



# 4 Square Engineering Consultancy Limited

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## DSEAR Compliance / Gap Analysis Report for the Refrigerant Transfer System

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**Report provided for: GAP Group - Gateshead**

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Prepared by:

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Recommendations detailed within this document are provided as examples of potential solutions or risk reduction measures. The recommendations are neither prescriptive, nor exhaustive and other alternative actions may be appropriate. The application of any such recommendations is the responsibility of the client.

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## Table of Contents

1.0	Summary.....	7
1.1	Objectives .....	7
1.2	Summary of Findings.....	7
2.0	Introduction .....	8
2.1	Refrigerant Transfer System.....	8
2.2	Regulatory Background .....	8
2.3	Scope.....	8
2.4	Report Format / Status .....	8
3.0	Summary of DSEAR Regulations.....	10
4.0	Compliance Report – DSEAR Verification.....	11
4.1	Regulation 1 – Citation and Commencement .....	11
4.2	Regulation 2 – Interpretation.....	11
4.2.1	Guidance for Dangerous Substances .....	11
4.2.2	Guidance for Hazard .....	11
4.2.3	Guidance for Risk.....	11
4.2.4	Guidance for Workplace.....	11
4.2.5	Guidance for Work Processes .....	11
4.2.6	Guidance for Explosive Atmospheres .....	11
4.2.7	General Compliance .....	12
4.3	Regulation 3 – Application .....	12
4.4	Regulation 4 – Duties under these Regulations.....	12
4.5	Regulation 5 – Risk Assessment .....	13
4.5.1	Reg. 5(1) – Risk Assessment .....	13
4.5.2	Reg. 5(2) – Risk Assessment Criteria .....	13
4.5.3	Reg. 5(2)(a) - Properties of Hazardous Substances Present.....	13
4.5.4	Reg. 5(2)(b) - Safety Information Provided by Supplier .....	13
4.5.5	Reg. 5(2)(c) - Type of Work or Activities Carried Out .....	13
4.5.6	Reg. 5(2)(d) - Non-operations Related Activities .....	14
4.5.7	Reg. 5(2)(e) - The Effect of Measures Taken.....	14
4.5.8	Reg. 5(2)(f) - Likelihood of an Explosive Atmosphere Being Present.....	14
4.5.9	Reg. 5(2)(g) - Likelihood of Ignition Sources Being Present .....	14
4.5.10	Reg. 5(2)(h) - Scale of the Effects of a Fire or Explosion.....	15
4.5.11	Reg. 5(2)(i) - Places Connected by Openings or Ducts.....	15
4.5.12	Reg. 5(2)(j) - Additional Information Relevant to the Assessment.....	15
4.5.13	Reg. 5(3) – Risk Assessment Review .....	15
4.5.14	Reg. 5(3)(a) – When the Risk Assessment is No Longer Valid.....	15
4.5.15	Reg. 5(3)(b) – When Plant has been Modified .....	15
4.5.16	Reg. 5(4) – Record Significant Findings.....	16
4.5.17	Reg. 5(4)(a) - Measures to be Taken.....	16
4.5.18	Reg. 5(4)(b) – Provide Information so as to Carry Out Work Safely.....	16

4.5.19	Reg. 5(4)(c) – Additional Information .....	16
4.5.20	Reg. 5(4)(c)(i) - Areas Classified into Zones .....	16
4.5.21	Reg. 5(4)(c)(ii) - Essential Safety Equipment .....	16
4.5.22	Reg. 5(4)(c)(iii) - Explosion Safety Verification.....	16
4.5.23	Reg. 5(4)(c)(iv) - Duty of Co-ordination Role.....	16
4.5.24	Reg. 5(5) – New Work Activities .....	16
4.6	Regulation 6 – Elimination or Reduction of Risks .....	17
4.6.1	Reg. 6(1) – Eliminate or Reduce the Risk.....	17
4.6.2	Reg. 6(2) – Risk Elimination Prioritisation .....	17
4.6.3	Reg. 6(3)(a)(b) – Risk Control and Mitigation.....	17
4.6.4	Reg. 6(4) – Risk Prioritisation .....	17
4.6.5	Reg. 6(4)(a) - Reduce Quantity of Dangerous Substance .....	17
4.6.6	Reg. 6(4)(b) - Avoid or Minimise Release of Dangerous Substances .....	17
4.6.7	Reg. 6(4)(c) - Control any Such Release .....	18
4.6.8	Reg. 6(4)(d) - Prevent the Formation of an Explosive Atmosphere.....	18
4.6.9	Reg. 6(4)(e) - Collect, Contain, Remove Releases to Safety.....	18
4.6.10	Reg. 6(4)(f)(i) - Prevent the Likelihood of an Ignition.....	18
4.6.11	Reg. 6(4)(f)(ii) - Prevent Adverse Conditions .....	19
4.6.12	Reg. 6(4)(g) - Segregate Incompatible Substances.....	19
4.6.13	Reg. 6(5) – Example Mitigation Actions .....	19
4.6.14	Reg. 6(5)(a) - Reduce the Number of Employees Exposed.....	20
4.6.15	Reg. 6(5)(b) - Avoid the Propagation of Fires.....	20
4.6.16	Reg. 6(5)(c) - Provide Explosion Pressure Relief Arrangements .....	20
4.6.17	Reg. 6(5)(d) - Provide Explosion Suppression Equipment.....	20
4.6.18	Reg. 6(5)(e) - Provide Plant which is Robustly Constructed .....	20
4.6.19	Reg. 6(5)(f) - Provision of Suitable PPE.....	20
4.6.20	Reg. 6(6) – Handling, Storage and Transportation.....	20
4.6.21	Reg. 6(7) – Maintain Measures Pursuant to the Regulations.....	21
4.6.22	Reg. 6(8) – General Safety Measures .....	21
4.7	Regulation 7 – Places where Explosive Atmospheres May Occur .....	21
4.7.1	Reg. 7(1) - Classify Workplaces into Zones .....	21
4.7.2	Reg. 7(2) - Install Suitably Rated Equipment in Hazardous Areas.....	21
4.7.3	Reg. 7(3) - Install Appropriate Signage.....	21
4.7.4	Reg. 7(4) – Verification of Site Explosion Safety .....	21
4.7.5	Assessment of Substances Present .....	22
4.7.6	Suitability of Plant.....	22
4.7.7	Work Processes and Activities .....	22
4.7.8	Prevention of Formation of Explosive Atmospheres .....	22
4.7.9	Control Risks from Explosive Atmospheres .....	22
4.7.10	Mitigate the Effects from an Explosion.....	22
4.7.11	Effectiveness of Emergency Arrangements .....	22

4.7.12	Reg. 7(5) – Provision of Suitable Work Clothing .....	22
4.7.13	Reg. 7(6) – Implementation of Transitional Arrangements.....	23
4.8	Regulation 8 – Arrangements to deal with Accidents, Incidents and Emergencies .....	23
4.8.1	Reg. 8(1)(a) – Emergency Procedures .....	23
4.8.2	Reg. 8(1)(b)(i) - Information on Handling Emergencies .....	23
4.8.3	Reg. 8(1)(b)(ii) - Information on Specific Hazards .....	23
4.8.4	Reg. 8(1)(c)(d) - Warning and Communication Systems .....	23
4.8.5	Reg. 8(2) – Information Available to Personnel.....	23
4.8.6	Reg. 8(2)(a) – Information Available to Emergency Services .....	23
4.8.7	Reg. 8(2)(b) - Information is Displayed at the Workplace. ....	24
4.8.8	Reg. 8(3) – Employer Emergency Actions .....	24
4.8.9	Reg. 8(3)(a)(i) - Mitigate the Effects of the Emergency.....	24
4.8.10	Reg. 8(3)(a)(ii) - Restore the Situation to Normal. ....	24
4.8.11	Reg. 8(3)(a)(iii) - Inform those Employees Affected.....	24
4.8.12	Reg. 8(3)(b) – Essential Personnel.....	24
4.8.13	Reg. 8(3)(b)(i)(ii) – Emergency Response PPE and Safety Equipment .....	24
4.8.14	Reg. 8(4) – Dispensation of Regulations 8(1), 8(2), 8(3) .....	25
4.9	Regulation 9 – Information, Instruction and Training.....	25
4.9.1	Reg. 9(1)(a) - Information, Instruction and Training.....	25
4.9.2	Reg. 9(1)(b) - Details of the Dangerous Substances .....	25
4.9.3	Reg. 9(1)(c) - Significant Findings of the Risk Assessment. ....	25
4.9.4	Reg. 9(2)(a)(b) – Information, Instruction and Training.....	25
4.10	Regulation 10 – Identification of Hazardous Contents of Containers and Pipes .....	25
4.11	Regulation 11 – Duty of Co-ordination .....	26
4.12	Regulation 12 – Extensions outside Great Britain .....	26
4.13	Regulation 13 – Exemptions.....	26
4.14	Regulation 14 – Exemptions for Ministry of Defence, etc.....	26
4.15	Regulation 15 – Amendments.....	26
4.16	Regulation 16 – Repeals and Revocations .....	26
4.17	Regulation 17 – Transitional Provisions .....	26
4.18	Schedule 1 – General Safety Measures.....	26
4.18.1	Workplaces and Work Processes .....	26
4.18.2	Schedule 1(2) – Design, Construction and Maintenance.....	26
4.18.3	Schedule 1(3) – Work Process Risk Minimisation .....	27
4.18.4	Schedule 1(4) – Work Process Maintenance .....	27
4.18.5	Schedule 1(5) – Mitigation of Additional Risks .....	27
4.18.6	Schedule 1(5)(a) - Power Failure.....	27
4.18.7	Schedule 1(5)(b) - Manual Override / Plant Shut Down Facilities. ....	27
4.18.8	Schedule 1(5)(c) - Dissipation of Accumulated Energy.....	27
4.18.9	Schedule 1(5)(d) - Confusion between Connecting Devices.....	27
4.18.10	Schedule 1(6) - Organisational Measures.....	27

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4.19 Schedule 2 – Area Classification .....28

4.20 Schedule 3 – Selection of Equipment and Protective Systems .....28

4.21 Schedule 4 – Explosive Atmospheres Warning Signs .....28

4.22 Schedule 5 – Marking of Containers and Pipes.....28

4.23 Schedule 6 – Amendments.....28

4.24 Schedule 7 – Repeal and Revocation .....28

Appendix A – Full List of Recommendations.....29

Appendix B – Reference Documentation .....32

**LIST OF ABBREVIATIONS**

ACOP	Approved Code of Practice
ALARP	As Low As Reasonably Practicable
ATEX	ATmosphere EXplosible
CAD	Chemical Agents Directive
COSHH	Control Of Substances Hazardous To Health
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations
EPS	Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations
MSDS	Material Safety Data Sheet
PED	Portable Electronic Devices
PPE	Personal Protective Equipment
PtW	Permit to Work
SOP	Standard Operating Procedure
SOP	Safe Operating Procedure
SSOW	Safe System of Work
WI	Work Instruction

## 1.0 SUMMARY

This DSEAR gap analysis report is a record of the review carried out in May 2022. The audit took place as a result of the management team's desire to ensure DSEAR compliance with the activities carried out with the Refrigerant Transfer System.

