

CDOIF

Chemical and Downstream Oil Industries Forum

Guidance

The Use of External Contractors in the Management of Ageing Plant

Foreword

CDOIF members, as part of their role in promoting and leading on key sector process safety initiatives, have developed guidance on the use of external contractors in the management of ageing plant. This principally relates to the provision of inspection services for equipment containing hazardous substances, but can cover other services.

It is not the intention of this document to specify particular contractual arrangements, nor replace any existing corporate policies or standards. The intent is to provide a reference for those organisations developing or wishing to review their existing arrangements for engaging specialist expertise from outside their own organisation.

There are no limitations on further distribution of this guidance to other organisations outside of CDOIF membership, provided that:

1. It is understood that this guidance represents CDOIF's view of good practice as applied to the use of external contractors in the management of ageing plant.
2. CDOIF accepts no responsibility in terms of the use or misuse of this document.
3. The guidance is distributed in a read only format, such that the name and content is not changed and that it is consistently referred to as "CDOIF Guidance – The use of external contractors in the management of ageing plant".
4. It is understood that no warranty is given in relation to the accuracy or completeness of information contained in the guidance except that it is believed to be substantially correct at the time of publication.

This guidance is not intended to be an authoritative interpretation of the law, however Competent Authority (CA) inspectors may refer to it in making judgements about a duty holder's compliance with the law. This will be done in accordance with the CA's published enforcement policies (refer to www.hse.gov.uk/pubns/hse41.pdf) and it is anticipated that this document will facilitate a consistent national approach.

It should be understood however that this document does not explore all possible options for engaging specialist expertise, nor does it consider individual site requirements. Following the guidance is not compulsory and duty holders are free to take other action.

If the duty holder does follow the guidance they 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 as illustrating good practice.

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Executive Summary

The COMAH Competent Authority identified, through their Strategic Priority on Ageing Plant, unsatisfactory outcomes arising from inadequately defined working arrangements between the site operators and the specialist contractors they may employ.

A working group was commissioned under CDOIF to develop this guidance to assist site operators and external contractors in this aspect of the asset management process. This is not intended to be prescriptive in defining the approach to be taken, but aims to highlight key factors that should be considered.

The guidance principally covers examinations of equipment providing containment to hazardous substances, but equally applies to other inspections or activities such as repair specification, design verification or fitness for service assessment.

While this document has been prepared to give advice to those who engage external contractors in the management of ageing plant, it is also to be of use to the service providers and provide a useful reference for site operators who engage with other company departments to provide such services.

The guidance recognises that the use of external contractors or consultants to provide specialist expertise in the management of ageing plant is common and provides a useful means to fill gaps in both resource and competence. It also recognises that there are many different models for such arrangements. However, any system will only be effective if key principles are applied.

It is important for all those involved in the supply chain to understand that the examination is not the end of the integrity management process. Assessment of the results and drawing conclusions to allow appropriate action to be taken, are the key outcomes. While tasks can be delegated, legal responsibilities cannot.

1. Introduction

Many site operators within the chemical and downstream oil industries use external contractors to provide specialist advice and capabilities, or additional resource, in the management of ageing plant. The use of such expertise is obviously welcome where it leads to a reduction of risk. However, issues have been known to arise. These include:

- Tasks given to those without the competence required.
- A failure to adequately define what is required of the parties involved.
- A failure to respond appropriately to the findings of a plant and equipment inspection.

Illustrative example

A site operator employed a specialist inspection company to carry out an examination of storage tanks used for toxic liquids.

The inspection company produced a report that included measured values for the tank shell thickness. However, it noted that these measurements were taken at un-corroded parts of the shell and that there were some significant areas of heavy pitting corrosion elsewhere. Recommendation was made that further work was required to assess the depth of corrosion and determine whether the remaining shell thickness met the minimum required.

The site operator made an assumption that because a competent and reputable company had inspected the tanks, all was well and the inspection report was filed away, and the tanks continued in service.

Comment

There was a mismatch between the expectations of the site operator and the inspection company. Consequently important work to assess the degradation and the suitability of the tanks for service was not undertaken.

