RPP-27195

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1.0 PURPOSE AND SCOPE
(7.1.1, 7.1.2)

This procedure provides direction for managing exposures to Tank Waste chemical vapors (Tank Vapors) in accordance with TOC-IH-59014 and TOC-IH-58435 Appendix F. The purpose is to provide guidance for implementation of standardized controls for the management of Tank Vapors.

The scope of this procedure applies to activities performed by H2C and its subcontractors where there is potential for worker exposure to chemical vapors from Tank Waste.

2.0 IMPLEMENTATION

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

3.0 RESPONSIBILITIES

Responsibilities are contained within Section 4.0.

4.0 PROCEDURE

4.1 General Requirements

NOTE: Exhauster stacks located outside of the farm that are inaccessible without special equipment (i.e., 702-AZ) do not require the EZ/Chemical CRZ (CRZ) posting unless dictated in specific work packages. Exhauster stack emission points inside of a farm that are inaccessible without special equipment (e.g., 241-AP-VTP) do not require the EZ posting.

The area surrounding the Tank Farms in 200E/200W will be administratively controlled and posted as an IZ. Tank Vapors are intentionally, either passively or actively, ventilated from the tank headspace to prevent accumulation of flammable gases. As such, the Tank Farms are administratively controlled as a CRZ(s).

NOTE: The CRZ for a farm-wide EZ is the farm boundary (i.e., same boundary location).

Tank Vapor EPs are direct pathways to the tank headspace and are administratively controlled as an EZ(s). An EZ shall be contained within a CRZ or connected to a CRZ as appropriate for egress purposes. The boundary of each area will be posted as such. Refer to Attachment A.

- CRZs without Permanent EZs Located within their Boundary - The AY/AZ Tank Farms exhauster is located outside the farm boundaries (702-AZ); however, they are controlled as CRZs. The exhauster 702-AZ will only be demarcated an EZ during WC-3 work activities that require access into the primary exhauster system (e.g., Paper Changes).

CRZs located outside of Tank Farm Boundaries - The ER-311 and 244-A exist outside of Tank Farm boundaries and are controlled as CRZs as they contain Tank Waste containing systems. An Industrial Hygienist will review the work scope and determine the applicability of the WC guidelines in Attachment B.

4.2 Evaluating Field Activities

When determining the WC(s) for a work activity, a standard set of criteria will be used for implementation of the Tank Vapor control sets. Table B.1 describes the WCs for work in a passively ventilated farm. Table B.2 describes the WCs for work in an actively ventilated farm.

Industrial Hygienist

1. Review work planning information (e.g., work instructions, procedures) for the work scope's planned Tank Farm operating configuration (i.e., standard operating, non-standard operating) and each work activity's relationship to Tank Farm headspace-connected or Tank Vapor containing system(s).

2. Determine the WC(s) from Attachment B for the planned work scope.

3. If engineering controls (e.g., valves, glove bag) are applied during the work scope, evaluate the potential exposures before application and removal of the engineering control (refer to Attachment C.

4. Determine the boundary postings from Attachment A for the planned work activity.

5. Determine the monitoring requirements from Attachment D for the planned work activity.

NOTE: Task specific RPF may be utilized, rather than the C-48 RPF (e.g., when additional respiratory hazards are present [e.g., asbestos]).

6. Determine the respiratory protection requirements from Attachment E for the planned work activity.

NOTE: Deviations from the sampling/monitoring requirements, and/or IHSP(s) are permitted.

7. Document deviations to the Tank Vapor control sets on the appropriate forms (e.g., work record entry, Observation Performance Tracking, Industrial Hygiene Task Specific Exposure Assessment [A-6007-357], Industrial Hygiene Sample Plan Deviation [A-6004-451], SWIHD Field Deviation screen).

8. Provide all the applicable forms (e.g., TVIS, IHSP, RPF) for inclusion in the work control document/package. Refer to Attachment F for crosswalk of Tank Vapor control sets.

IHT

9. At completion of work activities, review/submit all the sampling/monitoring surveys into the SWHID database in accordance with TFC-ESHQ-IH-C-46.

Industrial Hygienist

10. Review/complete the sampling/monitoring surveys in the SWIHD database in accordance with TFC-ESHQ-IH-C-46.

11. As applicable, update the corresponding IHEA.

4.3 Management of Exposure Assessments

Tank Vapor Program Owner/Industrial Hygienist

1. Use collected data to meet the requirements of TFC-PLN-34 and its definitions of Compliant, Non-Compliant Exposures, and Undetermined Exposures.

2. As applicable, update the associated Tank Vapor IHEA (e.g., Tank Farm Comprehensive EA).

3. Determine the effectiveness of the hazard control process in controlling worker exposure to tank waste chemical vapors.

4.4 Emission Point Evaluation

The EP listed on the TVIS will only be modified if the permanent EP(s) within a Tank Farm have been created, newly identified, changed, modified, or eliminated.

Tank Vapor Program Owner/Industrial Hygienist

1. Ensure the permanent EP(s) in a Tank Farm have been identified and detailed on the TVIS.

2. If an EP identified on the TVIS is accessible without special equipment, post an EZ around the EP(s) (refer to Section 4.5).

   a. Maintain the posting until further engineering controls are established and/or the source is eliminated.

Industrial Hygiene

3. If an EP is created for a work scope, evaluate and determine the appropriate size of EZ.

   a. Record the information in the appropriate work package documentation.

   b. Control or post the area as an EZ (refer to Section 4.5).

   c. If the EP is intended to be temporary, maintain control/posting until a permanent engineering control is applied to restrict the pathway to the tank headspace and the engineering control has been validated through DRI monitoring.

   d. If the EP is intended to be a permanent EP, notify the Tank Vapor Program Owner for inclusion on the TVIS.

