DOE-FIU SCIENCE & TECHNOLOGY WORKFORCE DEVELOPMENT PROGRAM

STUDENT SUMMER INTERNSHIP TECHNICAL REPORT

June 6, 2011 to August 12, 2011

Electrical Upgrades for Hanford Supporting Facilities

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Prepared for:

U.S. Department of Energy
Office of Environmental Management
Under Grant No. DE-EM0000598

ABSTRACT

During this internship at the Hanford Site, various tasks were completed in order to assist the In-House Engineering Design Group for Washington River Protection Solutions (WRPS). These tasks were composed of various facility upgrades that were essential to the safety and continued operation of the Hanford Site. Some of these upgrades were the HVAC unit on the 2750E building as well as electrical upgrades to the dining facility in the same building. These upgrades included tasks such as power draw calculations, hardware mount designs, panel board schedules, breakers for circuit protection, and creating engineering change notices (ECNs) in order to document the planned upgrades. Another facility upgrade was for the leak detectors in the tank farms which required research of specific sensors and relays as well as reviewing old drawings and ECNs in order to determine the current status of the sensors. At the end, the designs and plans would go into effect and the upgrade would be completed in a safe and efficient manner.

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1. INTRODUCTION

In 1943, as part of the Manhattan Project, the U.S. government built the Hanford Site. It eventually included nine nuclear reactors as well as various supporting and processing facilities. The reactors, as well as the other facilities, were used to produce plutonium, which was used for the manufacturing of atomic weapons for WWII as well as the cold war. The reactors at Hanford produced plutonium from 1944-1987. The many years of plutonium production produced a huge amount of radioactive waste which was stored in various underground tanks. Today, there are about 53 million gallons of waste at the Hanford Site and the Department of Energy is working to contain and dispose of this waste in an environmentally safe way. Facilities have been put in place to monitor and dispose of the waste as well as address other issues onsite. Some of these facilities are aging and are in need of upgrades in order to ensure their continued safe operation. Figure 1 shows the initial construction of the Hanford tanks while Figure 2 shows the completed reactors in full operation.

Figure 1. Initial construction of Hanford tanks.

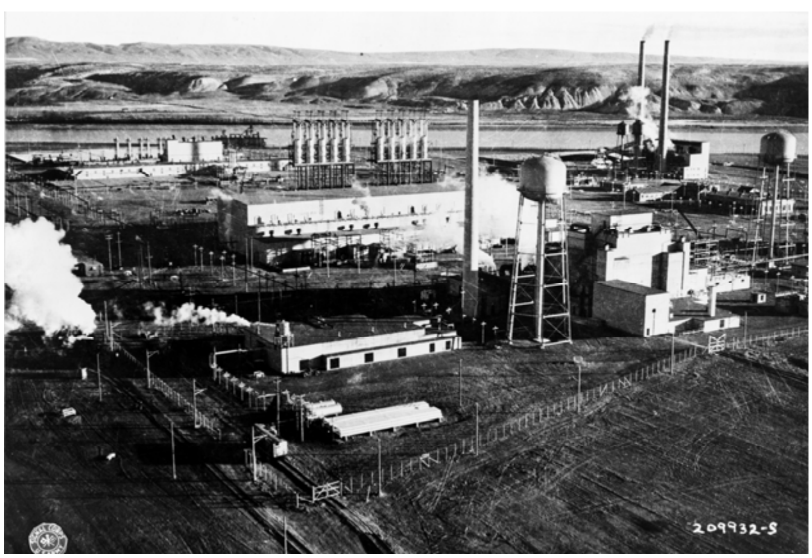

Figure 2. Reactors in full operation.

2. EXECUTIVE SUMMARY

This research work has been supported by the DOE-FIU Science & Technology Workforce Initiative, an innovative program developed by the US Department of Energy's Environmental Management (DOE-EM) and Florida International University's Applied Research Center (FIU-ARC). During the summer of 2011, a DOE Fellow intern (Mr. Janty Ghazi) spent 10 weeks doing a summer internship at the Hanford Site under the supervision and guidance of Rob Gurnick. The intern's project was initiated in June 6, 2011, and continued through August 12, 2011, with the objective of assisting with the various electrical engineering tasks in support of various facilities at Hanford.

