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Confined Space		

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1. PURPOSE







- 1.1. To properly designate Confined Spaces (CS) at Thompson Rivers University (TRU), to provide guidance to ensure the safety of personnel entering a CS, and to ensure legal compliance with WorkSafeBC Occupational Health and Safety Regulation Part 9, Confined Spaces.

2. SCOPE

- 2.1. This procedure applies anyone entering a CS at TRU.

3. PRECAUTIONS

POTENTIAL HEALTH & SAFETY HAZARDS

HAZARD		TO PROTECT YOURSELF
PINCH POINTS Gears and exposed moving parts		Use LOCK-OUT procedures when conducting any work in close proximity to an exposed pinch point. NEVER put your hands or feet near an exposed pinch point or gears!
HIGH SOUND LEVELS Sound levels exceed 85dB.		HEARING PROTECTION is required in designated areas
CHEMICAL EXPOSURE Skin contact, ingestion or inhalation of chemicals in the confined space		Wear the appropriate PPE for chemicals identified as having been in the Confined Space
ELECTRICAL HAZARD		Lock out before working on electrical equipment
FIRE Due to flammable liquids, gases or combustible dusts		Ventilate the CS. Complete a hot work permit work requires it.
HAZARDOUS ATMOSPHERE		Test the atmosphere before entering and continue to monitor

4. ASSOCIATED DOCUMENTATION

<u>Doc. Number</u>	<u>Doc. Title</u>
	Confined Space Entry Permit
	Equipment Isolation (lock-out/tag-out) Procedures
	Hot Work Permit

5. PROCEDURES AND RESPONSIBILITIES

5.1. Managers / Supervisors will ensure:

- 5.1.1. Employees under their supervision, and contractors, who require entry into CS, comply with procedures and are properly trained.
- 5.1.2. Personnel receive CS training.
- 5.1.3. That pre-entry inspections and testing is conducted based on this procedure.
- 5.1.4. That the CS Procedure is reviewed annually to confirm effectiveness.

5.2. Confined Space Supervisor will:

- 5.2.1. Oversee overall entry operations.
- 5.2.2. Verify the CS entry permit is completed.
- 5.2.3. Ensure that pre-entry tests and inspections are conducted.
- 5.2.4. Ensure that all the provisions of the CS entry permit are followed and signs the Permit to authorize entry.
- 5.2.5. Verifies that atmosphere testing is completed as stipulated in the permit and results are entered into logs.
- 5.2.6. Verifies the area is properly secured and all required signs posted.
- 5.2.7. Those only authorized workers enter a confined space

5.3. Confined Space Attendant (Standby Person) will:

- 5.3.1. Be equipped with an alarm, radio or other means of communication to immediately summon rescue if needed.
- 5.3.2. Know the locations of emergency response equipment (fire extinguishers, safety

showers, eye-wash, pull stations etc.) in the immediate area.

- 5.3.3. Maintain adequate continuous communication with personnel inside the CS to monitor their status.
- 5.3.4. Update the entry permit whenever a worker enters/exits the CS.
- 5.3.5. Not leave the CS entry site until the CS has been vacated and secured, or relieved by another qualified attendant who understands the work being undertaken.
- 5.3.6. Not be a person entering the CS.

The CS Attendant shall not enter the CS to attempt a rescue, unless properly relieved of the attendant duty, is trained in rescue procedures, and is part of the pre-planned rescue team.

5.3.7. Additionally a low hazard atmosphere attendant must:

- a) check on workers inside the CS at least every 20 minutes.

5.3.8. Additionally a moderate hazard atmosphere attendant must:

- a) be stationed at or near the CS entrance, and
- b) visually observe or check the well-being of workers inside the CS at least every 20 minutes or as often as needed by the work being done.

5.3.9. Additionally a high hazard atmosphere or where there is a risk of engulfment or entrapment attendant must:

- a) be stationed at the entrance and have no other duties apart from monitoring the well-being of workers inside the CS,
- b) be equipped and capable of rescue (using lifting equipment if needed), and
- c) prevent entanglement of lifelines and other equipment.