NOTE: The IH communication board on the H2C IH webpage will be changed as the TVIS(s) are updated (refer to Section 4.4, Step 1).

Industrial Hygienist/IH Records Administrator

4. Post permanent EPs on the H2C IH Webpage.

4.5 EZ Posting and Control

An EZ will be established around EP(s), direct pathways to the tank headspace, or other Tank Vapor exposure sources. An EZ must be large enough to encompass the area around the area that has the potential to exceed 50% of the OEL. The initial boundary should have a minimum 5ft. radius.

EZs are either permanent or temporary.

- Permanent EZs - Permanent EZs are established around permanent EPs engineered to provide ventilation to Tank Vapor containing systems during normal farm operation (standard operating configuration). These include exhaust ventilation stacks and passive breather filters.

- Temporary EZs - Temporary EZs are established around Tank Vapor exposure sources when a work activity temporarily breaches a Tank Vapor containing system (WC-2, WC-3), during non-standard operating conditions (WC-4), or established around fugitive emission points when discovered.

When permanent EZs are accessible without special equipment, the EZ will be posted with a physical barrier and signage. Permanent EZs that are inaccessible without special equipment are not required to be posted with a physical barrier or signage. Permanent EPs and their description, some including distance from the source, are listed on the TVIS (refer to 4.4, Step1).

When temporary EZs are attended with continual control and IHT DRI monitoring, the EZ is not required to be posted. The work crew can act as a standing temporary EZ boundary. When unattended, the temporary EZ will be posted with physical barrier and signage.

NOTE: Exhaust stack EPs that are inaccessible without special equipment (e.g., 702-AZ, 241-AP-VTP) do not require the EZ posting unless dictated in specific work packages.

FWS/OE/PIC

1. Ensure EZ(s) are appropriately controlled and/or posted.

   a. If EZ is temporary and unattended, ensure the EZ is posted with a physical barrier and signage.

IHT

2. Validate implemented controls (e.g., engineering control, RPE) for EZs during the work activities with DRI.

3. If EZ is temporary and a permanent engineering control is applied to restrict the pathway to the tank headspace, validate the effectiveness of the engineering control with DRI (refer to Section 4.6).

   a. Once validated, notify the FWS/OE/PIC and IH that EZ(s) associated with the work activity can be down posted by the appropriate craft.

4.6 Monitoring Protocols

Monitoring will be used to confirm/validate control methods for each WC.

FWS/OE/PIC	1.	Ensure all workers entering the Tank Farm have a PAM, or equivalent as directed by an IH.
IHT	2.	Validate implemented controls (e.g., engineering control, RPE) during the work activities with DRI.

4.7 Respiratory Protection Requirements

Respiratory protection is required when exposures to Tank Vapors cannot be reduced to a de minimis risk.

FWS/OE/PIC	1.	As applicable, ensure all workers are briefed on the RPF for the planned work scope.

4.8 Personal Sampling Protocols

Personal sampling will be conducted to evaluate Tank Vapor exposures. The personal sampling for individual work scopes, or groupings of similar work scopes, will allow for the evaluation of the effectiveness of applied specific control sets.

Sampling protocols have been developed for each Tank Vapor COPC and COC as outlined in TOC-IH-59014/TOC-IH-58435 in accordance with TFC-PLN-34. Deviations from the sampling protocol will be documented on the appropriate form (refer to 4.2).

NOTE 1: Deviations from the sampling protocol are permitted.

NOTE 2: The frequency of sampling for COC and COPC will be based on the minimum requirements identified in the exposure assessment.

COPC Lead Program Owner/Industrial Hygienist	1.	Implement Tank Vapor COPC/COC sampling protocols to evaluate the effectiveness of the control methods at controlling exposure.

4.9 Tank Vapor Work Control Documents

NOTE: The IH Sampling Methods poster may be utilized instead of an IHSP for personal exposure sampling.

Tank Vapor Program Owner/Industrial Hygienist	1.	Document the personal exposure sampling and/or monitoring plan using the IHSP form (A-6004-732) format in accordance with TFC-ESHQ-IH-C-23.
	a.	If the IHSP supports active retrieval or transfer activities, obtain review and signature approval of IH Management.

RPPA/Industrial Hygienist	2.	Document the respiratory protection requirements using the RPF form (A-6005-593) format in accordance with TFC-ESHQ-IH-STD-07.
	3.	Submit the completed Tank Vapor work control documents (both the native file and signed PDF) ^IH Records.

5.0 TERMS AND DEFINITIONS

5.1 Terms

BDGRE. Buoyant Displacement Gas Release Event.

DRI. Direct Reading Instrument.

EA. Exposure Assessment.

FWS. Field Work Supervisor.

H2C. Hanford Tank Waste Operations & Closure, LLC.

IDMS. Integrated Document Management System.

IHEA. Industrial Hygiene Exposure Assessment.

IHSP. Industrial Hygiene Sample Plan.

IHT. Industrial Hygiene Technician.

OE. Operations Engineer.

OEL. Occupational Exposure Limit.

PAM. Personal Ammonia Monitor.

PIC. Person-in-Charge.

RCT. Radiological Control Technician.

RIDS. Records Inventory and Disposition Schedule.

RPE. Respiratory Protection Equipment.

RPF. Respiratory Protection Form.

SWIHD. Site Wide Industrial Hygiene Database.

VTP. Ventilation Tank Primary System.

5.2 Definitions

Chemical of Concern (COC). A chemical found at a concentration greater than or equal to 50% of their OEL, highest result or based on statistical examination, making it reasonably likely they could pose a potential exposure hazard in the work area.

