Lusail Real Estate Development Company

Health, Safety, Security, Environment, Logistics & Quality Department

Lusail Construction Safety Management Procedure – Exposure Identification & Controls

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Amendment Record

This document is reviewed to ensure its continuing relevance to the systems and process that it describes. A record of contextual additions or omissions is given below:

Rev .No	Description / Comments	Prepared By	Checked By	Approved By	Issue Date
1	(Pg. 1) Company Propriety Information – Not controlled if printed has been added.	HSE Working Group	Michael Ford	Uwe Krueger	1st April 2015
1	(Pg. 2) Revised Amendment Table	HSE Working Group	Michael Ford Michael Ford	Uwe Krueger	1st April 2015

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1. Description

Employees performing work that may expose them to chemical hazards must wear adequate protective clothing and equipment to protect them from the hazards. When Lusail Construction Personnel, Contractors, Developers, and Subcontractor employees are assigned to a project that has the potential for benzene, cadmium, lead, asbestos, hydrogen sulfide, or other chemical exposure, a site-specific Health and Safety Plan (HASP) shall be developed prior to any site activities to comply with the Qatar Construction Specifications 2010 as they pertain to the specific chemical of concern.

This element of the LCSMP details the guidelines for air monitoring and sampling of potential chemical, biological, and radiological exposure to employees. This element applies to all construction personnel working on the Lusail Construction Project.

This element does not apply to noise and temperature extremes. For further information, refer to**LUS-HSE-WG3-446-007**, Hearing Conservation, and **LUS-HSE-WG3-446-036**, Heat Stress Management Plan.

This element does not include all regulations for listed hazardous chemicals.

2. Definitions

Term	Description
Action Level	Indicates the level of a harmful or toxic substance/activity that requires medical surveillance, increased industrial hygiene monitoring, or biological monitoring.
Job Hazards Analysis (JHA)	A process used to identify the hazards or potential hazards associated with each step of a particular job or work plan in order to uncover hazards and then eliminate, control, or remove them before the work is started.
American Conference of Governmental Industrial Hygienists (ACGIH)	A professional organization that sets recommended employee exposure guidelines called Threshold Limit Values (TLVs) and Biological Exposure Indices (BEI).
Asbestos	Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. Term includes ACM and PACM (defined below).
Asbestos-Containing Material (ACM)	Any material containing more than 1% asbestos.
Authorized Person	Any person authorized by Lusail Construction HSE and required by work duties to be present in regulated areas.
Building Facility Owner	The legal entity (including a lessee) that exercises control over management and recordkeeping functions relating to a building and/or facility in which activities covered by this procedure take place.
Class I Asbestos Work	Activities involving the removal of thermal system insulation (TSI) (defined below) and surfacing ACM and PACM.
Class II Asbestos Work	Activities involving the removal of ACM that is not thermal system insulation or surfacing material. Activities include the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction.

Term	Description
Class III Asbestos Work	Repair and maintenance operations during which ACM, including thermal system insulation and surfacing material, is likely to be disturbed.
Class IV Asbestos Work	Maintenance and custodial activities during which employees contact ACM and PACM and are involved in activities to clean up waste and debris containing ACM and PACM.
Clean Room	An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
Competent Person	One who is capable of identifying existing asbestos or lead hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, and who has the authority to take prompt corrective measures to eliminate them.
Critical Barrier	One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.
Decontamination	An area in an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment contaminated with asbestos.
Demolition	Wrecking or taking out any load-supporting structural member and any related razing, removal, or stripping of asbestos.
Disturbance	Contact that releases fibers from ACM or PACM or debris containing ACM or PACM. This term includes activities that disrupt the matrix of ACM or PACM, render ACM and PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount that can be contained in one standard-size glove bag or waste bag, in order to access a building component. In no event may the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag, measuring no more than 60 by 60 inches.
Dose	The quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body. When the provisions in this section specify a dose during a period of time, the dose is the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time.
Excursion Limit	The employer ensures that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1 f/cc) as averaged over a sampling period of 30 minutes.
Fiber	A particulate form of asbestos 5 micrometers (μ) or longer, with a length-to-diameter ratio of at least 3 to 1.
Fume	Tiny solid (metal) particles condensed from a vapor, normally in the presence of intense heat such as welding, cutting, soldering, or brazing.
Glove Bag	An impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.

Term	Description
Heat Stress	The total heat burden to which the body is subjected by both external and internal factors.
High-Efficiency Particulate Air (HEPA)	A filter capable of trapping and retaining at least 99.97% of all monodispersed particles of 0.3 µ in diameter or larger.
Homogeneous Area	An area of surfacing material or thermal system insulation that is uniform in color and texture.
Immediately Dangerous to Life or Health (IDLH)	Any atmosphere that poses an immediate hazard to life or poses immediate irreversible debilitating effects on health.
Industrial Hygienist (IH)	A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards. A certified industrial hygienist is accredited by the American Board of Industrial Hygienists (ABIH).
National Institute for Occupational Safety and Health (NIOSH)	NIOSH sets recommended employee exposure limits called recommended exposure limits (RELs).
Negative Initial Exposure Assessment	A demonstration by the employer that employee exposure during and operation is expected to be consistently below the exposure limits.
Negative Pressure	A local exhaust system capable of maintaining a minimum pressure differential of minus 0.02 inch of water column relative to adjacent unsealed areas.
Objective Data	Information demonstrating that a particular product or material containing lead or a specific process, operation, or activity involving lead cannot release dust or fumes in concentrations at or above the action level under any expected conditions of use. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of lead containing products or materials. The data used from an industry-wide survey must be obtained under workplace conditions that closely resemble the processes, types of material, control methods, work practices, and environmental conditions in the anticipated operation.
Overexposure	Employee exposure to a chemical, physical, or biological hazard by means inhalation, dermal, or consumption at a level greater than workplace exposure limit
Oxygen-Deficient Atmosphere	Atmosphere that contains less than 19.5% oxygen by volume (conversely, an oxygen-enriched atmosphere contains 23.5% or greater oxygen by volume)
Permissible Exposure Limits (PELs) Workplace Exposure Limits (WELS)	Regulatory limits on the amount or concentration of a substance in the air. Maximum concentration of asbestos that a worker may be exposed to an airborne concentration as an 8-hour TWA in excess of 0.1 f/cc.
Personnel Monitoring Equipment	Devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e.g., film badges, pocket chambers, pocket dosimeters, film rings, etc.
Presumed Asbestos Containing Material (PACM)	Thermal system insulation and surfacing material found in buildings constructed no later than 1980.

