PALO VERDE
NUCLEAR GENERATING STATION

Plant Welders

Classroom Lesson

Plant Welders	**Date: 9/16/2011 2:38:06 PM**
LP Number: NMW15C000103	**Rev Author: DAVID J. EVANS**
Title: Site Welding safety	**Technical Review:** Jordan, Fred L(Z54794) Digitally signed by Jordan, Fred L(Z54794) DN: cn=Jordan, Fred L(Z54794) Date: 2011.09.23 13:52:30 -07'00'
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INITIATING DOCUMENTS

Task Analysis of Welder Task List

REQUIRED TOPICS

None

CONTENT REFERENCES

OSHA 1910.252 Q Welding and Brazing

PVNGS Safety Manual

Palo Verde Standards & Expectations

OSHA/Training and Outreach Materials/Welding Health Hazards

OE23722 Hand held torch caught fire

OE26347 Fire blanket used for slag containment

OE32263 An Aerosol Can can in contact with a power connection

OE30188 Acetylene form a hose leak ignited

REVISION COMMENTS

Sep 16, 2011	Dave Evans	Record created

Tasks and Topics Covered

The following tasks are covered in Site Welding safety :

Task or Topic Number*	Task Statement
Lesson:	Site Welding safety
OAPA005	Cut Metal using a track
OAPA003	Use Plama Arc Equipment
TDIA001	Perform welding operations on turbine diaphragms
OAPA002	Perform Non-Certified Brazing
OAPA001	Perform Oxy-Acetylene Cutting
OAPA004	Store welding, cutting, and shielding gas cylinders
CTCA001	Use carbon air arc equipment
TWLD001	Perform tubing welding
WFPP001	Prepare joints for pipe welding
WPST003	Prepare Joints for Structural Welding
WPST004	Cut out an existing structural weld using a grinder
WFPP005	Cut out an existing pipe weld using a grinder
MIGW001	Perform MIG welding
PWLD001	Perform butt-weld on piping
SMAW001	Perform certified arc welding
SMAW002	Perform carbon plate welding
PWLD002	Perform piping socket welding
MDIA002	Reweld manway diaphragms
GTAW001	Perform certified heli-arc (TIG, e.g.) welding
MDIA001	Cut manway diaphragms
PSHG003	Remove and Install pipe support and hanger restraints (welded)
PSHG005	Rework pipe supports or hangers
PSHG004	Fabricate or modify pipe supports or hangers

Total task or topics: 23

TERMINAL OBJECTIVE:

1 When required to perform welding, brazing, soldering, or cutting operations, , the maintenance Technician will be able to safely operate the applicable equipment, as demonstrated by passing a written Exam with a minimum grade of 80% correct.

1.1 **01** Discuss Welding Health Hazards

1.2 **02** State precautions for hot work in confined spaces.

1.3 **03** Identify requirements for the storage and handling of fuel gas cylinders.

1.4 **04** Discuss the Eye and face protection requirements.

1.5 **05** Discuss the Health hazards associated with Chrome VI.

1.6 **06 Discuss** OE23722 - Turkey Point--Hand held torch caught on fire while in use.

1.7 **07 Discuss** OE26347 Fire Blanket Used for Slag Containment Caught on Fire.

1.8 **08 Discuss** OE32263 - During Welding, an Aerosol Can Came in Contact With a Welding Lead Resulting in a Small Fire (FitzPatrick)

1.9 **09 Discuss** OE30188 Acetylene from a Hose Leak Ignited under a Fire Blanket

1.10 10 Discuss OE 23497-Vendor employee received second degree burn when coveralls caught fire while using cutting torch

1.11 11 Discuss Routing Electrical cords and Hoses

TO: 1 When required to perform welding, brazing, soldering, or cutting operations, , the maintenance Technician will be able to safely operate the applicable equipment, as demonstrated by passing a written Exam with a minimum grade of 80% correct.

EO: 1.1 01 Discuss Welding Health Hazards

CONTENT **Methods and Activities**

EO01 Welding Health Hazards

A.

