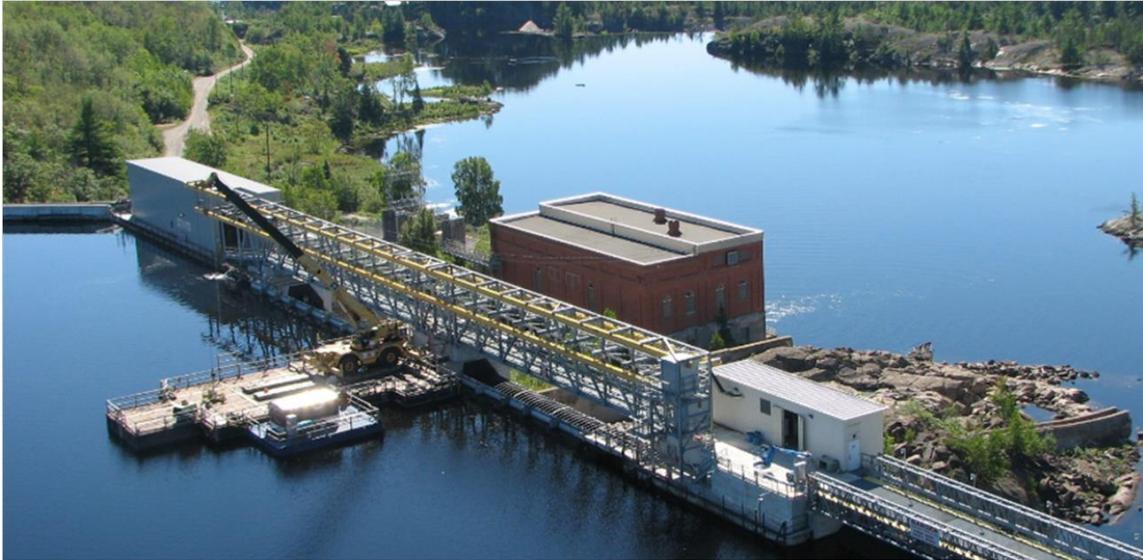


Tier 3: Power Plants / Dams Site Specific Orientation

1. Power Plants / Dams Orientation

1.1 Warehouse Orientation



Power Plants / Dams

Tier Three Orientation – Site Specific Access

1.2 Course Objectives

Course Objectives

Upon completion of this module as a worker you will be able to:

- Understand Plant Entry Procedure
- Identify Site Specific Hazards and Controls for Power Plants / Dams.
- Follow Procedures in the event of:
 - Equipment Damage
 - Personal Injury
 - Process Upset (Emergency Preparedness)
- Complete Plant Exit Procedure Checklist



