GUIDELINES

Pressure Guidelines

Understanding how the responsibilities of the COMAH Operator and organisations providing Competent Person services under either the PSSR or other Regulations interact

Document Reference:

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Please also note the work of SAFed with the HSE HID and EEMUA on producing a document dealing with: 'The management of mechanical integrity for equipment providing primary containment of hazardous substances'.

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1. Foreword

These guidelines have been prepared by a working group comprising technical representatives from the Safety Assessment Federation (SAFed). This publication should not be regarded as an authoritative interpretation of the law.

2. Introduction

Ensuring mechanical containment integrity is a key aspect of the Operator's responsibility under the Control of Major Accident Hazards Regulations, COMAH.

Typically much of the high hazard plant and equipment on a COMAH site will be classed as a pressure system, and come within the scope of Pressure Systems Safety Regulations (PSSR) which places key responsibilities on Competent Persons to draw up and/or certify Written Schemes of Examination (WSE) and to carry out examinations.

3. Scope

These Guidelines address the relationship between the responsibilities of the COMAH Operator and organisations providing Competent Person services under the PSSR or other Regulations.

The purpose of this document is to clarify the position of the Operator and SAFed member companies with respect to Roles and Responsibilities and thereby provide a common approach for the provision of support to the Operator in meeting their obligations under COMAH.

4. References

Health and Safety at Work etc Act 1974 – (HSAW)

Dangerous Substances and Explosive Atmospheres Regulations - (DSEAR)

Control of Substances Hazardous to Health - (COSHH)

Control of Major Accident Hazards Regulations 1999 (as amended) — COMAH

Pressure Systems Safety regulations 2000 — PSSR

Lifting Operations and Lifting Equipment Regulations 1998 — LOLER

Provision and Use of Work Equipment Regulations 1998 — PUWER

The Electricity At Work Regulations 1989 — EAW

HSG176 - The Storage of Flammable Liquids

EEMUA 159 – Users' Guide to the maintenance, inspection and repair of above ground vertical cylindrical steel storage tanks

HSE Guidance Note PM75 – Glass reinforced plastic vessels and tanks

HSE Guidance Note PM86 - Thermoplastic tank integrity management

5. Terms and Definitions

For the purposes of these Guidelines the following terms and definitions will apply.

5.1 Competent Person

The individual or organisation that provides services to assist the operator to meet their obligation under COMAH.

Note 1: This could include the preparation and certification of the Written Schemes of Examination under the Applicable Regulations.

Note 2: The Pressure Systems Safety Regulations define the required attributes of a Competent Person under those Regulations

Note 3: Other Regulations do not specifically define the required attributes of a Competent Person who carry out the examination.

5.2 Operator

The person at a COMAH site who is in control of the operation and is responsible for meeting their obligations under the Regulations.

Note: A person may be an individual, a corporate body or a partnership.

5.3 Examination

An examination of equipment / plant which is carried out by a Competent Person in accordance with PSSR, LOLER or other relevant Regulations.