### 1.1 Objectives

The key objectives of this report were as follows:

- To highlight where immediate steps could be taken to reduce risk within the area.
- To perform DSEAR compliance gap analysis and to propose remediation actions.

### 1.2 Summary of Findings

- The organisational measures in place within the complex comply with the requirements of Regulation 2, 3 and 4 in terms of hazard recognition and duty of care to employees and non-employees alike. Implement a formal risk assessment system. Update site induction to include the hazards associated with freon and pentane. A formal HSE auditing system is recommended. COSHH assessments require to be updated to include the new materials being handled.
- A DSEAR risk assessment has been created for the facility. The DSEAR risk assessment serves to fulfil the requirements of Regulation 5 (carry out a risk assessment) and Regulation 6 (elimination and reduction of risk). Operations procedures are stated to be in place (or are being created). Formal non-routine work authorisation procedures are in place. A management of change process is not currently in place but is recommended. Spill response procedures are in place and refresher training is to be provided. PUWER assessments require to be implemented for all activities using work equipment. The COSHH assessments require to be updated to include the new materials being handled. Antistatic PPE is recommended for operatives handling flammable liquids. Spill kits should be provided adjacent to the iso-tanker loading bay. Review the iso-tanker operating methodology to confirm that the intended means of determining when the tank is full will be a reliable method of determining fill status.
- The requirements of Regulation 7 (areas specifically associated with flammable atmospheres) have been fulfilled to a large extent. Hazardous area classification has been completed. Procedures for the formal inspection of the certified equipment should be implemented. ATEX signage should be installed to show operatives where the hazardous areas are located and this should be reviewed to ensure all necessary signage is installed. The specification of the PPE used by operatives handling flammable materials is antistatic.
- Regulation 8 is concerned with the arrangements for handling emergencies, incidents and accidents. Emergency procedures are stated to be in place. Liaison with the emergency services has been completed and is ongoing. Confirm personnel are trained for breathing apparatus and use of spill response equipment / materials. Confirm a fire call point will be located near to the iso-tanker.
- Documentation is stated to be in place fulfilling the requirements of Reg. 9 (Information, Training and Instruction). Personnel should be updated on the DSEAR documentation produced.
- It is a requirement of Regulation 10 that all conveyance and containment systems handling dangerous or flammable substances are adequately marked or labelled. This has generally been achieved but is under review and is ongoing.
- Regulation 11 requires a duty of co-ordination to be in place for all activities carried out at the site. A PtW system is in place for activities involving flammable or dangerous materials. Personnel require to be formally trained in the PtW system.

A complete listing of the recommendations for each DSEAR regulation is included in Appendix A – Full List of Recommendations.

## 2.0 INTRODUCTION

### 2.1 Refrigerant Transfer System

The Refrigerant Transfer System is to be used for decanting 1-tonne tanks into larger 22m<sup>3</sup> iso-tankers. The system is comprised of a pump specially selected for the refrigerant duty. The pump suction is connected to the 1-tonne tank by a flexible hose with a quick-connect coupling and the discharge port is connected to the iso-tanker by a similar means.

The 1-tonne tanks contain pentane or freon, or a combination of both, in unknown concentrations.

The final location of the transfer operation had not yet been confirmed at time of writing this report but the location is being selected based on minimising risk on the site from vehicle movements, affecting other adjacent processes (and vice-versa), minimising the number of people affected, etc.

The iso-tanker will be filled over an extended period of time (expected to be around twenty days) as a result of decanting one 1-tonne tank per day. The decanting operation is expected to take around twenty to thirty minutes to complete.

The current design of the iso-tanker includes for a pressure gauge being fitted to determine when the tanker is ready to be transported off-site for the further processing of the refrigerant contents. The current methodology is that it will be deemed to be full when a pressure of 10barg is achieved in the headspace.

This report was commissioned to examine and report on the equipment and operations carried out with the Refrigerant Transfer System in terms of DSEAR compliance.

### 2.2 Regulatory Background

The DSEAR<sup>1</sup> and EPS<sup>2</sup> regulations are the UK implementation of the ATEX Directives as issued by the European Community as part of the legislative process within the EC. The regulations fall under the Health and Safety at Work Act<sup>3</sup> and are mandatory. DSEAR also implements another EU directive: CAD<sup>4</sup> (Chemical Agents Directive), which falls under the EU Framework directive<sup>5</sup> (89/391/EC) for improvement of safety in the workplace as do the two ATEX directives detailed below.

Two EU directives have been issued to achieve safety in potentially explosive atmospheres: ATEX 100a<sup>6</sup> for equipment manufacture and the conformity assessment process and ATEX 137<sup>7</sup> for the safe use of such equipment and safe operation of the areas containing potentially explosive atmospheres.

### 2.3 Scope

The scope of this audit included those activities involved with the storage and use of flammable materials including those activities with flammable dust hazards.

### 2.4 Report Format / Status

Throughout this document, compliance with the DSEAR regulations is considered for each regulation and commented on where appropriate. The purpose of this report is primarily to consider what documentation is available and what organisational measures are in place that could be used as evidence to show compliance with the requirements of the regulations.

The DSEAR Approved Code of Practice (L138)<sup>8</sup> provides advice by way of "Guidance" and "ACOP" sections associated with each regulation.

The status of this advice is explained in the section below (extracted from L138):

#### **Approved Code of Practice**

This Code has been approved by the Health and Safety Executive, with the consent of the Secretary of State. It gives practical advice on how to comply with the law. If you follow the advice you will be doing enough to comply with the law in respect of those specific matters on which the Code gives advice. You may use alternative methods to those set out in the Code in order to comply with the law. However, the Code has a special legal status. If you are prosecuted for breach of health and safety law, and it is proved that you did not follow the relevant provisions of the Code, you will need to show that you have complied with the law in some other way or a Court will find you at fault.



**Guidance**

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

It follows that complying with the regulations through the application of the advice given in the ACOP and other information made available by government departments, such as HSE, does not automatically confer legal immunity from prosecution. The responsibility is upon the employer to ensure that all risks have been assessed and that they have been mitigated "so far as is reasonably practicable" to minimise risk, whether suggested within the ACOP or beyond.

Any mitigation actions outside the scope of the regulations which have been identified and could be used to minimise risk should be assessed for applicability and either implemented or discounted. Any supporting documentation showing the decision process should be retained in order to prove the level of rigour to which any risk assessment has been carried out.

In considering whether the Refrigerant Transfer System facility meets the requirements of DSEAR, this report considers only the evidence presented during the site visit and in subsequent verbal and written communications. In preparing this report, the author has not taken part in any additional structured assessment of risk beyond those already stated in the documentation presented for the verification process.

Where any potential gaps in compliance have been identified, these are defined in this report and suggestions/ methods whereby compliance can be achieved have been proposed.

### **3.0 SUMMARY OF DSEAR REGULATIONS**

The summary provided below is as described in DSEAR Approved Code of Practice (L138).<sup>8</sup>

Regulations 1 to 4 deal with preliminary issues, i.e. the date of entry into force of the Regulations, scope and definitions.

Regulation 5 requires employers and the self-employed to assess risks to employees and others whose safety may be affected by the use or presence of dangerous substances at work.

Regulation 6 sets out how the risk to safety from dangerous substances should be eliminated or reduced.

Regulation 7 contains specific requirements to be applied where an explosive atmosphere may be present (in addition to the requirements in regulation 6).

Regulation 8 requires the provision of arrangements to deal with accidents, incidents and emergencies.

Regulation 9 requires the provision of information, training and instruction on dangerous substances.

Regulation 10 requires the identification of pipes and containers where these contain dangerous substances.

Regulation 11 addresses the need to co-ordinate explosion protection measures where employers share the same workplace.

Regulations 12-16 deal with the application of the Regulations outside Great Britain, exemptions from the Regulations, and amendments to and removal of other legislation.

Regulation 17 sets out the transitional arrangements for workplaces and work equipment where explosive atmospheres may occur.

## 4.0 COMPLIANCE REPORT – DSEAR VERIFICATION

### 4.1 Regulation 1 – Citation and Commencement

This regulation does not require any specific actions to be carried out by employers; the purpose being to set out the commencement, scope and time scales of the regulations. All regulations are now in force; the last of the transitional arrangements having expired on 1<sup>st</sup> July 2006.