Term	Description
Project Designer	A person who has successfully completed the training requirements for an abatement project designer established by the governing regulatory agency.
Rad	A measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit of mass of the tissue. One rad is the does corresponding to the absorption of 100 ergs per gram of tissue (1 millirad [mrad] = 0.001 rad
Radiation	Includes alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but such term does not include sound or radio waves, or visible light, or infrared or ultraviolet light
Radiation Area	Any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirem. High Radiation Area is any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in one hour a dose in excess of 100 millirem.
Radioactive Material	Any material which emits, by spontaneous nuclear disintegration, corpuscular, or electromagnetic emanations.
Regulated Area	An area established by the employer to demarcate areas in which Classes I, II, and III asbestos work is conducted, and any adjoining area in which debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos exceed, or can reasonably be expected to exceed, the workplace exposure limit.
Rem	A measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen (r) of X-rays (1 millirem [mrem] = 0.001 rem). The relation of the rem to other dose units depends upon the biological effect under consideration and upon the conditions for irradiation. Each of the following is considered to be equivalent to a dose of 1 rem: • A dose of 1 roentgen due to X- or gamma radiation • A dose of 1 rad due to X-, gamma, or beta radiation • A dose of 0.1 rad due to neutrons or high energy protons • A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye.
Removal	Taking out or stripping asbestos (ACM or PACM).
Renovation	The modification of any existing structure, or portion thereof, where exposure to airborne asbestos may result.
Restricted Area	Any area access to which is controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.
Surfacing Material	Material that is sprayed, troweled on, or otherwise applied to surfaces (e.g., acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes).

Term	Description
Survey	An evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.
Thermal System Insulation (TSI)	ACM applied to pipes, fittings, boilers, breeching, tasks, ducts, or other structural components to prevent heat loss or gain.
Time-Weighted Average (TWA) Limit	Average value of exposure over the course of an 8-hour work shift. Thus, a worker may be exposed to a level higher than the workplace exposure limit for part of the day as long as he is exposed to levels below the workplace exposure limit for the rest of the day.
Unrestricted Area	Any area access to which is not controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.
Vapor	The gaseous phase of matter that normally exists in a liquid (or solid) state at room temperature.

3. Responsibilities

The Contractor is fully responsible for the pre-planning, development of Method Statements, Job Hazard Analysis, overall safe work planning and implementation. The Contractor's Project Management is responsible for the assurance that all work is planned and conducted according to the pre-planning document, Contractor and Lusail Health Safety & Environment (HSE) procedures and the Qatar Construction Specifications 2010. Should a conflict occur between procedures/standards or requirements the more stringent will apply.

4. Project Exposure Control Plan

The HSE Representative leads the development of a project-specific exposure control plan in accordance with Qatar Labor Laws and this element to evaluate the exposure potential for all identified and suspected chemical contaminants that could result from site activities. The Project Manager reviews and approves the plan.

The project exposure control plan is included in the LCSMP.

The Project Manager facilitates implementation and compliance with the plan, designating competent person(s) to conduct monitoring, and maintenance and calibration of air monitoring equipment.

The HSE Representative is responsible for overseeing the project exposure control plan. At a minimum, the project exposure control plan includes the following components:

- Name of the person responsible for maintaining the plan, and communicating requirements to employees.
- Name(s) of the designated competent persons assigned responsibility for conducting activities within the plan.
- Personal exposure monitoring requirements for relevant regulatory-listed chemical substances including asbestos, benzene, lead, and formaldehyde. For further information, refer to the regulations and **LUS-HSE-WG3-446-035**, Asbestos and Lead.
- Identification of potential high-exposure tasks lacking exposure data, based on AHAs.
- Perimeter monitoring requirements.
- Characterization of representative personal exposures based on existing data.
- Appropriate sampling methods such as passive dosimeters, diffusion tubes, filter cassettes and charcoal tube sampling with pumps and subsequent laboratory analysis (in accordance with the NIOSH Manual of Analytical Methods).

- Real-time air monitoring protocols for direct reading instruments.
- Relevant workplace exposure limits and/or action levels.
- Assessment records of tasks with overexposures and associated exposure controls.
- Provisions for maintaining, calibrating, and/or renting monitoring equipment.
- Provisions for training.

5. Exposure Assessments

The HSE Representative identifies potential chemical, biological, or radiological exposure hazards on the project using JHAs.

Employees report potential overexposures to the HSE Representative using Employee Report of Occupational Exposure Form (Attachment **LUS-HSE-FM4-446-026**).

The HSE Representative determines if an exposure assessment by an Industrial Hygienist (IH) is necessary to thoroughly assess the hazards and to recommend controls. Exposure assessment may consist of walkthrough and observation of suspect tasks, interviews with employees or supervisors, and air sampling and/or direct read air monitoring.

An experienced IH or environmental professional conducts indoor air quality and/or microbial assessments in accordance with currently-accepted professional guidelines.

5.1 Air Sampling

If air sampling is necessary to evaluate a potential exposure, it is conducted by an experienced IH technician in accordance with validated sampling and analytical methods.

The IH technician collects calibration and air sampling information in the field and documents it on the Personal Air Sampling Data Sheet (Attachment **LUS-HSE-FM4-446-027**).

Air sampling efforts focus on short-term or full-shift sampling of “worst-case” personnel, i.e., those most likely to receive the highest exposures over a representative sampling period (e.g., 8 hours).

Sampling results indicate the TWA concentrations for comparison to applicable PEL/TLVs. The HSE Representative determines the most stringent applicable PEL/TLV .

5.2 Direct-Read Air Monitoring

The competent person conducts representative direct-read air monitoring to identify any IDLH condition, overexposure, or other dangerous condition (e.g., the presence of flammable or oxygen-deficient environments) in the following circumstances:

- Confined space entry
- Discovery of contaminants other than those previously identified
- Initiation of a different type of operation (e.g., drum opening as opposed to exploratory well drilling)
- Employees handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon)
- Hazardous waste operations and response
- Leak detection

Situations may arise when it is necessary to perform perimeter monitoring around active work areas to determine if site operations are impacting air quality in the surrounding community. Such air monitoring is identified and described on the Real Time Monitoring Log (Attachment **LUS-HSE-FM4-446-028**). Perimeter air monitoring is generally performed by:

- Establishing background levels by either samples or measurements taken upwind of the site
- Taking representative samples or measurements from locations downwind of the operation
- Taking representative samples at the location of the nearest potential receptors

6. Benzene Exposure

This section applies to all occupational exposures to benzene in accordance with 29 CFR 1910.1028. When any exposures are over the Permissible Exposure Limit (PEL), a written program shall be established and implemented to reduce employee exposure to or below the PEL primarily by means of engineering and work practice controls.

6.1 Written Program

Each project that has a potential for benzene exposure will have a written program that includes the locations where employees may be exposed to benzene (i.e., well gauging and sampling), and a schedule for development and implementation of the engineering and work practice controls. These plans shall be reviewed and revised as appropriate based on the most recent exposure monitoring data, to reflect the current status of the program.

Site personnel shall be informed of the storage and use locations of benzene in host facility and aware of additional Contractor-specific safety rules.

