

Nuclear Power Business Unit  
RADIATION WORK PERMIT

Revision: 0

RWP Number: 04-113

Controlling Work Document: Various RG 1.16 Class: 6 Estimated Dose: 0350 Rem

Job Title: Rx Head Lift.

Job Location: U-1 Containment

Job Description: Rx Head Lift.

Radiological Assessment of Work

Significant increase in radiation levels is likely?  Yes  No Reason: Head Lift and Upper Cavity Entry (on 66, 46, 21')  
Significant increase in contamination levels is likely?  Yes  No Reason: \_\_\_\_\_  
Potential for internal dose?  Yes  No Reason: Head Lift and O-ring groove cleaning

RWP Tasks

Task 1: Rx head lift including disconnecting thermocouples, removing cavity ladder and safety net, and performing NDE exams.

Task 2:

Task 3:

Task 4:

Task 5:

Task 6:

Task 7:

Task 8:

Task 9:

Task 10:

Task 11:

Task 12:

RWP Review and Approval

Prepared By: CD 2/24/04  
Initials Date

ALARA Review By: \_\_\_\_\_ ALARA Review No.:  N/A  \_\_\_\_\_  
Initials Date

Approved By: [Signature] 7-28-04  
RP Supervisor Date

Terminated By: \_\_\_\_\_  
RP Supervisor Date

Information in this record was deleted  
in accordance with the Freedom of Information  
Act, exemptions 5

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**TASK 1: Rx head lift including disconnecting thermocouples, removing cavity ladder and safety net, and performing ligament exam.**

Radiation Protection personnel are authorized to suspend work activities in the event of a change in job scope, changes in radiological conditions, or a failure of personnel working under the RWP to abide by the RWP conditions.

Stop Work Dose Rate: 5000 mR/hr <sup>@30cm</sup> ED Dose Rate Alarm: 1500 mR/hr ED Dose Alarm: 151 mRem  
*Cavity personnel will be higher.*

Radiation Protection Hold Points:  N/A  
Contact RP prior to entering any High Radiation Area. → *CTMT will be ctrl'd as HRA*  
RP to be present prior to removing any items from the Rx Cavity

Only essential personnel in CTMT during Rx head lift as determined by Outage and RP Management.

When accessing a LHRA the key user must notify RP supervision prior to the entry and immediately upon completion of the entry. The key user is required to have a concurrent check of the gate/door lock. → *moving lock for cavity to upper cavity*

Authorized Radiological Work Areas: Any RWP permits entry into RCA(s), RMA, and RA.

- HRA    LHRA    VHRA    Ctmt, Reactor Critical  
 CA    HCA    HPCA    Airborne Radioactivity Area

Expected Radiological Conditions: Data From:  Current Survey    Historical Data    Estimated  
Radiation: GA 50 to 1000 mrem/hr   Contact: 200 to 20000 mrem/hr

Contamination: 2000 to >1E6 dpm/100 cm<sup>2</sup>   Internal Contamination: 2000 to >1E6 dpm/100 cm<sup>2</sup> ( estimated)

\* Airborne Radioactivity: <.25 DAC \*    P    I<sub>2</sub>    NG    <sup>3</sup>H   ( Estimated /  Actual DAC)

RP Job Coverage:  Routine    Direct    Start of Job    System Breach    Pre-Job Briefing Required

Special Instructions: Direct coverage required for cavity entry. Ensure RHLDA is posted when required. See Job File 106. Pre-job briefing required as soon as practicable prior to head lift.

*CTMT Purge currently req'd, & Operational*

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Radiological Survey Requirements:

A. Radiation:  Prior to/Start of Work  System Breach  Other

Special Instructions: Start of Job coverage not required if current survey is available. Additional requirements as per RP.

B. Contamination:  Prior to/Start of Work  System Breach  Other

Special Instructions: Start of Job coverage not required if current survey is available. Perform hot particle surveys as necessary. Additional requirements as per RP.

C. Airborne:  Prior to/Start of Work  System Breach  Other

Special Instructions: Change out cavity lo-vol sample head prior to and after head lift. Consider CAM changeout.

