1.0 PURPOSE AND SCOPE
(5.1.1)

This standard provides requirements for flammable gas monitoring.

Flammable gas monitoring is required by the Surveillance Requirements and/or Required Actions of the following technical safety requirements (TSR) (HNF-SD-WM-TSR-006).

- Limiting Condition for Operation (LCO) 3.1, "DST Steady-State Flammable Gas Control."
- LCO 3.2, "SST Steady-State Flammable Gas Control."
- LCO 3.3, "SST Steady-State Flammable Gas Control for 241-B-203 and 241-B-204."
- LCO 3.4, "DST Induced Gas Release Event Flammable Gas Control."
- LCO 3.5, "DST Annulus Flammable Gas Control."
- LCO 3.6, "DCRT Steady-State Flammable Gas Control."

Flammable gas monitoring may also be performed to allow the discontinuation of ignition controls during manned work activities in the following inactive/miscellaneous tanks/facilities where steady-state flammable gas hazards may exist (see TSR Administrative Control [AC] 5.8.3, "Flammable Gas Controls for Inactive/Miscellaneous Tanks/Facilities").

- Catch tanks (see HNF-SD-WM-TSR-006 Section 1.6 for the list of catch tanks).
- Inactive miscellaneous underground storage tanks (IMUST) (see HNF-SD-WM-TSR-006 Section 1.6 for the list of IMUSTs).
- 244-CR Vault tanks 244-CR-TK-001, -002, -003, and -011.
- 242-T Evaporator tanks/vessels 242-T-101, -102, -103, -104, -105, -106, -107, -108, -109, and -110.
- 242-S Evaporator (Hot Side) tanks/vessels.
- Miscellaneous inactive processing facilities ITS-1, 241-C-801, 241-SX-401, and 241-SX-402.
- Waste transfer systems (active and inactive primary piping and encasements).
- Hose-in-hose transfer line systems (primary hose and encasement hose assemblies).
- Vacuum retrieval system slurry tank and water separator.

- Ventilation system condensate seal pots and collection tanks where the potential volume of flammable gas ≥ 100% of the lower flammability limit (LFL) is > 10 L.

- IMUST vaults.

- Double-shell tank (DST) leak detection pits.

Flammable gas monitoring may also be performed to determine if a flammable gas hazard exists inside waste-intruding equipment (see TSR Administrative Control [AC] 5.8.2, Flammable Gas Control for WASTE-INTRUDING EQUIPMENT) or in a waste transfer-associated structure (pit) following a waste leak.

In addition, flammable gas monitoring may be required:

- By Industrial Safety and Hygiene based on specific knowledge of the conditions or activities taking place, or

- As a best management practice when there is uncertainty on the potential for a flammable gas hazard.

NOTE: The "additional gas monitoring" falls outside the scope of this procedure, and if required, the specifics will be addressed in the work package for the task.

2.0 IMPLEMENTATION

This standard is effective on the date shown in the header.

3.0 STANDARD

3.1 Manned Work Activity Entry Monitoring
(5.1.1)

Flammable gas entry monitoring ensures that flammable conditions are not present during manned work activities involving tank farm facilities where flammable gas hazards may exist. Entry monitoring verifies that the flammable gas concentration is ≤ 25% of the LFL prior to commencing work. If flammable gas concentrations are > 25% of the LFL, manned work activities are not started or stopped, except for flammable gas sampling/monitoring, deenergizing or removing equipment that does not meet ignition controls, and actions to reduce the flammable gas concentration. The flammable gas monitoring shall ensure a representative sample of the tank (facility) headspace (vapor space) (see Section 3.2).

Flammable gas entry monitoring is not necessary in the following locations monitoring because TSR flammable gas controls ensure that no flammable gas hazard exists in these locations.

1. Entry monitoring in DST headspace is not required.

2. Entry monitoring in single-shell tank headspace is not required.

3. Entry monitoring in double-contained receiver tank 244-S, 244-TX, or 244-BX headspace is not required.

4. Entry monitoring is not required in connected enclosed spaces (e.g., risers, waste transfer-associated structures) of a DST, single-shell tank (SST), or double-contained receiver tank (DCRT) unless there is uncertainty whether the space is connected to the tank headspace. For example:

   a. Entry monitoring is not required in a riser if a riser is known to be open to the tank headspace of a DST, SST, or DCRT.

      NOTE: If there is uncertainty that the riser is open to the tank headspace (i.e., the riser may extend into the waste and thus be waste-intruding equipment), entry monitoring should be performed.

   b. Entry monitoring is not required in a waste transfer-associated structure if the structure is known to be open to the tank headspace of a DST, SST, or DCRT (e.g., there is an open drain or riser between the structure and tank headspace).

