

STANDARD PROCEDURE INSTRUCTION

Title		SPI
Mould Management and Disposal		# 36-10
Department	Supersedes SPI Dated	Effective Date
Safety, Health & Environment	April 8, 2013	Jan 11, 2017

Mould Management and Disposal

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1. PURPOSE

To Manage mould at Vale MB Operations.

2. SCOPE

- 2.1. The procedure was developed to identify, sample and manage mould in VALE Manitoba Operations.
- 2.2. This procedure does not apply to natural ground and soil. Refer to “*AM 1.18 Mould Management in Underground Mines*” for mines specific mould remediation procedure.
- 2.3. The Safety, Health and Environment (S.H.E.) department shall initiate the review of this SPI and communicate any improvements to be made to the Manager of Safety, Health & Environment or a designate.
- 2.4. Additional forms, appendices, work instructions, procedures, and permits among others that are or might become part of this SPI will be updated separately by an Industrial Hygiene Coordinator and will be reviewed and approved by the Manager of the Safety, Health and Environment department or a designate. These can be obtained by contacting the Vale Health department.

3. GUIDELINES, REQUIREMENTS AND REFERENCES

- 3.1. Manitoba The Workplace Safety and Health Act W210.
- 3.2. Manitoba Guidelines for the Investigation, Assessment & Remediation of Mould in Workplaces, 2015.
- 3.3. Manitoba The Environment Act E125.
- 3.4. Guidelines on Assessment and Remediation of Fungi in Indoor Environments, the Environmental and Occupational Disease Epidemiology Unit of the New York City Department of Health and Mental Hygiene, 2008.
- 3.5. 212/2011 Combustible refuse 5.18 (1) (c)(d), 5.18(3)
- 3.6. 212/2011 Non Combustible materials for underground construction 5.9 (a)(b)
- 3.7. 217/2006 Control Measures for non-airborne hazards, Part 36.4

4. DEFINITIONS



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Abatement – elimination, reduction and prevention of a problem.

Bleach dilution – 3-6% household bleach diluted as 1 part bleach: 10 parts water.

Competent person –

- (i) is competent, because of knowledge, training or experience, to ensure that work is performed in a safe manner, and
- (ii) is familiar with the [*The Workplace Safety and Health Act W210*] Act and the regulations that apply to the work performed at the workplace;

Fungicide – biological chemical compound that kills or inhibits fungi.

HEPA filter – high efficiency particulate air filter that is capable of removing 99.97 percent of all particles greater than 0.3 micrometer from the air that passes through (as defined by US DOE-STD 3020-97).

HVAC – heating, ventilating, and air conditioning system.

Mold or mould – any of various fungi that frequently cause disintegration of organic matter.

Purposed room – any area designated for a long term particular purpose or regular habitation aside from mine production activities or drifts. This includes, but not limited to garage, refuge station, fuel bay, shaft station, pump room, jector station, oil bay, and others.

Remediation personnel – for Level 2 and Level 3 should have training as offered by certified consulting company.

Trained professional – a trained professional should have, at a minimum, a relevant science or engineering degree and two years of full-time supervised experience in mould assessment (AIHA).

Waste – as defined by Manitoba’s *the Environment Act E125*.

5. BIOLOGICAL DEFINITION OF MOULD

Mould, also spelt *mold*, is naturally occurring growth, coating or discoloration that develops in a damp environment mostly on surfaces that provide source of food for various fungi



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growth. Biologically, all true fungi have defined cell walls, lack chlorophyll and reproduce by means of spores or asexually. These organisms are present everywhere and are found in all environments. More than 100,000 species of fungi have been described. Depending on the growth environment fungi may be helpful (nutrient cycling role) or harmful. Only certain types of mould cause allergic reactions, produce mycotoxins, or cause fungal infection (mycosis).

6. SAMPLING AND TESTING

6.1. Controlling building moisture, humidity and maintaining adequate ventilation are critical to managing fungi indoors as mould growth may return if favorable conditions remain present.

6.2. A technically competent person from the S.H.E. department or trained professional shall evaluate the area and Laboratory results.

6.3. Typically, sampling is required in cases when visual presence of mould cannot be identified or when medical diagnosis in individuals is consistent with mould associated diseases.

6.4. Types of mould sampling:

- Surface sampling – tape or swab sampling is used to identify quantity of mould spores deposited on the surface of the material,
- Bulk and air sampling – is used to test concentration of mould per sample.

