



**CONFINED SPACE PROGRAM**

Prepared by

the

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**June 11, 2018**

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## **I. SCOPE**

This confined space program applies to all Gustavus Adolphus College (Gustavus) employees, contractors, visitors and vendors when entering confined spaces on the property of Gustavus. The program is available to all employees and their designated representatives.

The purpose of this program is to:

1. Protect the health and safety of all employees from the hazards that may be encountered when working in confined spaces
2. Establish the minimum requirements for confined space entry
3. Limit entry to authorized individuals
4. Define procedures necessary to control potential hazards when entering confined spaces

## **II. APPLICABILITY**

All Gustavus confined space operations.

## **III. DEFINITIONS**

### **Acceptable Entry Conditions**

The conditions which must exist in a confined space to allow entry and to insure that employees involved with a confined space entry can safely enter into and work in the space.

### **Attendant**

A trained individual stationed outside a confined space who monitors the authorized entrants and who performs all attendant's duties assigned in the Confined Space Program.

### **Authorized Entrant**

An individual who has been trained and authorized to enter a confined space.

### **Blanking or Blinding**

The absolute closure of a pipe, line or duct by the fastening of a solid plate (such as a pancake or skillet blind) that completely covers the bore and is capable of withstanding the maximum pressure possible for that pipe, line or duct with no leakage beyond the plate.

### **Confined Space**

A space that is large enough and configured such that a person/or persons can bodily enter and perform assigned work

A space that has limited or restricted means for entry or exit (Examples are tanks, vessels, silos, storage bins, hoppers, vaults, pits, trenches, sewer manholes and excavations)

A space that is not designed for continuous occupancy.

### **Control**

Refers to the reduction of severity associated with a hazard or the incident associated with a hazard. This can be accomplished through such measures as forced air ventilation, pressure relief valves, and closing and locking valves.

### **Double Block and Bleed**

Method of isolation that provides positive, verifiable isolation and reduces the potential hazards from valve or single isolation device failure. Double block and bleed consists of two isolation valves in series, with a bleed valve directed to a safe location between them. Equivalent protection to a double block and bleed includes: blinds, break & offset, or spool removal and offset (line breaking typically required).

### **Eliminate**

The process of completely removing the possibility of an occurrence of a specific hazard. This can be accomplished through such means as electrical lockout, double block and bleed, and removal of the hazard (i.e. engulfment)

### **Emergency**

Any occurrence or event internal or external to the confined space that could endanger entrants including any failure of hazard control or monitoring equipment.

### **Engulfment**

The surrounding and effective capture of a person by liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or purging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction or crushing.

### **Entry**

The action by which a person passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of any opening in the space.

### **Entry Supervisor**

The permit issuer, a trained and qualified individual responsible for determining if acceptable entry conditions are present at the confined space where entry is planned, for authorizing entry and managing entry operations, and for terminating entry. An entry supervisor may also serve as an attendant or as an authorized entrant, as long as the person is trained and equipped as required by the role that they fill.

## **Hazardous Atmosphere**

An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (escape un-aided from a confined space) or an injury/illness from one or more of the following causes :

1. Flammable gases, vapor or mist in excess of 10 percent of its lower explosive limit
2. Airborne combustible dust at a concentration that meets or exceeds its LEL (this concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less)
3. Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent
4. Atmospheric concentration of any substance for which a dose or a permissible exposure limit (PEL) or a threshold limit value (TLV) is published and which could result in employee exposure in excess of the dose or PEL or TLV
5. Any other atmospheric condition that is immediately dangerous to life or health

## **Immediately Dangerous To Life Or Health (IDLH)**

Means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

## **Inerting**

Means the displacement of the atmosphere in a confined space by a non-combustible gas (such as nitrogen) to such an extent that the resulting atmosphere is non-combustible. Note: This process will produce an atmosphere that is IDLH.

## **Isolation**

The process by which a confined space is removed from service and completely protected against the release of energy and material into the space by such means as:

1. Blanking or blinding
2. Misaligning or removing sections of lines, pipes or ducts
3. A double block and bleed system
4. Lockout of all energy sources
5. Blocking or disconnecting all mechanical linkages

## **Line Breaking**

The intentional opening of a pipe, line, vessel or duct that is or has been carrying flammable, corrosive or toxic material, an inert gas or any fluid at a volume, temperature or pressure capable of causing injury.

