rating parameters like voltage, power at a definite TDH;
- Each of the complete pumping system package (pump & controller) should be tested separately & the suppliers would not be allowed to interchange components among approved packages while taking part in quotation submission process;
- Test report should explicitly denote brand & model number of pump & controller.

Test set up:



3 Phase Variac | 10 ohm resistors (20A rating) | MPPT Inverter | Motor pump (8-10 kW)

Test guideline:

- Tests will be conducted at 3 frequencies i.e. 30, 40, 50 for a 50 Hz rated pump, while at 40, 50, 60 for a 60 Hz rated pump;
- Suppliers must declare TDH against which tests will be conducted to the testing authority i.e. BUET prior to testing. Suppliers must test the pump at its BEP (Best Efficiency Point)
- A decreasing trend is expected in combined efficiency with the decrease in testing frequency.

Test procedure:

- The voltage of the variac should be varied to control the input power to the inverter. I
- Inverter will try to maximize the power to the pump and will vary the speed to match the corresponding power input to the inverter.
- A lower variac voltage will lower the power to the inverter and the speed should be reduced.
- Higher variac voltage will make the inverter to run the pump at a higher speed. For lower power pump, the 10 ohm resistors should be replaced by resistor values given below

Table 2

Pump capacity	Resistor (Ohms)
5 kW-7.9 kW	15-18
3 kW-4.9 kW	20-25
1 kW-2.9 kW	30-40

2. Pump controller

- Controller may be of VFD/Fixed frequency operated;
- The controller may have MPPT technology;
- The maximum allowable restarting time must be less than 120 seconds;
- It is recommended that the pump shall not start below 70 % of the rated voltage of motor;
- Controller having a minimum protection of IP20 may be allowed if it is enclosed by a controller box having a minimum protection of IP41. If the controller itself has an IP 41protection, then no control box will be necessary;
- The controller should have short circuit and overload protection;

- Controller must have a minimum efficiency of 90 % at rated frequency;
- The controller must be tested and certified against efficiency from IDCOL accredited testing center i.e. (BUET).

3. PV panels

- The following are applicable standards for PV modules:
- International Electro Technical Committee (IEC) 61215:2005: Crystalline Silicon Terrestrial PV Modules Design Qualification and Type Approval
- IEC 61646: Thin Film Silicon Terrestrial PV Modules Design Qualification and Type Approval
- IEC 61701 Ed 2.0: Salt mist corrosion testing of PV Modules.
- IEC 61730 for safety equipment.
- The photovoltaic module should have a peak power output of at least 250Wp.
- All modules must be product tested and certified from IEC accredited laboratories. IEC 61215 (Or IEC 61646, whichever applicable) and IEC 61730 are mandatory for PV modules. IEC 61701 will be applicable for PV module installation in coastal areas.
- Each module must be factory equipped IP65 junction box with terminal strip that allows safe and long lasting wiring connection to the module. Where applicable, protective diodes should be used to avoid the effect of partial shading. Factory test report of the PV module must be provided during supply of product.
- Each module must have permanent labeling indicating at a minimum: Manufacturer, Model Number, Serial Number, Peak Watt Rating, Voltage and Current at peak power, Open Circuit Voltage, Short Circuit Current and Cell Efficiency of each module.
- Power tolerance must be positive for each of the PV modules.
- Module efficiency (η%) should be minimum 15% at STC.
- Fill Factor (FF) should be more than 70%.

Test guideline:

Test report for 2 (two) samples of each model from Bangladesh University of Engineering and Technology (BUET) or United International University (UIU). Test Report should include the following data at STC:

- I-V and P-V characteristics
- Output (Wp)
- Open circuit voltage (Voc)
- Short circuit Current (Isc)
- Voltage at Maximum Power (Vmp)
- Current at Maximum Power (Imp)
- Module efficiency (η%)
- Fill Factor (FF)
- Maximum System Voltage (V)

Civil construction standardization:

1. Underground pipeline & header tank

Table 3

Component	Number	Specification	
Piping	Region-wise & pump capacity – wise suggested maximum length (ft) can be found at **table 4**	**Diameter of pipe:** According to system requirement. Preferably 8”/6” or combination of both **Thickness of pipe:** 4.5mm-5.5mm **Trench:** 1.2 meter underground with minimum 0.5 meter width **Grade:** B	
Butterfly Valve	According to riser point number	MS Iron, good quality, 5-8 years guarantee	
Air Vent	According to riser point number in **table 5**	**Length:** Minimum 4 meter high with 4 ft below ground **Structure:** CC pipe with 6” diameter and net cap **Casting:** 9” deep under pipe	
Header Tank	1	**RCC Type**	**Dimension:** (10 ft /3 meter height) above ground **Casting:** RCC Casting **Diameter:** Minimum 0.75 meter inner diameter **Thickness:** 4”
		UPVC type	2000/4000 lt capacity

Region-wise suggested length of pipeline:

Table 4

Division	District	Flow (Lac lit/day)	Soil condition	Suggested length of pipe line (ft.)
Khulna	Jhenaidah	10 to 12	Sandy loam	2500
		13 to 14		2800
		15 to 16		3500
	Jessore	8 to 10		1800
		10 to 12		2500
		13 to 14		2800
		15 to 16		3500
	Kushtia/ Meherpur	8 to 10		1800
		10 to 12		2500
		13 to 14		2500
		15 to 16		3500
	Chuadanga	10 to 12		2500
		12 to 14		3000
		15 to 16		3500
Rajshahi	Bogra	4 to 6		1600
		6 to 8		1800
		10 to 12		2000
		13 to 14		2500
		15 to 16		3000
Rangpur	Gaibandha	4 to 6		1600
		6 to 8		2000
		10 to 12		2000
		13 to 14		2200
		15 to 16		3000
	Rangpur	5 to 7		1800
		8 to 9		1800
		10 to 12		2000
		13 to 14		2500
		15 to 16		3500

Guideline for suggested minimum diameter of pipeline for 8”/6” or combination of both (8”&6”)

Table 5

Length of total pipeline (ft)	Riser points			Applicable pipe dia (inch)		No of outlet in header tank (Nos.)	Length of each branch pipeline		Ratio between length of 8 inch & 6 inch pipe (if applicable)
	Minimum distance between riser points (ft)	Maximum distance between riser points (ft)	Maximum number of allowable riser points (Nos.)				Minimum(ft)	Maximum (ft)	
1600	150	300	11	6		3	400	700*	NA
1800	150	300	12	8	6	4	450	1100*	2:1
2000			13						
2200			15						
2500			17						
2800	150	300	19	8	6	4	700	1300*	2:1
3000			20						
3500			23						

*In no condition maximum length of each pipeline from the header tank can exceed the reference value. If not maintained, over flow from tank may occur

**Maximum no of riser points must not the suggested value for a given length of pipeline

2. Pump house

Component	Number	Specification
Pump House	1	**Dimension:** 10' x 8' x 9' with hole on roof **Door:** 6.5 ft length, 3 ft wide, MS sheet **Hole on roof:** 3 ft x 3 ft, MS sheet **Karnish:** 9" surrounding building **Sunshade:** 18" for door and 12" for window **Brick:** 1st class

Water Well

1. Technical standard

Component	Material	Minimum Grade/standard
Blind pipe/housing pipe	uPVC	C
Strainer/Filter	uPVC	C
Column pipe	MS	
Housing	-	Sufficiently wide to support 150 % of maximum yield (m3/hr) of pump
		Minimum 22 inch
Gravel shrouding	Pea Gravel	Must be netted in site in the presence of sponsor before shrouding
End cap	uPVC	C
Boring depth		*Minimum 200 ft *Sufficiently deep to support 150 % of maximum yield (m3/hr) of pump

2. Well development & testing

Testing & development of water wells needed to be ensured for longevity and sufficient water output. TSC has outlined the following procedure to be carried out immediate after the completion of well

1. Sand content test :

- Pumping of well at 150% of the rated capacity for 1 hour.
- Sand content < 100 PPM 5 minutes after the start of the test
- Less than 30 PPM during every 10 minutes interval of the test.
- An **Im Hoff Cone** may be used to determine the sand content.

2. Development of water wells :

A two stage development process may be followed within **12 hours** of well completion

- **Four hour development:** Immediately completing the sand test the well must undergo surge and single backwash with the pump at 5 to 10 minutes intervals while pumping at 150 % of the rated capacity of the tube well.

- **Multiple step test:** The well shall be pumped at 100 %, 125 % and 150% of rated capacity for 1.5 hours at each pump capacity

Warranty Provisions:

- **Pumping system (Controller & Pump) :** 5 years of replacement warranty
- **Pumping system performance warranty :** 100 % output warranty for 5 years
- **PV panels :**

A. Ten (10) Year Limited PV Module Warranty

PV Modules(s) should be warranted to be free from the defects and/or failures specified below for a period not exceeding ten (10) years from the date of sale to the original customer:

1. Defects and /or failures due to manufacturing;
2. Defects and/or failures due to materials;
3. Cracking of the front glass surface due to foreign objects inside the glass; or
4. Non-conformity with specifications due to faulty manufacturing and/or inspection processes.
5. If the PV Module(s) fails to conform to this warranty, PV module(s) should be immediately replaced.

B. Limited Power Output Warranty

Any power loss is due solely to defects in materials or workmanship; IDCOL demands the warranty of the power output of each type of PV Modules(s) as follows:

IDCOL demands that if, (a) within the first ten (10) years from the date of sale to the customer, the PV Modules(s) exhibits a power output of less than ninety percent (90%) of the original minimum rated power specified at the time of sale, or (b) within twenty (20) years from the date of less than eighty percent (80%) of the original minimum rated power specified at the time of sale, manufacturer will repair, fix (by putting additional panel) or replace the PV Modules(s) at their own cost or refund the Purchase Price taking into account a yearly depreciation of five percent (5%) of the panel price. In case of the refund of the depreciated price of the panel, the panel will remain with the user and company will not take it from him/her. The period of power output warranty for these replaced modules(s) will be equal to the remaining warranty period of the originally supplied module(s).

- **Underground pipelines and riser points:** 5 years of replacement warranty subjected to manufacturing/installation fault along with free workmanship for 5 yrs.