3. RESEARCH DESCRIPTIONS

For my internship, I was assigned to the In-House Engineering Group under the management of John Huber and the mentorship of Rob Gurnick. Throughout the summer, I assisted with various electrical tasks that were assigned to this group. These included an upgrade to the HVAC unit on the 2750E building. Figure 3 shows the existing HVAC unit.

Figure 3. Existing HVAC unit on 2750E Building.

For this task, I completed field activities such as taking measurements of the dimensions of the various ducts as well as locations of conduits. I also reviewed old drawings and schematics of the building in order to determine the wire allocations. I contacted the manufacturers of the various components in order to determine exact specifications and power draws for the electrical power draw calculations. These were then used in order to determine what panel would be used to supply power to the various components and to determine the necessary breakers for circuit protection. I was further assigned the tasks of constructing mounts for the various enclosures and designing the conduits to run the wiring. Figure 4 shows the design for the control mounts for the HVAC unit and Figure 5 shows the cut-off switch.

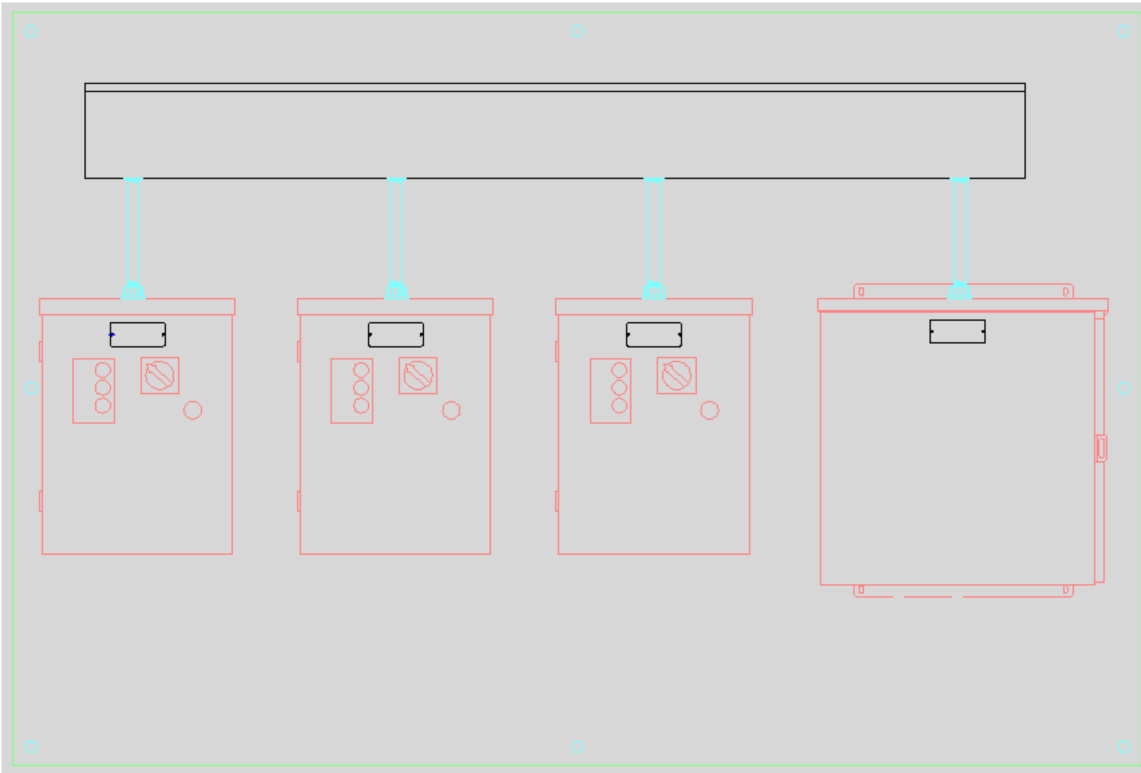

Figure 4. Design for control mounts for HVAC unit.

