

BEST MANAGEMENT PRACTICE FOR THE MANAGEMENT OF CONFINED SPACES IN BREWERIES

PREPARED BY THE BREWERS ASSOCIATION SAFETY SUBCOMMITTEE



Brewers Association
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TABLE OF CONTENTS

Purpose	3
Summary	3
Frequently Asked Questions	4
Confined Space Requirements	7
Appendix A - Sample Confined Space Entry Permits.....	11
Appendix B - Confined Space Sample Classification.....	17
Appendix C - Confined Space Atmospheric Testing	18



PURPOSE

The purpose of this document is to provide a helpful, consistent guideline for Brewers Association (BA) members to use when working in and around confined spaces in the brewery.

Employers and employees must work together to assure a safe workplace. Employers must perform workplace hazard assessments to identify confined spaces and then develop engineering controls, safe work practices and provide training and equipment to safely manage confined spaces. Employees have the responsibility to conduct themselves in a safe manner according to the equipment and training they have received.

SUMMARY

The recommendations herein are based on the experiences and expertise of BA Safety Subcommittee (SSC) members, contributing BA members, best practices utilized in trades with hazards similar to those found in breweries, and other resources including the Occupational Safety and Health Administration (OSHA), trade journals and safety professionals. This BMP is not itself a regulation, but is designed to lead breweries towards the development of their own standard operating procedures (SOPs) related to confined spaces.

The SSC and the BA believe the recommendations in this BMP are appropriate and essential for protecting the health and safety of the craft beer industry's hardworking, dedicated employees. Entry into any confined space presents many inherent dangers and should not be taken lightly. Proper management of confined spaces in the brewery can prevent serious injury or death.



FREQUENTLY ASKED QUESTIONS

1. What exactly is a confined space?

The OSHA confined space standard 29CFR1910.146 defines a confined space as the following:

- An area large enough and so configured that an employee can bodily enter and performed assigned work, and
- Has limited or restricted means of entry or exit and
- Is not designed for continuous occupancy.
- A space must meet all three of these characteristics to be considered a confined space.

2. What confined spaces typically exist in a brewery?

Examples of confined spaces typically found in breweries include bright tanks, fermenters, grain bins, silos, mash tuns, kettles, yeast propagation tanks, liquor tanks and trailers used for fresh or spent grain. In addition, larger breweries may have sump pits, utility vaults, water treatment tanks and other confined spaces.



3. What is the difference between a confined space and a permit required confined space?

When additional hazards may be present the space may be further classified as a permit required confined space (PRCS). OSHA defines a PRCS space as a confined space that has at least one of these additional hazards:

- Contains or has the potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant
- Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section.
- Contains any other recognized serious safety or health hazards.

Many types of brewery confined spaces will contain carbon dioxide and may also be oxygen deficient. Other serious safety hazards could include powered rakes, stir paddles, agitators, clean in place systems (CIP), inlets to allow entry of liquids or grains and other mechanical or physical hazards such as heat or steam. Performing work in the confined space can also introduce hazards into the space that cause the space to be classified as a PRCS. Examples could include welding in the space, bringing in electric power tools, using strong acids or bases or other hazardous chemicals.

4. What are the alternatives to a permit required confined space entry?

When all of the hazards of a PRCS can be eliminated from outside the confined space without entry, the space may be eligible for reclassification. Reclassified spaces can be entered without an entry permit. The entry still requires careful planning, employee training, as well as monitoring and control of the hazards.

An experienced and knowledgeable person should evaluate the reclassified space and certify that all hazards have been eliminated from the confined space before entry occurs. Should conditions change or hazards arise during the entry the employee must exit the space immediately and the employer must re-evaluate the space. Work performed or chemicals brought inside the reclassified space can create a hazard, for example, welding or using cleaning chemicals will require the space be treated as a PRCS. If the cleaning chemicals are not hazardous, for example, dilute detergents or caustics, then the space may remain reclassified. These hazards must be evaluated to determine the proper classification of the space. Proper personal protective equipment should be utilized regardless of the classification of the confined space.