Written compliance programs shall be furnished upon request for examination and copying to the Supervising Consultant and/ or Lusail HSE Representative, affected employees, and/ or their representatives.

6.2 Characteristics and Health Effects of Benzene

Benzene is used in the manufacture of plastics, detergents, pesticides, and other chemicals. It is found in emissions from burning coal and oil, motor vehicle exhaust, and evaporation from gasoline service stations and in industrial solvents. These sources contribute to elevated levels of benzene in the ambient air, which may subsequently be breathed by the public. Tobacco smoke contains benzene and accounts for nearly half the national exposure to benzene. Research has shown benzene to be a carcinogen (cancer-causing). With exposures from less than five years to more than 30 years, individuals have developed, and died from, leukemia. Long-term exposure may affect bone marrow and blood production. Short-term exposure to high levels of benzene can cause drowsiness, dizziness, unconsciousness, and death. The current permissible exposure limit (PEL) is 1 parts per million (ppm) over an 8-hour work period and a maximum 5 ppm short-term exposure limit (STEL) for any 15 minute period. Benzene is a colorless to light-yellow liquid with an aromatic, sweet odor. It is a volatile, highly flammable liquid that dissolves easily in water. Benzene vapors may form explosive mixtures in air. Fire extinguishers must be readily available. Smoking is prohibited in areas where benzene is used or stored.

6.3 Respiratory Protection And Selection

Employees shall be provided with any organic vapor gas mask or any self-contained breathing apparatus with a full facepiece to use for escape.

Organic vapor cartridge or canister with powered and nonpowered air-purifying respirators, and a chin-style canister with full facepiece gas masks shall be used.

Canisters used with nonpowered air-purifying respirators shall have a minimum service life of four hours when tested at 150 ppm benzene at a flow rate of 64 liters per minute (LPM), a temperature of 77 °F (25 °C), and a relative humidity of 85%; for canisters used with tight-fitting or loose-fitting powered air-purifying respirators, the flow rates for testing must be 115 LPM and 170 LPM, respectively.

Any employee who cannot use a negative-pressure respirator shall be allowed to use a respirator with less breathing resistance, such as a powered air-purifying respirator or supplied-air respirator.

Refer to **LUS-HSE-WG3-446-008**, Respiratory Protection Program for additional guidance on selection and use of respiratory protective equipment.

6.4 Protective Clothing and Equipment

PPE shall be provided and worn when appropriate to prevent eye contact and limit dermal exposure to liquid benzene. PPE must meet the requirements of QCS 2010 and will be provided at no cost to the employees

Examples of procedures and minimum PPE are as follows:

- Initial line break with chemical resistant slicker suit, monogoggles, faceshield, rubber boots, and taped cuffs on sleeves and over boots
- Cleaning up spilled solvents with rubber gloves, and side shield safety glasses
- Some cases may require supplied air

Chemically contaminated clothing is to be adequately cleaned or disposed of. Contaminated articles of PPE may not be stored with clean materials. Contaminated materials may not leave the worksite; employees may not take contaminated items home with them.

Additionally, the HSE Representative analyzes each potential chemical exposure situation and requires the proper equipment for the exposure.

6.5 Medical Surveillance

A medical surveillance program shall be made available for employees who are or may be exposed to benzene at or above the action level 30 or more days per year; for employees who are or may be exposed to benzene at or above the PEL 10 or more days per year; and for employees who have been exposed to more than 10 ppm of benzene for 30 or more days in a year prior to the effective date of the standard when employed by their current employer.

6.6 Exposure Monitoring

Determinations of employee exposure shall be made from breathing zone air samples that are representative of each employee's average exposure to airborne benzene.

Representative 8-hour time-weighted average (TWA) employee exposures shall be determined on the basis of one sample or samples representing the full-shift exposure for each job classification in each work area.

Determinations of compliance with the STEL shall be made from 15 minute employee breathing zone samples measured at operations where there is reason to believe exposures are high, such as where tanks are opened, filled, unloaded, or gauged; where containers or process equipment are opened; and where benzene is used for cleaning or as a solvent in an uncontrolled situation. The employer may use objective data, such as measurements from brief period measuring devices, to determine where STEL monitoring is needed.

Except for initial monitoring, where the employer can document that one shift will consistently have higher employee exposures for an operation, the employer shall only be required to determine representative employee exposure for that operation during the shift on which the highest exposure is expected.

7. Cadmium Exposure

This section applies to all occupational exposures to cadmium and cadmium compounds, in all forms, in all industries except the construction-related industries, which are covered under 29 CFR 1926.63.

7.1 Training

The employer must institute a training program for all employees who are potentially exposed to cadmium, ensure employee participation, and maintain a record of contents. Training must be provided before initial assignment and at least annually thereafter. The employer must certify that the training has been conducted by preparing a record that includes the following: (1) identity of employee trained; (2) the signature of the person who conducted the training; and (3) date of the training. Records must be kept for a 1 year minimum.

7.2 Action Levels

At 2.5 micrograms per cubic meter of air calculated as an 8-hour time-weighted average (TWA), a written compliance program shall be implemented when the PEL is exceeded.

7.3 Program and Compliance

The specific means that will be employed to achieve compliance will be consistent with 29 CFR 1910.1027. The written program must be reviewed and updated annually or more often to reflect significant changes in employer's compliance status and will contain the following:

1. Description of each operation where cadmium is omitted, machinery use, material processed, controls in place, crew size, employee job responsibilities and maintenance practices
2. A description of the specific means that will be employed to meet compliance including engineering plans
3. A report of technology considered in meeting the PEL
4. Air monitoring data
5. A detailed schedule for implementation
6. A work practice program

7. A written plan for emergency situations
8. Any other relevant information.

The assigned Supervising Consultant and/or the Lusail Construction HSE Department will monitor and have access to the written procedures. The written program must be provided for examination and copying upon request of the Supervising Consultant and/ or Lusail HSE Representative, affected employees, and/ or their designated representative.

7.4 Maintenance Procedures

Procedures shall be developed and implemented to minimize employee exposure to cadmium when maintenance of ventilation systems and changing of filters.

7.5 Respiratory Protection Program

LCSMP 08-00, Respiratory Protection, addresses respiratory protection requirements at Lusail, which meet the criteria found in 29 CFR 1910.134 and/or 29 CFR 1926.1127(g)(3).

7.6 Emergency Plan

The site-specific HASP will have a written plan for managing emergency situations involving substantial releases of cadmium. Respirator use and PPE shall be addressed.

7.7 Medical Surveillance

Medial surveillance will be provided to employees who are or may be exposed to cadmium at or above the action level.

8. Lead Exposure

8.1 Training

All affected employees are required to attend training programs. The training shall be provided prior to the time of initial job assignment. Training shall be provided at least annually. The employees shall be informed of the specific nature of the operations which could result in exposure to lead above the action level. Employees shall be informed of the purpose, proper selection, fitting, use, and limitation of respirators. Employees shall be informed of the engineering controls. The employees shall be informed of the purpose and a description of the medical surveillance program and the medical removal program. Employees shall be advised of the adverse effects on the reproductive system as a result of lead exposure. Employees shall be informed of Appendices A and B of 29 CFR 1910.1025.