Opportunities to identify and correct the error were missed.

Effective integrity management requires systems of work, which allow deterioration of assets to be monitored so they do not fail in service. Such systems are characterised by:

- The site operator knowing what plant and equipment they have, and what the consequences of its failure will be. (An asset register with some form of criticality assessment can achieve this.)
- Roles and responsibilities being defined and communicated.
- Clarity of what is expected of the contracted service. (A clear written contract can achieve this.)
- The input of all appropriate parties (including on site operations teams and externally contracted specialists) to determine the inspection requirements.
- Planning arrangements to achieve execution of inspections.
- An appropriate response to inspection findings.
- Performance monitoring and review of the external service provision.

An illustration of an integrity management process is given in figure 1 below.

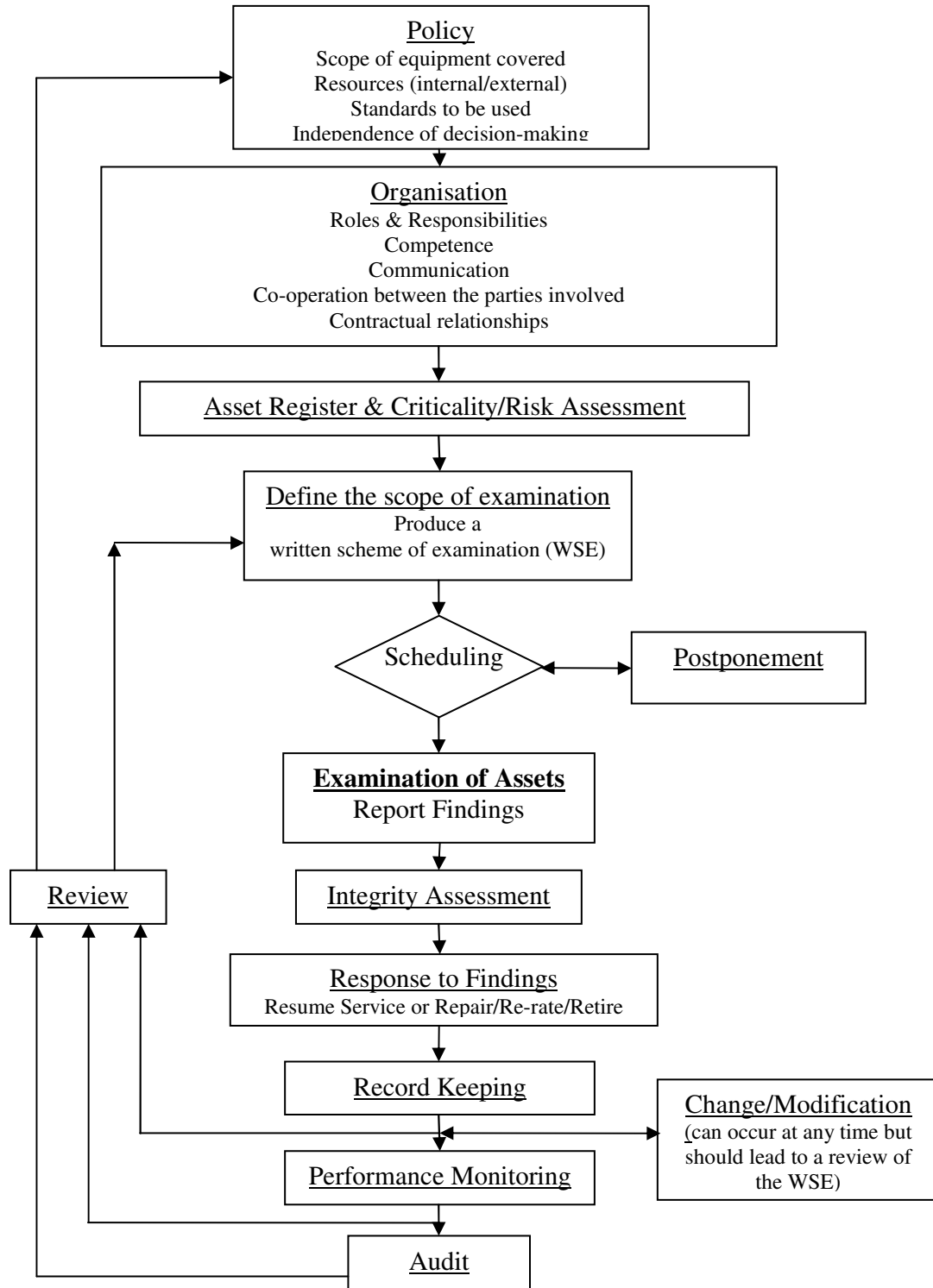


Figure 1 – A flowchart for the Integrity Management Process
(This flowchart is offered as an example only, to help the reader understand the process in which this guidance sits. It is not intended as complete or stand-alone guidance on integrity management.)

2. Understanding and agreeing the scope of the work to be done

When a site operator contracts out services to a supplier, there should be a clear understanding on both sides of what is required, and who is responsible for each task. This is to provide some level of assurance that all necessary aspects of asset integrity have been addressed, and that the responsibilities are allocated and understood.

In order to provide this assurance, it is important to understand the supply chain i.e. who is providing what service. Where site operators have outsourced activities to specialist contractors or consultancies, it is important to understand that those parties may themselves sub-contract certain aspects of the work, leading to an ever more complex supply chain. Failure to understand what is in place could result in competing priorities or a lack of understanding of others' needs.

Each site operator using third party expertise should clearly identify the individual(s) within their organisation responsible for managing the discussions with the third parties, ensure that this individual is competent to do this and that they are fully aware of the importance of their role in this process.

The parties involved should ensure that any agreement made in relation to the scope or requirements of the work is clearly documented.

2.1 Issues to consider

When determining the work to be done and how services will be procured, it is important to remember that whilst the work may be contracted out, the wider responsibilities for integrity management and the operation of critical equipment remain with site operator.

The following are issues to consider:

- How the contract with the external contractor will be placed?
 - This could be directly by the site operator, by a separate procurement department or even through a broker.