*AMS4 will <sup>be</sup> shut off due to <sup>high</sup> ntr.   
 ↓   
 False alarm*

III. Dose Assessment: TLD and EPD required.

Special Instructions: Whole body dosimetry relocation as per RP. Extremity dosimetry as per HPIP 1.66. Timekeeping required when working in a dose rate >1,500 mR/hr and the worker could receive more than 25 mrem.

IV. Protective Clothing

Coveralls, Booties, and Rubber Gloves (Minimum requirements for entering a contaminated area)

Labcoat, Booties, and Rubber Gloves may be used only with RP permission.

Coveralls, Double Booties or Booties and Rubber Totes/Boots, and Double Rubber Gloves for HCA entry to disconnect thermocouples.

Double coveralls, Double Rubber gloves, Double Booties, Rubber Totes/Boots.<sup>1</sup>

Plastic suit, Double Rubber Gloves, Double Booties, Rubber Totes/Boots.<sup>1</sup>

Surgeon's Gloves may be substituted for Rubber Gloves with RP permission.

Hood & Face Shield as per RP.

Other: See Special Instructions

<sup>1</sup> Safety review may be required for additional coveralls or plastics.

*for cavity personnel  
plastic bottoms.  
Doubles for those  
in RHLDA.*

Special Instructions: Additional requirements as per RP. Consider use of paper suit or plastic bottoms for ligament exam.

V. Respiratory Protection:

N/A

TEDE ALARA Review:

None

Special Instructions: Additional requirements as per RP Supervision.

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VI. Engineering Controls:

None

Special Instructions:

VII. ALARA Requirements:

See ALARA Review

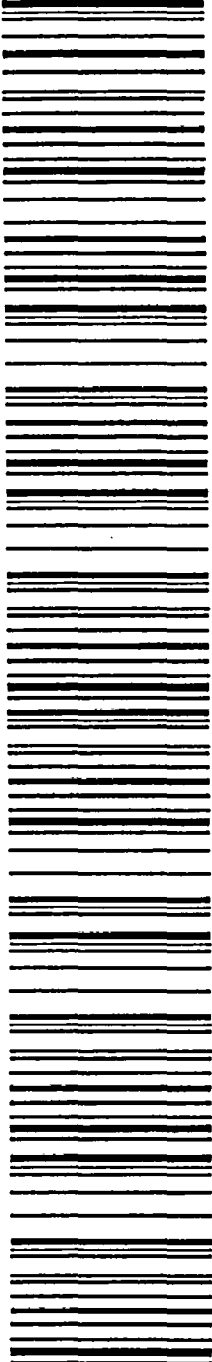
LDWA: RP to identify

Special Instructions: Maximize distance from Rx head during transfer. Avoid "shine" from bottom of reactor vessel head. Only essential personnel in CTMT during Rx head lift as determined by Outage and RP Management.

Foreign debris found within the refueling cavity, or primary systems may be highly radioactive and shall not be handled without RP permission.

- When working in these areas or handling equipment from these areas (such as refueling tools) workers shall monitor at least every two hours.
- Contact RP immediately if, during monitoring of protective clothing, the worker discovers >10,000 cpm above bkg using a frisker or >5 mRem/hr above bkg using an open window beta instrument.
- Contact RP immediately if, during monitoring of skin, personal clothing, or modesty garments any contamination above bkg is discovered.

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**JUST IN TIME BRIEFING  
ACTIVITY MM-8480D3**

Reactor Vessel Head Lift



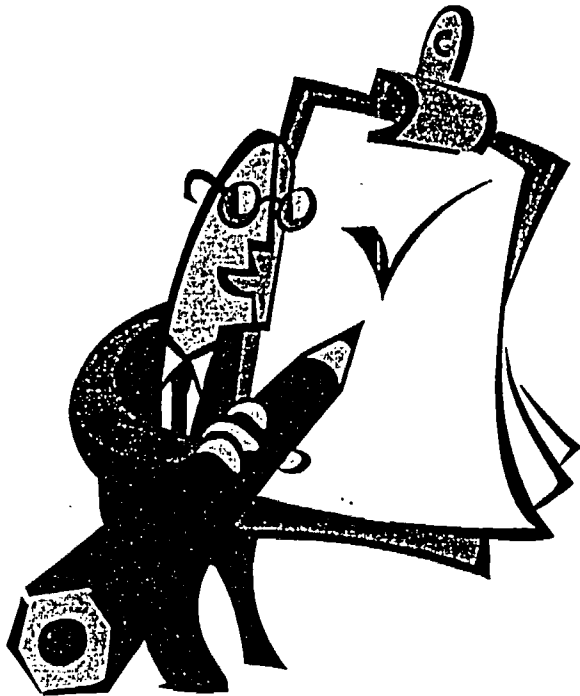
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# AGENDA