## **Non-Permit Confined Space**

A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

### **Oxygen Deficient Atmosphere**

An atmosphere containing less than 19.5 percent oxygen by volume.

### **Oxygen Enriched Atmosphere**

An atmosphere containing more than 23.5 percent oxygen by volume.

### **Permit Required Confined Space**

A confined space that has one or more of the following characteristics:

1. Contains or has the potential to contain a hazardous atmosphere.
2. Contains or has the potential to contain a material which could engulf an entrant.
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section.
4. Contains any other recognized serious safety or health hazard.

### **Permit System**

Written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

### **Prohibited Condition**

Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

### **Reclassification**

The process of changing the status of a permit required confined space to a non-permit required confined space through the elimination of all the hazards within the confined space.

### **Rescue Service**

The personnel designated to rescue employees from permit spaces.

### **Retrieval System**

The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

### **Testing**

The process by which the hazards that may confront entrants of a permit space are identified and evaluated.

## **IV. RESPONSIBILITIES**

### *A. Gustavus Employees, Contractors, Vendors and Visitors*

All persons attending or entering a confined space are must follow the Gustavus Confined Space Entry Program and Procedures. Everyone must recognize confined spaces and the associated hazards. Unless specifically authorized, entry into these spaces is strictly prohibited. Everyone is responsible to stop and inform personnel performing confined space entry if unsafe conditions become apparent.

### *B. Supervisors*

Supervisors are responsible for ensuring that the procedures and conditions for confined space entry are followed. The management group individuals also function as the entry supervisor.

### *C. Manager of Environmental Health and Safety*

The Manager of Environmental Health and Safety is responsible for the periodic audit and evaluation of the Confined Space Entry Program to ensure regulatory compliance. Additionally, this person (or trained designee) is responsible for atmospheric monitoring before and during and entry.

## **V. ACCESS CONTROL**

Inadvertent entry into confined spaces during periods when active work in the confined space is not taking place shall be controlled at all times may include the following:

- An attendant positioned near the confined space entrance continuously providing surveillance against unauthorized entry.
- Barricading off the entrance to the confined space to prevent entry.
- Placing a sign in the entrance to the confined space reading “ DANGER - CONFINED SPACE -ENTER BY PERMIT ONLY “ or its equivalent.

## **VI. IDENTIFICATION AND EVALUATION OF CONFINED SPACES**

By the end of 2009, each confined space at Gustavus will be identified and evaluated for their associated hazards to determine if a permit is required prior to entry. If it is deemed that a permit is required prior to entry, an entry procedure will be developed and permit used.

The procedure shall contain at a minimum:

1. Confined space hazards
2. Purge, flush and ventilation requirements
3. Atmosphere testing equipment and acceptable limits
4. Rescue equipment
5. Entry support equipment
6. Confined space isolation procedures

## VII. PRE-ENTRY PROCEDURES

Before entry into a permit-required confined space, a confined space evaluation must be conducted, a permit must be properly prepared and issued, and all necessary training must be conducted. General controls must be used to ensure safe entry. These include, but are not limited to:

A. All lines in and out of the confined space must be isolated

1. Internal coils, tubes, etc. are considered part of the confined space.
2. Jacket space on jacketed vessels is considered part of the confined space.

**Note:** It is permissible, with special planning, to circulate cold water through a vessel jacket during the vessel entry in order to reduce the heat stress on the entrants. All other lines, especially jacket steam and condensate lines, shall be isolated by a double block and bleed or equivalent.

3. Blinds shall have a pressure rating equal to the line source. Blinds must be secured, sealed and tagged.
4. Physically disconnecting and removing a section of line is acceptable isolation.

B. All energy sources must be locked out.

C. The confined space shall be purged, flushed or ventilated.

D. Forced air ventilation systems shall be used when either oxygen deficient or a hazardous atmosphere exists in the confined space. When using a forced air system:

1. No employee may enter the space until atmospheric hazards have been eliminated throughout the space.
2. The ventilation must be in the immediate area where the employees are present and must continue until all employees have left the space.
3. The air must be from a clean source and must not increase the hazards in the space.
4. Power sources to ventilation equipment will be tagged to prevent inadvertent de-energizing.