2. Introduction

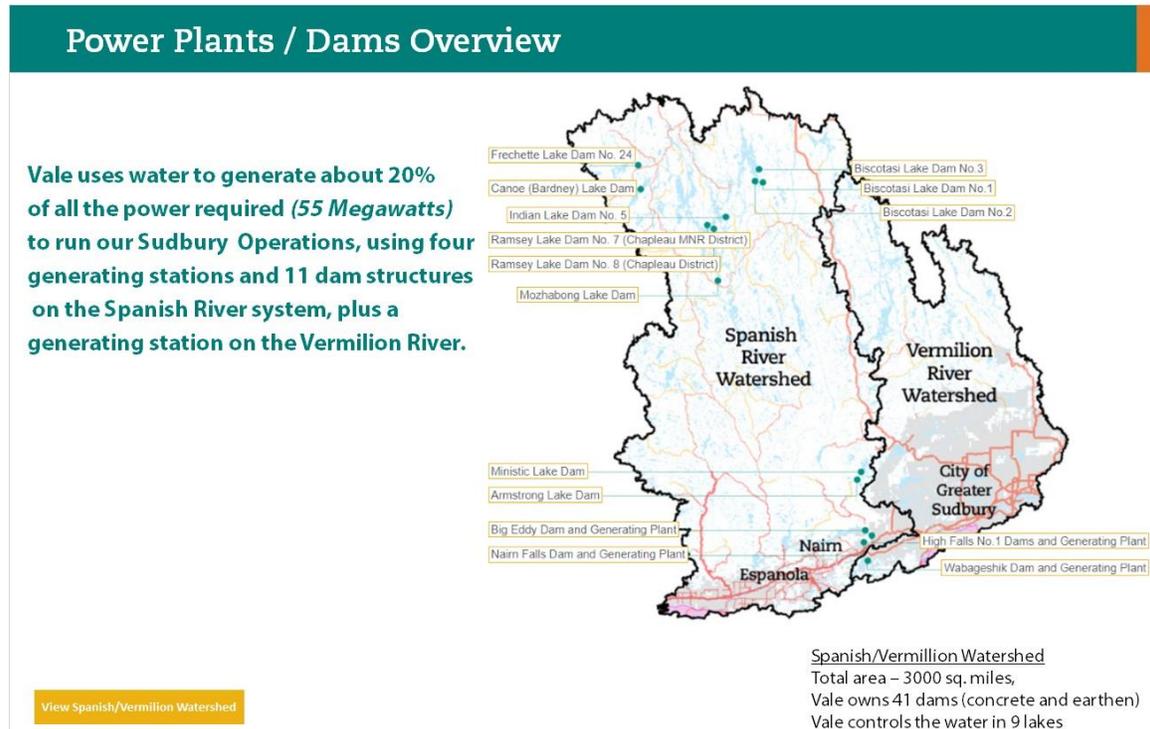
2.1 Introduction



Introduction

Power Plants / Dams Overview

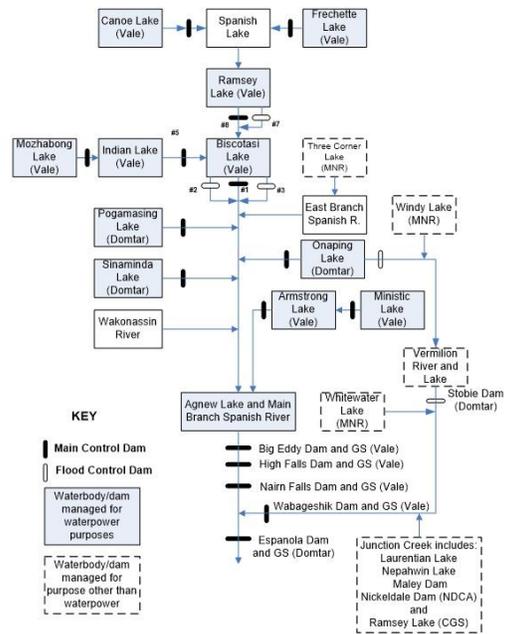
2.2 Power Plants / Dams Overview



Untitled Layer 1 (Slide Layer)

Power Plants / Dams Overview

Vale uses water to generate about 20% of all the power required (55 Megawatts) to run our Sudbury Operations, using four generating stations and 11 dam structures on the Spanish River system, plus a generating station on the Vermilion River.



Hide Spanish/Vermilion Watershed

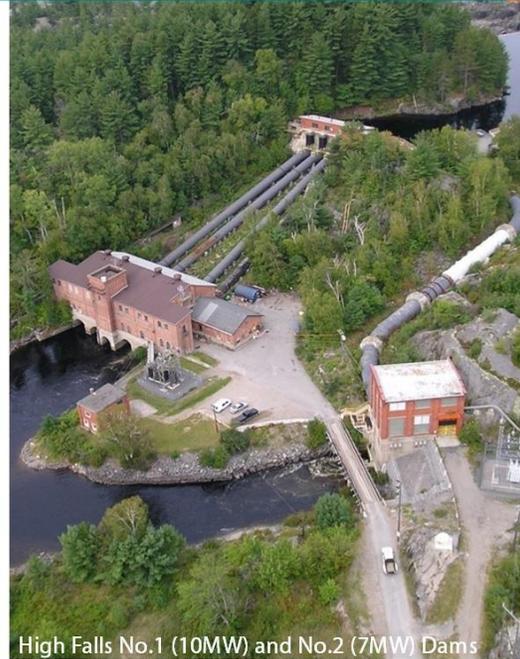
2.3 Power Plants / Dams Overview

Power Plants / Dams Overview

Located on the Spanish river, Big Eddy Dam, gatehouse, penstocks and plant produces 30MW of power.

