

RISK ASSESSMENT FOR THE CLEANING AND DEMOLITION OF THREE FUEL OIL RESERVOIR TANKS FROM THE ENEMALTA POWER STATION, MARSA.

1. PREAMBLE

- 1.1 The hazards associated with the tanks are those associated with the following risks:
 - 1.1.1 toxic atmospheres existing in the confined tanks,
 - 1.1.2 flammable and toxic chemicals in the residue sludge,
 - 1.1.3 noise and vibrations as part of the demolition works.
- 1.2 The local Legal Notices that governs the entry into the Enemalta tanks are the following:
 - 1.2.1 The Work Place (Minimum Requirements for Work) (Confined Spaces and Spaces having Explosive Atmospheres) Regulations, 2004, L.N. 41 of 2004. This LN transposes Directive 1999/92/EC of the European Parliament and of the Council on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres. The European Commission published a Non-binding guide to good practice for implementing Directive 1999/92/EC “ATEX” (explosive atmospheres).
 - 1.2.2 The Protection of the Health and Safety of Workers from Risks related to Chemical Agents at Work Regulations, 2003, L.N. 227 of 2003, as amended by Legal Notice 353 of 2007 and 53 of 2012.
 - 1.2.3 Work Place (Minimum Health and Safety Requirements for the Protection of Workers from Risks resulting from Exposure to Noise) Regulations. L.N. 158 of 2006.
 - 1.2.4 Work Place (Minimum Health and Safety Requirements for the Protection of Workers from Risks resulting from Exposure to Vibration) Regulations L.N. 371 of 2005.
- 1.3 Based on these LN’s, the request submitted by Enemalta asserts the removal and transfer of any fuel oil remaining in the tanks to a nearby reservoir tank, as well as the ventilation of the emptied tanks that are earmarked for demolition.
- 1.4 DDE ATTARD Ltd, shall consider the following assumptions, which shall be verified and certified:
 - 1.4.1 The tanks have been used exclusively for HFO for at least the past 5 years.
 - 1.4.2 The tanks shall be emptied completely by Enemalta or DDE Attard as per the agreement, and the levels of VOC’s inside the tank shall be lower than the occupational limits imposed by local and international guidelines.
 - 1.4.3 Prior to entry into the tank by DDE Attard personnel, a Confined Space entry permit shall be issued by the contractor as required in L.N. 41 of 2004 as per Annex 2 – Confined Space Entry Program – TUV v2.
 - 1.4.4 All the waste shall be transferred to the Enemalta Reservoir and shall become the sole responsibility of Enemalta according to EC Directive 2001/33/EC for final destruction locally or overseas following agreement with MEPA.
 - 1.4.5 It is likely that the deposits shall be in the region of about 20 m³. Five one kilogramme samples shall be collected from different areas of the tank bottom. These five samples shall be mixed as a composite sample. One sub-sample from this mix shall be sent to the lab for

characterisation. In case the sample proves to have a high quantity of mineral oil content, the sample shall be incinerated at 800 °C to simulate destruction of the oil. The resultant sand shall then undergo tests to classify according to Directive 2003/33/EC.

- 1.4.6 It is highly likely that any remaining settled sludge shall retain some fuel oil residues due to the absorption and adsorption characteristics of such sludges. The Sludge will be retained by Enemalta and will be disposed of as part of the Full MPS Decommissioning tender (Option 2)

2. HAZARDS ASSOCIATED WITH FUEL TANK CLEANING.

- 2.1 Although identifiable hazards found in a regular workspace can also be found in a confined space, the same hazards are far more hazardous in a confined space than in a regular worksite.
- 2.2 Hazards in confined spaces such as the Enemalta Tanks, include the following hazards which shall be addressed in this RA:
 - 2.2.1 Poor air quality: The atmosphere might contain a poisonous substance such as hydrocarbon fuel vapours and particulates that could make the worker ill or even cause the worker to lose consciousness.
 - 2.2.2 Natural ventilation alone will not be sufficient to maintain breathable quality air. Air quality may not be uniform throughout the tank due to inexistent air currents and localised residues of volatile chemicals.
 - 2.2.3 Chemical exposures may lead to skin contact or ingestion as well as inhalation of 'stale' air.
 - 2.2.4 Fire Hazard: There may be an explosive/flammable atmosphere due to residual flammable liquids and gases and combustible dusts which if ignited would lead to fire or explosion.
 - 2.2.5 Process-related hazards such as residual chemicals, release of the volatile fuels from supply lines.
 - 2.2.6 Noise and vibrations from reverberations inside the tanks.
 - 2.2.7 Safety hazards such as moving parts of equipment, structural hazards, entanglement, slips, and falls.
 - 2.2.8 Temperature extremes including atmospheric and surface.
 - 2.2.9 Shifting or collapse of bulk material.
 - 2.2.10 Visibility.
 - 2.2.11 Biological hazards.
- 2.3 The possible outcomes of these hazards include:
 - 2.3.1 The entrance/exit of the confined space might not allow the worker to get out in time should there be a surge of toxic air.
 - 2.3.2 Self-rescue by the worker is more difficult.
 - 2.3.3 The dimensions and the distance separating the manholes renders rescue of the victims more difficult.
 - 2.3.4 The interior configuration of the confined space often does not allow easy movement of people with breathing or working equipment within it.
 - 2.3.5 Work activities may introduce hazards not present initially.

