CONFINED SPACE TRAINING

For Fuel System Employees

CONFINED SPACE SAFETY - General

- (1) The purpose of these procedures will be to prevent hazardous materials exposure and injuries and to be in compliance with applicable federal regulations.
- (2) The Company will ensure safe entry and work in confined spaces per FAA and OSHA regulations 1910.146 and 1910.134.
- (3) All fuel cells and fuel tanks will be classified as permit-required confined spaces.
- (4) The Company has and will continue to identify permit-required confined spaces at all facilities.
- (5) Hazards associated with each permit-required confined space will be identified before worker entry is allowed in the space and documented on the confined space entry permit.

CONFINED SPACE SAFETY - Definitions

- (1) Attendant: An individual stationed outside one or more *permit required spaces who monitors the authorized entrants* and who performs all attendant duties as assigned in the confined space entry procedure.
- (2) Authorized Entrant: An employee who has been trained by the employer to properly enter a permit space.
- (3) Confined Space: Is large enough and configured so an employee can bodily enter and perform assigned work and has limited or restricted means for entry or exit. Is not designed for continuous employee occupancy.
- (4) Emergency: Any occurrence or event, internal or external to the permit space, which could endanger the entrants.

CONFINED SPACE SAFETY - Definitions

- (5) Engulfment: The surrounding and effective capture of a person by a liquid or flowable substance which can be aspirated to cause death by filling or plugging the respiratory system or exerting enough force on the body to cause death by strangulation, constriction, or crushing.
- (6) Entry: The action by which a person passes through an opening into a permit 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 an opening into the space.
- (7) Entry Permit: The written or printed document provided by the Company to allow and control entry into a permit space.

CONFINED SPACE SAFETY - Definitions

- (8) Entry Supervisor: The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry into the space, overseeing entry operations, and for the proper cancellation and record keeping requirements of the cancelled permit.
- (9) Hazardous Atmospheres: An atmosphere exposing employees to the risk of death, incapacitation, impairment of ability to self rescue, injury, or acute illness from one or more of the following causes:
  - (a) Flammable gas, vapor, or mist concentrations in excess of 10 percent of its lower explosive limit (LEL).
  - (b) Airborne combustible dust as a concentration meeting or exceeding its LEL.

CONFINED SPACE SAFETY - Definitions

(9) Hazardous Atmospheres: (cont.)

(c) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.

(d) Atmospheric concentration of any substance for which a Dose or permissible exposure limit (PEL) is published in subpart Z, Toxic and Hazardous Substances, or subpart G, Occupational Health and Environmental Control which could result in employee exposure in excess of its dose or PEL.

(e) Any other atmospheric condition immediately dangerous to life or health (IDLH).

CONFINED SPACE SAFETY - Definitions

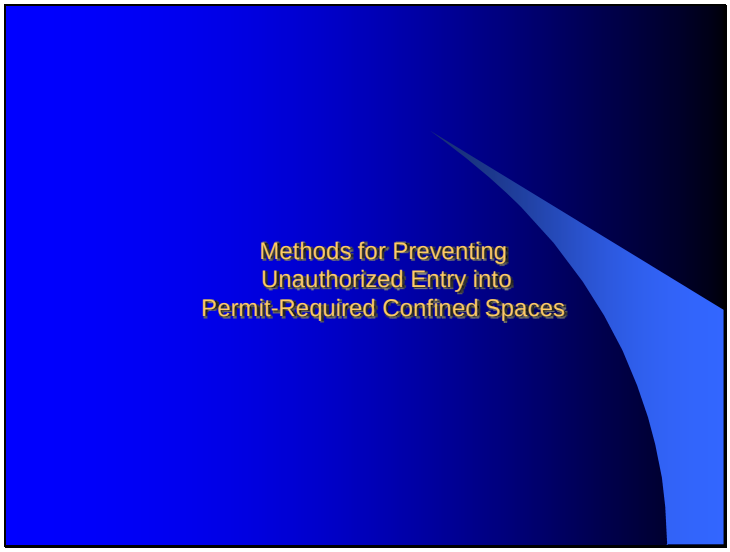
- (10) Immediately Dangerous to Life or Health (IDLH): Any condition posing an immediate or delayed threat to life, causing irreversible adverse health effects, or interfering with an individual's ability to escape unaided from a permit space.
- (11) Non-Permit Confined Space: A confined space that does not contain or have the potential to contain any hazard capable of causing death or serious physical harm.

