

Tier 3: Acid Plant Orientation - 23

1. Acid Plant Orientation

1.1 Introduction



1.2 Acid Plant Orientation

Acid Plant Orientation

Tier Three – Site Specific Access

1.3 Course Objectives

Course Objectives

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

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



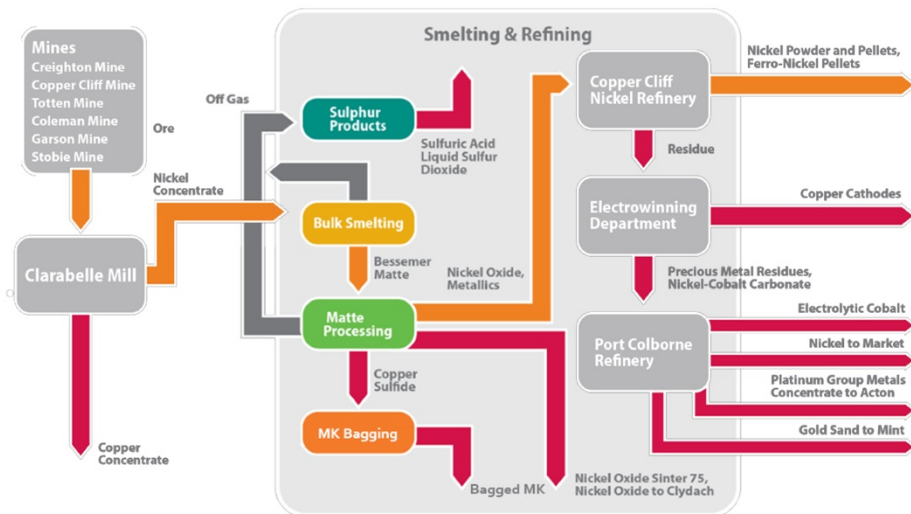
1.4 Acid Plant Overview

Introduction

Acid Plant Overview

1.5 Acid Plant Overview

Acid Plant Overview



1.6 Acid Plant Overview

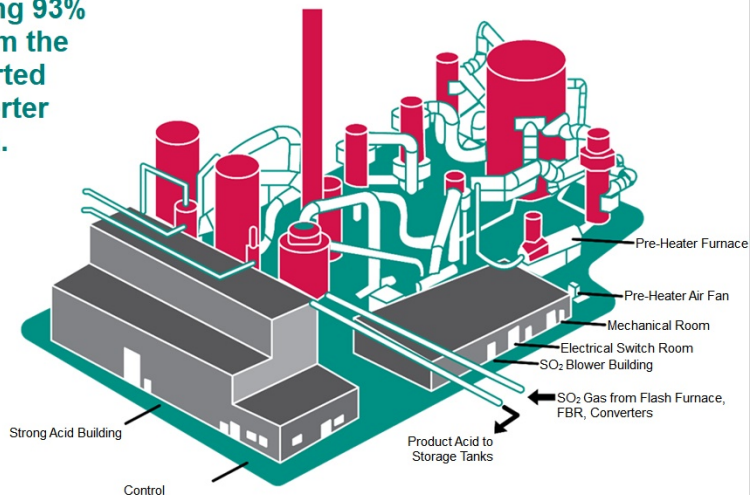
Acid Plant Overview

The Acid Plant receives SO_2 gas from the Copper Cliff Complex's smelting operations.

The gases are first dried using 93% acid in the drying tower. From the tower, the gas is then converted from SO_2 to SO_3 in the converter located in the courtyard area.

The SO_3 gas is absorbed into 98% acid in the absorbing towers.

Residual cleaned gases then exit through the Acid Plant stack.



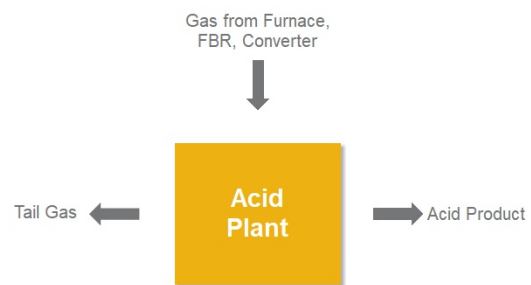
1.7 Acid Plant Overview

Acid Plant Overview

“Treated” acid is pumped from the production plant up to the storage tanks as either 93% or 99% sulphuric acid.

Finally, the acid is loaded into rail cars there are 12 loading stations or a transport truck (1 loading station) and shipped to customers to use in:

- Pulp and Paper industry (bleaching and pulp treatment)
- Steel industry (treating/pickling steel)
- Water treatment chemicals
- Fertilizer industry
- Domestic drain cleaners and various cleaning agents
- Electrolyte in lead-acid batteries



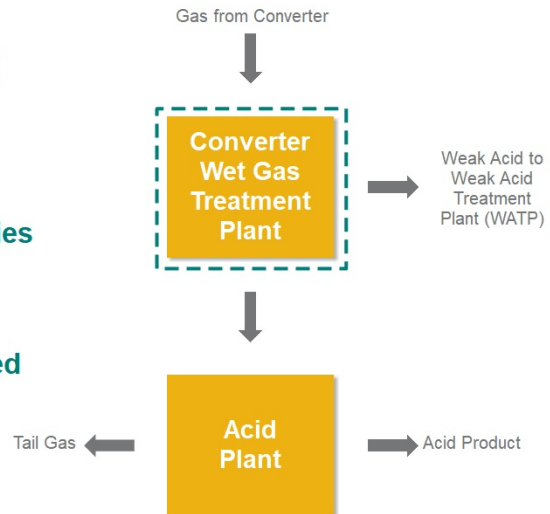
1.8 CV Wet Gas Treatment Plant Overview

CV Wet Gas Treatment Plant Overview

The purpose of the Converter Wet Gas Cleaning Plant (CV WGCP) is to clean and remove the dust particles, fumes, and acid mist from the converter feed gas prior to being sent to the Acid Plant for further processing.