8.2 Program and Compliance

A site-specific HASP will address the means of engineering and work practice controls. The means that will be employed to achieve compliance will be consistent with 29 CFR 1910.1025. Documentation of air monitoring, including the source of lead, will be covered in a site-specific HASP. A description of each operation in which lead is emitted should be outlined (i.e. machinery used, material used, material processed, controls in place, crew size and employee job responsibilities). The written program must be revised and updated every six (6) months.

8.3 Air Monitoring

If the initial monitoring reveals employee exposure to be below the action level of 30 micrograms per cubic meter of air ($\mu g/m^3$), the measurements need not be repeated unless there has been a production, process, control or personnel change which may result in new or additional exposure to lead, or whenever the employer has any other reason to suspect a change which may result in new or additional exposures to lead. If this occurs, additional monitoring in accordance with this paragraph shall be conducted.

If the initial monitoring reveals that employee exposure is above the permissible exposure limit (50 $\mu g/m^3$), then the employer shall repeat monitoring quarterly. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least seven (7) days apart, are below the PEL, but at or above the action level (30 $\mu g/m^3$), at which time the employer shall repeat monitoring for that employee every six months.

Within five (5) working days after the receipt of monitoring results, the employer shall notify each employee in writing of the results which represent that employee's exposure.

Whenever the results indicate that the representative employee exposure, without regard to respirators, exceeds the permissible exposure limit (50 $\mu g/m^3$), the employer shall include in the written notice a statement that the

permissible exposure limit was exceeded and a description of the corrective action taken or to be taken to reduce exposure to or below the permissible exposure limit.

8.4 Engineering and Work Practices Controls

Where any employee is exposed to lead above the permissible exposure limit (50 μg/m^3) for more than thirty (30) days per year, the employer shall implement engineering and work practice controls (including administrative controls) to reduce and maintain employee exposure to lead, except to the extent that the employer can demonstrate (and document the reasons) that such controls are not feasible. Wherever the engineering and work practice controls which can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest feasible level and shall supplement them by the use of respiratory protection.

Where any employee is exposed to lead above the permissible exposure limit, but for thirty (30) days or less per year, the employer shall implement engineering controls to reduce exposures to 200 μg/m^3, but thereafter may implement any combination of engineering, work practice (including administrative controls), and respiratory controls to reduce and maintain employee exposure to lead to or below 50 μg/m^3.

Where engineering and work practice controls do not reduce employee exposure to or below the 50 μg/m^3 permissible exposure limit, the employer shall supplement these controls with respirators.

8.5 Respirators

An employee may choose NIOSH-certified powered air-purifying respirators (PAPRs) at no extra cost to the employee. The respirator shall be used during the time period necessary to install or implement engineering or work practice controls. Refer to **LUS-HSE-WG3-446-008**, Respiratory Protection Program for additional information on respirators.

8.6 PPE

Gloves, hats, vented goggles, shoes, or disposable shoe covers shall be provided at no cost to the employee. Protective clothing shall be in clean and dry condition at least weekly. Protective clothing shall be cleaned, laundered, properly disposed and repair or replaced as necessary. See Section 6 Personal Protective Equipment for additional information on PPE.

8.7 Medical Surveillance

Medical examinations and procedures shall be performed by or under the supervision of a licensed physician. The blood sampling and monitoring should be conducted every 6 months until two consecutive blood samples and analysis are acceptable. The sampling and monitoring should be performed at least monthly during the removal period. Any employee with elevated blood levels should be temporarily removed. Employees should be notified in writing within five days when blood lead levels are not acceptable. The standard requires temporary medical removal with medical removal protection benefits. The medical surveillance is provided without cost to the employees.

8.8 Decontamination

The employer will provide decontamination and changing facilities. The employer shall assure that in areas where employees are exposed to lead above the PEL, without regard to the use of respirators, food or beverage is not present or consumed, tobacco products are not present or used, and cosmetics are not applied, except in change rooms, lunchrooms, and showers.

8.9 Signs

The employer shall post the following warning signs in each work area where the PEL is exceeded:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

The signs shall be illuminated and cleaned as necessary so that the legend is readily visible.

9. Asbestos

This section provides guidelines for projects involving asbestos, where Lusail and/ or Contractors may be conducting surveying, monitoring, and/or oversight of asbestos work. This section applies to all site construction personnel working on the Lusail Project who have or may be expected to have potential for asbestos exposure. This section does not cover environmental regulations, bulk sampling requirements, or asbestos air sampling analysis.

9.1 Project Asbestos Control Plan

The competent person in charge of the work develops and implements an asbestos control plan in accordance with Qatar Labor Laws and this LCSMP section. The Project Manager and HSE Representative review and approve the Plan. A Plan is required under the following conditions:

- When ACM or PACM are managed in place
- When friable asbestos materials are damaged
- When asbestos materials must be removed or disturbed during inspection, construction, or maintenance operations

The Project Manager and HSE Representative facilitate implementation and compliance with the Plan.

The Supervising Consultant oversees the asbestos control plan, updates the plan every 6 months, and monitors the Contractors to ensure compliance.

The requirements set forth by the regulatory agencies for asbestos work are quite extensive: those responsible for administration, implementation, enforcement, and monitoring must review them thoroughly before beginning any work task. Chromium VI Exposure Protection (Attachment **LUS-HSE-FM4-446-070**) is provided as a tool for the competent person to ensure that the regulations are addressed.

At a minimum, the asbestos control plan includes the following information:

- Name of the person responsible for maintaining the program, and communicating program requirements to employees
- Name(s) of designated persons assigned responsibility for conducting activities within the program
- Updated survey or list of PACM and/or jobs that may require disturbance of ACM or PACM, in accordance with AHAs

9.2 Asbestos Survey

TSI and sprayed-on or troweled-on surfacing materials in buildings are presumed to contain asbestos (PACM). Asphalt and vinyl flooring material installed no later than 1980 are also presumed to contain asbestos unless determined otherwise. PACM can be rebutted as nonasbestos-containing through an asbestos survey.

The Project Manager ensures that an asbestos survey is available or is completed by a certified asbestos building inspector before conducting demolition or renovations that may disturb PACM. A Qatar Government accredited laboratory must conduct a bulk sample analysis by polarized light microscopy (PLM).

If ACM and/or PACM is discovered on a worksite, the HSE Representative conveys the information concerning the presence, location, and quantity to the Supervising Consultant and Lusail HSE and to other Contractors working at the work site within 24 hours of the discovery.