Small particulate, less than 1 micro meter

Particles in the size range of 10 to 100 micrometers are also on the large end of the particle size scale of interest in the field of air pollution.

A 10-micrometer particle could not be seen if it had been included in Figure 1; it is simply too small to see.

Particulate varies with welding process or metals welded.

B.

May cause Metal Fume Fever

When you breathe in fumes from chemicals such as zinc oxide (ZnO) or magnesium oxide (MgO), which are themselves created by heating or welding certain metals, particularly galvanized steel

CONTENT **Methods and Activities**

C.

Measures to reduce risk or fumes:

1) Respiratory Protection
2) Ventilation
3) The use of a smoke extractor

D.

Chemical Agents:

1) Ozone
2) Carbon Monoxide
3) Nitrogen Oxides

1)

Ozone is produced by the light from the welding arc.

2)

Carbon Monoxide is a gas usually formed by the incomplete combustion of various fuels. Welding and cutting may produce significant amounts of carbon monoxide. In addition, welding operations that use carbon dioxide as the inert gas shield may produce hazardous concentrations of carbon monoxide in poorly ventilated areas.

3)

Nitrogen Oxides are produced by the ultraviolet light of arc in the welding process.

E.

Physical Agents:

1) Ultraviolet Radiation
2) Infrared Radiation
3) Intense Visible Light
4) Heat

CONTENT **Methods and Activities**

1)

Ultraviolet Radiation (UV)is generated by the arc in the welding process. UV exposure can result in severe burns in many cases without prior warning. UV radiation can also damage the lens of the eye. Many welders are aware of the condition known as "arc-eye," a sensation of sand in the eyes. This condition is caused by excessive eye exposure to UV.

2)

Infrared Radiation (IR) is produced by the weld arc and other flame cutting equipment may heat the skin surface and the tissues immediately below the surface. Except for this effect, which can progress to thermal burns in some situations, infrared radiation is not dangerous to welders. Most welders protect themselves from IR (and UV) with a welding hood (or glasses) and protective clothing.

3)

Intense Visable Light:

Exposure of the human eye to intense visible light can produce adaptation, pupillary reflex, and shading of the eyes. Such actions are protective mechanisms to prevent excessive light from being focused on the retina. In the arc welding process, eye exposure to intense visible light is prevented for the most part by the welder's helmet.

4)

Heat from the material being welded or cut on presents a Hazard during the welding process, and continues to be a hazard for a while after welding. The weld Electrode after the welding has stopped can be a hazard. Slag has been a contributor of burns either from falling from an elevated area or from placing a body part directly on slag.

EO01 Welding Health Hazards (cont.)

F.

Reduce Injuries associated with welding by Wearing The Proper PPE and clothing.

1) Wear cotton Clothing.
2) Wearing long sleeves shirts.
3) Avoid wearing synthetic materials.
4) Beware of pockets that can catch sparks.

G.

We use two types of smoke extraction in the shop and in the field

1) Fixed and Mobile

EO: 1.2 02 State precautions for hot work in confined spaces.

CONTENT	Methods and Activities
EO02 State precautions for hot work in confined spaces.	

CONTENT **Methods and Activities**

A.

Welding in a confined space

1. Before welding in a confined space, see 01DP- OIS12, confined space entry and 14DP-OFP36, hot work permit.

2. A cylinder or welding power source used in a confined space shall be placed and secured on the outside of the space where work is being performed.

3. The atmosphere in a confined space shall be tested with an approved device prior to an entry and continually while work is being performed, if practical.

4. If forced ventilation is not practical, welders shall wear air supplied hoods or SCBS's in the confined space. Exhaust ventilation at the welding point to reduce welding fumes shall be used where practicable.

5. Non-sparking tools shall be used if there is a possibility of an explosive atmosphere.

6. When safety harness and lifelines are used, they shall be so attached to the welder's body so that their body cannot be jammed in a small exit opening.

B.

Prior to Using Oxygen / Acetylene:

1. To lessen the possibility of having a leaking hose while performing work in a Confined space, the following checks **Shall** be Performed.