High Falls No.1 generating plant *shown on the left* works in conjunction with High Falls No. 2 plant *shown on the right* and the Big Eddy generating plant and is known as a 'cascade system'. High Falls No.1 and No.2 plants will use the water that passes through Big Eddy plant/dam.

If the flow from the Big Eddy plant/dam is greater than what High Falls No.1 and No.2 plants can use the water will by-pass the plants via the spill way.



High Falls No.1 (10MW) and No.2 (7MW) Dams

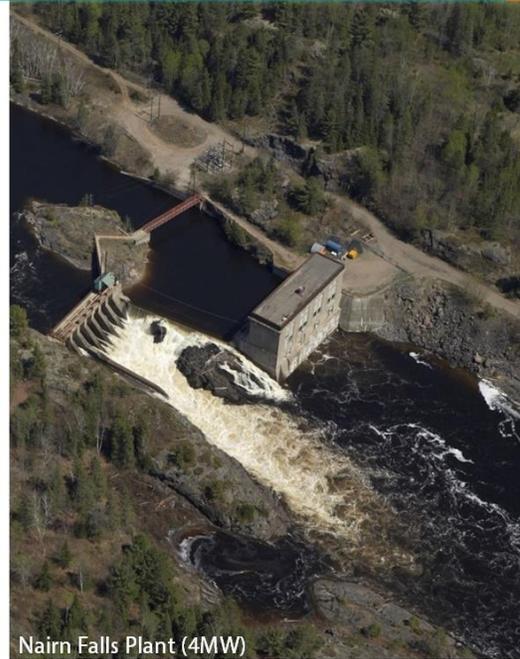
2.4 Power Plants / Dams Overview

Power Plants / Dams Overview

Nairn Falls generating plant works in conjunction with High Falls No.1 and No.2 plants and the Big Eddy generating plant as a 'cascade system'.

Nairn Falls will use the water that passes through Big Eddy plant/dam and High Falls No.1 and No.2 generating dams/plants.

If the flow from the Big Eddy plant/dam is greater than what High Falls No.1 and No.2 plants can use the water will by-pass the plants via the spill way.



Nairn Falls Plant (4MW)

2.5 Power Plants / Dams Overview

Power Plants / Dams Overview

Located on the Vermillion river, Wabageshik Plant , penstocks and spillway produce 4MW of power.

The Wabageshik generating plant is a 'run of the river facility'; this meaning that there is very little storage capacity in the forebay area.



3. Plant Entry

3.1 Plant Entry



3.2 Plant Entry Requirements

Plant Entry Requirements

Any person or group wishing to perform work at the Plants must make arrangements with the Supervisor of Power Generation of such work in advance of commencing the work.

This includes all contractors as well as Vale support groups such as Field Engineering, Non-Destructive Evaluation, etc.

Prior to the beginning of any work all personnel involved in the work must have successfully completed Vales T1 General Orientation, T2 Surface Orientation and this module, T3 Power Plants / Dams Tier Three Orientation – Site Specific Access.

All personnel working at the Plants are to possess a good general knowledge of each individual plant's layout and the local surroundings.

If a site visit is required, please arrange with your Vale Contact person.



3.3 Power Plants / Dams Contacts

Plant Entry Requirements

Power Plants / Dams Contacts

Richard Mullaly:

Operations and Generation Superintendent (705) 682-5679
Cell#: (705) 690-5688.

