

**Performance-Based Equipment  
Training (PBET) Transparency  
Masters**

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# Performance-Based Equipment Training (PBET) Transparency

**Masters**

Technology Transfer # 95103004A-TRG

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*December 31, 1995*

**Abstract:** This document contains a complete set of transparencies used in Performance-Based Equipment Training (PBET), a workshop developed by SEMATECH's Organizational Learning and Performance Technology Department. The workshop is intended for equipment trainers, technical trainers, and technical training developers from SEMATECH and SEMI/SEMATECH member companies. It includes instruction on effective equipment training; task and skills analysis; development of training checklists, lesson plans, and materials for specific equipment training applications; and communications skills. This document is supplemented by three companion documents: *Performance Based Equipment Training (PBET) Instructor Guide*, Technology Transfer #95102996A-TRG; *Performance-Based Equipment Training (PBET) Participant Guide*, Technology Transfer #95102995A-TRG; and *Performance-Based Equipment Training (PBET) Templates*, Technology Transfer #95103011A-TRG.

**Keywords:** Training, Equipment, Overall Equipment Effectiveness

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## **EXECUTIVE SUMMARY**

This document contains a complete set of transparencies used in Performance-Based Equipment Training (PBET), a workshop developed by SEMATECH's Organizational Learning and Performance Technology Department. It is intended for equipment trainers, technical trainers and technical training developers from SEMATECH and SEMI/SEMATECH member companies.

The course includes instruction on the following:

- Effective equipment training
- Skills for performing task analysis
- Skills analysis and development of training checklists
- Development of effective lesson plans
- Development of materials for specific equipment training applications
- Communications skills





The logo for SEMATECH, featuring the word "SEMATECH" in a bold, red, sans-serif font. The text is centered and framed by two thick, horizontal blue lines, one above and one below the letters.

# **PERFORMANCE-BASED EQUIPMENT TRAINING**

**a Performance Improvement Program developed by  
the SEMATECH Organizational Learning and  
Performance Technology Department**

**IN-1**

## **PERFORMANCE-BASED EQUIPMENT TRAINING**

### **PURPOSE:**

- **Learn Methods for Effective Equipment Training**
- **Learn or Improve Skills for Performing Task Analysis**
- **Perform Skills Analysis and Develop Training Checklists**
- **Learn an Easy Way to Develop Effective Lesson Plans**
- **Develop PBET Materials for a Specific Equipment Training Application**
- **Practice Communication Skills**

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# SEMATECH SEMI-SEMATECH

Technician Training  
Planning Committee

Technician Training  
Workshop

## 1993-94 Task Forces

- Benchmarking Training Programs
- Semiconductor Technical Curriculum
- Levels 3 & 4 Training Evaluation
- Standards for Electronic Documentation
- Define Technician Certification Process  
*Proceedings Doc. #94062402A-WS*  
*Presentations Doc. #94062403A-XFR*  
*Reports Doc. #94062404A-XFR*

## 1992-93 Task Forces

- Reference Manual
- Training Course Outline
- Training Evaluation  
*Doc. #93031567A-XFR*

SEMATECH  
Training Projects

- Mass Flow Controller  
*Doc. #93021493A-TRG*

- Performance-Based  
Equipment Training
- Furnace Processes  
Course Development
- Electronic Document

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# Intended Audience

- **SEMI/SEMATECH Member Companies**
    - Equipment Suppliers
    - OEM Manufacturers
  - **SEMATECH Member Companies**
- 
- **Who should attend this workshop?**
    - Equipment Trainers
    - Technical Training Developers
    - Technical Trainers

*... no experience necessary*

# Workshop Logistics

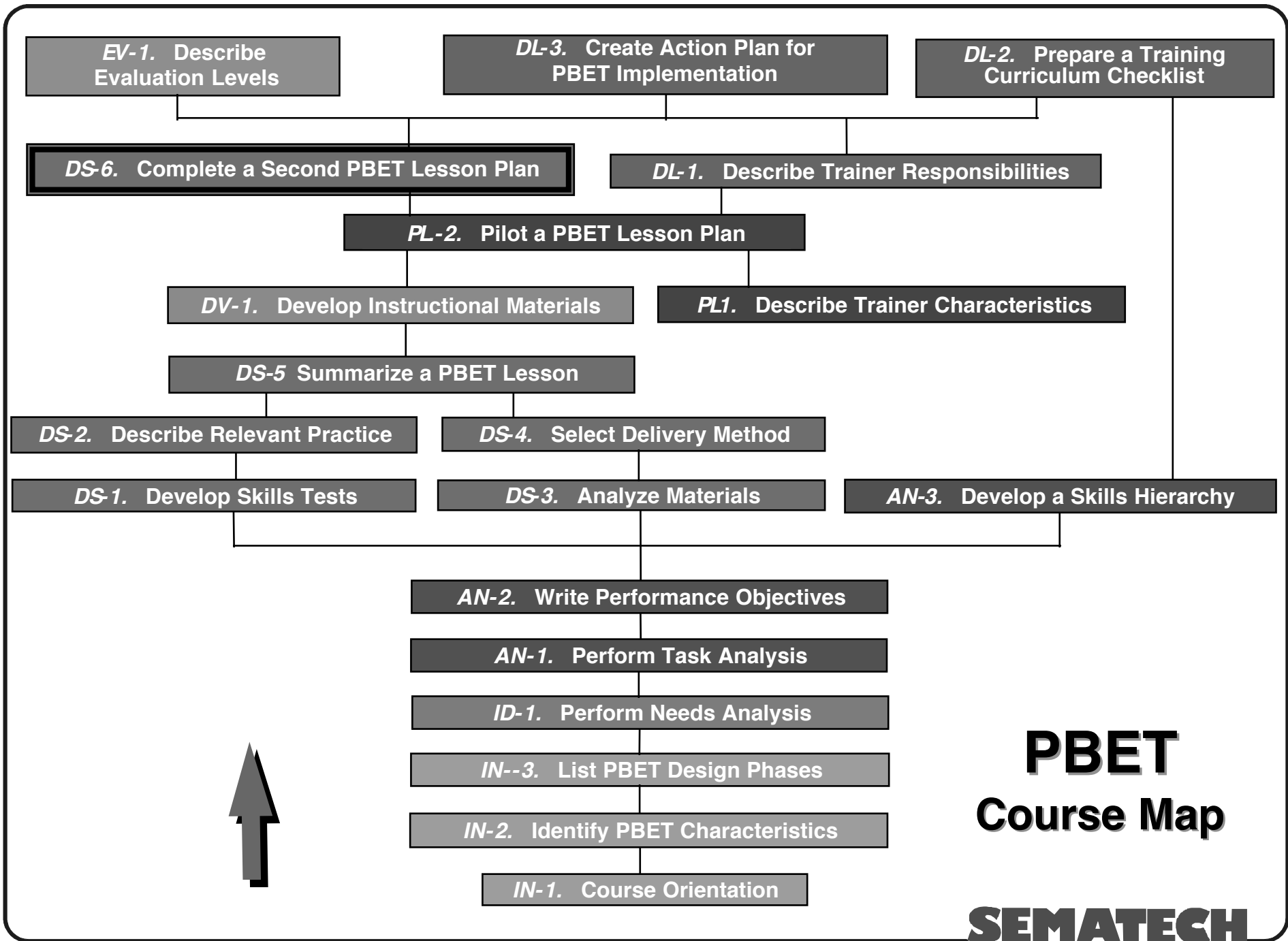


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# PBET Course Outline

SECTIONS	MOD.#	CONTENT
① Introduction	IN-1	Course Orientation
	IN-2	Identify PBET Characteristics
	IN-3	List PBET Design Phases
② Identify	ID-1	Perform Needs Analysis
	③ Analyze	AN-1
④ Design	AN-2	Write Performance Objectives
	AN-3	Develop a Skills Hierarchy
	DS-1	Develop Skills Tests
	DS-2	Describe Relevant Practice
	DS-3	Analyze Resource Materials
	DS-4	Select Delivery Method
⑤ Develop	DS-5	Summarize a PBET Lesson
	DS-6	Complete a Second PBET Lesson Plan
⑥ Pilot	DV-1	Develop Instructional Materials
	PL-1	Describe Trainer Characteristics
⑦ Deliver	PL-2	Pilot a PBET Lesson Plan
	DL-1	Describe Trainer Responsibilities
	DL-2	Prepare a Training Curriculum Checklist
⑧ Evaluate	DL-3	Create Action Plan for PBET Implementation
	EV-1	Describe Evaluation Levels

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# PBET Lesson Planning Form

Developer: \_\_\_\_\_

Class: \_\_\_\_\_

Module Title: \_\_\_\_\_

Target Audience: \_\_\_\_\_ Location: \_\_\_\_\_

Module Objective: \_\_\_\_\_  
\_\_\_\_\_

Prerequisite Skills: \_\_\_\_\_  
\_\_\_\_\_

Skill Test: \_\_\_\_\_  
\_\_\_\_\_

Additional Resources: \_\_\_\_\_  
\_\_\_\_\_

Training Aids & Media	Tools & Materials

Relevant Practice Description: \_\_\_\_\_  
\_\_\_\_\_

Conditions: \_\_\_\_\_  
\_\_\_\_\_

Type of Modeling: \_\_\_\_\_  
\_\_\_\_\_

Feedback Mechanism: \_\_\_\_\_  
\_\_\_\_\_

Module Content Description: \_\_\_\_\_  
\_\_\_\_\_



**IN-2**

## **IDENTIFY CHARACTERISTICS OF PERFORMANCE-BASED EQUIPMENT TRAINING**

### **OBJECTIVE:**

**Upon completion of this module, you will identify the six characteristics of Performance-Based Equipment Training (PBET).**

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# Performance-Based Equipment Training

## **DEFINITION:**

**PBET is equipment training based on front-end analysis that ensures participants are able to reach mastery of job skills as described in clearly stated and measurable learning objectives.**

# **Six Characteristics of PBET**

- **Derive performance objectives from analysis**
- **Identify prerequisite skills**
- **Derive course content from performance objectives**
- **Maximize hands-on practice**
- **Develop skill tests to measure competency**
- **Repeat practice and skill tests until mastery is achieved**

# Performance Objectives -- the Heart of PBET

## ANALYSIS PHASE

- Business objectives
- Performance analysis
- Goal analysis
- Job analysis
- Task analysis
- Target audience analysis



## DESIGN PHASE

- Course content
- Practice sessions
- Feedback methods
- Modeling methods
- Learning conditions
- Skill checks/tests
- Program evaluation

# Self-Check

- A. Performance objectives are derived from analysis.
- B. Any student, regardless of education, can participate.
- C. Trainees must possess certain prerequisite skills.
- D. Performance objectives determine course content.
- E. Tests determine the ranking of students in a class.
- F. PBET maximizes the use of hands-on practice.
- G. Skill tests determine mastery of skills.
- H. PBET allows for practice on each objective, followed by skill checks, until mastery is demonstrated.