6.5. Air sampling¹ might be performed for Level 3 abatements, as no exposure limits of spore distribution in the air are available. If a decision to test is made air should be sampled before, during and after hours during abatement, including times when ventilation is on and off in order to obtain results representative of an actual spore distribution in the air.

6.6. A qualified laboratory that participates in the AIHA Environmental Microbiology Proficiency Analytical Testing Program shall evaluate mould samples by standardized methods offered by ACGIH, NIOSH, OSHA or an equivalent.

¹ SHE department does not perform air sampling at this time. If a decision is made to sample, sampling for Level 3 would be determined based on case-by-case scenario.



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6.7. There are no federal or provincial legislations, or guidelines for concentrations of mould, mould spores, or mycotoxins. Therefore, sampling for mould is not required to start an investigation, remediation or confirmation for site re-occupation.

7. MOULD INSPECTION

7.1. Identify and notify operating department to eliminate the main source of the moisture problem as mould growth may return if left not fully treated.

7.2. Prior to initiation of Level 2 and Level 3 remediation project, the area must be inspected by the SHE department, USW representative and Project Coordinator at least 24 hours in advance.

7.3. Upon inspection mould remediation shall be performed within one (1) month.

7.4. Since mould sampling is not mandatory a surface or bulk sample may be taken by the SHE department if deemed necessary before commencing the project for Level 2 and Level 3 remediation process.

7.5. Allow sufficient amount of time to receive sample results² back before project commencement.

7.6. Mould contaminated area must not be covered by polyethylene sheeting or any other impermeable material, even as temporary measure.

8. TRAINING

8.1. Employees shall be retrained every 5 (five) years.

8.1.1. Employees engaged in Level 1 mould clean up on the surface require annual mould awareness presentation.

8.1.2. Employees, supervisors, planners/coordinators and inspectors engaged in Level 2 and Level 3 mould abatement projects must have adequate training on the abatement procedures as offered by a certified consulting company.

² Results will be analyzed in an external laboratory; may take up to 4 weeks.



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8.1.3. Employees engaged in mould cleanup underground require annual mould awareness presentation.

8.2. Learning & Development shall assist SHE department with training. All records shall be arranged by and entered into a system by Learning & Development.

8.3. Contractors shall provide a copy of valid training certification to a Project Coordinator and/or the SHE department.

9. PREVENTATIVE MEASURES

9.1. Keep area dry and prevent excessive moisture, condensation, leaking and dampness.

9.2. When possible keep relative humidity below 60%.

9.3. Install and maintain ventilation system to meet or exceed minimum engineering standards.

9.4. Remediation of HVAC System:

- Remediation processes for HVAC mentioned throughout this SPI apply for each type of mould abatement.
- The HVAC system may be required to be shut down during Level 2 abatement.
- The HVAC system must be shut down prior to abatement during Level 3 abatement. Contaminated area shall be put under negative pressure.

10. BIRD AND BAT DROPPINGS CLEAN UP PROCEDURE

10.1. Bird and bat droppings shall be assumed to contain fungi contaminants such as *Histoplasma capsulatum*, *Cryptococcus neoformans* and others.

10.2. SHE department and USW representative are not required for pre and post clean up inspections.

10.3. Trained personnel in Level 1 may perform this type of remediation. Special precautions required include :



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- PPE: full-face respirator with P100 cartridges, gloves and safety glasses, dust-impervious disposable coveralls taped to boots and cuffs. Thoroughly clean respirator and safety glasses.
- Shovel, scoop up or HEPA vacuum all loose material. Apply bleach solution or approved disinfectant. Gently brush/clean the area if required. Leave the area wet for 8 to 10 hours. Clean up or HEPA vacuum the area again. Once the surface is dry apply another round of bleach solution and let dry.
- Double bag waste into 6 mil polyethylene bags and dispose as regular waste.

11. MOULD MANAGEMENT IN UNDERGROUND MINES

11.1. Underground areas are generally non-combustible by design and are effectively treated as an outdoor equivalent, other than rooms designed for Refuge or office spaces. It is critical that mould be dealt with immediately as a housekeeping issue and not allowed to progress.

11.2. Precautions:

- 11.2.1. Ensure adequate ventilation flow
- 11.2.2. Bleach *must NOT* be used around explosive products or to decontaminate powder or fuse magazines due to potentially hazardous reactions with explosive products. Use only approved fungicide.
- 11.2.3. When possible, remove any mould contaminated cardboard, wood or porous containers in powder or fuse magazines.

11.3. Procedure:

- 11.3.1. Safety, Health and Environment department, USW representative are *not required* to be present for pre and post inspection for mould cleanup.
- 11.3.2. Employees that had “mould awareness presentation” can clean and remove visible mould.