Eric Labelle:

Supervisor Power Generation (705) 682-6727
Cell#: (705) 280-7500

Dan Caldwell:

Supervisor Power Generation (705) 682-7475
Cell#: (249) 377-6303



3.4 Personal Protective Equipment

Personal Protective Equipment

In the previous Tier 1 and Tier 2 Orientation, general equipment for personal protection was discussed.

Contractors must wear approved hard hats, safety glasses with side shields, high visibility clothing, steel toe boots with metatarsal guards and hearing protection while on the property.

Other PPE may be required depending on the work being performed and must be specified during the PHR meeting.

Clothing must be "FR" rated if working near electrical equipment such as, switchgear, generators and excitation equipment. Arc Flash labels as posted on the equipment must be followed.



4. General Safety

4.1 General Safety



General Safety

Rules and Regulations

Work Permits

Maintenance Procedures

4.2 Process Hazard Review (PHR)

Process Hazard Review (PHR)

A Process Hazards Review (PHR) meeting must be held for unusual and non-routine work.

The Power Plant Supervisor, area OSHE representative, Utilityman and Contractor Supervisor and crew must participate in the meeting.

The PHR must be signed and copies provided to those present, Utilitymen and power plant electronic file.



4.3 Work Permits

Work Permits

Lifting Permit

All lifts must be carried out by competent personnel qualified to lift the material or equipment.

When the contractor is required to perform a lift Vale's procedures;

- MPROC-70001 Training and Development Lifting and Mechanical Handling,
- MSPEC-70002 Rigging Training Levels, and
- MPROC-70003 Lifting Plan Guideline,

must be followed to categorize the lift, determine whether a lift plan is required and to specify the training levels necessary to perform the lift.

LIFT PLAN

The following is a sample lift plan format that can be used when planning a lift. For details on how to categorize a lift, refer to Page 7 and Page 8 of this template. **NOTE:** All lifts categorized as "critical" must have a written lift plan for job procedure that incorporates the elements identified in this lift plan.

1.0 GENERAL INFORMATION			
<ul style="list-style-type: none"> • Work Order/Project reference • Purpose of lift • Items to be lifted • Location of lift • Date of lift 			
Lift Supervisor	Phone	Lift equipment #1	Mobile
Is there an existing SAP Task List or existing Job Procedure describing this lift?		Yes	No
<small>If YES, review to ensure content is applicable to the current lift. Print, have sign off's completed and utilize. If NO, create a new lift plan. If the lift plan will be used again, provide details to the area's Maintenance Planner so that the lift plan details can be saved to a SAP Task List for future reference.</small>			
2.0 CRANE DETAILS		FIXED CRANE	
Manufacturer/Model or Equipment number	Maximum Crane Capacity (Tons)	Equipment Number	Maximum Crane Capacity (Tons) - Span Height
Boom Length / (2x) Length (if applicable)	Maximum Crane Capacity (Tons) - Auxiliary Hoist		
Lowest boom angle (°)	Maximum rated capacity for lift radius and boom angle (°)		
Maximum rated capacity for lift radius and boom angle (°)	Lift Rated Capacity (%)		
Weight of load including the hoist using data to the corresponding distance to which it is lifted	Overweight Footprint size (sq. ft.)		
Temperature de-rating	Maximum wind speed		
Comments: Add any additional information needed to lift equipment being used e.g., additional lift equipment to conduct a tandem lift.			
3.0 LIFT CALCULATIONS			
Load weight (lbs.)		Source of load weight (i.e., packing slip, calculated, etc.)	
Rigging weight (i.e., blocks, slings, beams, shackles, shackles, ropes etc.) (lbs.)			
Total load weight (lbs.) LOAD + RIGGING Total load weight shall not exceed Maximum Crane Capacity			
Weight of lift (lbs.)	Surface area of load (sq. ft.)	Consider impact due to wind	
# of Tag lines required to stabilize load	Working Load Limit (WLL) = order to WLL chart (lbs.) based on slings angle required		
<small>Everything below the hook point is calculated in the load. The load's center of gravity should be within and below hook points, in line with the hook. If there is potential that the load may be frozen, stuck, caught on other structures or ground, or under water - ensure the load is free before attempting the lift.</small>			
<small>Comments: Add any other information e.g., to stabilize the load, use references for sharp edges, additional hitch points etc.</small>			