3. ENTRY PERMITS INTO A CONFINED SPACE.

- 3.1 The basic information that one would include in order to apply for an Entry Permit, are the following:

- 3.1.1 Full details including dimensions and accessibility where exactly the work is to be carried out.
- 3.1.2 Clear identification of the work to be undertaken.
- 3.1.3 Hazard identification, including hazards due to the environment of the tank.
- 3.1.4 Current air quality and residues earmarked for removal.
- 3.1.5 Precautions that shall be projected to be undertaken, the person undertaking the precautions, as well as a checklist to show that the safety procedures are being followed
- 3.1.6 The personal protective equipment required.
- 3.1.7 An estimate of when the work will begin and when it is expected to end.
- 3.1.8 Time table of works including personnel shift work.
- 3.1.9 Procedure for handback, plant ready for testing and decommissioning.
- 3.1.10 Reports on any anomaly encountered during the work.

4 ENSURING SAFE AIR QUALITY ACCORDING TO OCCUPATIONAL HEALTH AND SAFETY STANDARD LIMITS

- 4.1 Prior to the commissioning of the works, and as part of the Confined Space Entry Permit, the following guidelines shall be used with respect to the analytical measurements of parameters:
 - 4.1.1 The concentration of the explosive and flammable hazardous fuel oil vapour or gas must be retained to less than 2% of its Lower Explosive Limit (LEL).
 - 4.1.2 Calculation of the LEL concentration of heavy fuel oil:
 - 4.1.2.1 HFO has an LEL of 0.5% v/v with respect to the volume of air.
 - 4.1.2.2 This works out to be 5 litres of the fuel in 1m³ of the confined space.
 - 4.1.2.3 The 5 litres of gaseous diesel consists of about 20,000 mg of hydrocarbon vapour by weight, which is therefore dispersed in 1m³.
 - 4.1.2.4 The LEL is therefore 20,000 mg/m³. A 2% safe limit of this LEL is therefore 400mg/m³.
 - 4.1.2.5 NO WORK WHATSOEVER SHALL BE ATTEMPTED IF THE LEVELS OF VOC's INSIDE THE TANK EXCEED THIS 400mg/m³ CONCENTRATION.
 - 4.1.2.6 If potential flammable atmosphere hazards are identified during the initial testing, the confined space should be cleaned or purged, ventilated and then tested again before entry to the confined space is allowed. Only after the air testing is within allowable limits should entry occur as the gases used for purging can be extremely hazardous.
- 4.2 Fuel vapour levels, as Volatile Organic Compounds (VOC's), inside and immediately outside the tank, shall be attempted to be lower than 20mg C/Nm³ which is the limit set by MEPA to Enemalta dated 15/05/2012.
- 4.3 VOC's have to be measured using real time reading monitors. The restricted and hazardous environment inside the tank precludes the use of electric or flame detectors. We shall use an AeroQual VOC monitor that provides real time results, reading 0-25 mg/m³ VOC as CH₄.
- 4.4 The inhalable particulate dust levels, measured as PM₁₀, shall be lower than 10mg/m³ which is the recommended limit by the UK HSE,
- 4.5 The respirable particulate dust levels, measured as PM_{2.5}, shall be lower than 4mg/m³ which are the recommended limit by the UK HSE.
- 4.6 Samples of residues shall be measured for pathogenic bacteria.
- 4.7 No conspicuous liquid fuel residues shall remain inside the tank, when the safe entry is given for the use of flames to strip the tanks.

- 4.8 DDE Attard Ltd shall use the manual scraping method to decontaminate the tanks from the inside, after removing the sludge. No water or chemicals shall be used for the decontamination process. DDE Attard state that this procedure shall be sufficient to complete decontamination, and that will need to be followed by my certification.
- 4.9 During the cleaning operation, continuous ventilation shall be provided at volumes and flow rates sufficient to ensure that the oxygen content is maintained at or above 19.5 percent and below 22.0 percent by volume.
- 4.10 During the cleaning operation, the following parameters shall be monitored in order to verify compliance to safety limits:
 - 4.10.1 Volatile organic compounds every 2-3 hours.
 - 4.10.2 Oxygen levels every 2-3 hours.
 - 4.10.3 Inhalable and respirable particulate dust levels every 8 hours.
- 4.11 Forced mechanical ventilation shall be provided, with a warning system in place to immediately notify the workers in the event of a hazard or a failure in the ventilation equipment.
- 4.12 The air being provided by the ventilation system to the confined space shall be 'clean' throughout the entire space.
- 4.13 In view of the danger of pockets of toxic fuel vapours and gases still remaining inside the tank, even with the use of mechanical ventilation, air movement shall be ensured to have a smooth flow throughout the confined space of the tank.
- 4.14 Air being removed from the confined space is exhausted away from workers on the outside of the tank areas.
- 4.15 No work using flames shall be used prior to the complete removal of oil and the issue of a safe entry certificate.
- 4.16 No electric power tools shall be used, although lighting shall be used using explosion proof light sources, with switches being isolated far away from the area of the tanks.

5 DOCUMENTATION AND FORMS

- 5.1 In order to comply to the requirements of L.N. 41 of 2004, DDE Attard Ltd shall present the following documents to the local OHSA:
 - 5.1.1 Checklist for the Explosion Projection Equipment Assessment INSIDE Tank.
 - 5.1.2 Checklist for the Explosion Projection Equipment Assessment OUTSIDE the Tank.
 - 5.1.3 The Confined Space Entry Permit
 - 5.1.4 The Permit to Work Form
 - 5.1.5 Checklist for Coordination Measures.
 - 5.1.6 Checklist for the Tasks of the Coordinator for Explosion Protection.
 - 5.1.7 Checklist following Completeness of Operation.

Copies of these documents shall be in line with the document:

Non-binding guide to good practice for implementing the European Parliament and Council Directive 1999/92/EC. Minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres. Employment Social Affairs of the European Commission Directorate-General for Employment, Social Affairs and Equal Opportunities Unit D.4. April 2003

DR GEORGE PEPLOW

FEBRUARY 2015