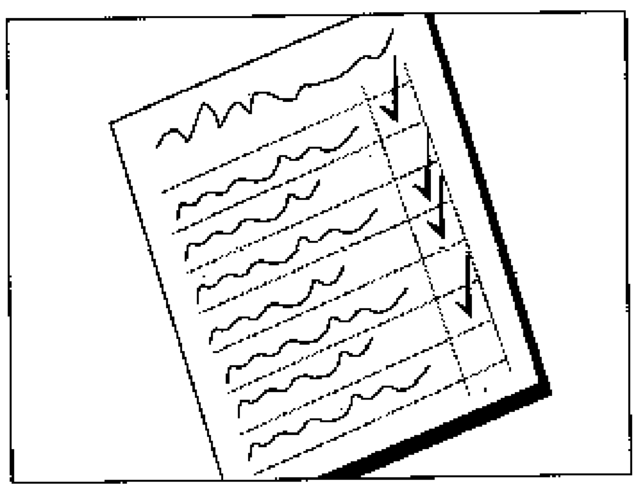
# APPENDIX C:

# INCIDENT SAFETY CHECK-OFF LIST

The Incident Safety Check-Off List, when completed correctly, fulfills the requirements for performing Preliminary Evaluations under 29 CFR section 1910.120. The checklist is divided into two sections.

Section I, which includes the basic preliminary evaluation criteria, must be completed prior to leaving the office for field activities. If the answers provided are not applicable to your particular site, you may write in the appropriate information and any necessary explanations. Section I must be reviewed and signed by a first line supervisor or a health and safety officer before field operations may begin.

Upon returning from the response action, fill out Section II to reflect what actually happened at the site. Section II must also be dated and reviewed by an appropriate supervisor or officer.



Adapted from the *OSWER Integrated Health and Safety Standard Operating Practice for Field Activities* (U.S. EPA, January 1992, Publication 9285.3-02).

# INCIDENT SAFETY CHECK OFF LIST

## I. BEFORE FIELD ACTIVITY

______________________________
Employee

1. **Incident:** Site ________________ City _________________ State ________________
2. **Activity Description:** Site Evaluation ___ Containment ___ Well Drilling ___ Facility Inspection ___
   Sampling - Air _____ Water _____ Drum _____ Soil _____ Residential _____ Other _____
3. **Type of Response:** Spill ______ Fire ______ Site ______ Train ______ Other _____
4. **Site Topography:** Moutains ______ Rivers ______ Valley ______ Rural ______
   Suburban ______ Level ______ Slopes ______ Unknown ___
5. **Incident Safety Plan:** Region ______________ Reviewed ______________
   ERT ______________ Briefed ______________
   Facility ______________ Not Developed ______________
6. **Site Accessibility:** Road: Good ______________ Air: Good ______________
   Fair ______________ Fair ______________
   Poor ______________ Poor ______________
7. **Suspected chemical(s) and pathway with source(s) involved:** (A) ______________________
   (B) ___________________ (C) ___________________ (D) _________________
8. **Emergency Response Teams Present for First Aid, etc.** Yes __________ No _____________
9. **Protective Level(s) Selected:** (A) ________ (B) ________ (C) ________ (D) _____________
   (a) If Level "C" - 1, Identify Canister _____________________________________________
   (b) If Level "D", JUSTIFY:
10. **SCBA Identify Buddy System:** Office/Name ________________________________________
11. **Last Response:** (a) Level Used: (A) ________ (B) ________ (C) ________ (D) _____________
    (b) Medical Attention/Exam Performed: Yes __________ No _____________

## II. AFTER RESPONSE

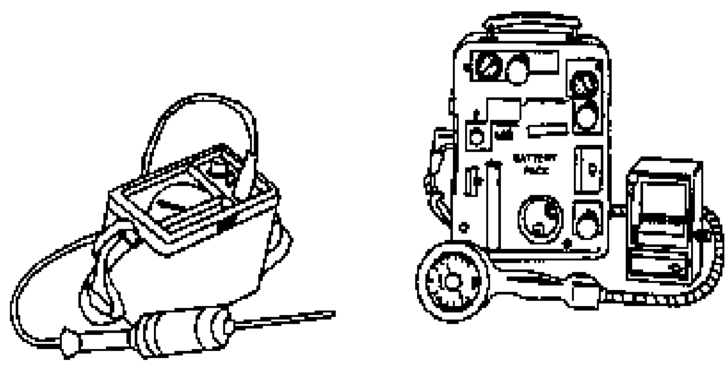
1. **Protective Level Used:** (A) ________ (B) ________ (C) ________ (D) __________________
   (a) If Level "C", Identify Canister ________________________________________________
   (b) If Level "D", JUSTIFY:
   (c) Level B or C skin protection: Tyvek __ Tyvek/Saran __ Acid/Rain __ Other _____
2. **List possible chemical exposure:** Same as above: ________ (A) _______________________
   (B) ___________________ (C) ___________________ (D) _________________
3. **Equipment Decontamination:** (a) clothing (b) respirator (c) monitoring
   Disposed: _____________ _____________ _______________
   Cleaned: _____________ _____________ _______________
   No Action: _____________ _____________ _______________
4. **Approximate time in exclusion area:** __________ hours per day for _______ days
5. **Was medical attention/exam required for this response:** Yes __________ No _____________