MOR INTERNAL EMPLOYEE USE ONLY Page 1 of 8

4.4 Work Permits

Work Permits

Confined Space Work Permit

All employees who may be required to work in, or manage the work in a confined space or perform related work with respect to the same confined space require "Generic" confined space entry, air quality testing and monitoring training (e.g. NORCAT) and be also trained to the specific entry plan and procedures.

Rescue personnel and staff personnel who may be required to develop a confined space rescue plan or manage a rescue must also be trained in rescue, rescue equipment and the specific written on-site rescue procedures.



4.6 Work Permits

Work Permits

List of Confined Space Work Areas

Big Eddy Power Plant:

- Penstocks and scroll cases of #6, #7, #8 units
- Draft tube at Big Eddy #6, #7, #8 units
- Blower House Basement

High Falls No.1 Plant

- Penstocks and scroll cases of #1, #2, #3 and #4 units
- Crawl space under washroom area (2 entrances)

High Falls No.2 Plant

- Penstock and scroll case of unit #5
- #5 Penstock Drain Valve

Nairn Falls Power Plant

- Scroll cases of #1, #2 and #3 units
- Area above dry type transformer

Wabaageshick Power Plant

- Penstocks and scroll cases of #1 and #2 units

4.7 Rules and Regulations

Rules and Regulations

Contractors and all personnel employed by them must know and abide by the current Occupational Health & Safety Act, Ontario Regulation for Mines and Mining Plants when working at the Power Plants.

Contractors must also conform to Plant Regulations and all of Vale Standards.

Signs:

All signs posted on buildings, roadways, dams, etc. are to be strictly adhered to.

Tags:

Under no circumstances is anyone to attempt to operate any tagged electrical, mechanical or hydraulic equipment. Unauthorized removal of any tag can lead to dismissal.

Always communicate with the Power Plant Utility Person regarding the operation or tagging of plant equipment.

5. Plant Hazards and Controls

5.1 Plant Hazards and Controls



✔ Plant Hazards & Controls

5.2 Site Specific Hazards

Hazards and Controls

Using the tools that you learned in Tier 1 Orientation, ensure you apply the necessary operation controls to mitigate risk associated with the identified hazards.



Be Aware

Be aware of your surroundings and the risks around you.



Follow Policies & Procedures

Our internal policies and procedures guide us in doing our work in a manner that reduces risk.

The following section lists identified hazards that may be encountered in the work you're doing. Knowing if these hazards apply to your work can be found through:

- Vale Contact Person
- PHA/PHR (or other Risk Assessment Tools)
- SLAM

5.3 Hazards and Controls

Hazards and Controls

While working at the Powerplants/Dams workers need to be aware of site-specific hazards and their related controls. These include but are not limited to:

- Water
- Generators
- Electricity



5.4 Hazard - Water

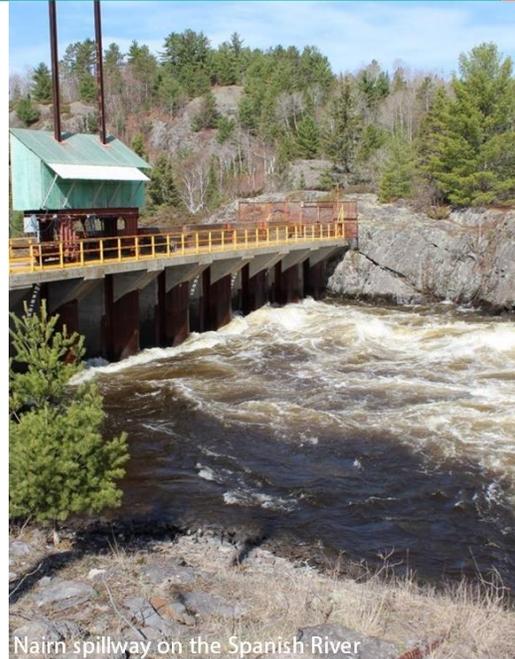
Hazards and Controls

Hazard - Water

In hydroelectric generating stations, water under pressure can pose potential hazards.