**NOTE:** *If you feel you need more practice, review the module, and then practice writing the six characteristics of PBET on a blank sheet of paper. Otherwise, proceed to the skill test.*

**IN-3**

## **LIST SEVEN BASIC PHASES IN THE DEVELOPMENT OF PBET SYSTEMS**

### **OBJECTIVE:**

**List the seven basic phases in the development of Performance-Based Equipment Training (PBET) systems.**

**IN-3**

## **Seven Basic Phases in the Development of Performance-Based Equipment Training**

- 1. Identify**
- 2. Analyze**
- 3. Design**
- 4. Develop**
- 5. Pilot**
- 6. Deliver**
- 7. Evaluate**

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# 1. Identify a Need

- Identify a performance discrepancy
- Identify a new performance standard
- Identify a need for new product training (PBET)



1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



## 2. Analyze the Needs

- Perform job/task analysis
- Determine target audience
- Derive performance objectives from analysis
  - Terminal objectives
  - Enabling objectives
  - Prerequisite objectives
- Develop a skills hierarchy



1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate

## **3. Design the Course**

- **Develop skill tests (skill check)**
- **Describe relevant practice methods**
- **Analyze supporting instructional and resource materials**
- **Select delivery method and media**
- **Summarize the lesson plans**



1. **Identify**
2. **Analyze**
3. **Design**
4. **Develop**
5. **Pilot**
6. **Deliver**
7. **Evaluate**

## 4. Develop Course Materials

- Determine course content
- Develop course materials
- Develop instructional aids

1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



## 5. Pilot the Course

- Try out the course
- Assess course performance
- Revise the course

1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



## 6. Deliver the Course

- **Implement the training course**
  - Participant Guide
- **Orient and direct the trainers**
  - Instructor Guide
- **Arrange practice and feedback**

1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



## 7. Evaluate the Course

- Develop evaluation system
- Implement evaluation system
- Interpret results and provide feedback
- Continue to improve course

1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



**IN-3**

## **Review**

### **Seven Phases in the Development of Performance-Based Equipment Training**

- 1. Identify**
- 2. Analyze**
- 3. Design**
- 4. Develop**
- 5. Pilot**
- 6. Deliver**
- 7. Evaluate**

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**IN-3**

# **Self-Check**

## **Seven Basic Phases in the Design of Performance-Based Equipment Training**

- 1. Identify**
- 2. Analyze**
- 3. Design**
- 4. Develop**
- 5. Pilot**
- 6. Deliver**
- 7. Evaluate**

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# Seven Basic Phases in the Development of Performance-Based Equipment Training



1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate

**ID-1**

## **PERFORM NEEDS ANALYSIS**

### **OBJECTIVE:**

**Working in teams, use the needs analysis worksheet provided in this lesson to analyze a given performance problem. Each team will work through the needs analysis process described in this lesson.**

**ID-1**

## **PBET SIMPLIFIED NEEDS ANALYSIS**

<b>Identify the Performance Need</b>		<b>Identify the Performance Solution</b>	
<b><i>Informal Triggers</i></b>			
<ul style="list-style-type: none"><li>• <b>New standards, goals, or outcomes</b></li><li>• <b>New equipment, products, or processes</b></li><li>• <b>A readily apparent performance discrepancy</b></li></ul>			

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## PBET SIMPLIFIED NEEDS ANALYSIS

Identify the Performance Need		Identify the Performance Solution	
<i>Informal Triggers</i>	<i>Formal Techniques</i>		
<ul style="list-style-type: none"> <li>• New standards, goals, or outcomes</li> <li>• New equipment, products, or processes</li> <li>• A readily apparent performance discrepancy</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Conduct observations</b></li> <li>• <b>Conduct Interviews</b></li> <li>• <b>Conduct surveys and/or questionnaires</b></li> <li>• <b>Examine performance data</b></li> </ul>		

## PBET SIMPLIFIED NEEDS ANALYSIS

Identify the Performance Need		Identify the Performance Solution	
<i>Informal Triggers</i>	<i>Formal Techniques</i>	<i>Possible Causes of Performance Problems</i>	
<ul style="list-style-type: none"> <li>• New standards, goals, or outcomes</li> <li>• New equipment, products, or processes</li> <li>• A readily apparent performance discrepancy</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct observations</li> <li>• Conduct Interviews</li> <li>• Conduct surveys and/or questionnaires</li> <li>• Examine performance data</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Equipment problem</b></li> <li>• <b>Improper or inadequate incentives</b></li> <li>• <b>Lack of information</b></li> <li>• <b>Lack of skills</b></li> </ul>	

## PBET SIMPLIFIED NEEDS ANALYSIS

Identify the Performance Need		Identify the Performance Solution	
<i>Informal Triggers</i>	<i>Formal Techniques</i>	<i>Possible Causes of Performance Problems</i>	<i>Possible Solutions to Performance Problems</i>
<ul style="list-style-type: none"> <li>• New standards, goals, or outcomes</li> <li>• New equipment, products, or processes</li> <li>• A readily apparent performance discrepancy</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct observations</li> <li>• Conduct Interviews</li> <li>• Conduct surveys and/or questionnaires</li> <li>• Examine performance data</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment problem</li> <li>• Improper or inadequate incentives</li> <li>• Lack of information</li> <li>• Lack of skills</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Re-engineering</b></li> <li>• <b>Create or improve incentives</b></li> <li>• <b>Provide feedback or job aids</b></li> <li>• <b>Provide practice or training</b></li> </ul>

ID-1

# Gilbert's Six-Cell Matrix

<b>Environmental Supports</b>	<b><u>Data</u></b> <i>Test measurment results, yield data</i>	<b><u>Instruments</u></b> <i>Production equipment, metrology tools</i>	<b><u>Incentives</u></b> <i>Company rewards high throughput</i>
	<b><u>Knowledge</u></b> <i>Can't tell good product from bad</i>	<b><u>Response *</u> <u>Capacity</u></b> <i>Doesn't have prerequisite skills</i>	<b><u>Motives *</u></b> <i>Fear of failure or fear of getting fired</i>
<b>Person's Repertory of Behavior</b>			

*\* Trainers have little or no control over response capacity and motives*

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# Phases in the Development of Performance-Based Equipment Training



- 1. Identify**
- 2. Analyze**
- 3. Design**
- 4. Develop**
- 5. Pilot**
- 6. Deliver**
- 7. Evaluate**



**AN-1**

## **PERFORM A TASK ANALYSIS**

### **OBJECTIVE:**

**Upon completion of this lesson, you will perform a task analysis.**

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# **Basic Steps of a Task Analysis**

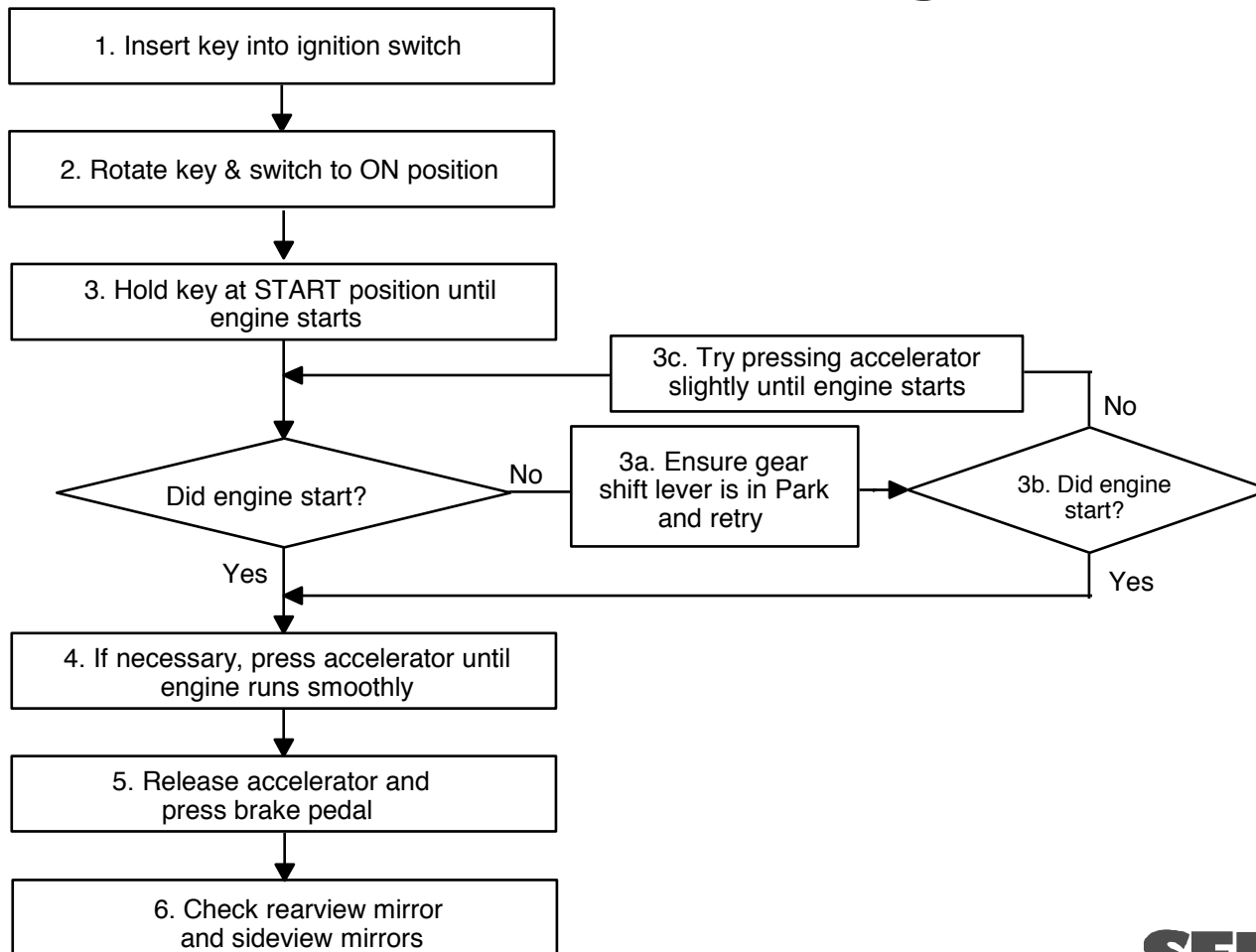
- 1. Gather and read all relevant documentation**
- 2. Interview and observe the expert performers**
- 3. Record the steps and decisions involved**
- 4. Look for hidden knowledge**
- 5. Flowchart the steps in the task**
- 6. Detail each step in the task**
- 7. List tools, materials, documents, etc.**
- 8. Perform the task**

# Example No. 1: Task Listing

## Starting a Car and Pulling Out from a Parking Space

1. Insert key into ignition switch.
2. Rotate the key and ignition switch to ON position.
3. Hold key at START position until the engine starts.
4. If necessary, using your right foot, press accelerator pedal slightly to keep the engine running.
5. Release the accelerator pedal and step on the brake pedal.
6. Check rearview mirror and sideview mirrors.
7. Place gear shift lever in Reverse (R) position.

