Hall C Dump
Cooling Water System Repairs

Reporter: Will Oren

Cast: Facilities, RADCON, EES, Vacuum & Installation, Machine Shop, Mechanical Engineering,

Accelerator Operability, Quality Assurance,

Outside Vendor…..and a cast of many more

What Is the Dump?

What Was Going On??

- I was in and out on travel so I didn't have the whole story
- Records Reviewed
  - RWP
  - ATLis entries
  - Elogs
  - Welding records
  - Installation Group work plans
  - Drawings
  - Interviews

…What Was Going On???

- Original plan was for sight glass removal and level controller installation in the Hall A dump building (plan was well developed with roles & responsibilities defined), ATLis #7348, C. Jones
- Long standing strip charts show increased N2 usage in Hall C dump (1btl/mnth to 2 btls/wk)
- Rick Gonzales pushes resolution of possible leak in Hall C dump. ATLis #7701, numerous e-logs
- Locating leak takes about 1 month, of on & off effort
- “Facilities” finds the leak(s) on Oct 9/10, in hydrogen recombiner welds

Hydrogen Recombiner

Oh My! What Do We Do?

- Repair is time critical, machine startup and ALARA considerations
- Ownership of problem & its resolution is not clear. Complicated by multiple interfaces & areas of expertise.
- Neil Wilson pushes repair effort forward
- Fix is complicated by new welding policies
- Individuals identified, roles & responsibilities defined
- Great effort by many folks with long hours necessary

Lots of Documentation - ATLis #7701

Investigate Hall C Dump for possible N2 leak

comments/History:

10/10/08 16:55 COMMENT ON by S_Suhring:

As work plan is developed, it will be attached.

10/10/08 16:53 COMMENT ON by S_Suhring:

As many of you already knew, the hydrogen recombiner in Bldg 95 has a serious nitrogen leak in one leg of the heater assembly. This afternoon, a leak-check revealed that the other leg also leaks. What are the odds?

In a meeting this afternoon (prior to discovery of the second leak), a plan was agreed to in which a new heater well would be fabricated by the machine shop. The old well is to be removed by cutting the flange weld with an angle grinder, pulling the well out and inserting the new one, which is to be configured with a socket coupling for welding to the outer pipe stub. This arrangement seems to make the most sense from both a materials integrity and radiological control perspective. It will reduce or eliminate the handling and/or modifications necessary to the existing components, which have unknown, but suspected high levels of tritium surface contamination.

Now that the other leg of the assembly is known to be leaking, presumably, a second well will be fabricated, and the repair will be repeated on that leg.

You know what I'm going to ask for next....

Carroll, Neil, Mark, and/or whoever has some part to play in configuring the tank and conducting the work, could you draft a stepwise description of the work for review, and also submit an ATLis? We ask for the same data points on the procedure as with the TMDU level controller - roughly how long each part of the job will take, and how many people are involved. We'll take that and build the RWP from it.

Also, for your information, we made some radiological assessments of the conditions in the building due to the recombiner leaks. We had some concerns that the long-term leakage may have spread contamination to nearby surfaces, or perhaps might be impacting the environmental conditions in the building. We took swipe/swab samples in the heater wells, and found very low levels of tritium, at about 1% of the contamination limit (not an issue). We also took a tritium air sample and found that the airborne activity

Status

Task ID:	**7701**
Task Status:	**OK**
Time Estimate:	**4 Hours**
Required PSS:	**RA**
Risk Classification:	**0**
Priority:	**First Opportunity**
Scheduled:	**10/13/08**
Created:	**08/29/08**
Last Modified:	**10/10/08**
Created By:	**R_Gonzales (x.7198)**
Owned By:	**R_Gonzales (x.7198)**
Created For:	**ENGINEERING**
Responsible:	**R. Gonzales**
Project:	**Other - No Project**
Charge Code:	

PPE Required

Safety Glasses w/side shields
Proper Work Clothes

Systems

EH&S
FACILITY
RADCON

Areas

ENCLOSURE:
- Other

BUILDINGS:
- Dump C (95)

Lots of Documentation - ATLis #7811

Remove & Replace Bldg 95 Dump LCW Exp. Tk Hydrogen Recombiner Heater Wells

comments/History:
Submit this task to JLAB Operating Experience program

11/03/08 04:52 COMPLETED by N_Wilson:

Work completed - Detailed Lessons Learned to follow.

10/17/08 07:15 APPROVED by S_Suhring:

10/16/08 10:45 COMMENT ON by K_Welch:

RWP in preparation. We are prepared to cover the first segment of the job (cutting and removing the wells) on 10/16/08.