   A. Gas hoses and fittings shall be checked using a pressure drop test after assembly to ensure there is no leakage at any point between the supply and the torch.
   B. If a drop in pressure is noticed, then snoop each connection to find the leak.

EO: 1.3 03 Identify requirements for the storage and handling of fuel gas cylinders.

CONTENT ***Methods and Activities***

EO03: Identify requirements for the storage and handling of fuel gas cylinders.

1. ***Storage Of Cylinders****:*

   A. *Store cylinders upright and secure them with a chain, strap, or cable to a stationary building support or to a cylinder cart to prevent them from tipping over or falling.*

   B. *Completely close the valves, and keep the protection devices, such as caps or guards, securely in place.*

   C. *Store cylinders in a dry, well-ventilated area at least 20 feet from combustible materials. Do not keep cylinders in lockers. If they leak, buildup of gases can occur inside the locker.*

   D. *Mark the storage area with proper precautionary signs, such as flammable, oxidizer, or toxic.*

   E. *Place them in a location where they will not be subject to mechanical or physical damage, heat, or electrical circuits to prevent possible explosion or fire. keep cylinders away from Vehicle traffic.*

   F. *Store empty cylinders separate from full ones.*

   G. *Keep oxygen cylinders 20 feet away from fuel-gas cylinders, such as acetylene, or separate them with a non-combustible barrier (such as a wall) at least 5 feet high with a fire-resistant rating of at least one-half hour.*

CONTENT ***Methods and Activities***

EO03: (cont.)

2. ***How to transport cylinders****:*

A. *Most accidents or injuries involving cylinders happen when moving or handling the gas cylinders.*

B. *Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders to avoid personal injury and cylinder damage.*

C. *Wear protective footwear, safety glasses, and heavy gloves.*

D. *Securely install the Valve protection devices, such as caps and guards.*

E. *Secure cylinders upright to a proper hand truck or cylinder cart designed for the purpose.*

F. *Don't drag or roll the- use a properly designed cart or hand truck.*

G. *When using a crane, be sure to use proper cradles, nets, boats, or special platforms designed for this purpose to prevent cylinders from falling.*

H. *Do not lift by the protective cap/guard or use magnets or slings to lift or move them since valves may be damaged or sheared off.*

I. *While compressed gas cylinders are not in use, they shall be properly secured in an approved cylinder cart with the protective cap installed.*

3. ***How to use Cylinders****:*

   A. *Keep cylinders upright and away from heat, sparks, fire, physical damage, or electrical circuits to avoid rupture.*

   B. *Use in a well-ventilated area to avoid gas accumulation.*

   C. *Do not bring cylinders into a confined space to avoid inhaling the gas and possible suffocation from the accumulation of flammable, toxic, or reactive gases.*

   D. *Read, understand, and follow all cylinder markings and labels to avoid misuse.*

   E. *Before connecting a regulator, stand to one side, and momentarily open the valve and then close it immediately. This procedure, called "cracking" the valve, is done to clear the valve of dust or dirt that could enter the regulator.*

   F. *Open Valves slowly by hand to avoid gauge damage. If a specific tool is required to open the valve, leave it in position so that the flow of gas can be stopped quickly in an emergency.*

   G. *Lift and move cylinders properly.*

   H. *Close the gas cylinder valves when not in use such as during breaks, lunch, or end of shift to avoid leaks.*

   I. *Avoid getting oil or grease on the gas cylinders or the regulators, particularly oxygen, to avoid fire or explosion.*

   J. *Storage is not required for single cylinders of fuel gas and oxygen ready for use with regulators attached, and secured to a proper cart.*

   K. *Compressed gas cylinders containing, whether full or empty, shall not be stored in Direct sunlight when ambient temperatures exceed 104 degrees Fahrenheit or in areas above 125 degrees Fahrenheit under any circumstances.*

EO: 1.4 04 Discuss the Eye and face protection requirements.

CONTENT **Methods and Activities**

EO04: Eye and face protection requirements.