# Example No. 2: Task Detailing -- Flowcharting



# Example No. 3: Task Detailing -- Cause-Effect Relationship Chart

<u>STEP</u>	<u>ACTIONS</u>	<u>RESULTS</u>
1.	Insert key into ignition switch.	Proper key will slip in easily.
2.	Rotate key and ignition switch toward the ON position.	Oil lamp and temp. lamp will light. Listen for sound of seat belt buzzer or door left open.
3.	Hold key at START position until the engine starts.	Engine should start immediately if gear shift lever is in Neutral or Park.
4.	If necessary, press accelerator pedal with right foot to keep engine running.	Engine will sputter and perhaps stop if it is not receiving the right amount of fuel. Listen for the sound of the engine running. It should run smoothly.
5.	Release the accelerator pedal and press on the brake pedal.	You may engage the transmission when the engine is stabilized.
6.	Check rearview mirror and sideview mirrors.	Look for reflection of possible obstructions.
7.	Place gear shift lever in Reverse (R) position.	If placed in the proper position, the letter R will be easily visible and possibly illuminated on the gear shift indicator.

**AN-2**

## **WRITE PERFORMANCE OBJECTIVES**

### **OBJECTIVE:**

**Prepare at least one performance objective in an area of your expertise. The objective must contain three minimum requirements: *performance, condition, and standard.***

***Note:*** Write the objective in the Lesson Planning Form provided for you in this workshop.

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# **An Objective Statement Answers Questions Like These**

- **Who is the performer?**
- **What task is the performer expected to do?**
- **How will the performance be evaluated?**
- **How accurate must the performance be?**
- **What are the conditions for performing the task?**
- **What materials and resources will be needed?**
- **When is the performance supposed to occur?**
- **Where is the performance to occur?**

**AN-2**

## **Three Characteristics of a Well-Stated Objective**

- **Performance**
- **Condition**
- **Standard**

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AN-2

# Three Characteristics of a Well-Stated Objective

No. 1

## ***Performance***

The performance is the action that results from executing the task that is described in the objective.

**<Example>**

***Calibrate a QM-500 mass flow controller.***

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AN-2

# Three Characteristics of a Well-Stated Objective

No. 2

## ***Condition***

The condition describes the environment, location, and/or the situation where the performance is to occur, and it tells what materials, supplies, tools, equipment, and resources may be used while performing the objective.

## **<Example>**

*In a classroom the trainee will be provided with a mis-calibrated QM-500 MFC, hand tools, and appropriate test instruments.*

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# Three Characteristics of a Well-Stated Objective

## No. 3

### ***Standard***

The standard gives the acceptable level of performance (*standard of performance*). It may be stated in terms of how accurate the performance must be, how many times it must be done, or how much time is allowed.

### **<Example>**

*The 10 steps of the calibration procedure must be performed in correct sequence according to Spec. No. 4.3.6 and completed within 30 minutes.*

AN-2

## Example of a Well-Stated Performance Objective

***Given a mis-calibrated QM-500 MFC, hand tools, and appropriate test instruments, the trainee will calibrate a QM-500 mass flow controller according to the 10-step procedure given in Spec. No. 4.3.6. The calibration must follow the correct sequence of steps, and be completed within 30 minutes.***

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## AN-2

# Questions and Answers to “get at” the Three Parts of a Performance Objective

QUESTIONS	ANSWERS
<p><i>To get at the <u>performance</u>, ask --</i></p> <p>What exactly do I want technicians to do as a result of this training program which they cannot do now?</p>	<ul style="list-style-type: none"><li>• Locate</li><li>• Operate</li><li>• Maintain</li><li>• Replace</li><li>• Adjust</li><li>• Disassemble</li><li>• Install</li><li>• Troubleshoot</li><li>• Calibrate</li></ul>
<p><i>To get at the <u>conditions</u>, ask --</i></p> <p>Under what conditions should they be able to perform these tasks?</p>	<ul style="list-style-type: none"><li>• From memory</li><li>• With a standard tool kit</li><li>• While wearing gas mask</li><li>• With schematics</li></ul>
<p><i>To get at the <u>standard</u>, ask --</i></p> <p>How well do I want them to perform each of these tasks?</p>	<ul style="list-style-type: none"><li>• According to Spec XYZ</li><li>• To the component level</li><li>• Within four hours</li><li>• 10 out of 12</li><li>• Accurate to 0.01 micron</li></ul>

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# Performance Words

**Action Words:** *state, operate, identify, construct, draw, write, describe, calibrate, etc.*



**Abstract Words:** *appreciate, know, understand, apply knowledge, interest, awareness, etc.*



# Commonly Used Performance Words

show  
select  
use  
find  
state  
draw  
write  
identify\*  
locate\*  
gather  
illustrate  
describe\*  
measure  
prepare  
classify  
compute\*  
discriminate  
operate  
assemble  
adjust

test  
tune  
prove  
justify  
apply  
relate  
verify  
specify  
contrast  
construct  
analyze\*  
organize\*  
formulate  
estimate  
interpret  
distinguish  
compare  
determine  
differentiate  
program

design  
infer\*  
deduce\*  
predict\*  
invent  
discover  
propose\*  
integrate  
synthesize\*  
generalize\*  
examine  
manipulate  
diagnose  
troubleshoot  
formulate  
facilitate\*  
reorganize  
calibrate  
repair

## **AN-2**

# **Practice Exercise**






- 1. Having attended at least one class in semiconductor processing, be able to have a sense of appreciation for submicron technology.**
- 2. Having attended the Thermite Furnace Class, be able to calibrate a thermocouple.**
- 3. Having available 10 wafers and the MiG-19 inspection system, be able to locate 100% of the defects and correctly categorize them according to the station job aid. You will have 30 minutes in which to perform this task.**
- 4. Assuming that all tools, parts, and documentation are available, the lamp uniformity must be within 0.5% of the specification.**
- 5. Without referring to any resources, locate and describe the function of each component on the BRN-1 gas control panel with 100% accuracy.**

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## AN-2

# Self-Check

-  1. Having attended at least one class in semiconductor processing, be able to have a sense of appreciation for submicron technology. *NO PERFORMANCE WORDS USED*
-  2. Having attended the Thermite Furnace Class, be able to calibrate a thermocouple. *NO CONDITION OR STANDARD*
-  3. Having available 10 wafers and the MiG-19 inspection system, be able to locate 100% of the defects and correctly categorize them according to the station job aid. You will have 30 minutes in which to perform this task. *GOOD P.O.*
-  4. Assuming that all tools, parts, and documentation are available, the lamp uniformity must be within 0.5% of the specification. *NO PERFORMANCE IS INDICATED*
-  5. Without referring to any resources, locate and describe the function of each component on the BRN-1 gas control panel with 100% accuracy. *GOOD PERFORMANCE OBJECTIVE*

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Developer: 

**AN-2**

Class: 

Module Title: 

Target Audience: 

Location: 

Module Objective: 

*Fill in these items.*

Prerequisite Skills:

Skill Test:

**AN-3**

## **DEVELOP A SKILLS HIERARCHY**

### **OBJECTIVE:**

**Given a terminal objective for equipment training, develop a skills hierarchy of enabling objectives. Label objectives according to classification -- *terminal*, *enabling*, or *prerequisite*. Show the relationships to each one by drawing a skills hierarchy.**