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- ◆ Overview of evolution
- ◆ Current conditions
- ◆ Operating experience
- ◆ Management expectations for this evolution
- ◆ Error likely situations
- ◆ Human performance tools
- ◆ Key aspects of the job

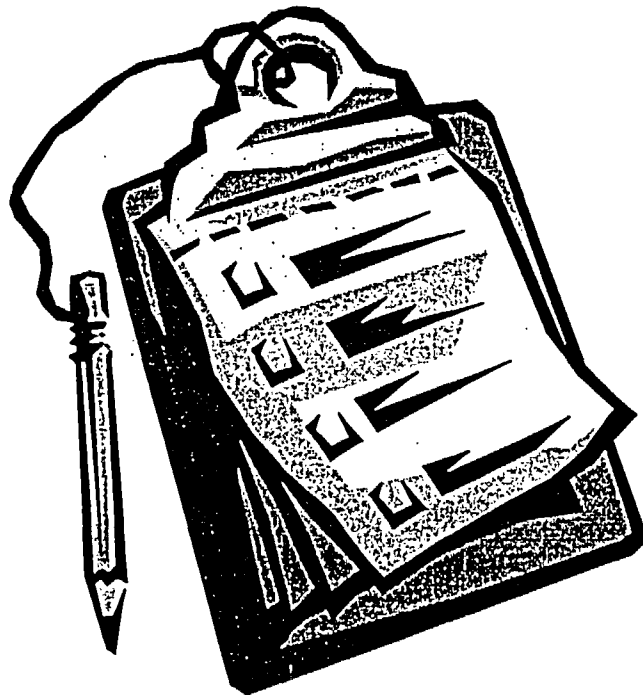
# CURRENT CONDITIONS



- ◆ Required OPS conditions met
- ◆ Rx Head de-tensioned
- ◆ RCP Motor has been moved to the stand
- ◆ Cavity Seal installed
- ◆ Sandbox and Top hat covers checked tight
- ◆ Lift rig inspection complete
- ◆ Lift Rig Installed w/exception of hookup

# OVERVIEW

## Reactor Vessel Head Lift



- ◆ Establish FME Boundary
- ◆ Obtain Permission From Shift Manger
- ◆ Remove Interference from Containment Hatches
- ◆ Perform Head Lift





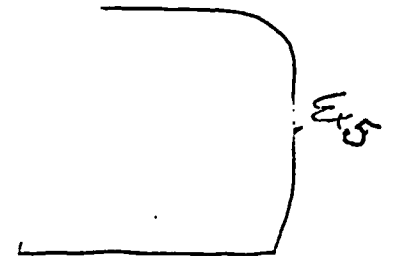
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# OPERATING EXPERIENCE

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**Weaknesses in procedures, verification, communication, and planning have contributed to unanticipated radiation exposure, damage to reactor internal components, and delays in refueling outages**





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# OPERATING EXPERIENCE

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## **OE15463 Oyster Creek - Reactor Vessel Head Became Stuck on Alignment Sleeve during Vessel Head Removal**

- ◆ **The lift was started with the RPV head out-of-level.**
- ◆ **The load was adjusted to compensate for the out-of-level condition by moving the crane trolley.**
- ◆ **This compounded or masked the misalignment and caused binding on the alignment pin.**



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# OPERATING EXPERIENCE

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## **Containment Polar Crane Failure during Reactor Head Inspection -- Reference: OE15887**

- ◆ **On October 3, 2002, when transferring the reactor head into the lower cavity for cleaning, the containment polar crane raise/lower hoist functions failed with the reactor head suspended above the lower cavity floor.**
- ◆ **Subsequent inspections revealed stator to rotor contact within the main hoist drive Magnetorque assembly.**



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# OPERATING EXPERIENCE

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## **Containment Polar Crane Failure during Reactor Head Inspection -- Reference: OE15887**

- ◆ **The Magnetorque assembly was replaced on October 6 and the polar crane was returned to service.**



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# Safety Aspects of the Move

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- Head Weight-174,600 lbs (87 tons) plus lifting rig
- Head lift rig inspection
- Safety Man at Polar Crane power disconnect.
- Polar Crane pre lift inspection
- No part of your body can be under this load!