11.4. General Housekeeping:

- 11.4.1. Ensure mould housekeeping is a part of preventative maintenance.
- 11.4.2. Inspect and suppress further growth by using bleach solution or fungicide monthly as part of preventative maintenance or when mould becomes visible.
- 11.4.3. Determine the source of moisture; minimize moisture accumulation within the area.



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- 11.4.4. Ensure engineering controls are in place.
- 11.4.5. Ensure mould growth is controlled when no adequate ventilation is available in the area.

12. DISPOSAL

- 12.1. Dispose of all significantly water damaged and contaminated porous materials and contents, including furniture, ceiling tiles, board and plaster, drywall, carpet, and plywood.
 - Dependent on the severity of damage and when recommended, material in question may be separated to be recycled, incinerated or land filled.
- 12.2. Should the porous materials be kept, those materials must be dried and disinfected within 24 to 48 hours.
- 12.3. Waste should be double bagged and sealed in 6 mil polyethylene bag. Dispose of as regular waste.



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APPENDIX A

TYPES OF MOULD REMEDIATION

1. Low risk / Level 1 – less than 1 m²

- 1.1. SHE department, USW representative are not required for pre and post inspections for Level 1/Low Risk remediation.
- 1.2. Visible mould can be cleaned and removed by Maintenance, Housekeeping or any other employees using mild detergent and water, or bleach dilution³.
- 1.3. Area must be unoccupied, no containment is necessary.
 - PPE⁴ - gloves and safety glasses, half-face respirator with P100 cartridges.
- 1.4. Remove all surrounding porous materials, such as drywall, plywood etc. within 30 centimeters from the visible contamination site.
- 1.5. Ceiling tiles – up to 7.5 square meters (80 square feet) of mould contaminated ceiling tiles can be removed as Level 1.
- 1.6. Small tools and parts (unlimited quantities of mechanical and hand) shall be cleaned as per Level 1 procedure.
- 1.7. All other contaminated items such as paper gaskets, cardboard and wooden boxes, objects made from natural and man-made fibers and fabric shall be disposed of as regular waste.
- 1.8. This procedure does not cover mould (and mildew) growth on grout in bathrooms, on floor tiles and window frames regardless of the surface area. In those instances standard house cleaning methods apply. However, if there are large areas of surface condensation (more than 10 m²) the area may be inspected for mould growth due to water leakage.
- 1.9. Waste shall be disposed of as regular waste.

³ Bleach dilution (10 parts water : 1 part bleach)

⁴ As outlined in SPI-34-10.



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1.10. When using bleach solution make sure that cleaned surface is thoroughly washed and dried as bleach has corrosive properties.

2. Moderate risk / Level 2 – 1 m² to 3 m²

2.1. SHE department, USW representatives and Project Coordinator are required for pre and post inspections for Level 2 / Moderate Risk remediation.

2.2. Only trained personnel or Contractor may perform this type of remediation.

2.3. Special precautions are in place:

- PPE - full-face respirator with P100 cartridges, gloves and safety glasses, disposable coveralls.
- Warning signs are in place.
- Work permit to be posted 24 hours before work commences.
- Electrical equipment to be disconnected, unless equipped with ground-fault circuit interrupters.
- Seal ventilation, ducts and other openings. HVAC (heating, ventilating, and air conditioning) system might be required to be shut down in the area.
- A two-chamber worker decontamination unit to be constructed when recommended by the SHE department.
- Isolate the area with 6 mil plastic sheeting by taping it to floors and walls.
- Use an exhaust fan with a HEPA filter to create a negative pressure (-0.02 inches of water gauge) vented to the outside of building.
- Use spraying mist to control dust and small debris release.
- Scrub or brush the mould contaminated area with a mild unscented detergent solution. Rinse well with clean water while scrubbing with a clean sponge or rag. Repeat. Dry quickly.
- Double bag waste into 6 mil polyethylene bags; dispose of as regular waste.
- HEPA vacuum the surfaces that were cleaned as well as surrounding areas after the surface has been thoroughly dried.

2.4. No eating, drinking, or smoking is permitted in a contaminated area.



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2.5. When using bleach solution make sure that cleaned surface is thoroughly washed and dried as bleach has corrosive properties.

Note: for stubborn mould on concrete use 3% hydrogen peroxide, bleach dilution, or any fungicide approved by Safety, Health and Environment. Keep it wet for up to 15 minutes, then rinse well with clean water while scrubbing with a clean sponge or rag. Dry thoroughly as quickly as possible.