9.3 Asbestos Exposure Assessment

During an asbestos abatement, a competent person arranges and oversees personal employee monitoring in accordance with federal and state regulations:

- Eight-hour TWA samples representative of full-shift exposures are taken for employees in each work area.
- Short-term samples representing 30-minute exposures are taken during worst-case conditions for employees in each work area.
- Initial exposure assessment is conducted before or at the initiation of asbestos work to ascertain expected exposures.

- For any one specific asbestos job, a negative exposure assessment may be conducted to demonstrate that employee exposures are below the PELs.
- If periodic monitoring statistically determines that employee exposures are below the PELs, monitoring for those employees may be discontinued.
- Reinstitute exposure monitoring when there is a change in process, control equipment, personnel, or work practices that may result in new or additional exposures above the PELs.

Area samples may be collected to ensure that controls prevent the migration of fibers into unregulated areas. Area samples are collected from locations determined by the Supervising Consultant, which may include:

- Inside containment (worst-case)
- Inside clean room
- Outside containment entrance
- Outside decontamination chamber exit
- Negative air exhaust
- Perimeter of containment
- Perimeter of adjacent occupied areas

The Supervising Consultant determines the need for third-party clearance sampling.

Exposure monitoring samples must be analyzed by phase contrast microscopy (PCM). PCM methods accurately assess fiber exposure levels, but PCM cannot differentiate between asbestos and nonasbestos fibers. Transmission electron microscopy (TEM) methods can be used to identify fibers, but it cannot be used to quantify air concentrations for occupational exposure.

The Contractor HSE Representative ensures that no employee is exposed to an airborne concentration of asbestos in excess of PELs:

- PEL: 0.1 f/cc of air as an 8-hour TWA
- Excursion Limit: 1.0 f/cc of air as averaged over a sampling period of 30 minutes

Contractor HSE Representative must notify affected employees of monitoring results that represent that employee's exposure as soon as possible following receipt of monitoring results.

9.4 Asbestos Abatement

All Class I, II, and III asbestos work, as well as other operations in which asbestos may exceed the PEL, is conducted by a licensed and certified abatement company with oversight by the Supervising Consultant.

Engineering controls and work practices and procedures for Class I, II, III, and IV work must follow Qatar Labor Laws and regulations deemed applicable by Lusail and the Supervising Consultant. Lead Respiratory Protection Table (Attachment **LUS-HSE-FM4-446-075**) is provided as a tool.

Regulated areas must be demarcated by signs and barriers and access limited to only trained and authorized persons using an appropriate respirator.

A decontamination area must be established adjacent and connected to the regulated area for the decontamination of employees. The decontamination area consists of an equipment room, shower area, and clean room in series. Employees enter and exit the regulated area through the decontamination area.

Lusail requires Contractors to provide asbestos workers with appropriate respiratory protection for asbestos work, in accordance with **LUS-HSE-WG3-446-008**, Respiratory Protection Program, and the Asbestos Respiratory Protection Table (Attachment **LUS-HSE-FM4-446-025**).

Qualitative fit tests may be used only for half-mask respirators or full-facepiece air-purifying respirators where they are worn at levels at which half-facepiece air-purifying respirators are permitted.

Appropriate protective clothing for asbestos work shall be provided by the asbestos Contractor, in accordance with **LUS-HSE-WG3-446-006**, Personal Protective Equipment.

9.5 Training

Supervisors address and communicate appropriate hazards, controls, and work practices at daily huddles before beginning work. Supervisors are responsible for identifying training needs during risk mitigation planning (2-week look-ahead).

10. Hydrogen Sulfide Exposure

10.1 Characteristics and Potential Exposures

Hydrogen sulfide (H_2S), also known as sour gas, swamp gas, poison gas, is a poisonous gas byproduct of the exploration and production of oil and gas. It is formed from the decomposition of organic matter and as a byproduct of various chemical reactions.

Hydrogen sulfide may be found and impose hazards in one or more of the following areas/operations:

- Water floods
- Sewers or septic systems
- Disposal wells
- Stagnant cellars and sumps
- Hydrogen sulfide production zones
- Vacuum/transport trucks
- Drilling/workover operations
- Flowlines
- Production facilities including the following:
  - Sweetening plants and tank batteries
  - Reserve pits
  - Water from sour crude wells
  - Blowouts
  - Tank gauging (tanks at producing , pipeline, and refining operations)
  - Field maintenance

10.2 Hazards and Health Effects

Do not rely on your sense of smell to detect H_2S.

H_2S effects include the following:

- Causes eye irritations
- Causes paralysis of the respiratory center in the brain and can result in immediate collapse and death
- Inhalation of lower concentrations of H_2S gas can cause irrational behavior resulting in unsafe acts and injuries
- Is very flammable
- Reacts with steel to form iron sulfide which can ignite when exposed to air
- When burned produces sulfur dioxide (SO_2) which is also toxic
- Is highly corrosive and may lead to metal embrittlement/fatigue
- Effects are influenced and possibly accelerated by alcohol and certain medications

Concentrations of H_2S may affect each individual differently! Exposure may cause the following:

- Skin and/or eye irritation
- Loss of appetite

- Fatigue
- Nausea
- Headache
- Dizziness
- Dryness in nose and/or throat
- Coughing
- Loss of consciousness or death

10.3 Detection and Exposure Limits

Personal and area monitors shall be preset to alarm at twenty (20) ppm, which is the PEL. When monitor alarms sound, evacuate the area and do not re-enter without proper respiratory protection.

Other concentration levels and their effects are described in Table 9-1 below:

Table 9-1—H_2S Concentrations and Effects

Concentrations (PPM)	Effect
0.032 – 0.02	Odor threshold (begin to smell)
Above 10	Toxic to personnel; wear respiratory protection equipment
20	Acceptable ceiling concentration
50 – Maximum duration 10 minutes once, only if no other measurable exposure occurs.	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift
Above 300. Considered Immediately Dangerous to Life and Health (IDLH).	Quickly deadens the sense of smell
Above 500.	Attacks respiratory center in the brain, causing breathing to stop and loss of consciousness within 15 minutes.
Above 700	Rapid loss of consciousness and death.
Above 1000	Immediate unconsciousness and death if not revived promptly.

10.4 Guidelines

- Use detection equipment when working in an area where there is a possibility of H_2S gas, especially in enclosed or below grade areas (holes, trenches, reserve pits).
- Maintain and calibrate detection equipment per manufacturer's specifications.
- Do not enter an H_2S area without proper training and authorization.
- In IDLH atmospheres a standby person(s) with suitable self contained breathing apparatus (SCBA) must be available for purposes of rescue.
- **Never attempt to rescue an H_2S victim without a SCBA.**
- Employees working in H_2S areas are required to be properly fit tested.
- All H_2S exposure victims should be treated by a physician before returning to work.
- In the event of a H_2S emergency, all personnel should follow the site emergency plan.
- H_2S areas, facilities, pipelines, and/or flowlines should be properly identified with signage.