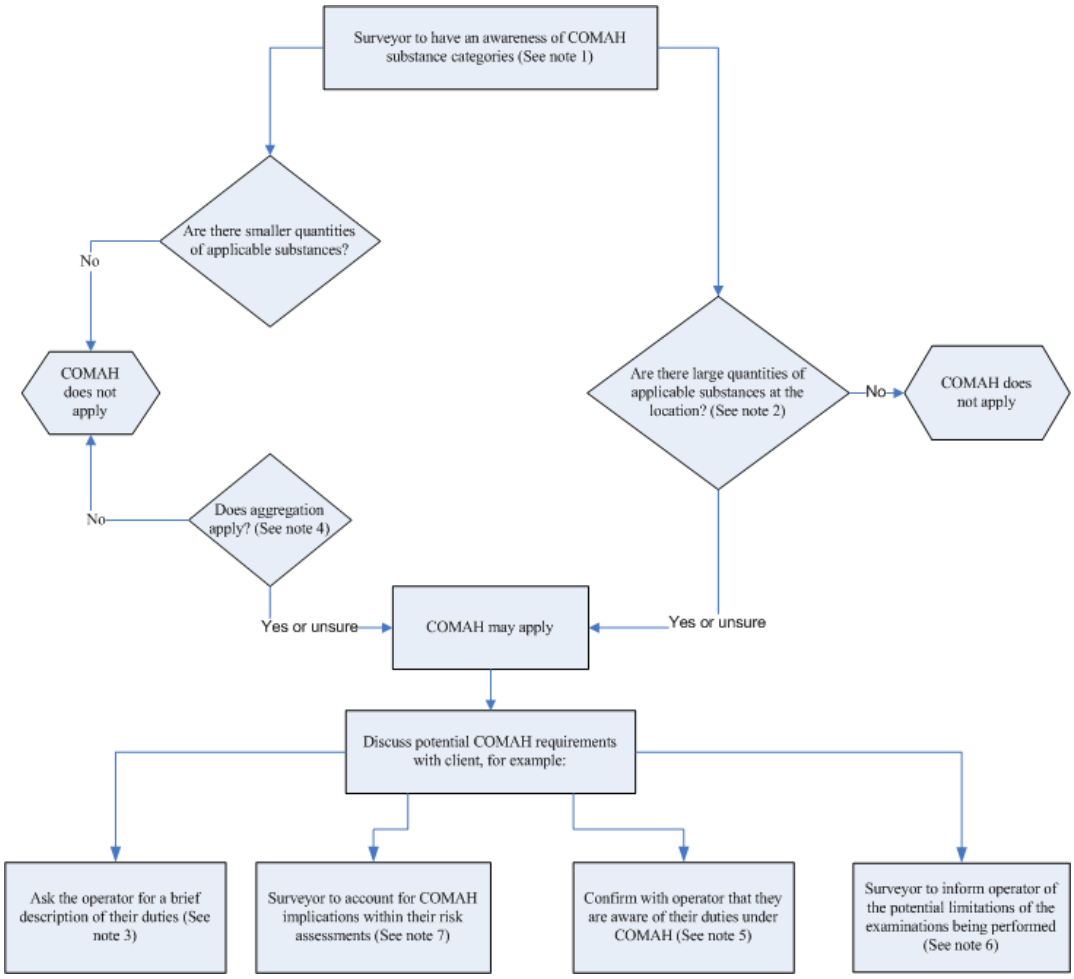
5.4 Inspection

An inspection of equipment / plant to determine its condition which in isolation would not be sufficient to meet the requirements of PSSR, LOLER or other relevant Regulations.

Note: Additional work carried out over and above PSSR and LOLER examinations to assist the operators in meeting his obligations under COMAH Regulations would generally be termed as an inspection

6. Work on potential COMAH site

It is the Operator's responsibility to ensure that all relevant legislation is applied on their site. Therefore they should be able to confirm their COMAH status at the initial visit. There are occasions where some smaller organisations may not be clear on what the requirements are for COMAH and the flowchart gives some guidance to the Competent Person to advise the organisation that they may not be compliant.



COMAH flowchart - notes

1. The Engineer Surveyor should have a basic awareness of the substance categories that could lead to COMAH classification of a site e.g. very toxic, toxic, explosive, flammable, highly flammable, extremely flammable, and dangerous for the environment.
2. Once at a location, if it appears that reasonable quantities of potentially applicable substances are stored, COMAH may apply. The Surveyor should ask the operator if they are a COMAH site – it is the operator's responsibility to know.
3. The Surveyor should ask the operator for a brief description of their operation – it may be that due the properties of the substances involved in their processes, small stored quantities may result in COMAH classification for the site.
4. If it is apparent that smaller quantities of a variety of COMAH applicable substances are stored at a location, the Surveyor should be aware of the effect of aggregation of such products to establish whether or not COMAH applies, this should be discussed with the operator.
5. Once it is established that the Surveyor is on a COMAH site, they should confirm that the operator is aware of their duties under the regulations to take all measures necessary to prevent major accidents and limit their consequences to persons and the environment.
6. At a COMAH site, the Surveyor should inform the operator of the potential limitations of the examinations that are being undertaken during the visit e.g. Thorough Examinations in accordance with PSSR or LOLER may not meet the requirements laid out in COMAH, as outlined in relevant section of this document. The operator may need to introduce further measures to ensure compliance.
7. The Surveyor should take account of being on a COMAH site in any subsequent risk assessment they carry out. This may be in relation to the condition and future safe operation of an item that they examine and / or their own personal risk assessment whilst working at the location.

If it is established that the CP is on a COMAH site, it should be confirmed that the Operator is aware of the potential limitations of the services that the Competent Person has been contracted to provide.

The CP should take account of the nature of the substances, and activities in any risk assessment they carry out. This may be in relation to the condition and future safe operation of an item that they examine and / or their own personal risk assessment whilst working at the location.

7. The interaction with other Regulations on a COMAH site

Regulation 4 of COMAH has a general requirement for the Operator to take all measures necessary to prevent major accidents and limit their consequences to persons and the environment. Applying individual Regulations such as the PSSR or LOLE|R may not be sufficient as they focus on specific risks and may not consider the effects on containment or process operating conditions.

For the Operator to show compliance with Regulation 4 they will need to demonstrate that they have reduced all risks to as low as reasonably practicable (ALARP). This will include risks not related to the examination, e.g. secondary containment, operator error, maintenance, emergency shutdown, control systems etc.

7.1 Pressure Systems Safety Regulations (PSSR) 2000

COMAH sites by their very nature contain substances which pose danger to persons and the environment should containment be lost. Where pressure systems are concerned such risks may not be covered under a PSSR written scheme of examination.

Where it is agreed with the Operator that additional inspections are to be carried out to address the risks of loss of containment then an extended examination / inspection plan can be put in place.

7.2 Provision and Use of Work Equipment Regulations (PUWER)

Under PUWER the operator is responsible for carrying out a suitable and sufficient risk assessment for the use of all work equipment which should then identify any inspections that may be required. The risk assessment should encompass all the risks associated with the use of a piece of equipment, personnel safety, major accident, environmental etc.

Any inspection completed for PUWER must take into account those additional risks as required under COMAH.

7.3 Lifting Operations and Lifting Equipment Regulations (LOLER

LOLER requires the Thorough Examination of lifting equipment either in accordance with maximum periods between inspection or minimum frequencies or applying a scheme of examination. The vast majority of lifting equipment in use in the UK is examined in accordance with the 'standard' frequencies within LOLER. These frequencies have been assessed on the potential danger to persons from failure of the equipment and not the consequences of the loss of containment of a COMAH substance due to equipment failure. COMAH would require the operator to take account of potential hazards of each lifting operation and address this and reduce the risks to ALARP e.g. by increased inspection frequency, or lower rejection limits for ropes chains or liftingtackle

7.4 Control of Substances Hazardous to Health (COSHH)

Within COSHH there are examination requirements where Local Exhaust Ventilation (LEV) is used to control substances hazardous to health at the point of work.

