

STANDARD PROCEDURE INSTRUCTION

Title		SPI
P.P.E. Requirements for Electrical Personnel		SPI No. 32-2 Rev.4
Department	Supersedes SPI Dated	Effective Date
Maintenance	February 9, 2012	September 14, 2015

P.P.E. Requirements for Electrical Personnel

STANDARD PROCEDURE INSTRUCTION

1. Purpose

To establish standard practices and procedures for the minimum Personal Protective Equipment required for electrical personnel working within operating plants and mines.

2. Scope

This policy applies to all people working for Vale's Manitoba Operations, including contractors. This policy applies at all Vale Manitoba Operation properties and where work is being conducted under the authority of Vale's Manitoba Operations, Including work done for Vale Technology Development (Canada) Limited in Manitoba.

3. Administration

Revisions to this SPI shall be reviewed by the Vale Manitoba Electrical Standard Practices Committee and approved by Manitoba Operations General Manager prior to implementation.

4. General Instructions

4.1 The outer layer of clothing worn by personnel working on or near live electrical equipment shall be Arc-rated Flame Resistant (FR).

4.2 **Clothing** – shirts, pants, coveralls, undergarments

4.2.1. All personnel, including Vale personnel and contractors, working on or near live electrical equipment shall wear an external layer of Arc-rated FR clothing meeting or exceeding minimum requirements as defined by CSA Z462 Workplace electrical safety and having a minimum value of HRC 2 or ATPV 8 cal/cm².

4.2.2. All Arc-rated FR clothing worn by Vale electrical personnel shall be made of inherently flame resistant material. Treated cotton or a treated cotton blend FR material **does not** meet this standard.

4.2.3. All clothing worn by persons working on or near live electrical equipment shall be non-melting, including undergarments. No article of clothing should be worn if it may contribute to any injury when exposed to an electrical arc flash. This includes all 100% or blends of synthetic fabrics such as acetate, polyester, nylon, polypropylene and spandex.

Only natural fiber clothing, or clothing which is inherently FR, such as cotton, leather, wool or silk, shall be worn under FR clothing.

4.2.4. Whenever Arc-rated FR clothing is required the FR clothing shall provide complete coverage over non-FR clothing and all cuff buttons and collars must be closed.

- 4.2.5. All Arc-rated FR clothing shall have clearly legible permanent tags or labels identifying the degree of protection provided by the clothing. It shall be identified by the arc thermal performance value (ATPV) expressed in cal/cm² or hazard/risk category (HRC) from table 5 of CSA Z462. Clothing which does not have this identification shall not be worn.
- 4.2.6. Arc-rated FR clothing to be worn shall meet or exceed the degree of protection required for the “Hazard / Risk Category” as defined by table 5 of CSA Z462, unless otherwise posted on arc flash hazard labels.
- 4.2.7. The “Hazard / Risk Category” for specific tasks shall be as defined by tables 4A and 4B of CSA Z462, unless otherwise posted on arc flash hazard labels.
- 4.2.8. Outer Garments shall meet or exceed CSA Z96 Hi-visibility safety apparel standard class 3. All outer garments shall have clearly legible permanent tags or labels identifying the Hi-visibility classification provided by the clothing.

4.3 Footwear

- 4.3.1. Footwear worn by all personnel, including Vale personnel and contractors, working on or near live electrical equipment, shall bear the CSA and Omega symbol in addition to all other footwear requirements as per plant standards.
- 4.3.2. All footwear shall be leather, rubber or inherently FR.

4.4 Gloves

- 4.4.1. Gloves shall be leather and shall provide full coverage at the wrists.
- 4.4.2. Use of leather gloves shall be for protection of arc flash. No shock protection is provided by the use of leather gloves.
- 4.4.3. Voltage rated gloves shall be worn as required by CSA Z462 tables 4A and 4B

4.5 Face shields

- 4.5.1. Face shields shall be arc rated for the correct level of incident energy.
- 4.5.2. Safety glasses, hearing protection and an arc rated balaclava must be used with a face shield.
- 4.5.3. The Arc-rated 40cal/cm² switching hood may be substituted with an arc rated face shield and balaclava. Provided the arc-rated face shield and balaclava meet the requirements of clause 4.5.1

4.6 Head Protection

4.6.1. Hard hats for all Vale personnel working on or near live electrical equipment are preferred to be class E, rated at 20 000V.

Class E hard hats which are modified for a cap lamp are re-classified to class C (not electrically rated) and are permitted.

4.6.2. Earmuffs with exposed metal supports shall not be used.

4.7 Safety Glasses

4.7.1. All non-prescription safety glasses shall be non-metal.

4.7.2. Metal framed prescription safety glasses shall be secured to prevent glasses from accidentally falling from a person's face.

4.8 Fall Arrest Harnesses

4.8.1. Fall arrest harnesses used when a person may be exposed to an arc flash hazard shall be tested to ASTM F887-05.

4.9 Flash Suits

4.9.1. For tasks requiring Arc-rated FR clothing protection greater than 8cal/cm², a minimum ATPV 40cal/cm² flash suit shall be used.