Water passages, such as tunnels, surge tanks, penstocks and scroll cases, are fed by high-pressure, high-volume sources of hydraulic energy.

Work inside such passages exposes a worker to a potentially uncontrolled release of water into the work area.



Nairn spillway on the Spanish River

5.5 Hazard - Generators

Hazards and Controls

Hazard - Generators

Each power plant contains generators where the prime motive force to turn them is water.

There are numerous rotating parts and parts that are energized. No one is allowed to work above operating generators.



5.6 Hazard - Electricity

Hazards and Controls

Hazard - Electricity

There is a risk of exposure to 130 Volt DC at the battery banks, exciters and slip rings on the end of generator shafts.

There is also a risk of exposure to live 2300 volt equipment in the basement at Nairn and 4160 volt equipment at Highfalls #1.

There are 69,000 volt transmission lines and substations at all power plants.



Generator Shaft



Transmission Lines

5.7 Hazards and Controls - Powerhouses

Hazards and Controls - Powerhouses

All contractors must follow Procedure #61PP----- "Entry into Power Plants"

Under no circumstances is anyone to perform work
within a Powerhouse without first notifying the
Power Plant Utility person.



5.8 Powerhouses Hazards - Electrical

Hazards and Controls - Powerhouses

Powerhouses Hazards - Electrical

Hazardous electrical voltages from 110V AC to 69kV, also 130V DC (battery chargers, slip rings, field exciters, etc.) Any work on or around high tension (69,000 volt) equipment must be arranged through the Senior Power System Operator at No.1 Substation in Copper Cliff.

All outages are to be requested on a "Power Isolation Request form" and reviewed days ahead of the switching with the Senior Power System Operator.



5.9 Powerhouses Hazards - Mechanical

Hazards and Controls - Powerhouses

Powerhouses Hazards - Equipment

Due to the nature of the business at the Power Plants, there is an abundance of large rotating mechanical equipment and hydraulic pumps/cylinders, feed lines, etc. located within the powerhouses and dam sites. Be aware at all times of your surroundings.



5.10 Powerhouses Control - Equipment

Hazards and Controls - Powerhouses

Powerhouses Control - Equipment

Under no circumstances is anyone allowed to operate or work on any powerhouse equipment unless they have made prior arrangement with the Power Plant Supervisor or Utility Person on duty.

Where power generation equipment is involved, the Power Plant Utility person or Supervisor may designate a qualified person to operate the equipment.

This rule applies to equipment located on dams and within gatehouses as well.

Power Plant equipment starts automatically with no alarms. Be aware of your surroundings at all times.



5.11 Air supply at each Power Plant

Hazards and Controls - Powerhouses

Powerhouses Control - Equipment

Air supply at each Power Plant

Station air supply is for the station air generator brakes and governor oil system. This air is not to be used to operate air-powered equipment.

A separate supply will be required if air powered equipment is to be used.



5.12 Tools

Hazards and Controls - Powerhouses

Powerhouses Control - Equipment

Tools

Under no circumstance is anyone to use plant tools without first receiving authorization from Power Plant Utility person. In cases where tools that are borrowed are broken or damaged through negligence or misuse, they shall be repaired or replaced by the borrowing party.



5.13 Housekeeping

Hazards and Controls - Powerhouses

Powerhouses Control - Equipment Housekeeping

Contractors and outside personnel working in the Powerhouses are to work in accordance with good housekeeping practices. Unused tools and equipment must not be left lying about.