As an example, if a mash tun with a powered rake must be entered, the grain could be removed and the tun rinsed clean, the powered rake could be locked out, the steam jacket emptied and cooled, and any piping connected to the tun could be disconnected to prevent entry of liquids. In this case all of the hazards have been eliminated without entering the mash tun except for the potential lack of oxygen. Direct fired vessels could also have an additional hazard of carbon monoxide from combustion gases. The atmospheric hazards can be addressed using mechanical ventilation of the mash tun to provide fresh air. The mash tun must then be tested from outside the confined space with a multi-gas meter to confirm and document that oxygen levels are acceptable and then the space can be re-classified from PRCS to a non-PRCS and entry can proceed. Remember though that introducing any further hazard in that space causes the space to again be classified as a PRCS.

5. What if our employees are just sticking their head inside a hatch to look inside the confined space?

OSHA considers a confined space entry to have occurred when any part of the employee's body breaks the plane of the opening to the confined space. Consider the case of a fermenter with an atmosphere deficient in oxygen because of high concentrations of CO₂. An employee looking into this space could be quickly rendered unconscious with their head inside the tank and their torso outside.

Another example is reaching into a confined space to clean the area under the manway where the CIP system may not reach. Employees typically reach into the manway to perform the cleaning and often stick their head inside to check the progress of the cleaning. These situations are considered a confined space entry by OSHA and all of the same precautions must be taken as if the employee had completely entered the vessel.

6. Is there some way our brewery can eliminate the need to enter confined spaces?

The safest way to manage confined spaces is to not enter them in the first place. Clean in place systems allow cleaning and sanitation without entry; inspections can be performed from outside the vessel using mirrors and flashlights, video cameras or fiber optic camera systems. In cases where spray ball(s) for the CIP is not reaching all areas of the tank then portable cleaners can be purchased that can be placed through the manway opening for additional coverage. When placing standpipes, flavoring or hop bags, a long handled gripper tool can be used to perform the work from outside the confined space. Cleaning can be performed with long handled scrubbers.



If the brewery does not have the expertise to safely perform and manage a confined space entry a contractor experienced in this type of work may be an option.

7. How is the atmosphere in a confined space tested to ensure ventilation has controlled the contaminants inside?

The atmosphere inside a confined space must be tested using equipment that can detect the hazards that may be present. Multi-gas meters that detect oxygen, carbon monoxide, lower explosive limit and toxic gases such as hydrogen sulfide are typically used to test a confined space prior to entry. For brewery applications the meter must also be capable of detecting carbon dioxide. Any meter used for confined space entry must be properly maintained, calibrated and bump tested prior to use to ensure it is functioning properly. OSHA requires that confined spaces first be tested for oxygen levels, then combustible gases, and finally any toxic gases or vapors in that order.

Atmospheric testing must be performed from outside the vessel, multi-gas pumps can be equipped with a battery operated pump and tubing to allow testing inside a confined space without entry. The space should be tested from top to bottom and side to side to ensure there is not any stratification of the atmosphere inside the tank. Users of these meters must be properly trained, due to the length of tubing used and the response time of the sensors, the meter can take up to a few minutes to accurately provide a reading at each measurement point. All measurements should be recorded to document the space is safe to enter.

The confined space should be tested periodically during entry to ensure the space remains safe for entry. One means to accomplish this is to require entrants to wear a small portable gas detector with alarm that can monitor oxygen and carbon dioxide levels (and any other contaminants that may be present) to ensure the space remains safe for entry during work. The multi-gas meter used to initially test the confined space can also be used to take periodic measurements. Additional types of air sampling may be needed if the work inside the space can generate hazardous contaminants or gases.



CONFINED SPACES REQUIREMENTS

1. Confined Space Identification

- a. The brewery must inventory and evaluate the hazards of each confined space in the workplace. This can be accomplished by listing each confined space, where it is located, how often the space may be entered and the classification of the confined space.
- b. If the brewery contains permit required confined spaces the employees must be notified of their existence, location and the hazards present. This can be accomplished by posting signs such as "DANGER - - PERMIT REQUIRED CONFINED SPACE - - AUTHORIZED ENTRANTS ONLY". Confined spaces and their dangers should be included in the training for new hires and in refresher training for existing employees.
- c. If the brewery determines that employees will not enter a PRCS then steps must be taken to secure the space and prevent entry by employees for example securing hatches and manways.
- d. If employees will be entering a permit required confined space then a permit required confined space entry program must be developed.

