

Use of Internal Combustion Engines (Carbon Monoxide Poisoning)

APPLICABILITY:

This EH&S Instruction applies to United Technologies Aerospace Systems sites worldwide, including contractors working at UTAS facilities. The document describes minimum safeguards that must be implemented by an UTAS site that is considering the use of any equipment that contains an internal combustion engine (ICE). Motor vehicles are not covered by this EH&S Instruction. UTAS sites must also comply with any local regulatory requirements that are more stringent than this EH&S Instruction.

SUMMARY:

Any UTAS site that uses equipment that contains an internal combustion engine (ICE), excluding motor vehicles, shall ensure that adequate controls are in place to minimize employee exposure to carbon monoxide. Internal combustion engines used for routine work shall be properly maintained, and adequate ventilation provided to minimize exposures. Non-routine work involving the use of an ICE requires the prior review and approval of responsible UTAS personnel as describe under Key Elements and the Approval to Use Combustion Engine form (Appendix A.)

Where available and appropriate, less hazardous equipment (e.g. electric, battery, pneumatic) shall be used instead of internal combustion engines in enclosed areas.

BACKGROUND:

A significant potential hazard arising from the use of internal combustion engines is carbon monoxide (CO) poisoning. CO is a poisonous, colorless, odorless and tasteless gas which is a by-product of combustion, including fuel burning activities. When inhaled, CO displaces oxygen in the blood and deprives the heart, brain and other organs of oxygen. Symptoms of CO poisoning include: headache, fatigue, dizziness, drowsiness or nausea. Because it is difficult to detect the presence of CO, victims can be overcome with little warning. Large concentrations of CO can overcome a victim in minutes, causing loss of consciousness and death.

KEY ELEMENTS: Any UTAS site planning to use an ICE must comply with the following:

Routine Work: (e.g. Propane lift trucks used for material handling, production testing of UTAS products that contain internal combustion engines):

Propane lift trucks must be part of a total preventive maintenance program that ensures that the CO level at the exhaust is below 100 ppm. The CO level in the exhaust shall be tested and verified at least annually.

Product testing of internal combustion engines must be conducted in areas with local exhaust direct powered ventilation affixed to the exhaust pipe of the unit and vented outside the building. CO monitors with audible and visual alarms shall be installed, and set to alarm at 35 ppm, or lower if local regulations specify.

Any other activities known to produce CO shall have appropriate CO monitors in place to ensure that CO levels remain below applicable occupational health exposure standards.

Non-Routine Work: (e.g. Construction, Maintenance, Renovation, Gasoline powered lift trucks, propane powered lift truck used in an enclosed area):

1. The UTAS Project Manager (the UTAS individual responsible for specifying the use of the ICE) shall complete Appendix A prior to the start of the project. Appendix A requires the review and approval of the site EH&S Department, the site Operations Manager and the site Emergency Services Manager (if applicable).

2. The UTAS Project Manager shall specify methods to be used to provide direct powered ventilation to remove the exhaust from the ICE to a safe location exterior to the building. **General area ventilation and catalytic converters cannot be relied upon to control CO exposure.**
3. The UTAS Project Manager shall also specify proposed personal protective equipment, if any (e.g. air supplied respirators).
4. While the ICE is in use, only employees/contractors directly involved with the use of the ICE, and the CO monitor observer (see # 7 below) shall be present in the immediate vicinity of the ICE.
5. An area CO monitor that continuously measures CO concentration and is capable of emitting both audible and visible alarms when the CO concentration reaches 35 parts per million shall be placed within 10 feet of the ICE.
6. All CO monitors shall be calibrated in accordance with the manufacturer's specification immediately prior to the start of the project, (e.g. each day for multi-day projects).
7. The CO monitor shall be continuously observed by a qualified individual who has no other responsibilities during the operation of the ICE. If the monitor at any time indicates a CO concentration of 35 ppm, the equipment must immediately be shut down, all employees/contractors must leave the area, and the area must be ventilated. Work can not resume until the cause of the initial CO build up has been identified and corrected, and the CO monitor reads 9 ppm or lower.
8. If appropriate, the UTAS Project Manager must also specify additional project monitoring methods to be used to ensure that operators are regularly checked (e.g. periodic visual checks, "Man Down" system, radios, cell phone).
9. All UTAS employees, contractors or other personnel who will use the ICE or work in the immediate vicinity of the ICE shall receive specific detailed training related to the potential for carbon monoxide poisoning, including how to recognize symptoms.
10. Internal combustion engines used in exterior areas must be located far enough from any building air intake locations to ensure that CO is not inadvertently drawn into the building. Exterior uses of internal combustion engines shall also be conducted in areas that have adequate ventilation.