Chemical of Potential Concern (COPC). A chemical found at a concentration greater than or equal to 10% but less than 50% of their OEL, highest result or based on statistical examination.

Chemical Contamination Reduction Zone (CRZ). An administrative control boundary established around EZ(s). Chemical CRZs are areas where the potential for Tank Vapors exposure is less than 50% of the OEL(s). Additional training requirements are needed to access the area. Typically, this area will be designated as the Tank Farm fence line but may be larger or outside of a Tank Farm, as necessary.

De Minimis Risk. A level of risk that is acceptable and does not require further reduction. The American Industrial Hygiene Association (AIHA) deems compliant exposures as acceptable exposure profiles (acceptable risk) if they are shown to be below 50% of the OEL ($UTL_{95/95}$ is less than 50% of the OEL). Unacceptable exposure profiles are those where the $UTL_{95/95}$ is greater than the OEL. Further categorization into minor and major exposure may be made when defining and judging the exposure profiles. Minor exposures are those with a $UTL_{95/95}$ less than 10% of the OEL, and major have a $UTL_{95/95}$ greater than or equal to 10% of the OEL. If an exposure profile is determined to be a minor exposure, then less frequent reassessment is required.

Emission Point (EP). A pathway to tank headspace either permanent (e.g., breather filters) or created by a temporary modification of the system (e.g., opening a riser).

Engineering Control. Any permanent/temporary piece of equipment or change in the original tank system that prevents, mitigates, or alters access to tank headspace (e.g., breather filter isolation valves, active ventilation that maintains inward flow).

- Permanent Engineering Controls are system components that during normal Tank Farm operation are configured to prevent the escape of tank headspace vapors from the system. If reconfigured to allow access to the system to perform work (system breach), this system component will be considered a permanent engineering control after its configuration is returned to the normal operating configuration.

- Temporary Engineering Controls are materials, components, or systems installed during a work activity to prevent emission of Tank Vapors or system components that during normal Tank Farm operation is configured to allow tank headspace vapors to exist inside of a system. If said system component is re-configured to isolate the system from tank headspace vapors to perform work (isolation), this is considered a temporary engineering control.

Exclusion Zone (EZ). An administrative control boundary established around emission points (temporary or permanent) where Tank Vapors have the potential to exceed 50% of their OEL(s) (Tank Vapor COCs). The EZ boundary is to be identified using a physical barrier and signage, unless controlled as outlined in Section 4.5 (e.g., by continuous monitoring). EZs can be inside or outside of a Tank Farm.

- Permanent EZs are those that are in place during normal farm operation (standard operating configuration), where Tank Farm vapors are emitted to provide ventilation of the tank headspace (permanent EP).

- Temporary EZs are those that are established during a work activity where a Tank Vapor containing system is breached (temporary EP), established during non-standard operating conditions (WC-4), or established around fugitive emission points when discovered pending further characterization and application of controls.

Exposure Source. An emission point providing a pathway for Tank Vapors to travel from the tank headspace (source) or Tank Vapor containing system (e.g., exhaust ventilation system) to the worker breathing zone.

Industrial Zone (IZ). Also known as Administrative Zone. This zone is demarcated at the 200E and 200W fence lines by an Industrial Zone Posting and includes all areas inside the fence line unless otherwise marked as a CRZ or EZ. Inside an IZ, all administrative functions and various other support work can be performed without routine monitoring or sampling. Workers performing work in this zone exclusively do not require exposure or medical monitoring.

Maximum Use Concentration (MUC). The maximum atmospheric concentration of a hazardous substance to which an employee can be expected to be protected against when wearing a respirator is the occupational exposure limit times the assigned protection factor (APF) of the respirator (MUC = APF x OEL). The MUC shall not exceed Immediately Dangerous to Life and Health (IDLH) concentrations. When the calculated MUC exceeds the IDLH level for a hazardous substance, or the performance limits of the cartridge or canister, then the maximum MUC is set at that lower limit (DOE-0352).

Quantitative Risk Analysis (QRA). A study utilizing Computational Fluid Dynamics Modeling to determine tank headspace and exhauster stack Tank Vapor concentrations necessary to create ground receptor exposure values above applicable occupational exposure limits during active ventilation and passive ventilation during quiescent, waste disturbing, and BDGRE conditions in all hypothetical weather conditions.

Sentinel Indicator. Ammonia is used as the sentinel Tank Vapor chemicals of potential concern. Determining the concentration of some Tank Vapor COPCs/COCs with sampling/laboratory analysis is difficult and real-time monitoring for those Tank Vapor COPCs/COCs is currently impossible. Ammonia's concentration can be easily determined by sampling/laboratory analysis, and real-time monitoring is possible; therefore, it is a good candidate to use as an indicator of changing conditions within and outside/adjacent to the Tank Farms. Because nitric acid was common to nearly all processes that generated Tank Waste, and the most common result of those processes was reduction of nitrate ion to ammonia during the dissolution (oxidation) of irradiated fuel, ammonia is the most common Tank Vapor COPCs/COCs and is found in all tanks. It is logical to choose ammonia as an indicator because it is a byproduct of all production processes and found in all tanks.

Source. Is the tank headspace or as Tank Vapors are produced within the tank waste containing system.

Tank Vapors. The volatile component of chemical waste in headspaces of Hanford Tank Farms tanks, and tank chemical waste containing structures and equipment.

Tank Vapor COC. Tank Vapor chemical, highest result or based on statistical examination, found in tank headspaces at a concentration greater than or equal to 50% of their OEL, making it reasonably likely they could occur outside the tank headspace, and pose a potential exposure hazard in the work area.