      NOTE: Entry monitoring is also not required in a waste transfer-associated structure if the waste volume in the structure is known to be < 10% of the structure volume.

5. Entry monitoring in a double-shell tank annulus is not required unless there has been a waste leak or misroute into the annulus, and the annulus waste level is >15 in.

6. Entry monitoring in an inactive/miscellaneous tank/facility is not required if there is documented verification that the steady-state flammable gas concentration is < 100% of the LFL and the spontaneous release of flammable gases is insufficient to achieve 100% of the LFL. (See the TSR AC 5.8.3 requirement for manned work activities involving inactive/miscellaneous tanks/facilities.)

3.2 Tank Headspace Monitoring
(5.1.1)

3.2.1 Actively Ventilated Tanks
(5.1.1)

Flammable gas monitoring for actively ventilated tanks shall be performed in the tank headspace by monitoring in one of the following locations.

- The tank headspace at a location at least three feet below the bottom of a riser (i.e., through a permanently installed or temporary sample tube, through a Standard Hydrogen Monitoring System (SHMS) probe or Multi-Functional Instrument Tree (MIT) middle or lower gas sample port). The three foot requirement ensures a representative tank headspace sample even if the riser is open.

  NOTE: For gas sampling tubes in closed risers, there is no required minimum distance of the sampling location below the bottom of the risers (i.e., the sampling tube inlet must simply be in the tank headspace below the riser).

- In the exhaust ventilation system up to the suction side of the first mixing point for a tank exhausted through a common header.

- In the exhaust ventilation system up to the discharge location for a tank that has a dedicated ventilation exhaust system.

- At another location as evaluated and approved in accordance with Section 3.2.3.

3.2.2 Passively Ventilated Tanks
(5.1.1)

Flammable gas monitoring for passively ventilated tanks shall be performed by monitoring in one of the following locations:

- The tank headspace at a location at least 3 feet below the bottom of a riser (i.e., through a permanently installed or temporary sample tube, through a SHMS probe or MIT middle or lower gas sample port). The three foot requirement ensures a representative tank headspace sample even if the riser is open.

  NOTE: For gas sampling tubes in closed risers, there is no required minimum distance of the sampling location below the bottom of the risers (i.e., the sampling tube inlet must simply be in the tank headspace below the riser).

- Inside a sealed riser through a sealed connection such as an Enraf flush port which utilizes quick-disconnect plugs with a positive shutoff valve for passively ventilated tanks with no induced gas release event hazard present.

  NOTE: No induced gas release event hazard is present if no flammable gas controls for induced gas release event hazards are required by HNF-IP-1266, AC 5.8.1, "DST Induced Gas Release Event Evaluation."

- At another location as evaluated and approved in accordance with Section 3.2.3. For example, see TE-09-022 for DCRTs 244-BX, 244-S, and 244-TX.

3.2.3 Selection of Other Monitoring Locations

An alternative sampling location requires a technical evaluation performed in accordance with TFC-ENG-FACSUP-C-02 that demonstrates the alternative sampling location meets the requirements for tank headspace monitoring in accordance with this standard.

In passively ventilated tanks when no gas release event hazard is present, monitoring locations for flammable gas monitoring other than in the tank headspace may be used if an evaluation is performed that ensures the flammable gas measurement is representative of the tank headspace flammable gas concentration. The evaluation shall consider the following:

- The monitoring location shall be sealed to ensure that the flammable gas concentration in the monitored location is not diluted by in flowing air

- Physical connection of the flammable gas monitor shall not dilute the flammable gas concentration in the monitored location. If connecting the flammable gas monitor dilutes the flammable gas concentration in the location to be monitored, monitoring may be allowed if: (1) the location is purged to replace the diluted air with air drawn from the tank headspace or (2) the flammable gas concentration measurement is delayed by the time required for diffusion to return the flammable gas concentration in the location to a concentration that is representative of the tank headspace (see RPP-19013).

4.0 DEFINITIONS

Connected enclosed spaces are enclosed spaces directly connected to the tank headspace that could reasonably achieve the flammable gas concentration of the headspace.

Manned work activities are activities that can cause an uncontrolled ignition source (e.g., errant spark) as a result of the use or manipulation of equipment or material by personnel or human error.

Waste-intruding equipment is defined in HNF-SD-WM-TSR-006.

5.0 SOURCES

5.1 Requirements

1. HNF-SD-WM-TSR-006, "Tank Farms Technical Safety Requirements."

5.2 References

1. RPP-19013, "Measuring Headspace Flammability Through Tank Risers."

2. TE-09-022, "Evaluation of Flammable Gas Sampling Locations on Single-Shell Tanks and Double Contained Receiver Tanks."

3. TFC-ENG-FACSUP-C-02, "Operability/Technical Evaluation."