II. **Article 3 Eye and Face Protection:**

A. Individuals shall use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

B. Those individuals who wear prescription lenses while engaged in operations that involve eye hazards shall wear eye protection that incorporates the prescription in its design, or wear ANSI approved eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.

2. **Combination Face And Eye Protection**

CONTENT **Methods and Activities**

EO04: Eye and face protection requirements.

A. Full cover goggles with face shields shall be worn

When an employee is engaged in or exposed to the following work activities.

1. While power chipping masonry, concrete, paint, pipe coatings or metal or metal welding slag.
2. Power grinding, buffing or wire brushing.
3. Hand drilling, sanding or sawing of overhead object.
4. Use of powered tools such as saws, sanders, jackhammers and other tools that create flying projectiles.
5. When using compressed air for cleaning purposes.
6. Pouring hot lead, hot compounds or the use of other hot or injurious substances
7. Thermite (Cadweld) type welding.
8. Flying particles caused by other work men.
9. At the direction of a leader.

Note: Any deviation from the combination Face and Eye protection requirements must have a Variance.

EO: 1.5 05 Discuss the Health hazards associated with Chrome VI.

CONTENT **Methods and Activities**

EO05: Health Hazards associated with chrome VI

III. Chronic overexposure to chrome (VI), also known as Hexavalent chrome or chrome +6, has been determined to be a potential cancer hazard. In order to protect personnel from potential exposure while complying with federal /state safety requirements, these guidelines have been developed.

A. Prior to performing tasks which could result in exposure to chrome (VI), personnel shall be given training in the potential hazards, health effects and protective measures relating to chrome (VI).

B. This training can be fulfilled through the computer based training(CBT) course NGH-34. NON-utility employees whose company provides equivalent training may use that training to meet the requirements of this paragraph.

Chrome (VI)is present at PVNGS primarily in the form of an alloy in various metals such as stainless steel or Inconel. The tasks of concern are torch cutting or SMAW (stick welding) when the chrome content is 10.5% or higher.

C. When performing these tasks on these materials there are two forms of protection.

1. Use of a HEPA filtered fume extractor. Use of this equipment will effectively remove all welding fume particulate, including chrome (VI), alleviating the need for further protective measures.

NOTE: A Fan or air mover is not considered acceptable.

CONTENT	Methods and Activities

C. (continued)

2. Establishment of a regulated area. This consists of using red "Danger" tape to demarcate the area. The barricade must be established at least six-feet from the point where the task is taking place.

The barricade must be labeled with a sign reading; "Danger-Chrome VI Hazard. Do Not Cross Without Authorization". The person designated as the fire watch may be responsible for control of the regulated area.

All personnel in the regulated area must wear appropriate respiratory protection while the task is being performed. This would be a minimum of a half-face negative pressure respirator with HEPA cartridges.

Respiratory protection is not required within the regulated area when the task itself (i.e., welding) is not being performed.

EO: 1.6 06 Discuss OE23722 - Turkey Point--Hand held torch caught on fire while in use.

CONTENT	Methods and Activities

EO06: OE23722-Turkey Point--Hand held torch caught on fire while in use

IV. Event Summary:

A. During Preheating in preparation for a welding activity a hand held torch being used for task performance ignited. The fire was quickly extinguished by the posted fire watch, no injuries occurred.

CONTENT **Methods and Activities**

B. Description:

During performance of a work activity to repair a pinhole leak discovered on a valve, a hand held heating torch flared up. The welder was using the torch to preheat the weld area with the torch in his right hand and the source bottle in the left hand. The bottle was being held approximately waist level at about a sixty degree angle. It was noticed that the bottle was leaking gas from the top of the regulator valve and that some liquid or gas was coming from the base of the valve handle. The welder turned the valve upright and reached to shut the valve with his right hand. The torch came into proximity of the gas leaking from the bottle and ignited it. The welder dropped the bottle to the ground where the fire watch extinguished the fire using the portable fire extinguisher. Fire Protection and Control Room personnel were notified. The welder and the fire watch person were both uninjured, no other personnel were affected.