### 4.2 Regulation 2 – Interpretation

This regulation defines certain terms contained within the regulations such as “dangerous substance”, “explosive atmosphere”, “hazard”, “personal protective equipment”, “preparation”, “public road”, “risk”, “risk assessment”, “safety data sheet”, “substance”, “workplace”, “work processes”. These definitions minimise the likelihood of any ambiguities concerning the application of the regulations or their fundamental meaning.

The definitions within this regulation also set out the basis for a site to assess the applicability of the regulations to any or all activities carried out.

#### 4.2.1 Guidance for Dangerous Substances

The DSEAR ACOP<sup>8</sup> recommends employers to assess the following:

- Step 1: Check if the substance or preparation is classified under the Classification, Labelling and Packaging of Substances and Mixtures Regulations (CLP).<sup>9</sup>
- Step 2: Assess the physical and chemical properties of the substances and also the work processes involved to determine if the work activity creates a potential for fire or explosion.
- Step 3: Check if the work activity involves creation or, handling of combustible or explosive dusts.

The Refrigerant Transfer System will be designed for the flammable pentane hazard present. Freon is classified as non-hazardous in terms of flammability. It is clearly very harmful to the environment, hence why the gas from old fridges and freezers is being collected for reprocessing but is not a significant hazard under the definitions of DSEAR.

Flammable dusts are not in use.

#### 4.2.2 Guidance for Hazard

A hazard is defined as anything that can cause harm including chemicals, electricity, working at height, etc. The health effects of hazards are covered by the COSHH regulations.<sup>10</sup>

Specifically, under DSEAR, the term hazard relates to the harmful physical effects that could occur as a result of fire and explosion, i.e., thermal radiation effects (burns), overpressure effects (blast injuries) and oxygen depletion effects (asphyxiation). The causes of all such effects are included under the scope of DSEAR, e.g., fire, explosion, runaway exothermic reactions, decomposition of unstable compounds, etc.

#### 4.2.3 Guidance for Risk

Risk is defined as the chance that someone will be harmed by the hazard. Under DSEAR the risks to be addressed are those created by the “hazards” that are present.

#### 4.2.4 Guidance for Workplace

Workplace is defined as any location (domestic, commercial or industrial) in which people are actively employed to carry out activities that put them at risk from the effects of fire, explosion or dangerous substances.

#### 4.2.5 Guidance for Work Processes

Work processes are defined as all technical aspects of work including technical means of supervision, connecting devices, control and protection systems, engineering controls and solutions, equipment, materials, machinery, plant, protective systems and warning / communications systems.

Work processes does not include the systems of work employed by an organisation such as permits, access controls, etc. but does include any technical aspects of such systems such as gas detection, equipment interlocks, etc.

#### 4.2.6 Guidance for Explosive Atmospheres

The DSEAR ACOP<sup>8</sup> sets the conditions under which an explosive atmosphere is defined, i.e. atmospheric pressure and ambient temperatures. It should be noted that the DSEAR regulations

apply only to explosive atmospheres in air. Oxygen rich atmospheres or situations where substances containing their own oxidising agent are present are outside the scope of certain DSEAR regulations but may be subject to others depending on the circumstances.

The handling and storage of pentane in the transfer system and iso-tanker fall within this definition.

#### 4.2.7 General Compliance

The works health and safety management systems and procedures provide for risk assessment of identified site hazards and activities by way of workplace risk assessments.

### 4.3 Regulation 3 – Application

The DSEAR ACOP<sup>8</sup> defines those areas of maritime, commercial, industrial situations (or otherwise) which are outside the scope of DSEAR.<sup>1</sup>

The activities carried out at the facility are not outside the scope of the regulations, henceforth the production of this report and all associated site documentation referred to within this report.

### 4.4 Regulation 4 – Duties under these Regulations

This regulation requires employers to provide a duty of care to all persons who may be affected by the work processes carried out therein. This includes a duty of care to non-employees in the facility and also to members of the public who may be affected by any incident within the facility but which may have effects beyond the confines of the facility.

Given the location of the facility and adjacent areas surrounding the perimeter it is feasible that a risk to the public and non-employees is present.

#### **Risk Assessment Procedure**

A formal risk assessment procedure is not currently in place. A health and safety policy is in place. Such procedures allow for all activities to be assessed uniformly ensuring that the risk to workers and others is reduced in accordance with corporate policy requirements.

##### Action:

It is recommended that a formal method of creating workplace risk assessments is implemented.

#### **Health, Safety and Environmental Policy**

An HSE policy is stated to be in place by which the expected performance standards and goals are set at the highest level of the company.

#### **Permit to Work Procedure**

A formal PtW system is stated to be in place for all activities involving potentially explosive materials and PtW training has been completed for operatives that use the PtW system.

#### **Induction**

A formal induction system is in place by which essential HSE information is passed to personnel.

##### Action:

The site induction should be updated to include all identified flammable / dangerous materials hazards.

#### **Facility Access**

As a result of the security arrangements in place there is little scope for access by unauthorised personnel and any such access is likely to be challenged by site personnel immediately. Anyone entering the facility legally must do so through the reception / gatehouse at the main entrance.

#### **Site Safety Audits**

Informal safety audits are stated to be carried out.

##### Action:

It is recommended that a formal system of audits is implemented and that these will include the activities associated with the handling of flammable materials such as pentane as used in the refrigerant transfer system.

#### **Line Management**

Line supervision is present to ensure that production / transfer activities are carried out in accordance with company procedures.

**COSHH Assessment System**

A system of completing and recording COSHH assessments is stated to be in place. Personnel are stated to be trained in their content as part of their training for each of the operational areas.

Action:

Update COSHH assessments to include the new materials associated with the refrigerant transfer system.

**Fire Prevention Plan**

A fire prevention plan is in place. The objectives of this plan are to ensure that fire is prevented for all foreseeable workplace activities and that if it does occur, then appropriate measures are in place to ensure the safety of the site personnel and those people outside the site who may be affected by any such incidents.

**4.5 Regulation 5 – Risk Assessment**

The risk assessment required by DSEAR should form the basis of all work processes carried out in the hazardous areas and should identify any necessary control and mitigation measures that must be put in place in order to minimise risk. The risk assessment should be carried out in association with the risk assessment required by Management of Health and Safety of Workers Regulations (Regulation 3).<sup>12</sup> The significant findings should be recorded and be made available to all personnel affected by the activities carried out on site.

**4.5.1 Reg. 5(1) – Risk Assessment**

Regulation 5(1) requires employers to carry out a risk assessment to determine the risks to employees and others as a result of the work processes carried out on site.

Operating procedures are stated to be in place. Machine operating procedures and COSHH assessments are stated to be in place. A DSEAR-specific risk assessment has been produced and is under review.

No further action is considered necessary at this time.

**4.5.2 Reg. 5(2) – Risk Assessment Criteria**

Regulation 5(2) states that the risk assessment should cover the aspects listed in section 5(2)(a to j) and any other relevant aspects not included.

**4.5.3 Reg. 5(2)(a) - Properties of Hazardous Substances Present**

MSDSs are stated to be available for all materials handled or produced at the facility and all personnel affected have access to the MSDSs either directly or through their line management.

COSHH assessments are stated to be in place for all activities involving dangerous substances at the site.

Action:

The COSHH assessments should be created / updated to include the new materials being handled.

**4.5.4 Reg. 5(2)(b) - Safety Information Provided by Supplier**

MSDSs are available to operatives using and handling materials. MSDSs are readily available to personnel.

No further action is considered necessary at this time.

**4.5.5 Reg. 5(2)(c) - Type of Work or Activities Carried Out**

The only function of the new refrigerant transfer system is to decant 1-tonne tanks by pumping the refrigerant materials to an adjacent iso-tanker. The 1-tonne tanks will be located on a weigh scale during emptying to allow the operative to know when the tank is empty.

Routine production, planned and reactive maintenance activities are expected to be carried out. These activities are stated to be included in operating and maintenance procedures.

Workplace risk assessments are stated to be in place for routine activities. For non-routine activities such as work to be carried out by contractors, method statements and risk assessments are stated to be required and a formal permit to work system is stated to be in place to control such activities. All such work is closely controlled by the site management team and only carried out when there are no conflicting processing activities on-going.

The type of activities carried out at the refrigerant transfer system will generally be routine and understood by all concerned. Changes to the process such as using different materials or

methods requires a review of the activities and the employee training requirements to ensure that all personnel are aware of the new hazards that may be present (fire, explosion, etc.) and more importantly, how to prevent such an incident occurring. Changes to processes and materials are rare. A formal management of change procedure / process is not currently in place to cover the assessment of such modifications when they do occur.

Action:

Consider implementation of a formal management of change system.

#### 4.5.6 Reg. 5(2)(d) - Non-operations Related Activities

A formal permit to work procedure is stated to be in place for non-operational / non-routine activities. The majority of non-routine activities carried out are break down maintenance and servicing of the process plant. In those situations it is normal practice for the equipment to be out of production. Flammable materials may still be present under such circumstances. An in-house technician can carry out basic breakdown and servicing of the equipment and systems but contractors are usually used for such tasks. Some of those tasks are covered by SOPs / WIs while others are controlled using the permit to work system. Contractors carrying out work would be subject to the PtW system at all times.

Any non-routine work requires to be reviewed prior to commencing. Such work is covered by risk assessment and method statement (RAMS). Only after these have been approved can the work proceed to the authorising stage. The work activities are reviewed with respect to ensuring that all release and ignition hazards are adequately assessed for the range of activities carried out. Measures implemented are stated to provide for formal isolation and de-isolation of equipment, confined space entry, and work completion / hand-over procedures (including in house personnel).

No further action is considered necessary at this time.

#### 4.5.7 Reg. 5(2)(e) - The Effect of Measures Taken

Any measures specifically put in place as a result of conforming to the requirements of DSEAR must be assessed in terms of the effect (especially negative effects) that they may have on existing practices and procedures.

The DSEAR risk assessment has been created and is under review for implementation.

