Lusail Real Estate Development Company

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

Lusail Construction Safety Management Procedure – Hazardous Materials Handling, Transportation & Storage

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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:

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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

This element of the LCSMP describes Lusail Construction HSE requirements for handling, transportation, storage, and disposal of hazardous materials. This element applies to all Lusail, Consultant, Contractor, subcontractor and vendor personnel entering and/ or working on the Lusail Project site.

This element is not all inclusive of applicable regulations; it does not address shipping or environmental regulations. This element also does not address liquefied petroleum (LP) bulk storage or specific hazardous waste regulations. Refer to **LUS-HSE-WG3-446-013**, Construction Hazardous Waste Management & Operations, and Lusail Waste Management Plan (Rev.3) for guidance on management of hazardous wastes.

2. Definitions

Term	Description
Job Hazards Analysis (JHA)	A process designed to identify hazards or potential hazards associated with each step of a job or work plan to uncover hazards and eliminate, control, or remove them before work is started.
Bonding	The process of connecting two or more conductive objects together by means of a conductor.
Combustible Liquid	Any liquid having a flash point at or above 100°F. Combustible liquids are designated as Class II and Class III liquids as follows: • Class II: Flash point ≥100°F and <140°F. • Class III: Flash point ≥140°F. Class III liquids are divided into two groups: • Class IIIA: Flash point ≥140°F and <200°F • Class IIIB: Flashpoint ≥ 200°F
Flammable Gas	A gas that is flammable when mixed with air in concentrations of 13% or less by volume in air.
Flammable Liquid	Any liquid having a flash point below 100°F. Flammable liquids are designated as Class I liquids, which are divided into three groups: • Class IA: Flash point <73°F and boiling point <100°F. • Class IB: Flash point <73°F and boiling point ≥100°F. • Class IC: Flash point ≥73°F and boiling point <100°F.
Flammable (Explosive) Limits	The term “lower flammable limit (LFL)” or “lower explosive limit (LEL)” describes the concentration of vapor to air below which propagation of a flame or an explosion will not occur in the presence of an ignition source. The term “upper flammable limit (UFL)” or “upper explosive limit (UEL)” is the vapor-to-air concentration above which propagation of flame or an explosion will not occur. If a vapor-to-air mixture is below the LFL or LEL, it is described as being “too lean” to burn; if it is above the UFL or UEL, it is “too rich” to burn. When the vapor-to-air ratio is between the LFL or LEL and the UFL or UEL, fires and/or explosions can occur.
Grounding	The process of connecting one or more conductive objects to the ground; a specific form of bonding.

Term	Description
Inert Gas	A simple asphyxiant gas that displaces oxygen in the air necessary to sustain life. Inert gases can cause rapid suffocation because of a resultant oxygen deficiency.
Material Safety Data Sheet (MSDS)	The written document that sets forth the specific information about a toxic or hazardous substance.
NFPA Small Compressed Gas Cylinder	A National Fire Protection Association-approved cylinder having a maximum water capacity of 1,000 pounds (i.e., 120 gallons) or less.

3.0 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.

4.0 General Handling

- Where practical, site personnel will avoid manual material handling tasks.
- Supervisors ensure that material handling equipment (mechanical and/or powered) is available when practical.
- Instruct site personnel in the proper techniques and practices for manual material handling before beginning work.
- When assigning manual material handling tasks consider personal physical limitations that vary among individuals.
- When heavy or bulky material is to be moved, evaluate the material handling requirements in terms of weight, size, distance, and path of movement. Observe the following hierarchy when selecting a means for material handling:
  - Eliminate material handling needs by engineering
  - Move by mechanical device (e.g., lift truck, overhead crane, or conveyor)
  - Move by manual means with handling aid (e.g., dolly or cart)
  - Move using safe lifting techniques. Refer to safe lifting procedures in **LUS-HSE-WG3-446-003**, Ergonomics.
- Ensure that material handling devices suit the material handling needs of an activity. Provide the proper tools for the job to be performed.
- Wear PPE as prescribed.
- In all instances, personnel must seek assistance when performing manual material handling tasks that appear to be beyond their physical capabilities. No single worker shall attempt to manually handle loads in excess of 22.7 Kg (50 lbs.).
- If a lift appears to be very strenuous, apply a test strain first. Avoid high manual overhead lifts; as a general rule, stack materials manually to about waist height.
- Two or more personnel lifting one item coordinate the movement of materials in unison.
- Use additional planning for such problems as sharp edges, odd sizes of shapes of loads, hazards of fragile material, uneven weight distribution, and routes of travel while handling material.
- When using jacks, remove the handles when they are not in use. Jacks must be level and set on a firm surface and are operated by hand, not by foot.
- Do not hoist bagged material, lumber, bricks, masonry blocks, and similar unsecured type materials by slings unless they are secured against falling by straps, sideboards, nets, or other suitable devices that fully secure the load.

