

Exposure Control Plan

Exposure to Hydrogen Sulphide (H₂S) during Manure Handling Operations

Employer Company Information

- Name
- Address
- Contact information (names and phone numbers)

Purpose

- We have a duty to protect our workers from exposure to airborne contaminants during manure handling operations. Studies have shown that Hydrogen Sulphide (H₂S) can be released when manure is collected, moved, processed and stored. Effective controls are available to protect workers from exposure to H₂S.
- We know that a combination of control measures will be required to achieve this objective. We commit to being diligent in our efforts to select the most effective control technologies available and to ensure that the best practices, as described in this exposure control plan (ECP), are followed at our worksite.
- The protective measures and work procedures we establish will protect not only our workers but also all other workers on our site.

Responsibilities

The employer is responsible for the following:

- Identify and assess work processes that might lead to worker exposure to H₂S during manure handling.
- Ensure that the materials (e.g. tools, equipment, and personal protective equipment [PPE]) and other resources (e.g. worker training) required to fully implement and maintain this ECP are readily available where and when they are required.
- Conduct a periodic review (at least annually) of the effectiveness of the ECP. This includes a review of available control technologies to ensure these are selected and used when practical.
- Ensure that all required tools, equipment, and PPE are used as required by the ECP.
- Ensure that supervisors and workers are educated and trained to an acceptable level of competency.
- Maintain records of training, fit-test results, crew talks, and inspections (e.g. for equipment, PPE and work methods or practices).
- Investigate all near misses and exposure incidents.
- Coordinate work with other employers to ensure a safe work environment, including the following:
 - Inform all subcontractors of the specific hazards on the worksites
 - Ensure subcontractors have ECPs and written safe work procedures
 - Ensure that all subcontractors have the proper personal gas monitors and other equipment



Supervisors are responsible for the following:

- Ensure that workers have received adequate instruction on the hazards associated with manure handling.
- Select and implement the appropriate control measures.
- Ensure that workers using respirators have been properly fit-tested and that the results are recorded.
- Direct the work in a manner that ensures the risk to workers is minimized and adequately controlled.
- Liaise with other employers to ensure a safe work environment.
- Ensure that subcontractors are following the proper safe work procedures.

Workers are responsible for the following:

- Attend educational sessions provided by the employer.
- Use the assigned protective equipment in an effective and safe manner.
- Follow established work procedures as directed by the supervisor.
- Report any unsafe conditions or acts to the supervisor.
- Refuse unsafe work.
- Know how to report exposure incidents.

Risk Identification and Assessment

- H₂S may form and be released when organic material such as manure or vegetable matter breaks down without oxygen. This may happen, for example, in animal barns, manure piles, tanks, pits or ponds when insufficient oxygen is present.
- Workers can be exposed to H₂S when they:
 - Collect/Move manure in animal barns
 - Operate manure agitation propeller/pumping equipment or transferring equipment
 - Operate equipment for mixing manure in piles, tanks, pits or ponds (storage structures)
 - Pump liquid manure into tanks or tanker trucks
 - Spread /Apply/Irrigate fields with liquid manure
 - Maintain/Service manure handling equipment
 - Inspect or clean manure tanks, pits or ponds (storage structures)
 - Repair plumbing or piping that carries liquid manure



Health Hazards

Hydrogen sulphide (H₂S) exposure

- H₂S is a very toxic gas. It has no colour, but it smells like rotten eggs. In larger amounts, H₂S quickly blocks the sense of smell — that is why odour should never be used to rate H₂S levels.
- The gas can irritate and affect the nervous system, eyes, nose, throat, and lungs. Too much H₂S can cause a worker to stop breathing, and may lead to death.
- Because H₂S is heavier than air, it may settle in low spots. This can pose risks when entering areas where the gas may be present.

Exposure Limits

- **Hydrogen sulphide** — The occupational exposure limit (OEL) is a ceiling (a value not to be exceeded) of 10 ppm. The IDLH limit for H₂S is 100 ppm.

The Occupational Health and Safety Regulation requires employers to select controls based on the following hierarchy:

1. Elimination/Substitution of manure handling
 2. Engineering controls (e.g. mechanical ventilation)
 3. Administrative controls (e.g. signage and barriers to keep workers away from potentially hazardous areas)
 4. Personal protective equipment (e.g. respirators, gloves, goggles, and coveralls)
- Respirators will be used in conjunction with other controls, such as ventilation, to reduce worker exposure to H₂S.

Acceptable control methods for exposure to H₂S, methane during manure handling operations

- The work methods that appear in the following table are acceptable, provided that the respirator selection and other controls are used.
- The control options must be used to eliminate or reduce the risk to workers of exposure to H₂S.