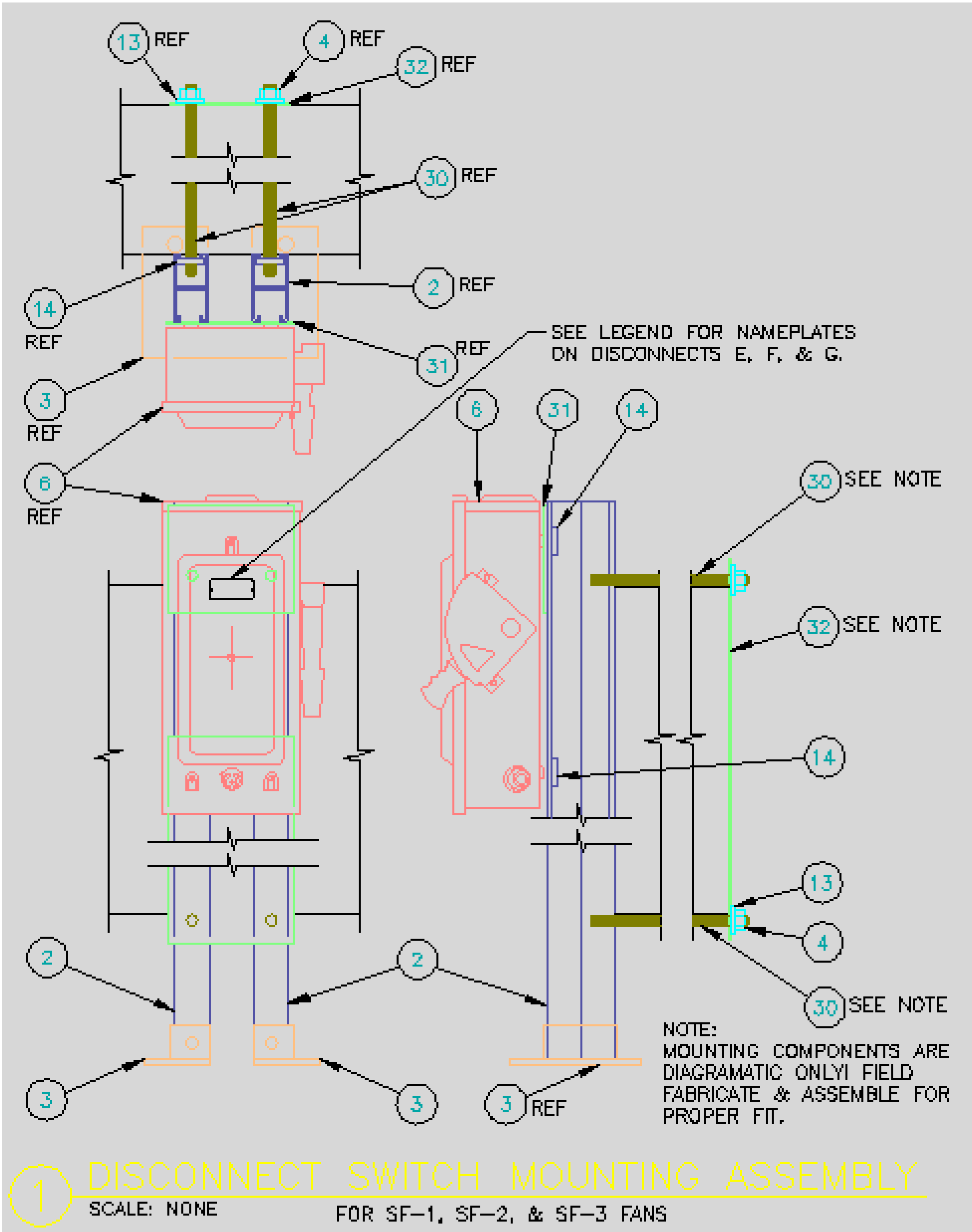

Figure 5. Cut-off switch for HVAC unit.

There were certain constraints on the conduit type as well as the enclosures because they were going to be mounted on the roof of the building where they would be exposed to the elements. Figure 6 shows the design for the conduit routing and Table 1 provides the parts list for the HVAC upgrade.