 - Whichever route is taken, it is important that all parties clearly understand what is required. This can be problematic as supply chains become more complex.
 - Information needs to be provided to the external contractor to allow them to sufficiently assess the task and provide a realistic quote.
- What work, if any, the site operator will carry out?
 - These responsibilities have to be clearly identified to the supplier.
- On what basis is the contract with the supplier to be placed?
 - This should not be decided solely on price, but should also consider the ability of the supplier to provide the standard of services required.
- Will the supplier place sub-contracts with others? If so:
 - How will the site operator maintain control of the work?
 - How will the site operator be assured of the competence of sub-contractor?
 - How will the site operator have confidence in the communication between all suppliers and their sub-contractors?
 - How will the sub-contractor be made aware of the end user's needs?

2.2 Points to address

- Be sure to understand how your supply chain works, those who will be involved, and how decisions are made.
- Clearly specify what will be required of the supplier and define the standards and competency requirements for the work to be undertaken (see chapter 3 of this guidance).
- Ensure that competent engineering input is available for the procurement process, not only to aid in the development of the specification, but also to assess the responses received.
- Recognise that where suppliers are involved in the development of an integrity management regime (including schemes of examination), they will require input of local and process knowledge from the site operator. This should be addressed within any contractual arrangements (see section 4).

Overall, it is important that the site operator or employer procuring services has the ability to act as an intelligent customer. Further guidance can be found on this subject on the HSE website (<http://www.hse.gov.uk/humanfactors/topics/customers.htm>).

3. Roles and Responsibilities

While a site operator may employ a specialist contractor to carry out a specific function, each party retains their own legal responsibilities. It is important to remember that while tasks can be delegated, responsibility under legislation cannot.

3.1 Arrangements for effective integrity management

When looking to secure external expertise, roles and responsibilities need to be considered to ensure that:

- All roles and responsibilities are either covered by one party or the other.
- Responsibilities under legislation are fully understood by both parties.
- Each party is competent to complete the duties assigned.
- The site operator is competent and able to act upon the information they receive.
- Levels of authority are adequately defined, and that these are appropriate to the criticality of the task.
- Arrangements are made to secure the effective co-operation between the parties involved in the process and that channels of communication are set up.