Grease and any other slippery material must be wiped up immediately. All oil or fuel spills regardless of their size, must be reported immediately to the Supervisor of Power Generation and the Power Plant Utility person without delay.



5.14 General Hazards

Hazards and Controls - Powerhouses

Areas Outside of the Powerhouses:

Normally areas outside the Powerhouses are locked and/or fenced in. Access to the plants is to be made with the Power Plant Supervisor or the Utility person.

Dams:

Caution must be exercised at all times when working on dams. Care must be taken when transporting heavy equipment over dams to avoid damage to dams and equipment. If anyone at any time notices water flowing over roadways or other areas immediately notify the Power Plant Supervisor.

Gatehouses:

Qualified and authorized personnel will operate the equipment at the gatehouse. In all cases, the Power Plant Utility person is to receive prior notice.



5.15 General Hazards

Hazards and Controls - Powerhouses

Roadways:

Roadways must be kept open to traffic at all times. When driving on gravel roads beware of the following: washboard that could cause loss of control, washouts or wildlife. Where gates are locked, contact the Power Plant Utility Person to arrange for entry. Maximum speed on plant property is 25km/h.

Vehicles and Motorized Equipment:

In addition to the plant-owned vehicles, there are various types of motorized equipment in use at the Power Plants. These include lawn mowers, chain saws, portable gas generators, snow blowers, pumps, outboard motors, etc.

Under no circumstance is anyone allowed to operate any of the above without receiving prior authorizations from Plant Supervision or Plant Utility Person.



6. Accident/Incident Reporting

6.1 Accident/Incident Reporting



✓ Accident/Incident Reporting

6.2 Accident/Incident Reporting

Accident/Incident Reporting

An incident is an event that results in loss or harm to personnel in the form of (injury/illness), environment, asset, or equipment.



Iris

Even with "near misses", all workers, including Offsite Personnel are encouraged to initiate and/or participate.

The Intent is to prevent recurrences and reduce or eliminate any further injuries.

Iris is our platform for reporting of problems and events related to health and safety, environment, communities and operational occurrences.

6.3 Personal Injury

Accident/Incident Reporting

Personal Injury/Equipment Damage

All incidents, accidents or injuries must be immediately reported by contacting the supervisor and report to Totten Mine First Aid (705-866-3800) to register the event.

For Minor Injuries - the individual shall contact their supervisor and report to Totten Mine First Aid to register the event.

If the injured person reports to a hospital or clinic directly, #1 First Aid is to be notified at 705-682-6622 so that the reported event can be completed.

If EMS is required, 911 shall be called directly. Immediately thereafter a call must be placed to #1 First Aid at 705-682-6622 to inform them that an ambulance is attending the site.



Who can report problems and events?

Events can be reported by any employee or contractor who has access to the Vale network.



Reporting Deadline

All events must be registered within 48 hours.

6.4 Vehicle Accident

Accident/Incident Reporting

Vehicle Accident

In the event of a vehicle accident, report it immediately to the Power Plant Utility Person (705-920-4133) and Vale Contact person.

If neither are available contact Totten first aid (705-866-3800) who will arrange for emergency assistance.

Trespassing, Vandalism or other Similar Incidents

Call the Protection Services Supervisor at 705-682-5246. They will provide a response and/or further direction for the incident as required.



Who can report problems and events?

Events can be reported by any employee or contractor who has access to the Vale network.



Reporting Deadline

All events must be registered within 48 hours.