5.4. Confined Space Entrant(s) will:

- 5.4.1. Be part of the CS Team for the job and be familiar with the provisions of the CS Entry Permit and the hazards of the CS.

The CS Team shall consist of a CS Supervisor, CS attendant(s), CS entrant(s), and rescue team (if used).

- 5.4.2. Sign or initial the CS entry permit prior to initial entry.

5.4.3. Confirm that any other appropriate permits, e.g., Hot Work, for the CS have been issued and are current before entry into the CS.

5.4.4. Maintain adequate communication with the CS Attendant.

5.5. Confined Space Rescue and Emergency Services

5.5.1. An in-house or contracted rescuer will:

- a) be informed of hazards he/she may encounter,
- b) provide rescue in an appropriate time frame, and
- c) be trained, equipped and proficient in performing the needed services.

5.5.2. In-house rescuers will:

- d) be properly equipped and adequately trained to carry out such duties,
- e) hold current first aid and CPR certifications,
- f) practice CS rescues at least once every 12 months. The practice will be within the scope of the types of CS on site, and
- g) be informed of CS work prior to work starting.

SPECIAL TOOLS AND EQUIPMENT

5.6. Including, but not limited to:

5.6.1. ANSI or CSA approved atmospheric tester (e.g., oxygen, toxic gas, LEL/LFL, etc.)

5.6.2. Personal Protective Equipment (e.g., respirator, harness and lanyard, gloves, etc.)

5.6.3. Communication equipment (e.g., radio, alarm, etc.)

5.6.4. Rescue equipment (e.g., lifelines, harness, and lifting equipment).

PRECAUTIONS

5.7. If CS entrants believe that any unsafe condition exists in the CS they should NOT proceed with or continue with an entry.

5.8. Air ventilation, including forced-air ventilation, used to control hazardous atmosphere may create an explosive atmosphere by changing the air-to-fuel ratio.

5.9. All access points to a CS will be posted with signage.

- 5.10. Unauthorized entry into any CS is prohibited. Prevention of unauthorized entry will be made through training and posting of signs. Any person observing unauthorized entry or unsafe work in or around a confined space shall warn the workers performing the work of the perceived hazards and immediately notify their supervisor.
- 5.11. If work is done in a high hazard atmosphere CS then each person must either carry or have within arm's reach an emergency escape respirator that will allow them to leave the CS without assistance.
- 5.12. Compressed gas cylinders are not permitted inside a CS except for compressed air supplying a respirator, medical resuscitation equipment, handheld aerosol sprays and fire extinguishers.
- 5.13. Torches and hoses used for brazing, cutting or welding must be removed from a CS when not in use or when the CS is vacated when practicable.
- 5.14. Electrical tools and equipment must be grounded and double insulated and marked as such. An approved ground fault circuit interrupter should be used if wet or damp conditions exist.
- 5.15. If flammable or explosive gases, vapours or liquids are present only non-sparking tools can be used.

HAZARD ASSESSMENT

5.16. The worker qualified to conduct the assessment will:

5.16.1. Consider conditions that may exist in the CS (before workers enter) due to its:

- a) design,
- b) location, and
- c) use.

5.16.2. Consider hazards that may develop during work on or around the CS.

5.16.3. Give special consideration to the potential for:

- d) oxygen enrichment or deficiency,
- e) flammable gas, vapour or mist,
- f) combustible dust, and
- g) other hazardous atmospheres.

5.16.4. Consider other potential hazards in the CS, including:

- h) materials that may engulf or entrap a worker,
- i) slipping and tripping hazards,
- j) drowning,
- k) noise exposure,
- l) electrical hazards or lines containing harmful substances that require lockout and isolation,
- m) thermal extremes, and
- n) radiation.

5.16.5. Following the assessment will rate the CS as either

- o) Low Hazard Atmosphere,
- p) Moderate Hazard Atmosphere, or
- q) High Hazard Atmosphere.

