

1. PURPOSE

- 1.1 The purpose of this procedure is to establish minimum rules to protect the health and safety of Albany NanoTech workers and its contractors required to enter confined spaces to clean, repair, inspect or perform other duties.
- 1.2 This procedure is not intended to provide the basis for establishing more detailed entry and work procedures for permit required confined spaces. The procedures used will depend on the scope of work, size of space, material and equipment to be used in the space.
- 1.3 Although this procedure describes specific safety steps to be taken for entry into permit required confined spaces, it is not intended to prevent the use of any additional measures that may be deemed necessary for a particular situation. Each situation must be reviewed on an individual basis by the responsible Supervisor.
- 1.4 This procedure is not intended to list the confined spaces that are associated with tenant owned and operated equipment or tools.

2. SCOPE

- 2.1 This program establishes the minimum requirements for entering confined spaces at the Albany NanoTech facility. Tenant employees, contractors and sub-contractors may comply with their own organization's program provided that it meets and/or exceeds the minimum requirements set forth in this procedure.
- 2.2 This program applies to Albany NanoTech employees, tenant employees, contractors and sub-contractor who may be entering confined spaces within the facility.
- 2.3 Albany NanoTech employees, tenant employees, contractors and sub-contractors will be notified of the requirement to follow this program and are required to comply with the restrictions and limitations imposed upon them by Albany NanoTech during confined space activities.

3. DEFINITIONS

- 3.1 A confined space is defined by OSHA as a space that:
 - 3.1.1 Is large enough for a worker to enter and perform work;

- 3.1.2 Has limited or restricted entrances or exits; and
- 3.1.3 Is not designed for continuous employee occupancy.
- 3.2 A permit required confined space is a confined space that, in addition to the above, poses any one or more of the following hazards:
 - 3.2.1 Potentially hazardous atmosphere;
 - 3.2.2 Potential engulfment of a worker;
 - 3.2.3 An internal configuration, such as a tapered floor, which could cause a worker to become trapped.
- 3.3 A potentially hazardous atmosphere is defined as any atmosphere that could cause death, incapacitation, injury, or acute illness, impairment of ability to self rescue, and would include any of the following:
 - 3.3.1 An atmosphere with a build-up of flammable gases or vapors in excess of 10% of the LEL;
 - 3.3.2 Excessive airborne combustible dust;
 - 3.3.3 An oxygen deficient (less than 19.5%) or an oxygen enriched (greater than 23.5%) atmosphere;
 - 3.3.4 Atmospheres containing acutely toxic contaminants at a concentration level greater than the permissible exposure limit (PEL) or the threshold limit value (TLV).

4. PERSONNEL ROLES AND RESPONSIBILITIES

Personnel who are involved with routine permit confined space entry will perform one of the three roles. These roles are:

- Authorized Entrant(s),
- Attendant, or
- Entry Supervisor.

- 4.1 **Authorized Entrants** are personnel who enter permit spaces to perform work. In addition to safely performing the assigned task within the permit space, their responsibilities are to:
 - 4.1.1 Know the hazards associated with the permit space and their effects,
 - 4.1.2 Properly use the equipment required for entry,