# Early Stages of Course Design

Introduce  
PBET

Introduce  
Feedback

Perform  
Task Analysis

To Complete a  
Lesson Plan?  
... hmmm

Develop a  
Skills Hierarchy

List PBET  
Design Phases

Describe  
Relevant Practice

Develop a  
Skill Test

Describe  
Conditions

Prepare  
Objectives

List  
Materials

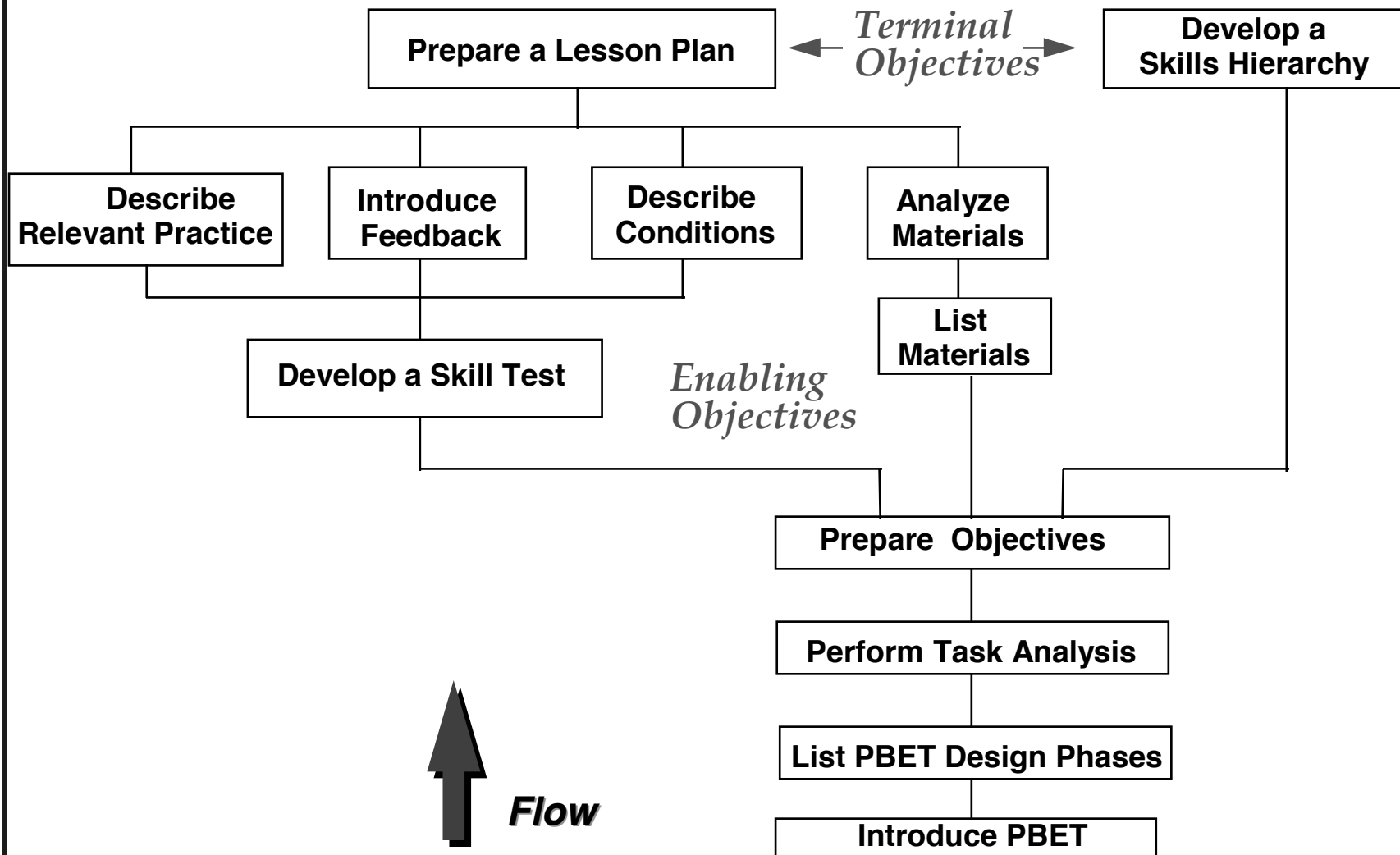
Prepare a  
Lesson Plan

Analyze  
Materials



AN-3

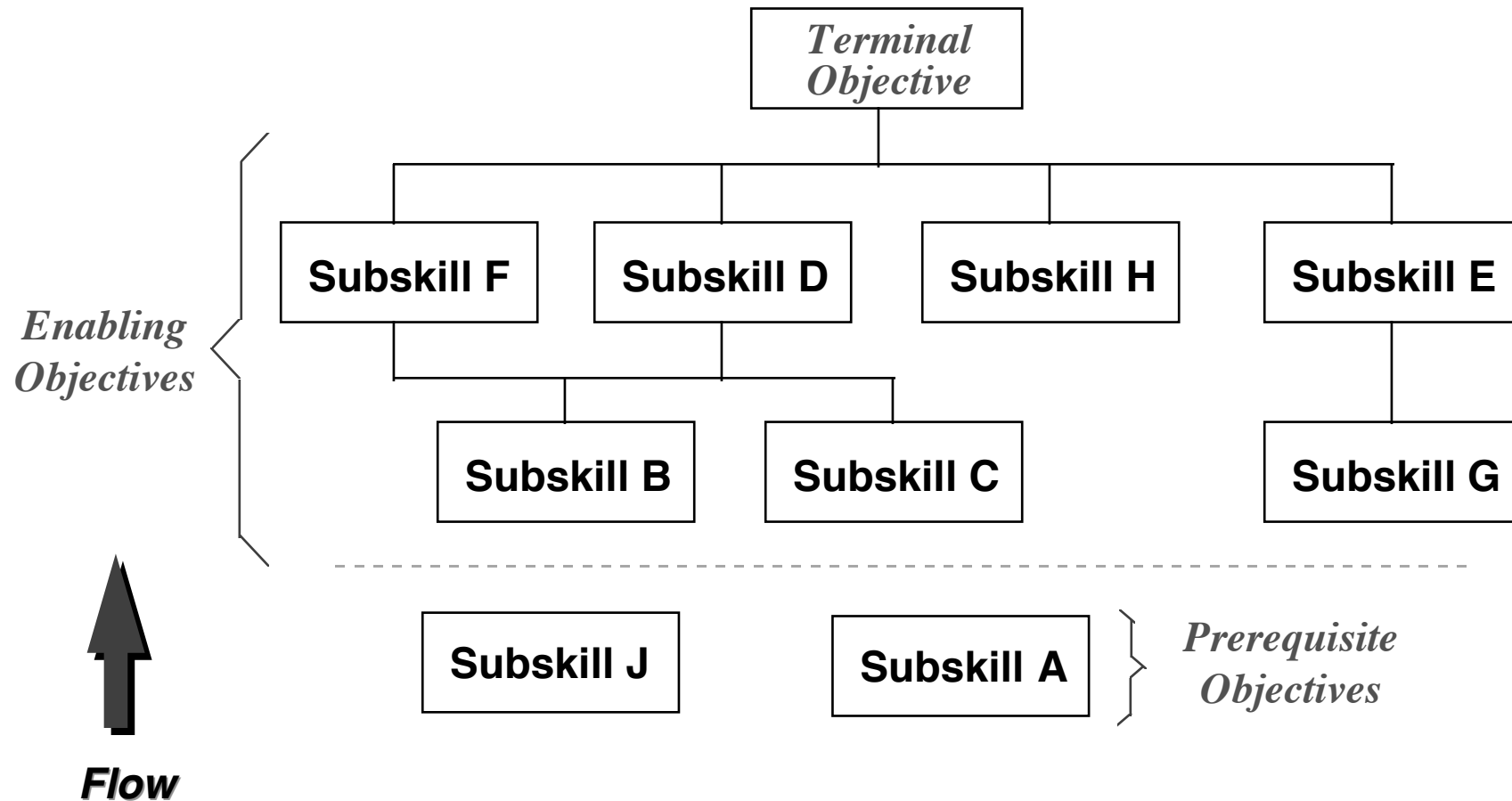
# Skills Hierarchy



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AN-3

# Skills Hierarchy



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# Three Categories of Objectives

TYPE	DESCRIPTION	EXAMPLES
<ul style="list-style-type: none"> <li>Terminal Objectives</li> </ul>	<p>These are the significant, final outcomes of a training program.</p>	<ul style="list-style-type: none"> <li>Design a process</li> <li>Troubleshoot problems</li> <li>Repair equipment</li> <li>Perform maintenance</li> <li>Program a process recipe</li> <li>Operate a machine</li> </ul>
<ul style="list-style-type: none"> <li>Enabling Objectives</li> </ul>	<p>These are the objectives which must be mastered if an individual is to master the terminal objective.</p>	<ul style="list-style-type: none"> <li>Write a process recipe</li> <li>Interpret computer screens</li> <li>Follow safety procedures</li> <li>Identify hazards</li> <li>Locate and describe parts</li> <li>Describe process steps</li> <li>List process steps</li> </ul>
<ul style="list-style-type: none"> <li>Prerequisite Objectives</li> </ul>	<p>These are the objectives that state what an individual must have mastered before entering the training course.</p>	<ul style="list-style-type: none"> <li>List four areas of a fab</li> <li>Describe a cleanroom</li> <li>Use Ohm's law to calculate . . .</li> <li>Operate a multimeter</li> <li>Interpret the metric system</li> <li>Read and write English</li> </ul>

# **Guidelines for Interpreting a Skills Hierarchy**

- **The skills hierarchy shows which subskills must be learned before going on to a higher skill.**
- **It does not tell which skill out of the entire group should be learned first. There could be a variety of starting points.**
- **It does not indicate the proper sequence in which steps of a task should be performed.**
- **It does not relate anything about the importance of each skill.**
- **The relative importance of a skill in a skills hierarchy does not indicate the degree of difficulty that a person will have learning that skill.**



# **Guidelines for Developing a Skills Hierarchy**

- **Write out the complete terminal objective and place it at the top of the workspace.**
- **Write out all subordinate objectives in short form on individual index cards, sticky note paper, etc.**
- **To organize the hierarchy, look at each objective and ask, “what must I be able to do before I can do this?” Then, position objectives accordingly.**
- **Be ready and willing to create new objectives if required.**
- **All subskills must be derived from terminal skills. If a subskill has no relevance to the terminal skill, it should not be included in the hierarchy.**
- **Skill hierarchies should be validated.**