Weak acid containing the captured impurities is bled from the process to the Weak Acid Treatment Plant.

The Tail Gas leaving the system is saturated with water.



1.9 Plant Entry

Plant Entry

Driving In, Walking In

1.10 Approaching The Plant

Approaching The Plant



The Acid Plant is located within the Copper Cliff Complex and is accessible from several different ways, most notably:

Yellow = from General Office direction

Orange = From Main Gate direction

The roads are single laned roadways with strict restrictions from passing any vehicles.

Be sure to follow general roadway rules.

1.11 Approaching The Plant

Approaching The Plant

Acid Plant Perimeter Warning Lights

As mentioned in the Tier 2 Orientation, Perimeter Warning Lights are activated during a plant emergency to protect workers from entering an area during a process upset.

The Acid Plant has established a boundary that is identified by signs and activated with flashing lights and sirens.



The test for the Perimeter Warning lights is on Mondays at 1:35pm.
Do not enter the area during a test

1.12 Approaching The Plant

Approaching The Plant

Acid Plant Perimeter Warning Lights

As a reminder, if you are approaching this area and the warning lights and sirens have been activated, the instructions are as follows:

- Do not enter the plant or property and keep entry routes clear for Emergency Response vehicles.
- Remain in your vehicle, close the windows and shut off the ventilation.
- Follow any instruction from Vale Emergency Response or Plant Protection personnel.
- If it is safe to do so, drive off the site until the emergency condition is controlled (if you're unable to do so, remain parked in your vehicle).
- Inform your supervisor of your current location due to entry restrictions and remain in contact until the emergency is resolved.
- Return to the site once the emergency has been declared "all clear".

1.13 Parking Lot

Parking

The available spaces for the Acid Plant parking lot are very limited, workers are encouraged to park in the contractor assigned areas at the Main Gate or Benjamin Drive Parking Lots.

Parking is available as identified **P** for a limited number of vehicles.

The parking is shared between the Acid Plants and Matte Processing.

If you require your vehicle to be located within the plant, you must obtain authorization from the control room operator.



1.14 Sign in Procedures

Sign in Procedures

All contractors and visitors going to the Acid Plant or the Converter Wet Gas Cleaning Plant must proceed to the Acid Plant Control Room located at door 587.

Before any work commences all workers are required to sign in using the Sulphur Products Sign-In Sheet.

All work within the Acid Plant area(s) must be authorized by the Acid Plant Control Room Operator.



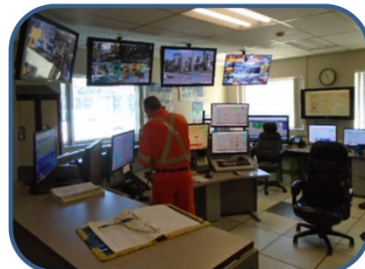
1.15 Sign in Procedures

Sign in Procedures

This sheet includes additional fields such as:

- Job Description
- Confined Space Status
- Emergency Shower Tested

When signing in or signing out, workers must be authorized by the Acid Plant Operator.



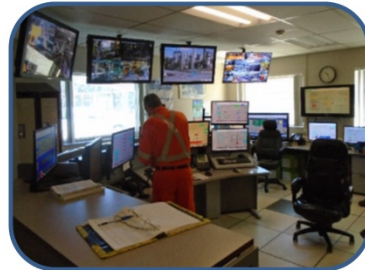
Be sure to write legibly when filling in the Sign-In Sheet

1.16 Sign in Procedures

Sign in Procedures

Control Room personnel will also assist by authorizing work within the Acid Plant and CV WGCP such as;

- Obtaining Work Permits
- Obtaining authorization to access equipment when necessary
- Securing Hot Work or Confined Space permits
- Coordinating work areas to minimize risk to multiple work groups (i.e. not working over each other)



Remember that no work begins without proper permits and authorization from the Acid Plant Operator.

1.17 Acid Plant Complex Layout

Acid Plant Complex Layout

There are several areas that make up the Acid Plant Area, including;

- Converter Wet Gas Cleaning Plant
- Booster Fan Building
- Courtyard
- SO₂ Blower Room
- Cooling Tower
- Storage & Load out
- Mechanical Room
- Laydown Area



If you are unfamiliar with the area, a tour will be coordinated with your Vale Contact Person.



2. Acid Plant - Site Specific Hazards

2.1 Acid Plant

Acid Plant

Site Specific Hazards

2.2 Site Specific Hazards

Site Specific Hazards

Using the tools that you learned in Tier 1 Orientation, ensure to use operation controls to mitigate risk associated to 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

2.3 Site Specific Hazards

Site Specific Hazards

The Acid Plant has workplace specific hazards that have been identified and need to be controlled. These include but are not limited to:

- Acids
 - 93%
 - 99%
 - Weak Acid (CV WGCP)
- Gases
- SO₃ Acid Plant
- SO₂ and
- NO_x (nitrogen oxides)
- Hydrogen Peroxide
- Overhead Piping
- Cooling Towers (noise and fog)
- Loud Noise
- Lab
- Storage and Loadout

Communicate with your Vale contact person concerning the procedures pertaining to designated substances, product locations, and process hazards in your work area.

* Separate training is required for handling / working with designated substances.



2.4 General Precautions:

Site Specific Hazards

Working in and around the Acid Plant

General Precautions:

- When entering a building always stop at the doorway, look, listen, and smell, before proceeding.
- Assume all puddles are acid and not water.
- Acid leaks can come from above. Use caution when looking up.
- Never take short cuts through buildings and always be aware of your surroundings.
- Always wear gloves, acid may be present on equipment or railings.
- Leather gloves will feel tight and will discolor when contaminated with acid.
- Acid is clear and looks just like water, is oily and can make floors, stairs and ladders slippery.