Tank Vapor COPC. Tank Vapor chemical, highest result or based on statistical examination, found in any tank headspace or anywhere in the Tank Farm at a concentration greater than or equal to 10%, but less than 50%, of their OEL.

Tank Vapor Information Sheet (TVIS). The TVIS is a communication tool prepared by the Industrial Hygienist to communicate vapor hazards, Tank Vapor COPCs/COCs, Tank Vapor Watch List Chemicals, and EPs in a specific Tank Farm. It is posted at the Tank Farm change trailers and on the IH website.

Tank Vapor Intrusiveness. A work activity's relationship to Tank Farm headspace-connected or Tank Vapor containing systems regarding the potential exposure to Tank Vapors.

NOTE: If a system/space normally contains Tank Vapors; however, an engineering control has been applied and validated, the work activity is categorized as a Non-Tank Vapor Intrusive Activity.

- Non-Tank Vapor Intrusive Activity- Work activity that does not intrude/breach a Tank Vapor containing system/space.

- Tank Vapor Intrusive Activity- Work activity intruding into a tank, tank headspace, or tank system (Tank Vapor containing system/space) creating an open pathway to the tank vapor source (i.e., WITHOUT engineering controls applied to reduce exposure hazards).

NOTE: Although the Tank Vapor Waste Disturbing Activity definition does not materially differ from the intended use of the definition of "waste-disturbing activity" in the Hanford Challenge/Local 598/Parties Vapors Settlement Agreement, it does not replace it. All work activities will be evaluated for their potential to change the concentration of tank headspace gases and vapors. Both definitions provide the appropriate level of context for their respective intended audiences and provide the same concern for evaluation: some activities may change the concentration of the tank headspace gases and vapors. The definition provided in TOC-IH-58435 Appendix F and TFC-ESHQ-IH-C-48 was modified from "waste-disturbing activity" to "Tank Vapor Waste Disturbing Activity" to further clarify this point.

Tank Vapor Waste Disturbing Activity. An activity that disturbs the tank waste resulting in the potential increase in headspace Tank Vapor concentrations. Tank Vapor waste disturbing activities include:

- Mixing of the waste (e.g., waste transfers, tank recirculation, ALC operation)
- Waste processing (e.g., Evaporator Campaign, TSCR)
- Chemical processes (e.g., caustic additions, water additions)

- In-tank preparations (e.g., water lancing).

Tank Vapor Watch List Chemical. Tank Vapor chemical meeting one of the following criteria: 1) Chemicals with insufficient data (i.e., non-detectable Tank Vapor chemicals statistically analyzed to be greater than or equal to 10% of their OEL due to a lack of data and/or analytical capabilities) to classify as a COPC, COC, or non-COPC and 2) Chemicals the Tank Vapor Program Owner determines needs additional sampling (e.g., anticipated to increase in concentration, regulatory changes).

Tank Vapor Work Category (WC). The WCs are categories based on the Tank Farm operating configuration (i.e., standard operating, non-standard operating) and the work activity's relationship to Tank Farm headspace-connected or Tank Vapor containing systems. The WCs are designed for easy worker hazard recognition/communication and implementation of Tank Vapor control sets.

Upper Tolerance Limit 95%/95% ($UTL_{95/95}$). A value where one can be 95% confident that at least 95% of the data will be below that value.

Vapor Monitoring Detection System (VMDS). Continuous exhauster stack monitoring equipment. Possesses sensors for various leading indicator chemicals and sentinel indicator chemicals.

6.0 RECORDS

The following records may be generated during the performance of this procedure:

- Industrial Hygiene Task Specific Exposure Assessment (A-6006-357) (IH Records Administrator)
- Industrial Hygiene Sample Plan (A-6004-732) (IH Records Administrator and/or Work Control)
- Industrial Hygiene Sample Plan Deviation (A-6004-451) (IH Records Administrator and/or Work Control)
- Respiratory Protection Form (A-6005-593) (IH Records Administrator and/or Work Control)
- Tank Vapor Information Sheet (A-6004-063) (IH Records Administrator and/or Work Control)
- SWIHD Surveys and Attachments.

Sampling and monitoring data and attachments are entered into the SWIHD and when reviewed and completed by the Industrial Hygienist, are uploaded to IDMS via an automated interface. Site Form records generated will be emailed to ^IH Records and uploaded to IDMS for record retention by the IH Records Management Administrator.

The record custodian identified in the company-level RIDS is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.

7.0 SOURCES

7.1 Contractual Requirements

7.1.1 10 CFR 851, “Worker Safety and Health Program.”

7.1.2 29 CFR 1910.1000 Table Z-1, “Limits for Air Contaminants.”

7.2 Other Requirements

7.2.1 TOC-IH-59014, “Tank Waste Chemical Vapors: Evaluation and Management Strategy.”

7.2.2 TOC-IH-58435, Appendix F, “Industrial Hygiene Technical Basis for Applicable Requirements,” “Tank Waste Chemical Vapors.”

7.3 References

7.3.1 American Conference of Governmental Industrial Hygienists (2016). TLVs® and BEIs® Based on the Documentation of the Threshold Limit Values for Chemicals Substances and Physical Agents & Biological Exposure Indices.