2. Confined Space Classification

- a. The OSHA permit required confined space program recognizes different types of confined spaces; permit required confined space, reclassified confined space (non-permit required) and alternate entry procedure confined space. Confined spaces that do not fall into the above classifications are not covered by the confined space standard but other OSHA standards may apply.
 - i. A PRCS meets all the definitions of a confined space and also contains or could contain:
 - 1) a hazardous atmosphere
 - 2) a material that has the potential for engulfing an entrant,
 - 3) Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section, for example a conical fermenter
 - 4) Contains any other recognized serious safety or health hazards.

A PRCS may contain other recognized serious safety or health hazards. Hazards may be introduced into the space due to the work being performed, for example welding or cleaning with hazardous chemicals.

- ii. An alternate entry procedure confined space is one where the only hazard in the space is a hazardous atmosphere and continuous ventilation alone is sufficient to maintain a safe atmosphere in the space. Continuous monitoring of the space using a gas detector may be needed to ensure the ventilation is effective in controlling the hazard.
- iii. A reclassified confined space is a permit required confined space where there is no atmospheric hazard present and all the hazards of the confined space can be eliminated prior to entry. This renders the confined space a non-permit required confined space.

While entry into a reclassified confined space must still be approached with caution, and an attendant outside the confined space is still recommended, the entry process is simplified compared to a PRCS. This may be the most viable option for breweries where all hazards can be eliminated prior to entry.

3. PRCS Entry Procedure

- a. *Written Program* - If the brewery plans to allow employees to enter permit required confined spaces then a written confined space program is required. The OSHA confined space standard requires the written program to:
 - i. Implement measures to prevent unauthorized entry.
 - ii. Identify and evaluate permit space hazards before allowing entry.
 - iii. Test atmospheric conditions in the space before and during entry.
 - iv. Perform testing for the following atmospheric hazards in this sequence: too much or too little oxygen, combustible gases or vapors, toxic gases or vapors.
 - v. Develop procedures and practices to eliminate or control hazards necessary for safe permit entry.
 - vi. Identify employee job duties.

- vii. Provide and maintain, at no cost to employees, PPE and any other equipment necessary for safe entry and require employees to use it.
 - viii. Ensure that at least one attendant is stationed outside the permit confined space for the duration of the entry operations.
 - ix. Coordinate entry operations when employees of more than one employer are working in the permit space.
 - x. Implement procedures for summoning rescue and emergency services, and preventing unauthorized personnel from attempting rescue.
 - xi. Establish in writing a system for the preparation, issue, use and cancellation of entry permits.
 - xii. Review established entry operations annually and revise the permit space entry program as necessary.
 - xiii. Implement procedures that any attendant who is required to monitor multiple spaces at the same time will follow during an emergency in one or more of those spaces.
- b. *Entry Procedure* - A permit required confined space entry procedure must be developed for each permit required confined space that details the procedures and practices necessary for safe permit space entry including:
- i. Acceptable entry conditions
 - ii. Providing each entrant with the opportunity to observe monitoring or testing of the space
 - iii. Isolating the permit space
 - iv. Purging, flushing or ventilation of the permit space to eliminate or control atmospheric hazards
 - v. Providing pedestrian, vehicle or other barriers to protect entrants from external hazards
 - vi. Verifying that conditions in the permit space are acceptable for entry throughout the entry.
- c. *Entry Permit* - An entry permit must be completed prior to entering the PRCS. The permit should include the following information:
- i. The space to be entered,

- ii. Purpose of the entry,
- iii. Date, start and end times,
- iv. Hazards of the space,
- v. Acceptable entry conditions,
- vi. Measures used to isolate the permit space and to eliminate or control hazards,
- vii. Means of communicating with entrants,
- viii. Name of entry supervisor, names of entrants and attendants,
- ix. Equipment needed for safe entry,
- x. Air monitoring results,
- xi. Rescue and emergency services.

The permit must be signed by the entry supervisor and available to all entrants into the confined space.