- Use tag lines to control loads when hoisting materials near personnel, structures, or equipment. Exceptions to this requirement can be considered when it is shown that use of tag lines creates undue hazards.

5.0 General Storage

Handling and storage requirements must be in accordance with the literature provided in the product MSDS described in **LUS-HSE-WG3-446-010**, Control of Substances Hazardous to Health.

Perform housekeeping of storage areas in accordance with **LUS-HSE-WG3-446-005**, Field & Office Facilities.

Store materials in a planned and orderly manner to avoid endangering the safety of employees:

- Do not store materials under overhead power lines.
- Stack combustible materials securely. Do not allow stacks or piles to exceed 4.8 m (16') in height. Do not store combustible material within 3.0 m (10') of a building or structure.
- Do not place or store materials so as to interfere with accessways, doorways, or hoistways. Ensure that the aisle width is adequate to accommodate the firefighting equipment.
- Maintain a clearance of 44 inches around the path of travel of fire doors.
- Do not place materials stored inside buildings under construction within 1.8 m (6') of any hoistway, or inside floor openings, or within 3.0 m (10') of an exterior wall that does not extend above the top of the material stored.
- Ensure that driveways between and around combustible storage piles are at least 4.5 m (15') wide and are maintained free of accumulations of material or rubbish. For driveways in an open yard, plan for combustible material storage areas.
- To prevent tripping hazards, each tool must have a designated storage place when not in use. Subcontractors will not leave loose tools and materials on stairways, poles, ladders, or other elevated locations.
- Do not allow accumulations of scrap or materials to obstruct accessways and exits. Separate material and store it in piles of similar sizes and types.
- Store and maintain office supplies in neat and orderly piles with similar materials stacked together.
- Do not leave boxes and/or materials unattended on the floor, and do not allow them to block access to any area.
- Do not store or leave loose or light materials on roofs unless they are safely tied down or secured.
- Avoid running hoses, power cords, welding leads, ropes, and other tripping hazards across traffic areas.
- Secure cords, hoses, and leads 2.1 m (7') above walkways and work areas.
- Provide containers for storing or carrying rivets, bolts, and similar items.
- Ensure that stacks, tiers, and piles are stable and stacked to facilitate safe handling and loading.
- Stack bagged materials by stepping back the layers and cross-keying the bags at least every ten (10) bags high, except when restrained by walls or partitions of adequate strength.
- Ensure that all nails are removed from reusable lumber before it is stacked for storage. Place scrap lumber in containers; do not allow it to accumulate in work areas.
- Stock brick and blocks on an even, solid surface.

Except for floors or slabs on grade, post the maximum safe load limits in pounds per square foot in conspicuous locations in all indoor storage areas. Do not exceed these maximum safe loads.

Display weight limits prominently on all pallet racks throughout the storage facility. Materials stored on pallet racks cannot exceed the recommended weight limits set by the manufacturer. Use shrink-wrap or other adequate means to contain all materials stored at or above 2.1 m (84") from floor level.

Maintain a clearance of at least .9 m (36") between stored materials and sprinkler heads.

Portable fire extinguishing equipment rated 2A40B:C is provided at accessible, marked locations in the yard. Portable fire extinguishers are placed so that maximum travel distance to the nearest unit does not exceed 100 feet.

Store, handle, and pile materials with consideration for their fire characteristics, according to **LUS-HSE-WG3-446-012**, Fire Protection:

- Separate incompatible materials that may create a fire hazard by a distance of at least 25 feet or isolate them by a barrier having at least a 1-hour fire rating.
- Pile material to minimize the spread of fire internally and to provide convenient access for firefighting.
- Ensure that portable fire extinguishers have a minimum rating of 2A40B:C and are stored at accessible marked locations in the building.
- Place portable fire extinguishers so that the maximum travel distance to the nearest unit does not exceed 23 m (75').
- Do not store flammable liquids, paints, and thinners unless they are required for operation. If storage is necessary, keep flammable liquids in a metal cabinet approved for storage of flammable liquids.