2.5 General Precautions:

Site Specific Hazards

Working in and around the Acid Plant

General Precautions:

- Report any leaks, pungent odors, or gases to the acid plant operator immediately.
- Ensure you communicate all aspects of your job with the acid plant operator.
- Always head upwind in the case of an emergency (Use the wind sock(s)).
- The Acid Plant Laboratory should not be entered as operators frequently travel in/out of this area with acid samples. Please stay out and away from the doorway.



2.6 Hazard - Sulphuric Acid (H₂SO₄)

Hazard - Sulphuric Acid (H₂SO₄)



Sulfuric acid is one of the most important compounds made by the chemical industry.

It is used to make hundreds of compounds needed by almost every industry.

At Vale most SO₂ emissions are collected and sent to the Acid Plant rather than going up the Super Stack to minimize environmental impact and converted into Sulphuric Acid, which Vale in turn sells to market.



2.7 Hazard - Sulphuric Acid (H₂SO₄)

Hazard - Sulphuric Acid (H₂SO₄)



The properties of Sulphuric Acid are that it's a clear and colourless oily liquid that is not combustible that depending on its purity can be odourless.

Hazards:

- Very toxic; fatal if inhaled
- Highly reactive
- Incompatible with many common chemicals
- Reacts violently with water
- Corrosive and will cause severe skin burns and eye damage

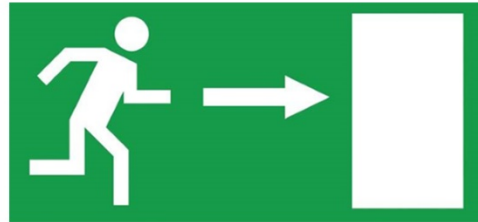


2.8 Control - Sulphuric Acid (H₂SO₄)

Control - Sulphuric Acid (H₂SO₄)

Workers can be exposed to sulphuric acid but will be under the proper controls (i.e. PPE and ZES). In the event of an uncontrolled exposure to sulphuric acid spill (i.e. uncontrolled spill, leak) the following should generally be the safe course of action:

- Evacuate the area immediately
- Contact the Acid Plant Control Room
- Keep out unnecessary and unprotected personnel
- Do not touch damaged containers or spilled product unless wearing appropriate protective equipment
- Water should never be used to clean spills



2.9 Control - Sulphuric Acid (H₂SO₄)

Control - Sulphuric Acid (H₂SO₄)

Additional controls to reduce the risk of exposure to sulphuric acid include:

- Using the required Site Specific PPE
- Knowing where the Eyewash and Emergency Shower Installations are and how to use them
- Following Procedures such as locking and tagging (ZES)



2.10 Control - Sulphuric Acid (H_2SO_4)

Control - Sulphuric Acid (H_2SO_4)

PPE Requirements

At the Acid Plant and CV WGCP, the basic requirements for Personal Protective Equipment (PPE) is Class 4 approved PPE which consists of:

- Face Shield (Class 6A) is to be worn when work involves potential exposure to acid.
- Hi-Vis clothing in accordance with Vale SAF-SPI-23
- Leather gloves



2.11 Control - Sulphuric Acid (H_2SO_4)

Control - Sulphuric Acid (H_2SO_4)

PPE Requirements

Class 3 approved PPE is required when working on any piece of equipment that contains or may have contained acid (this includes the field handling of valves and the taking of acid samples), the starting of pumps and the loading or off-loading of acids or other chemicals.

Depending on the task, an additional level of hand protection may be required. Consult with your Vale Contact Person/Acid Plant Control Room Operator what is required.



2.12 Control - Sulphuric Acid (H_2SO_4)

Control - Sulphuric Acid (H_2SO_4)

PPE Requirements

Depending on the task, additional PPE such as a Class 3, 2 or 1 personal protection may be required. Your Vale Contact Person will advise of these requirements and ensure you are properly trained for the class of PPE.

Class 1 or 2 approved full or partially encapsulated protection is required when performing specific tasks such as entering active towers or removing tower elbows.



2.13 Hazard - Acid 93% and 99%

Hazard - Acid 93% and 99%

Chicken Wing and Acid:



Start



2.14 Hazard - Acid 93% and 99%

Hazard - Acid 93% and 99%

Chicken Wing and Acid:



Start



1 Minute



2.15 Hazard - Acid 93% and 99%

Hazard - Acid 93% and 99%

Chicken Wing and Acid:



Start



1 Minute



1.5 Minutes



2.16 Hazard - Acid 93% and 99%

Hazard - Acid 93% and 99%

Chicken Wing and Acid:



2 Minutes



2.17 Hazard - Acid 93% and 99%

Hazard - Acid 93% and 99%

Chicken Wing and Acid:



2 Minutes



3 Minutes



2.18 Hazard - Acid 93% and 99%

Hazard - Acid 93% and 99%

Chicken Wing and Acid:



2 Minutes



3 Minutes



5 Minutes



2.19 Hazard - Acid 93% and 99%

Hazard - Acid 93% and 99%

Chicken Wing and Acid:



Before



After



2.20 Control - Acid 93% and 99%

Control - Acid 93% and 99%

Eyewash & Emergency Shower Stations

In the event of being exposed to sulphuric acid, several eyewashes and emergency shower stations are located throughout the plant:

- Before starting work, be familiar with their nearest location.
- Stations at the Acid Plant must be tested before commencing certain work; verify the requirements with the Acid Plant Control Room Operator.
- If you get acid on yourself start rinsing Immediately.
- Remove clothing and rinse for at least 20 minutes.