- d. *Training* - Entry supervisors, attendants and employees who will be entering confined spaces (entrants) must receive training on their duties during permit confined space entry and the entry procedures so they can perform the work safely. Employees who work around confined spaces but will not enter should also receive awareness training so that they are aware of the dangers of confined spaces and the employers confined space procedures.
- e. *Equipment* - The employer must provide the equipment needed to enter a permit required confined space at no cost to employees and ensure that employees use the equipment properly. This can include:
 - i. Testing and monitoring equipment
 - ii. Ventilation equipment
 - iii. Communications equipment if required
 - iv. Personal protective equipment (PPE)
 - v. Lighting equipment
 - vi. Barriers and shields as needed
 - vii. Equipment needed for safe entry and exit, for example ladders
 - viii. Rescue and emergency response equipment
 - ix. Any other equipment to ensure safe entry and rescue from permit spaces

f. *Rescue and Emergency Services* – An employer who relies on outside rescue and emergency services must:

- i. Evaluate the rescuer's ability to respond quickly, their proficiency in rescuing entrants, and availability of equipment needed to perform a rescue. The employer must also inform the rescue team of the hazards they are likely to face when they perform the rescue. The rescue team must also be provided access to permit required spaces so they can develop appropriate rescue plans and practice rescue operations.

An employer who designates their own employees to perform rescue operations must:

- ii. Provide employees with PPE needed to conduct rescue safely and train them so they are proficient in using the PPE. They must train the employees on rescue duties and ensure they are proficient as an authorized entrant, train employees on first aid and CPR, ensure that rescue employees practice making permit space rescues at least annually. This can be performed by means of simulated rescue operations using manikins or dummies. Retrieval systems or equipment must be provided to facilitate non-entry rescue unless the retrieval equipment increases the hazard to entrants.

4. Reclassified Confined Space Entry Procedure – A space classified as a permit required space may be reclassified as a non-permit required confined space as follows:

- a. If the permit space poses no atmospheric hazards and if all hazards within the space are eliminated without entry into the space the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.
- b. If it is necessary to enter the space to eliminate hazards that entry must be performed using PRCS entry procedures. If testing and inspection during that entry demonstrate that all hazards have been eliminated then the permit space may be reclassified as a non-permit confined space.
- c. The employer must document how it was determined that all hazards in a permit space

were eliminated through a certification that contains the date, location of the space, and the signature of the person making the determination. This must be made available to each entrant into the confined space.

- d. If hazards arise in the reclassified confined space employees must exit the space. The employer must then reevaluate the space and determine whether it must be reclassified as a permit space.
- e. If work is performed in the reclassified space that introduces a hazard such as welding, electrical tools or use of a hazardous chemical then the space cannot be reclassified as a non-permit space.

5. Alternate Entry Confined Space Procedure – Alternate entry procedures can be utilized under the following conditions:

- a. The employer can demonstrate that the only hazard is an actual or potential hazardous atmosphere; continuous forced air ventilation alone is sufficient to maintain the space safe for entry, employer develops monitoring and inspection data that supports the demonstration of the above; if initial entry is needed to obtain data required under this procedure it must be made in accordance with the PRCS entry requirements; determinations and supporting documentation developed by the employer are made available to each employee who enters the space.
- b. Any conditions making it unsafe to open an entrance cover must be eliminated before the cover is removed; when covers are removed guarding is provided to prevent falls into the opening; before employees enter the space the atmosphere must be tested for oxygen content, flammable or toxic vapors or gases; continuous forced air ventilation is used to eliminate any hazardous atmosphere; ventilation is directed to the areas employees will be working; air supplied for ventilation must be from a clean source; the atmosphere within the space must be periodically tested; if a hazardous atmosphere is detected during entry all entrants must leave the space immediately.
- c. The employer must develop a written certification that the above conditions have been met, this certification must contain the date, location of the space, and the signature of the person providing the certification.

6. Contractors – When arranging for a contractor to perform work involving permit required confined space entry the host employer must:

- a. Inform the contractor that the workplace contains permit required confined spaces and that entry into these spaces is allowed only through compliance with a permit space entry program.
- b. Inform the contractor of the hazards identified for the space and the employers experience with the space that make the space permit required.
- c. Inform the contractor of any precautions or procedures the employer has implemented for the protection of employees in or near permit spaces where the contractor will be working.
- d. Coordinate entry procedures with the contractor, when both host employer and contractor personnel will be working in or near permit spaces.
- e. Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry.