7.3.2 DOE-0352, “Hanford Site Respiratory Protection Program (HSRPP).”

7.3.3 EH-09-001, “Safety & Health Fact Sheet- Action Limit for Volatile Organic Compounds (VOC).”

7.3.4 RPP-22491, "Industrial Hygiene Chemical Vapor Technical Basis.”

7.3.5 RPP-RPT-61594, “VMDS Quantitative Risk Analysis 241-AX Tank Farm.”

7.3.6 RPP-RPT-61595, “VMDS Quantitative Risk Analysis 241-AY/AZ Tank Farms.”

7.3.7 RPP-RPT-61679, “VMDS Quantitative Risk Analysis 241-AP Tank Farm.”

7.3.8 RPP-RPT-61689, “VMDS Quantitative Risk Analysis 241-AW Tank Farm.

7.3.9 RPP-RPT-61783, “VMDS Quantitative Risk Analysis 241-AN Tank Farm.”

7.3.10 RPP-RPT-61904, “VMDS Quantitative Risk Analysis 241-A Tank Farm.”

7.3.11 RPP-RPT-62214, “VMDS Quantitative Risk Analysis 241-SY Tank Farm.”

7.3.12 RPP-RPT-62584, “VMDS Quantitative Risk Analysis 241-TX Tank Farm.”

7.3.13 RPP-RPT-62676, “VMDS Quantitative Risk Analysis 241-TY Tank Farm.”

7.3.14 RPP-RPT-63064, “VMDS Quantitative Risk Analysis 241-AX Tank Farm with AX101 & AX103 Activity.”

7.3.15 RPP-RPT-63228, “VMDS Quantitative Risk Analysis 241-BX & 241-BY Tank Farms.”

7.3.16 RPP-RPT-63383, "VMDS Quantitative Risk Analysis 241-SX Tank Farm."

7.3.17 RPP-RPT-63812, "VMDS Quantitative Risk Analysis 241-B Tank Farm."

7.3.18 RPP-RPT-63813, "VMDS Quantitative Risk Analysis 241-T Tank Farm."

7.3.19 RPP-RPT-64073, "Vapor Monitoring & Detection System Quantitative Risk Analysis 241-S Tank Farm."

7.3.20 RPP-RPT-64076, "Vapor Monitoring & Detection System Quantitative Risk Analysis 241-AY and 241-AZ Tank Farm (Quiescent Conditions)."

7.3.21 RPP-RPT-64719, "Vapor Monitoring & Detection System Quantitative Risk Analysis 241-U Farm."

7.3.22 RPP-TE-58944, "Active Waste Tank Ventilation During Operations That Modify Tank Configuration."

7.3.23 TFC-BSM-IRM_DC-C-02, "Records Management."

7.3.24 TFC-ESHQ-IH-C-22, "Implementation of Industrial Hygiene Surveillance Strategy for Sampling and Monitoring in Non-Farm Areas."

7.3.25 TFC-ESHQ-IH-C-23, "Industrial Hygiene Monitoring and Sampling."

7.3.26 TFC-ESHQ-IH-C-46, "Site Wide Industrial Hygiene Database."

7.3.27 TFC-ESHQ-IH-C-62, "In-Farm Emissions Source Surveillance."

7.3.28 TFC-ESHQ-IH-C-66, "Identifying Chemicals of Concern in Hanford Tank Farms."

7.3.29 TFC-ESHQ-IH-C-67, "Maintenance of the Industrial Hygiene Chemical Vapor Technical Basis."

7.3.30 TFC-ESHQ-IH-C-69, "Industrial Hygiene Exposure Assessments."

7.3.31 TFC-ESHQ-IH-C-78, "Field Use of the Ventis Pro5 Personal Ammonia Monitor and PAM-C KIOSK."

7.3.32 TFC-ESHQ-IH-P-72, "Industrial Hygiene Business Processes."

7.3.33 TFC-ESHQ-IH-STD-03, "Exposure Monitoring, Reporting, and Records Management."

7.3.34 TFC-ESHQ-IH-STD-07, "Respiratory Protection."

7.3.35 TFC-PLN-34, "Industrial Hygiene Exposure Assessment Strategy."

7.3.36 TFC-PLN-174, "Industrial Hygiene Chemical Vapor Technical Basis Program Plan."

7.3.37 TOC-IH-58451, "Industrial Hygiene Basis for Defining the Unrestricted Work Boundary."

7.3.38 TOC-IH-58957, "Tank Farm COPC-COC Sampling: Requested Flow Rates and Sampling Duration."

7.3.39 TOC-IH-RPT-50042, "Ammonia Monitoring- Rate of Change of Tank Vapor Source Concentration and Monitoring Frequency."

7.3.40 WRPS-1904672.1, "Tank Farm Exhaust Stack Concentration Alarm/Action Levels for Ammonia."

Attachment A – Boundary Signs

Figure A-1 – Administrative Boundary Signage – Industrial Zone



Attachment A – Boundary Signs (cont.)

Figure A-2 – Administrative Boundary Signage – Chemical CRZ



Attachment A – Boundary Signs (cont.)

Figure A-3 – Administrative Boundary Signage – EZ



Attachment B – Tank Vapor Work Categories

Tank Vapor management will include implementation of a Tank Vapor Work Category (WC) structure to assist in the work planning process for ongoing evaluation of potential exposures. The WCs will be managed under a set of criteria that will encompass all work within the Tank Farms where potential exposures exist. Multiple WCs may be applied as appropriate during a single work evolution.

The first determination when assigning a WC for an activity is the facility operating configuration. WCs 1-3 apply to Tank Farm facilities in their "standard operating configuration" (i.e., validated engineering control applied and/or EZ boundaries administratively controlled). Under WC 1-3, all Tank Farm equipment is in a configuration where Tank Vapor EPs are adequately controlled. WC-4 applies to Tank Farm facilities in "non-standard operating configuration." Under WC-4, Tank Vapor EPs may not be adequately controlled at the exposure source. This results in the need for additional controls until the farm configuration is restored to a normal operating status.