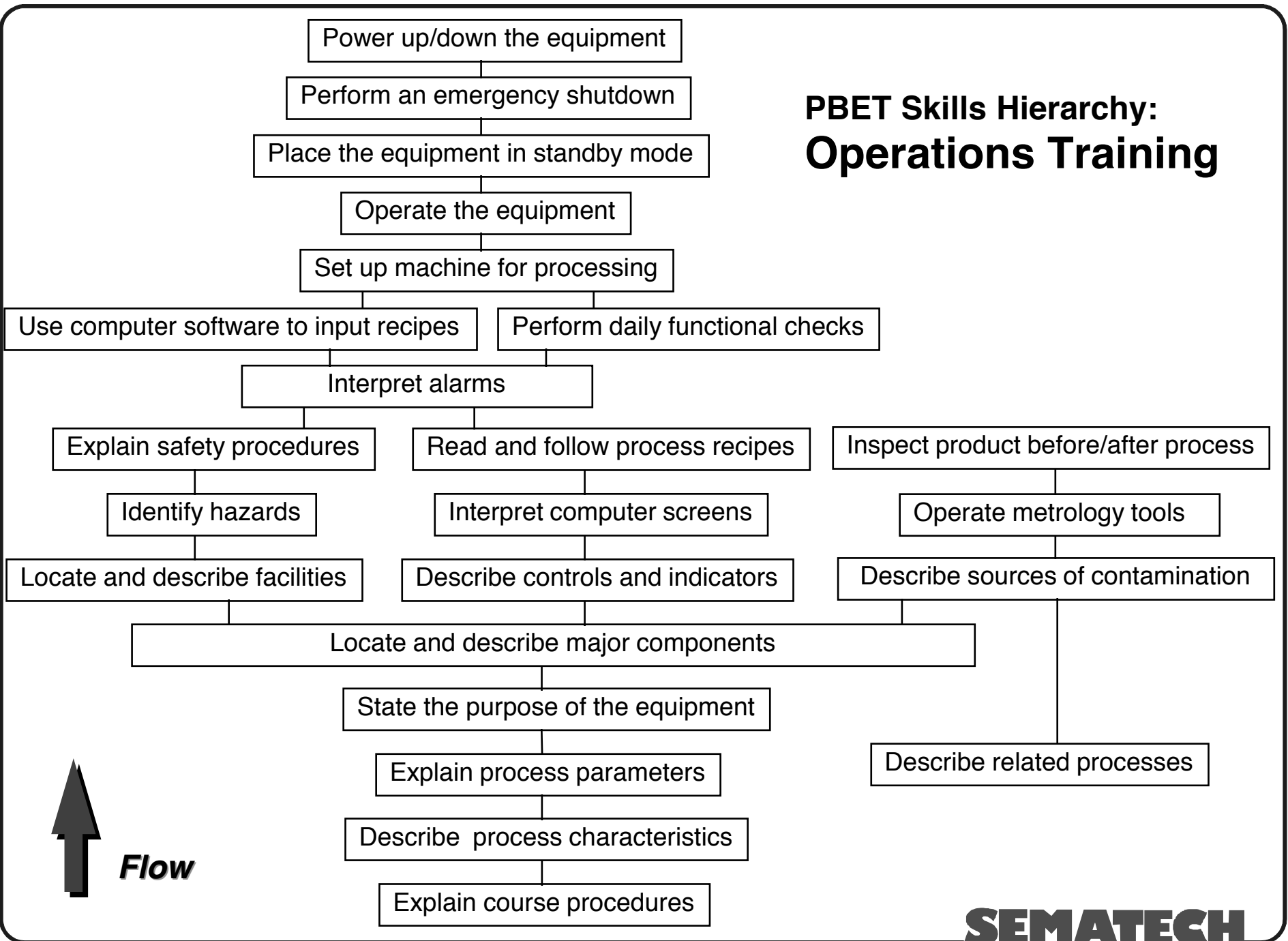
**AN-3**

# **Skills Hierarchy Practice Exercise**

- **Terminal Objective:**
  - Perform daily functional checks on manufacturing equipment
- **Subordinate Shortform Objectives:**
  - Explain safety procedures
  - interpret computer screens
  - Interpret alarms
  - Describe controls and indicators
  - Identify hazards
  - Locate major equipment components
  - Identify equipment contamination sources
  - Describe process characteristics

**SEMATECH**

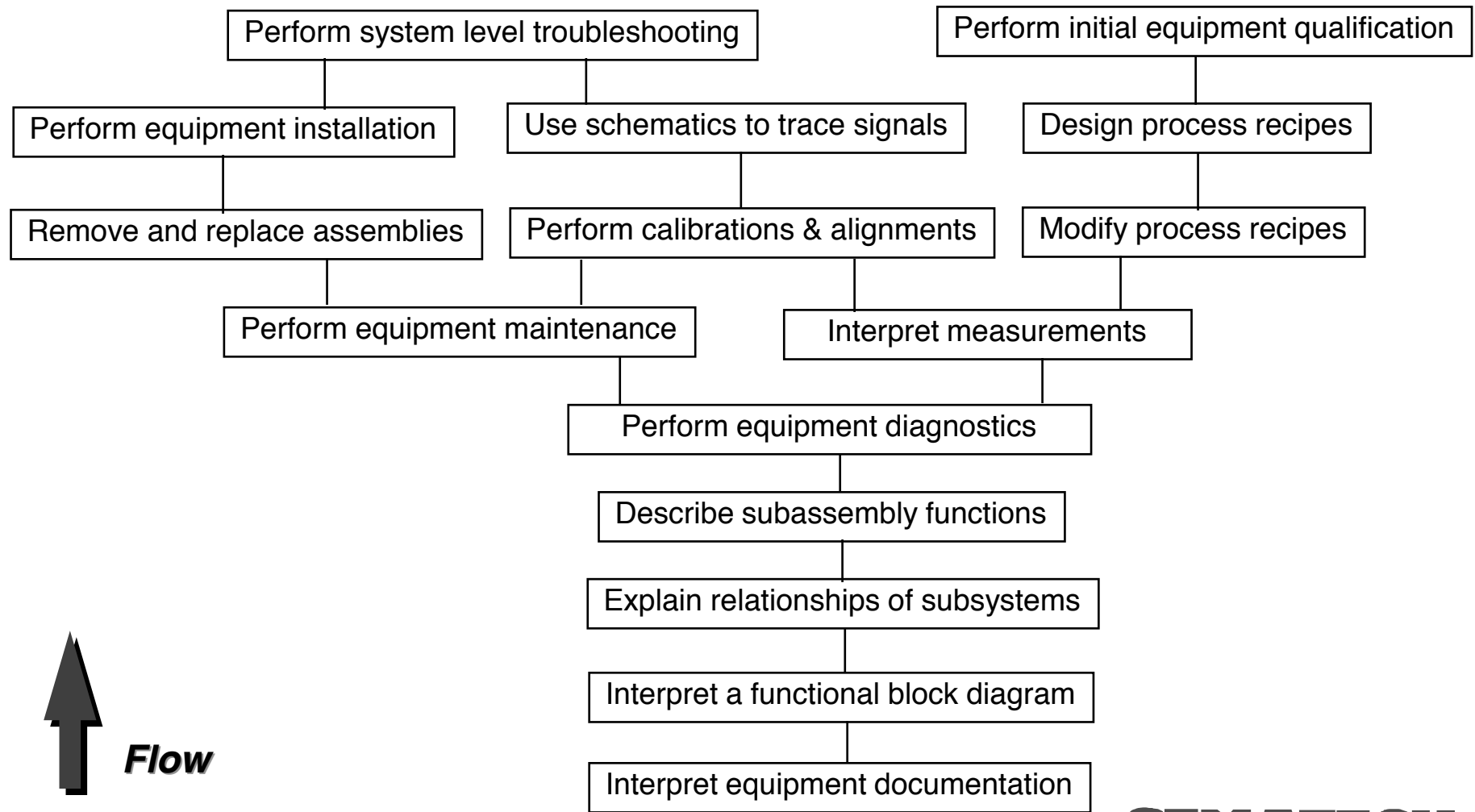
# PBET Skills Hierarchy: Operations Training



**Flow**

**SEMATECH**

# PBET Skills Hierarchy: Service Training for Technician/Engineer



**Flow**

**SEMATECH**

# Seven Basic Phases in the Development of Performance-Based Equipment Training



1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate

**DS-1**

## **DEVELOP SKILL TESTS**

### **OBJECTIVE:**

**Given a performance objective for equipment training, develop a skill test to match the requirements of the objective. The test must be conducted under the same conditions as indicated in the corresponding objective. The performance standard must also match that of the stated objective.**

DS-1

# Traditional Applications of Tests



**SEMATECH**

## DS-1

# Norm-Referenced Testing vs. Performance-Based Testing

	<u>Norm-Referenced</u>	<u>Performance-Based</u>
	<u>Scoring</u>	<u>Scoring</u>
1. Describe Process Steps	10	✓
2. Name 25 Major Parts of the System	10	✓
3. Locate 35 Major Parts of the System	10	✓
4. Describe Function of 35 Parts	10	✓
5. Identify 10 Hazards & Explain Safety	0	-
6. Describe Functions of Controls	10	✓
7. Perform Daily Equipment Checks	10	✓
8. Interpret Computer Screens	10	✓
9. Interpret Process Recipes	10	✓
10. Operate the System	<u>10</u>	<u>-</u>
<b>Final Score</b>	<b>90</b>	<b>NC*</b>

*\*This person is not yet competent or has not yet mastered all of the PBET course requirements.*

**SEMATECH**



# Requirements for Writing Effective PBET Skill Tests

**A well-written skill test must be a good match to a well-written performance objective, which is accompanied by three important components:**

- **Performance requirement**
- **Conditions under which the performance is to occur**
- **Standard of performance must match the stated objective**

**DS-1**

# **Skill Test Example No. 1**

## **WAFER INSPECTION SKILL TEST**

**OBJECTIVE:** Given 10 production wafers of different masking levels, and having available all the necessary resources and metrology tools in the fab, identify which wafers have defects, and locate the area and nature of the defect. The inspections must be 100% accurate and completed within 40 minutes.

**SKILL TEST:** Perform the following wafer inspection skill test in the presence of your trainer.

- You will be provided all necessary items you will need for the wafer inspection test including the metrology tool in the fab.
- The instructor will provide 10 wafers of known origin and types of process defects.
- For each wafer tell the instructor where the defect is located and explain the nature of the defect.
- Performance standard is 100% accuracy and will require no more than 40 minutes to complete.

**SEMATECH**

**DS-1**

# **Skill Test Example No. 2**

## **RUN A FIRST MASK EXPOSURE JOB**

**OBJECTIVE:** Given the proper reticle, resist-coated wafers, and a job number, load the reticle and the wafers into the *Astaire-1950 Stepper*, call up the proper job parameters, and execute a first mask exposure job. Your performance will be evaluated by the course instructor against the Operations Specifications.

**SKILL TEST:** At the designated stepper, explain to your trainer the procedure for executing a first mask exposure job.

- Show him where you would load the wafers and where to place the reticle.
- Show him on the stepper which job parameters to use.

**SEMATECH**

**DS-1**

# **Skill Test Example No. 3**

## **PERFORM AN RF GENERATOR ALIGNMENT**

**OBJECTIVE:** Assuming all tools, parts, schematics, and alignment specifications are available, perform a complete alignment on an *FRQ-5000* RF generator. The alignment must be completed in less than 20 minutes and the harmonic distortion  $<5\%$ .

**SKILL TEST:** Given the following steps required in the *FRQ-5000* RF generator alignment, number them in the proper order from 1 to 6.