E. Pedestrian, vehicle or other activities will be barricaded as necessary to protect entrants from external hazards.

F. All electrical equipment must be 12 volts or less or be protected by a ground fault circuit interrupter (GFCI) located outside of the confined space.

G. Lighting equipment shall be provided to enable employees to see well enough to work safely and exit the space quickly in the event of an emergency.

H. Personal protective equipment shall be provided and its use required

whenever feasible engineering and work practice controls do not protect the entrants.

- I. Communication equipment will be provided when direct vocal contact is inhibited between the authorized entrant and attendant due to confined space restrictions of noise or physical barriers.
- J. Testing and monitoring equipment will be provided and testing and monitoring of the confined space will be performed to assure that acceptable entry conditions are being maintained during the course of entry operations.
- K. Retrieval devices and lifelines will be provided when necessary.

### **VIII. ATMOSPHERIC TESTING**

Atmospheric sampling within the confined space must be performed to verify that acceptable entry conditions are met prior to and during entry. Sampling shall be conducted on either a periodic or continuous basis. The type of sampling will be dependent upon the type of space entered and the potential for hazardous atmospheric conditions to occur. For example, if the initial testing found no evidence of a flammable gas or vapor, monitoring frequency can be low. If a flammable gas or vapor is initially detected, frequent or continuous monitoring would be appropriate. Testing will be completed by the Manager of Environmental Health and Safety or trained designee.

#### **It is mandatory to carry out testing before entry is authorized.**

- A. All confined spaces shall be tested to assure the following atmospheric conditions are being met. These tests must be carried out in the following order using a calibrated, direct reading instrument.
  - 1. Oxygen Content must not be below 19.5% or above 23% by volume to enter. If this oxygen level is not present, no other testing shall be performed until the recommended levels can be obtained. Oxygen level should be monitored continuously.
  - 2. Flammable Gas, Vapor or Mist must be at or below the listed PEL or TLV, and below 10% of the lower explosive limit (LEL). This concentration for airborne combustible dust may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less.
- B. The Atmospheric Concentration of any substance for which a dose, PEL or TLV has been published and which could result in employee exposure requires continuous monitoring.
- C. Temperature within the confined space is a factor that must be addressed.
- D. The need for periodic monitoring for permit required confined spaces must be evaluated and specified on the permit. The following can be used to make this decision:
  - 1. Does the space have potential for contamination from outside?
  - 2. Does the space have potential for contamination from work being conducted inside

the space?

3. Does the space have self-contained piping with potential for contamination?

## **IX. DUTIES OF AUTHORIZED ENTRANTS**

- A. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms and consequences of exposure by reviewing the written procedure.
- B. Properly use the following equipment:
  - Monitoring equipment
  - Ventilating equipment
  - Communications equipment
  - Lighting equipment
  - Personal protective equipment
  - Barriers and shields
  - Equipment such as ladders needed for safe entry and exit
  - Rescue and emergency equipment
- C. Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.
- D. Alert the attendant whenever:
  1. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
  2. The entrant detects a prohibited condition.
- E. Exit from the confined space as quickly as possible whenever:
  1. An order to evacuate is given.
  2. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
  3. The entrant detects a prohibited condition.
  4. An alarm is noted.
  5. When the entrant begins to lack in sense of well-being.

## **X. DUTIES OF ATTENDANTS**

- A. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms and consequences of the exposure.