Roles and responsibilities should be determined and agreed as part of the procurement process (ref. Section 2). These should be reviewed periodically and updated accordingly (ref. section 6).

3.2 Elements in the integrity management process

Key elements that need to be considered when defining roles and responsibilities include:

- Approval or authorisation of key requirements (such as written schemes of examination, repair specifications or fitness for service assessments etc).
- Assessment of criticality/risk.
- The actual preparation of the written scheme of examination. Further information can be found in 'The mechanical integrity of plant containing hazardous substances: A guide to periodic examination and testing' a joint publication by SAFed and EEMUA (SAFed ref - IMG01 : EEMUA ref – Publication 231).
- Planning and scheduling of inspection activity (ref. Section 4).
- Preparation of equipment for examination (taking out of service, provision of access, cleaning, provision of 'safe systems of work' etc).
- Conducting the examination (which in itself may be made up of several constituent parts carried out by different parties).
- Reporting on the examination and provision of all findings.
- Assessment of the inspection findings, and providing a conclusion of whether or not equipment remains suitable for continued use.
- Fitness for service assessments where degradation or damage has occurred.
- Specification of repairs or remedial works, where necessary.
- Verification of completion of such repairs or remedial works.
- Maintaining copies of inspection records and associated documentation.

Illustrative example

A site operator required inspection of their pipework. They did not produce schemes of examination for the pipework but had procedures for the task, which identified internal erosion as a degradation mechanism for the pipework and required thickness checks at intervals along the pipe length and at every change of direction. They employed a qualified NDT contractor, who carried out ultrasonic thickness testing at the required locations on the line 'where accessible'.

The NDT did not include any thickness readings at the bend most likely to suffer internal erosion. There was no assessment made of the condition of the pipework at the supports, even though the design of those supports was one that would give rise to a risk of corrosion.

Comment

Competence is task specific. While the contractor was shown to be competent at carrying out ultrasonic thickness checks, they were not competent in pipework inspection.

The pipework was not appropriately assessed for internal erosion at the key first bend, and it was not assessed at all for other degradation mechanisms (such as corrosion at the supports).

A properly prepared scheme of examination would have identified all the degradation mechanisms and the likely locations, clearly defining the inspection requirements. This would have also made clear the accessibility requirements for the examination.

4. Planning of Inspection Work

It is important that appropriate planning and execution of inspection work is undertaken in order to achieve an effective inspection. There are several aspects of planning inspection work to be considered before the inspection takes place. The site operator defines what needs to be inspected with expert help as required. The timing of the inspection is defined in order to ensure safety of operation, and that the plant continues to be fit for purpose. The access provided and the time allowed must be adequate for the inspection team to complete the work. Those engaged to carry out the activity must be adequately trained, experienced and supervised allowing the client to be assured of competence. This section outlines what to consider when deciding what, how and when to inspect.

4.1 What needs to be inspected?

It is the site operator's responsibility to determine what needs to be inspected. They will understand the process and the operating conditions better than others. They should participate actively in identifying credible degradation mechanisms and specifying the correct extent and type of inspection required to detect these.

There are various inputs to this process:

- a) Legislative requirements.
- b) The plant history, maintenance regimes, the operating conditions, environmental conditions and the materials of construction. A cross-disciplinary team may need to be assembled to identify credible degradation and define an effective inspection regime. The relevant disciplines could include metallurgists, chemical engineers, plant operators, and mechanical engineers as well as expert inspectors.
- c) Degradation mechanisms. When engaging a specialist to carry out inspections, the site operator should explain the credible degradation mechanisms (actual and possible) before the extent of the inspection is defined, and the techniques able to detect such deterioration agreed.