10.5 Respiratory Protection

The selection of respiratory protection is covered in **LUS-HSE-WG3-446-008**, Respiratory Protection Program. Typically, respirators shall be selected according to airborne concentrations of hydrogen sulfide or condition of use. These respirators shall be approved by NIOSH. The respiratory protection program shall be established in accordance with 29 CFR 1910.134.

A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes or a combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply shall be worn whenever work is required in an IDLH atmosphere.

Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

10.6 Training

Employees must be aware of and follow provisions of site specific contingency plans established by the owner. **Comprehensive training shall be provided for workers in H_2S operations. Example topics include:**

- The characteristics, sources, and hazards of H_2S
- Proper use of the H_2S detection methods used on the site
- Recognition of, and proper response to, H_2S warnings at the workplace
- Symptoms of H_2S exposure
- Proper rescue techniques and first-aid procedures to be used in a H_2S exposure
- Proper use and maintenance of personal protective equipment. Demonstrated proficiency in using PPE should be required
- Worker awareness and understanding of workplace practices and maintenance procedures to protect personnel from exposure to H_2S
- Wind direction awareness and routes of egress
- Confined space and enclosed facility entry procedures
- Locations and use of safety equipment
- Locations of safe briefing areas
- Use and operation of all H_2S monitoring systems
- Emergency response procedures, corrective action, and shutdown procedures
- Effects of H_2S on the components of the H_2S handling system and the importance of drilling

11. Ionizing Radiation

11.1 Exposure to Employees

There are many and diverse sources of exposure to ionizing radiation and conditions in which employees can be exposed. Exposures can result from natural sources, such as radioactive materials that exist in the soil, and from cosmic sources (i.e., the sun). Workers can also be exposed to radiation from sources that result from human activities. For example, exposure to ionizing radiation can result from naturally occurring radioactive materials (NORM), or from equipment that emits radiation such as X-ray devices.

Worker exposure to ionizing radiation also takes place when naturally occurring radioactive material is “enhanced” in some way. Technologically enhanced naturally occurring radioactive materials (TENORM) are created when industrial activity enhances the concentrations of radioactive materials or when the material is redistributed as a result of human intervention or industrial processes and this can result in increased worker exposures. TENORM can result from manufacturing processes, such as the production of materials and equipment from raw materials that contained NORM, and concentrations of these materials are sometimes increased as a result of these processes. Another example is increased concentrations of NORM materials in filters and the solid sludge from large quantities of water used in some manufacturing processes, such as paper and pulp mills, or from water treatment systems used to supply drinking water. Workers who clean or change filters or handle sludge may be exposed to these increased

concentrations. In addition, downstream use of materials containing TENORM, such as coal ash, aluminum oxide, and fertilizers can result in employee exposure.

TENORM also can be the byproduct or waste product of oil, gas and geothermal energy production. Sludge, drilling mud, and pipe scales are examples of materials that often contain elevated levels of NORM, and the radioactive materials may be moved from site to site as equipment and materials are reused.

Disposal, reuse and recycling of TENORM can cause occupational exposures. For example, reusing concrete aggregate contaminated with TENORM (i.e., phosphate slag) can lead to increased radiation exposure for construction workers.

In addition to NORM and TENORM, accelerator produced radioactive material that results from operation of atomic particle accelerators for medical, research or industrial purposes can cause occupational exposures. When reference is being made to both naturally and accelerator produced radioactive materials, the acronym NARM is used. NARM is a term used to describe naturally occurring radioactive material including TENORM, discussed above and accelerator produced material that results from the operation of atomic particle accelerators for medical, research, or industrial purposes. The accelerator uses magnetic fields to move atomic particles at increasing velocities before crashing into a preselected target. This reaction produces desired radioactive materials in metallic targets or kills cancer cells where a cancer tumor is the target. However, it also produces some radioactive waste products that are frequently managed as low-level radioactive waste. The radioactivity contained in the waste from accelerators is generally short-lived.

Equipment that produces ionizing radiation is another source of workplace exposure. X-ray equipment and electron microscopes are examples of sources of worker exposure to ionizing radiation.

Contractors shall not possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified in Table 9-2 below:

Table 9-2—Body Part and Rems per Calendar Quarter

Body Part	Rems per Calendar Quarter
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads	1 1/4
Hands and forearms; feet and ankles	18 3/4
Skin of whole body	7 1/2

An employee in a restricted area may receive doses to the whole body greater than those permitted under bullet 1 of this paragraph, so long as:

- During any calendar quarter the dose to the whole body shall not exceed 3 rems; and
- The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5 (N-18) rems, where "N" equals the individual's age in years at his last birthday; and
- The employer maintains adequate past and current exposure records which show that the addition of such a dose will not cause the individual to exceed the amount authorized in this subparagraph. As used in this subparagraph ***Dose to the whole body*** shall be deemed to include any dose to the whole body, gonad, active bloodforming organs, head and trunk, or lens of the eye.

Any employee who is under 18 years of age shall not receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in Table 9-2, above.

Contractors shall not possess, use, or transport radioactive material in such a manner as to cause any employee, within a restricted area, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table 1 of appendix B to 10 CFR part 20.

The limits given in Table 9-2 are for exposure to the concentrations specified for 40 hours in any work week of 7 consecutive days. In any such period where the number of hours of exposure is less than forty (40), the limits specified in Table 9-2 may be increased proportionately. In any such period where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.

Contractors shall not possess, use, or transfer radioactive material in such a manner as to cause any individual within a restricted area, who is under eighteen (18) years of age, to be exposed to airborne radioactive material in an average

concentration in excess of the limits specified in Table II of appendix B to 10 CFR part 20. For purposes of this paragraph, concentrations may be averaged over periods not greater than 1 week.

Note: ***"Exposed"*** as used in this section means that the employee is present in an airborne concentration. No allowance shall be made for the use of protective clothing or equipment, or particle size.

11.2 Personnel Monitoring

Each employee shall receive appropriate personnel monitoring equipment, such as film badges, pocket chambers, pocket dosimeters (thermoluminescent [TLD]), or film rings, and shall be required to use such equipment if the following pertains:

- They enter a restricted area under such circumstances that they receive, or are likely to receive, a dose in any calendar quarter in excess of twenty-five (25) percent of the applicable value specified in Table 9-2
- The employee is under eighteen (18) years of age and who enters a restricted area under such circumstances that they receive, or are likely to receive, a dose in any calendar quarter in excess of 5 percent of the applicable value specified in Table 9-2
- The employee enters a high radiation area.

Portable survey instruments such as Geiger counters and scintillation detectors may also be used to detect the presence of radiation.

The Project Manager designates the competent person(s) to conduct monitoring, and maintenance and calibration of air monitoring equipment.

Records of the radiation exposure of all employees for whom personnel monitoring is required shall be maintained and each employee advised of his individual exposure on at least an annual basis.