Where the Operator is using the Examination carried out under COSHH to satisfy Regulation 4 of COMAH they must be able to demonstrate that the initial appraisal has taken account of COMAH substances.

7.5 Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) and Electricity At Work Regulations (EAW)

DSEAR requires the Operator to undertake or provide a risk assessment of any work activities involving dangerous substances and then to provide measures to eliminate or reduce risks as far as is reasonably practicable.

The EAW Regulations aim is to prevent death or personal injury to any person from electrical causes in connection with work activities and as such addresses the following risks; electrical shock, electrical burn, fires of electrical origin, electrical arcing or explosions initiated or caused by electricity.

The Operator should complete a suitable and sufficient risk assessment taking into account risks associated with the COMAH substances and apply the required measures.

Note: the appropriate information concerning zone classification and permits to work must be made available to the CP prior to the commencement of inspection and tests of electrical systems and installations.

8. Information requirements for a COMAH inspection plan

Where it is agreed between the Operator and the CP that additional inspections are required, these should be documented in a COMAH inspection plan. Dependant on the complexity of the COMAH site and the risks to be considered, this may be drawn up by a multi discipline team, but in any case should be agreed by the Operator and CP.

8.1 Information required

The Operator should supply the following information:

The Major Accident Hazards Identified. (Required for COMAH application).

- Required for the creation of inspection plans that assist the operator in meeting the requirement of preventing release of COMAH Substances.
- The COMAH substances in use and their quantities.-

- To ensure that all COMAH substances are considered in the plan and that the Tier level for COMAH is known
- Material Hazard Data Sheets for substances — These give the properties of substances in use and assist in assessing the potential for release and the consequences of a release.

Plant and Instrumentation Drawings (P&ID's).

- Site drawings are a major asset in identifying plant and can also be used to mark terminal points of a system. Pipe diameters and materials of construction should be shown on drawings.

Equipment Data.

- Required to assess typical damage mechanisms likely to be present and also the probable failure scenarios. Typically this will include;
- Substances used in the equipment, materials of construction, original design data, modifications. The jointing materials should also be identified.

Process operating conditions.

- Information is required as the damage mechanisms may be affected by process conditions. Typically this information will include:
  - Temperatures, pressures, cycles, concentrations, mixing sequences flowrates.
  - Cleaning conditions, and cleaning substances.

Abnormal occurrences

- Susceptible to exothermic/endothermic reaction, solidification

History of Previous Failures.

- Previous failures can be an indication of where and how a release is likely to occur.
- Where changes have been made due to a particular failure this can be used in justifications for the inspection plan.

History of Equipment Duty

- In many cases the duties of vessels will change over the life of the installation. It may be that a component of a system was in use under more onerous conditions that have left residual issues that need to be considered in the inspection plan.

8.2 Review of information received

The Competent Person will need to review the data supplied and be able to take account of the likely shortcomings and accuracy of the information. It may be necessary to apply some validation of the data to ensure its accuracy under the actual process conditions.

Some typical examples of where further investigation may be required:

- The partial use of a design code.

  E.g. Generally in accordance with (usually means that the inspection element at construction was not completed, e.g. no Form X for PD5500 vessels), or construction only to a reference code. Where full documentation in accordance with a suitable standard is not available, further validation will generally be required (see section 8.3)

- The use of an inapplicable code:

  E.g. BS2654 Manufacture of vertical steel welded non-refrigerated storage tanks with butt-welded shells for the petroleum industry. The code limits the maximum design pressure to 56mbar, this would not be suitable for pressure vessels, horizontal storage tanks etc.

- There should be physical evidence that information supplied is correct and not based on assumptions e.g. Nameplates on vessels should be checked against supplied data. Safety valve set

pressures should be checked against the design data for the vessel and also against the inspection reports, as safe operating limits may have changed over the life of the plant.

- For some components within a system the required information may not be available and further investigation and/or other testing may be required to determine the base line data. The Competent Person is often requested to undertake a retrospective assessment of tanks and pressure vessels containing hazardous substances in order for the Operator to be able to fully demonstrate the design and construction integrity of the equipment under COMAH.

  Where previous inspection reports are not available it may not be possible to ensure that a particular failure mechanism is not occurring and a judgement will be made based upon worst case. The inspection plan should assume that a suspected defect mechanism is occurring until there is sufficient evidence to demonstrate that the failure mechanism is not present.

- The Competent Person involved in drawing up an inspection plan should note that secondary substances, not specified under COMAH may cause situations that could cause a major accident hazard. For example, cooling water may contain high levels of chlorides which if introduced to a susceptible vessel may cause stress corrosion cracking leading to a release of a COMAH substance. Additionally the leakage of cooling/heating mediums into some substances could cause an unexpected reaction again leading to the release of COMAH substances.

8.3 Validation

Each item of equipment needs be considered on its merits when demonstrating integrity but the following general broad principles should be applied:

The design should be assessed to the code or standard to which it was originally built where this is known and is considered to be appropriate. There are numerous national and international standards which are well recognised as suitable for the design and manufacture of tanks and vessels. There are also a number of industry codes of practice which can also provide useful supplementary information to standards.

When assessing the original design and construction standards the Competent Person will need to consider whether the standard adequately addresses all aspects of the design. Ageing plant may need additional assessments of the design to cover loading on the support attachments, fatigue and low temperature properties of the materials. Current standards may need to be used in such cases, where applicable.

