



Chemical Protective Clothing Standard

1.0 PURPOSE

This standard supports the SaskPower Personal Protective Equipment Policy and specifies the requirements for a chemical protective clothing program. This standard is intended to promote the proper selection, use, maintenance and limitations of chemical protective clothing.

2.0 DEFINITIONS

2.1 Chemical protective clothing (CPC)

An item of clothing that is specifically designed and constructed for the intended purpose of isolating all or part of the body from a chemical hazard.

2.2 Degradation

A measurement of the physical deterioration of the material, due to contact with a chemical. The material may get harder, stiffer, more brittle, softer, weaker or may swell. The worst example is that the material may actually dissolve in the chemical.

2.3 Penetration

The passage of contaminants through seams, zippers, pinholes and other imperfections in the material.

2.4 Permeation

Permeation rate is the rate at which the chemical will move through the material. It is measured in a laboratory and is expressed in units such as $\mu\text{g}/\text{cm}^2\cdot\text{min}$. The higher the permeation rate, the faster the chemical will move through the material. Breakthrough detection time is used to quantify the time it takes a chemical to permeate through a material.

2.5 Program

A documented strategy with procedures for selecting and using CPC.

3.0 SCOPE

- This standard presents the elements that constitute a CPC program and conditions to be used in establishing a program for the selection and use of CPC.
- This standard does not address the various methods for testing CPC or obtaining and evaluating the data upon which CPC assessments are made (refer to Chemical Protective Clothing – Selection and Evaluation SOP).
- CPC should be used when other means of control are not available. Use of this standard applies to:
 - a) Maintenance operations. Engineering controls should be stressed as the first line of defense in all situations;
 - b) Upset and emergency conditions;
 - c) In lieu of engineering controls when they are not feasible or are being installed;
 - d) Supplemental to engineering controls when they fail to completely control a hazard; and
 - e) In the event that engineering controls fail.

4.0 ROLES AND RESPONSIBILITIES

4.1 SaskPower Divisions Shall:

- Communicate changes to the CPC Standard
- Monitor the CPC program and procedures for their respective areas of responsibility
- Conduct regular reviews of the CPC Standard and procedures
- Retain records in accordance with SaskPower Enterprise Classification & Retention



Schedule

4.2 Corporate Safety Shall:

- Develop, implement and monitor compliance with the CPC Standard and procedures
- Maintain CPC Standards and procedures
- Support each Division in meeting their responsibilities by:
 - Facilitating training when needed
 - Aid in evaluation of hazards and CPC as per test methods
 - Aid in selection of CPC

4.3 Employees and Contractors shall:

- Comply with Division requirements
- Use CPC in accordance with training and manufacturer recommendations
- Inspect and maintain CPC in accordance with CPC program
- Report changes in CPC performance and symptoms of overexposure to supervisor

4.4 Occupational Health Committees (OHC) shall:

- Monitor compliance with the Chemical Protective Clothing Standard and procedures as they relate to health and safety.

5.0 METHOD/PRACTICE

For personal protective equipment to be effective as a control measure it must be consolidated as a program and managed properly. A chemical protective clothing program consists of the following elements:

5.1 Selection of CPC

5.1.1 Hazard Assessment

As in all situations where a chemical hazard may be encountered, the Material Safety Data Sheet (MSDS) should be consulted; this will contain sections to address the hazards of the chemical as well as the recommended Personal Protective Equipment (PPE). The Canadian Centre for Occupational Health and Safety also provides PPE recommendations for various chemical hazards.

The hazards of chemical exposure shall be determined with consideration of the following:

- a) What contaminants may be present;
- b) Exposure situation (vapour, pressured splash, liquid splash, intermittent liquid contact, and continuous liquid contact);
- c) Toxicity and amount of the chemical(s) (best knowledge or estimate);
- d) Likelihood of contact to a hazardous chemical, duration of exposure and direction of exposure;
- e) Physical properties of the chemical(s);
- f) Functional requirement as defined by the task; and
- g) Properties of the CPC which are relevant to the physical and chemical hazards and functional requirement. These properties include, but are not limited to permeation resistance, degradation resistance, penetration resistance, dexterity, and resistance to tear. Selection should consider the material properties, seam construction and overall design.