Action:

Confirm significant findings of the risk assessment have been conveyed to affected operatives.

#### 4.5.8 Reg. 5(2)(f) - Likelihood of an Explosive Atmosphere Being Present

A hazardous area classification assessment has been completed for those areas that have potentially explosive atmospheres.

The potential for flammable atmospheres being present must be conveyed to affected personnel.

In the event of a spill occurring, all employees involved in working with potentially explosive materials should be trained in how to respond to releases and spills to allow them to immediately take corrective action and to avoid escalation.

The operating procedures are being reviewed and updated to include the actions to be carried out if a release / spillage occurs.

The DSEAR risk assessment has been created and is under review for implementation.

Action:

Update procedures to include spills of pentane and freon.

#### 4.5.9 Reg. 5(2)(g) - Likelihood of Ignition Sources Being Present

The quantity of flammable materials present within the refrigerant transfer system presents a credible flammable / explosive hazard. Most of the equipment within the hazardous areas appears to have been correctly specified for use in potentially explosive atmospheres (from process safety audit, no site survey completed).

The flammable / combustible hazards are stated to be identified in the facility health and safety procedures.

The removal of clothing within the hazardous areas (producing electrostatic discharges) should be prevented by means of training for the operatives to make them aware of this hazard.

Personnel handling and decanting flammable materials should be provided with anti-static footwear as a minimum.

Electrostatic charging from pumping fluids in pipe work systems is also a hazard that can occur. The containment systems are conductive and are earthed and can therefore be assumed to present an insignificant risk of electrostatic discharge. The alcohol concentration of the pumped fluids is relatively low and highly unlikely to present any such hazards in practice.

A formal hazardous area equipment inspection policy is stated to be in place for the Refrigerant Transfer System. Such a policy ensures that an adequate regime of periodically inspecting explosion-protected hazardous area equipment is in place. Current guidance requires all explosion-protected equipment to be inspected at least every 3 years. The earthing and earth bonding system are included in those checks.

**Action:**

Ensure personnel are aware of the electrostatic discharge hazard and how to avoid it.

Confirm operatives using the system are provided with static-dissipative footwear.

#### 4.5.10 Reg. 5(2)(h) - Scale of the Effects of a Fire or Explosion

This regulation requires employers to consider and define who will be affected by an explosion, the number of people involved and the extent of their injuries. The assessment should also include those who may be affected including those beyond the confines of the site if applicable.

It is considered possible that a BLEVE explosion could occur with the iso-tanker but this is less likely than a simple fire.

A DSEAR risk assessment has been produced and is under review for implementation.

No further action is considered necessary at this time.

#### 4.5.11 Reg. 5(2)(i) - Places Connected by Openings or Ducts

There are several places connected by openings and ducting. The whole site is designed to ensure that any spills are collected and retained within the interceptor. The refrigerant transfer operation is to be carried out outdoors.

No further action is considered necessary at this time.

#### 4.5.12 Reg. 5(2)(j) - Additional Information Relevant to the Assessment

No immediate action is considered necessary; however, it is recommended that this situation is kept under review should such information become available which will affect existing risk assessments. Such information is likely to be produced when carrying out safety audits, reviewing workplace risk assessments and also during routine activities.

A contractor control procedure is in place to ensure non-routine tasks are fully assessed and approved prior to commencing.

**Action:**

Confirm that the fire risk assessment has been updated to include the new refrigerant transfer system and that any resultant actions have been addressed.

#### 4.5.13 Reg. 5(3) – Risk Assessment Review

This regulation requires the risk assessment to be reviewed by the employer to keep it up to date. The events, which require it to be reviewed, are shown below.

#### 4.5.14 Reg. 5(3)(a) – When the Risk Assessment is No Longer Valid

The DSEAR risk assessment has been completed and is under review. The management procedures require all risk assessments to be periodically reviewed or when a modification to plant or process is implemented.

No further action is considered necessary at this time.

#### 4.5.15 Reg. 5(3)(b) – When Plant has been Modified

Regulation 5(3)(b) requires the risk assessment to be reviewed when modifications which may invalidate the original assessment, including modifications to processes, methods of working, materials being handled, etc. are carried out.

A formal management of change process is not in place for such situations.

**Action:**

Consider implementation of a formal management of change system.

**4.5.16 Reg. 5(4) – Record Significant Findings**

Regulation 5(4) requires the risk assessment significant findings to be recorded where more than 5 employees are employed. The most significant of those are listed below.

**4.5.17 Reg. 5(4)(a) - Measures to be Taken**

A record of the measures taken pursuant to the significant findings of the risk assessment should be made.

Basic safety controls and measures are documented in the DSEAR risk assessment.

**Action:**

Review and implement the DSEAR risk assessment and ensure that the control and mitigation measures necessary to maintain safety are detailed therein.

**4.5.18 Reg. 5(4)(b) – Provide Information so as to Carry Out Work Safely**

The work activities carried out are stated to be documented by safe operating procedures or work instructions. Hazardous area classification has been completed and hazardous area classification drawings are in place.

Procedures are stated to be in place for routine and non-routine activities (such as break down maintenance, cleaning up liquid spills).

**Action:**

The work instructions should be reviewed and updated to include any relevant information contained in the DSEAR documentation (risk assessment, hazardous area classification and gap analysis document).

The location of spill kits should be reviewed to ensure that they are available at the refrigerant transfer area.

**4.5.19 Reg. 5(4)(c) – Additional Information**

Additional information should be recorded as defined below.

**4.5.20 Reg. 5(4)(c)(i) - Areas Classified into Zones**

A hazardous area classification assessment has been completed and hazardous area classification drawings have been produced.

No further action is considered necessary at this time.

**4.5.21 Reg. 5(4)(c)(ii) - Essential Safety Equipment**

Several items of safety equipment are in place such as spill response kits, dust explosion venting, safety shower, fire extinguishers and the fire alarm system. Personnel are stated to be trained for any interaction with these systems and equipment.

No further action is considered necessary at this time.

**4.5.22 Reg. 5(4)(c)(iii) - Explosion Safety Verification**

This document is a record of the verification process.

Other than following up actions listed herein, no further action is considered necessary.

**4.5.23 Reg. 5(4)(c)(iv) - Duty of Co-ordination Role**

A formal safe system of work is in place for the routine activities carried out. A permit to work system is stated to be in place and overall control of the facility work areas is under the control of a small number of personnel with little scope for conflict to occur. The PtW system is stated to be subject to periodic review.

No further action is considered necessary at this time.

**4.5.24 Reg. 5(5) – New Work Activities**

Regulation 5(5)(a) requires all new work activities involving dangerous substances to be assessed prior to commencement of the work and 5(5)(b) requires that the measures required by DSEAR regulations have been implemented.

All such workplace activities are properly planned and permitted through the safe system of work / duty of co-ordination processes in place. Risk assessments and method statements are in place prior to all such activities commencing.



No further action is considered necessary at this time.

#### **4.6 Regulation 6 – Elimination or Reduction of Risks**

##### **4.6.1 Reg. 6(1) – Eliminate or Reduce the Risk**

This regulation requires employers to eliminate or reduce risk so far as is reasonably practicable.

Action:

Review DSEAR risk assessment to confirm risk has been reduced to as low as reasonably practicable.

##### **4.6.2 Reg. 6(2) – Risk Elimination Prioritisation**

The reduction and elimination of risk should be prioritised. Substitution of a dangerous substance for a substance which eliminates or reduces the risk is the preferred method of risk reduction.

The nature of the materials handled and the processes carried out within the Refrigerant Transfer System mean that elimination and substitution of the hazard is not possible.

Other than keeping the present situation under review no further action is considered necessary at this time.

##### **4.6.3 Reg. 6(3)(a)(b) – Risk Control and Mitigation**

Where such elimination and substitution cannot be achieved, the risk should be controlled and mitigated.

Personnel are stated to be trained for the activities that they carry out including any specialist training requirements such as operating plant, etc. Machinery / PUWER-specific risk assessments are being created.

Direct control and supervision by supervisory personnel is in place.

COSHH assessments are stated to be in place.

The DSEAR risk assessment details the control and mitigation measures in place.

Action:

Complete creation of PUWER assessments.

##### **4.6.4 Reg. 6(4) – Risk Prioritisation**

The prioritisation of risk control and mitigation is clearly defined in the regulations and should be applied in the order listed below.

##### **4.6.5 Reg. 6(4)(a) - Reduce Quantity of Dangerous Substance**

The quantity of material held is limited to the inventory of the iso-tanker and the space available for the storage of 1-tonne tanks. Only a small number of tanks is expected to be held. The normal procedure would be to decant the tank contents to the iso-tanker shortly after it arrives on site with only temporary storage until this occurs.

The proposed quantities held appear to be reasonable for the activities carried out.

Other than keeping the present situation under review no further action is considered necessary at this time.

##### **4.6.6 Reg. 6(4)(b) - Avoid or Minimise Release of Dangerous Substances**

The release of flammable or dangerous materials to atmosphere is inevitable (though avoidable) with any storage, use, handling and transportation activities.

Leaks and spills may occur at each location where the flammable materials are used e.g., where connected to pumps / manifolds, etc. but these areas are monitored by operations personnel when in use. Spill kits are in place throughout the facility.

All containment systems are stated to be periodically examined as part of the site equipment integrity assurance programme.

The 1-tonne tanks are located on cradles so as to ensure that they cannot roll or become unstable during storage and use.

Periodic audits are stated to be carried out to confirm that operations are completed in accordance with company procedures.

Other than keeping the present situation under review no further action is considered necessary at this time.

#### 4.6.7 Reg. 6(4)(c) - Control any Such Release

Spill response kits are in place. Personnel are stated to be trained in the deployment of spill response equipment / materials. Operating procedures have not been examined but these are stated to include the requirement that personnel shut down equipment causing such a release and commence clean-up activities immediately.

