PALO VERDE
NUCLEAR GENERATING STATION

HVAC

Classroom Lesson

HVAC Training	**Date: 01/13/2005**
LP Number: NMH10X000402	**Rev Author: Paula Stapleton**
Title: Multiplexer and Gas Turbine AC Units	**Technical Review:** Digitally signed by: Sherman, John L(Z85359) Date: 01/14/2005 13:35:09 Reason: I have reviewed this document Location: PVNGS
Duration : 1 Hour	
	Teaching Approval: Digitally signed by: Edmunds, Derek S(Z99318) Date: 01/18/2005 08:16:12 Reason: I am approving this document Location: PVNGS

INITIATING DOCUMENTS:

15DP-OTR69 Training and Qualification Administration

HVAC Technician Training Requirements

Training Program Description for HVAC Maintenance

REQUIRED TOPICS

NONE

CONTENT REFERENCES

EDC 96-00284 for 13-MN-598B capacities and enviromental temperatures

Maintenance Standard and Expectations handbook

VTD-C150-0033-1 Carrier Heat Pump 50QJ008,012 Gas Turbine Bldg

VTM 5903-001 Carrier Heat Pump 50QJ008,012 Gas Turbine Bldg

WO Task# 094225 Inspect/clean air conditioner (HSNA33)

WO Task# 094241 Inspect/clean air conditioner (HSNA37)

Maintenance Prevent Events Strategy

TCS# 03-0636 OE14567 - Technician received a minor burn by a vapor flash from a refrigeration unit.

TSC# 03-0358 OE15842 - Worker suffers refrigerant burn from liquid refrigerant.

Palo Verde Safety Manual

Lesson Plan Revision Data

Jan 13, 2005	Paula Stapleton	Developed LP for CBT TCSAI# 2686324 Revision includes more P.E., Standards & Expectations. Deleted objectives describe operation of the Multiplexer and describe operation of the Gas Turbine A/C Units. Moved task ACU 29 - Troubleshoot the PMUX A/C Unit to HVAC General 2.

Tasks and Topics Covered

The following tasks are covered in Multiplexer and Gas Turbine AC Units:

Task or Topic Number*	Task Statement
Lesson:	Multiplexer and Gas Turbine AC Units
ACU28	Check the operation of the PMUX A/C unit

Total tasks or topics: 1

TERMINAL OBJECTIVE:

1.1 Given a CBT presentation, describe the purpose and good maintenance practices of the Multiplexer Air Conditioners and Gas Turbine Air Conditioning Units. Mastery will be demonstrated by successfully completing the questions at the end of the CBT presentation with a score of 80% or greater.

1.1.1 State the purpose of the Multiplexer A/C Unit

1.1.2 Identify good Maintenance practices when working on the Multiplexer A/C Unit

1.1.3 State the purpose of the Gas Turbine A/C Unit

1.1.4 Identify good Maintenance practices when working on the Gas Turbine A/C Unit

Lesson Introduction: Multiplexer and Gas Turbine AC Units

The following items are things to consider in your Lesson Introduction. They are not mandatory. You should develop your own introduction and place that material in the Program Hierarchy in the Lesson Introduction Tab or appropriate Training Unit.

CLASSROOM GUIDELINES

- If applicable, remind students of class guidelines as posted in the classroom.
- Pass the attendance sheet around and have it signed in Dark ink.
- Ensure that student materials needed for the class are available for each student.
- Emphasize student participation and remind them of your philosophy on asking and answering questions, if applicable.

ATTENTION STEP

- Give a brief statement or story to get student concentration focused on the lesson subject matter.

LESSON INTRODUCTION

- Give a brief statement that introduces the specific lesson topic. Should be limited to a single statement.

MOTIVATION

- Focus student's attention on the benefits they derive from the training. At Instructor's discretion. The need for motivation in each succeeding lesson must be analyzed by the Instructor and presented as necessary.
- Instructor should include how the STAR process can be used to improve or enhance Operator Performance, if applicable.
- Read and discuss lesson terminal objective and review lesson enabling objectives, if desired.
- If applicable, briefly preview the lesson topic outline and introduce the major points to be covered. The objective review may have been sufficient.
- REINFORCE the following PVNGS management expectations as opportunities become available
  - Nuclear Safety
  - Industrial Safety Practices
  - STAR and Self-Checking
  - Procedure Compliance
  - Communication Standards
  - ALARA
  - Prevent Events

T.Obj 1.1	**Given a CBT presentation, describe the purpose, and good maintenance practices of the Multiplexer Air Conditioners and Gas Turbine Air Conditioning Units. Mastery will be demonstrated by successfully completing the questions at the end of the CBT presentation with a score of 80% or greater.**

1.1.1 Introduction

Describe the purpose and good maintenance practices for the Multiplexer and Gas Turbine Air Conditioning Units.