6. Compressed Gas Storage

- Store all compressed gas cylinders in an upright position.
- Secure cylinders by a chain to ensure that they will not be accidentally knocked over.
- Ensure that storage locations are well ventilated, in accordance with **LUS-HSE-WG3-446-037**, Ventilation. Do not allow ambient room storage temperatures to exceed 52°C (125°F).
- When rigs are not in use, turn off valves, and bleed down and disconnect hoses, remove regulators, and place safety caps on bottles.
- Ensure that cylinder storage locations are distinctly marked with the names of each compressed gas maintained at the location. Post "NO SMOKING — FLAMMABLE GAS" signs at all entrances to locations where flammable gases are stored.
- Ensure that each compressed gas cylinder maintained at a storage location is labeled with proper identification of its contents.
- All cylinders in storage require valve protection caps at all times except when the cylinder contents are being dispensed.
- Ensure that storage locations for oxidizing gas (i.e., oxygen) and flammable gas (e.g., acetylene) cylinders maintain a minimum distance of 6.1 m (20') to separate the oxidizing and flammable gas cylinders.
- Control and segregate cylinder storage areas which contain flammable gases to avoid contact with a possible ignition source. Walls of the storage area must have a fire rating resistance of at least 1 hour, and doors must be in accordance with NFPA 80.
- Heat flammable gas storage areas by indirect means (i.e., steam or hot water).
- Electrical equipment within a flammable storage area must be in accordance with **LUS-HSE-WG3-446-024**, Electrical, and NFPA 70.
- Ensure that portable fire extinguishers consisting of carbon dioxide and/or dry chemical are available at the storage locations.

7. Compressed Gas Transportation

- When transporting gas bottles, securely mount them in a rack or cart. Cylinders must be secured individually, rather than "gang strapped."
- Do not roll, slide, or drag compressed gas cylinders from one location to another. Do not roll cylinders onto a forklift.
- If cylinders are to be hauled by a powered vehicle, secure them in a vertical position. Do not use chokers to haul cylinders.
- Use only an approved handtruck to transport cylinders.
- Before moving any cylinders, remove all pressure regulators and install valve protection caps.
- Do not hoist compressed gas bottles by a sling.

- Do not use protective caps to lift cylinders.

8. Compressed Gas Handling

- Before using a compressed gas cylinder, inspect all cylinder connections, hoses, valves, regulators, and torches. All connections must be tight with no leaks. Do not use damaged and/or deteriorated cylinder, valves, couplings, hoses, etc.
- Do not lubricate compressed gas-cylinder valves, couplings, hoses, etc., or allow them to come into contact with oil and/or grease. Ensure that regulators are kept free of oil. Do not place cylinders of compressed gases in areas where there may be oil and/or grease; do not handle these cylinders with oily and/or greasy hands.
- If the contents of a compressed gas cylinder are depleted, fully close the cylinder valve and reinstall the valve protection cap. Mark the cylinder tank appropriately with an “EMPTY TANK” sign and store the tank in a secured upright position.
- Tag cylinder valve leaks and remove leaking cylinders from service. If a fuse plug leaks, leave the cylinders in service and apply tags stating “DO NOT USE.”
- Do not use compressed gas cylinders in areas where the cylinder tank may come in contact with any sparks or flames.
- Compressed gases contained within a cylinder are under extremely high pressure. Therefore, whenever gas is to be withdrawn from a cylinder, use pressure-reducing valves. Under no circumstances is gas to be removed from a cylinder without the use of a pressure-reducing valve.
- When opening cylinder valves, point the gas outlets away from the user and any other facility personnel standing in the immediate usage area.
- Open all cylinder valves slowly using only approved wrenches for the cylinder as provided by the supplier. When using a compressed gas cylinder, ensure that the operating wrench remains on the cylinder valve at all times.
- After each use of a compressed gas, fully close the cylinder valve and slowly purge all gas remaining in the regulator valve. Remove the regulator valve, install, the cylinder valve cap, and remove the cylinder tank from the work area and return it to its proper storage location.
- Use cylinder trucks to secure cylinders in a vertical position while in use.
- Ensure that cylinders are never placed where they can become part of an electrical circuit.
- Keep cylinders away from actual work so that no sparks, hot slag, or flame can reach them. If cylinders cannot be isolated, provide fire-resistant shields for them.
- Install flashback arrestors on all gas lines at the pressure regulators. Torches must have flashback protection built into the torch body or check valves between hose and torch.