10/15/08 16:43 EHS&Q REVIEW by B_May:

10/15/08 15:50 COMMENT ON by N_Wilson:

This is a complex job requiring several groups coordinated efforts. This ATLis is to cove only the portion under the control of the MSINST Group. There should be others to cover the other portions of this project.

10/15/08 15:47 Updated by N_Wilson:

Added attachment_id 2828: Hydrogen Recombiner Work Plan.docx

Hazard Identification Worksheet

✔ Task Hazard Analysis has been reviewed by EHS&Q group.

NO	Do you require familiarization with the work area and its current state? Do you need to perform a pre-job walkdown?
NO	Are there MSDS requirements for the materials being used with which you are unfamilar?
YES	Will you create dust, welding arcs, heat, excessive noise, ionizing/non-ionizing radiation, or chemical mixtures during the tasks? *Heater wells will be cut off using die grinder & cutting wheel. Appropreate PPE will be worn. Supv. Will provide task specific*

Status

Task ID:	7811
Task Status:	DONE
Time Estimate:	5 Days
Required PSS:	NA
Risk Classification:	0
Priority:	Immediat
Scheduled:	
Created:	10/15/08
Last Modified:	11/03/08
Created By:	N_Wilson
Owned By:	N_Wilson
Created For:	ENGINEE
Responsible:	Neil Wilsc Taylor
Project:	Other - Nc
Charge Code:	RSRINS

PPE Required

Safety Glasses w/side s
Gloves
Face Shield
Proper Work Clothes
Ear Protection

Systems

DIAGS
EH&S
INSTALL
FACILITY
RADCON

Areas

ENCLOSURE:
BUILDINGS:
- Dump C (95)

Attachments

Jefferson Lab

Lots of Documentation - RWP

Form : HPF-OSP-002 Revision: 1 Date: 8/1/1995	*JEFFERSON LAB* Radiation Work Permit	Applicable to procedure: HPP-OSP-001 Sheet 1of 4

Serial Number: 08-J015	Start Date: *10/16/2008*	Expiration Date: *10/23/2008*

Work Area/Description of Work:

Building 95 HYDROGEN RECOMBINER REPAIR

Task Description:

1) RadCon to perform surveys and job coverage
2) Facility Management personnel to perform disassembly preparation to include water and Nitrogen isolation After installation of new components, FM will perform necessary leak checks, static checks and start-up of main pump
3) Mechanical installation technicians to perform removal of old heater wells, and preparation and installation of new equipment. This includes grinding, sanding, deburring and welding processes.
4) Certified welding inspector and QA personnel to perform certification of welding joints and visual inspection of leak testing, respectively.
5) Design authority/engineers to oversee and approve work progression and inspections
6) Advex technicians to perform final weld inspection on heater wells an QA approval for tightness test
7) AES personnel to re-install heater assemblies and re-assemble associated hardware
8) Rework to provide clearance for heater well fins. Entries will be made using 8-(x) with x representing the original task association.

Work Area Radiological Conditions:

☒ Radiation Levels:	☒ Contamination Levels:	☐ AirborneLevels:
Maximum5mR/hr	Maximum see other	Maximum_____
Contact N/A*	Location_____	Location_____
Whole Body3mR/hr		

☒ Other: ***Contamination concerns primarily from tritiated water ~10000dpm/100cm²***
****No significant dose rate on contact. Dose associated with job due to resin tanks.***

ALARA Estimate: (whole body dose rate is an estimate of "average" conditions)

58 (Total Man-hours) X .002R/hr(Whole Body Exposure Rate) = ***117.31*** Man-Rem

Training Requirements for Entry on this RWP:

☒Radiation Worker I ☒Radiation Worker II ☐Respirator Qualified

Dosimetry Requirements for Entry:

Jefferson Lab

JSA

Lots of Documentation (RWP)

Form: HPF-OSP-009 Revision: 4 Date: 2/29/08	TJNAF Radiation Control Group Radiological Work Permit Closeout Analysis RWP No. 08-J015	Applicable to procedure: HPP-OSP-001 Page: ____ of _____

Name (please print)	Pre-Work dose estimate (mrem)	Total Net Dosimeter (mrem)	Individual Comments (e.g., type of work)
D. Hamlette	4	1.55	Radiological job coverage
R. Danforth	4	3.15	Radiological job coverage
Ricky Taylor	22.87	7.65	Provide mechanical repairs(grinding, fabrication, and welding)
Genard Alston	22.87	6.9	Provide mechanical repairs(grinding, fabrication, and welding)
M. Sprouse	18	2.78	Provided liquid and N2 isolation, pump down, pressure testing, and restart of system
C. Jones	18	0	Provided liquid and N2 isolation, pump down, pressure testing, and restart of system
Mike Bevins	ND	1.62	Design authority – provided QA and repair oversight
Neil Wilson	23.57	1.42	Provide mechanical repairs(grinding)
Rick Gonzalez	2	.68	Performed leak testing, disassembly of, removal and re-installation of heater wells and H-sensors
Marty Ferenc	2	.27	Provided outside QA/CWI of repairs
David Seidman	ND	1.09	Re-installation of heater wells
George Greenfield	ND	.71	Re-installation of heater wells
Bob Rice	ND	1.48	Assisted in pressure testing, and restart of system.
TOTAL DOSE	117.31	29.4	