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# Safety Aspects of the Move

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- What if the person in the cavity has a health emergency? How do we get him out with the head attached to the crane?



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# Safety Aspects of the Move

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- ◆ Radios ready and operational check completed if using them for:
  - Crane operator
  - Lead
  - Cavity person
  - Head laydown area person
  - Crane power switch person *(2 radios for this person)*
- ◆ What do we do if we develop a problem with the Crane?
- ◆ Who is decision maker?



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# Safety Aspects of the Move

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- ◆ What work in containment will be allowed to continue? → All CTMT work stopped during lift.
- ◆ Inspect/remove lay down are for unauthorized personnel prior to head lift
- ◆ Who can monitor lift and where will they be?





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# Safety Aspects of the Move

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- ◆ Hard hat requirements?



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# Safety Aspects of the Move

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- Hand Signals
  - Review hand signals with all personnel involved in the lift.
  - Only one person should be giving the signals.
  - Anyone can give Emergency Stop signal.



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# Safety Aspects of the Move

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- Observers
  - Minimize talking during lift except for personnel directly involved with lift
  - Stay in designated areas
- Qualifications For Maintenance Crew
  - Crane operator must be crane qualified



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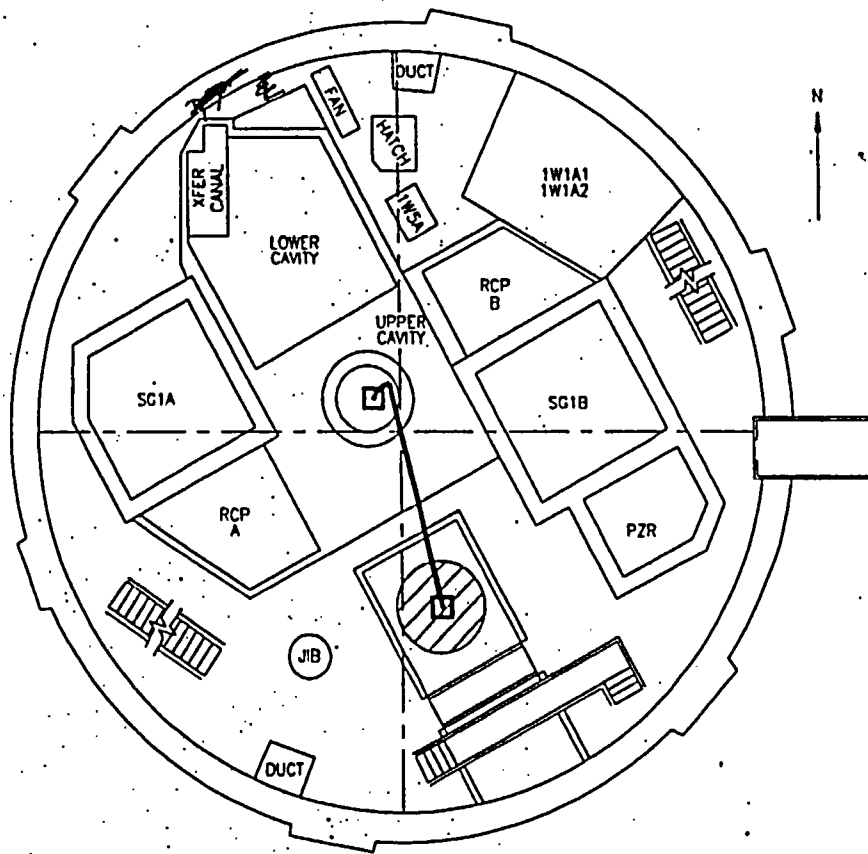
# Safe Load Paths – SLP-1

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## CAUTION

- The movement of heavy loads over the reactor vessel when the head is removed and fuel is in the core is prohibited. The only exceptions are for the PaR device, upper internals, and the reactor vessel head, and the Upper & Lower Vessel Internals Lift Rig.
- Only one person should be giving the signals.
- Anyone can give Emergency Stop signal.
- Per NP 8.4.7, The Crane Operator and a second individual are responsible to understand and follow Safe Load Path and Rigging Program for the particular lift.