It is important that the Operator provides the Competent Person with the full operating parameters for the equipment undergoing assessment. This should include:

- maximum and minimum conditions of pressure/temperature
- full range and frequency of pressure and temperature operating cycles
- the start-up/shut down conditions
- details of any external loads.

The Operator would also need to provide information on the substances used including fill levels and any corrosive/erosive effects these substances may have on the equipment.

The results/output of the design assessment should be sufficient to demonstrate that the design integrity has been fully evaluated. This should include:

- all of the design parameters that have been considered including those which have been eliminated as not being applicable
- the outcome of the calculations including calculated thicknesses
- general indication of areas of high stress/low stress

8.3.1 Constructional validation

When undertaking an assessment of the design the Competent Person needs to consider whether there is sufficient confidence in the integrity of the construction. Generally for equipment manufactured to

older design standards, the requirements for material and welding will have met the requirements of that standard. Where there is no information of the original code of construction, additional validation may be required.

This is particularly relevant when determining appropriate factors of safety. Detailed constructional records relating to material specifications, welding qualifications, heat treatment, testing etc may not exist for old equipment. It is inevitable that a judgement will need to be made regarding such things as material strength and weld quality and whether non-destructive testing or material analysis/testing are necessary. Calculated stress values, operating experience and the results of on-going inspections can be used to support any judgement made. Any supplementary testing will need to form part of the assessment records.

8.3.2 Non-metallic component validation.

Unless full design and construction information is available it will generally not be feasible or practical to carry out an effective assessment of the integrity of the non-metallic component. Often replacement is the most viable option.

When full design and construction information is available, specialist personnel may be required to carry out the assessment. HSE guidance PM75 and 86 applies.

9 Scope of Agreement

The following points should be considered by the Operator and the Competent Person when agreeing the scope of services to be provided:

- The extent of the system(s)
- Parts not covered by the PSSR written scheme to be taken into account
- Additional examination requirements to ensure containment of COMAH substances
- Containment – Primary Only or including Secondary
- Safety Systems – e.g. Emergency shutdown systems, level control
- Access requirements
- Preparation for examination
- Responsibility for and scope of the Inspection Plan

10 COMAH Inspection plan.

10.1 General.

This section covers written schemes of examination as required by PSSR together with additional inspections carried out by the Competent Person to assist the Operator in meeting their obligations under COMAH.

10.2 Non PSSR inspections e.g. COMAH Substances that are not relevant fluids.

For non PSSR services it is best practice for the Competent Person carrying out any inspection activities to be working to a documented inspection plan as agreed with the Operator.

10.3 PSSR Written Schemes of Examination.

Pressure systems on COMAH sites fall broadly into three categories:

1) PSSR relevant fluids.
2) COMAH Substances that are also PSSR relevant fluids.
3) COMAH substances interacting with PSSR relevant fluids.

10.4 PSSR relevant Fluids

Site pressure systems containing PSSR relevant fluids may not impact on COMAH requirements. Providing the pressure system does not interface with containment or management of a COMAH substance then it should be inspected and certified in accordance with the PSSR. Such pressure systems

might be those associated with compressed air or steam raising plant where loss of function would not affect the containment of COMAH substances.

10.5 COMAH substances which are a relevant fluid.

Where the Operator clearly indicates that the Competent Person is only undertaking the production of written schemes of examination, and any associated examinations, to satisfy the requirements of the PSSR then the only additional requirement is for the Competent Person to fully understand the failure mechanisms associated with the relevant fluid.

For COMAH process systems consultation with the Operator will be required to understand the process and possible failure mechanisms.

Where the Operator would like to use the written scheme produced to satisfy the PSSR to support compliance with Regulation 4 of COMAH then consultation between the Operator and the Competent Person must take place to produce a suitable inspection plan. This could be in the form of two separate documents or one combined PSSR Written scheme and inspection plan, depending on the scope of services agreed with the Competent Person.

Risks other than the release of stored energy should be identified and an inspection plan drawn up to address them. The Operator should be able to demonstrate that the proposed inspections will reduce these risks to ALARP.

Particular consideration should be given to pipework where the stored energy risks may be low however risks associated with the loss of containment may be substantial.

10.6 COMAH substances interacting with relevant fluids

Examples of such systems are:

- Steam jacketed reactor vessels where the process side contains a COMAH substance.
- Steam heated heat exchangers where the secondary side is a COMAH substance.
- Process vessels capped with nitrogen above a COMAH substance.
- Blow eggs, where compressed air is introduced to displace COMAH substance.

In these situations the complete item should be included in the WSE and the associated examinations should not be limited to the parts containing a relevant fluid.

e.g.:

The WSE and examination for a jacketed vessel or heat exchanger must include both the primary and secondary containment parts in all cases. In each case the degradation mechanisms related to all fluids/substances must be taken into account.

10.7 COMAH Substances that are not relevant fluids.

Examples are:

Storage Tanks for substances stored at atmospheric pressure which are flammable, explosive or toxic.

Silos containing powdered/granular COMAH substances

Pipework systems

Process plant

These systems will not require a WSE under PSSR however an inspection plan may be required where there is a risk of loss of containment from the degradation of the plant.

11 Reporting

For examinations completed under the PSSR only the guidance to Regulation 9 gives suggested items to be included in a typical report and the regulation requires a written report to be issued on completion of the examination.