**Part I: DATE PREPARED:** ______________ **Reviewed by:** _____________ **Date:** ___________

**Part II: DATE PREPARED:** ______________ **Reviewed by:** _____________ **Date:** ___________

## APPENDIX D

# CHARACTERISTICS OF THE PHOTOIONIZATION DETECTOR (PID) AND THE FLAME IONIZATION DETECTOR (FID)



# CHARACTERISTICS OF THE PHOTOIONIZATION DETECTOR (PID) AND THE FLAME IONIZATION DETECTOR (FID)

## I. INTRODUCTION

The HNU® Photoionizer* and the Foxboro® Organic Vapor Analyzer* (OVA) are two of the most widely used hand-held real-time instruments used in the field to detect a variety of compounds in air. The two instruments differ in their modes of operation and in the number and types of compounds they detect (**Table D-1**). Both instruments can be used to detect leaks of volatile substances from drums and tanks, determine the presence of volatile compounds in soil and water, make ambient air surveys, and collect continuous air monitoring data. If personnel are thoroughly trained to operate the instruments and to interpret the data, these instruments can be valuable tools for helping to decide the levels of protection to be worn, assist in determining other safety procedures, and determine subsequent monitoring or sampling locations.

## II. ORGANIC VAPOR ANALYZER (OVA)

The OVA operates in two different modes. In the survey mode, it can determine approximate total concentration of all detectable species in air. With the gas chromatograph (GC) option, individual components can be detected and measured independently, with some detection limits as low as a few parts per million (ppm).

In the GC mode, a small sample of ambient air is injected into a chromatographic column and carried through the column by a stream of hydrogen gas. Contaminants with different chemical structures are retained on the column for different lengths of time (known as retention times) and hence are detected separately by the flame ionization detector. A strip chart recorder can be used to record the retention times, which are then compared to the retention times of a standard with known chemical constituents. The sample can either be injected into the column from the air sampling hose or injected directly with a gas-tight syringe.

In the survey mode, the OVA is internally calibrated to methane by the manufacturer. When the instrument is adjusted to manufacturer's instructions it indicates the true concentration of methane in air. In response to all other detectable compounds, however, the instrument reading may be higher or lower than the true concentration. Relative response ratios for substances other than methane are available.

To correctly interpret the readout, it is necessary to either make calibration charts relating the instrument readings to the true concentration or to adjust the instrument so that it reads correctly. This is done by turning the ten-turn gas-select knob, which adjusts the response of the instrument. The knob is normally set at 3.00 when calibrated to methane. Calibration to another gas is done by measuring a known concentration of a gas and adjusting the gas select knob until the instrument reading equals that concentration.

The OVA has an inherent limitation in that it can detect only organic molecules. Also, it should not be used at temperatures lower than about 40 degrees Fahrenheit because gases condense in the pump and column. It has no column temperature control, (although temperature control kits are available) and since retention times vary with ambient temperatures for a given column, determinations of contaminants are difficult. Despite these limitations, the GC mode can often provide tentative information on the identity of contaminants in air without relying on costly, time-consuming laboratory analysis.

## III. HNU

The HNU portable photoionizer detects the concentration of organic gases as well as a few inorganic gases. The basis for detection is the ionization of gaseous species. Every molecule has a characteristic ionization potential

---

Note: The use of any trade names does not imply their endorsement by the U.S. Environmental Protection Agency.