Selection of CPC shall be documented with respect to the above considerations.

5.1.2 Selection

Determine the degree of protection and the appropriateness of CPC. Refer to Chemical Protective Clothing – Selection and Evaluation SOP. The general selection process is described below:



- a) Match CPC to the hazard;
- b) Obtain advice (manufacturer and occupational hygiene);
- c) Review standards, performance requirements and testing;
- d) Involve workers in evaluation;
- e) Consider physical comfort of PPE (ergonomics);
- f) Evaluate cost considerations;
- g) Check the fit;
- h) Perform regular maintenance and inspections;
- i) Conduct training;
- j) Obtain support from Divisions; and
- k) Audit the program.

5.2 Use

- CPC should always be used in accordance with the manufacturer's instructions. Where doubts concerning the intended uses of CPC exist, the manufacturer should be contacted. The intended uses of CPC should be conveyed to employees during training.
- Emergency-use CPC should be differentiated clearly from routine-use CPC in the hazard and risk assessment. Only persons who have received appropriate training should use emergency-use CPC.
- For CPC selected for splash protection only, the employee should be aware of the limited use of such CPC. When splashed, the employee should immediately leave the area and remove the CPC. If the hazard and risk assessment warrants, an emergency shower should be utilized, and where practicable, notify the control room or applicable administration. Refer to Emergency Showers and Eye Wash Station Standard.
- Where a material safety data sheet (MSDS) recommends the use of specific CPC, instructions should be followed, unless reliable data contradicts the MSDS or conditions of use permit alternative CPC.

5.3 Configuration

5.3.1 Layers

Layering is an important principle to consider, particularly where the problems of loss of coordination or tactility, or exposure to mixtures, or both, is involved. For CPC that provides adequate permeation qualities but poor tactility or coordination and loose fit, tightly fitting CPC may be applied over the loose fitting CPC garment (in particular, gloves) in order to improve the coordination properties. Layering of CPC garments having different polymeric makeup may provide an adequate barrier for mixtures of different classes of chemicals. There are no hard-and-fast rules for making the selection of the layers in the latter case. It is recommended that permeation resistance testing be performed in order to determine the adequacy of layers. Finally, layering may be used to protect an expensive CPC garment with a less expensive one. The outer garment should be disposed of properly after use.

5.3.2 CPC Components

For certain CPC types, the selector must consider the components in addition to the suit material itself. Face shields, pressure relief valves, gloves, and boots may be made of materials that differ from the suit. Consequently, they may be the weakest links in the exposure control process and should be considered individually for particularly toxic contaminants.

5.3.3 Respirator Selection

Where respirators will be used with CPC, it is important that the selection of respirator and CPC be coordinated. Important factors include loss of visibility, inability to control respirator valves or view pressure gauges, and improper fit of the respirator within or around the hood of the suit.



5.4 Training

Training and documentation of training shall be provided to each CPC user at the Division level, including:

1. The nature, extent, and health effects of chemical hazards posed by the job.
2. The proper use, limitations, and purpose of the assigned CPC.
3. Where appropriate, symptoms and effects of heat stress, including first aid and preventive measures.
4. Appropriate inspection procedures.
5. The need to inform supervisors of any problems experienced with CPC.
6. The appropriateness of the CPC used and its limitations with respect to use on other industrial tasks.
7. Instructions for donning the CPC with particular attention to personal hygiene. Exposure of the skin to the chemical(s) prior to the donning of CPC will increase the absorption of those chemicals after the CPC is donned. Consequently, washing of hands and appropriate work practices prior to donning CPC are of extreme importance.
8. Maintenance and storage of the CPC.
9. Information regarding the total allowable time of use for the CPC and its final disposition, whether it is disposable or reusable and requires decontamination.
10. Symptoms that may indicate that a CPC is no longer providing adequate protection include changes in the appearance of the hands or other body parts, such as reddening, or swelling, or a burning sensation, or both, and dizziness, headache, or nausea. Specific warning signs should be understood for each chemical used.
11. The essential concepts of penetration, degradation, and permeation.
12. Where appropriate, how to avoid unnecessary contamination of CPC that could lead to the need for decontamination or disposal.
13. Where appropriate, a simulation, while wearing the CPC, of the work to be performed. This is particularly important for totally-encapsulating suit use.