2.21 Control - Acid 93% and 99%

Control - Acid 93% and 99%

Eyewash & Emergency Shower Stations

In the event of being exposed to sulphuric acid, several eyewashes and emergency shower stations are located throughout the plant:

- Once either part of the station is engaged a local alarm will sound and red light will flash.
- The control room will get an alarm, help is on the way.
- Stay in the station until help arrives.



2.22 Control - Acid 93% and 99%

Control - Acid 93% and 99%

Diphoterine (DAP):

Diphoterine® solution is a sterile, active washing solution for skin and eyes that is used for the flushing of corrosive acidic, basic and irritant skin and eye splashes.

The use of this product requires authorization from “your company” and training in its application and use.

For more information on the product, consult with your Supervisor.



2.23 Hazard - Sulfur Dioxide (SO₂)

Hazard - Sulfur Dioxide (SO₂)

SO₂ is soluble in water. In water, Sulphur Dioxide is converted to sulfurous acid; this acid is what causes irritation of the nose and throat.

For concentrations between 10-20ppm the following symptoms typically occur: rhinorrhea, choking, cough and in some instances reflex bronchoconstriction with increased pulmonary resistance.

Inhaled SO₂ is only slowly removed from the respiratory tract. After absorption in the blood stream, the sulfurous acid is widely distributed throughout the body, quickly converted to sulfite and bisulfite, which in turn is oxidized to sulfate and excreted in the urine.



2.24 Hazard - Sulfur Dioxide (SO₂)

Hazard - Sulfur Dioxide (SO₂)

Individuals with asthma can be much more susceptible to the respiratory effects of sulfur dioxide (SO₂).



The **TWA** or “time-weighted average limit” for SO₂ to which a worker may be exposed in a work day or work week is:

TWA (8 hour shift) = 2 ppm

TWA (10 hour shift) = 1.6 ppm

TWA (12 hour shift) = 1.33 ppm

STEL” or “short-term exposure limit” means the maximum airborne concentration of SO₂ to which a worker may be exposed in any 15-minute period.

STEL (15 min) = 5 ppm

2.25 Hazard - Sulfur Dioxide (SO₂)

Hazard - Sulfur Dioxide (SO₂)

Long Term Health effects:

- NIOSH has recognized the phenomenon that adaptation to irritating concentrations of SO₂ occurs in experienced workers. Other studies have shown that acclimatization to the subjective effects of SO₂ does occur. This will result in detection and recognition in the upper concentration ranges outlined previously.
- Long-term occupational exposure to sulfur dioxide has been associated with respiratory effects such as decreased pulmonary function and an increased incidence of chronic bronchitis. However, the information located is not sufficient to draw firm conclusions (CCOHS).
- **Sulfur dioxide is not known as a respiratory sensitizer. However, in some cases workers have developed asthma following short or long-term exposure to sulfur dioxide. This effect is most likely due to airway hypersensitivity caused by severe irritation of the respiratory tract, which occurs following “gassing”.**



2.26 Hazard - Sulfur Dioxide (SO₂)

Hazard - Sulfur Dioxide (SO₂)

Long Term Health effects:

- Sulfur dioxide is not known to be a human carcinogen. Several human population studies have examined the possibility that sulfur dioxide may cause cancers such as lung cancer, stomach cancer or brain tumours. In all of the studies, there were uncontrolled compounding factors, such as concurrent exposure to other chemicals.
- The International Agency for Cancer (IARC) has reviewed these studies and concluded there is inadequate evidence for carcinogenicity in humans. There is limited evidence of carcinogenicity in animals.



2.27 Control - Sulfur Dioxide (SO₂)

Control - Sulfur Dioxide (SO₂)

To maintain the health of workers and contractors within the Acid Plant and CV WGCP, controls have been put in place to reduce the risks associated with elevated exposure concentrations of sulfur dioxide (SO₂).

Engineered Control: The Acid Plant and Converter Wet Gas Cleaning Plant are equipped with SO₂ monitors that alarm at 20 ppm. A red flashing light at every door indicates the presence of SO₂ and alarms in the Acid Plant Control Room. If the monitors are alarming, avoid entering the plant or don your respirator and exit the plant immediately.



2.28 Control - Sulfur Dioxide (SO₂)

Control - Sulfur Dioxide (SO₂)

Respiratory Protection Program

A minimum half face air purifying respirator (NIOSH-approved) with a combination particulate and chemical cartridge(s) (ie: P-100/OV/Acid Gas) appropriate for sulfur dioxide must be carried on each worker accessing the Acid Plant or CV WGCP.



2.29 Control - Sulfur Dioxide (SO₂)

Control - Sulfur Dioxide (SO₂)

Users Shall:

- Wear the appropriate respirator when required.
- Use respirator in accordance with instructions and training received.
- Check that the respirator is in good operating condition.
- Fit-check the face to facepiece seal immediately after donning.
- Take all precautions to prevent damage to the respirator and report any malfunction or damage to your supervisor.
- Clean the respirator after each use.
- Be clean-shaven where the facepiece seals to the skin.



2.30 Control - Sulfur Dioxide (SO₂)

Control - Sulfur Dioxide (SO₂)

If you encounter the smell or taste of SO₂: (0.33 to 5ppm)

- Don your half face respirator and continue with your task.

If you experience respiratory irritation and/or burning of the eyes: (estimated concentration to be in the range of 10 – 20 ppm)

- Don your respirator (if it has not already been donned), ensure equipment and/or process is safe, immediately exit the area and report the occurrence to the supervisor and/or nearest control room.
- **Plant Supervision** will investigate the area wearing the proper respiratory protection and measure the SO₂ concentration to identify the source of emission and establish a plan of action to correct the problem and reduce SO₂ concentrations.