- 4.1.3 Maintain a continuous means of communication with the attendant,
- 4.1.4 Alert the attendant in the event of an emergency, and
- 4.1.5 Evacuate the space if an emergency occurs.
- 4.2 **Attendants** are personnel stationed outside the permit space to monitor the conditions in and around the space and the authorized entrants. They additionally coordinate rescue efforts in the event of an emergency. Their specific responsibilities are to:
 - 4.2.1 Know the hazards associated with the permit space and their effects,
 - 4.2.2 Maintain an accurate account of the authorized entrants,
 - 4.2.3 Remain at their assigned station until relieved by another attendant or until the permit space entry is complete and authorized entrants have exited the space,
 - 4.2.4 Monitor conditions in and around the permit space,
 - 4.2.5 Contact the entry supervisor who will summon rescue and applicable medical services in the event of an emergency,
 - 4.2.6 Perform continuous monitoring of the space,
 - 4.2.7 Perform non-entry rescue procedures, and
 - 4.2.8 Perform appropriate measures to prevent unauthorized personnel from entering the permit space.
- 4.3 **Entry Supervisors** are personnel who supervise activities, which require confined space entry. Their responsibilities are to:
 - 4.3.1 Know the hazards associated with the permit and their effects,
 - 4.3.2 Verify that the safeguards required by the permit have been implemented,
 - 4.3.3 Terminate entry and cancel the permit when the entry operations have been completed or a condition arises that is not allowed under the entry permit,
 - 4.3.4 Remove personnel who are not authorized to enter the permit space during entry operations, and
 - 4.3.5 Determine, when appropriate, that the entry operation is performed consistent with the requirements of the permit space entry procedures and that acceptable entry conditions are maintained.

5. HAZARDS

- 5.1 The potential hazards which may be encountered in permit required confined spaces are the following:
 - 5.1.1 A lack of or excess oxygen, which may cause asphyxiation or increased fire hazard.
 - 5.1.2 Flammable gases or liquids in excess of their lower explosive limit (LEL).
 - 5.1.3 Toxic gases, vapors and liquids in excess of their threshold limit values (TLV's).
 - 5.1.4 Injury caused by direct contact with corrosive or dermatitis producing chemicals.
 - 5.1.5 Physical hazards, such as slipping and falling.
 - 5.1.6 Electric shock from portable lights and tools.
 - 5.1.7 Inability to readily get into or out of the space due to the location and/or size of openings.

6. ENTRY REQUIREMENTS

- 6.1 All employees associated with a permit required confined space entry shall be properly trained in safe entry and rescue procedures, use of protective equipment, and instructed as to the hazards they may encounter.
- 6.2 The entry supervisor is responsible for assuring that the workers are properly instructed as stated above for each job requiring confined space entry.
- 6.3 Entry into permit required confined spaces shall be by written entry permit (Attachment A), issued and approved by the responsible supervisor or other qualified person. The purpose of the entry permit is to ensure that a checklist of precautions has been reviewed prior to entry. This permit describes:
 - 6.3.1 The work to be done
 - 6.3.2 Time and date
 - 6.3.3 Nature of space
 - 6.3.4 Inspection checklist

- 6.3.5 Protective and rescue equipment requirements
- 6.3.6 Approvals for entry
- 6.4 This permit is an authorization, and approval in writing certifying that all existing hazards have been evaluated and necessary protective measures have been taken to ensure the safety of the entrant.
- 6.5 The space shall be emptied, flushed or otherwise purged of flammable, injurious or incapacitating materials as much as possible.
- 6.6 The confined space shall be isolated by:
 - 6.6.1 Disconnecting, blinding, or blocking off any piping, lines or vents which may convey flammable, injurious or incapacitating materials into the space, and
 - 6.6.2 De-energizing and locking or tagging out any machinery, mixers or agitators.
 - 6.6.3 All items above which have been disconnected, blanked, capped, blocked off or turned off, shall be identified with a Lock Out/Tag Out 'DANGER' tag which shall not be removed until the entrants are out of the space and the work complete.
- 6.7 The air in the space shall be tested for contaminants listed below. The space shall be tested prior to entry and periodically while an entrant is in the space:
 - 6.7.1 Flammable or combustible vapors using a combustible gas indicator.
 - 6.7.2 Oxygen deficiency or excess using a properly calibrated oxygen meter.
 - 6.7.3 Toxic or corrosive contaminants using a suitable. The choice of test will depend on whether the space contained any particular corrosive or toxic chemicals or whether any such chemical will be used during entry operations, such as cleaning.
 - 6.7.4 Test shall be performed by a qualified person who has been trained in proper sampling methods, correct interpretation of results, and proper calibration and limitations of test instruments.