4.2 How to inspect?

- a) All inspection activities shall be performed under a safe system of work i.e. Permit to Work or task specific method statement and risk assessment.
- b) The appropriate inspection technique should be understood and used to ensure the effective detection of any damage, deterioration or weakness which could affect safe operation. For example, screening techniques such as crack-detection or thickness measurements are used to detect defects or material loss over time.
- c) The probability of detection and the limitations for each of the techniques proposed as part of the inspection should be understood. By taking account of what is being measured and the accuracy of the measurements, confidence can be gained in the results of inspection, and the interval required before the next inspection.

4.3 When should the inspection be carried out?

The aim is to inspect at a frequency which allows any degradation to be detected, ensuring the continued safe operation of the equipment. Regulations may not prescribe specific inspection intervals, but require a competent person to set an appropriate

interval for each part of the system depending on a risk assessment or the remaining life principle.

- a) Risk based assessments may be used to determine an appropriate inspection scheme. The outcome of each inspection should be used to review the risk based assessment and inform future inspection intervals.
- b) For those items of equipment which are required to be taken out of service in order for inspection to be carried out, the inspection should be thoroughly planned. Due consideration should be given to scheduling downtime and the preparatory activities to provide clean, safe access to all relevant parts of the equipment such as: erection of scaffolding, removal of lagging and removal of inspection hatches. Entry to a vessel should be a permit controlled activity.
- c) If an upset event or excursion in operating conditions occurs, it should not be assumed that there is no change in the rate of degradation in the equipment. Consider performing a supplementary inspection, even if this is well within the period for which the equipment has been endorsed to operate.
- d) Where a uniform deterioration rate has been firmly established and conditions allow the monitoring to be effective, then a number of online monitoring devices are available, (to measure losses of thickness for example). The use of such devices does not remove the requirement to perform a thorough inspection. However they can inform inspection results, and help define inspection intervals.

4.4 Who can carry out the inspection on behalf of the site operator?

It is the site operator's responsibility to ensure that they appoint an external contractor or Inspector with appropriate competence to carry out an effective inspection. When appointing an external contractor:

- a) Examine the evidence of the contractor's competence and ensure that they are able to carry out an effective inspection. A number of organisations such as UKAS, EEMUA or SAFed can give guidance on acceptable qualifications for inspectors and the accreditation of inspection bodies. *(See reference section for specific guidance).*
- b) Inspection qualifications and non-destructive testing certification can lapse over time. Ensure that the Inspector or technician has current evidence of competence, for the technique(s) to be used before they start work. BINDT can advise on acceptable qualifications and competence of NDT technicians.
- c) Personnel associated with the inspection process shall retain their independence, be free from any conflicts of interest and shall act impartially.
- d) Responding to the findings of an inspection report, by a properly appointed competent external contractor, is a separate issue dealt with in the next section.

5. Response to Examination Findings

External expertise is commonly used in carrying out equipment examinations. However, examination results often require interpretation and conclusions need to be drawn to allow decisions to be made on what further action is necessary. These decisions can be made either by the site operator/customer, or by a specialist contractor. Therefore, careful allocation of roles and responsibilities (as discussed in section 3) should ensure that all necessary elements of the integrity management process are covered.

The key point is that it is important to remember that the examination is not the end of the integrity management process. Finding specialist expertise to conduct the examination may not be sufficient to meet all necessary requirements to ensure the continued integrity of the equipment involved. Similarly, it may not be sufficient to meet all the site operator's legal duties. Assessment of the results and drawing conclusions to allow appropriate action are the key outcomes.

5.1 Communication and management of actions

Measures to address the issues above can include:

- Clear communication of the output of the examination process so that the end user (e.g. operations department) knows what action to take (e.g. repair, removal from service, continued use etc).
- Demarcation of actions to clearly identify which are necessary requirements to allow return to or continued service and those that are advisory. Where relevant, actions should be provided with a target date or timescale (this may be of a form such as 'before return to service'). Actions may also set limits on service or operating conditions.
- Management systems to control the follow up from the examination and ensure that any actions are completed, whether they be allocated to the site operator or external contractor. This includes verification (including testing) of remedial actions or repairs.