- Set up the frequency counter for a frequency of 13.5 MHz.
- Adjust crystal amplifier for maximum output.
- Connect the oscilloscope to the AGC test point.
- Adjust the output of the first IFPA to maximum.
- Monitor the SWR meter on the front panel.
- Adjust the PA LC network for maximum power.

**SEMATECH**

**DS-1**

# **Skill Test Example No. 4**

## **LOCATE AND DESCRIBE SIX PARTS OF A WAFER**

**OBJECTIVE:** Given a diagram of a wafer and the correct wafer terminology, locate the six parts of a wafer by matching the correct descriptions.

**SKILL TEST:** Using the wafer diagram and the list of matching words and statements from the Appendix, correctly locate and identify the six parts of a wafer.

**SEMATECH**

**DS-1**

**Skill Test**

**Instructor:** \_\_\_\_\_ **Class:** \_\_\_\_\_

**Module Title:** \_\_\_\_\_

**Target Audience:** \_\_\_\_\_ **Location:** \_\_\_\_\_

**Module Objective:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Prerequisite Skills:** \_\_\_\_\_

**Skill Test:** *Write the skill test in this area.*  
↓  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## DS-2

# DESCRIBE RELEVANT PRACTICE TO SUPPORT OBJECTIVES

### OBJECTIVE:

Given an objective in your area of expertise, write a description of relevant practice that includes a description of the following elements:

- The activity trainees will be doing when practicing the performance
- The conditions under which the practice activity is to occur
- A feedback mechanism to inform your trainees how well they are doing
- The type of modeling that will be used to demonstrate desired performance

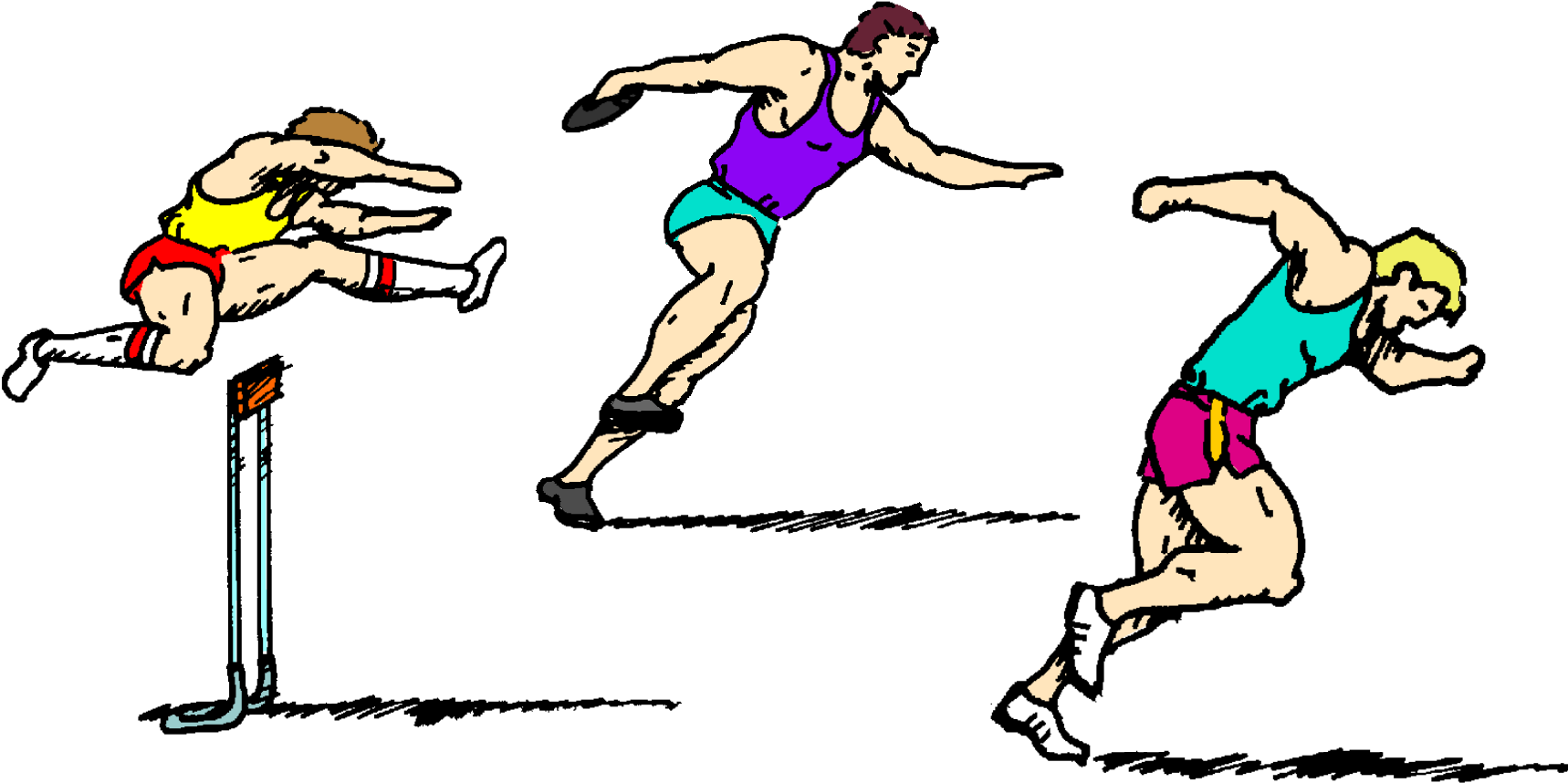
# **Four Components of Relevant Practice**

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• <b>Performance</b></li></ul> | <p>The activity which the trainees will be doing when they are practicing the intended performance stated in the objective.</p> |
| <ul style="list-style-type: none"><li>• <b>Conditions</b></li></ul>  | <p>Where, how, and with what the relevant practice is to be performed.</p>  |
| <ul style="list-style-type: none"><li>• <b>Modeling</b></li></ul>    | <p>The method in which the performance can be demonstrated to the trainees.</p>   |
| <ul style="list-style-type: none"><li>• <b>Feedback</b></li></ul>    | <p>The indicators, signs, or cues that trainees can use to measure their own performance.</p>                                   |



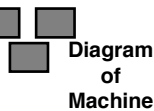
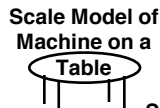
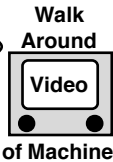
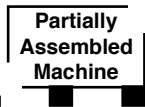
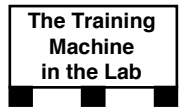
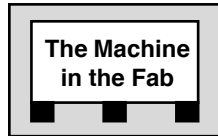
DS-2

# Relevant Practice



**SEMATECH**

# Relevant Conditions Continuum



**OBJECTIVE:**  
Given a fully functioning machine in the wafer fab, locate parts and state one function of each part on Lab List B.

As the Original Conditions Are Approximated Less and Less...

...The Reliability of the Inference Diminishes

**PROBLEMS?**

- Safety?
- Available instructors?
- Equipment access?
- Costs?
- Not enough time?
- Effort???

This is the inference: That trainees CAN and WILL perform the same under fab conditions as when certified under the conditions provided when tested.

Does it matter? Only to the degree of importance of the original performance discrepancy.



DS-2

## Relevant Practice

***Model Behavior***

***- Demonstrate***

***- Coach***

***- Train***

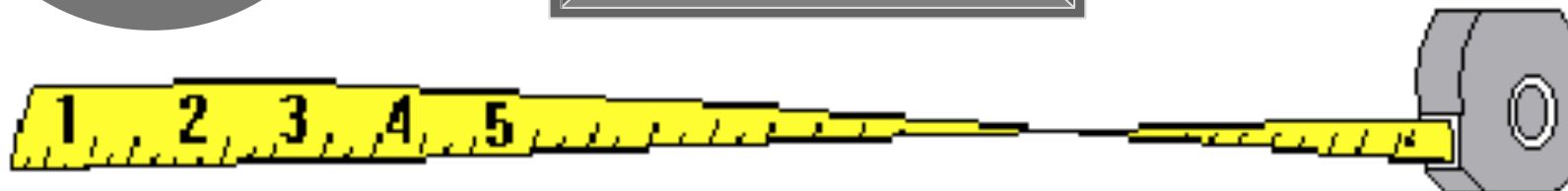
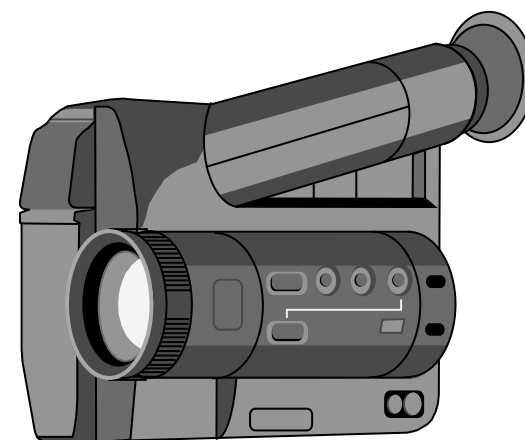
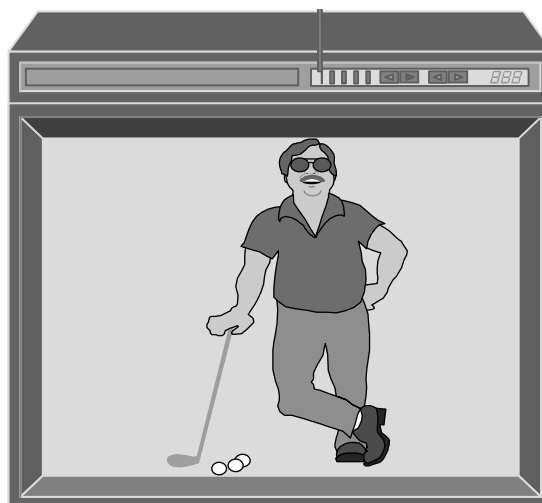
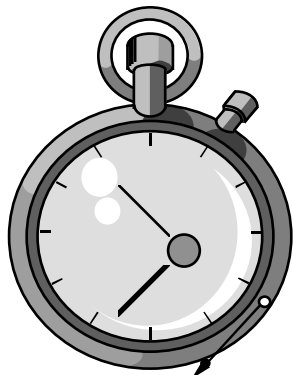


**SEMATECH**

DS-2

# Relevant Practice

## *Feedback Mechanisms*



**SEMATECH**

**DS-2**

# **Pitfalls to Avoid When Planning Relevant Practice**

- **Partial practice**
- **Disproportionate practice**
- **Misdirected practice**
- **Limited practice**

**SEMATECH**

# 1. Examples of Relevant Conditions

**Objective:** Given a list of 10 parts belonging to an ion source, locate them and state the purpose of each one.

1A. Best Case Condition: Have the exact ion source available so students can practice.