9. Flammable and Combustible Liquid Storage

- The project manager designates a qualified person to oversee all storage, handling, and use of flammable and combustible liquids in accordance with NFPA 30.
- Smoking is prohibited within 15 m (50’) of areas used for flammable and combustible material storage and handling. Use signs to designate no smoking areas.
- Only approved containers and portable tanks may be used to store flammable and combustible liquids:
  - Use approved metal safety cans for flammable liquids in quantities greater than 1 gallon.
  - For quantities of 1 gallon or less, use only the original manufacturer’s container or approved metal safety cans.
    - Label containers in accordance with **LUS-HSE-WG3-446-010**, Control of Substances Hazardous to Health.

- Plastic containers shall never be used for flammable and combustible liquids storage.

- Lubricating, linseed, and motor oils in small quantities need not be stored in safety cans. However, never store these oils in open containers (e.g., cans or buckets), and always tag, label, or otherwise indicate the contents on the outside of each container.
- Do not store flammable or combustible liquids in areas used for exits, stairways, or normally used for the safe passage of people.
- Store flammable and combustible liquids in excess of 25 gallons in an approved cabinet meeting the requirements of the governing regulatory agency, or the NFPA.
  - Do not store more than 25 gallons of flammable/ combustible liquids in a room outside of an approved storage cabinet.
  - Label storage cabinets in conspicuous lettering: “FLAMMABLE — KEEP FIRE AWAY.”
  - Do not store more than 60 gallons of flammable liquids or 120 gallons of combustible liquids in any one storage cabinet. Do not locate more than three cabinets in a single storage area.
- Store large containers (55-gallon drums) of oils or solvents outside in specially designed lined and bermed containment areas.
- For storage of flammable and combustible liquids outdoors, containers (no more than 60 gallons each) cannot exceed 1,100 gallons in any one pile or area. Separate piles or groups of containers by a 2.0 m clearance and a distance of 6.1 m (20”) from any building or structure.
- Within 60.0 m (200’) of each pile of containers, provide a 3.7 m (12’) wide access way to permit approach of fire control apparatus.
- Grade the storage area to divert possible spills away from buildings or other exposures, or surround it by a curb or earthen berm at least 12” high. When curbs or berms are used, make provisions to drain off accumulations of groundwater or rainwater, or spills of flammable or combustible liquids.
- Take precautions to prevent the ignition of flammable/combustible vapors. Sources of ignition include:
  - Cutting and welding
  - Frictional heat
  - Hot surfaces
  - Lightning
  - Open flames
  - Radiant heat
  - Smoking
  - Spontaneous ignition, including heat-producing chemical reactions
  - Static, electrical, and mechanical sparks
- To prevent accumulation of static charge, ensure that containers are electrically bonded and grounded according to **LUS-HSE-WG3-446-024**, Electrical.
- Locate at least one portable fire extinguisher (with a rating of no less than 20-B units) between 7.6 m (25’) and 22.9 m (75’) feet from any flammable/combustible liquid storage area located outdoors.
- Provide ventilation to prevent vapor accumulations in enclosed chemical storage areas in accordance with LCSMP 37-00, Ventilation:
  - Vapors released by solvents without adequate ventilation will be explosive if concentrated in sufficient volume in closed or restricted areas.
  - Where flammability is not of concern, inhalation toxicity protection can be afforded by breathing air equipment, in accordance with **LUS-HSE-WG3-446-008**, Respiratory Protection Program. Skin contact, skin absorption, and oral ingestion protection must be considered as part of the protection ensemble.

- Employees must guard carefully against any part of their clothing becoming contaminated with flammable or combustible fluids. Employees shall not continue work if their clothing becomes contaminated; they must remove or wet down the clothing as soon as possible.
- Hot work such as welding, cutting, and brazing operations, use of spark-producing power tools, and chipping operations is permitted only under the conditions of a hot work permit, in accordance with **LUS-HSE-WG3-446-028**, Welding, Cutting, and Brazing.
- Tank cars/trucks must be spotted and not loaded or unloaded until brakes are set and wheels chocked, precautions are taken against fire or other hazards, and cars/trucks are properly bonded and grounded. Tank cars/trucks must be attended by a designated person during loading or unloading.

10. Explosives Transportation & Handling

The use of explosives is not anticipated at the Lusail Real Estate Development Project. However, should work activities require the use of any material defined as explosive, the following guidelines shall be followed.