- B. Be aware of possible behavioral effects of hazard exposure in authorized entrants.
- C. Continuously maintain an accurate count of authorized entrants in the confined space and accurately identify them.
- D. Remain outside the confined space during entry operations until relieved by another attendant or all entrants have exited the space and the entrance has been secured. All attendants must be listed on the initial permit.
- E. Communicate with authorized entrants as necessary to monitor entrant status and to be continuously able to alert entrants of the need to evacuate the space.
- F. Monitor activities inside and outside of the confined space to determine if it is safe for entrants to remain in the space and order the authorized entrants to evacuate the space immediately under any of the following conditions:
  - 1. Detection of a prohibited condition.
  - 2. Detection of behavioral effects of hazard exposure in an authorized entrant.
  - 3. Detection of a situation outside the space that could endanger the authorized entrants.
  - 4. If the attendant cannot effectively and safely perform all of his/her required duties.
  - 5. If communication between the entrant and attendant is jeopardized in anyway.
- G. Summon rescue and other emergency services as soon as the attendant determines the authorized entrants may need assistance.
- H. Take the following actions when unauthorized persons approach or enter a confined space while entry operations are being performed:
  - 1. Warn the unauthorized persons that they must stay away from the permit space.
  - 2. Advise the unauthorized persons that they must exit immediately if they have entered the permit space and inform the authorized entrants and entry supervisor.
- I. Perform non-entry rescue as specified by the program.
- J. Perform no duties that may interfere with attendant's primary duty to monitor and protect the authorized entrants.

## **XI. DUTIES OF ENTRY SUPERVISORS**

- A. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms and consequences of the exposure.
- B. Verify that all appropriate entries have been made on the confined space entry permit and that all tests specified on the confined space procedure have been conducted. The entry supervisor must ensure that all confined space entry procedure conditions have been met prior to entry and authorization of the entry operation.

- C. Terminate the entry and cancel the permit when:
  - 1. The entry operations covered by the entry permit have been completed
  - 2. A condition that is not allowed under the entry permit arises in or near the permit space.
- D. Verify that the means for summoning rescue services are operable.
- E. Remove unauthorized individuals who enter or attempt to enter the confined space during entry operations.
- F. When entrants exit from a confined space, the entrants shall be debriefed regarding the confined space entry procedure followed and regarding any hazards confronted or created in the confined space during entry. Any problems encountered during entry must be noted on the confined space entry permit and the entry supervisor must be notified immediately.

## **XII. CONFINED SPACE ENTRY RESCUE**

The Fire Department is the rescue service. Gustavus will inform the Fire Department of the hazards they may confront when called on to perform rescue at the Gustavus facility. Additionally, Gustavus will provide the Local Fire Department with access to permit spaces from which rescue may be necessary, so that the rescue service can develop appropriate rescue plans and practice operations. Prior to all permit required confined space entries, the Fire Department must be informed of the entry.

## **XIII. OUTSIDE CONTRACTORS**

- A. Permit -required confined space entries involving Gustavus approved outside contractors shall be pre-planned and coordinated by the contractor's job site supervisor and the Gustavus designated entry supervisor. Prior to entry, the entry supervisor and the contractor's job site supervisor will exchange information and discuss the confined space entry.
- B. Specific procedures will be implemented if contractors will occupy the same permit required confined space as Gustavus employees prior to entry. These procedures will be established so that employees of one employer do not endanger the employees of any other employer.

## **XIV. RETRIEVAL RESCUE METHODS**

To facilitate non-entry rescue, retrieval systems shall be used whenever an authorized entrant enters a confined space unless retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. All entrants entering into a permit required confined space must wear a harness to help facilitate retrieval.

## **XV. PERMIT SYSTEM**

- A. Authorization to enter a confined space shall be made with a Gustavus Confined Space Entry Permit (Appendix A). Authorization to enter a permit required confined space is given after all preparation conditions have been met and verified. A qualified individual authorized to act as an entry supervisor in that area shall authorize the permit.
- B. The Confined Space Entry Permit and Confined Space Entry Procedure will be posted near the entrance of the confined space along with all other necessary hazardous work permits such as a hot work permit
- C. Each entrant and attendant shall read and then sign the confined space permit
- D. The duration of the permit may not exceed the time required to complete the designed task or job identified on the permit(s) or exceed the end of the issuing entry supervisor's shift. At the end of the shift, the permit shall terminate. The new entry supervisor will complete the necessary permit issuance requirements as stated in this program.
- E. The entry supervisor shall terminate entry and cancel the entry permit when:
  - 1. The entry operations covered by the entry permit have been completed
  - 2. A condition that is not allowed under the entry permit system arises in or near the confined space
- F. All completed confined space entry permits shall be maintained by the originating department until the annual review of the confined space program. The review shall have the objective of determining any process weaknesses and making the necessary changes to ensure that individuals participating in entry operations are protected from confined space hazards.
- G. A confined space entry permit is an agreement. Signing the permit indicates that all parties agree to the scope of work and conditions set by the permit.
- H. A confined space entry permit is not a "stand-alone" permit. Other hazardous work performed in conjunction with the confined space entry requires an appropriate permit.
- I. All permit-required confined space entries must follow the steps as outlined in the "Permit Required Confined Space Entry Procedures" described on the permit.