# SLP-1 Rx Vessel Head Approved Load Path



REACTOR VESSEL HEAD

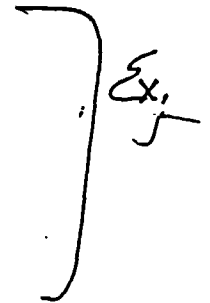


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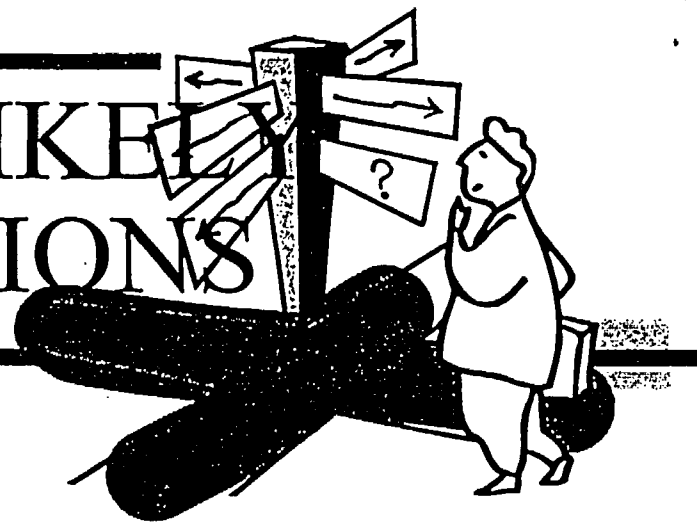
# Management Expectations

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- ◆ Human Performance Tools
- ◆ Stop Work Points
- ◆ Contingencies
- ◆ Communications



# ERROR LIKELY SITUATIONS



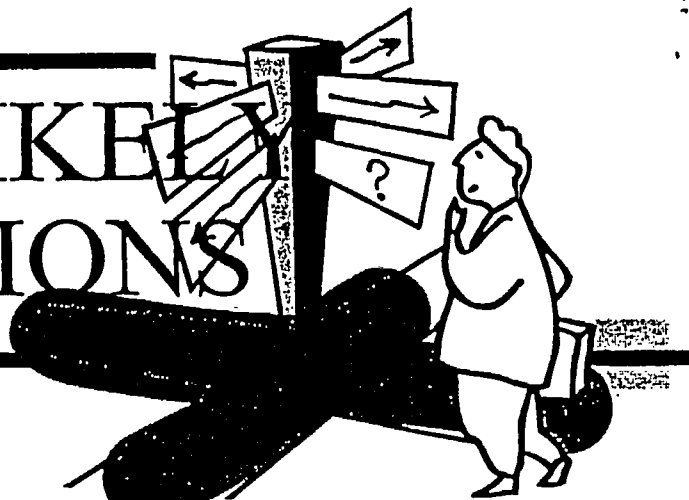
 Knowledge Mode.

Know where you are going and follow the procedure!

If you have to make a quick decision or choice  
– you are in the knowledge mode!

Give a NUC a 50/50 choice and 90% of the  
time he will be wrong.

# ERROR LIKELY SITUATIONS



- ◆ Rigging Safety Issues
  - Failed or damaged rigging equipment
  - Pinch Points
  - Do Not Allow Yourself to get trapped by other structure or object,
  - Load or rigging contact with surrounding equipment
  - Getting under load
- ◆ Straying from Safe Load Path
- ◆ Dose and contamination
- ◆ FME
- ◆ Temp Changes to the procedure
- ◆ What can you think of?