**Action:**

It is recommended that spill response refresher training is included in personnel training programmes.

It is recommended that the spill response procedures are reviewed to ensure that the response prevents escalation of any incident that may occur.

#### 4.6.8 Reg. 6(4)(d) - Prevent the Formation of an Explosive Atmosphere

As a result of the activities carried out it is not possible to completely remove the hazards due to the presence of the flammable pentane.

The process is located outdoors so as to ensure that any releases may be swept away with the aid of natural ventilation.

Other than keeping the present situation under review no further action is considered necessary at this time.

#### 4.6.9 Reg. 6(4)(e) - Collect, Contain, Remove Releases to Safety

Spills within the facility will be quickly detected by operations personnel and cleaned up as necessary. Spill kits are in place. Areas containing liquids are all bunded or fitted with drainage systems so as to contain the release and prevent escalation to other areas.

The approved code of practice for unloading of petrol tankers (L133) provides guidance on the safety measures necessary for such activities. It recommends the guidance in the "Red Guide" from the Energy Institute. This contains the following guidance for bunding associated with fuel stations and tanker operations. Whilst the operation does not involve petrol, the pentane present has a flashpoint of -49°C, similar to petrol, and the guidance would be equally applicable to such a material.

"42) Tanker standing areas should have design features to deal with spillages, such as diversionary kerbs, slope to a safe area, drainage grids/channels and interceptor or constructed wetland systems. Where such features are provided it is important that they have the capacity to collect/retain a sudden release of a minimum of 3 000 litres of petrol or diesel. It is also important that they are properly maintained; for example, make sure drainage channels are regularly cleared of debris like leaves or mud.

43) If you do not have permanent physical features of this type you may have to rely on temporary equipment, such as moveable bunds, supported by operational procedures and management controls. You must always provide suitable absorbent material for mopping up small spills during unloading."

It can be seen that a fixed bund around the tanker location is not a specific requirement but that some form of collection and containment must be present (even if it's temporary and manually deployed).

**Action:**

Confirm arrangements to deal with spills meet the requirements of the Red Guide.

#### 4.6.10 Reg. 6(4)(f)(i) - Prevent the Likelihood of an Ignition

The DSEAR risk assessment defines the measures in place to prevent ignition. Strict smoking restrictions are in place.

A policy for the prevention of inadvertent ignition is in place. The risk of ignition from portable electronic devices (PEDs) such as mobile phones, MP3 players, etc., is recognised. The potential for electrostatic discharge from personnel should also be addressed as part of this formal policy.

The plant, machinery and associated equipment should be earthed / bonded to prevent discharges occurring between different parts of the equipment.

The risk of personnel electrostatic discharges should be addressed by ensuring that operatives working directly with flammable materials are aware of the conditions under which an electrostatic discharge may occur. Those personnel should be provided with antistatic footwear and antistatic or cotton rich outer garments to prevent the charge and discharge cycle from occurring. Clothing should never be removed in a designated hazardous area.

The electrical equipment located within the hazardous areas should be formally inspected in accordance with BSEN 60079-17 to confirm that it is suitable and properly installed.

**Action:**

It is recommended that the installation of equipment in hazardous areas is subject to strict control and authorisation and that all such hazardous areas are regularly reviewed to ensure that no detrimental modification of plant has occurred.

Confirm new transfer system includes for earthing and bonding of all equipment.

Confirm personnel PPE is antistatic.

#### 4.6.11 Reg. 6(4)(f)(ii) - Prevent Adverse Conditions

This regulation requires employers to assess any adverse conditions, which could occur and which would result in additional risk or harmful effects.

The proposed operation of the iso-tanker relies on the measurement of the pressure in the tank to determine when the tank is full and ready for transportation for reprocessing.

When the iso-tanker arrives on site, it is expected to be at atmospheric pressure but filled with freon gas, i.e., 22m<sup>3</sup> of freon at standard atmospheric conditions. If the tanker is then filled with freon, it would be expected that the gas in the tank would interact with the liquid and recombine. The vapour pressure of freon is approximately 4.6barg at 20°C. This headspace vapour pressure would be expected to be maintained until the tank is hydraulically full. The tank headspace pressure would not be expected to rise above 4.6bar until hydraulically full and with continued pumping of new material into the tank or thermal radiation causing expansion of the fluid already present. The tank should not be filled to greater than approximately 85% to allow for thermal expansion of the fluid. The pressure gauge does not provide for a guaranteed measurement of tank level or fill volume status.

If the tank were to be inerted after each discharge, with a gas such as nitrogen, this gas would not interact with the freon present and would allow the original design intent to function correctly, i.e., to show 10 bar on the headspace pressure gauge when full.

If the tanker has a nominal 22m<sup>3</sup> of freon present at atmospheric pressure and it is then filled with successive loads of pentane only, this would have a marginal affect on the headspace pressure. When the headspace reaches 4.6barg, the freon present will be compressed into liquid form. The volume of liquid in the tank required to be compress the headspace to such a pressure is approximately 18m<sup>3</sup>. In this situation, the 22m<sup>3</sup> of freon gas will turn into approximately 44 litres of freon liquid. This concentration of freon (using Raoult's Law) in 18m<sup>3</sup> of pentane would have an insignificant effect on the headspace pressure and it could be assumed that the gas present in the headspace would behave as intended. A complicating factor is that the vapour pressure of pentane is 0.56bara.

**Action:**

Review the proposed operating methodology to determine whether the installation of level monitoring equipment on the iso-tankers would provide a more robust means of measuring the liquid level within the iso-tankers.

A study of the expected interactions between freon and pentane should be completed to confirm pressures expected to be produced in the iso-tankers for all states of dilution and mixture concentrations.

#### 4.6.12 Reg. 6(4)(g) - Segregate Incompatible Substances

No such situations have been identified.

Other than keeping the existing practices and material storage conditions under review, no further action is considered necessary at this time.

#### 4.6.13 Reg. 6(5) – Example Mitigation Actions

It should be noted that these actions are not considered a complete listing of all possible actions. Any actions other than those listed are also valid and should be documented.

#### 4.6.14 Reg. 6(5)(a) - Reduce the Number of Employees Exposed

The refrigerant transfer area may present a significant risk to personnel if procedures are not adequately followed.

Where additional temporary personnel are employed for any reason health and safety management systems are in place (detailed throughout this report) by which the additional risk can be quantified and appropriate measures put in place to maintain safety.

Other than keeping the existing practices under review, no further action is considered necessary at this time.

#### 4.6.15 Reg. 6(5)(b) - Avoid the Propagation of Fires

The storage and use of flammable materials should be under strict control and the quantity of material present at any time should be minimised.

Spill response procedures are in place with which to clean up spills and thereby to prevent the ignition of released materials and from occurring.

A fire risk assessment is stated to be in place (not examined).

Action:

Confirm fire risk assessment has been updated to include the new refrigerant transfer processes.

#### 4.6.16 Reg. 6(5)(c) - Provide Explosion Pressure Relief Arrangements

No such requirements have been identified.

Other than keeping the existing practices under review, no further action is considered necessary at this time.

#### 4.6.17 Reg. 6(5)(d) - Provide Explosion Suppression Equipment

No such protection is fitted or believed to be required.

Other than keeping this situation under review, no further action is considered necessary at this time.

#### 4.6.18 Reg. 6(5)(e) - Provide Plant which is Robustly Constructed

The equipment used / specified for the refrigerant transfer area is standard equipment approved for the use in which it is placed. No specific arrangements have been considered as necessary with regard to their need to withstand the effects of explosions. The DSEAR risk assessment does not show any requirement for such construction methods to be applied.

Other than keeping this situation under review, no further action is considered necessary at this time.

#### 4.6.19 Reg. 6(5)(f) - Provision of Suitable PPE

This regulation requires the employer to issue PPE to its employees, which has been designed so as to minimise the likelihood of an electrostatic discharge and therefore prevent ignition of any flammable mixtures present.

The personnel that work within those areas directly handling flammable materials / combustible dusts are at an increased risk of ignition occurring. The specification of PPE for those personnel involved in directly handling flammable liquids should be antistatic.

With refrigerants, there is a potential for cold burns to operatives if they are splashed with the material during use of the system. The use of thermal gloves may prevent such injuries.

Action:

Confirm PPE is antistatic.

Confirm thermal gloves are available to operative working in the area.

#### 4.6.20 Reg. 6(6) – Handling, Storage and Transportation

This regulation requires employers to arrange for the safe handling, storage and transportation of dangerous substances.

Employees are stated to be trained in the activities they carry out including the use of machinery and mechanical handling equipment is provided for moving containers around the site.

Employees are trained in the use of all such equipment.

MSDS sheets and COSHH assessments for all materials stored and handled are stated to be readily available to employees.

PUWER-specific assessments are not in place for all equipment and machinery.

Action:

Complete PUWER assessments for the work equipment in use.

#### 4.6.21 Reg. 6(7) – Maintain Measures Pursuant to the Regulations

This regulation requires the employer to sustain any measures required by these regulations in the elimination and reduction of risk.

Informal workplace safety auditing is stated to be carried out.

A clear description of every employee's roles and responsibilities in terms of safety performance and operational expectations is stated to be in place and is reviewed annually.

The fire protection systems are periodically tested.

All ignition-capable equipment located within the defined hazardous areas is periodically inspected to ensure ignition-capable faults are detected and prevented.

Action:

It is recommended that a formal workplace safety auditing system is implemented.

#### 4.6.22 Reg. 6(8) – General Safety Measures

See Schedule 1.

Regulation 6(8) requires the employer to take the general safety measures listed in Schedule 1, so far as is reasonably practicable.

### 4.7 Regulation 7 – Places where Explosive Atmospheres May Occur

Regulation 7 is concerned specifically with those places where explosive atmospheres are expected to occur.