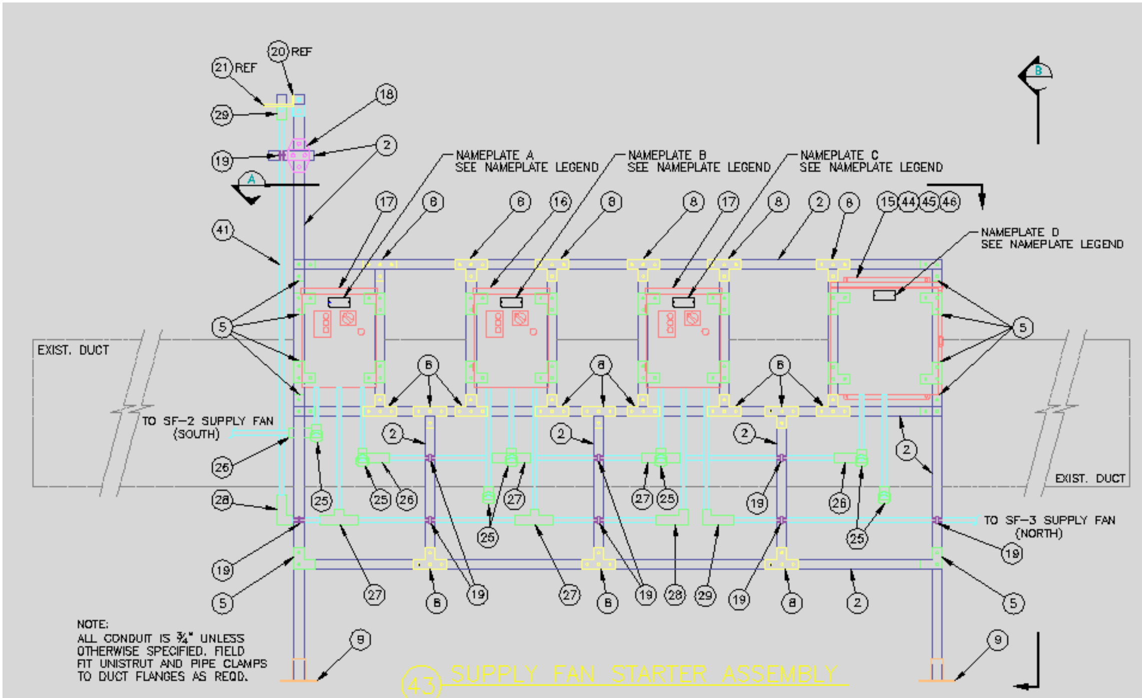

Figure 6. Design for conduit routing on HVAC unit.

Another task that I worked on was the electrical upgrades to the dining facilities in the 2750E building. There was a plan in place to increase the number of workers stationed in the building and so there was consequently an increased demand on the dining facilities. The plan called for the addition of several microwaves, refrigerators, ovens, and slow-cookers. Each of these needed to be on an individual circuit with a dedicated breaker. In order to accommodate this, a new breaker panel needed to be installed. I was set to the task of determining the total power draw for the new panel based on the various appliances to be added. I also determined the proper breakers to be used in the new panel for each of the loads and created an engineering change notice, which included panel board layouts, in order to submit the proposed changes for the building. Figure 7 shows the existing panel from which power will be drawn.