Acceptable Control Methods

Work Activity	Controls	Personal Protective Equipment	Comments
Collect/Move manure in animal barns	<ul style="list-style-type: none"> Signs warning of potential H₂S exposure, posted near the work area 	<ul style="list-style-type: none"> H₂S monitor Half-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100, or MSA GME P100 Super Cartridge) Gloves (nitrile or equivalent) 	<ul style="list-style-type: none"> Monitor high alarms should be set for 10 ppm H₂S (Low 5 ppm) If the monitor alarm sounds, exit the area immediately Check monitor before re-entering the area to make sure concentrations have dropped below alarm levels
Operate manure agitation propeller/pumping and transferring equipment, outside of a barn or structure	<ul style="list-style-type: none"> Signs warning of potential H₂S exposure, posted near the work area A wind direction indicator (e.g. windsock) installed near the work area Barriers (e.g. warning tape) 	<ul style="list-style-type: none"> H₂S monitor Half-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100 or MSA GME P100 Super Cartridge) Gloves (nitrile or equivalent) 	<ul style="list-style-type: none"> Monitor high alarms should be set for 10 ppm H₂S (Low 5 ppm) If the monitor alarm sounds, exit the area immediately Check monitor before re-entering the area to make sure concentrations have dropped below alarm levels
Operate equipment for mixing manure in piles	<ul style="list-style-type: none"> Signs warning of potential H₂S exposure, posted near the work area A wind direction indicator (e.g. windsock) installed near the work area Barriers (e.g. warning tape) 	<ul style="list-style-type: none"> H₂S monitor Half-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100 or MSA GME P100 Super Cartridge) Gloves (nitrile or equivalent) Goggles (unless in a vehicle cab) 	<ul style="list-style-type: none"> Monitor high alarms should be set for 10 ppm H₂S (Low 5 ppm) If the monitor alarm sounds, exit the area or vehicle immediately Check monitor before re-entering the area or vehicle to make sure concentrations have dropped below alarm levels



Work Activity	Controls	Personal Protective Equipment	Comments
Pump liquid manure into tanks or tanker trucks	<ul style="list-style-type: none"> • Signs warning of potential H₂S exposure, posted near the work area • A wind direction indicator (e.g. windsock) installed near the work area • Barriers (e.g. warning tape) 	<ul style="list-style-type: none"> • H₂S monitor • Half-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100 or MSA GME P100 Super Cartridge) • Gloves (nitrile or equivalent) • Goggles 	<ul style="list-style-type: none"> • Monitor high alarm should be set for 10 ppm H₂S (Low 5 ppm) • If the monitor alarm sounds, exit the area or vehicle immediately • Check monitor before re-entering the area or vehicle to make sure concentrations have dropped below alarm levels
Irrigate fields with liquid manure	<ul style="list-style-type: none"> • Signs warning of potential H₂S exposure, posted near the work area • A wind direction indicator (e.g. windsock) installed near the work area 	<ul style="list-style-type: none"> • H₂S monitor • Half-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100 or MSA GME P100 Super Cartridge) • Gloves (nitrile or equivalent) • Goggles 	<ul style="list-style-type: none"> • Monitor high alarms should be set for 10 ppm H₂S (Low 5 ppm) • If the monitor alarm sounds, exit the area immediately • Check monitor before re-entering the area to make sure concentrations have dropped below alarm levels
Maintain/Service manure handling equipment	<ul style="list-style-type: none"> • Signs warning of potential H₂S exposure, posted near the work area 	<ul style="list-style-type: none"> • H₂S monitor • Half-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100, or MSA GME P100 Super Cartridge) • Gloves (nitrile or equivalent) 	<ul style="list-style-type: none"> • Monitor high alarm should be set for 10 ppm H₂S (Low 5 ppm) • If the monitor alarm sounds, exit the area immediately • Check monitor before re-entering the area to make sure concentrations have dropped below alarm levels