1.1.2 Main Idea

Prevent Events & STAR
Achieving Breakthrough Performance
What is the first thing we do when we have a new task?
Every task begins with a **Pre-Job Brief.**
Let's use the five prevent events questions as we review the new task….

What is the task I am going to perform?
The **TERMINAL OBJECTIVE** in this case actually contains two tasks.
Describe the purpose and good maintenance practices for the Multiplexer and Gas Turbine Air Conditioning Units.
Let's look at the Multiplexer A/C Unit first.

Do you understand it?
State the purpose of the Multiplexer A/C Unit
Identify good Maintenance practices when working on the Multiplexer A/C Unit
State the purpose of the Gas Turbine Air Conditioning Unit
Identify good Maintenance practices when working on the Gas Turbine Air Conditioning Unit

What is the worst thing that could happen and how can I prevent it?
The Multiplexer cooling equipment is located in the switch yards and the cooling towers switchgear of each of the units. These are areas that you may not work in frequently so you may not be as familiar with the hazards. Your first defense is to participate in the pre-job briefing and be clear on the work scope. You will need to notify Operations in Unit One prior to entering the switch yard.

What else could go wrong?
Working near the high voltage overhead power lines create an induction and static charge potential. Additionally, whenever you are carrying anything keep it parallel to the ground and at least a 10 foot clearance from potentially energized equipment to prevent contact.
Perform a Two-minute drill. This provides an opportunity to perform an at the workplace assessment of the hazards and conditions present for performance, and to validate any assumptions made during the pre-job brief.
As you progress through the work evolution you may find that the initial Pre-job briefing did not include a specific task. STOP, Ask yourself the Prevent Events questions again.

What safety and/or radiation protection equipment is needed?
There are no radiological concerns. If you have questions contact the appropriate Unit Radiation Protection desk.
Required PPE; Hard hats, safety glasses with side shields, and a pair of work gloves.

Is my training and are my qualifications up-to-date?
Prerequisites to this CBT course are:
NMH05, Chiller Control Panel Troubleshooting

HVAC-0001-00 EPA Certification,
Always check your qualifications for a task prior to performing work. If you do not know how to check, or you are in doubt, ask your Leader

EO 1.1.1	State the purpose of the Multiplexer A/C Unit

1.1.1.1 Main Idea

To reduce the number of hardwired signals the remote multiplex terminals (RMT) convert electrical signals into a digital form. It then multiplexes the information into a signal suitable for transmission along a fiber optic cable.

Remote multiplexing terminals are located at each cooling tower and in the switchyard.

Each RMT consists of a cabinet partitioned into a termination compartment and an electronic compartment.

The PMUX/multiplexer A/C unit provides cooling for the heat sensitive equipment inside the non-quality RMT electrical enclosure.

The multiplexers are located in the switch yard and each of the cooling tower switchgear buildings

The switchyard multiplexer is equipped with two direct expansion air conditioners:

1) A high ambient A/C Unit with a set point of 80°F
2) A room-type A/C Unit with a set point of 75°F.

The cooling tower multiplexer is equipped with a room-type direct expansion air conditioner with a set point of 80°F.

EO 1.1.2	Identify good Maintenance practices when working on the Multiplexer A/C Unit

1.1.2.1 Main Idea

HVAC performs PM tasks on the Multiplexer A/C units such as:

Clean/inspect coils
Check for loose electrical connections
Check for degraded components
Check for refrigeration leaks
Verify that the unit is cooling the enclosure

Familiarize yourself with your surroundings before the start of the job.

Notify Unit 1 operations prior to entering switchyard

If, while servicing the Multiplexer A/C Units it is determined that the equipment requires major repairs, the A/C unit can be replaced as specified in Specification 13-MN-598B Table 5-1.