3. High risk / Level 3 - more than 3 m²

3.1. SHE department, SHE USW and Project Coordinator are required for pre and post inspections for Level 3 / High risk remediation.

3.2. Only trained personnel or a Contractor may perform this type of remediation.

3.3. Special precautions are in place.

- PPE – full-face respirator or PAPR with P100 cartridges, gloves and safety glasses, disposable coveralls.
- Warning signs are in place.
- Work permit to be posted 24 hours before work commences.
- HVAC (heating, ventilating, and air conditioning) system must be shut down in the area. Seal all openings.
- Electrical equipment to be disconnected, unless equipped with ground-fault circuit interrupters.
- A two-chamber worker decontamination unit to be constructed.
- Isolate the area with plastic sheeting by taping it to floors and walls.
- Use an exhaust fan with a HEPA filter to create a negative pressure (-0.02 inches of water gauge) vented to the outside of building.
- Use spraying mist to control dust and small debris release.
- Scrub or brush the mould contaminated area with a mild unscented detergent solution. Rinse well with clean water while scrubbing with a clean sponge or cloth. Repeat. Dry quickly.
- HEPA vacuum the surfaces that were cleaned as well as surrounding areas.
- Double bag waste into 6 mil polyethylene bags; dispose of as regular waste.



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- The enclosure and worker decontamination unit must be inspected at the beginning and at the end of each workday, and at least once per day on days where there are no shifts by a Project Coordinator.
- If air monitoring was recommended, final clearance tests must be taken inside the enclosure prior to it being removed. The concentration of mould in the enclosure must be qualitatively similar to that of outdoor air prior to the site being dismantled.

3.4. No eating, drinking, or smoking is permitted in a contaminated area.

3.5. When using bleach solution make sure that cleaned surface is thoroughly washed and dried as bleach has corrosive properties.

4. Underground Structures

4.1. SHE department, USW representative are *not required* for underground pre or post inspection for mould remediation (cleanup).

4.2. Special precautions are in place:

- Clean up area must be unoccupied. No containment is necessary.
 - The cleanup areas would always include storage areas, equipment and nearly any area of the mine.
- Employee training – refer to section 8.
- Employees can clean visible mould using mild detergent solution, bleach solution or fungicide.
- PPE: half-face respirator with P100 cartridges approved for underground use, gloves, safety glasses. Decontaminate coveralls, respirator and safety glasses when work is completed for the day.
- Remove all surrounding porous materials, such as drywall, plywood etc. within 30 centimeters (1 foot) from the visible contamination site.
 - Wherever possible, place a drop sheet below the mouldy materials to be removed.
- For smooth cemented walls and floors, clean smooth rock and painted rock in purposed room – wet the contaminated area down with bleach solution or fungicide and clean with brush. Re-wet down surfaces with mild detergent solution and scrub clean. Wet the area down to rinse. Let it dry.



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4.3. The following items shall be cleaned in *unlimited* quantities as part of housekeeping or preventative maintenance.

- Machinery and mobile equipment – thoroughly wipe or wash in and out with mild detergent solution, bleach solution or fungicide. Rinse or wipe with clean cloth. Dry well.
- Tools (hand and mechanical) – thoroughly wash tools and other washable items in mild detergent solution, bleach solution or fungicide. Rinse or wipe with clean cloth. Dry well.
- Electrical equipment and wiring – make sure that electrical wiring is disconnected, locks tagged and tested. Clean the equipment, wires with mild detergent solution, bleach when feasible, or fungicide. Rinse or wipe clean. Dry well. Do not use air powered mechanical devices to clean and remove mould.
- For mould on rock surfaces use bleach solution or fungicide. Keep the area wet for 15 minutes; rinse well with clean water while scrubbing with sponge, rag or brush.

4.4. All items including small and bulky items such as pallets, wooden boxes, gasket paper and items made from cloth, fibrous or porous materials that are deemed unsuitable for further use and cannot be cleaned are to be placed with regular waste. Double bag in 6 mil polyethylene, seal and dispose.

Note: for stubborn mould on concrete use bleach dilution. Keep it wet for up to 15 minutes, then rinse well with clean water while scrubbing with a clean sponge or rag. Dry thoroughly as quickly as possible. An approved (by the SHE department) fungicide may be used as an alternative option. Follow manufacturer’s recommendations.



Mould work permit.doc



Mould Inspection Form_2016 (NEW).doc



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Approved By	Title Vice-President, Vale Manitoba Operations
Date	