CONFINED SPACE SAFETY - Definitions

- (12) Permit-Required Confined Space: A confined space that has one or more of the following characteristics:
- (a) Contains or has the potential to contain a hazardous atmosphere;
- (b) Contains a material having the potential for engulfing an entrant;

(c) Has an internal configuration in which an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section; or

- (d) Any other recognized serious safety or health hazard.



CONFINED SPACE SAFETY - Methods for Preventing Unauthorized Entry into Permit-Required Confined Spaces

- (1) Danger signs are used to inform and prevent unauthorized entry into permit required confined spaces. These are:
- (a) Permanently affixed to any facility door or opening which could inadvertently be opened by unauthorized employees to enter any permit space.
- (b) Affixed to stands and placed around the confined space opening
- (c) Temporarily taped to any open hole on any fuel cell or fuel tank of aircraft when fuel cell covers have been removed and staying in place until the covers have been installed and secured.

CONFINED SPACE SAFETY - Methods for Preventing Unauthorized Entry into Permit-Required Confined Spaces

- (2) When facility confined space entrance covers have been removed, they shall be promptly guarded by an acceptable railing or other barrier which will prevent an accidental fall through the opening. No barriers are required for open fuel cells

- (3) Danger signs shall read,

"DANGER – OPEN FUEL TANKS - CONFINED SPACE - ENTER BY PERMIT ONLY – NO UNAUTHORIZED ENTRY."

CONFINED SPACE SAFETY - Methods for Preventing Unauthorized Entry into Permit-Required Confined Spaces

CONFINED SPACE SIGN

OPEN FUEL TANKS
CONFINED SPACE
ENTRY BY PERMIT ONLY
NO UNAUTHORIZED ENTRY

Entry Permit

CONFINED SPACE SAFETY – Entry Permit

- (1) Prior to employees entering a permit-required confined space, a trained entry supervisor must properly complete all sections of the entry permit form, discuss the job with the attendant and the entrants, and post the permit conspicuously at the entrance.
- (2) The entry supervisor shall determine when to terminate the permit as follows:
- (a) When the work is completed.

  (b) When a condition that is not allowed under the entry permit arises in or near the permit space.

  (c) Whenever a permit is terminated for any reason, a new permit will be issued when acceptable entry conditions have been met and before re-entry is allowed.

Testing for Acceptable Entry Conditions

CONFINED SPACE SAFETY - Testing for Acceptable Entry Conditions

- (1) Before any employee enters the space, the internal atmosphere shall be tested with a calibrated direct reading instrument for the following conditions, in the order given below:

  (a) Oxygen content

  (b) Flammable gasses and vapors

  (c) Potential toxic air contaminants. (Contact the site manager or Quality Control if toxins are suspected.)

- (2) Employees may not enter the space whenever a hazardous atmosphere exists without proper training and personal protective equipment. If for any reason a space must be entered having a hazardous atmosphere, refer to the procedures for entering "hot" fuel cells for the conditions which must be met prior to entry.

CONFINED SPACE SAFETY - Testing for Acceptable Entry Conditions

- (3) Forced air ventilation shall be used during all permit space entries. The Forced air ventilation shall be directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space.

  (a) Air supply shall be from a clean source and may not increase the hazards in the space.

- (4) Atmospheric testing shall be done before initial entry and at least every four (4) hours thereafter with the results documented on the entry permit.

CONFINED SPACE SAFETY - Testing for Acceptable Entry Conditions

- (5) If a hazardous atmosphere is detected during entry

  (a) All employees will leave the space immediately.

  (b) The permit will be cancelled and the space evaluated to determine how the hazardous atmosphere developed.

  (c) Corrective actions will be taken to secure safe and acceptable entry conditions before re-entry is allowed.

  (d) A new permit will be issued and posted before re-entry is allowed with corrective actions listed on the permit

Confined Space Work

CONFINED SPACE SAFETY - Confined Space Work

(1) Use only battery-operated explosion proof flashlights or explosion-proof lighting fixtures.

(2) Use only air tools or explosion-proof electrical tools when entering a fuel cell.