1B. Alternative Condition: Have available one or more color photographs of the exact ion source with alphanumeric labels.

## 2. Other Examples of Relevant Conditions

**Objective:** Given a list of 10 parts belonging to an ion source, locate them and state the purpose of each one.

2A. Best Case Condition: Classroom.

2B. 1st Alternative Condition: Shop area, storage area.

2C. 2nd Alternative Condition: Ion implanter inside fab.

### 3. Examples of Modeling Methods

**Objective:** Given a list of 10 parts belonging to an ion source, locate them and state the purpose of each one.

- 3A. Best Case Modeling Method:** A trainer or other technician can point at one part of the ion source, say the name of the part, and describe the purpose of it.
- 3B. Alternative Modeling Method:** Provide one or more color pictures; one part of the ion source has a label on it naming the part and a short description of the purpose of the part.



## 4. Examples of Feedback Mechanisms

**Objective:** Given a list of 10 parts belonging to an ion source, locate them and state the purpose of each one.

- 4A. **Best Case Feedback Mechanism:** A trainer or other technician can inform the trainee of the number of correct responses the trainee made and which specific ones were correct.
- 4B. **Alternative Feedback Mechanism:** The trainee will have available a checksheet with the correct responses.

## Practice Exercise No. 1

**Objective:** Given 10 production wafers of different mask levels, tell which wafers have defects and locate the area and nature of the defect.

1. **Description of Performance**  
Same as objective
2. **Description of Conditions**
  - 2A. Best case
  - 2B. Alternative or none
3. **Description of Modeling Method**
  - 3A. Best case
  - 3B. Alternative or none
4. **Description of Feedback Mechanism**
  - 4A. Best case
  - 4B. Alternative or none

## Practice Exercise No. 2

**Objective:** Given an *Astaire Stepper* and a 14-step checksheet designated for “daily checks,” the trainee will perform each daily check accurately, and relate any errors or nonstandard conditions to the trainer. The trainee must also interpret the nonconforming conditions correctly to the trainer.

1. **Description of Performance**  
Same as objective
2. **Description of Conditions**
  - 2A. Best case
  - 2B. Alternative or none
3. **Description of Modeling Method**
  - 3A. Best case
  - 3B. Alternative or none
4. **Description of Feedback Mechanism**
  - 4A. Best case
  - 4B. Alternative or none

**DS-2**

**Relevant Practice Description:**

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**Conditions:**

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**Type of Modeling:**

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**Feedback Mechanism:**

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**Module Content Description:**

**DS-3**

## **ANALYZE RESOURCE MATERIALS**

### **OBJECTIVE:**

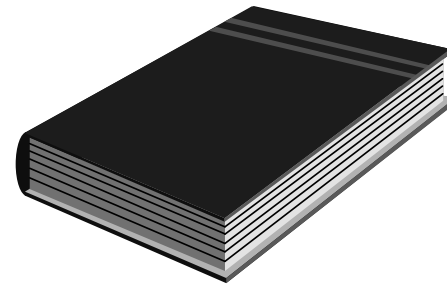
**Having available resource materials that you will use or that you have previously used to teach a course, diagnose assumptions about entry level skills that are suggested but not explained in the materials.**

**SEMATECH**

**DS-3**

# Select Supporting Resources and Instructional Materials

- **Technical Manuals**
- **Textbooks**
- **Videotapes**
- **Slides**
- **Brochures**
- **Checklists**
- **Written Procedures**



**SEMATECH**

# **Evaluate Supporting Resources and Instructional Materials**

- **Are there adequate examples for the target audience?**
- **Are the skills and concepts adequately covered?**
- **Is the language or reading level appropriate?**
- **Is it too technical -- not technical enough?**
- **If a student tried the material, what would he or she think?**
- **Are the assumptions made that a learner might not understand?**
- **Is the glossary in the front or the back of the book?**

**Module Objective:** \_\_\_\_\_

**Prerequisite Skills:** \_\_\_\_\_

**Skill Test:** \_\_\_\_\_

*Fill in the Additional Resources  
needed to support the module.*

**Additional Resources:**  \_\_\_\_\_



**DS-4**

## **SELECT DELIVERY METHOD**

### **OBJECTIVE:**

**Given the course objectives and performer information, determine the delivery method for the training module you are developing.**

**SEMATECH**

# List Additional Instructional Aids and Supporting Materials

## TRAINING AIDS & MEDIA

- **Transparency Foils**
- **Equipment Manual**
- **Video**
- **Checklists**
- **Flipchart & Markers**
- **Drawing Board**
- **Paper & Pencils**
- **Job Aid**
- **Camcorder**

## TOOLS & MATERIALS

- **Test Wafers**
- **Hand Tools**
- **Test Instruments**
- **Astaire Stepper**
- **Strip Chart Recorder**
- **Microscope**
- **Coater-Developer**
- **Calculator**
- **SPC Control Charts**

**Additional Resources:** \_\_\_\_\_

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**Training Aids & Media**

**Tools & Materials**

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# DS-5

## Summarize a PBET Lesson

### OBJECTIVE:

Having completed all of the prerequisite steps in the PBET Lesson Planning Form, summarize the lesson you are preparing. The summary will be reviewed and approved by the PBET course instructor.

# Items to Include in the Lesson Summary

## 1. A description of relevance

- What benefit will the lesson provide?
  - » What's in it for the student?
- How does this lesson support
  - » The overall training course?
  - » A specific training program?
  - » A trainee's understanding or skills?
  - » A specific task, job, career, etc.?

# Items to Include in the Lesson Summary

## 2. Logistics

- Special instructions and/or requirements:
  - » Instructional aids, media, supplies, etc.
- Location, environment, conditions, etc.:
  - » Room, temperature setting, lighting, special seating
- Purchases, reservations, rentals, etc.:
  - » Equipment, supplies, materials, personnel

## Items to Include in the Lesson Summary

### 3. Sequence of events

- Transition into new lesson
- Explain lesson objective (*tell them*)
  - » Introduce concepts and skills
- Model the desired performance (*show them*)
- Provide time for practicing (*let them try it*)
- Provide time for skill test (*let them show you*)





**DS-6**

## **COMPLETE A SECOND PBET LESSON PLAN**

### **OBJECTIVE:**

**Given a PBET Lesson Planning Form, prepare at least one lesson plan in an area of your training responsibility. All sections of the form must be completed according to the standards delineated in the PBET Participant Guide.**

**SEMATECH**

**DS-6**

# PBET Lesson Planning Form

Developer:

Class:

Module Title: \_\_\_\_\_

Target Audience: \_\_\_\_\_ Location: \_\_\_\_\_

Module Objective:  
\_\_\_\_\_  
\_\_\_\_\_

Prerequisite Skills:  
\_\_\_\_\_  
\_\_\_\_\_

Skill Test:  
\_\_\_\_\_  
\_\_\_\_\_

Additional Resources:  
\_\_\_\_\_  
\_\_\_\_\_

Training Aids & Media	Tools & Materials

Relevant Practice Description:  
\_\_\_\_\_

Conditions:  
\_\_\_\_\_  
\_\_\_\_\_

Type of Modeling:  
\_\_\_\_\_  
\_\_\_\_\_

Feedback Mechanism:  
\_\_\_\_\_  
\_\_\_\_\_

Module Content Description:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SEMATECH**

# **Lesson Planning Form Is Not an Instructor Guide**

- **Don't confuse the Lesson Planning Form with the instructor guide.**
- **The Lesson Planning Form acts as an outline for the lessons/modules in PBET training courses.**

**DS-6**

# **The Lesson Planning Form Is Your Outline**

- **It contains the instructional decisions you made about your PBET training.**
- **It will guide you as you create the training course.**

**SEMATECH**

# **The Structure of the Lesson**

- **Each lesson or module will vary in length.**
- **Lessons or modules may stand alone as self-contained lessons, but they all need a framework or structure.**

**DS-6**

## **Skill Test**

**Prepare a second Lesson Plan for a simple lesson in an area of your own training expertise.**

**You may consult any part of this course manual for assistance, or you may ask any of the course instructors or participants for help.**

**SEMATECH**

# Seven Basic Phases in the Development of Performance-Based Equipment Training



1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate

**DV-1**

# **Develop Instructional Materials**

## **OBJECTIVE:**

**Having completed a Lesson Planning Form, produce the training aids and media that you will need to support the PBET lesson you are preparing. The materials you create will be reviewed and approved by the PBET course instructor.**



**DV-1**

# **Prepare Training Aids & Materials**

- **Checklists and instructions**
- **Flipchart**
- **Drawings**
- **Job aids**
- **Participant's guide**
- **Transparency foils**
- **Photographs**
- **35 mm Slides**
- **Videotape**
- **Other resources**

**SEMATECH**

**DV-1**

# **Design of Overhead Transparency Foils**

## **Formats**

A vertical gray rectangle representing a portrait orientation.

**Portrait**

A horizontal gray rectangle representing a landscape orientation.

**Landscape**

**Stick to one format or the other. Try not to mix them.**

**SEMATECH**

DV-1

## Design of Overhead Transparency Foils (28 pt.)

# FONT TYPES, STYLES, SIZES (36 pt.)

24 pt. Helvetica, Normal, **Bold**, *italics*, underline

24 pt. Times Roman, Normal, **Bold**, *italics*, underline

20 pt. Helvetica, Normal, **Bold**, *italics*, underline

20 pt. Times Roman, Normal, **Bold**, *italics*, underline

18 pt. Helvetica, Normal, **Bold**, *italics*, underline

18 pt. Times Roman, Normal, **Bold**, *italics*, underline

14 pt. Helvetica, Normal, **Bold**, *italics*, underline

14 pt. Times Roman, Normal, **Bold**, *italics*, underline

**SEMATECH**

DV-1

# Design of Overhead Transparency Foils

## Use of Color for Text Only

- Black on white background is easy to read.
- Blue on white is fairly easy to read.
- Burple on white is also easy to read.
- Brown on white is OK too.
- Green is not too difficult to read.
- But, red is getting difficult to read.
- Orange is not so good.
- Yellow is one of the worst.
- **White or yellow on a black background is OK.**

**Remember. The four B's are the best.**

**SEMATECH**

# Design of Overhead Transparency Foils

## General Guidelines for Using Foils

- Try not to exceed more than 8 lines per foil.
- Stick to one theme in a foil.
- Use bullets rather than paragraph narrative.
- Try not to read from the foils.
- Use pointers or markers to emphasize a point.
- Know when to switch the overhead on and off.
- If it's important enough to put on a foil, then give people a chance to read it.
- Whenever possible, say it with pictures.