2.31 Control - Sulfur Dioxide (SO₂)

Control - Sulfur Dioxide (SO₂)

At 100ppm, the condition of SO₂ is considered IDLH to be an (Immediate Danger to Life and Health) and an SCBA must be worn. Fit testing and training are required to use an SCBA.

In the case of sulfur dioxide related adverse health effects, workers shall notify their supervisor and report to first aid for evaluation.

An incident report form needs to be created as per the established process.



2.32 Control - Sulfur Dioxide (SO₂)

Control - Sulfur Dioxide (SO₂)

If you encounter the smell or taste of SO₂ (0.33 to 5ppm):

- All air purifying chemical cartridges used within the Acid Plant and CV WGCP for protection against sulfur dioxide (SO₂) shall be changed annually, based on a calculated service life for 3M and MSA cartridges.
- North respiratory protection does not meet the necessary service life hours in comparison to 3M and MSA. Therefore, it is recommended that North manufactured respirators and chemical cartridges should not be used for Vale's application at the Smelter.
- In the case of breakthrough (i.e. an worker can taste or smell SO₂ or feels irritation), the worker shall immediately exit the work area, dispose of their current cartridge and replace with a new cartridge.



2.33 Hazard - Sulphuric Acid (weak acid)

Hazard - Sulphuric Acid (weak acid)

Hazards associated with Sulphuric Acid (weak Acid) contact include:

- Exposure to skin can cause chemical burns if left untreated.
- Brief skin contact with the acid will result in an itching sensation.
- Prolonged skin contact will result in redness, deep irritation and eventual ulceration of the skin if not properly treated.



2.34 Control - Sulphuric Acid (weak acid)

Control - Sulphuric Acid (weak acid)

Weak acid is contained within pipes but workers still have the potential to be exposed.

To mitigate the risk of exposure:

- Lines are labeled throughout the plant.
- Workers must wear rubber gloves when working on anything that contains weak acid.
- If exposed to acid on skin or in the eyes:
 - Use eyewash station and emergency showers
 - Immediately and thoroughly flush with large quantities of clean water for 20 minutes
 - Report to Supervisor and First Aid.



2.35 Control - Sulphuric Acid (weak acid)

Control - Sulphuric Acid (weak acid)

Because of the extensive amount of piping and vessels containing acid, workers are required to report any visible leaks or smells of pungent odours or gas to the Acid Plant Control Room Operator immediately.



Remember that acid and water look alike.
Assume wet areas are weak acid
until their pH is verified.

Floors will be slippery and SO₂ may be
generated from the area of leak.

2.36 Hazard - Acid Plant / CV WGCP Gases

Hazard - Acid Plant / CV WGCP Gases

The process of making Sulphuric Acid at the Acid Plant and Converter Wet gas Cleaning Plant includes the management of several liquids and gases.

The gases with the highest risk to workers are:

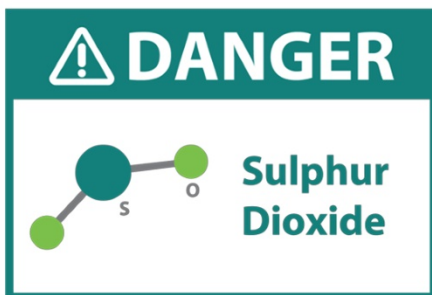
- Sulphur Dioxide (SO_2)
- Sulphur Trioxide (SO_3) (Acid Plant)
- NOx (NO and NO_2)



2.37 Sulphur Dioxide (SO_2)

Hazard - Acid Plant / CV WGCP Gases

Sulphur Dioxide (SO_2)



Sulphur Dioxide (SO_2) is normally contained within the Acid Plant and CV WGCP process, however there is always a potential for an occurrence of a spill or leak.

Sulphur Dioxide is a colourless gas with a sharp, pungent, suffocating or choking odor.

SO_2 is soluble in water. In water, Sulphur Dioxide is converted to sulfurous acid; this acid is what causes irritation of the nose and throat, rhinorrhea, choking, cough and in some instances reflex bronchoconstriction with increased pulmonary resistance.



2.38 Sulphur Trioxide (SO₃)

Hazard - Acid Plant / CV WGCP Gases

Sulphur Trioxide (SO₃) *(Exists at the Acid Plant Only)*

 **DANGER**



**Sulphur
Trioxide**

Sulphur dioxide enters the converter and produces sulphur trioxide (SO₃) which is a precursor to the creation of sulphuric acid.

In industry, sulphur trioxide in its gaseous form is a significant pollutant and a primary agent in acid rain.



2.39 Sulphur Trioxide (SO₃)

Hazard - Acid Plant / CV WGCP Gases

Sulphur Trioxide (SO₃) *(Exists at the Acid Plant Only)*

 **DANGER**



**Sulphur
Trioxide**

SO₃ is highly corrosive and hygroscopic in nature. It should be handled with extreme care because it reacts with water violently and produces highly corrosive sulphuric acid in the form of an opaque white cloud.

SO₃ irritation to the lungs, throat, nose and eyes due to its corrosive and hygroscopic properties where if exposed will create a sulphuric acid mist.



If a Sulphur Trioxide leak occurs, the leak will rapidly absorb moisture and generate a sulphuric acid mist, which appears as a dense white cloud.

2.40 Nox Gas

Hazard - Acid Plant / CV WGCP Gases

(NO_x)

 **DANGER**



**Nitrous
Oxide**



NO_x (pronounced “knocks”) is a combination of gases comprised primarily of NO and NO₂.

NO_x may be irritating to the skin, eyes and mucous membranes. Nitric acid may form in the presence of moisture (sweat or tears) to cause burns.