Where the plant examined is installed on a COMAH site, the examination reporting requirements should be enhanced as more information is required regarding the actual condition of the plant and the details of examination and tests carried out.

The content of a typical report for a reactor vessel on a COMAH site may include:

- A clear statement of the extent of the examination. E.g. Amount of lagging removed and the type of access to internal and external parts of the vessel. For areas that are inaccessible it should be confirmed that the requirements of the inspection plan have been achieved.
- The condition of the parts examined should be clearly reported e.g. Evidence of leakage, mechanical damage, impact damage, loose baffle plates, depth and area of any corrosion/erosion, extent of pitting, manufacturing defects found. Statements such as "In order as seen" will not be sufficient.
- Where a hydraulic test is required, details of the pressure applied, the date of the test, the time period, the calibration reference of the test gauge and the result of the test including any evidence of deformation or leakage should be recorded.
- Where other testing is required the type of test, extent of test and whether the results are acceptable should be detailed in the report and reference made to any other reports issued. e.g.
    - Spark test on linings.
    - Surface Crack Detection.
    - Ultrasonic thickness survey.
    - Ultrasonic flaw detection.
- Details of all safety valves, bursting discs and other protective devices examined should be listed individually. Where these items have been overhauled and reset or replaced then suitable documentation should be referenced. The Competent Person should ensure that the organisation completing testing and overhaul are suitably qualified for the work undertaken.
- Where proving the relief stream is part of the inspection plan then the proving methods and results should be reported.
- Calibration certificates for pressure gauges used as indicators of imminent system failure should be referenced on the report.

12. High hazard sites not coming within the scope of COMAH Regulations.

The thresholds for quantities of dangerous substances that would classify a site as Tier 1 or Tier 2 under the COMAH regulations are listed in schedule 1 of these regulations. Hazards associated with COMAH substances remain despite the quantities stored falling below the COMAH thresholds. Under the Health & Safety at Work Act1974 a duty remains to provide a safe work place and these hazards may need to be considered further.

The Health and Safety Executive (HSE) may apply similar requirements to sites with thresholds below the COMAH limits and a similar inspection regime to that completed at COMAH sites could be considered best practice.

13. Case studies

13.1 Storage tank inspection — Ethanol storage facility 4000 tonnes

The quantity of ethanol stored at this site is less than the lower tier threshold of COMAH regulations (5000 tonnes). However general Health and Safety Legislation would apply and the installation would come within the scope of HSG 176 'The Storage of Flammable Liquids in Tanks'. This guidance includes requirements for tanks, pipework and fittings to be examined periodically by a Competent Person and that a written scheme of examination should be in place.

The Competent Person carried out a review of the initial documentation that was supplied with the tank farm and confirmed that the tanks had been manufactured to a recognised standard (at the time of construction). However the pipework had very little documentation supplied with it and required further assessment by the Competent Person to confirm its integrity. A gap analysis was carried out to

determine what was known about the pipework and to compare this with an applicable design code of modern origin. This involved the Operator in such activities as Positive Material Identification (PMI), weld examinations, thickness measurements, support reviews etc before the pipework was deemed suitable.

Once the above work was completed a scheme of examination was produced by the competent person based on the information provided by the Operator and other published data such as EEMUA 159. The operator needed direction from the Competent Person throughout this exercise in understanding his obligations to ensure the safety and integrity of his storage facility and taking the necessary steps to confirm its ongoing suitability for use.

13.2 Storage tank inspection — Hydrogen peroxide storage in thermoplastic tanks

The operator stored hydrogen peroxide in twin thermoplastic tanks and had previously made no provisions to have the tanks inspected. The quantity stored was less than the lower tier threshold of COMAH so these regulations would not apply but the requirements of general Health and Safety Legislation including PUWER would need to be applied.

The Competent Person examining plant at this site under PSSR advised that PM86 'Thermoplastic tank integrity management' contains appropriate guidance for this installation and suggests that a scheme of examination should be determined.

A review of the available documentation for the tanks revealed that the tanks had no design pedigree and that they were over ten years old so replacement was advised.

Once new tanks had been installed that been properly designed and installed to suitable standards the competent person was able to produce a WSE for the tanks in conjunction with the operator taking account of PM86 and subsequently carry out the examinations specified.

13.2 Cooling systems — Stress Corrosion Cracking.

Austenitic stainless steel can suffer from Stress Corrosion Cracking (SCC) where chloride concentrations occur, usually at temperatures above about 60ºC. It is often associated with pitting or crevices at welds and the problem can occur due to chloride content in towns water, chlorides from the atmosphere or other sources such as insulation or seawater cooling.

An Operator has a stainless steel reactor vessel with water cooling via a stainless steel limpet coil containing towns water. The coil is not used for heating the vessel.

Initially the cooling water was thought to reach a maximum temperature of 50ºC but with further research it was believed that it could go higher than that, but the maximum temperature was harder to establish.

If the cooling circuit failed there was a high risk of an exothermic reaction in the reactor. Also if there was water leakage into the reactor that could trigger an exothermic reaction.

Because of the consequences of failure of the limpet coil or water contamination of the product, additional crack detection of the coil and welds was specified using eddy current techniques.

13.3 Pipework

The Operator of a COMAH site has low pressure hydrogen pipework that has been excluded from the requirement for routine examination by a Competent Person under a PSSR written scheme.

The Operator, in conjunction with the Competent Person, decided to have the pipework examined to meet his obligations under PUWER, particularly because of the fire risk should leakage occur.