# Guidelines for Using the Flipchart and Marker Boards

- Great for notepad and brainstorming.
- Print large and legibly.
- It's OK to mix two or three colors.
- Stick to the four B's.
- Beware of different marker types.
- Use bullets and short sentences.
- Use graphical designs wherever possible.
- Be creative.
- Use soft stick masking tape.

# Seven Basic Phases in the Development of Performance-Based Equipment Training

1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



**PL-1**

## **DESCRIBE TRAINER CHARACTERISTICS**

### **OBJECTIVE:**

**Given a scenario in a training activity, be able to select at least five favorable trainer characteristics that could be used in dealing with the situation.**

**SEMATECH**



**PL-1**

## **Describe Trainer Characteristics**



**SEMATECH**

**PL-2**

## **PILOT A SHORT PBET LESSON**

### **OBJECTIVE:**

**Try out/pilot a short PBET lesson as either a performer or trainer and identify the pilot results.**

**SEMATECH**

**PL-2**

# **Performance-Based Equipment Training Requires a Pilot**

- **All PBET training courses need a tryout or pilot before the courses are delivered.**
- **The pilot is the first opportunity to try out the efforts from the earlier PBET phases.**

**SEMATECH**

**PL-2**

# **Piloting PBET Courses**

**Allows developers to detect areas that:**

- **Need some improvement or reorganization**
- **Are successful and work well**
- **Can be eliminated**

**SEMATECH**

# Seven Basic Phases in the Development of Performance-Based Equipment Training

1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



**DL-1**

## **DESCRIBE PBET TRAINER RESPONSIBILITIES**

### **OBJECTIVE:**

**List at least five responsibilities of an effective trainer.**

**DL-1**

# **GROUP ACTIVITY**

## **Describe Trainer Responsibilities**

- 1. Each participant will list five responsibilities of an effective trainer; for example:**
  - Provides quality instruction at all times**
  - Stays up to date in the latest technology**
  - Updates the employee's training records**
- 2. Share your list with others in your group.**
- 3. Compile the group's list on an easel pad.**
- 4. Select a spokesperson from each group.**

**DL-2**

## **PREPARE A TRAINING CURRICULUM CHECKLIST**

### **OBJECTIVE:**

**Having available a skills hierarchy of performance objectives, skill tests, supporting instructional materials, and a detailed task analysis, assemble a training checklist for training others in an area of your own expertise.**

**SEMATECH**



**DL-2**

# **SEMATECH Manufacturing Technician Training and Certification Process**

## **PURPOSE:**

**The purpose of the Manufacturing Technician (MT) Training and Certification program is to document the demonstration of the skills required for safe operating, process monitoring and/or maintaining process equipment according to SEMATECH specification.**

**SEMATECH**

# **SEMATECH MT Certification Program?**

---

- 1. SEMATECH MT Certification Process**
- 2. Guidelines for writing certification tests**
- 3. Guidelines for developing training and certification checklists**
- 4. Manufacturing technician training checklist (example)**

# **What Are Some Other Side Benefits of the MT Certification Program?**

---

- **Provides a “learning by design” attitude rather than by “trial and error.”**
- **Forces us to organize and manage the training of all MTs.**
- **Develops a cooperative team environment.**
- **Establishes a baseline for MT skills across all shifts.**
- **Could be tied to advancement requirements within Manufacturing Methods.**

# How It Works

---

## **1. Communications and Ownership**

### **– Training Request Form Is Issued**

- » **Shift Manager**
- » **Document Control**
- » **Peer Trainer**
  - Training specialist
  - An experienced MT
  - Process engineer or technician
  - Equipment engineer or technician
  - Field service engineer
- » **Process Engineer or Technician**
- » **Equipment Engineer or Technician**
- » **MT Trainee**

## **2. Prepare an Individualized Roadmap**

# Major Steps

---

## Step 1 Kickoff Meeting

- Manager, MT trainee, and peer trainer
- Importance of training, schedule, expectations

## Step 2 Roadmap Explanation

- What will be done, how long, how evaluation will be conducted

## Step 3 4-Step Training Process

- Trainer tells trainee what the trainee will do
- Trainer explains/shows and answers questions
- Trainee practices and trainer provides coaching
- Trainee explains/shows and answers questions

## Step 4 Record Keeping

- Both agree mastery of a skill has occurred
- Both sign and date the training checklist

## **Step 5 Certification Test**

- **Must achieve competency on performance test (hands-on)**
- **Written test must be completed**
- **Both must be done error-free**
- **Successful completion is determined by assigned engineer or technician**
- **Remedial action -- engineer or technician will notify the manager and the trainer with further recommendations**

## **Step 6 Recognition**

- **Sign the certificate and present to MT**

## **Step 7 Recertification**

- **Significant spec violation**
- **Significant spec change**
- **Periodic abbreviated recertification**

# **Guidelines for Developing Training and Certification Checklists**

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- **Required Materials**
  - Training Request Form
  - Course Prerequisites
  - Task Analysis
  - List of Training Objectives
  - Relevant Documentation
  - Training Checklist
  - Estimated Time for Completion
  - Certification Test
    - » Performance Test
    - » Written Test
  - Certification Form

**DL-2**

# **Three Parts of a Manufacturing Technician Training Checklist**

- I. Core Courses**
- II. Non-Tool Training**
- III. Tool-Related Skills**

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# I. CORE COURSES

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	<u>DESCRIPTION</u>	<u>TIME</u>
1.	<b>Week One Orientation</b> <ul style="list-style-type: none"><li>- PC Windows</li><li>- E-Mail</li><li>- HAZCOM</li><li>- Site Safety</li><li>- Chemical Safety</li><li>- Cleanroom Entry Cert.</li></ul>	<b>28</b>
2.	<b>WorkStream Training</b>	<b>14</b>
3.	<b>Semiconductor Process Overview</b>	<b>8</b>
4.	<b>Electrical Safety</b>	<b>6</b>
5.	<b>Lockout/Tagout</b>	<b>1</b>
6.	<b>RS1/Quickstart</b>	<b>7</b>
7.	<b>Intro to Statistical Methods</b>	<b>7.5</b>
8.	<b>Passive Data Collection</b>	<b>7.5</b>

**DL-2**

## **II. NON-TOOL TRAINING**

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- 1. Tour of Bay**
- 2. Safety Items**
- 3. Key Contacts**
- 4. Housekeeping**
- 5. Wafer Handling**
- 6. Equipment Owners**
- 7. Timesheets**
- 8. Special Codes**
- 9. Hazardous Waste**

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## **III. TOOL-RELATED SKILLS**

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- 1. Process Overview**
- 2. Equipment Overview**
- 3. Locate and Describe Related Hazards**
- 4. Describe Safety Procedures**
- 5. Locate and Describe Controls and Indicators**
- 6. Define Operating Codes or Software Commands**
- 7. Read and Interpret Specifications**
- 8. Process Wafers According to Specifications**
- 9. Apply Principles of SPC to the Tool**
- 10. Preventive Maintenance**
- 11. Qualifications**
- 12. Troubleshooting (optional)**
- 13. Engineering Audit**

**DL-3**

## **CREATE AN ACTION PLAN FOR PBET IMPLEMENTATION**

### **OBJECTIVE:**

**At the end of this module, complete an action plan for implementing PBET at your company.**

**SEMATECH**

# Seven Basic Phases in the Development of Performance-Based Equipment Training

1. Identify
2. Analyze
3. Design
4. Develop
5. Pilot
6. Deliver
7. Evaluate



**EV-1**

# **EVALUATION OF TRAINING**

## **OBJECTIVE:**

**Given evaluation characteristics, identify all four levels of evaluation correctly.**

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# **The Evaluation Phase of PBET**

- **Determines the effectiveness and relevance of the equipment training program**
- **Obtains feedback from customers relating to the appropriateness and effectiveness of the training program**

**EV-1**

# **Donald Kirkpatrick's Four Levels of Evaluation**

**Level 1 -- Measures participant's first reactions**

**Level 2 -- Measures participant's learning**

**Level 3 -- Measures application of learning at  
the workplace**

**Level 4 -- Measures return on investments**

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**EV-1**

# **Level 1 -- Measures Participant's First Reactions**

**Information is captured in questionnaires:**

- **Sometimes referred to as course satisfaction sheets**
- **They gauge participant's first reactions to training**

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**EV-1**

## **Level 2 -- Measures Participant's Learning**

**Tests participant's skills and knowledge against the course:**

- **Can take the form of simulation, demonstration, or written or hands-on test**
- **Skill tests used in PBET**
- **Sometimes called a test, skill check, evaluation, pretest, posttest, etc.**

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**EV-1**

## **Level 3 -- Measures Application of Learning at the Workplace**

**Conducted a few months after training at  
workplace:**

- **By interviews, observations, or  
assessments from participants and  
supervisors**
- **Determine if participants are using their  
new skills**

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**EV-1**

## **Level 4 -- Measures Return on Investments**

**Measures the value of the training activity  
within the company**

**What is the impact to the company in terms of:**

- **Time saved?**
- **Improved productivity?**
- **Improved efficiency?**
- **\$\$ saved?**

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**EV-1**

# **Skill Test**

**Level \_\_\_\_**

- **Conducted at workplace a few months after training**
- **Determines if participants are using new skills**

**Level \_\_\_\_**

- **Gages participant's reactions to training**
- **Questionnaires sometimes referred to as course satisfaction sheets**

**Level \_\_\_\_**

- **Written test, demonstration, or simulation that measures participant's skills against course objectives**

**Level \_\_\_\_**

- **Looks for return in investment of training within the company**

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