Once the assessment has been completed for a specific activity in a particular space or group of like-spaces and the specific procedure completed if there has been no change within the space or to the activity another assessment is not needed.

IDENTIFICATION AND ENTRY PERMITS

5.17. Confined Space Identification signs will be:

5.17.1. Posted at unsecured access points indicating the hazard and prohibits entry by unauthorized workers.

5.18. Entry permits will be completed and signed by the responsible supervisor before entry into a CS when:

5.18.1. the CS has a high hazard atmosphere,

5.18.2. lockout or isolation procedures need to be followed, or

5.18.3. there is a hazard of entrapment or engulfment.

5.19. The entry permit must be posted at designated entry points unless:

5.19.1. the permit is posted at a minimum of one entry point,

5.19.2. other entry points are identified and have up-to-date information on whether it is

safe to enter, or

5.19.3. all authorized workers are informed of the location of posted entry permits.

5.20. To ensure the safety of workers inside a CS, permits will be updated/alterd by:

5.20.1. the stand-by worker to update the list of workers inside the CS,

5.20.2. the tester to record test results, or

5.20.3. the responsible supervisor who signed the permit will re-authorize and sign the permit when:

- a) there is a change in the work crew,
- b) after each shift change, or
- c) after a change of the responsible supervisor.

5.20.4. Affected workers must be informed of alterations to permits that affect precautions or the work activity.

5.21. The signed permit must be retained for at least one year.

LOCKOUT AND CONTROL OF HARMFUL SUBSTANCES

Lockout

5.22. Before a worker enters a confined space, any material conveyance equipment that transports material to or from the space must be free of material if the material could present a hazard.

Isolation

5.23. Before a worker enters a confined space, adjacent piping which contains, or has contained, a harmful substance must be controlled by one of the following means:

5.23.1. disconnecting, blanking, blinding or an equivalent engineering system,

5.23.2. if adjacent piping contains a harmful substance that is not a gas, vapour or a liquid of sufficient volatility to produce a hazardous concentration of an air contaminant in the discharge of the piping, double block and bleeding is needed,

5.23.3. if adjacent piping contains a harmful substance that is hazardous only because of its pressure, temperature or quantity, before a worker enters the CS, the pressure must be controlled by de-energizing and locking out the pressure source and depressurizing the line, or

5.23.4. isolation of a CS from gases found in a gravity-flow municipal or domestic sanitary or storm sewer system may be accomplished by a p-trap provided that the integrity of the trap is ensured immediately upon entry and the atmosphere is continuously monitored and shown to contain clean respirable air.

VERIFICATION AND TESTING

5.24. Verification:

5.24.1. Before a worker enters a CS, pre-entry testing and inspection must be conducted to verify that the required precautions have been effective at controlling identified hazards and that it is safe for the worker to enter.

5.25. Atmospheric testing will be completed:

5.25.1. not more than 20 minutes before a worker enters a CS (pre-entry testing),

5.25.2. when all workers have vacated the CS for more than 20 minutes,

5.25.3. when a worker is inside a moderate or high hazard atmosphere CS additional testing must be done to ensure the worker's continuing safety, and

5.25.4. whenever practicable, continuous monitoring must be done and when the worker is in a moderate or high hazard atmosphere if a flammable or explosive atmosphere is in excess of 20% of the lower explosive limit could develop.

5.26. Procedures and Equipment

5.26.1. CS tests must be carried out by an adequately trained worker.

5.26.2. Test records (section 3 of the permit) will show the date and time of the test, the initials of the tester and the levels or conditions found.

5.26.3. Test results, other than continuous monitoring results, must be posted without delay at all entry points to the CS.

5.26.4. If a CS is known to, or is shown by pre-entry testing to contain other than clean respirable air, the hazard must be controlled by cleaning, purging, or venting the CS. The atmosphere must be re-tested before a worker enters the space.

