

Learning Activity Sheets for Photovoltaic Systems Installation

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Learning Activity Sheet for Photovoltaic Systems Installation

Grade 11 – 2nd Term

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Table of Contents

Lesson Exemplar 1: Inspection of PV Components: Compliance with IEC, UL, and PEC Standards	1
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LEARNING ACTIVITY SHEET (LAS)

Learning Area:	PHOTOVOLTAIC SYSTEMS INSTALLATION	Term:	2
Lesson Exemplar:	1	Date:	
Lesson Title/ Topic:	Inspection of PV Components: Compliance with IEC, UL, and PEC Standards		
Name:		Grade & Section:	

I. ACTIVITY NO. 1: The Standard Detective

II. OBJECTIVES:

After completing this learning activity sheet, you will be able to:

1. Identify the key PV components (module, inverter, charge controller) and the major standard-setting bodies (IEC, UL, PEC).
2. Explain the significance of IEC, UL, and PEC standards in ensuring safety, performance, and compliance.
3. Apply an inspection checklist to verify the physical condition and certification labels of PV components.
4. Analyze whether a PV component label meets the requirements of the PEC and relevant international standards.

III. MATERIALS NEEDED:

- Sample product labels of PV components (provided in this LAS or printed by the teacher)
- PV Component Inspection Checklist (provided on page 5)
- Ballpen or pencil
- Highlighter (optional)
- Smartphone or internet access (for enrichment activity only)

IV. INSTRUCTIONS (Duration: 60 Minutes)

Pedagogy: 4As Approach (Activity, Analysis, Abstraction, Application)

A. Activity: Label Hunting (10 Minutes)

Examine the sample label below from a real PV module. Encircle or list down any logos, acronyms, or symbols that look like official certifications. Write your observations in the space provided below.

My Observations (List all logos/acronyms you found):

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

Processing Question: Why do you think manufacturers put these symbols on their products?

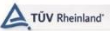


PV Module Specifications (Interpretation)

SOLARMAX SM-450W-Mono

- Maximum Power (Pmax): 450 W
- Open Circuit Voltage (Voc): 49.8 V
- Short Circuit Current (Isc): 11.2 A

Certifications & Standards



Other Details

- Serial Number: PV-2024-12345
- Made in accordance with PEC requirements

How This Is Used in Design

String Voltage Calculation:

Voc × Number of Panels



Current Sizing:

Isc × 1.25 for Wire & Breakers



Power Estimation Example:

- 10 Panels × 450 W = 4,500 W (4.5 kW)



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B. Analysis: **Why Standards Matter** (10 Minutes)

Direction: Read the scenario below and answer the reflective questions that follow.

Scenario:

You are a newly hired PV system installer. Your team lead gives you two identical-looking solar panels. Panel A has a UL 1703 and IEC 61215 certification label. Panel B has no certification labels at all—only a generic "Made in X-country" sticker. Both panels are being sold at the same price. Your client asks you: "Which one should I buy, and why does it matter?"

Reflective Questions: (Write your answers in complete sentences)

1. Which panel would you recommend to your client? Why?

2. What potential risks might the client face if they choose the uncertified Panel B?

3. Based on the scenario, what is the most important reason for inspecting PV components before installation?

C. Abstraction: The Three Pillars of PV Standards (15 Minutes)

Directions: Study the information below. Then complete the matching exercise that follows.

The Three Major Standards for PV Components

Standard	Full Name	What It Covers	What to Look For
IEC	International Electrotechnical Commission	International standards for electrical technology. IEC 61215 tests PV module durability (hail, wind, temperature cycles).	Label stating IEC 61215 or IEC 61730
UL	Underwriters Laboratories	US-based safety testing. UL 1703 tests PV modules for fire and electrical shock hazards.	UL logo (circled "UL") or UL 1703 on label
PEC	Philippine Electrical Code	The governing electrical law in the Philippines. Article 6.90 covers PV systems. Requires components to be listed by a recognized testing lab.	Not a sticker—but mandates that UL/IEC marks must be present

The "Glass Box" Analogy for Inspection:

Think of standards as the "glass box" that contains the rules. Just as orthographic projection shows all sides of an object, a proper inspection shows all aspects of compliance:

Plane	Inspection Equivalent
Frontal Plane (Front View)	Physical condition of the component (no cracks, corrosion, or damage)
Horizontal Plane (Top View)	Label presence and legibility
Profile Plane (Side View)	Certification marks (IEC, UL, PEC compliance)

Matching Exercise: Match the standard (Column A) to its correct description (Column B).