5.2 Resolving differences

There may be situations where the site operator/customer does not agree with the advice or actions provided by a third party specialist, and does not feel it appropriate to be bound by such conditions. This may occur where it is felt that the consultant was being overly conservative. As external bodies are often employed to fill a gap in the specialist competencies of the site operator, it would be unwise to ignore their advice.

The site operator should have a formal process for dealing with differences of opinion. For example, this may seek to ensure that the level of competence of those making the final decision is at least equivalent to those making the original recommendation. Any site operator should ensure that the primary motivation in making decisions in this process is the integrity of the equipment and the safe operation of the site.

6. Performance Monitoring, Audit and Review

The relationships within an integrity management process can become complex. Especially as that process will often apply to a range of different equipment and can include a number of different parties. There is often potential for improvement and scope to learn from experience. Performance monitoring, audit and review should be used to maximise the opportunity for such benefits.

6.1 Performance monitoring

Performance may be measured in the following areas:

- Engagement of the contractor
 - Where contracts are placed with suppliers, the performance of that function should not be based solely on savings made, but also consider the suppliers quality of service and their ability to meet the needs of the original contract.
- Execution of the required examinations
 - Performance indicators can be used to assess the delivery of the process. This may include measuring the proportion of examinations undertaken on schedule, and other parameters.
- The response to the results of examination
 - Agreed actions closed within specified timescales

6.2 Audit

The relationships between site operators and external contractor are part of a larger management system. Therefore it is important that they are included as part of the wider audit arrangements of the asset management function.

6.3 Review

Routine performance monitoring and audits are expected to provide an input into a periodic review aimed at developing learning and improving risk control on site.

Illustrative example – Benefits of review

A site operator had used an independent external contractor to prepare a written scheme of examination of an insulated stainless steel distillation column. A second external contractor was employed to carry out the periodic thorough examinations. The scheme did not identify stress corrosion cracking of the vessel as a potential degradation mechanism, and it was not looked for during examinations. This was apparently because the inspection bodies had mistaken the materials of construction and therefore did not recognise the threat.

However, the site maintenance team had encountered failures of the stainless steel bolted fastenings on the main body joint of the column. The failed parts were analysed by a specialist, who diagnosed chloride induced stress corrosion cracking (CISCC).

Some years later leaks were found on the body of the vessel. Examination found that it too had suffered from CISCC, with through wall cracks now evident. Analysis found the column to be an unstable structure and required replacement, causing a significant period of plant downtime.

Comment

It can be argued that the original scheme of examination should have identified the threat of chloride induced stress corrosion cracking of the column, there were clearly issues with sharing information on materials of construction. However, the error should have been corrected once site maintenance staff had identified the degradation. It is important that site staff recognise the important knowledge they possess and have an input into the integrity management process even when tasks are contracted out to external bodies.

Summary and Conclusions

The use of external contractors or consultants to provide specialist expertise is common in the management of ageing plant and asset integrity. It provides a means to fill gaps in both resource and competence.

There are many different models for such arrangements. These have to cater for the differing management systems used by site operators and for the different areas where the specialist resource is required. This flexibility is welcome if it allows the customers or site operators to meet their needs. However, any system will only be effective if key principles are applied.

The customer/site operator should be able to:

- Know what they need,
 - So that they can define what is required of the supplier, but also so that they understand what is required of themselves.
- Assess what they receive,
 - So that they can understand whether the supplier meets their requirements.
- Know how and when to act
 - So that they are assured that remedial work is undertaken wherever necessary.

These are the principles of being an intelligent customer

Similarly the supplier of specialist services should be able to:

- Know what is required of them,
 - Not only so that they can fulfil their obligations, but also so that they can advise the customer of what they are not doing, but may be required
- Understand that they are part of a team,
 - So that there can be a clear flow of information and co-operation between them and the customer.
- Provide clear conclusions with justification,
 - So that they help the customer know the limits of the work done, and the action required of them.

It is important for the site operator/customer to understand that the examination is not the end of the integrity management process. Assessment of the results and drawing conclusions to allow appropriate action to be taken, are the key outcomes.