7. VENTILATION

- 7.1 Proper and adequate ventilation of the space with safe respirable air shall be required if one or more of the following conditions exist or could exist during the course of the work:

- 7.1.1 Flammable or combustible vapors are present above 10% of the LEL.
- 7.1.2 Combustible dusts are present.
- 7.1.3 Toxic or corrosive contaminants are present above the TLV.
- 7.1.4 The oxygen concentration is below 19.5% or above 21.5%.
- 7.1.5 Toxic or other contaminants which:
 - 7.1.5.1 Have no rated TLV, or
 - 7.1.5.2 Cannot be accurately determined to be present with field testing instruments.
- 7.2 Oxygen shall not be used to ventilate a confined space.
- 7.3 Equipment used for ventilation shall be suitable for the atmosphere which is being ventilated. When flammable contaminants are present, only equipment designed for use in hazardous locations shall be employed. Sources of ignition shall be eliminated.

8. PROTECTIVE EQUIPMENT REQUIREMENTS

- 8.1 Appropriate protective equipment for eyes, ears, head, hands, feet and body shall be provided to the entrant prior to entry.
- 8.2 If necessary, the appropriate respiratory equipment shall be provided by the entrant's organization, provided they are listed under their organization's Respiratory Protection Program.
- 8.3 The use of approved respiratory protection with separate air supply shall be required when one or more of the following conditions exists, or could exist during confined space operations:
 - 8.3.1 Flammable or combustible vapors greater than 10% of the LEL.
 - 8.3.2 Oxygen content below 19.5% or above 21.5%.
 - 8.3.3 Toxic or corrosive contaminant above the TLV.
- 8.4 Approved safety belts or harnesses and safety lines shall be provided. Lines shall be at least 1/2 inch in diameter, 2,000 pound test, and long enough to be secured outside the entry opening.
- 8.5 Approved rescue equipment shall be pre-positioned near the entrance prior to the entry into the confined space. This is to cut down on the response time should a rescue be required.

- 8.6 An effective means of communication between employees inside a confined space and a standby employee ("buddy") shall be provided and used whenever:
- 8.6.1 The use of respiratory equipment is required, or
 - 8.6.2 Whenever the employees inside the space are out of sight of the "buddy".
- 8.7 In spaces which require lighting and there exists the potential for flammable vapors above the LEL, lighting shall be explosion proof and rated for hazardous locations.

9. PERSONNEL REQUIREMENTS

- 9.1 Only trained personnel shall be utilized for confined space operations.
- 9.2 The "buddy system" shall be employed whenever an employee is inside a permit required confined space. At least one employee shall stand by outside the space to provide assistance in case of emergency. This person shall remain in visual contact or have direct communication with the employee inside the space and have no other duties except to provide assistance in case of an emergency.
- 9.3 The permit required confined space work team shall have at least one person who is trained in CPR. This person must remain outside the space and be immediately available. This requirement can also be met by having a member of the on-site Emergency Response team (ERT) present during the entry.

10. SPECIAL REQUIREMENTS FOR PERMIT REQUIRED CONFINED SPACE OPERATIONS

- 10.1 If the concentration of flammables or combustibles exceeds 20% of the LEL, entry into a confined space shall "NOT" be made and existing operations shall be terminated if this condition occurs during the entry. Workers shall leave the space immediately. Approved ventilation shall be used to lower the concentration to 10% LEL and the source eliminated.
- 10.2 Sources of ignition are prohibited within the confined space, except where hot work is required. A separate "Hot Work Permit (EHS-00029-F1)" is required whenever the use of flame, arc or spark, such as welding or cutting, is necessary.
- 10.3 Whenever oxygen consuming equipment, such as torches are used, or welding is performed, adequate local exhaust venting shall be provided.