The contractor must:

- a. Obtain information regarding permit space hazards and entry operations from the host employer.

- b. Coordinate entry operations with the host employer, when both host employer and personnel and contractor personnel will be working in or near permit spaces.
- c. Inform the host employer of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces, either through debriefing or during entry operations.

Resources

OSHA has a number of resources to assist with the management of confined spaces at:

<https://www.osha.gov/SLTC/confinedspaces/index.html>

OSHA's guide to permit required confined spaces can be found here:

<https://www.osha.gov/Publications/osha3138.html>

The University of Washington Department of Environmental and Occupational Health Sciences has a resource page for the winery industry that includes a written confined space entry program along with other safety and health resources. Winery exposures are similar to those in a brewery these may provide a good starting point.

<http://depts.washington.edu/wineryhs/Resources.html>

APPENDIX A - SAMPLE CONFINED SPACE ENTRY PERMITS

The following sample fill-in-the-blank confined space entry permits can be modified to fit your particular entry. Make sure you use only the appropriate portions of the forms to create your own entry permit. You can also design your own entry permit.

CONFINED SPACE ENTRY PERMIT

Sample 1

Date:					
Site location or description:					
Purpose of entry: _____ _____					
Supervisor(s) in charge of crews:		Type of crew (welding, plumbing, etc)		Phone #:	
Permit duration:					
Communication procedures (including equipment): _____ _____					
Rescue procedures (also see emergency contact phone numbers at end of form): _____ _____					
REQUIREMENTS COMPLETED (Put N/A if item doesn't apply)	DATE	TIME	REQUIREMENTS COMPLETED (Put N/A if item doesn't apply)	DATE	TIME
Lockout/De-energize/Verify			Supplied Air Respirator (N/A if alternate entry)		
Line(s) Broken-Capped-Blank			Respirator(s) (Air Purifying)		
Purge-Flush and Vent			Protective Clothing		
Ventilation			Full Body Harness w/ "D" ring		
Secure Area (Post and Flag)			Emergency Escape Retrieval Equip		
Lighting (Explosive Proof)			Lifelines		
Hot work Permit			Standby safety personnel (N/A if alternate entry)		
Fire Extinguishers			Resuscitator—Inhalator (N/A if alternate entry)		
Add other specific information, if needed, or attach additional instructions or requirements. See the following examples in bold print.					
Line(s) to be bled/blanked:					
Ventilation equipment:					
PPE clothing:					
Respirator(s):					
Fire extinguisher(s):					
Emergency retrieval equipment:					

CONFINED SPACE ENTRY PERMIT

Sample 1 (continued)

AIR MONITORING									
Substance Monitored		Permissible Levels		Monitoring Results					
Time monitored (put time) Percent Oxygen		Record the time 19.5% to 23.5%							
LEL/LFL		Under 10%							
Toxic 1: CO ₂		____ PEL	____ STEL						
Toxic 2: CO		____ PEL	____ STEL						
Toxic 3: H ₂ S		____ PEL	____ STEL						
Toxic 4:		____ PEL	____ STEL						
REMARKS: _____ ----- ----									
Air Tester Name	ID#	Instrument(s) Used <small>(For example: oxygen meter, combustible gas indicator, etc.)</small>			Model # or Type	Serial# or Unit			
ATTENDANTS AND ENTRANTS									
Attendant(s) <small>(Required for all confined space work except alternate entry)</small>			ID#	Confined Space Entrant(s)			ID#		
REMARKS: _____ _____									
SUPERVISOR AUTHORIZATION - ALL CONDITIONS SATISFIED Department or phone number: _____									
EMERGENCY CONTACT PHONE NUMBERS: AMBULANCE: FIRE: SAFETY: RESCUE TEAM: OTHER: _____ _____ _____ _____ _____									