7. Emergency Preparedness

7.1 Emergency Preparedness



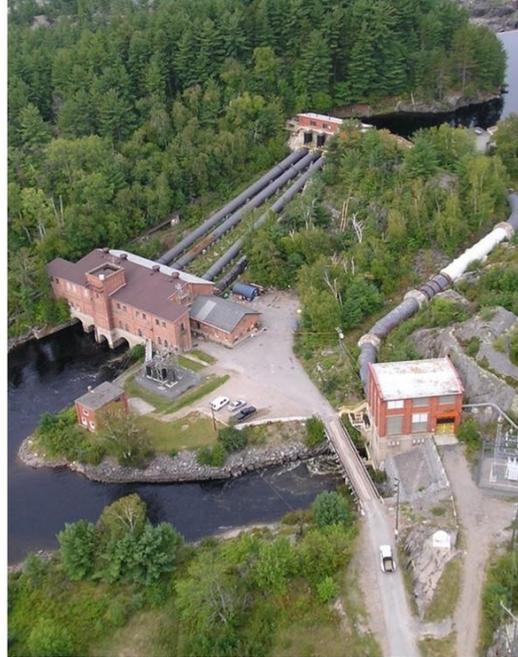
Emergency Preparedness

7.2 Emergency Preparedness

Emergency Preparedness

The Surface Tier 2 Orientation provided guidance on the application of Emergency Preparedness including activating an emergency and how to classify one.

The following is how to respond to an emergency at the Power Plants / Dams.



7.3 Emergency Preparedness

Emergency Preparedness

All workers at the Plants are to become familiarized with the Power Plants in respect to hazardous materials and high hazard areas, as well as the location of emergency equipment. You must also be familiar with local procedures in respect to emergencies.

The Power Plant Utility Person is the First Response Emergency Preparedness Co-ordinator for the Power Plants.

All plants have telephones and each visitor should be familiar with the location of the nearest phone and the appropriate emergency numbers.



7.4 Emergency Preparedness

Emergency Preparedness

Fires

Any fire must be reported promptly to the Power Plant Utility Person or #1 Substation operator (705-682-6677).

If you feel the fire can be extinguished or brought under control when first discovered, do so without delay, and then call the Power Plant Utility Person or #1 Substation Operator.

Fire alarms will be activated when smoke is detected within the plants. These alarms, in turn, initiate alarms on the scada system for the Power System Operator in Copper Cliff.

! Setting of fires to burn rubbish is prohibited.



8. Plant Exit

8.1 Plant Exit



8.2 Plant Exit

Plant Exit

Good work practices dictate that you close the loop on work you were doing to avoid creating risks or hazards for other work groups, cross shifts, or other work in the area. Here are some tasks to consider when getting ready to exit the plant to ensure your safety and that of those around you:

- ✓ **Housekeeping** - Is your worksite cleaned up after your job?
- ✓ **Personal Lock and Tag** - Has your personal protection been removed at the end of the shift?
- ✓ **Status Tagging** - Is there ongoing work that needs a status tag placed or is there equipment in Bad Order that needs to be identified?
- ✓ **Guarding** - Have you returned all guards to their proper location?
- ✓ **Waste Segregation** - Have you disposed of materials in the appropriate waste receptacles/bin/area?
- ✓ **Vale Contact Person** - Do they need an end of shift report from me?
- ✓ **Permits** - Do I need to close or hand in any permits?
- ✓ **Sign out** - and call the Utilityman.

9. Conclusion

9.1 Conclusion



✔ Conclusion

9.2 Conclusion

Conclusion

You have completed your review of this module, as a worker you should now be able to:

- Understand Plant Entry Procedure
- Identify Site Specific Hazards and Controls for Power Plants / Dams.
- Follow Procedures in the event of:
 - Equipment Damage
 - Personal Injury
 - Process Upset (Emergency Preparedness)
- Complete Plant Exit Procedure Checklist



9.3 Reference Documents:

Conclusion

Forms and Procedures:

The following forms and procedures are available upon request from your Vale Contact Person.

- Power Isolation Request form
- Procedure #61PP-013 - Accessing Power Plants.
- Procedure MPROC-70001- Lifting and Mechanical Handling.
- Procedure MPROC-70002 - Rigging Training Levels.
- Procedure MPROC-70003 - Lifting Plan Guideline
- Procedure MPROC-50001 - Switch Room & Substation Access Procedure
- MPROC-55002 - Authorization to Work Around Energized Overhead Conductors
- MSPEC-55003 - Storage of Material Under Energized Transmission Lines Prohibited