| TABLE D-1<br><br>COMPARISON OF THE OVA AND HNU | | |
|---|---|---|
| **Action** | **OVA** | **HNU** |
| Response | Responds to many organic gases and vapors | Responds to many organics and some inorganic gases and vapors. |
| Application | In survey mode, measures total concentration of detectable gases and vapors. In GC mode, identifies and measures specific compounds. | In survey mode, measures total concentration of detectable gases and vapors. |
| Detector | Flame ionization detector (FID) | Photoionization detectors (PID) |
| Limitations | Does not respond to inorganic gases and vapors. Kit available for temperature control. | Does not respond to methane. Does not detect a compound if probe has a lower energy than compound's ionization potential. |
| Calibration gas | Methane | Isobutylene |
| Ease of operation | Requires experience to interpret correctly, especially in GC mode. | Fairly easy to use and interpret. |
| Detection limits | 0.1 ppm (methane) | 0.1 ppm (benzene) |
| Response time | Two - three seconds (survey mode) for $CH_4$ | Three seconds for 90% of total concentration of benzene. |
| Maintenance | Periodically clean and inspect particle filters, valve rings, and burner chamber. Check calibration and pumping system for leaks. Recharge batteries and refill hydrogen cylinder after each use. | Clean UV lamp frequently. Check calibration regularly. Recharge batteries after each use. |
| Useful range | 0-1000 ppm | 0-2000 ppm |
| Service life | Eight hours; 3 hours with strip chart recorder. | Ten hours; 5 hours with strip chart recorder. |

(I.P.) which is the energy required to remove an electron from the molecule, yielding a positively charged ion and the free electron. The incoming gas molecules are subjected to ultraviolet (UV) radiation, which is energetic enough to ionize many gaseous compounds. Each molecule is transformed into charged ion pairs, creating a current between two electrodes.

Three probes, each containing a different UV light source, are available for use with the HNU. Ionizing energies of the probe are 9.5, 10.2, and 11.7 electron volts (eV). All three detect many aromatic and large molecule hydrocarbons. The 10.2 eV and 11.7 eV probes, in addition, detect some smaller organic molecules and some halogenated hydrocarbons. The 10.2 eV probe is the most useful for environmental response work, as the lamp's service life is longer than the 11.7 eV probe and it detects more compounds than the 9.5 eV probe.

---

Note: The use of any trade names does not imply their endorsement by the U.S. Environmental Protection Agency.

The HNU factory calibration gas is benzene. The span potentiometer (calibration) knob is turned to 9.8 for benzene calibration. A knob setting of zero increases the response to benzene approximately tenfold. As with the OVA, the instrument's response can be adjusted to give more accurate readings for specific gases and eliminate the necessity for calibration charts.

While the primary use of the HNU is as a quantitative instrument, it can also be used to detect certain contaminants, or at least to narrow the range of possibilities. Noting instrument response to a contaminant source with different probes can eliminate some contaminants from consideration. For instance, a compound's ionization potential may be such that the 9.5 eV probe produces no response, but the 10.2 eV and 11.7 eV probes do elicit a response. The HNU does not detect methane or most inorganic compounds.

The HNU is easier to use than the OVA. Its lower detection limit is also in the low ppm range. The response time is rapid; the meter needle reaches 90% of the indicated concentration in 3 seconds for benzene. It can be zeroed in a contaminated atmosphere.

## IV. GENERAL CONSIDERATIONS

Both of these instruments can monitor only certain vapors and gases in air. Many nonvolatile liquids, toxic solids, particulates, and other toxic gases and vapors cannot be detected. Because the types of compounds that the HNU and OVA can potentially detect are only a fraction of the chemicals possibly present at an incident, a zero reading on either instrument does not necessarily signify the absence of air contaminants.

The instruments are non-specific, and their response to different compounds is relative to the calibration setting. Instrument readings may be higher or lower than the true concentration. This can be an especially serious problem when monitoring for total contaminant concentrations if several different compounds are being detected at once. In addition, the response of these instruments is not linear over the entire detection range. Care must therefore be taken when interpreting the data. All identifications should be reported as tentative until they can be confirmed by more precise analysis. Concentrations should be reported in terms of the calibration gas and span potentiometer or gas-select-knob setting.

Since the OVA and HNU are small, portable instruments, they cannot be expected to yield results as accurate as laboratory instruments. They were originally designed for specific industrial applications. They are relatively easy to use and interpret when detecting total concentrations of individually known contaminants in air, but interpretation becomes extremely difficult when trying to quantify the components of a mixture. Neither instrument can be used as an indicator for combustible gases or oxygen deficiency.

The OVA (Model 128) is certified by Factory Mutual to be used in Class I, Division 1, Groups A,B,C, and D environments. As HNU now markets three models, it should be noted that the basic HNU (PI 101) is certified by SIRA Class I, Division 2, Groups A, B, C, and D. However, a model certified for Class I, Division I, Groups A, B, C, and D is available.