The pipework had very little documentation available and required further assessment by the Competent Person to confirm its suitability for use. Once this had been carried out an inspection plan was derived which included examinations for condition, leakage, earth conductivity, support adequacy, etc. The results of this examination and testing were used by the Operator to help demonstrate his safety case under regulation 4 of COMAH.

13.4 Relief systems

Relief system sizing can be a complicated issue with so many requirements and is beyond the scope of this document it is therefore assumed that the venting system has been correctly designed for all foreseeable fault conditions.

Relief systems are an integral part of system safety and play an important role in the uncontrolled release of content. Failure of the vent system can be grouped:

- Blockage – Fail to allow the discharge of content to a safe place.
- Leakage – Fails to take the discharge to a safe place, and may release hazardous content into populated areas.

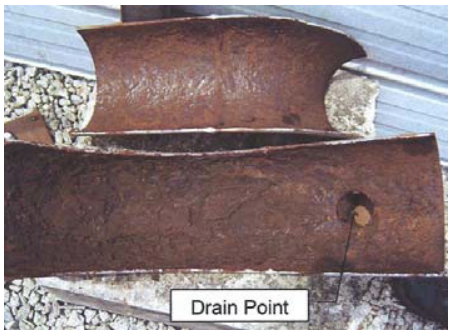
Case study

The emergency relief pipe from a reaction vessel bursting disc is segregated into Vent System 1 and 2 and gases are all relieved to a common emergency relief tank. The material of construction for all the emergency relief headers and piping is carbon steel.

The venting system outwardly appeared to be in a safe condition and the relief system was inspected externally. However there was occasion to remove a section of the pipework for other maintenance activities and the vent systems was found to be almost choked.

Subsequent inspection found that the 6" header elbow required replacement due to blockage. About 80% of the 6" header elbow was found accumulated with iron oxide like material. The blockages at the 6" pipe header ranged 50% to 80%. The 12" main header elbow was almost 100% blocked. A small portion of a 12" vertical emergency relief header was also repaired due to significant wall loss.

Blockage in 6" elbow.



Thinning of Wall Section.

Bore reduction by corrosion.

In order to detect for potential piping internal blockage, external and remote visual inspection were subsequently carried out on the entire emergency vent system. Significant corrosion was found within the emergency vent system. A 30m length of 6" horizontal header and a 12" main header elbow to a catch pot were also found accumulated with iron oxide like material.

This picture shows the external condition of the vent, and demonstrates how unreliable a visual external examination can be without additional investigation.

If there had been occasion for the system to operate it is unlikely that condition of the pipework would have allowed sufficient discharge to alleviate system failure. It has also been considered that the remaining thickness of the pipe would not have been sufficient to sustain the forces imposed by the sudden opening of the protective devices.

A full inspection regime has now been established for venting systems to prove integrity, including support structures and capacity reduction. Additionally the system has now been fitted with alarms across the bursting discs which indicate a failure. The vent line inspection is brought forward following the operation of the protective devices.

Annex A — HSE third party expertise in the demonstration of COMAH

Introduction

This paper is intended to set into context the regulatory framework as it relates to the management of equipment integrity and in-service inspection in relation to the Control of Major Hazards Regulations 1999 (as amended) (COMAH). Specifically it describes what the D/H should do when contracting in a third party to demonstrate COMAH compliance. It sets out the main roles and responsibilities of those to whom the regulations apply, the requirements to make demonstration that 'all measures necessary' have been taken and illustrates the need to consider all applicable regulations.

Issue

An important aspect of an D/H duties under COMAH is the maintenance of plant integrity. In this respect there is a lot of common ground with the requirements of other pieces of legislation such as the Health and Safety at Work Act (HSWA), the Provision and use of Work Equipment Regulations (PUWER) and The Pressure Systems Safety Regulations (PSSR).

Frequently the D/H may employ third party expertise in order to assist in demonstrating their duties under COMAH relating to the management of equipment integrity and in-service inspection. Issues have arisen where the inspection regime formulated to meet the requirements of one set of legislation does not meet the requirements of the inspection part of the plant integrity scheme under COMAH. Reasons for this include:-

- The D/H accepting an inspection regime which does not take into account the scope of COMAH - which may need to take account of degradation mechanisms that go beyond the requirements of an alternative regime seeking, for example, to comply only with PSSR.
- The D/H contracting in a third party who is not aware of the requirements of COMAH maintenance of plant integrity regime, or does not have the specific knowledge needed to implement it.
- The D/H may not have, or be in a position to supply all the detailed plant and process information required to fully understand the complex degradation mechanisms that a high hazards chemical plant may be subject to.

Legislation

As well as COMAH other key legislation exists including the Health and Safety at Work Etc Act 1974 (HSWA), the Provision and Use of Work Equipment Regulations 1998 (PUWER) and Pressure Systems Safety Regulations 2000 (PSSR). HSWA is the principle statutory instrument in relation to health and safety law in the UK and applies to virtually all workplaces. PUWER includes all work equipment, including that covered by PSSR but also pressure systems containing non relevant substances and non pressure systems such as fluid containing tanks. It is concerned with all hazards and it requires plant to be maintained and inspected. PSSR covers pressure systems as defined within the Regulations. It stipulates a more prescriptive format detailing the type of pressure system, the working fluid and what in examinations are required and all stated in a Written Scheme of Examination (WSE). Examinations under PSSR are often termed 'Statutory' with other non-PSSR inspection termed 'non-statutory'. Clearly, the fact that any examination /inspections and at what interval (PUWER) means this terminology is misleading.