4.9.2. The recommended flash suit arrangement for Vale personnel is a arc-rated flash coat and pants or bib-overalls with a ventilated double layer flash hood.

4.9.3. At minimum two flash suits shall be available for use by persons working on or near live electrical equipment. Flash suits shall be provided at locations which are easily accessible and without causing undue delay in completing work tasks.

4.9.4. Flash suits of various sizes shall be available to ensure no additional risk is contributed by an ill-fitting suit.

4.9.5. Each flash suit shall be stored to ensure protection against dirt, moisture and damage when not in use.

4.9.6. Flash Suits are exempt from clause 4.2.8

4.10 Winter Clothing and Raingear

- 4.10.1. All winter clothing and raingear worn within arc flash protection boundaries shall be Arc-rated FR and meet the requirements of section 4.2.

4.11 General Consideration

- 4.11.1. The use of conductive objects (e.g. metallic jewelry) while engaged in electrical activities on or near exposed (i.e. not suitably guarded) energized electrical conductors or circuit parts shall be prohibited.
- 4.11.2. Pockets shall not be overstuffed with material that may propagate flame.
- 4.11.3. Pockets shall not contain conductive material while performing work on live equipment.
- 4.11.4. Prior to use all clothing and flash suits shall be inspected for excess or flammable soiling, damage to seams, zippers and fasteners, and tears. No clothing or flash suit shall be worn if it exhibits any of these characteristics.

5. Purchasing

- 5.1 The following Arc-rated FR clothing is provided by Vale for Vale electrical personnel working full time in both the surface plants and underground:

- Two long sleeve heavy weight work shirts and two pairs of heavyweight work pants; **or**

One long sleeve heavy weight work shirt, one pair of heavyweight work pants and one set of light weight coveralls; **or**

Two sets of light weight coveralls

- Two balaclavas

Note: Heavy weight work pants may be substituted with heavyweight unlined bib front overalls.

- 5.2 The following Arc-rated FR clothing is provided by Vale for Vale electrical engineering & technical support personnel who are not working full time in an operating plant or mine but occasionally work within arc flash protection boundaries:

- One long sleeve heavy weight work shirt and one pair of heavyweight work pants; **or**

One set of light weight coveralls

- One balaclava

Note: Heavy weight work pants may be substituted with heavyweight unlined bib front overalls.

- 5.3 The following cold environment Arc-rated FR clothing shall be available through tool crib issue or at plant supervision's discretion by direct employee issue:
- A full zip hooded polar fleece jacket or a lightweight quilted chore coat
 - An extreme cold weather winter parka or a winter bomber jacket shell c/w winter bomber jacket liner and winter quilt lined heavyweight bib overall
- 5.4 Employees requiring non-standard size Arc-rated FR clothing shall provide their measurements. The required measurements are height, neck, chest, waist, inseam and arm length.
- 5.5 Purchase requisitions shall be raised to purchase Arc-rated FR clothing for employees. Purchase requisitions shall include the name of the individual, employee number, sizes and/or measurements, and a line item c/w quantity and description for each type of Arc-rated FR clothing item being ordered.
- 5.6 Purchase requisitions shall be raised to purchase cold weather Arc-rated FR clothing (item 5.3 above). Purchase requisitions for cold weather Arc-rated FR clothing being issued direct to an employee shall include the name of the individual, employee number, sizes and/or measurements, and a line item c/w quantity and description for each type of Arc-rated FR clothing item being ordered.

6. Maintenance

- 6.1 All personnel, including Vale personnel and contractors, working on or near live electrical equipment shall ensure their Arc-rated FR clothing is in good condition and kept clean of all combustible contaminants.
- 6.2 All personnel, including Vale personnel and contractors, working on or near live electrical equipment shall ensure their Arc-rated FR clothing is cleaned as per the manufacturer's instructions.
- 6.3 Treated cotton FR clothing which is washed with bleach loses its fire resistant properties and shall not be worn. Inherently FR clothing which has been washed with bleach shall have the bleach residue rinsed out otherwise the residue can ignite.
- 6.4 Individuals wearing treated cotton FR clothing shall be responsible to ensure their personal FR clothing is within the manufacturer's specified lifespan.
- 6.5 Arc-rated FR clothing shall not be washed or dried with fabric softeners as these products may leave a flammable residue on the clothing. Inherently FR clothing which has been washed with fabric softeners shall have the softener's residue rinsed out otherwise the residue can ignite.
- 6.6 In the event of a tear, mending must be completed with inherently FR material and/or thread.

7. Training

- 7.1 All electrical personnel, including Vale personnel and contractors, shall complete Electrical Arc Flash and PPE Safety Training prior to working on or near live electrical equipment.
- 7.2 Vale's maintenance training coordinator shall organize the Electrical Arc Flash and PPE Safety Training.
- 7.3 All records of all Vale personnel who have completed the Electrical Arc Flash and PPE Safety Training program shall be recorded in V.I.P.
- 7.4 All electrical personnel, including Vale personnel and contractors, shall update their Electrical Arc Flash and PPE Safety Training every year.

Lovro Paulic
Vice President
Vale
Manitoba Operations

Date