If inhaled, NO_x will penetrate deep into the lungs. Low concentrations will cause airway reactivity such as coughing, or shortness of breath. Increased concentrations will cause further harm.

NO_x is not stable in the air and quickly oxidises to NO₂. NO₂ is a strong oxidant and manifests itself into a reddish brown cloud with a pungent odor (bleach smell) that may accumulate in low-lying areas.

Look for reddish brown clouds

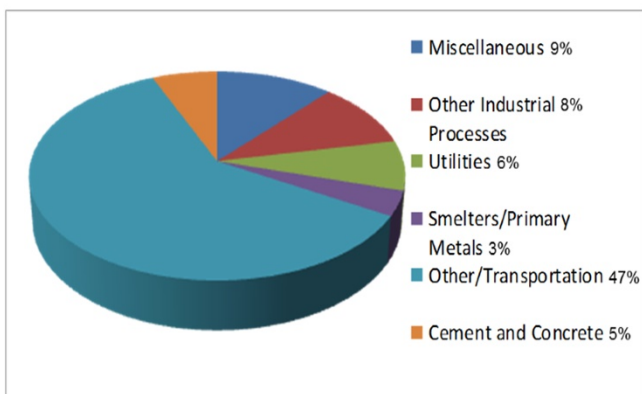
2.41 Nox Gas

Hazard - Acid Plant / CV WGCP Gases

 **DANGER**



**Nitrous
Oxide**



Ontario Nitrogen Oxides Emissions by Sector
(Emissions from Point/Area/Transportation Sources, 2012 Estimates)

Reference:

2.42 Control - Acid Plant / CV WGCP Gases

Control - Acid Plant / CV WGCP Gases

The primary methods of control of gases in the Acid Plant are the detection, reporting and notifications of a spill or leak.

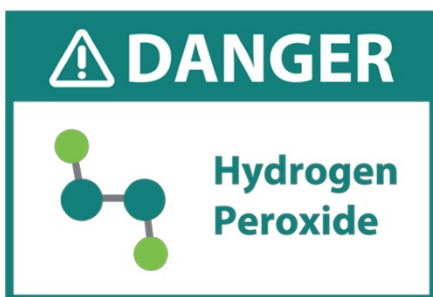
If you encounter a gas leak anywhere in the Acid Plant, report the leak to the Control Room Operator and leave the area immediately and maintain a position upwind from the hazard and proceed to the nearest safe assembly area.



Remember: Gas clouds can appear as white opaque (SO_3) or reddish brown (NO_x)

2.43 Hazard - Hydrogen Peroxide

Hazard - Hydrogen Peroxide



Hydrogen peroxide is well-established as an environmentally-friendly, deodorizing and bleaching agent.

Its application at the Acid Plant is to treat impurities in the final product. The Acid plant uses Hydrogen Peroxide at a concentration of 50%.

Hydrogen Peroxide is corrosive to organic substances such as wood, leather and cotton. On skin, it can cause severe burns and when in contact with organic substances can smolder or possibly ignite.



2.44 Control - Hydrogen Peroxide

Control - Hydrogen Peroxide

 **DANGER**



The controls for Hydrogen Peroxide at the Acid Plant are almost entirely engineered, meaning that workers have little influence or control over their effectiveness.

Hydrogen Peroxide is kept in sealed storage tanks and piping.



Working on these systems will likely require Class 3 PPE



2.45 Control - Hydrogen Peroxide

Control - Hydrogen Peroxide

 **DANGER**



To mitigate other risks associated to Hydrogen Peroxide:

- Follow instructions of the Acid Plant Control Room Operator.
- Obey all conditions on work permits.
- If you are exposed to Hydrogen Peroxide get into the nearest safety shower or use the eyewash station immediately.



Working on these systems will likely require Class 3 PPE



2.46 Hazard - Overhead Pipes

Hazard - Overhead Pipes

A network of overhead trestles carry high volume acid lines, SO₂ or SO₃ gas, Natural Gas, High power electrical cables, and service water.

Care should always be taken when working around any lines or vessels, but extra precautions must be taken when working on those containing acid.



2.47 Hazard - Overhead Pipes

Hazard - Overhead Pipes

Hazards associated with overhead infrastructure:

- Mobile equipment coming into contact
- Leaks at joints and valves



2.48 Control - Overhead Pipes

Control - Overhead Pipes

When working around the Acid Plant's network of overhead trestles and pipes, consider the following:

- The operation of motorized vehicles must be done with care and moved around the property with any service extensions lowered.
- Never park beneath trestles or piping.
- Report suspicious leaks to the Acid Plant Control Room.
- To work at height near the Acid Plant, you require the expressed permission of the Acid Plant Operator/Control Room; prior to commencing work.



2.49 Hazard - Cooling Towers

Hazard - Cooling Towers

The Plant process includes the use of a cooling tower to cool process equipment.

The cooling water used in the cooling towers is treated with chemicals that aid in their efficiency of operation.

These chemicals could be hazardous to humans.

Another hazard associated to the cooling towers pertains to the fog that's emitted, mostly in the winter months from the cooling towers.

Heavy fog in this area can cause low visibility when travelling in the area.



2.50 Control - Cooling Towers

Control - Cooling Towers

If working on cooling towers follow necessary precautions identified through discussions with your Acid Plant Control Room Operator.

Use caution, and if you have any questions about the chemicals themselves, refer to the applicable MSDS sheets.

For areas laden with fog from the cooling towers:

- Use caution when working, walking or driving.



Working with cooling tower chemicals will likely require Class 3 PPE



2.51 Hazard – Acid Plant Storage & Load Out

Hazard – Acid Plant Storage & Load Out

After production, sulphuric acid is pumped from the production plant to storage tanks where it's later loaded into rail cars or trucks.