Lessons Learned/Suggested Improvements/Comparison of totals from previous job (if applicable):

The Hydrogen-recombiner repair was unexpected and a potential "show-stopper", however great effort went into planning this job to ensure that all facets of this repair were discussed, evaluated, reviewed and documented with ALARA practices receiving the highest priority. Several different groups provided input to establish a working procedure, complete with manpower requirements and time estimates. The dose estimates proved to be over-estimated, however, after performing what was thought to be the completion of repairs, the Design authority (engineer) requested that we re-open the system to verify the proximity of two critical components(heater well fins) . The mechanical installation technicians were able to provide copies of pictures from

Lots of Documentation - Installation Work Plan

Hydrogen Recombiner Repair Work Plan MSINST's Portion

1) Review & Sign RWP for work.
2) Prefab new hydrogen recombiner heater wells in Bldg 59 as per supplied drawings and weld spec's.

Prerequisites: -

a) Ensure all required documentation for material & welding is accepted & approved by the Design Authority and QC prior to starting any welding.
b) Any hold points must be identified before fabrication starts.
c) Weld procedure identified & welders cert's verified by QC.

3) Cut out existing defective parts. See Attached photo's for details.

a) Cover area under hydrogen recombiner where grinding will occur with fire cloth.
b) Write & have approved "Hot work permit"
c) Using right angle air grinder with thin cutting wheel cut just behind the weld as indicated on attached photo. Take care not to cut into the inner tube.

RADCON Note: Contamination levels inside the tube appear to be low, however, there are inaccessible surfaces that could have higher levels. The grinding operation is not expected to remove or spread any significant quantity of contamination due to natural containment provided by the tube configuration. Also as the cut is made, tape will be applied to the breached portion to further seal the opening. Given expected surface contamination levels and degree of disturbance, airborne radioactivity is not expected, however a tritium air sample will be taken.

d) When cut is complete slide out the heater well. There is a tab welded inside which prevents the well rotating and act as a deflector.

RADCON Note: The well is to be placed directly in a plastic bag and sealed. The wells will be retained for subsequent inspection.

e) Once the heater well is removed dress up the cut edge and deburr. Using a flapper wheel clean the outer surface where new weld will be performed.

RADCON Note: Use a non-aggressive dressing method if possible. When using power/air tools, the inner portion of the pipe should be contained. This can be accomplished by taping a plastic bag to the inside of the pipe, just inside the edge.

4) Repeat step 2) on second heater well.
5) Install new heater well taking care to ensure a fin is aligned in the tabs slot.
6) Push the new heater well so that the outer pipe is fully engaged in the weld socket, mark and pull back ~ 1/16" to 1/8". Tack weld in position.

Note: - Possible hold point for QC Inspection.

7) Weld out joint as per specified procedure.
8) **Note: - Possible hold point for QC Inspection after root weld is performed. This needs to be clarified.**
9) Final weld inspection by QC.
10) Repeat step 4) through 8) on second heater well.

Notes: -

Oops, We Forgot Something!

- Design Authority has a 3:00 A.M. “Oh oh….I forgot something” moment
  - Clearance for thermal expansion was not allowed for (Could be root cause of initial failure)
  - Rework plan is formulated & executed over the weekend
  - Required welding program is followed

Lessons Learned/Observations

- Great effort by all involved – wonderful individual initiative shown by our workforce
- Work planning & execution documentation was good
- Coordination meetings when multiple groups involved are critical
- Pressure Systems & Welding Programs can be used efficiently
- Some drawings are outdated

Lessons Learned/Observations

- Work in difficult areas shouldn't wait until the last moment – ALARA issues are a concern
- Analysis of a failure is as important as the fix
- Roles & responsibilities must be defined (Guiding Principle #2)
- This relates to the question of ownership

Lessons Learned/Observations

- Lack of clear ownership designation is a management failure
- What to do?
  - If you find yourself involved in a complex project where roles/responsibilities/ownership is in question, do not hesitate to let management know. (Steve/Will/Arne…,)
  - We need your help to know where we are failing!!