The fit of the replacement A/C units may change depending on the mounting configuration and the supply and return air footprint, ensure the most efficient fit up.

EO 1.1.3	State the purpose of the Gas Turbine A/C Unit

1.1.3.1 Introduction

Time to reset ourselves....we are starting a new task.

What is the task I am going to perform?
Now we will look at the second part of the **TERMINAL OBJECTIVE:**
Describe the purpose and good maintenance practices for the Multiplexer and Gas Turbine Air Conditioning Units. Focusing on the Gas Turbine Air Conditioning Units.

Do you understand it?
State the purpose of the Gas Turbine A/C Unit
Identify good Maintenance practices when working on the Gas Turbine A/C Unit

What is the worst thing that could happen and how can I prevent it?
OE15842 - Documents an event where a technician suffered from liquid refrigerant burns to his right hand when a quick disconnect valve failed to seal on the compressor while the technician disconnected gauges. Proper use of PPE and a hazard assessment may have mitigated this event.

What else could go wrong?
OE14567 - Documents an event that occurred at Calvert Cliffs Nuclear Power Plant when replacing ventilation equipment servicing the switchgear rooms. A technician received 2nd degree burns to his forearm requiring first aid when the torch used to separate a refrigerant line caused the oil/refrigerant mixture in ignite.

What safety and/or radiation protection equipment is needed?
There are no radiological concerns. If you have questions contact the appropriate Unit Radiation Protection desk. Required PPE; Hard hats, safety glasses with side shields, and a pair of work gloves.

Is my training and are my qualifications up-to-date?
Prerequisites to this CBT course are:
NMH05, Chiller Control Panel Troubleshooting
HVAC-0001-00 EPA Certification,
Always check your qualifications for a task prior to performing work. If you do not know how to check, or you are in doubt, ask your Leader

1.1.3.2 Main Idea

The Gas Turbine Generators are located outside the protected area, plant east of Unit 1 and south of the Water Reclamation Facility (WRF) near the WRF boundary. Power cables are run to each unit in buried conduit duct banks. The GTGs are controlled from the turbine control room (TCR) which is located near the GTGs. The GTGs cannot be controlled from any unit control room.
The purpose of the gas turbine control room A/C unit is to provide cooling for the Batteries, MCC, Switchgear, and Control panels located inside the control room.
The thermostat set point is 65F- 80F temperature range.
Unit alarms in the Unit 1 Control Room when temperatures reaches 90F range.

The Gas Turbine Control Room A/C Unit is a Carrier Heat Pump, model 50QJ008,012.
(VTD-C150-0033 & VTM S903-001) It's equipment number is AM-HSN-A56

EO 1.1.4	Identify good Maintenance practices when working on the Gas Turbine A/C Unit

1.1.4.1 Main Idea

HVAC performs PM tasks on the Gas Turbine Control Room A/C Unit such as:

1.Clean/inspect coils
2.Check for loose electrical connections
3.Check for degraded components
4.Check for refrigeration leaks
5.Check or replace belt
6.Replace air filters
7.Verify that the unit is cooling
the enclosure

Temporary control room cooling may be necessary if temperature exceeds 90F

Unit 1 control room and the Water Rec Facility must be notified, when working on this unit.

When tagging is required to perform maintenance on the equipment the permit MUST be generated through The Water Rec Facility. You will need WRF:TAG/ACCEPT/RELEASE qualification to sign on to the clearance.

SUMMARY OF MAIN PRINCIPLES

The following items are things to consider in your lesson summary. They are not mandatory. You should develop your own summary.,

Objectives Review

Review the Lesson Objectives

Topic Review

Restate the main principles or ideas covered in the lesson. Relate key points to the objectives. Use a question and answer session with the objectives.

Questions and Answers

Oral questioning

Ask questions that implement the objectives. Discuss students answers as needed to ensure the objectives are being met.

Problem Areas

Review any problem areas discovered during the oral questioning, quiz, or previous tests, if applicable. Use this opportunity to solicit final questions from the students (last chance).

Concluding Statement

If not done in the previous step, review the motivational points that apply this lesson to students needs. If applicable, end with a statement leading to the next lesson.

You may also use this opportunity to address an impending exam or practical exercise.

Should be used as a transitional function to tie the relationship of this lesson to the next lesson. Should provide a note of finality.