(3) Entrants and attendants will only were cotton clothing with non-sparking zippers/buttons whenever entering a confined space. Nylon, woolen or synthetic clothing shall not be worn during fuel tank entry.

(4) Matches, lighters, cigarettes, pagers, cell phones or jewelry will not be worn or brought into any fuel tank. If wedding rings can not be removed. then it must be covered to prevent snagging and the potential for sparking when coming in contact with other metal.

CONFINED SPACE SAFETY - Confined Space Work

(5) Cell Phones, Pagers, or Radios will not be brought onto an aircraft with open fuel cells.

(6) Refer to appropriate MSDS for personal protective equipment requirements for any chemicals or materials used or encountered while working in confined spaces. These requirements shall be listed on the entry permit.

Training

CONFINED SPACE SAFETY - Training

(1) Training shall be given to all authorized entrants, attendants, and entry supervisors prior to assignment.

(a) Confined Space and Confined Space Attendant Training

(b) Hazard Communication Training

(c) Respirator Training (Annually)

(d) Safety Training

CONFINED SPACE SAFETY - Training

- (2) Retraining shall occur:

(a) If there is a change in assigned duties;

(b) Whenever there is a change in permit space operations presenting a hazard in which the employees have not been previously trained;

(c) Whenever there are deviations from the procedures required by OSHA as indicated in the confined space regulations.

(d) When customer/air carrier requires retraining or in accordance with their Policies and Procedures.

(e) All training will be documented in the employees training records.

CONFINED SPACE SAFETY - Training

- (3) Employee proficiency will be evaluated periodically. The results will be used to revise training methods and procedures, as necessary.
- (4) Training records will be kept on file and available for review by the employee or any governing agency wishing to review them.

Entry Procedures

CONFINED SPACE SAFETY - Entry Procedures

- (1) Identify the space to be entered.
- (2) Notify the supervisor of the need to enter the specified confined space. The supervisor initiates the means for safe entry as follows.

  (a) Specify acceptable entry conditions, based on the hazards that would be expected in each specific confined space.

  (b) Isolate the confined space.

  (c) Physically lock out or de-energize all mechanical, electrical, pneumatic or hydraulic equipment which may be associated with the confined space.
  (Use lock out/Tag out procedures)

CONFINED SPACE SAFETY - Entry Procedures

- NOTE: Customer or air carrier Lock out and tag out procedures will be used when requested or required by the customer or air carrier

  (d) Purge or ventilate the space to eliminate or control the atmospheric hazards.

  (e) Provide barriers and/or signs as necessary to prevent unauthorized individuals from entering the space.

- NOTE: Customer or air carrier barrier and sign procedures will be used when requested or required by the customer or air carrier.

  (f) Monitor conditions in the confined space from the outside of the space to verify that entry is safe. Record these levels on the entry permit.

CONFINED SPACE SAFETY - Entry Procedures

- NOTE: Acceptable Levels O2 (oxygen) 19.5 to 23.5 percent LEL (Lower Explosive Limit) below 10 percent

(g) Ensure that communications can be maintained at all times with the workers inside the confined space. Communication shall be by visual, voice or taping method.

(h). Provide appropriate lighting, emergency rescue plans and personal protective equipment as appropriate and required for safe entry.

(i). The entry supervisor shall designate which appropriately trained personnel will monitor atmospheric conditions in the space.

(j) Review the procedures for contacting rescue personnel with all members of the crew performing the confined space work.

(k) Initiate the confined space permit. Sign the properly completed permit authorizing entry into the confined space.

CONFINED SPACE SAFETY - Entry Procedures

- NOTE: The Customer may use customer or air carriers confined space permit and permit procedures when required or requested by the customer air carrier.
- The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit or 1 shift which ever is shorter. The Company classifies a shift as no more than a 12 hour work period.
-
- (l) Post the permit at the entry site

CONFINED SPACE SAFETY - Entry Procedures

(3) Provide at least one outside attendant for the duration of the entry procedure. An attendant must be at or near the confined space entrance at all times.

(a) The attendant shall have visual, voice contact or use the taping method with the entrants at all times.

(b) The attendant performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

(c) The attendant shall not enter the confined space or leave the sight for any reason without being properly relieved

(d) The attendant shall be ready to summon rescue assistance in the case of an emergency. The attendant will not attempt to enter the space to facilitate rescue unless he/she is a qualified and certified rescue team member and then only after another attendant is available to stand watch.