COMAH Regulations

COMAH Regulations (Control of Major Accident Hazard Regulations) implement the Seveso 2 Directive, European legislation that arose as the result of significant major accidents involving chemical plant. COMAH applies to a range of high-hazard sites defined by the type and quantity of hazardous substances present on site.

COMAH requirements are more searching than other legislation in that they require the Operator to take all measures necessary to prevent accidents and limit their consequences to persons and the environment and any other relevant features that may cause a COMAH incident, e.g. flammability and/or toxicity. Therefore a relatively small leak that may not cause serious injury to persons from release of stored energy may still be sufficient to compromise Regulation 4 of COMAH.'

The COMAH Regulations essentially require a demonstration, that the plant has been designed, built, operated, maintained and inspected such that it does not present a major accident hazard (MAH).

Key phrases are "all measures necessary" and 'as low as reasonably practicable' (ALARP). This latter phrase qualifies the first and permits a balance of effort / cost versus benefit

Responsibilities

In the areas we are discussing there are three principal the Operator's s within the scope of this paper, the D/H, the Competent Authority (HSE together with EA, or SEPA in Scotland), and any third party providing expertise.

Operator responsibilities under COMAH

Under Regulation 4 of COMAH, the Operator is required to take all measures necessary to prevent major accidents and limit their consequences to persons and the environment. The operator is responsible for ensuring the plant is designed, operated, maintained, inspected and decommissioned etc safely. This responsibility cannot be delegated to a third party.

Specifically in terms of in-service inspection, the Operator is required to ensure the plant is maintained in a safe condition (i.e., does not present a hazard from pressure, toxic, flammables etc) and part of this would include the examination, inspection and testing etc to confirm that this was the case. That is also a general requirement under HSWA and PUWER as well COMAH.

The Competent Authority responsibilities under COMAH

COMAH Regulation 19 requires the Competent Authority to organise an intervention programme. The Competent Authority is therefore required by law to visit sites looking for a demonstration from the Operator that all measures necessary to prevent major accidents have been taken.

Third party responsibilities under COMAH

Where a third party is acting to provide the operator with a competent source of advice, in seeking to help maintain the integrity of major hazard equipment they have duties under HSWA section 3 and section 36 to ensure health and safety of others than their employees, and to act appropriately in their role. This includes ensuring they are competent to carry out the role.

Making the demonstration under COMAH

Responsibility for managing the integrity of equipment with major hazard potential rests with the COMAH the Operator's i.e. the operator and the onus is on the operator to discharge any duties under COMAH. Complex management systems may be required that may require implementation by a multidisciplinary team throughout the life cycle. Whilst an operator may seek to rely on third party expertise to help provide a COMAH demonstration and apply the relevant good practice they should be fully aware that the duty to comply with COMAH remains with the operator and cannot be delegated.

An examination or inspection regime would normally form part of the demonstration that the operator of a COMAH plant has taken all measures necessary to prevent major accidents and limit their consequences. As such the technical basis for such a regime and the arrangements to implement it must be robust. Under COMAH major accident hazards could be fire, explosion, toxic releases or an uncontrolled release of stored pressure energy. The level of complexity involved to manage the integrity of COMAH equipment means that a multidisciplinary team would normally be needed with access to site specific information and process knowledge to inform technical decisions. In such cases it is unlikely that a team made up entirely of 3rd party experts would suffice.

In- service Examination

If the operator is going to rely on the work of a third party to secure mechanical containment integrity then the operator must ensure that any examination scheme adopted takes account of all relevant degradation mechanisms to prevent both catastrophic failure and also reduce the risk of smaller scale loss of containments (LoC) from the vessel. If this is not the case, for example where the scheme of examination is focussed on PSSR compliance, then the operator must decide what further measures are required e.g. to prevent/mitigate the hazards from small scale LoCs .

Competence and Communication

Where an operator relies upon the work of the third party, as part of a COMAH demonstration, to develop and/or apply relevant good practice, the operator must take all appropriate measures such as ensuring:-

- that the third party understands the full scope of the task they have been set
- that they are competent to do the work
- that they have access to all necessary plant information and expertise
- and that what is then provided is sufficient to meet the operator duties under COMAH.

For their part the third party must:-

- understand what is expected from them in relation to requirements under COMAH
- make efforts to ensure they have all the necessary information on the plant
- and ensure that they are competent to carry out the work.

Clearly both good communication between COMAH the Operator's and the third party and understanding of their responsibilities is essential under these circumstances.