AgSafe recommends suitably qualified personnel assist with the items in blue



Work Activity	Controls	Personal Protective Equipment	Comments
Inspect or clean manure tanks, pits or ponds (storage structures)	<ul style="list-style-type: none"> • Signs warning of potential H₂S exposure, posted near the work area • A wind direction indicator (e.g. windsock) installed near the work area • Mechanical ventilation [must list fan and ducting specifications here] • Barriers (e.g. warning tape) 	<ul style="list-style-type: none"> • H₂S monitor • Full-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100 or MSA GME P100 Super Cartridge) • Gloves (nitrile or equivalent) • Goggles (worn during cleaning activities) 	<ul style="list-style-type: none"> • Monitor high alarm should be set for 10 ppm H₂S (Low 5 ppm) • If the monitor alarm sounds, exit the area immediately • Check monitor before re-entering the area to make sure concentrations have dropped below alarm levels • Confined space program must be followed if these are confined spaces
Repair plumbing or piping that carries liquid manure	<ul style="list-style-type: none"> • Signs warning of potential H₂S exposure, posted near the work area • A wind direction indicator (e.g. windsock) installed near the work area • Mechanical ventilation if piping is enclosed [must list fan and ducting specifications here] • Barriers (e.g. warning tape) 	<ul style="list-style-type: none"> • H₂S gas monitor • Full-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S (e.g. North Defender 75SCP100, 3M Multi-G/V/P100 or MSA GME P100 Super Cartridge) • Gloves (nitrile or equivalent) • Goggles 	<ul style="list-style-type: none"> • Monitor high alarms should be set for 10 ppm H₂S (Low 5 ppm) • If the monitor alarm sounds, exit the area immediately • Check monitor before re-entering the area to make sure concentrations have dropped below alarm levels • Confined space program must be followed if these are confined spaces
Operate equipment for mixing manure within tanks, pits or ponds (storage structures)	<ul style="list-style-type: none"> • Signs warning of potential H₂S exposure, posted near the work area • A wind direction indicator (e.g. windsock) installed near the work area • Mechanical ventilation [must list fan and ducting specifications here] • Barriers (e.g. warning tape) 	<ul style="list-style-type: none"> • H₂S gas monitors • Full-face respirator with combination P100/multi-purpose gas cartridges for particulates of H₂S and NH₃ (e.g. North Defender 75SCP100, 3M Multi-G/V/P100 or MSA GME P100 Super Cartridge) • Gloves (nitrile or equivalent) • Goggles 	<ul style="list-style-type: none"> • Monitor high alarms should be set for 10 ppm H₂S (Low 5 ppm) • If the monitor alarm sounds, exit the area immediately • Check monitor before re-entering the area to make sure concentrations have dropped below alarm levels • Confined space program must be followed if these are confined spaces



Respirators

- Each worker will be fit-tested if a respirator is required.
- If a worker is required to wear a respirator that requires an effective seal with the face for proper functioning, the worker must be clean-shaven where the respirator seals with the face.
- When the worker notices a resistance to breathing or a sudden odour, the respirator filters must be replaced.
- Respirators will be used, cleaned, and stored in accordance with the respirator program.

Other PPE and Hygiene

- Workers will wear coveralls (e.g. washable cotton or disposable Tyvek-type coveralls). These coveralls will be laundered and changed (or disposed of) regularly. Workers will not wear them outside the work area. For example, workers must remove coveralls before eating lunch.
- Workers will wear other PPE (e.g. protective eyewear, hearing protection, safety footwear, hard hats, or high-visibility vests) as required.
- Personal gas monitors must be bump tested before use.

Safe Work Planning

- Work from the Acceptable Control Methods table included in this exposure control plan.
- Establish a barrier (e.g. warning tape) around the work zone to restrict access by unprotected workers.
- Inspect all equipment and tools to make sure they are in good working order.
- Use and maintain all tools and equipment as specified by the manufacturer.
- Ensure that workers inspect their respirators before work begins.
- If the work involves a confined space (e.g. a pit, pond or tank), then the confined space program must be followed.

Cleanup and Decontamination

- Remove and clean respirators. Use duct tape to cover cartridge inlets.
- Wash your face, then your hands with soap and water.

Worker Training for H₂S Exposure

- Training will be performed by the employer or the employer's designate.
- Records of attendance, dates of training, and training material will be documented and retained.
- Additional training or reference material on exposure to H₂S will be made available to employees upon request.
- Training topics:
 - Health hazards of exposure to H₂S (e.g. Enform's H₂S Alive course)
 - Operations and materials that can produce H₂S
 - Engineering controls and safe work practices used to protect workers
 - The importance of proper equipment control and maintenance
 - Proper use of personal monitoring equipment, including bump testing
 - Proper use of respirators and the respirator program
 - Personal hygiene procedures to reduce exposures
 - The details of the exposure control plan
 - The details of the confined space program



Health Surveillance

- Workers will receive regular medical examinations from their family physicians.
- Workers will report any symptoms of exposure to the employer and WorkSafeBC for tracking and investigation.

Annual Review

- This exposure control plan will be reviewed at least annually and updated as necessary by the employer, in consultation with the workplace joint health and safety committee or the worker health and safety representative.

Please understand this document is a guideline and should be adjusted specifically for your workplace.

Other potential hazards associated with manure handling may include but not limited to exposure to methane, ammonia, oxygen deficient environments, bio aerosols and carbon dioxide.