CONFINED SPACE SAFETY - Entry Procedures

Note: Attendants may be assigned to monitor more than one permit space provided they can maintain visual, voice, or taping contact with all entrants.

(4) The attendant shall take the following actions when unauthorized persons approach or enter a permit space while entry is underway.

(a) Warn unauthorized persons that they must exit immediately if they have entered the permit space.

(b) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

(5) The attendant will summon rescue and other emergency services as soon as he/she determines that the authorized entrants may need assistance to escape from the permit space hazard.

CONFINED SPACE SAFETY - Entry Procedures

(6) The entry supervisor shall cancel the permit and remove workers from the space when:

(a) All tasks requiring the entry are completed.

(b) Conditions that are not allowed under the permit arise.

(c) The scheduled shift of the crew performing the entry is completed.

NOTE: The Company classifies a shift as no more than a 12 hour work period.

CONFINED SPACE SAFETY - Entry Procedures

- (7) File the cancelled permit with the appropriate records for retention. These permits must be retained for 12 months from the date of the permit cancellation and must be readily available for inspection.

The periodic inspection of these records will be used to evaluate the effectiveness of the program and to make any corrections as needed. Cancelled permits will be evaluated by the Director of Quality Control at least annually.

Atmospheric Testing Equipment

CONFINED SPACE SAFETY - Atmospheric Testing Equipment

- (1) All atmospheric testing equipment used at NAAS will be maintained in a safe working condition at all times.
- (2) Testing equipment will meet or exceed all applicable OSHA standards and will be calibrated in strict accordance with the manufacturer's specified recommendations.
- (3) Calibrations will be performed by qualified personnel only.
- (4) Use of non-calibrated or malfunctioning test equipment is strictly prohibited

Procedures for Entering Hot Fuel Cells / Tanks

CONFINED SPACE SAFETY -Procedures for Entering Hot Fuel Cells / Tanks

- (1) Whenever acceptable atmospheric entry conditions can not be met in accordance with this paragraph and the Company procedures then:

  (a) The entry supervisor must notify the confined space rescue team of his or her intent to make a confined space entry and that all acceptable entry conditions can not be met.

  (b) The confined space rescue team must acknowledge they are aware of the entry and are capable of responding in an emergency situation. If the rescue team is not able to respond for any reason, the entry will not be made.

  (c) The entry supervisor will insure all respiratory requirements of OSHA 1910.134 have been met and all personnel have been trained, qualified, fit tested, and had documented medical evaluations before performing any work in the space with respiratory protection equipment.

CONFINED SPACE SAFETY -Procedures for Entering Hot Fuel Cells / Tanks

(d) The entry supervisor will insure all pertinent MSDS sheets have been thoroughly reviewed, are readily available for rescue personnel if needed, and all PPE required by the MSDS is available and worn for the duration of the work being performed.

(e) The entry supervisor will thoroughly review all hazards with entry personnel before entry is allowed.

(f) The entry supervisor will document, on the permit, the time, date, and name of the confined space rescue team member contacted

(g) The entry supervisor will notify the confined space rescue team upon completion of the job and the cancellation of the permit.

(h) These procedures are to be followed in addition to all other rules previously listed in the Company confined space entry program. These additional procedures must be strictly followed due to the dangerous and serious nature of entering confined spaces with potential IDLH atmospheres.

CONFINED SPACE SAFETY -EMERGENCY SERVICES

- Each Site Manager will insure a confined space rescue team or plan used by the host Facility is in compliance with 29CFR 1910.146. This plan will also incorporate all other OSHA references, such as 1910.134 sections on IDLH confined space work.

Confined Space Permit

CONFINED SPACE SAFETY – Confined Space Permit TOP

SAMPLE

COMPANY NAME **CONFINED SPACE ENTRY PERMIT**	**A/C Reg. No.:** 1	**Task Card or Log Book Page No** 3.
	W/O No: 2	**Date:** 4

Location & Description of Confined Space.
5

Purpose of Entry.
6

Scheduled Start	7	a.m./p.m.	Scheduled Finish	8	a.m./p.m.
Day/date/time			Day/date/time		

Entrants:
9

Attendants:
10

(Check those items below which are applicable to your confined space permit.)