- Use explosives in accordance with **LUS-HSE-WG3-446-031**, Blasting, and applicable DOD standards.
- No smoking, open lights, or fire of any kind is allowed within 15.2 m (50”) of any area where explosives are being handled.
- Explosives must be:
  - Opened from containers using nonsparking tools
  - Removed from containers only as they are needed for immediate use
  - Separated from detonators and taken to the blasting area in original containers

11. Disposal

- Dispose of all refuse materials in a safe and efficient manner that eliminates the threat of workplace injury or illness.
- The Contractor shall provide containers for the storage and/or collection of waste, trash, scrap, leftover materials, and other refuse. If PPE or other precautions are necessary to handle waste, these items will be handled as waste material.
- The Contractor shall facilitate removal of combustible debris as detailed below:
  - All receptacles for combustible materials must be constructed of metal or other suitable material. Do not use paper or pasteboard cartons, wooden boxes, crates, or similar containers for collection of combustible trash.
  - Ensure that receptacles are equipped with a solid, tight-fitting cover.
  - Ensure that receptacles intended for waste and rags saturated with oil, grease, turpentine, or other flammables subject to spontaneous ignition are of the self-closing lid type approved for this purpose. They must also be marked for this purpose “only.”
  - Ensure that receptacles located inside buildings are kept at least 1.0 m away from combustible walls and partitions.
  - Ensure that receptacles located outside of buildings for combustible trash are located at least 4.6 m (15’) from the building or other combustible material.
- Do not throw cigarette and cigar butts, matches, etc., into trash receptacles; dispose of them in regulated areas known as “smoke pens.”
- Place glass (broken, empty jars, etc.), scrap metal, and similar material in properly labeled trash containers using mechanical means (e.g., brush and dustpan).
- Place all personal litter or lunch remnants in trash receptacles.
- Ensure that scrap materials for disposal are cleared from work areas, passageways, and stairs.
- Prevent nail punctures by removing nails from reusable material or by bending the nails over until they do not protrude.

- Remove any empty bags previously containing cement lime or other dust-producing materials from work areas at least daily.
- Do not throw waste materials and rubbish down from a height of more than 1.8 m (6'), unless an enclosed chute is used, or the area into which the material is dropped is enclosed with barricades greater than 1.1 m (42") in height, with signs warning of the hazard of falling material.
- Collect, handle, store, and dispose of construction hazardous wastes (e.g., vehicle and equipment oils and lubricants, containers and drums for solvents, and adhesives, spills) in accordance with Lusail Waste Management Plan.

12. Periodic Inspection

The Contractor project manager ensures that hazardous materials storage areas are inspected at least weekly. Personnel responsible for inspection shall be knowledgeable of all fire prevention and chemical compatibility requirements.

Inspectors shall document their storage area inspections and report findings to the HSE Representative. Inspectors shall have the authority to make required changes to storage areas which are necessary for fire, adverse reaction and/ or spill prevention.

13. Training

Contractors shall train their employees in the proper handling and storage procedures to be used on the worksite. All training shall be documented and filed retained in the Contractor site office files.

The HSE Representative arranges employee training at the time of initial assignment. Supervisors are responsible for identifying additional employee training needs during risk mitigation planning (2-week look ahead). Training can be organized and presented to groups or on a work area by work area basis, depending on the operation.

Employees are trained in safe lifting techniques in accordance with **LUS-HSE-WG3-446-003**, Ergonomics.

Additional re-training is conducted whenever there are deviations from, or inadequacies in, the employee's knowledge or use of proper procedures. The re-training re-establishes employee proficiency and introduces new or revised control methods and procedures, as necessary.

14. Documentation

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

15. References

Qatar Construction Specifications 2010 Section 1 Part 10.3.12 "Compressed Gas Cylinders"

Qatar Construction Specifications 2010 Section 1 Part 10.5 "Fire Precaution and Prevention"

Qatar Construction Specifications 2010 Section 1 Part 10.5.3 "Hazardous Substances"

Qatar Construction Specifications 2010 Section 2 Part 1.5 "Use of Explosives"

Qatar Construction Specifications 2010 Section 11 Part 1.5.9 "Other Hazardous Activities"

Qatar Construction Specifications 2010 Section 11 Part 1.7 "Fire and Flammable Substances"

NFPA 30, Flammable and Combustible Liquids Code

NFPA 70, National Electrical Code (NEC)

NFPA 80, Standard for Fire Doors and Fire Windows