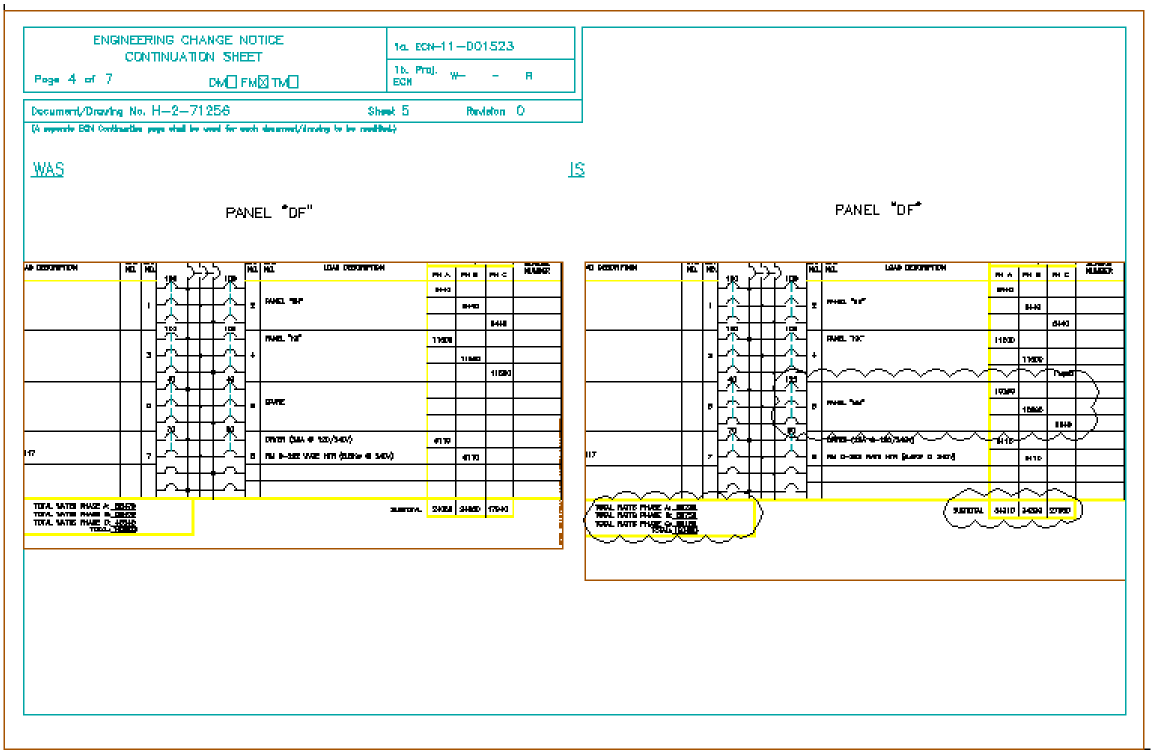

Figure 7. Existing panel from which power will be drawn.

The final task I worked on was the upgrades to the leak detectors on the tank farms. After so many years, the leak detectors need to be retrofitted with more advanced and reliable technologies. New sensors and relays were proposed and I was given the task of looking up all the old related engineering drawings as well as any change notices against the drawings in order to determine the most current status of the leak detectors. I then began to contact manufacturers in order to research possible new sensors and relays.

4. RESULTS AND ANALYSIS

After the completion of the various calculations for each of the upgrade tasks, the design was submitted to a drafter who added details and symbols to the drawings and compiled an engineering change notice which included all of the drawings, a materials list, and a specification for all of the wires, conduits, supports, etc. The completed ECN was then sent to the drafting manager for initial approval of the drawing to make sure they complied with the Hanford drafting standards. They were then sent to the respective managers for safety and budget approvals. Once approved, the materials would be acquired and field workers would begin work on turning the drawings and drafts into reality. Some of the specific tasks I completed were the panel board schedules for the kitchen upgrade shown in Figure 8 .Also I put together some WAS-IS drawings, which are drawings that depict a change to a previously existing design shown in Figure 9. Figure 10 shows the ECN drawing for the leak detector upgrades. Finally Table one shows the materials list for the HVAC system upgrade.