CONFINED SPACE ENTRY PERMIT
Sample 2

Date and time issued:			
Job site/ space I.D.:			
Equipment to be worked on:			
Standby personnel:			
Date and time expires:			
Job supervisor:			
Work to be performed:			
1. Atmospheric Checks:		Time: _____	
Oxygen	_____ %		
Explosives	_____ %L.F.M.		
Toxic	_____ PPM		
2. Tester's signature: _____			
3. Source isolation (No Entry):		N/A	Yes
Pumps or lines blinded, disconnected, or blocked:		<input type="checkbox"/>	<input type="checkbox"/>
4. Ventilation modification:		N/A	Yes
Mechanical:		<input type="checkbox"/>	<input type="checkbox"/>
Natural Ventilation only:		<input type="checkbox"/>	<input type="checkbox"/>
5. Atmospheric check after isolation and ventilation:			
Oxygen:	_____ %	>19.5%	
Explosive:	_____ % L.F.M.	<10%	
Toxic:	_____ PPM	<10PPM H ₂ S	
CO ₂ :	_____ PPM		
Time:	_____		
Tester's signature:	_____		
6. Communication procedures:			

CONFINED SPACE ENTRY PERMIT Sample 2 (continued)

7. Rescue procedures:				

8. Entry standby and backup persons successfully completed required training?			Yes ()	No ()
Is it current?			()	()
9. Equipment:		N/A	Yes	No
Direct reading gas monitor-tested:		()	()	()
Safety harnesses and lifelines for entry and standby persons:		()	()	()
Hoisting equipment:		()	()	()
Powered communications:		()	()	()
SCBA's for entry and standby persons:		()	()	()
Protective clothing:		()	()	()
All electric equipment listed: Class I, Division I, Group D and non-sparking tools		()	()	()
10. Periodic atmospheric tests:				
Oxygen	_____ %	Time _____	Oxygen	_____ % Time _____
Oxygen	_____ %	Time _____	Oxygen	_____ % Time _____
Explosive	_____ %	Time _____	Explosive	_____ % Time _____
Explosive	_____ %	Time _____	Explosive	_____ % Time _____
Toxic	_____ %	Time _____	Toxic	_____ % Time _____
Toxic	_____ %	Time _____	Toxic	_____ % Time _____
We have review the work authorized by this permit and the information contained here. Written instruction and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit not valid unless all appropriate items are completed.				
Permit prepared by: _____ Entry Supervisor				
Approved by: _____ Unit Supervisor				
Review by: _____ Operations Manager				
This permit is to be kept at the job site. Return this job site copy to the unit supervisor following job completion.				
Entrants Name	Sign in	Sign out	Sign in	Sign out

CONFINED SPACE ENTRY PERMIT

Sample 3 (continued)

GAS TESTER NAME & CHECK #: _____

INSTRUCTIONS USED: _____

MODEL &/OR TYPE: _____

SERIAL &/OR UNIT #: _____

SAFETY STANDBY IS REQUIRED FOR ALL CONFINED SPACE WORK

SAFETY STANDBY PERSON(S)

CHECK#

CONFINED SPACE ENTRANT(S)

CHECK #

SUPERVISOR AUTHORIZATION - ALL CONDITIONS SATISFIED:

Department or phone number: _____

EMERGENCY CONTACT PHONE NUMBERS:

Ambulance: _____

Fire: _____

Safety: _____

Gas coordinator: _____

APPENDIX B - CONFINED SPACE SAMPLE CLASSIFICATION

BREWERY CONFINED SPACE INVENTORY				
Vessel	Identifier	Location	Frequency Of Entry	Classification
Base Malt Silo	SILO	west entrance	never	Permit Required
Mash Tun	MT	brewhouse deck	weekly	Reclassified
Lauter Tun	LT	brewhouse deck	daily	Reclassified
Brew Kettle	BK	brewhouse deck	weekly	Reclassified
Whirlpool	WP	brewhouse deck	weekly	Reclassified
Hot Liquor Tank	HLT	brewhouse floor	never	Permit Required
Cold Liquor Tank	CLT	brewhouse floor	never	Permit Required
20 bbl Fermenter	FV1	cellar	never	Permit Required
20 bbl Fermenter	FV2	cellar	never	Permit Required
20 bbl Fermenter	FV3	cellar	never	Permit Required
20 bbl Fermenter	FV4	cellar	never	Permit Required
20 bbl Fermenter	FV5	cellar	never	Permit Required
40 bbl Fermenter	FV6	cellar	never	Permit Required
20 bbl Bright Beer Tank	BBT1	cellar	never	Permit Required
40 bbl Bright Beer Tank	BBT2	cellar	never	Permit Required
10 bbl Serving Tank	ST1	walk-in cooler	never	Permit Required
10 bbl Serving Tank	ST2	walk-in cooler	never	Permit Required
10 bbl Serving Tank	ST3	walk-in cooler	never	Permit Required
10 bbl Serving Tank	ST4	walk-in cooler	never	Permit Required
10 bbl Serving Tank	ST5	walk-in cooler	never	Permit Required