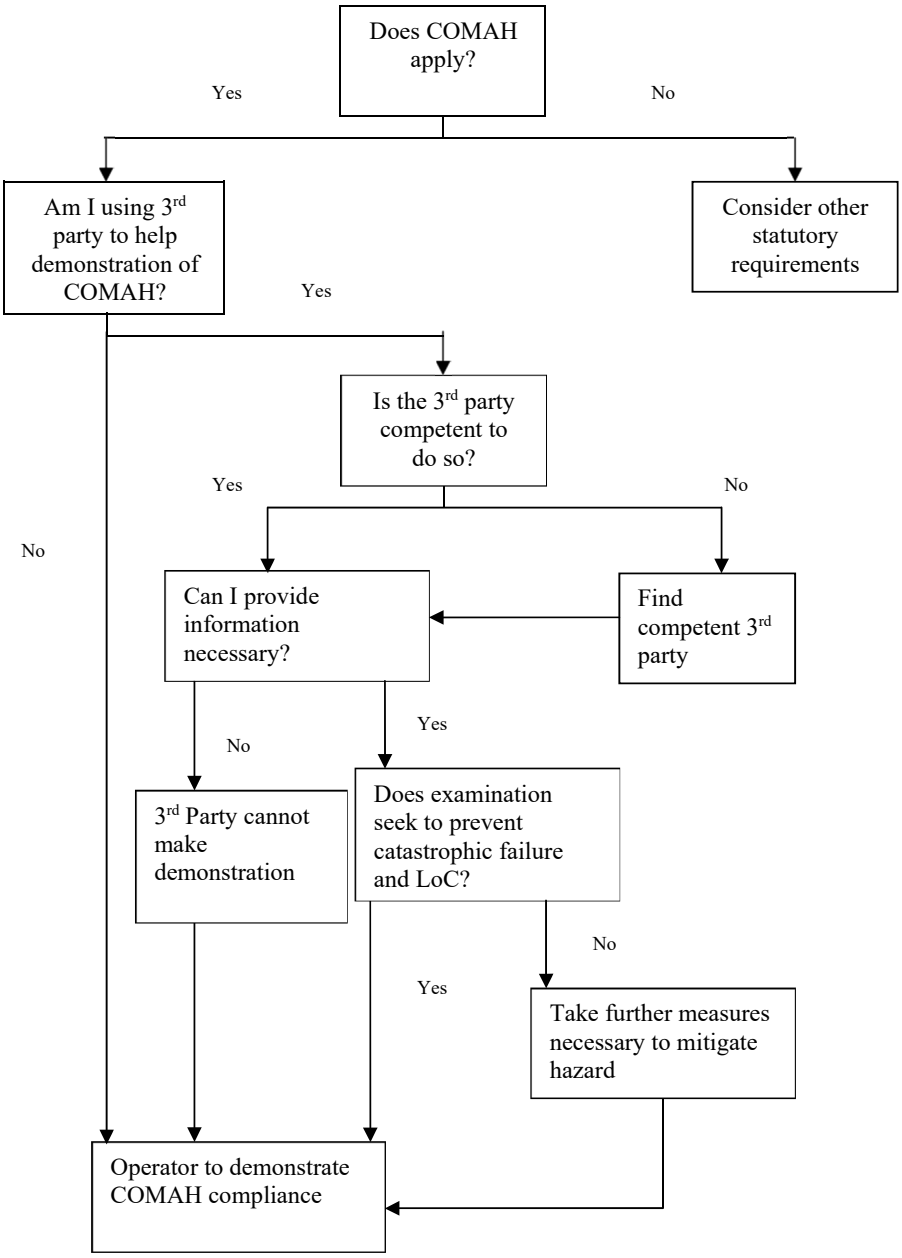
Provision of Information

Chemical and petrochemical plant are often complex and can be affected by a range of degradation mechanisms. Knowledge of the plant and process as well as the vessel is necessary to assure that a suitable integrity management strategy is in place.

Where the COMAH Regulations apply, the third party should normally expect to be a member of a multi-disciplinary team with access to site specific information and process safety expertise. The third party should also expect to receive information on where the high risk elements are on site. The operator is responsible for providing all the necessary and current information and for ensuring COMAH equipment is identified and properly managed. If the operator does not provide the necessary information then it is reasonable for the third party to request this information. If the information is not forthcoming it may be possible to develop or review an inspection regime using a precautionary approach. In such cases the third party must clearly state any assumptions underpinning the resulting inspection regime. An inspection regime developed through a 'precautionary approach' should ensure a fail safe position is adopted to account for missing information. This may involve extending the scope of the inspection to cover a wider range of degradation mechanisms than might otherwise be necessary.

In order to develop or review an examination and inspection regime under COMAH, the sort of information which should be made available includes: safety reports, risk assessments; process hazards/ consequences; plant safety and integrity management arrangements; design specification and material selection philosophy; plant-specific operation, maintenance and inspection history. Any integrity management adopted should reflect the complexity of the plant and the potential severity of the consequences of failure.

Flow chart of Operator duties in relation to COMAH and the management of equipment integrity and in-service



Conclusion

As well as COMAH, other key legislation applies to equipment on COMAH and Sub-COMAH sites and the management of equipment integrity including HSWA, PUWER and PSSR.

The operator is required to take all measures necessary to prevent major accidents on COMAH sites. This requirement cannot be delegated to a third party and remains with the Operator,

The Operator must ensure that any third party engaged is competent to carry out work related to securing COMAH compliance.

If a third party is contracted to address issues under COMAH they are acting as a competent person under HSWA. In this role they have duties under section 3 and 36 to ensure health and safety of others than their employees and to act appropriately in their role. This includes ensuring they are competent to carry out the role.

The cornerstone of compliance with COMAH is the availability of information with regards to plant, processes, etc. If the third party is not supplied with adequate information to carry out their role, it would be reasonable for them to request this. For example, such information is essential in order that all relevant degradation mechanisms may be identified and addressed when developing or reviewing inspection regimes. If information is not forthcoming the third party should take a precautionary approach to develop or review an inspection regime.

If the competent person has carried out reasonable enquiries and notified the operator of any deficiencies which prevent or influence the development or review of an inspection regime, they will have discharged their duties under HSWA. The duty to comply with COMAH remains with the operator.

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