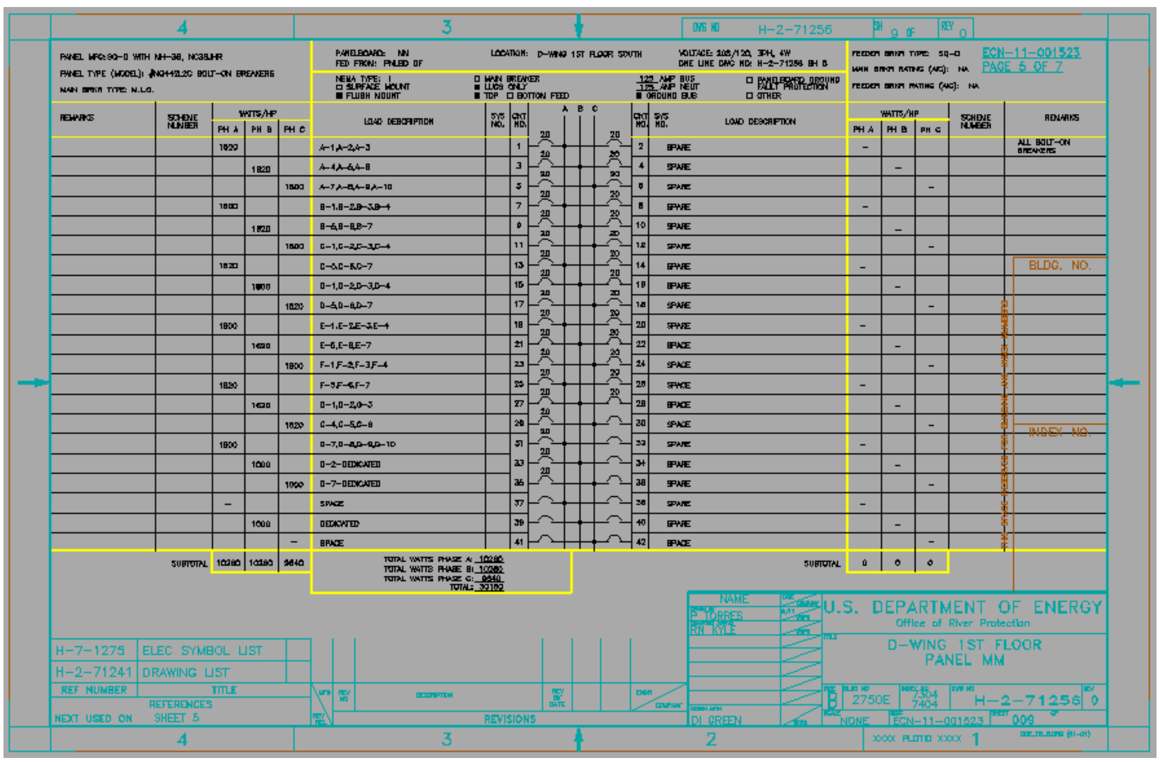

Figure 8. Panel schedule for proposed upgrade.

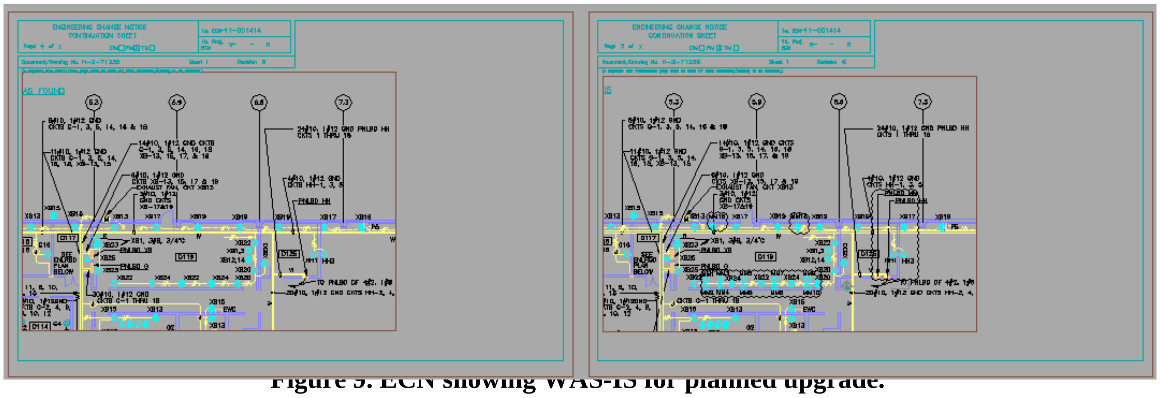

Figure 9. ECN showing WAS-13 for planned upgrade.