The storage area consists of:

- Three 10,000tonne and one 5,000tonne tank.
- A rubberized berm, engineered to meet environmental requirements in the case of a spill.
- A “loading ramp” that transfers acid in up to 12 rail cars or 1 transport truck.
- A building with remote plant controls, circulating acid pumps and other equipment.



The hazard associated to this area are any acid spills.



2.52 Control – Acid Plant Storage & Load Out

Control – Acid Plant Storage & Load Out

The controls associated to the Acid Plant Storage and Loadout are related to procedures:

- The entire area is considered restricted. Sign in at the Control Room before entering the area.
- All work on the loading platform must be coordinated with the Acid Plant.
- Any work within 12ft. of the railway tracks also requires a track isolation permit through the transportation department.



Never drive within the berm
without the authorization
of the Control Room



2.53 Control – Acid Plant Storage & Load Out

Control – Acid Plant Storage & Load Out

The controls associated to the Acid Plant Storage and Loadout are related to procedures:

- Know all the Safe Assembly Areas and their locations.
- The Acid Loading Ramp will be automatically shutdown in the event of an eyewash/safety shower station being activated or if any of the e-stops along the ramp are triggered, and will also alarm in the Acid Plant Control Room.



Never drive within the berm
without the authorization
of the Control Room



2.54 Hazard - Reagents

Hazard - Reagents

Shown here are some additional chemicals/substances that can be found within the Acid Plant areas.



Chemical	Comments	Hazard
Carbon Monoxide (CO)	a colorless, odorless, and tasteless gas that is slightly less dense than air	No warning properties (no colour, odour)Has a higher affinity to bond with hemoglobin over oxygen (250X)
Methane (CH ₄)	methane is a colorless, odorless gas	Asphyxiant/Flammable gas/Oxygen displacing
Sulphur Dioxide (SO ₂)	A toxic gas with a pungent, irritating smell	Very Toxic/Concentrations of 10 to 20 ppm can irritate mucous membranes Severe irritation of the nose, throat and lungs.
Cooling Water Treatment Chemicals		
Optisperse 5150	These chemicals are added to the cooling water either by metering pump/educter from a bulk tote or manually into the sump in small quantities by bucket.	May cause moderate irritation to the skin. Severe irritant to the eyes, possibly corrosive. Mists/aerosols may cause irritation to upper respiratory tract.
Genguard GN8209 GN8007		
Spectrus OX1201,BD1507, NX1100	All cooling water chemicals are treated in the same manner and require class 3 ppe when interacting with them.	
Sodium Hypochloride		
JEX 12		
Foamtrol		
Depositrol SF5100		
Floguard MS6206		

2.55 Control - Reagents

Control - Reagents

Shown here are some additional chemicals/substances that can be found within the Acid Plant areas.

These chemical hazards are posted in the Acid Plant Control Room and properties and controls can be discussed with the Acid Plant Control Room Operator.



Chemical	Comments	Hazard
Carbon Monoxide (CO)	a colorless, odorless, and tasteless gas that is slightly less dense than air	No warning properties (no colour, odour)Has a higher affinity to bond with hemoglobin over oxygen (250X)
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Sodium Hypochloride		
JEX 12		
Foamtrol		
Depositrol SF5100		
Floguard MS6206		

2.56 Risk Management

Risk Management

As mentioned, there are controls to manage risk. Actions or inactions in response to controls may result in one of three conditions; an **Unsafe Condition**, a **Near Miss**, or an **Incident**. Any of the three must be reported immediately to a Supervisor or Contact Person.



BE AWARE

Be aware of my surroundings and the risks around me.

FOLLOW POLICIES & PROCEDURES

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



In the case of incidents, there may be additional steps required if the resulting action include:

- Equipment Damage
- Personal Injury
- Process Upset

3. CV - WGCP - Site Specific Hazards

3.1 Converter

Converter Wet Gas Cleaning Plant

Site Specific Hazards

3.2 Site Specific Hazards

Site Specific Hazards

In addition to the hazards and controls described earlier in this section, the CV WGCP has additional hazards which include but are not limited to:

- Wet Electrostatic Precipitator (ESP) and
- 17% Caustic



Communicate with your Vale contact person concerning the procedures pertaining to designated substances, product locations, and process hazards in your work area.

* Separate training is required for handling working with designated substances.



3.3 Hazard - 17% Caustic

Hazard - 17% Caustic

The Chemical Cleaning System is based on a caustic solution being used as a cleaning agent for the Weak Acid Coolers.

The Weak Acid Sump collects the liquid from the containment area under the weak acid equipment, WESPs, the Wet Gas Fan Sump and in the event of an emergency overflow from the Retention Vessel or the Gas Cooling Tower.



3.4 Hazard - 17% Caustic

Hazard - 17% Caustic

Hazards associated with 17% Caustic contact include:

- Exposure to skin or eyes can cause chemical burns, chronic skin contact with low concentrations may cause dermatitis.
- Inhalation of mists can cause severe respiratory irritation. Inhalation could result in pulmonary edema (fluid accumulation).
- Ingestion may cause severe irritation and corrosive damage in the mouth, throat and stomach.