C. Causes:

On the spot investigation, found that the bottle was held in a horizontal direction. This may have caused the internals of the cylinder valve to allow the liquid to leak out. The pressure regulator appears to have failed or the seal may have frozen. The bottle instructions state that if the torch flares up or sputters return the bottle upright and turn off the torch. Subsequent investigation indicates that the bottle can be used in other than upright angles.

D. CORRECTIVE ACTIONS:

The fire was quickly extinguished, and the valve shut. Both the welder performing the task and the welder acting as a fire watch were coached on the proper use of equipment.

EO: 1.7 07 Discuss OE26347 Fire Blanket Used for Slag Containment Caught on Fire.

CONTENT **Methods and Activities**

EO07: OE26347-*Fire Blanket Used for Slag Containment Caught on Fire.*

V. **Event Summary**:

A. With Clinton Power Station shutdown for Refuel Outage C1R11, craft personnel were performing propylene torch cutting on a condenser wall plate to establish proper fit up around a 30 inch pipe.

The craft utilized an approved welding blanket as a means to contain the molten slag produced during the torch cutting evolution.

As the molten slag accumulated in the welding blanket, the welding blanket caught fire and was unable to be completely extinguished with a fire extinguisher. The smoldering weld blanket was subsequently wrapped in an alternate fire blanket in the area, placed in a metal drum and submerged with water.

The welding blanket does not appear to be suitable for use as a slag containment barrier.

B. **Description:**

During hot work activities to install a 30-inch Extraction Steam line though the condenser wall, the fire blanket being utilized caught fire. The fire blanket, 'Panther Felt Welding Protection Blanket, Style CF16', was used as a damming material to contain the slag produced during torch cutting and fit up of the steel plate that surrounds the 30-inch pipe.

The hot work was being conducted on a scaffold platform. The scaffold area was tented in a fireproof, refractory silica cloth commonly known as re-frazzle'.

The scaffold decking/floor, where the scaffold floor met the condenser wall, was dammed with the material known as Black Panther Felt, to contain the slag and prevent the molten slag from dropping below the scaffold deck.

CONTENT **Methods and Activities**

As the cutting operations progressed, the fire watch person noticed the black panther felt ignite and produce smoke. Hot work was immediately suspended and a fire extinguisher was discharged to extinguish the small fire.

Following extinguisher discharge, the panther felt continued to smolder and produce smoke. The panther felt was then wrapped with some of the re-frazzle cloth, lowered from the scaffold into a metal drum with a tight fitting lid and submerged with approximately 15 gallons of water to ensure the blanket was extinguished.
The Main Control Room and the station's Fire Marshall were contacted and investigation and recovery commenced.

C. **Causes:**

The Panther Felt Welding Protection Blanket, Style CF16 was not suitable for molten slag containment

D. **Corrective Actions:**

The area where the hot work took place was re-tented with re-frazzle fire blanket, the fire extinguisher was replaced, fire investigation report completed, hot work area was inspected and hot work recommenced.

A site wide briefing was conducted with outage personnel informing them the Panther Felt Welding Protection Blanket was to be used only for shielding operations and not containment operations

Further evaluations will be made to determine if this material will be used in any applications in the future

EO: 1.8 08 Discuss OE32263 - During Welding, an Aerosol Can Came in Contact With a Welding Lead Resulting in a Small Fire (FitzPatrick)

CONTENT **Methods and Activities**

EO08: OE32263 *During Welding, an Aerosol Can Came in Contact With a Welding Lead Resulting in a Small Fire.*

VI. **Event Summary**:

A. During the Fall 2010 Refueling Outage, an aerosol can came in contact with a welding lead resulting in a small fire which was quickly extinguished. Proper insulation material was not used by the welders.

Lessons Learned for the Industry:
Stations should review this event and ensure TIG welding activities address proper insulation of the power adapters and reinforce housekeeping and combustible material control in hot work areas.