#### 4.7.1 Reg. 7(1) - Classify Workplaces into Zones

Hazardous area classification has been completed. Hazardous area classification drawings have been produced.

Other than keeping this situation under review, no further action is considered necessary at this time.

#### 4.7.2 Reg. 7(2) - Install Suitably Rated Equipment in Hazardous Areas

The electrical equipment installed with the refrigerant transfer system should be subjected to formal inspection for specification and correct installation and should be periodically inspected in accordance with BSEN 60079-17 to confirm ongoing suitability and installation status.

An inventory of ignition-capable equipment located within the hazardous areas should be in place and a schedule of periodic inspections should also be present.

It was noted that there was no formal method of specifying equipment for use in potentially explosive atmospheres.

Action:

Confirm an inventory of ignition-capable equipment is in place and that a schedule of periodic inspections is in place.

Formalise a method of procurement for hazardous areas duty that ensures only ATEX-certified equipment (or equivalent) is ordered for use in hazardous areas.

#### 4.7.3 Reg. 7(3) - Install Appropriate Signage

ATEX-approved "Ex" warning triangle signs should be installed around the transfer operations area.

Action:

It is recommended that the requirement for hazardous area signage is reviewed in accordance with the hazardous area classification assessment.

It is recommended that the Ex hazardous area sign is included in the site induction.

#### 4.7.4 Reg. 7(4) – Verification of Site Explosion Safety

The ACOP defines the following actions for the verification process.

- Assessment of the substances present, their quantities and hazardous properties.
- Suitability of plant for use in the hazardous areas.
- Work processes and activities carried out on the site.
- Effectiveness of measures to prevent:
  - Explosive atmospheres forming.
  - Control risks from explosive atmospheres.
  - Mitigate the effects of an explosion.
- Effectiveness of Emergency Arrangements.

#### 4.7.5 Assessment of Substances Present

COSHH assessments are stated to be in place for all the chemicals and materials handled.

The workplace risk assessments and DSEAR risk assessment consider the relevant physical properties of the flammable materials in use.

Action:

Update COSHH assessments as necessary.

#### 4.7.6 Suitability of Plant

The equipment installed within the hazardous areas should be certified for use in the zones / hazards present.

Several items of explosion-certified equipment are expected to be installed in the transfer system. All such equipment should be included in a formal schedule of inspection.

Action:

Review equipment located within the defined hazardous areas.

#### 4.7.7 Work Processes and Activities

The routine work processes and activities carried out are detailed in the SOPs. The hazards associated with those activities are detailed in the DSEAR risk assessment.

Other than keeping this situation under review, no further action is considered necessary at this time.

#### 4.7.8 Prevention of Formation of Explosive Atmospheres

See sections 4.6.1 and 4.6.8.

#### 4.7.9 Control Risks from Explosive Atmospheres

See sections 4.6.5 to 4.6.12 for recommended actions.

#### 4.7.10 Mitigate the Effects from an Explosion

See sections 4.6.14 to 4.6.19 for recommended actions.

#### 4.7.11 Effectiveness of Emergency Arrangements

Fire and emergency / evacuation procedures are stated to be in place. Evacuation exercises are stated to be carried out periodically.

Liaison with the local Fire and Rescue Service (F&RS) has taken place and they have a record of the dangerous / flammable materials held on site.

Other than keeping this situation under review, no further action is considered necessary at this time.

#### 4.7.12 Reg. 7(5) – Provision of Suitable Work Clothing

The operatives involved with receipt and handling of flammable materials should be supplied with antistatic footwear and antistatic / cotton-rich outer garments.

For those personnel tasked with spill response it is essential that suitable PPE is made available for those activities in accordance with the COSHH and DSEAR risk assessment requirements.

Action:

Confirm status of PPE.

#### 4.7.13 Reg. 7(6) – Implementation of Transitional Arrangements

This regulation enables the transitional arrangements described in Regulation 17.

No direct action required as a result of this regulation. All transitional arrangements have now expired.

### 4.8 Regulation 8 – Arrangements to deal with Accidents, Incidents and Emergencies

Regulation 8(1) requires an employer to protect his employees from the effects of fire, explosion and other risks related to the presence of dangerous substances.

#### 4.8.1 Reg. 8(1)(a) – Emergency Procedures

Emergency response procedures are stated to be in place and are currently under review.

For most personnel the emergency procedure is the same, i.e., to make safe any running equipment, evacuate by the nearest exit and to proceed to the assembly point.

All contractor personnel are stated to receive a safety induction prior to commencing work activities or are directly supervised (or often both) and are therefore able to act correctly in an emergency.

Safety drills / evacuation exercises are carried out. Formal records of these are stated to be kept.

Action:

Complete review of spill and emergency response procedures.

Confirm emergency response procedures include the PPE requirements of the necessary response.

#### 4.8.2 Reg. 8(1)(b)(i) - Information on Handling Emergencies

See section 4.7.11.

#### 4.8.3 Reg. 8(1)(b)(ii) - Information on Specific Hazards

COSHH assessments are stated to be in place for all materials handled or produced at the facility.

The emergency response procedures are stated to cover the actions to be carried out for all identified emergencies.

Spill response refresher training is provided to all affected personnel.

The DSEAR risk assessment details the hazards associated with the flammable materials used on site.

Action:

It is recommended that the COSHH assessments are updated to include the new materials being handled.

It is recommended that spill response refresher training is provided to all operatives that may be affected by or expected to respond to spills and dust releases. Training should include how to dispose of collected materials safely.

#### 4.8.4 Reg. 8(1)(c)(d) - Warning and Communication Systems

A fire alarm system is in place (call points and smoke alarms) on site. It is expected that there will be a call point close to the refrigerant transfer system location.

Action:

Confirm fire alarm call point to be located at the iso-tanker.

#### 4.8.5 Reg. 8(2) – Information Available to Personnel

This regulation refers to the information that employers must make available to relevant personnel and states where it ought to be stored or displayed.

#### 4.8.6 Reg. 8(2)(a) – Information Available to Emergency Services

Liaison has taken place with the local fire and rescue service personnel.

Other than keeping this situation under review, no further action is considered necessary at this time.

#### 4.8.7 Reg. 8(2)(b) - Information is Displayed at the Workplace.

Notice boards, safety signage and other information systems are displayed which provide safety information to personnel on site. Most emergency escape routes are clearly marked and unobstructed.

A fire risk assessment is stated to be in place.

Emergency escape routes are stated to be examined as part of the safety audit schedule (signage and unobstructed route).

Other than keeping this situation under review, no further action is considered necessary at this time.

#### 4.8.8 Reg. 8(3) – Employer Emergency Actions

Regulation 8(3) states the actions that employers must take in the event of an emergency occurring, as listed below:

##### 4.8.9 Reg. 8(3)(a)(i) - Mitigate the Effects of the Emergency.

Emergency procedures are stated to be in place. The emergency procedures are periodically reviewed to ensure that potential emergencies are identified and adequate means of control are considered and effectively implemented should the need arise. Also see section 4.7.10.

Other than keeping this situation under review, no further action is considered necessary at this time.

##### 4.8.10 Reg. 8(3)(a)(ii) - Restore the Situation to Normal.

See section 4.7.11.

As noted above.

##### 4.8.11 Reg. 8(3)(a)(iii) - Inform those Employees Affected.

See section 4.7.11. Several warning systems are present as noted above (fire alarm, gas detection, explosion vent sensors, etc.). No additional requirements have been identified.

Other than keeping this situation under review, no further action is considered necessary at this time.

##### 4.8.12 Reg. 8(3)(b) – Essential Personnel

Only essential personnel should remain in the affected area.

Personnel are not expected to respond to emergencies. It is everyone's responsibility to evacuate the area, report to the assembly point and await the arrival of the emergency services.

Essential personnel (e.g. fire marshals / team leaders) are stated to have clear roles and responsibilities in the event of an emergency and also in preparation for emergencies by arranging training, exercises, evacuation drills, etc. Several personnel on site are also trained for emergency tasks / emergencies involving the use breathing apparatus.

Other than keeping this situation under review, no further action is considered necessary at this time.

##### 4.8.13 Reg. 8(3)(b)(i)(ii) – Emergency Response PPE and Safety Equipment

Any personnel remaining in an area affected by an emergency should only be requested to do so provided that they have been supplied with suitable PPE for the conditions and any necessary safety / escape equipment is in place.

On-site personnel are not expected to fight full scale fire / explosion incidents and are not trained for such activities. No such PPE or safety equipment is therefore provided or necessary for this hazard. Operational personnel are trained in the use of basic equipment such as fire extinguishers but are instructed only to attempt fire-fighting if the source of release can be isolated and that they do not put themselves in danger of doing so.

As noted above, a few personnel are trained in the use of breathing apparatus should there be a requirement for this during an emergency.

###### Action:

It is recommended that operatives receive periodic refresher training for cleaning up small spills and the use of any essential safety equipment and PPE. This should include the hazards associated with pentane and freon.



#### 4.8.14 Reg. 8(4) – Dispensation of Regulations 8(1), 8(2), 8(3)

Regulation 8(4) allows employers to dispense with 8(1)(2)(3) if the site risks have been reduced as described in Regulation 6(1) or if the risk has been assessed as so low as to be negligible (Reg. 8(4)(a)).

The application of this dispensation would require specific justification in the risk assessment. As a specific justification for such dispensation does not exist, this regulation is not applicable at this time.

### 4.9 Regulation 9 – Information, Instruction and Training

Where dangerous substances are present, the employer shall provide information, instruction and training.

#### 4.9.1 Reg. 9(1)(a) - Information, Instruction and Training

All personnel are required to undergo minimum HSE training (corporate and job specific).

Operations personnel are trained for each task within the complex as necessary by a buddy-type system, i.e., constant supervision by another fully trained person is in place until the operative has gained enough knowledge, practical experience and training to enable them to carry out the task on their own. Final approval for such working arrangements is stated to be informal and not actually formally signed off by the trainer / buddy / supervisor.