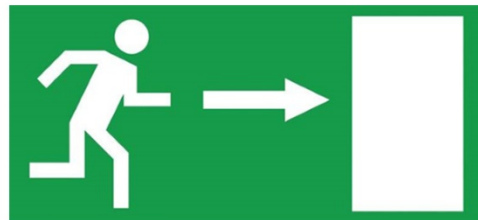


3.5 Control - 17% Caustic

Control - 17% Caustic

In the event of an uncontrolled exposure to 17% caustic, the following should generally be the safe course of action:

- Evacuate the area immediately
- Contact the Acid Plant Control Room
- Keep out unnecessary and unprotected personnel
- Do not touch damaged containers or spilled product unless wearing appropriate protective equipment
- Ventilate closed spaces before entering them



3.6 Control - 17% Caustic

Control - 17% Caustic

Additional controls to reduce the risk of exposure to 17% Caustic include:

- Personal Protective Equipment including, eye/face protection, chemical goggles and face shield are recommended
- Where contact is likely, wear chemical-resistant gloves, a chemical suit and rubber boots
- In case of insufficient ventilation, wear suitable respiratory equipment
- Knowing where the Eyewash and Emergency Shower Installations are and how to use them



3.7 Hazard and Control WESP (Wet Electrostatic Precipitator)

WESP (Wet Electrostatic Precipitator) - Hazard and Control



Wet Electrostatic Precipitators use high voltages to perform their task. Improper work on the equipment may lead to electrocution.



To work on this equipment, workers must:

- Receive authorization from the Acid Plant Control Room prior to entering the area
- Strictly follow all procedures related to this equipment



4. Equipment Damage

4.1 Equipment Damage

Equipment Damage

4.2 Equipment Damage

Equipment Damage

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

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

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

Get in touch with your Vale Contact Person for any information required on the Incident/Accident Investigation system.

Incident Management (SAP IM)



Click to log into the SAP IM database to process Incident, Near Miss, and Unsafe Condition reports.



Web-based Search tool
Records are from prior day or earlier



SAP IM Procedures
Tools & Resources

5. Personal Injury

5.1 Personal Injury

Personal Injury

5.2 Personal Injury

Personal Injury

Acid Plant Emergency Numbers

Report immediately to the Acid Plant Control Room and #1 First Aid.

Phone First Aid at 705-682-6622

Notify, the Acid Plant Control Room:

- (705) 682-8616
- (705) 682-8609
- By radio channel 7 to the Acid Plant Control Room



6. Emergency Preparedness

6.1 Emergency Preparedness

Emergency Preparedness

6.2 Emergency Preparedness

Emergency Preparedness

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

The following is how to respond to an emergency at the Acid Plant.



6.3 Notification – Acid Plant

Notification – Acid Plant

Fire Evacuation - OUTVAC

Continuous Tone



Leave the building by the nearest exit.

In the event of a fire evacuation or upon hearing an intermittent alarm at the acid plant, all workers, except specific, qualified personnel, will proceed immediately to the Fire Evacuation area or Safe Assembly Area and await further instructions.

Assembly Area - INVAC

Intermittent Tone



Go to the nearest Safe Assembly Area.

Alarm testing is conducted each Monday at 1:30 pm. Report any malfunctions immediately to your Supervisor to ensure that it is corrected in a timely manner.

6.4 Fire Evacuation Area – OUTVAC

Fire Evacuation Area – OUTVAC

Upon hearing a Continuous alarm, proceed immediately to the nearest Fire Evacuation area and await further instructions.

Do not leave the evacuation area until instructed to do so, or until the all clear is given.

The Fire Evacuation Areas for the Acid Plant are:

- Acid Loadout
- Matte Processing Parking Lot
- SPD Maintenance Shop and
- ERM Office Trailer



6.5 Safe Assembly Area - INVAC

Safe Assembly Area - INVAC

Upon hearing an intermittent alarm, proceed immediately to the nearest safe assembly area and await further instructions.

Do not leave the safe assembly area until instructed to do so, or until the all clear is given.

- ERM Trailer near the Booster Fan Building (Mon-Fri Dayshift Only).
- SPD Maintenance Shop (Mon-Fri Dayshift Only)
- Acid Plant Control Room (24/7)



6.6 Safe Assembly Area - INVAC

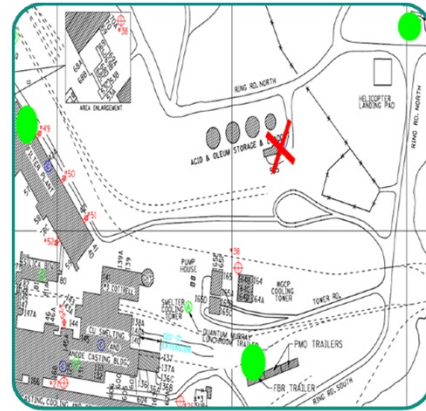
Safe Assembly Area - INVAC

Storage and Loading Safe Assembly Areas

- Day Construction Trailer (Mon-Fri Dayshift only)
- Filter Bldg door 44 (24/7)

Note: There is no Safe Assembly Area at the Storage & Loading site.

Use the Wind Socks to determine which Safe Assembly to go to.



7. Plant Exit

7.1 Plant Exit

Plant Exit

7.2 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 the safety to you and 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?
- ✓ **End States** - Have you left the process in the proper state?
- ✓ **Waste Segregation** - Have you disposed of materials in the appropriate waste receptacles/bin/area?
- ✓ **Control room** - Do I need to let the control room know that I'm clear of an 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** at the gate or other designated areas.

8. Conclusion

8.1 Conclusion

Conclusion

8.2 Conclusion

Conclusion

This concludes the material for the Acid Plant Tier 3 Orientation. You should now have a working knowledge and understanding of:

- Plant Entry
- Site Specific Hazards and Controls for the Acid Plant Procedures in the event of:
 - Equipment Damage
 - Personal Injury
 - Process Upset (Emergency Preparedness)
- Plant Exit Procedure

This Orientation provided information to access the Acid Plant site. In order to feel comfortable with the area, you may arrange a field visit with your Vale Contact Person to specifically identify procedures provided in the Orientation.

Additionally, depending on the site or work you're doing, you may require task-specific information through either the local Learning & Development Group or your Vale Contact Person.

8.3 Start The Module Quiz



**Thank you for completing the
Vale Online Module Training.**

To start the module Quiz

CLICK HERE