- 10.4 When required, the standby employee, as well as the employee in the space, shall be equipped with appropriate respiratory protective apparatus, including an independent source of breathing air. The equipment must be available for immediate use.
- 10.5 Periodic testing of air in confined spaces shall be performed with sufficient frequency to assure that dangerous air contaminants and/or oxygen deficiency (or excess) does not occur during confined space operations. Non-permit required confined spaces are identified with a two digit number (01 to 99). Permit required confined spaces are identified with a three digit number (101 and above).

11. TRAINING

- 11.1 Authorized Entrants, Attendants and Entry Supervisors must receive formal training concerning their roles and responsibilities. Formal training ensures that they have acquired the understanding, knowledge, and skills necessary to perform their assigned duties. Training for each authorized person is provided:
- 11.1.1 Before personnel are assigned duties outlined in this plan,
- 11.1.2 When their assigned duties change, and/or
- 11.1.3 When there is a change in a permit space that creates hazards of which affected personnel have not been informed.
- 11.2 Each Authorized Entrant, Attendant and Entry Supervisor receives refresher training annually in confined space entry procedures. ERT members shall also receive annual training on the use, care, maintenance and inspection of Personal Fall Arrest System.
- 11.3 Training records are maintained by the EH&S Department.

12. RESCUE AND EMERGENCY MEDICAL SERVICES

- 12.1 In the event of an emergency, the ERT will be used for rescue and emergency medical services.
- 12.2 A method of communication such as telephone or radio must be in place between the Attendant and Entry Supervisor during a confined space entry. If multiple confined space entries are performed, sufficient emergency personnel must be available to perform simultaneous rescues at each entry location.

- 12.3 Requests for emergency services must be made by telephone or two-way radio directly to the Entry Supervisor. The Entry Supervisor will then contact Security at 78600 who will contact the ERT for assistance.
- 12.4 In accordance with OSHA regulations (29 CFR 1910.146), an emergency rescue drill, including emergency responders and authorized personnel, will be performed annually at the facility.
- 12.5 During this annual training the ERT are evaluated in terms of proficiency with rescue-related tasks and equipment, and if they function appropriately while rescuing entrants from a permit-required confined space.

13. CONTRACTOR ENTRY COORDINATION

- 13.1 The EH&S Department shall coordinate entry into a permit-required confined space, which may involve Authorized Entrants from more than one contractor. The EH&S Department must understand the hazards of the work to be performed by all Authorized Entrants and ensure that the activities of one contractor or sub-contractor do not endanger employees of another.
- 13.2 Before a contractor begins work in a confined space, the site project coordinator will:
 - 13.2.1 Inform the contractor that the workplace contains permit-required confined spaces and that entry into such spaces is allowed only through compliance with a Confined Space Entry Program meeting the requirements of 29 CFR 1910.146;
 - 13.2.2 Review and approve the contractor's Confined Space Entry Program;
 - 13.2.3 Ensure that contractor personnel have received the required confined space entry training as required by 29 CFR 1910.146;
 - 13.2.4 Ensure the contractor monitors the space prior to and during entry, and completes a confined space entry permit form EHS-00007-F1;

14. FORMS

- 14.1 Confined Space Entry Permit (EHS-00007-F1)
- 14.2 Permit Required Confined Spaces (EHS-00007-F2)
- 14.3 Non-Permit Required Confined Spaces (EHS-00007-F3)

Document History Page

Rev.	Description of Change	Release Date	DCN NO.	DCN Initiator	Document Owner
1	Initial Release.	12/21/04	DCN0028	J. Trodden	R. Segura
2	Removing Appendices A, B & C. Changing references to Appendices A, B & C to the appropriate form #s. Creating new form files for each Appendix. Appendix A is now Form EHS-000007-F1. Appendix B is now Form EHS-000007-F2. Appendix C is now Form EHS-000007-F3. Adding Hot Work Permit form # EHS-00029-F1	3/10/06	DCN 0131	B. Borden	R. Segura