## **XVI. RECLASSIFICATION OF PERMIT REQUIRED CONFINED SPACES**

- A. If it is possible to eliminate hazards within a permit-required confined space, it may be possible to reclassify it to a non-permit required confined space. If you must enter the permit space to eliminate the hazards, it must be entered, as a permit required confined space. However, once the hazards are eliminated, the space can then be reclassified to a non-permit required confined space.

B. Reclassification can occur under the following conditions:

1. No atmospheric hazard (or potential atmospheric hazards) exists

**NOTE:** Forced air ventilation does not constitute the elimination of an atmospheric hazard.

2. Hazards (such as electrical, slips, trips and falls, engulfment, etc.) associated with the confined space are eliminated prior to opening the space. Also, if the work inside the space will create a hazard (such as welding) then the space must remain permit required
3. Certify the basis for determining all hazards are eliminated, with the date, location and the signature of the person making the determination using the Confined Space Reclassification Form. In addition, the certification must be posted at the confined space entrance. The Reclassification Form must be retained for 1 year from the date of entry
4. Only permit required confined spaces that contain dry or no material could be considered for reclassification. Examples of these spaces include dust collectors, dryers, and receivers

C. When reclassification occurs, the requirements associated with a permit required confined space entry are removed (such as an attendant, monitoring, and a permit).

D. The Facility Manager or his/her designee must approve reclassification of any confined space. When considering reclassification factors such as access, chemicals present, potential for external hazards to enter into the space, etc. must be taken into consideration.

E. The reclassification is only valid for the duration of the job. Once the work is completed, the space is considered to be a permit required confined space.

F. If hazards arise within the reclassified space, each employee shall exit the space. The space shall then revert back to a permit-required confined space.

## **XVII. ANNUAL PROGRAM REVIEW**

The Owner or designee shall review the effectiveness and proper application of the Confined Space Entry Program annually. The review will include an audit of:

1. Completed and canceled confined space entry permits
2. Results of confined space air testing
3. Equipment inspection and calibration logs
4. Employee training records

## **XVIII. PRE-ENTRY INSTRUCTION REQUIREMENTS**

Training shall be provided so that all individuals whose work falls under this

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procedure acquire the understanding, knowledge and skills necessary for the safe performance of their roles. Training shall be provided to each affected individual:

1. Before the individual is first assigned duties under this procedure
2. Before there is a change in assigned duties
3. Whenever there is a change in confined space conditions that presents a hazard for which an individual has not previously received training
4. Whenever there is reason to believe that there are deviations from the confined space entry procedures or there are inadequacies in the individual's knowledge or use of these procedure

## **XIX. TRAINING**

Employees must receive appropriate training before serving as attendants, entrants, or entry supervisors. Records of employee training are to be kept on file.

Gustavus provides training so that all employees who enter and work in confined spaces acquire the understanding, knowledge, and skills necessary for the safe performance of their duties.

Training will be provided to each affected employee:

1. Before the employee is first assigned duties.
2. Before there is a change in assigned duties
3. Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained
4. Whenever there is reason to believe that there are deviations from the permit space entry procedures required or that there are inadequacies in the employee's knowledge or use of these procedures

The training shall establish employee proficiency in the duties required and shall introduce new or revised procedures, as necessary.

## **XX. ENFORCEMENT**

Constant awareness of, and respect for, the hazards involved in confined space operations, and compliance with all safety rules are considered conditions of employment. The supervisor has the right to issue disciplinary warnings to employees, up to and including termination, for failure to follow the guidelines of this program. The Disciplinary Action Policy can be found in the Employee Handbook.