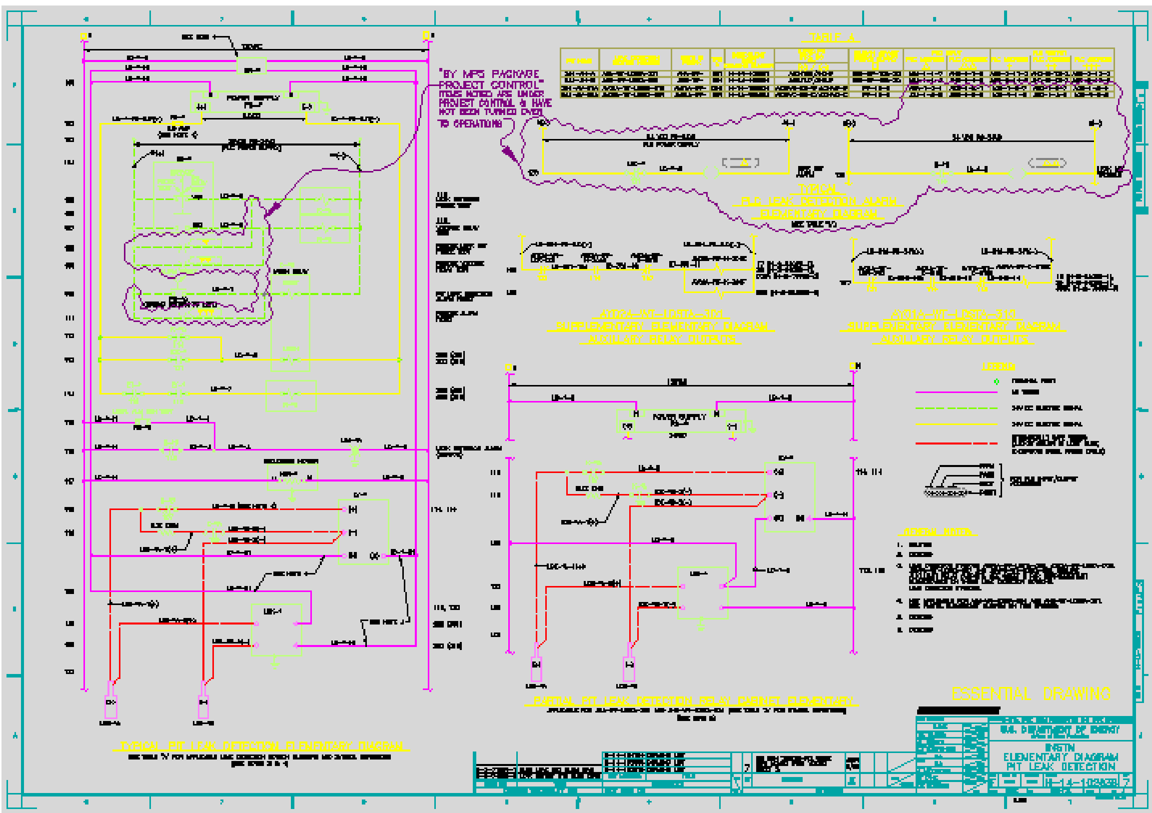

Figure 10. ECN drawing for leak detector upgrades.

Table 1. Parts List for HVAC Upgrade

Part #	Item Description	Length	Quantity	Page #	Finish	Drawing Number
B22SHA	Double-sided Channel			41	Zn	1
B140	Three Hole Corner Plate		16	62	Zn	9
B133	Four Hole Tee Plate		8	62	Zn	12
3/8"x3/4"HCCS	Hex Head Cap Screw		12	53	Zn	
3/8"x1"HCCS	Hex Head Cap Screw		80	53	Zn	
3/8"x1 1/4"HCCS	Hex Head Cap Screw		12	53	Zn	
3/8"LW	Lock Washer		12	55	Zn	
N228	3/8-16 Spring Nut for B22 Channel		68	47	Zn	
B281MSQ	Base for B22 (four hole)		2	86	Zn	13
B281AFL	Base for B22 (two hole)		6	85	Zn	2
B22SHA	Double-sided Channel			22	Zn	1
B140	Three Hole Corner Plate		3	62	Zn	9
B129	Two hole splice plate		3	61	Zn	10
3/8"LW	Lock Washer			55	Zn	
N228	3/8-16 Spring Nut for B22 Channel			47	Zn	
3/8"x1"HCCS	Hex Head Cap Screw			53	Zn	
B365	67.5 deg closed angle plate		4	71	Zn	6
B330	67.5 deg open angle plate (short)		4	70	Zn	4
B163	22.5 deg open angle plate		4	70	Zn	5
B251	67.5 deg open angle plate (long)		4	70	Zn	3
B521	90 deg angle		4	70	Zn	7
BHR1250ZN	All-Thread		6	56	Zn	8
B22	Channel			22	Zn	11

5. CONCLUSION

The conclusion of all this summer's work is the completion of upgrades to the facilities based on the engineering designs produced. With all the engineering change notices approved and completed, they were then sent to the field workers who implemented the changes based on the designs and using the materials ordered from the parts lists. The upgrades to the different facilities were implemented in a safe and timely manner. Figures 11, 12 and 13 show the completed control enclosures and upgraded electrical panel.

The upgrades to the deteriorating systems in the aging facilities can now allow the Hanford Site to continue to operate even while accounting for the increased work load. The work being done at the In-house Engineering Group is essential to the upkeep of the Hanford Site as well as for the containment and proper disposal of the waste.

Figure 11. Control enclosures after being assembled.

Figure 12. Side view of control enclosures.

Figure 13. Electrical panel for upgrade.

6. REFERENCES

Hanford Site Electrical Safety Program (HSESP).

Electrical reference drawings:

H-6-14990-1.dwg (Sht 1, Rev 0)
H-6-14990-2.dwg (Sht 2, Rev 0)