TYPES OF HAZARDS 11

- Oxygen-Deficient Atmosphere
- Oxygen-Enriched Atmosphere
- Welding/Cutting
- List type of chemical Hazard:
- Engulfment
- Toxic Atmosphere
- Flammable Atmosphere
- Energized Electrical Equipment
- Entrapment
- Hazardous Chemical

SAFETY PRECAUTIONS 12

- Self-Contained Breathing Apparatus
- Air-Line Respirator
- Fire-Retardant Clothing
- Ventilation
- Protective Gloves
- Lifelines
- Respirators
- Lockout/Tagout
- Fire Extinguishers
- Barricade Job Area
- Signs Posted
- Clearances Secured
- Lighting
- Ground Fault Interrupter

Atmospheric Hazards have been eliminated with continuous forced air ventilation: 13
Supervisor Signature

CONFINED SPACE SAFETY – Confined Space Permit TOP INSTRUCTIONS

- The initiation and completion of the confined space permit is the responsibility of the confined space supervisor. If a lead mechanic is assigned responsibility for the entry the supervisor shall remain responsible for the accuracy and completion of the permit.
- Block 1. Enter the Aircraft Reg. Number
- Block 2. Enter the Job Work Order number
- Block 3. Enter the Routine or Non-Routine Task Card Number or Aircraft Log Book Page Number that generated the requirement for the Confined Space Permit.
- Block 4. Enter the date the permit was issued.
- Block 5. Enter the location and description of the confined space.
- Block 6. Enter the reason for the confined space entry.
- Block 7. Enter the scheduled start date and time of the confined space entry.
- Block 8. Enter the scheduled finish date and time of the confined space entry

CONFINED SPACE SAFETY – Confined Space Permit TOP INSTRUCTIONS

- Block 9. Enter the name of the employees authorized to enter the confined space
- NOTE: Only personnel listed on the confined space permit as and entrant may enter the confined space.
- Block 10. Enter the name of the employees authorized to act as attendants outside the confined space.
- NOTE: Only personnel listed on the confined space permit as and attendant may
- Perform the duties of an attendant
- Block 11. The Confined space supervisor or lead mechanic conducting the safety briefing and pre-entry check list shall check each block that pertains to the hazards in the confined space.
- Block 12. The Confined space supervisor or lead mechanic conducting the safety briefing and pre-entry checklist shall check each block that pertains to the safety precautions for the confined space.
- Block 13. Enter the signature of the supervisor who certifies the only hazard associated with the entry is a hazardous atmosphere and that the hazard has been eliminated with continuous forced air ventilation.

CONFINED SPACE SAFETY – Confined Space Permit Bottom

ENVIORNMENTAL CONDITIONS

Test To Be Taken	Re-Testing
Date__A___ Init__B___ 14	Date____A__ Init____B_____ 14
Oxygen_____C_____% _____D_____a/p	Oxygen_____C_____% _____D_____a/p
Lower Explosive Limit__E____% _____F____a/p	Lower Explosive Limit__E____% _____F____a/p
Toxic Atmosphere PPM___G____ Time___H____	Toxic Atmosphere PPM___G_____ Time___H____
Instruments Used: Type____I_____ S/N___J____	Instruments Used: Type____I_____ S/N___J____

Supervisor Conducting Pre-Entry Checklist: Signature: _____15_____

Rescue Service Notified if Required _____16_____ _____17_____ _____18_____
Date Time Supervisor Signature

Entry Authorization	Entry Cancellation
All Actions and or Conditions for safe entry have been performed Person In Charge Of Entry _____19_____	Entry has been completed and all entrants have exited permit space Person in Charge Of Entry _____20_____

CONFINED SPACE SAFETY – Confined Space Permit Bottom
INSTURCTIONS

- Block 14. Environmental Condition.
  - Block A. Enter the date the reading was accomplished
  - Block B. Enter the initials of the individual taking the reading
  - Block C. Enter the oxygen reading in percent.
  - Block D. Enter the time the oxygen reading was taken
  - Block E. Enter the Lower Explosive Limit (LEL) percent.
  - Block F. Enter the time the LEL reading was taken.
  - Block G. Enter the parts per million (PPM) of the toxic atmosphere.
  - Block H. Enter the time the toxic reading was taken.
  - Block I. Enter the Type and model number of the instrument used.
  - Block J. Enter the serial number of the instrument used.
- Block 15. Signature of the confined space supervisor or lead conducting the safety briefing and pre-entry checklist
- Block 16. Enter the date the rescue service was notified of the entry.
- Block 17. Entire the time the rescue service was notified of the entry