11.3 Caution Signs, Labels, and Signal

Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol shown in Figure 9-1 and the following words:

CAUTION
RADIATION AREA

Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol shown in Figure 9-1 and the words:

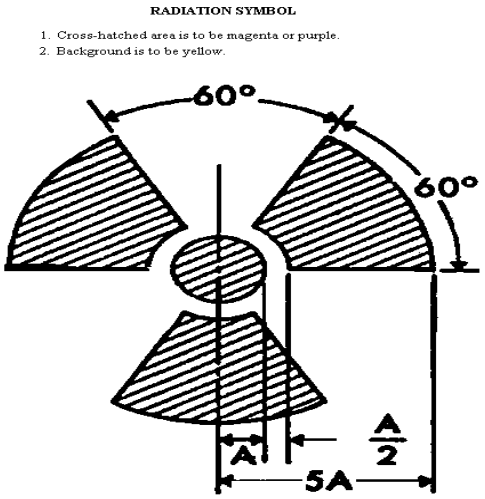

Figure 9-1—Radiation Symbol

Each high radiation area shall be equipped with a control device which shall either cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in 1 hour upon entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the employer or a supervisor of the activity are made aware of the entry. In the case of a high radiation area established for a period of 30 days or less, such control device is not required.

A room or area is not required to be posted with a caution sign because of the presence of a sealed source, provided the radiation level 12 inches from the surface of the source container or housing does not exceed 5 millirem per hour.

Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than 8 hours, provided:

- The materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the provisions of this section; and
- Such area or room is subject to the employer's control.

11.4 Packaging, Containers, Storage, and Disposal

Each container in which is transported, stored, or used a quantity of any radioactive material greater than the quantity of such material specified in Appendix C to 10 CFR part 20 (or greater than ten (10) times the quantity specified for natural uranium or thorium) shall bear a durable, clearly visible label bearing the radiation caution symbol described in Figure 9-1 and the words:

CAUTION
RADIATION MATERIALS

11.5 Training

All employees working in or frequenting any portion of a radiation area shall be:

- Informed of the occurrence of radioactive materials or of radiation in such portions of the radiation area
- Instructed in the safety problems associated with exposure to such materials or radiation and in precautions or devices to minimize exposure
- Instructed in the applicable provisions of this policy for the protection of employees from exposure to radiation or radioactive materials
- Advised of reports of radiation exposure which employees may request pursuant to the regulations

- Required to review the site-specific health and safety plan, which will also be available for examination upon request that describes the operating procedures applicable to the work to insure that employees working in or frequenting radiation areas are protected.

All employees whose work may necessitate their presence in an area covered by an emergency signal shall be made familiar with the actual sound of the signal-preferably as it sounds at their work location.

11.6 Protection

Studies indicate that the health effects associated with exposure to ionizing irradiation vary depending on the total amount of energy absorbed, the time period, the dose rate and the particular organ exposed.

As a result, employees shall use the following methods to protect themselves against over exposure to radioactive materials or ionizing radiation:

- Time means radiation exposure occurs over a given period of time. Therefore, the shorter the time, the less the exposure.
- Distance means radiation drops off with the square of the increase in distance (i.e. inverse square law). The use of devices such as extension poles, remote manipulation and long forceps can reduce exposure by several orders of magnitude as compared to handling with a gloved hand.
- Shielding means two factors control the effectiveness of shielding. The penetrating ability of the radiation and the absorbing ability of the shield. Both the density and the thickness of the shield affect its ability to absorb or attenuate radiation.

Gloves, labcoats, and shoe covers shall be worn for contamination protection. These prevent personal contact with radioactive material and subsequent ingestion. Frequent hand washing is also required to avoid possible contamination before ingestion.

Where there is a significant airborne hazard present, work is done in a fume hood, also, filter masks, or air supplied masks might be necessary.

Habits such as fingernail biting, pen chewing, smoking, eating, drinking, or storage of food or beverages is not allowed in radioisotope areas.

12. HEXAVALENT CHROMIUM

This section applies to all occupational exposure to hexavalent chromium (Chromium [VI]) in accordance with 29 CFR 1910.1026. However, this does not include exposures to Portland cement or where there is objective data demonstrating that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of chromium (VI) in concentrations at or above 0.5 $\mu g/m^3$ as an 8-hour TWA under any expected conditions of use.

12.1 TRAINING

All affected employees are required to attend training programs. The training shall be provided prior to the time of initial job assignment. Training will provided that is understandable to ensure that each employee can demonstrate knowledge of the health hazards associated with hexavalent chromium exposure; location, manner of use, and release of chromium in the workplace; engineering controls and work practice controls; purpose, proper selection, fitting, proper use and limitations of respirators and protective clothing; emergency procedures; measures employees can take to protect themselves from exposure; purpose and description of medical surveillance program; contents of the standard. Employers must make a copy readily available without cost to all affected employees. Training shall be documented.

12.2 AIR MONITORING

No employee shall be exposed in excess of the PEL of five (5) micrograms per cubic meter of air as an 8-hour TWA.

Employee monitoring or measuring of employee exposure shall be provided. Periodic monitoring shall be conducted at least every six (6) months if initial monitoring shows employee exposure. Air monitoring will be performed at the beginning of each job task. If exposure monitoring results indicate exposure is above the PEL, the corrective action being taken to reduce exposure to or below the PEL will include a written notification.

12.3 REGULATED AREAS

Regulated areas must be established when an employee's exposure is or is expected to be in excess of the PEL. Regulated areas shall be marked with warning signs to alert employees. Access is restricted to “authorized persons”.

12.4 ENGINEERING AND WORK PRACTICES CONTROLS

Where any employee is exposed to chromium (VI) above the permissible exposure limit (5 μg/m3) for more than thirty (30) days per year, the employer shall implement engineering and work practice controls (including administrative controls) to reduce and maintain employee exposure to chromium (VI), except to the extent that the employer can demonstrate (and document the reasons) that such controls are not feasible. Wherever the engineering and work practice controls which can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest feasible level and shall supplement them by the use of respiratory protection.

Respirators must be used when engineering controls and work practices cannot reduce employee exposure, during work operations where engineering controls and work practices are not feasible, and emergencies. Respirators shall be provided in accordance with QCS 2010.

12.5 PPE

Where a hazard is present or is likely to be present from skin or eye contact with chromium (VI), appropriate personal protective clothing and equipment shall be provided at no cost to employee. Supervisors shall ensure that employees use such clothing and equipment.

Supervisors shall ensure that employees remove all protective clothing and equipment contaminated with chromium (VI) at the end of the work shift or at the completion of their tasks involving chromium (VI) exposure, whichever comes first.

Supervisors shall ensure that no employee removes chromium (VI)-contaminated protective clothing or equipment from the workplace, except for those employees whose job it is to launder, clean, maintain, or dispose of such clothing or equipment.