5.5 Inspection, Maintenance and Storage

- Inspection should be performed upon receipt and periodically by qualified persons where appropriate, and it should always be performed by the user prior to donning the CPC. In addition, co-workers should inspect each other's CPC garments after donning to ensure ensemble integrity.
- Each time a CPC garment is used, the user should inspect it for integrity. This entails inspection for cracks, punctures, holes, or other losses of integrity. Qualified personnel shall inspect totally-encapsulating suits.
- Maintenance tasks may be performed as necessary on CPC. Repairing holes, tears, or other losses of integrity should be performed only by a qualified person who has received training in this area. Replacement of boots, gloves, face shields, or exhaust valves should also be performed only by qualified persons. After repairs or other maintenance, appropriate integrity tests should be performed.
- CPC may be degraded by ozone and other oxidants, ultraviolet and other forms of electromagnetic radiation, and heat. CPC should consequently be stored in clean areas with minimum light exposure, adequate temperature control, adequate ventilation, and in areas that are separate from chemical storage.
- Many types of CPC may crack along folds or creases. CPC should consequently not be stored in a folded position. They should be hung without undue stress on the CPC.

5.6 Decontamination and Disposal

- Once CPC has been contacted by a chemical, the CPC must be either decontaminated prior to reuse or properly disposed of.
- Where the toxicity and absorption potential of the contaminant allow for safe and adequate decontamination and the cost of the garment warrants it, the CPC should be decontaminated. Consult CPC manufacturers instructions and the MSDS for the contaminant in question for complete details prior to any decontamination attempt. In general, warm soapy water containing detergent will help



remove most surface contamination.

- All liquids and materials used to decontaminate the CPC must be disposed of as hazardous waste in accordance with SaskPower procedures and local, provincial and federal regulations.
- Where decontamination of the CPC has been determined to not be safe, adequate or practical, the CPC must be disposed of as a hazardous waste in accordance with SaskPower procedures and local, provincial and federal regulations.

5.7 Purchasing

Specific CPC should be identified, and an equipment and supplier list should be approved within Divisions. Requests for new or not previously approved CPC should be forwarded to the Division Administrator. Changes in vendors or manufactures should be approved by the Division Administrator. Inventory control should be practiced, and limits should be placed on minimum and maximum amounts of CPC in storage.

5.8 Medical and Human Factors

All garments inhibit the rate of heat loss from the body. Heat stress must be considered through work planning or use of devices for cooling in some cases.

Workers should be screened to determine whether the employee can use the CPC assigned safely. Mobility, dexterity, visual acuity, and ability to communicate may compromise performance. Training and evaluation should be conducted under simulated conditions.

5.9 Auditing

Auditing is an essential element of the CPC program. The audit should consist of a written check list for evaluating, implementation and effectiveness of program elements. The audit should include a spot check of selections of CPC and interview with a selection of CPC users. Determination should be made as to whether CPC is being used appropriately and properly. The recommended frequency of these audits is at least annually.

6.0 REFERENCES

- Saskatchewan
 - The Saskatchewan Occupational Health and Safety Regulations, 1996.
 - Personal Protective Equipment
 - Chemical and Biological Substances
- Safety (located on SafetyNet)
 - Personal Protective Equipment Policy
 - Hazard Controls Policy
 - Job Hazard Assessment Policy
 - Hazard and Risk Assessment Standard
 - WHMIS Standard
 - Safety Rulebook
 - Chemical Inventory List
 - Emergency Showers and Eye Wash Station Standard
 - Chemical Protective Clothing – Selection and Evaluation Standard Operating Procedure (SOP)
 - WellNet (MSDS)
- Third Party
 - ASTM F1461-12