APPENDIX C - CONFINED SPACE ATMOSPHERIC TESTING

Atmospheric monitoring of a confined space is conducted using a direct reading gas detection instrument (DRI). Monitoring is conducted within confined spaces to verify that there is adequate oxygen for breathing and to confirm that there space is free of explosive or toxic air contaminants. The instrument must have:

- a legible, real-time display of the contaminant concentrations
- a visible/audible alarm that trips when concentrations exceed established limits
- a pump that can draw the air sample from within the space to provide more representative measurements of the atmosphere

Common DRI, also referred to as four-gas or multi-gas meters, usually come standard with oxygen and explosive gas detectors and can be outfitted with additional sensors specific to the hazards (such as hydrogen sulfide, carbon monoxide, carbon dioxide, ammonia, chlorine) found to be present in a space or facility. A sampling probe with tubing is a recommended accessory that enables samples to be collected from a distance so that measurements can be completed from outside of the space. A DRI should be operated only by trained individual, must be calibrated before use and be maintained on a regular basis. A confined space may not be entered until the atmosphere has been sampled and confirmed to be free from hazardous conditions.

Confined Space Gas Sampling Procedure

1. Pre-use verification of accuracy (Bump Test) of the gas detector using calibration gas. Document result of test on Company required document. (Note: this document is the one your company program requires that you use.) If a calibration is required, follow the manufacturer's calibration procedure. Document the calibration on a log. If you are ever audited, it is always in your best interest to have proof that you consistently calibrate the equipment. If something goes wrong during the entry, proper documentation will be essential.
2. Open the space and begin mechanical ventilation. Rule of thumb is 15 to 20 minutes of mechanical ventilation

prior to taking your sample of the atmosphere inside the space. First, it is unlikely a newly opened space will have clean breathable atmosphere. Second, exposure to excess humidity like CIP mists, will clog the detector's filters and sensor surfaces. Humidity will fog mirrors in IR sensors. This will interfere with accurate sampling and can damage your equipment. (Your best use of time may be to open the space and let it air out, while you do your bump test/ calibration.)

3. When you are ready to sample, turn off the ventilation. Your sample needs to accurately record the atmosphere inside the space. If the ventilation is still forcing clean air in, you may mistakenly think you are safe to enter.
4. Perform the test on the detector's pump to make sure it is drawing atmosphere through the sample probe and tubing with no leaks.
5. Slowly insert the probe into the manway. Remember that the pump will draw no faster than 2 seconds per foot, the sensors need time to react to give you an accurate reading. This is usually 15 to 30 seconds. If you are lowering the probe from a top of space manway, lower it in about 3 feet to take your first sample. Because gases can stratify, you will take readings every 4 to 5 feet in height down to the bottom of the space. Slowly sweep the probe side to side. If you are entering through a side manway, start low and sweep side to side. Begin raising the probe higher and higher in the space while continuing to sweep side to side.
6. Watch the display for any changes in the readings. If you see a change, restart your ventilation right away. Any change in display means you can't enter, don't waste the time to sample the entire space. Run ventilation for another 5 minutes, and re-start the sampling process again.
7. When you have a clean atmosphere, document the readings on your entry documents, sign legibly and include the time and date. Make sure you keep these documents on file as required by OSHA Regulations.

It is recommend that you keep notes about each space. Over time, you will learn what needs to happen for the sampling of each space to reach a clean breathable atmosphere. One space may take 15 minutes and another may take a lot longer. Plan other tasks that you can complete while you wait to document your safe entry.