The next consideration in determining the WC is work activity's relationship to Tank Farm headspace-connected or Tank Vapor containing system.

Non-Tank Vapor Intrusive Activities

- Work Categories 1 and 2 apply to activities where Tank Vapor exposures are assumed to be a de minimis risk. For WC-1, the work activity does not intrude/breach a Tank Vapor containing system/space (non-Tank Vapor intrusive activity). For WC-2, an engineering control has been applied to the Tank Vapor containing system/space to reduce exposures. Once the engineering control is validated through monitoring, WC-2 activities are categorized as a non-Tank Vapor intrusive activity.

Tank Vapor Intrusive Activities

- For WC-3 activities, an engineering control cannot be applied to reduce exposures. As such, WC-3 activities are Tank Vapor intrusive, and the Tank Vapor exposures are assumed to be up to the maximum concentration the individual tank headspace or headspace mixtures within the active ventilation exhauster/train. For WC-4 activities, the farm is in a non-standard operating configuration, and the EPs may not be adequately controlled. As such, WC-4 activities are categorized as Tank Vapor intrusive, and the Tank Vapor exposures are assumed to be up to the maximum concentration the individual tank headspace.

The WC evaluation will be conducted utilizing the WC assignment. Refer to Table B.1 for WC determination for Passively Ventilated Farms and Table B.2 for Actively Ventilated Farms.

Attachment B – Tank Vapor Work Categories (cont.)

Table B-1 – WC Determination for Passively Ventilated Farms

WC	Facility Status	Work Activity
1	Standard Operating*	General Farm Entry. Any work inside Tank Farm boundary WITHOUT breaching Tank Farm headspace-connected, or Tank Vapor containing, systems (non-Tank Vapor Intrusive). NOTE: Work Scope may NOT include EZ Entry, Pit Work, or activities that include a direct open path to a tank head space. Examples Include, but not limited to: • General farm entry and work with the CRZ. • Operator/RCT/IHT rounds and routines that do not require entering EZs or pits. • Walk downs (e.g., Employee Accident Prevention Council or Job Hazard Analysis).
2	Standard Operating*	Any work inside Tank Farm headspace-connected, or Tank Vapor containing, systems WITH validated engineering controls (once validated, non-Tank Vapor Intrusive). NOTE: Temporary application of engineering control(s) to isolate work from Tank Vapor containing systems. Examples Include, but not limited to: • Work within the CRZ. • Work within Temporary EZ. • Instrument calibrations utilizing application of in-place isolation valves. • Access into permanently established EZ boundary AFTER isolation valve is closed and validated with DRI.
3	Standard Operating*	Any work inside Tank Farm headspace-connected, or Tank Vapor containing, systems WITHOUT validated controls (Tank Vapor Intrusive). NOTE: Breaching of Tank Vapor containing systems. Examples Include, but not limited to: • Work within Temporary & Permanently established EZ. • Open pit work. • Accessing risers (equipment removal/installation, replacement of isolation valves, sludge-weight measurements) • Intrusive activities into (drain-seal) closed waste contacted pits.
4	Non-Standard Operating	Any work inside Tank Farm boundary during non-standard operating conditions (Tank Vapor Intrusive). NOTE: Upset/non-standard conditions/configurations within the Tank Farm boundary resulting in uncontrolled Tank Vapor exposure. Examples Include, but not limited to: • TF-AOP-005: Response to Unexpected Flammable Gas Concentration, Waste Level, or Waste Tank Temperature Change. • TF-AOP-011: Response to Chemical and/or Radiological Events. • Work within farm wide Temporary EZ.

*Passively Ventilated Farm Standard Operating Configuration:

- Tank Waste containment is intact,
- All engineered EPs are adequately posted (EZs).

Attachment B – Tank Vapor Work Categories (cont.)

Table B-2 – WC Determination for Actively Ventilated Farms

WC	Facility Status	Work Activity
1	Standard Operating*	General Farm Entry. Any work inside Tank Farm boundary WITHOUT breaching Tank Farm headspace-connected, or Tank Vapor containing, systems (non-Tank Vapor Intrusive). NOTE: Work Scope may NOT include EZ Entry, Pit Work, components integrated to the air flow of the Primary Ventilation System, or activities that include a direct open path to a tank head space. Examples Include, but not limited to: • General farm entry and work with the CRZ. • Operator/RCT/IHT rounds and routines that do not require entering EZs or pits. • Walk downs (e.g., Employee Accident Prevention Council or Job Hazard Analysis).
2	Standard Operating*	Any work inside Tank Farm headspace-connected, or Tank Vapor containing, systems WITH validated engineering controls (once validated, non-Tank Vapor Intrusive). NOTE: Primary Ventilation System maintains negative flow during Work Scope (WC-2a) OR the temporary application of engineering control(s) to isolate work from Tank Vapor containing systems and/or Primary Ventilation System maintains positive flow (WC-2b). WC-2a (Ventilation) Examples Include, but not limited to: • Work within the CRZ. • Work within Temporary EZ. • Exhaust ventilation system access on the negative pressure side where flow of atmosphere into primary tank head space occurs. • Camera or probe installs in pits when drain seal is open to provide active ventilation. • Camera or probe install/removal in tanks with active ventilation. • Open riser work on actively ventilated by the exhauster system. WC-2b (Isolation) Examples Include, but not limited to: • Work within the CRZ. • Work within Temporary EZ. • Instrument calibrations utilizing application of in-place isolation valves.
3	Standard Operating*	Any work inside Tank Farm headspace-connected, or Tank Vapor containing, systems WITHOUT validated controls (Tank Vapor Intrusive). NOTE: Primary Ventilation System does not maintain negative flow during Work Scope. Examples Include, but not limited to: • Work within Temporary & Permanently established EZs. • Exhaust ventilation system access on the positive pressure side. • Open pit work in Tank Waste containing pits. • Intrusive activities into (drain-seal) closed waste contacted pits without active ventilation.
4	Non-Standard Operating	Any work inside Tank Farm boundary during non-standard operating conditions (Tank Vapor Intrusive). NOTE: The determination of WC-4 activity is based upon the operational status and effectiveness of the ventilation system for controlling potential exposures to Tank Vapors. For WC-4 activities the primary ventilation is NOT operating OR has NOT been validated following restart. Examples Include, but not limited to: • TF-AOP-021: Response to Tank Farm Ventilation Upset. • Work within farm-wide Temporary EZ (exhauster is not operating or NOT validated).