5.26.5. During the occupancy of a CS, testing shall be repeated periodically where there is potential for accumulation of the hazardous atmosphere. Testing frequency shall be determined by the CS team.

5.26.6. Pre-entry testing is not required in "low hazard atmospheres" when the location and the control of the space ensure that a more hazardous atmosphere could not inadvertently develop.

VENTILATION

Continuous Ventilation

5.27. Continuous Ventilation will occur when a worker is inside the CS except when:

5.27.1. the atmosphere has been intentionally inerted,

5.27.2. a low hazard is controlled as noted below, or

5.27.3. ventilation is not practicable in an emergency rescue.

Mechanical Ventilation

5.28. For the control of airborne contaminants must be designed, installed and maintained in accordance with established engineering principles and must be included in written procedures.

5.29. Equipment must be located and arranged to adequately ventilate all occupied areas of the CS.

5.30. Contaminants produced in a CS must be controlled at source by Local Exhaust Ventilation, by general (dilution) ventilation or by a combination of both.

Low Hazard Atmospheres

5.31. A minimum of 85 m³/hr (50 cfm) of clean, respirable air is supplied for each worker inside the CS with a low hazard atmosphere.

5.32. Continuous ventilation is not required in a low hazard atmosphere CS if

5.32.1. the atmosphere is continuously monitored and shown to contain clean respirable air, and

5.32.2. the space is occupied for less than 15 minutes, work inside the CS generates no contaminants other than exhaled air and has a volume greater than 1.8 m³ (64 cu ft) per occupant.

Natural Ventilation

5.33. If used the airflow rate must be monitored to ensure airborne contaminant concentrations are maintained below the applicable exposure limits.

5.34. Must not be used:

5.34.1. if it is a High Hazard Atmosphere CS, or

5.34.2. if air other than clean respirable air could be drawn into the CS.

RESCUE

- 5.35. Rescue services must be provided when a worker enters a CS. There will be a written agreement showing services provided if a firm or agency is used. If an external rescue service agreement indicates they will be available 24 hours/day no notification of entry into a CS is required.
- 5.36. Anyone acting as a rescuer must be trained, with a practice drill at least annually, and equipped. Records of training and drills will be maintained by TRU.
- 5.37. Rescuers must be notified by the responsible supervisor or attendant before anyone enters a CS and will be notified after work is complete.
- 5.38. Entry into more than one CS at the same time requires rescue personnel to be on alert status when work commences.
- 5.39. Rescuers must monitor the means to summon them in the event of an emergency.
- 5.40. Rescue will be directed by an adequately trained supervisor or qualified rescue person.
- 5.41. Voice communication must be maintained at all times between the person directing the rescue and the workers performing the rescue.
- 5.42. A rescue worker must not enter the CS unless there is at least one worker outside the CS capable of assisting.
- 5.43. SCBA or supplied air respirator must be used if the atmosphere is unknown or is IDHL.

LIFELINES, HARNESSSES & LIFTING EQUIPMENT

- 5.44. A harness of a type to permit rescue is required when entering a high hazard atmosphere, risk of entrapment or engulfment CS or if there is another recognized serious health and safety.
- 5.45. A lifeline must be attached to the harness unless the risk assessment shows it is unsafe or impracticable and will be tended at all times by the attendant stationed at the entrance to prevent entanglement.
- 5.46. The attendant must have suitable lifting equipment for rescue.
- 5.47. If the attendant(s) cannot achieve a rescue using harnesses, lifelines and lifting equipment at least one worker stationed at the CS entrance must be equipped and capable of entering and conducting a rescue.

6. RECORDS/VERIFICATION OF UNDERSTANDING

6.1. Records:

6.1.1. Confined Space Entry Permits

6.1.2. Hot Work Permits

6.2. Verification of Understanding:

A training master log will be maintained by

7. SUMMARY OF CHANGES

Revision #	Date	Change (include section #)	Issued By
3	04.04.2014	Reviewed	OHS Officer