CONFINED SPACE SAFETY – Confined Space Permit Bottom INSTURCTIONS

- Block 18. Enter the signature of the confined space supervisor after the rescue service was notified of the entry and block 16 and 17 are completed.
- Block 19. Enter the signature of the supervisor or lead authorizing the confined space entry.
- Block 20. Enter the signature of the supervisor or lead canceling the entry permit after all work has been accomplished or at the end of the shift.
- NOTE: All confined space permits must be maintained for a period of 12 months. When a permit is cancelled, the permit must remain with the work package, or filed in the quality control office.

CONFINED SPACE SAFETY – Confined Space Permit Bottom

- **RECLASSIFICATION OF AIRCRAFT POWER-ON ENTRY AUTHORIZATION**
- **Additional procedures required for reclassification authorizing aircraft power-on work shall be in accordance with air carrier or customer General Maintenance Manual for Fuel Cell Entry/Permit Required Space Program. if authorized and aircraft maintenance manuals .**
- **RECLASSIFICATION OF POWER-ON WORK HAS BEEN ACCOMPLISHED IN ACCORDANCE WITH: _____21_____**
- ___22_____ _____23_____ _____24_____
- DATE LOCATION OF SPACE SIGNATURE
- CONF-ENT. COMPANY -QC-100 Page 1 8/01/08
- Previous revisions may be used
- **In Case of Emergency Call 911**

CONFINED SPACE SAFETY – Confined Space Permit Bottom INSTRUCTIONS

- Block 21. If the aircraft is being re-classified for power on, enter the maintenance manual or customer manual procedures which allows for power on re-classification.
- Block 22. Enter the date of the re-classification
- Block 23. Enter the location of the hazard that has been re-classified.
- Block 24. Enter the signature of the supervisor or lead who accomplished power on re-classification.
- NOTE: If power must be removed form the aircraft after a power on re-classification, a new permit must be accomplished.

CONFINED SPACE SAFETY – Confined Space Permit Top Back

Entrants – Continuation from Front side
Entrants

_____9_____
_____
_____
_____

Attendants – Continuation from Front Side
Attendants

_____10_____
_____
_____
_____

ENVIROMENTAL CONDITIONS – CONTINUATION FORM PAGE 1

Re-Testing Date____A__ Init____B_____ 14	Re-Testing Date____A__ Init____B_____ 14
Oxygen_____C_____% _____D_____a/p	Oxygen_____C_____% _____D_____a/p
Lower Explosive Limit__E____% _____F____a/p	Lower Explosive Limit__E____% _____F____a/p
Toxic Atmosphere PPM___G____ Time___H____	Toxic Atmosphere PPM___G____ Time___H____
Instruments Used: Type____I_____ S/N___J____	Instruments Used: Type____I_____ S/N___J____

CONFINED SPACE SAFETY – Confined Space Permit Bottom Back

PRE-ENTRY CHECK LIST

1. Conduct a survey of the surrounding area to ensure it is free of hazards such as drifting vapors form operating ground power equipment.
2. All electrical and mechanical hazards tagged and blocked.
3. .Aircraft Grounded
4. Fuel storage and sumping barrels and/or containers grounded
5. One wheeled dry chemical fire extinguisher, located within 50 feet of the open fuel tank.
6. Motorized equipment shut down or positioned at least 50 feet from confined space entrance until such time as a fire safe condition is assured
7. Hazardous area Drops lights, flashlights and other electrical equipment for Class I, Group D, Division 1 used.
8. Functional test of the gas monitor accomplished prior to the first reading on the shift.
9. Continuous ventilation applied into the confined space
10. All Personal Protection Equipment (PPE) required for entry available and in place.
11. Non-sparking clothing (cotton only) worn during fuel tank entry. No nylon, woolen or synthetic clothing shall be worn during entry.
12. All personnel participating in the confined space entry trained and understand the current confined space procedures
13. Confined space permit initiated and properly fill out in accordance with the procedures used
14. Oxygen, LEL and CO readings acceptable prior to Entry