*Actively Ventilated Farm Standard Operating Configuration:
- Tank Waste containment is intact,
- Primary ventilation operational, and
- Tank flow into primary tank headspace from atmosphere is verified via instrumentation (refer to RPP-TE-58944).

Attachment C – Examples of Engineering Controls

Engineering Control Type	Examples
Permanent	• Active ventilation exhaust system. • Blind flange with gasket. • Hard rubber plugs. • Threaded plugs/caps with thread seal. • Valves (e.g., ball, butterfly) normally CLOSED, opened to perform a specific scope of work. • Impermeable membrane (MDI Foam and Topcoat) WITH an established periodic surveillance and maintenance program (i.e., procedure, PMID).
Temporary	• Valves (e.g., ball, butterfly) normally OPEN, closed to perform a specific scope of work. • Aluminum tape. • Soft rubber (e.g., electrical putty, RTV). • Plastic sheeting or glove bags (without breather, or chemical vapor filtering breather) with work instructions to ensure that materials remain intact and in good condition if left for extended periods of time.

NOTE: If a system component is used as isolation (e.g., valves, plugs, or dampers), engineering control status (temporary vs. permanent) depends on system configuration during normal Tank Farm operation:

- IF a system component is configured to allow tank headspace vapors to exist inside of a system, and said system component is re-configured to isolate the system from tank headspace vapors to perform work (isolation):
  - Then the engineering control is considered a temporary engineering control.
- IF a system component is configured to prevent the escape of tank headspace vapors from the system, and is reconfigured to allow access to the system to perform work (system breach):
  - Then the system component is considered a permanent engineering control AFTER its configuration is returned to the normal operating configuration and verified through monitoring.

Attachment D – Tank Vapor Monitoring Requirements

Tank Vapor management will include implementation of monitoring requirements based on the Tank Vapor Work Category (WC) structure. Multiple WCs, and monitoring requirements, may be applied as appropriate during a single work evolution.

Table D-1 – Monitoring Requirements for Passively Ventilated Farms

WC	Boundary Posting	Monitoring Requirement
1	CRZ (outside EZ)	• Personal Ammonia Monitor, or equivalent as directed by IH, required.
2	EZ (Permanent or Temporary)	Engineering Control utilized: • Perform intermittent DRI monitoring. - Perform initial DRI monitoring of exposure source to validate the effectiveness of engineering control (isolation). - Perform intermittent monitoring of exposure source thereafter. • Personal Ammonia Monitor, or equivalent as directed by IH required.
3	EZ (Permanent or Temporary)	No Engineering Control utilized: • Perform continuous DRI monitoring. - Monitor exposure source (e.g., breather outlet). - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE.
4	Non-Standard Operating Conditions: Temporary EZ	• Perform continuous DRI monitoring. - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE. - Monitor work area for indication of fugitive emission sources.

Table D-2 – Monitoring Requirements for Actively Ventilated Farms

WC	Boundary Posting	Monitoring Requirement
1	CRZ (outside EZ)	• PAM, or equivalent as directed by IH, required.
2	EZ (Permanent or Temporary)	Engineering Control utilized: • **2a**: Ventilation (negative pressure side, flow maintained)- Perform continuous DRI monitoring. - Monitor exposure source (threshold of system breach) to validate the effectiveness of engineering control. - Monitor worker breathing zone to ensure exposure does not exceed the AL. • **2b**: Isolation- Perform intermittent DRI monitoring. - Perform initial DRI monitoring of exposure source to validate the effectiveness of engineering control. - Perform intermittent monitoring of exposure source thereafter. • PAM, or equivalent as directed by IH, required.
3	EZ (Permanent or Temporary)	No Engineering Control utilized: • Perform continuous DRI monitoring. - Monitor exposure source (e.g., breather outlet). - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE.
4	Non-Standard Operating Conditions: Temporary EZ	• Perform continuous DRI monitoring. - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE. - Monitor work area for indication of fugitive emission sources.

Attachment E – Tank Vapor Respiratory Protection Requirements

Tank Vapor management will include implementation of respiratory protection requirements based on the WC structure. Multiple WCs, and respiratory protection requirements, may be applied as appropriate during a single work evolution.

NOTE: The default minimum RPE requirements are established for a broad range of work activities. These requirements may be upgraded or downgraded for individual/specific work activities through additional evaluation/IH Task Specific EA(s).

The default minimum RPE requirements are for Tank Vapor hazards only. Protection from particulate or other chemical gases and vapors must be evaluated in a task specific exposure assessment.