Action:

It is recommended that a formalised method recording training is implemented.

#### 4.9.2 Reg. 9(1)(b) - Details of the Dangerous Substances

All such information is readily available in the MSDSs and COSHH assessments for all materials handled on site are available.

Other than keeping the existing practices under review, no further action is considered necessary at this time.

#### 4.9.3 Reg. 9(1)(c) - Significant Findings of the Risk Assessment.

A DSEAR risk assessment has been produced. It is a requirement that workers are advised of the hazards and control / mitigation measures in place, i.e., the significant findings of risk assessments must be communicated to those personnel affected.

The DSEAR risk assessment has been created and is under review for implementation.

Action:

It is a requirement that the significant findings of the DSEAR risk assessment are conveyed to affected operatives.

#### 4.9.4 Reg. 9(2)(a)(b) – Information, Instruction and Training

The information, instruction and training provided must be adapted as required when conditions are changed and it must be provided in accordance with the risk assessment requirements.

A formal management of change procedure / policy is not currently in place. The procedure/process would be used to identify any requirements for updating information, instruction and training as a result of plant modifications.

Safety-related documentation associated with training is subject to periodic review and marked with a review date.

Action:

Consider the implementation of a formal management of change system.

### 4.10 Regulation 10 – Identification of Hazardous Contents of Containers and Pipes

The employer shall, where required, mark all pipes and containers so as to identify the hazardous contents.

The personnel involved with the storage, use and handling of the dusts, liquids and gases are trained for those activities.

The site is specifically in place for the transfer of refrigerants from 1-tonne tanks to iso-tankers.

## Action:

Fit labels / markers to all pipe work and connections that may contain dangerous or flammable materials.

**4.11 Regulation 11 – Duty of Co-ordination**

In places where explosive atmospheres may occur, and where two or more employees share the same workplace, the employer responsible for the workplace shall co-ordinate the implementation of all necessary measures to protect employees from risk.

Safe systems of carrying out work and routine operational activities are stated to be in place. This is mostly through the use of the permit to work system or by internal control of work procedures. Personnel are stated to be informally trained in the operation of the PtW system.

Non-routine work activities are only carried out when there are no operational activities taking place. All such activities (if carried out by a contractor) are only authorised after successful review of the risk assessments and method statements.

## Action:

Complete formal training of personnel in permit to work issuing and administration.

**4.12 Regulation 12 – Extensions outside Great Britain**

This regulation requires no action to be taken.

**4.13 Regulation 13 – Exemptions**

The Refrigerant Transfer System is not exempt and must therefore comply with all relevant regulations.

**4.14 Regulation 14 – Exemptions for Ministry of Defence, etc.**

This regulation requires no action to be taken in this application.

**4.15 Regulation 15 – Amendments**

This regulation brings Schedule 6 into force. No further action is necessary as a result of this regulation.

**4.16 Regulation 16 – Repeals and Revocations**

This regulation defines those acts and parts of legislation modified or revoked as a result of DSEAR coming into force.

Provided all other DSEAR regulations are complied with, no further action is necessary as a result of this regulation.

**4.17 Regulation 17 – Transitional Provisions**

This regulation defines the dates on which certain parts of the legislation come into force. It also defines the conditions under which the legislation must be applied.

All transitional arrangements have now expired. No further action is considered necessary as a result of this regulation.

**4.18 Schedule 1 – General Safety Measures****4.18.1 Workplaces and Work Processes**

This schedule is associated with Regulation 6(8).

**4.18.2 Schedule 1(2) – Design, Construction and Maintenance**

Schedule 1(2) requires the employer to ensure that the workplace is designed, constructed and maintained so as to reduce risk.

The overall design of the transfer system appears to provide for a reasonable level of risk reduction.

Most activities carried out do not ordinarily expose a significant quantity of flammable materials outside the containment systems and equipment deployed.

All in-house non-routine work is carried out under the direction of the facility operations manager or his/her designate through the permit to work system.

Maintenance is carried out by in-house personnel. More significant tasks are carried out by contractors under the direction of the facility operations manager or his/her designate. All such activities are stated to require method statements and risk assessments to be approved prior to commencing work activities.

A formal management of change (MoC) process is not currently in place. Significant changes to equipment, materials and methods do not occur frequently.

All work areas are periodically audited to ensure that there are no unauthorised modifications to plant and equipment and that all work being carried out is in accordance with procedures.

Action:

Consider implementation of a formal management of change process.

#### 4.18.3 Schedule 1(3) – Work Process Risk Minimisation

See section 4.7.7.

#### 4.18.4 Schedule 1(4) – Work Process Maintenance

Schedule 1(4) requires those work processes to be maintained so as to sustain the levels of safety required by the original plant design.

Safety-related equipment such as the fire alarm system is periodically inspected, tested and maintained. Systems of work and maintenance are in place so as to ensure that the integrity of all safety systems, equipment and procedures is maintained.

All procedures and documentation are periodically reviewed in accordance with this requirement.

Other than keeping the existing practices under review, no further action is considered necessary at this time.

#### 4.18.5 Schedule 1(5) – Mitigation of Additional Risks

Schedule 1(5) requires the employer to consider and mitigate the effects of additional risks such as those listed below.

##### 4.18.6 Schedule 1(5)(a) - Power Failure

Power failure has not been identified as presenting a significant hazard. The existing emergency response procedures are stated to have taken account of this potential hazard.

Other than keeping the existing practices under review, no further action is considered necessary at this time.

##### 4.18.7 Schedule 1(5)(b) - Manual Override / Plant Shut Down Facilities.

Local e-stops will be fitted to the pumping equipment.

Other than keeping this situation under review, no further action is considered necessary at this time.

##### 4.18.8 Schedule 1(5)(c) - Dissipation of Accumulated Energy.

No such hazards have been identified.

Other than continuing to monitor this situation no further action is considered necessary at this time.

##### 4.18.9 Schedule 1(5)(d) - Confusion between Connecting Devices.

When parts of equipment or machinery could be connected or assembled incorrectly such that they would present an ignition or release hazard, this type of fault should be designed out of the system or rendered safe by implementation of additional controls.

No potentially hazardous situations have been identified.

Other than continuing to monitor this situation no further action is considered necessary at this time.

##### 4.18.10 Schedule 1(6) - Organisational Measures

Employers shall have in place systems of work for issuing written instructions for carrying out work (Schedule 1(a)) and a system of permits to work.

Formal operations procedures (SOPs) are stated to be in place.

Formal non-routine work authorisation procedures are stated to be in place.

Other than keeping the existing practices under review, no further action is considered necessary at this time.

**4.19 Schedule 2 – Area Classification**

This regulation requires the employer to classify all hazardous areas according to the zone definitions described in Schedule 2(2). This schedule is associated with Regulation 7(1).

See section 4.7.1.

**4.20 Schedule 3 – Selection of Equipment and Protective Systems**

Unless the risk assessment finds otherwise, all equipment purchased for use in a hazardous area must conform to the requirements of the EPS Regulations. This schedule is associated with Regulation 7(2).

See section 4.7.2.

**4.21 Schedule 4 – Explosive Atmospheres Warning Signs**

This schedule defines the type of sign that should be installed at the entrance to hazardous areas and is associated with Regulation 7(3).

See section 4.7.3.

**4.22 Schedule 5 – Marking of Containers and Pipes**

This schedule lists all UK legislation (incl. DSEAR), which requires this action to be carried out.

See section 4.10.

**4.23 Schedule 6 – Amendments**

This schedule is associated with Regulation 15. This schedule deals exclusively with industries and applications not associated with the activities carried out at the Refrigerant Transfer System and no further action is necessary as a result of this regulation.

**4.24 Schedule 7 – Repeal and Revocation**

This schedule is associated with Regulation 16 and defines those acts and parts of legislation modified or revoked as a result of DSEAR coming into force.

Provided all other DSEAR regulations are complied with, no further action is necessary as a result of this regulation.

## APPENDIX A – FULL LIST OF RECOMMENDATIONS

To achieve compliance with the DSEAR regulations, it is recommended that the list of actions below are addressed. Details of each compliance statement included in this list may be found in the individual sections associated with each regulation.

Regulation	Action	Complete (Initial / Date)
1	No action considered necessary.	-
2	No further action considered necessary. See section 4.2.1.	-
3	Covered by compliance with other regulations.	-
4	Compliance partly achieved. See section 4.4. It is recommended that a formal method of creating workplace risk assessments is implemented. The site induction should be updated to include all identified flammable / dangerous materials hazards. Implement formal HSE site safety auditing system. Update COSHH assessments to include the new materials associated with the refrigerant transfer system.	
5(1)	No further action considered necessary. See section 4.5.1.	-
5(2)(a)	Compliance partly achieved. See section 4.5.3. The COSHH assessments should be created / updated to include the new materials being handled.	
5(2)(b)	No further action considered necessary. See section 4.5.4.	-
5(2)(c)	Compliance partly achieved. See section 4.5.5. Consider implementation of a formal management of change system.	
5(2)(d)	No further action considered necessary. See section 4.5.6.	-
5(2)(e)	Compliance partly achieved. See section 4.5.7. Confirm significant findings of the risk assessment have been conveyed to affected operatives.	
5(2)(f)	Compliance partly achieved. See section 4.5.8. Update procedures to include spills of pentane and freon.	
5(2)(g)	Compliance partly achieved. See section 4.5.9. Confirm personnel aware of electrostatic ignition hazards. Confirm operatives using the system are provided with static-dissipative footwear.	
5(2)(h)	No further action considered necessary. See section 4.5.10.	-
5(2)(i)	No further action considered necessary. See section 4.5.11.	-
5(2)(j)	Compliance partly achieved. See section 4.5.12. Confirm that the fire risk assessment has been updated to include the new refrigerant transfer system and that any resultant actions have been addressed.	
5(3)(a)	No further action considered necessary. See section 4.5.13.	-
5(3)(b)	Compliance partly achieved. See section 4.5.15. Consider implementation of a formal management of change system.	
5(4)(a)	Compliance partly achieved. See section 4.5.17 and 4.5.5. Review and implement DSEAR risk assessment.	
5(4)(b)	Compliance partly achieved. See section 4.5.18. Review and update formal operations procedures / work instructions. The location of spill kits should be reviewed to ensure that they are available at the refrigerant transfer area.	
5(4)(c)(i)	No further action considered necessary. See section 4.5.20.	-
5(4)(c)(ii)	No further action considered necessary. See section 4.5.21.	-
5(4)(c)(iii)	No further action considered necessary. See section 4.5.22.	-
5(4)(c)(iv)	No further action considered necessary. See section 4.5.23.	-
5(5)	No further action considered necessary. See section 4.5.24.	-
6(1)	Compliance partly achieved. See section 4.6.1. Review and implement DSEAR risk assessment.	