Write the letter of your answer in the blank.

Answer	Column A	Column B
	1. IEC 61215	A. The electrical code enforced in the Philippines
	2. UL 1703	B. Tests PV modules for durability against hail and wind
	3. PEC Article 6.90	C. The logo that indicates third-party safety certification
	4. UL logo (circled)	D. Tests PV modules for fire and electrical shock hazards
	5. PEC	E. The specific section covering Solar PV Systems

D. Application: PV Component Inspection Simulation (25 Minutes)

Task: You are a PV system installer conducting a pre-installation inspection. You will analyze three component cards below. For each card, complete the Inspection Checklist and determine whether the component PASSES or FAILS the inspection.

PV Module Inspection Card #1

Physical Condition:

- ☒ **Glass surface:** No cracks or scratches
- ☒ **Frame:** Slight corrosion on corner
- ☒ **Junction box:** Cover securely fastened

Label Information:

- ☒ IEC 61215:2016
- ☒ UL 1703 Certified
- ☒ TÜV Rheinland*
- ☒ **Label condition:** Legible, permanently affixed

☒ **Label condition:** Legible, permanently affixed

INVERTER INSPECTION CARD #2

Physical Condition:

- ☒ **Enclosure:** No dents or damage
- ☒ **Ventilation slots:** Clear, no blockage
- ☒ **Terminal cover:** Present and secure

Label Information:

- ☒ **CE Mark** (self-declaration only)
- ☒ No UL or IEC marks found
- ☒ "For European market only"
- ☒ **Label condition:** Legible but slightly faded

☒ **Label condition:** Legible but slightly faded

DC DISCONNECT SWITCH INSPECTION CARD #3

Physical Condition:

- ☒ **Housing:** Cracked near handle base
- ☒ **Terminals:** No visible corrosion
- ☒ **Handle:** Moves freely

Label Information:

- ☒ **UL 508** (Industrial Control)
- ☒ Rated 600V DC / 30A
- ☒ Label partially torn, some text missing.
- ☒ **Label condition:** Partially legible

☒ **Label condition:** Partially legible

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PV COMPONENT INSPECTION CHECKLIST

Inspection Item	PV Module	Inverter	DC Switch
Physical Condition			
No cracks or damage?	☐	☐	☐
No corrosion?	☐	☐	☐
Enclosure/cover secure?	☐	☐	☐
Label & Documentation			
UL mark present?	☐	☐	☐
IEC mark present?	☐	☐	☐
PEC compliance indicated?	☐	☐	☐
FINAL DISPOSITION	☐ PASS ☐ FAIL	☐ PASS ☐ FAIL	☐ PASS ☐ FAIL

Decision Questions: (Answer after completing the checklist)

1. For **Card 1 (PV Module)**: What is the main issue that might cause this module to FAIL, if any? Explain.

2. For **Card 2 (Inverter)**: Why is the "CE" mark alone not sufficient for PEC compliance?

3. For **Card 3 (DC Switch)**: What two problems make this component non-compliant?

V. SYNTHESIS / EXTENDED PRACTICE / DIFFERENTIATION

A. Synthesis (Exit Slip): Answer the following questions on a separate sheet of paper.

1. Why is it important that a PV component label is "permanently affixed" and not just a removable sticker?
2. What is the relationship between the PEC and certification marks like UL and IEC? (Which one is the law, and which one provides the evidence of compliance?)
3. Aside from checking labels, why is a physical inspection (looking for cracks, corrosion, loose parts) equally important?

B. Extended Practice (Enrichment):

Using your smartphone or computer, search for an actual product label from a real PV module or inverter (you can look up brands like SolarMax, Growatt, Huawei, or SMA). Take a screenshot or draw the label and identify the following:

- UL mark (circled "UL") or UL standard number
- IEC standard number (e.g., IEC 61215, IEC 61730)
- Recognized testing laboratory name (e.g., TÜV, CSA, Intertek)
- Serial number or model number

Submit your findings to your teacher on the next meeting.

C. Remediation (For students who need more practice):
Create a simple **3-column table** comparing IEC, UL, and PEC. Include:

Standard	Purpose	What to look for during inspection
IEC		
UL		
PEC		

Submit the completed table to your teacher.