Table E-1 – Default Minimum RPE Requirements for Passively Ventilated Farms

WC	Boundary Posting	RPE Requirement
1	CRZ (outside EZ)	• No RPE Required
2	EZ (Permanent or Temporary)	Engineering Control utilized: • No RPE Required
3	EZ (Permanent or Temporary)	No Engineering Control utilized: • FF-APR with Farm appropriate Chemical Cartridges
4	Non-Standard Operating Conditions: Temporary EZ	• FF-APR with Farm appropriate Chemical Cartridges

Table E-2 – Default Minimum RPE Requirements for Actively Ventilated Farms

WC	Boundary Posting	RPE Requirement
1	CRZ (outside EZ)	• No RPE Required
2	EZ (Permanent or Temporary)	Engineering Control utilized: • **2a**: Ventilation (negative pressure side, flow maintained) - No RPE Required • **2b**: Isolation - No RPE Required
3	EZ (Permanent or Temporary)	No Engineering Control utilized: • FF-APR with Farm appropriate Chemical Cartridges
4	Non-Standard Operating Conditions: Temporary EZ	• FF-APR with Farm appropriate Chemical Cartridges

Attachment F – Tank Vapor Controls Crosswalk

The Tank Vapor management strategy consists of the implementation of the hierarchy of controls (i.e., engineering controls, administrative controls, PPE). Each component of the strategy is dependent on the other controls utilized. Refer to Table F.1 for the Passively Ventilated Farms Control Strategy. Refer to Table F.2 for the Actively Ventilated Farms Control Strategy.

Table F-1 – Passively Ventilated Farms Control Strategy

WC	Facility Status	Engineering Controls	Administrative Controls		PPE
			Boundary/Posting	Monitoring Requirements	Tank Vapors RPE
1	Standard Operating Configuration*	• None	• CRZ (Access to Tank Farm)	• PAM or equivalent as directed by IH.	• None Required
2	Standard Operating Configuration*	• Isolation. (Refer to Attachment C)	• Temporary EZ (Controlled or Posted during System Breach)	• PAM or equivalent as directed by IH. • Intermittent DRI Monitoring during Work Activity. - Initial DRI monitoring to verify effectiveness of isolation (Readings should decline from initial reading and approach background if isolation was effective). - Intermittent monitoring of exposure source thereafter.	• None Required
3	Standard Operating Configuration*	• Additional engineering controls cannot be applied.	• Permanent EZ (EZs boundaries established a minimum of 5' from permanent EPs). • Temporary EZ (Controlled or Posted during System Breach)	• Continuous DRI monitoring during Work Activity. - Monitor exposure source (e.g., breather outlet). - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE.	• FF-APR with Farm appropriate Chemical Cartridge if exposure source is < MUC. • Supplied Air if exposure source is ≥ MUC.
4	Non-Standard Operating Configuration	• None	• Temporary EZ (Controlled or Posted around Affected Area and/or Farm Boundary)	• Continuous DRI monitoring during Work Activity. - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE. - Monitor work area for indication of fugitive emission sources.	• FF-APR with Farm appropriate Chemical Cartridge.

*Passively Ventilated Farm Standard Operating Configuration:

- Tank Waste containment is intact,
- All engineered EPs are adequately posted (EZs).

Attachment F – Tank Vapor Controls Crosswalk (cont.)

Table F-2 – Actively Ventilated Farms Control Strategy

WC	Facility Status	Engineering Controls	Administrative Controls		PPE
			Boundary/Posting	Monitoring Requirements	Tank Vapors RPE
1	Standard Operating Configuration*	• No additional engineering control required.	• CRZ (Access to Tank Farm)	• PAM or equivalent as directed by IH. • Stack Monitoring (VMDS/VMDS Alternate).	• None Required
2a	Standard Operating Configuration*	• Ventilation (negative pressure side, flow maintained)	• Temporary EZ (Controlled or Posted during System Breach)	• PAM or equivalent as directed by IH. • Stack Monitoring (VMDS/VMDS Alternate). • Continuous DRI monitoring during Work Activity. - Monitor exposure source (threshold of system breach) to validate the effectiveness of engineering control (Readings should be consistent with background readings). - Monitor worker breathing zone to ensure exposure does not exceed the AL.	• None Required
2b	Standard Operating Configuration*	• Isolation. (Refer to Attachment C)	• Temporary EZ (Controlled or Posted during System Breach)	• PAM or equivalent as directed by IH. • Stack Monitoring (VMDS/VMDS Alternate). • Intermittent DRI Monitoring during Work Activity. - Initial DRI monitoring to verify effectiveness of isolation (Readings should decline from initial reading and approach background if isolation was effective). - Intermittent monitoring of exposure source thereafter.	• None Required
3	Standard Operating Configuration*	• Additional engineering controls cannot be applied.	• Permanent EZ (EZs boundaries established a minimum of 5’ from permanent EPs). • Temporary EZ • (Controlled or Posted during System Breach)	• Stack Monitoring (VMDS/VMDS Alternate). • Continuous DRI monitoring during Work Activity. - Monitor exposure source (e.g., breather outlet). - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE.	• FF-APR with Farm appropriate Chemical Cartridge if exposure source is < MUC. • Supplied Air if exposure source is ≥ MUC.
4	Non-Standard Operating Configuration	• None	• Temporary EZ (Controlled or Posted around Affected Area and/or Farm Boundary)	• Continuous DRI monitoring during Work Activity. - Monitor worker breathing zone to ensure exposure does not exceed the MUC of RPE. - Monitor work area for indication of fugitive emission sources.	• FF-APR with Farm appropriate Chemical Cartridge.

*Actively Ventilated Farm Standard Operating Configuration:

- Tank Waste containment is intact, primary ventilation operational, and Tank flow into primary tank headspace from atmosphere is verified via instrumentation (refer to RPP-TE-58944).