COMPLIANCE DATES: The requirements of this EH&S Instruction are effective immediately.

For further information, contact:

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Document Changes

<u>Revision No.</u>	<u>Date</u>	<u>Description of Change</u>
0	3/01/07	Initial release.
1	3/01/12	Review for adequacy; no changes required.
2	6/7/12	Change HS to UTAS

Appendix A: Approval to Use Internal Combustion Engine

SECTION I: PROJECT DESCRIPTION AND APPLICABILITY DETERMINATION

United Technologies Aerospace Systems Project Manager: Name / Telephone and Pager #:

Alternate United Technologies Aerospace Systems Contact: Name / Telephone and Pager #:

Date(s) Permit is Valid (5 Days Max.): Start: _____ **End:** _____

Time(s) Permit is Valid: Start: _____ **End:** _____

Is Weekend/Off-Shift/Holiday Work Required? Yes ☐ No ☐

If Yes, UTAS contact who will monitor work during this time:

Describe the intended use of the Internal Combustion Engine (ICE):

Does the project require the use of an ICE indoors, in an exterior area with limited ventilation or near any building air intake?

- ☐ **No:** Sections II and IV are not applicable; obtain signatures in Section III prior to beginning the project.
- ☐ **Yes:** Explain below why the use of less hazardous equipment (e.g. battery, electric, pneumatic, etc.) is not feasible, and complete Sections II and III. Section IV must be completed immediately prior to the project.

SECTION II: REQUIRED CONTROLS

Describe the specific methods to be used to ensure that the exhaust from the ICE will be directly ventilated to the exterior of any building, away from any source of building make-up air. (General area ventilation and catalytic converters can not be relied upon to protect the operators.)

Describe additional personal protective equipment to be used by ICE operators, if any:

Describe additional monitoring methods to be used, if any: (Periodic visual checks, radios, cell phones)

Briefly summarize the carbon monoxide awareness training to be provided to all operators who will work in the immediate vicinity of the internal combustion engine:

Person(s) Responsible for Training: _____

Planned Training Dates: _____

Duration: _____

Describe Topics to be Reviewed:

A CO monitor with visual and audible alarms, capable of measuring CO concentrations from 0 – 35 ppm, shall be continuously observed by an individual with no other responsibilities.

Indicate CO monitor Manufacturer Name: _____

Indicate CO monitor Model Number: _____

Who will observe the CO monitor during the project? _____

Monitors must be calibrated per manufacturer's specifications immediately prior to the start of the job.

Who will calibrate the monitors? _____

SECTION III: ADVANCE PROJECT APPROVAL (1 Through 4 Required)

1. UTAS Project Manager: _____ Date: _____

2. Operations Manager: _____ Date: _____

3. EH&S Department: _____ Date: _____

4. Emergency Services (If present on Site): _____ Date: _____

OTHER SIGNATURES AS NECESSARY

5. Area UTAS Supervisor/Foreman: _____ Date: _____

6. Other: _____ Date: _____

7. Other: _____ Date: _____

SECTION IV: APPROVAL TO PROCEED

DATE: _____

Verify that specified external exhaust ventilation is installed and operating: ☐ ☐ ☐ ☐ ☐

Verify that CO monitors are calibrated and project observer is present: ☐ ☐ ☐ ☐ ☐

Verify that individuals have received CO awareness training: ☐ ☐ ☐ ☐ ☐

UTAS Project Manager's Initials: _____

If CO level reaches 35 ppm, immediately shut down the ICE, evacuate the work area, and contact the UTAS Project Manager and EH&S Department.