B. **Description:**

On 9/29/10, during the Fall 2010 Refueling Outage, while performing welding on the "A" Recirc Motor Reactor Building Closed Loop Cooling piping in the West Drywell Hatch, a Welder set his Tungsten Inert Gas (TIG) torch down while he was between welds. The stinger/power adapter connection grounded to an aerosol can resulting in an arc which caused a small pin-hole leak in the can. The flammable aerosol propellant ignited and resulted in a small fire. The fire was immediately extinguished by the Fire Watch.

The stinger supplies power to the torch via the power adapter. During welding operations of this type, the power adapter needs to be covered with an insulating material to prevent arcing. Sil-temp was wrapped around the adapter to provide the required insulation. At some point during welding, the Sil-temp shifted position exposing the power adapter.

C. **Causes:**

The Welder failed to use the proper insulation material and to inspect the power adapter insulation to ensure it was still in place prior to setting the lead down. Additionally, a job site review should have identified and removed combustible material.

CONTENT **Methods and Activities**

D. **Corrective Actions:**

Actions Completed

1. All work was stopped until the area was evaluated and proper safety precautions were implemented to prevent future occurrences.

2. Supplemental Personnel Supervisors and Industrial Safety performed a stand down with the work crew to discuss this event and reinforce requirements and expectations with the welders.

3. High voltage insulators were obtained and installed for the TIG leads to prevent future arc over events.

4. Insulated boots were installed on the TIG torch leads prior to recommencing work.

5. This event was discussed with all site personnel to reinforce housekeeping standards and expectations.

6. All individuals involved in the event were coached on expectations and requirements for HU tool usage.

Corrective Action:
Training to incorporate this event into Fire Watch training.

EO: 1.9 **09 Discuss OE30188 Acetylene from a Hose Leak Ignited under a Fire Blanket**

CONTENT **Methods and Activities**

EO09: OE30188 *Acetylene from a Hose Leak Ignited under a Fire Blanket*

CONTENT **Methods and Activities**

VII. **Event Summary**:

A. Acetylene gas from a hose leak collected under fire blankets and was ignited. There was no damage, and the fire was quickly located and extinguished by the fire watch. The workers using acetylene torches were coached on the need to check their hose fittings at the start of each shift and whenever the hoses are reconfigured.

Lessons Learned for the Industry:
Acetylene from hose leaks can collect under fire blankets and similar arrangements. Acetylene hose connections, including those hidden by fire blankets and other equipment, need to be checked by each shift.

B. **Description:**

While heating a containment tendon with an acetylene torch in preparation for welding on a lifting lug an unexpected flash of light occurred. The fire watch suspended the heating and investigated. Under the fire blankets, he found a small flame from an acetylene hose connection leak. He promptly put out the flame with a fire extinguisher and notified operations. The welders ensured the hose connections were tight and not leaking.

C. **Consequences:**
The prompt resolution of the situation avoided any direct consequences from the fire. The tendon work was suspended for a stand-down to discuss the event and fire protection practices.

D. **Causes:**

The welders had not checked the acetylene hose connections before beginning their shift and thus missed an opportunity to detect the acetylene leak. The fire blankets collected a pocket of acetylene that was ignited to cause the flash of light.

E. **Corrective Actions:**

The workers using acetylene torches were coached on the need to check their hose fittings at the start of each shift and whenever the hoses are reconfigured. To reduce the number of hose connections, the unnecessary acetylene hose connections were removed.

EO: 1.10 10 Discuss OE 23497-Vendor employee received second degree burn when coveralls caught fire while using cutting torch

CONTENT **Methods and Activities**

EO10: OE23497 Vendor employee received second degree burn when coveralls caught fire while using cutting torch.

VIII. **Event Summary**:

A. While performing a cutting operation in the moisture separator re-heater (MSR), a vendor employee received second degree burns to his upper arm when the coveralls he was wearing caught fire.

B. **Description:**

While performing a cutting operation in the moisture separator re-heater, a vendor employee was burned when the coveralls he was wearing caught fire.

The employee was using a cutting torch to remove overhead sections of the MSR chevrons when he noticed the sleeve of his coveralls on fire. The employee attempted to extinguish his sleeve himself, but was unsuccessful.