When contaminated protective clothing or equipment is removed for laundering, cleaning, maintenance, or disposal, the employer shall ensure that it is stored and transported in sealed, impermeable bags or other closed, impermeable containers.

See **LUS-HSE-WG3-446-006**, Personal Protective Equipment for additional information on PPE.

12.6 HOUSEKEEPING

Surfaces shall be maintained as free as practicable of accumulation of chromium. All spills and releases of chromium shall be cleaned promptly by trained responders. Methods of cleaning include HEPA filtered vacuums, dry or wet sweeping, shoveling or other methods to minimize exposure.

12.7 MEDICAL SURVEILLANCE

Medical surveillance shall be provided when an employee experiences signs or symptoms of the adverse health effects of Hexavalent Chromium (dermatitis, asthma, bronchitis, etc). Medical evaluations will be provided at no cost to employees. Examinations will be performed by or under the supervision of a physician or other licensed health care professional.

12.8 HYGIENE AREAS AND PRACTICES

Change rooms for decontamination shall be provided to ensure facilities prevent cross-contamination. Washing facilities shall be readily accessible for removing chromium from the skin. Workers must wash their hands and face or any other potentially exposed skin before eating, drinking or smoking.

Whenever employees are allowed to consume food or beverages at a worksite where chromium (VI) is present, eating and drinking areas and surfaces are maintained as free as practicable of chromium (VI).

Employees shall not enter eating and drinking areas with protective work clothing or equipment unless surface chromium (VI) has been removed from the clothing and equipment by methods that do not disperse chromium (VI) into the air or onto an employee's body.

12.9 RECORDKEEPING

An accurate record of all employee exposure monitoring, medical surveillance and training records shall be maintained and made available in accordance with QCS 2010.

13. ENGINEERING CONTROLS

Engineering control is the most effective means of controlling atmospheric contaminants in the workplace. The ambition of controls is to reach concentrations that are as low as reasonably achievable (ALARA) in the following order of precedence:

- Engineering controls are instituted to limit exposure to hazardous substances, agents, and environments within acceptable limits refer to **LUS-HSE-WG3-446-037**, Ventilation.
- When engineering controls are not feasible or are not sufficient to limit exposure to hazardous substances, agents, and environments to within acceptable limits, work practice controls (e.g., wetting hazardous dusts) are instituted.
- When engineering or work practice controls are not feasible or are not sufficient to limit exposure to hazardous substances, agents, and environments to within acceptable limits, PPE programs are instituted in accordance with **LUS-HSE-WG3-446-006**, Personal Protective Equipment; and **LUS-HSE-WG3-446-008**, Respiratory Protection Program.

Ventilation systems are designed to prevent contaminants from dispersing into the air or drawing through the work area, of dusts, fumes, mists, vapors, and gases in concentrations that could cause harmful exposure.

14. IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH) AREAS

During risk mitigation planning (2-week look-ahead), Supervisors are responsible for identifying work in areas with chemical concentrations that may be IDLH in accordance with the Lusail Construction Safety Management Procedures Manual. Engineering and/ or administrative controls shall be used to reduce potential exposures, if possible.

When work is required in an IDLH area, the Project Manager designates at least two standby employees outside the IDLH area. Only one standby employee is required if the IDLH condition is well characterized will remain stable, and one employee can adequately manage the following responsibilities:

- Monitor employees in the IDLH area
- Implement communication
- Initiate rescue duties

Standby employees must be trained in emergency rescue and must be medically qualified and fit tested to wear a pressure-demand SCBA or a pressure-demand air-line respirator with an auxiliary SCBA. Refer to **LUS-HSE-WG3-446-008**, Respiratory Protection Program; and **LUS-HSE-WG3-446-011**, Emergency Planning & Responce, for further details.

When it would help with the effective rescue of the entrant, The Supervising Consultant will equip standby employees with these respirators, and the appropriate retrieval equipment, or an equivalent means of rescue.

Standby employees maintain visual, voice, or signal line communication with employees in the IDLH area.

In an emergency, standby employees notify the HSE Representative (or designee) before they enter the IDLH AREA TO PROVIDE EMERGENCY RESCUE.

15. MONITORING EQUIPMENT

At the HSE Representative's request, arrangements can be made for necessary monitoring equipment.

The competent person designated by the HSE Representative is responsible for maintenance and calibration of any direct-read monitoring equipment that is assigned to the project.

The competent person calibrates the air sampling instruments before and after sampling and documents the calibration on the Monitor Calibration Log (Attachment **LUS-HSE-FM4-446-029**).

The competent person also conducts quarterly instrumentation inventory and inspections. All instrumentation not in the field is inspected, receives routine maintenance, and is calibrated to ensure that it is in proper working order and available for use. The competent person records the inspection information in a monitoring instrumentation log and includes the date, person performing inspection, necessary maintenance performed, repairs required, calibration gas or other standard value, instrument response, and any adjustments, if required.

Instruments that are identified as requiring repairs beyond routine maintenance (e.g., cleaning or replacement of consumables) are shipped to a qualified vendor or to the manufacturer for repair.

16. TRAINING

All Contractors shall ensure that provisions for employee training are included in the project exposure control plan.

The HSE Representative arranges employee training at the time of initial assignment and when a new hazard is introduced to the jobsite. This training can be organized and presented to groups or on a work area by work area basis, depending on the operation.

Supervisors brief employees on air monitoring during daily huddles before beginning work.

At a minimum, the following information and training is provided:

- Employees conducting air monitoring are trained to use and read the monitors and to recognize monitor alarms.
- Competent persons maintaining air monitoring instruments are trained to calibrate, charge, and conduct routine maintenance of the instruments.
- Employees wearing personal air sampling instruments are informed of instructions to comply with air sampling. For example, employees will conduct duties as normal to provide a representative sample of exposure.

Using an acceptable training form, the records custodian maintains a record of all training or instruction given to employees.

17. DOCUMENTATION

The records custodian documents all instruction and training. The HSE Representative maintains these safety and health training records at the site for the duration of the project and archives them for a minimum retention time of 10 years from creation date.

18. REFERENCES

10 CFR 34

29 CFR 1910.120, 1910.134, 1910.1000 (Table Z-2), 1910.1020, 1910.1025, 1910.1026, 1910.1096; 29 CFR 1926.53, 1926.65

EM 385-1-1 6.B, 6.E, 6.F, 6.L

NIOSH Manual of Analytical Methods

American Conference of Governmental Industrial Hygienist (ACGIH) Threshold Limit

Value Pocketbook

Qatar Construction Specifications 2010

National Institute of Occupational & Safety and Health Pocket Guide to Chemical Hazards

19. ATTACHMENTS

LUS-HSE-FM4-446-026	Employee Report of Occupational Exposure
LUS-HSE-FM4-446-027	Personal Air Sampling Data Sheet
LUS-HSE-FM4-446-028	Real Time Monitoring Log
LUS-HSE-FM4-446-029	Monitor Calibration Log