*Pre discussed*

*Regular jobs*

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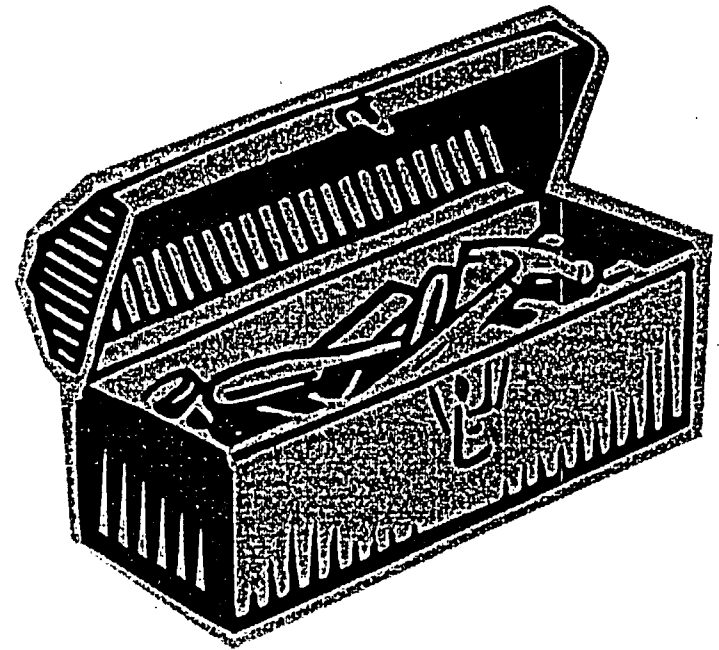
*Ex. 5*



# ERROR REDUCTION TOOLS

## - Time to break open the tool box

- 👉 Two Minute Rule
- 👉 Stop When Unsure
- 👉 Challenge Information
  - 👉 Are you ready checklist
  - 👉 Co-Worker Coaching
  - 👉 Peer Checks
  - 👉 Place Keeping
  - 👉 Procedure Use
  - 👉 STAR
  - 👉 Verbal Communications





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# KEY ASPECTS OF THE JOB

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- ◆ Remove head walkway and zip-lift power cables
- ◆ Disconnect thermocouples
- ◆ Polar crane pre-lift inspection
- ◆ Z-024A <sup>Fuel Transfer Tube</sup> danger tagged shut during heavy load lifts to address potential loss of SFP inventory issues



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# KEY ASPECTS OF THE JOB

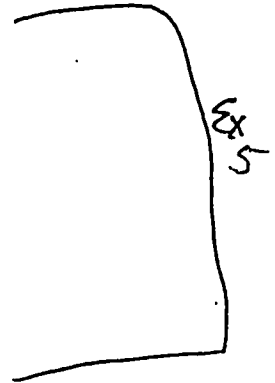
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## Hold Point

- ◆ Permission from Shift Mgmt to remove head
  - Who is the decision maker
- ◆ Ensure one door in each air lock is capable of being closed
- ◆ Crane movement limitations
- ◆ Crane alignment
  - How is it aligned? (*Markings on overhead/trolley.*)

# KEY ASPECTS OF THE JOB

- ◆ Station all lift personnel
  - Crane operator-responsibilities?
  - Cavity watch -responsibilities?
  - Crane disconnect watch -responsibilities?
  - Laydown area watch -responsibilities?
  - Lead -responsibilities?
  - Others as assigned-responsibilities?
  - RP Techs
    - How many and where? 
    - Interactions between RP and The Crane Operator



# KEY ASPECTS OF THE JOB

- ◆ Clear un-necessary personnel from Containment

- What work will be allowed to continue?
- Who will be allowed in containment and where will those who are not directly involved with the head lift be?

- ◆ Verify Safe Load Path clear



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# KEY ASPECTS OF THE JOB

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- ◆ Establish FME Controls
- ◆ Perform Lift
  - Lift head just clear of flange and ensure head is level
  - Lift to 1 ft above RV flange and inspect for head level, no unusual sounds or vibrations, and head oring retainer clips or screws missing
  - Lift head to about 4 ft above RV flange and inspect for head level, no control rod drives with head, and no unusual sounds or vibrations present



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# KEY ASPECTS OF THE JOB

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## Hold Point

- Ensure no change in RP-1A conditions for RV Head removal and RV Head removal conditions complete
- Shift Mgmt permission to complete RV Head removal
- Inspect/remove unauthorized personnel from head lay down area
- Move head via safe load path to lay down area and lower onto support flange



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# KEY ASPECTS OF THE JOB

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- Install thermometer on RV head flange
- Remove cavity ladder and ladder cage sections