Another employee who was performing fire watch activities noticed the flames and immediately extinguished the employee's coveralls by use of a portable fire extinguisher.

The employee was taken for off site medical care for treatment of second degree burns to his upper arm.

C. **Causes:**

The cause of the fire was determined to be inappropriate protective clothing. The coverall the employee was wearing was found to contain 65% polyester.

The coverall had been issued to the employees for protection of their personal clothing while working in a dirty environment, not for protection during welding and cutting operations. Other similar coveralls were also discovered in use.

The brand names found included Berco Wear, Red Kap, Universal Coverall, and Berne. All were found to contain 65% polyester.

CONTENT **Methods and Activities**

E. **Corrective Actions:**

Immediate corrective actions were taken to stop all hot work and remove all polyester containing coveralls.

Employees performing hot work were issued flame resistant coveralls and/or welding leathers. All non flame-resistant coveralls were segregated and labeled as "non-hot work only."

EO: 1.11 11 Discuss Routing Electrical cords and Hoses

CONTENT **Methods and Activities**

EO11: Routing Electrical cords and Hoses

IX. Safety Manual Rev. 38

A. Section XI

CONTENT **Methods and Activities**

Routing of Extension Cords /Cabling

- Cables shall be routed above walkways or driveways whenever possible. Routing across the ground, floor or grating should be avoided.
- Temporary power cables shall be routed in accordance with 30DP-)wm12 – Housekeeping. In addition, contact Radiation Protection prior to routing power cords and Hoses in the Radiological Control Area(RCA) more than six (6) feet above that floor.
- Temporary power cables shall not be routed in active cable trays.
- Temporary power cables shall be routed so they will be kept out of water.
- Extension cords/cables must be routed in a manner which will not create a trip Hazard or hazard around moving equipment.
- Excess cable should be neatly coiled if required for installations.
- Cables shall not breach fire barriers without proper permits (fref:40DP-9ZZ17 – Control of Doors, Hatches and Floor Plugs)
- When installed in traffic areas the cabling shall be protected by traffic channel or durable protectors specifically designed and approved for this purpose.
- The "User" is responsible for removal of temporary power cabling in a timely manner following the end of the need for temporary power.
- Refer to AC-1256 – Control of 480 V Extension and "Y" cords at PVNGS

2. Specification 13-EM-700 Rev. 2

A. **Separation Requirements Without Barriers**

Redundant separation Group – Four separation groups designed by color coding and /or letter designation to identified redundant (Class 1E) equipment or systems at PVNGS. Color and letter designation (see Installation Specification 13-EN-303, Electrical Cable and Raceway Identification, or Procedure 80DP-0CC04, Plant Numbering, for additional details) are as follows:

CONTENT **Methods and Activities**

EO11: Routing Electrical cords and Hoses (cont.)

X. Specification 13-EM-700 Rev. 2

Redundant separation Group (cont.)

Redundant separation Group "A" = RED = Protective Channel A = A Train

Redundant separation Group "B" = Green = Protective Channel B = B Train

Redundant separation Group "C" = Yellow = Protective Channel C = C Train

Redundant separation Group "D" = Blue = Protective Channel D = B Train

2. **Class 1E** – The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal, or are otherwise essential in preventing significant release of radioactive material to the environment.

B. **Separation Requirements Without Barriers**

Installed electrical equipment and cables shall have either a **3 ft horizontal** or **5 ft vertical** minimum separation distance form any redundant (class 1E) separation group equipment, component, or circuit.

Barrier – A device or structure interposed between Class 1E equipment or circuits and a potential source of damage to limit damage to Class 1E systems to an acceptable level.

To comply with IEEE 384-1974 barrier requirements and for the purpose of this specification, the following configurations are considered barriers at PVNGS:

- Rigid steel, intermediate steel, and electrical metallic tubing conduit
- Aluminum and copper sheathed cable
- Flexible metal conduit (insulated or non-insulated)
- Flat galvanized stainless steel sheets or encirclement structure
- Encirclement installations, which include :

Thermo-lag wrap (non-heat transferable material)

Welding Blankets (heat transferable material)

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.