## Appendix A – Full List of Recommendations

6(2)	No further action considered necessary. See section 4.6.2.	-
6(3)(a)(b)	Compliance partly achieved. See section 4.6.3. Complete creation of PUWER assessments.	
6(4)(a)	No further action considered necessary. See section 4.6.5.	-
6(4)(b)	No further action considered necessary. See section 4.6.6.	-
6(4)(c)	Compliance partly achieved. See section 4.6.7. Include spill response refresher training in personnel training programmes. Review spill response procedures for materials being handled.	
6(4)(d)	No further action considered necessary. See section 4.6.8.	-
6(4)(e)	Compliance partly achieved. See section 4.6.9. Confirm arrangements to deal with spills meet the requirements of the Red Guide.	
6(4)(f)(i)	Compliance partly achieved. See section 4.6.10. Confirm all hazardous areas are subject to periodic audit to ensure all equipment in use is properly certified. Confirm new transfer system includes for earthing and bonding of all equipment. Confirm personnel PPE is antistatic.	
6(4)(f)(ii)	Compliance partly achieved. See section 4.6.11. Review operating methodology of iso-tanker to confirm if level measurement should be installed. Review expected behaviour of pentane and freon in the containment system to determine whether the intended operating methodology of filling to 10barg is feasible.	
6(4)(g)	No further action considered necessary. See section 4.6.12.	-
6(5)(a)	No further action considered necessary. See section 4.6.14.	-
6(5)(b)	Compliance partly achieved. See section 4.6.15. Confirm fire risk assessment has been updated to include the new refrigerant transfer processes.	
6(5)(c)	No further action considered necessary. See section 4.6.16.	-
6(5)(d)	No further action considered necessary. See section 4.6.17.	-
6(5)(e)	No further action considered necessary. See section 4.6.18.	-
6(5)(f)	Compliance partly achieved. See section 4.6.19. Confirm PPE is antistatic. Confirm thermal gloves are available to operative working in the area.	
6(6)	Compliance partly achieved. See section 4.6.20. Complete PUWER assessments for the work equipment in use.	
6(7)	Compliance partly achieved. See section 4.6.21. Implement formal workplace safety auditing system.	
6(8)	Actions as recommended in Schedule 1.	
7(1)	No further action considered necessary. See section 4.7.1.	-
7(2)	Compliance partly achieved. See section 4.7.2. Confirm an inventory of ignition-capable equipment is in place and that a schedule of periodic inspections is in place. Formalise a method of procurement for hazardous areas duty that ensures only ATEX-certified equipment (or equivalent) is ordered for use in hazardous areas.	
7(3)	Compliance not achieved. See section 4.7.3. Review ATEX signage requirements. It is recommended that the Ex hazardous area sign is included in the site induction.	
7(4)	Compliance partly achieved. See section 4.7.4 to 4.7.11. Update COSHH assessments. Review equipment specified for use in the defined hazardous areas.	
7(5)	Compliance partly achieved. See section 4.6.19. Confirm status of PPE.	
7(6)	No further action considered necessary. Considered elsewhere in report.	-

## Appendix A – Full List of Recommendations

8(1)(a)	Compliance partly achieved. See section 4.8.1. Complete review of spill and emergency response procedures. Confirm emergency response procedures include the PPE requirements of the necessary response.	
8(1)(b)(i)	No further action considered necessary. See section 4.7.11.	-
8(1)(b)(ii)	Compliance partly achieved. See section 4.8.3. It is recommended that the COSHH assessments are updated to include the new materials being handled. Provide spill response refresher training.	
8(1)(c)(d)	No further action considered necessary. See section 4.8.4. Confirm fire alarm call point to be located at the iso-tanker.	
8(2)(a)	No further action considered necessary. See section 4.8.6.	
8(2)(b)	No further action considered necessary. See section 4.8.7.	
8(3)(a)(i)(ii)(iii)	No further action considered necessary. See sections 4.7.10 and 4.6.14 to 4.6.19.	-
8(3)(b)	No further action considered necessary. See section 4.8.12.	-
8(3)(b)(i)(ii)	Compliance partly achieved. See section 4.8.13. Confirm safety refresher training is provided (breathing apparatus, spill response, etc.)	
8(4)	No further action considered necessary. See section 4.8.14.	-
9(1)(a)	Compliance partly achieved. See section 4.9.1. It is recommended that a formalised method recording training is implemented.	
9(1)(b)	No further action considered necessary. See section 4.9.2.	-
9(1)(c)	Compliance partly achieved. See section 4.9.3. Convey the significant findings of the DSEAR risk assessment to affected operatives.	
9(2)(a)(b)	No further action considered necessary. See section 4.9.4. Consider the implementation of a formal management of change system.	-
10	Compliance partly achieved. See section 4.10. Fit labels / markers to all pipe work and connections that may contain dangerous or flammable materials.	
11	Compliance partly achieved. See section 4.11. Complete formal training of personnel in permit to work issuing and administration.	
12	Not applicable.	-
13	Not applicable.	-
14	Not applicable.	-
15	No direct actions considered necessary.	-
16	No direct actions considered necessary.	-
17	Not applicable.	-
Schedule 1(2)	Compliance partly achieved. See section 4.18.2. Consider implementation of a formal management of change process.	
Schedule 1(3)	No further action considered necessary. See section 4.7.7.	-
Schedule 1(4)	No further action considered necessary. See section 4.18.4.	-
Schedule 1(5)(a)	No further action considered necessary. See section 4.18.6.	-
Schedule 1(5)(b)	No further action considered necessary. See section 4.18.7.	-
Schedule 1(5)(c)	No further action considered necessary. See section 4.18.8.	-
Schedule 1(5)(d)	No further action considered necessary. See section 4.18.9.	-
Schedule 1(6)	No further action considered necessary. See section 4.18.10.	-
Schedule 2	No further action considered necessary. See section 4.19.	-
Schedule 3	No further action considered necessary. See section 4.20.	-
Schedule 4	No further action considered necessary. See section 4.21.	-
Schedule 5	No further action considered necessary. See section 4.22.	-
Schedule 6	No direct action considered necessary.	-
Schedule 7	No direct action considered necessary.	-

**APPENDIX B – REFERENCE DOCUMENTATION**

1. Dangerous Substances and Explosive Atmosphere Regulations. (SI 2002 No. 2776)
2. The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations. (SI 1996/192 - SI 2001/3766)
3. Health and Safety at Work Act 1974.
4. CAD: Protection of the Health and Safety of Workers from the Risks Related to Chemical Agents at Work. (98/24/EC)
5. Framework Directive: Introduction of Measures to Encourage Improvements in the Safety and Health of Workers at Work. (89/391/EC)
6. ATEX 100a: Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres. (2014/34/EU: formerly 94/9/EC)
7. ATEX 137: Minimum Requirements for Improving the Safety and Health of Workers in Potentially Explosive Atmospheres. (99/92/EC)
8. L138 - Dangerous Substances and Explosive Atmosphere Regulations ACOP.
9. Classification, Labelling and Packaging of Substances and Mixtures Regulations. (<http://www.echa.europa.eu/web/guest/regulations/clp/legislation>).
10. Control of Substances Hazardous to Health Regulations (COSHH). (SI 2002 No. 2677)
11. Health, Safety and Environmental Policy.
12. The Management of Health and Safety at Work Regulations 1992. (SI 1999/3242)
13. Explosive Atmospheres: Classification of Areas – Explosive Gas Atmospheres (BSEN 60079-10-1)
14. Explosive Atmospheres – Electrical Installations Inspection and Maintenance. (BSEN 60079-17)
15. Fire Risk Assessment. (Not examined)
16. COSHH Assessments. (Not examined)
17. Energy Institute Model Code of Safe Practice – Part 15. (EI 15)
18. Fire Safety Storage Cabinets. Safety Storage Cabinets for Flammable Liquids. (BSEN 14470-1)
19. Chemical Warehousing: The storage of Packaged Dangerous Substances. (HSG71)
20. Explosive Atmospheres: Classification of Areas – Explosive Dust Atmospheres. (BSEN 60079-10-2)
21. Explosive atmospheres: Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements. (BSEN ISO 80079-36)
22. Guidance for the Storage of Gas Cylinders in the Workplace. (Guidance Note GN2: British Cylinder Gases Association)
23. Hazardous Area Classification Assessment. (4SQ\_P692256\_266\_09\_02\_Rev\_A)
24. DSEAR Risk Assessment. (4SQ\_IMBNZ\_284\_08\_04\_Rev\_A)
25. Hazardous Area Classification Drawings. (4SQ\_UBMNZ\_284\_05\_05\_Rev\_A)
26. Separation distances in the gases industry. (BCGA guidance note 41)
27. Red Guide. (Energy Institute)