While tasks can be delegated, legal responsibilities cannot be delegated.

CDOIF

**Chemical and Downstream Oil
Industries Forum**

CDOIF is a collaborative venture formed to agree strategic areas for joint industry / trade union / regulator action aimed at delivering health, safety and environmental improvements with cross-sector benefits.

Abbreviations & Glossary

| Abbreviation | Description |
|--------------|---|
| BINDT | British Institute of Non-Destructive Testing |
| CA | Competent Authority |
| CDOIF | Chemical and Downstream Oil Industries Forum |
| EEMUA | Engineering Equipment and Materials Users Association |
| HSE | Health and Safety Executive |
| NDT | Non Destructive Testing |
| PSSR | Pressure System Safety Regulations |
| SAFed | Safety Assessment Federation |
| UKAS | United Kingdom Accreditation Service |
| WSE | Written Scheme of Examination |
| | |

| Term | Definition |
|-------------------------------------|--|
| Competent Person | A competent person is someone who has sufficient training and experience or knowledge and other qualities that allow them to enable the Site Operator to meet the requirements of health and safety law. |
| Criticality Assessment | An assessment of the consequences of failure of an item of plant or equipment to allow some prioritisation of maintenance and inspection activity. Criticality can be assessed with respect to a number of parameters (which may include safety, environment, business etc) depending on the definition applied by the duty holder to meet their needs. However, care needs to be taken to ensure that legislative requirements are met, e.g. guidance to the Control of Major Accident Hazards Regulations refers to the periodic examination and assessment of safety-critical components (here the term 'safety' should be interpreted to include matters affecting health, safety or environment). |
| Customer | In the context of this guidance the customer is the person procuring the service. A site operator will become a customer, but so will contractors if they sub-contract work packages. |
| Duty Holder | The person or organisation with the responsibility to meet the relevant legal requirements. |
| External Contractor, or Supplier | Organisation engaged to deliver the scope of services specified in the contract. |
| Inspection/Examination | Within this guidance these are considered interchangeable terms to describe various activities aimed at assessing the integrity of plant and equipment. |
| Site Operator | A person who is in control of the operation of the establishment or installation. A person may be an individual, corporate body or a partnership. |
| Written Scheme of Examination (WSE) | A plan used to define the scope and frequency of examinations to be carried out. (NB there are specific requirements for a WSE within the Pressure Systems Safety Regulations, where they apply) It should be noted that different terms may be used for this 'plan' where PSSR does not apply. |

Acknowledgements

This document was created as part of the Chemical and Downstream Oil Industries Forum, CDOIF, wish to record their appreciation to the working group members who were responsible for creating this guidance:

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Paul Stanworth (Chair)
Andrew Fowler
Chris Blackmore
Douglas Leech
Francis Drew
Bud Hudspith
Hugh Bray
Ian McCluskey
Jean Martin

Julian Hought
Kevin McKeown
Martin Denny
Miles Gardner
Alec Morrow
Nick Girdham
Paul Jackson
Peter Davidson
Phil Scott
Richard Hakeem
Richard Hulmes
Robin Luxmoore
Stefan Kukula
Stuart Pointer

Organisation

Health and Safety Executive
HFL Consulting Ltd
Institution of Chemical Engineers
Chemical Business Association
UM Group Ltd
Unite the Union
Tank Storage Association
Avantigas
Murco Petroleum Limited /
InSite Technical Services Ltd
HFL Consulting Ltd
Calor Gas Ltd
BP
Zurich
Lyondell Basell
Total
ABB
UK PIA
Chemical Industries Association
UK LPG
SAFed
EEMUA
EEMUA
Health and Safety Executive

Other Relevant Publications

Enforcement Policy Statement (www.hse.gov.uk/pubns/hse41.pdf)

Human factors: Intelligent customer capability
(<http://www.hse.gov.uk/humanfactors/topics/customers.htm>)

A guide to the Control of Major Accident Hazards Regulations 1999 (as amended), L111, HSE Books, ISBN 9780717661756

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Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and Guidance, L22, HSE Books, ISBN 978 0 7176 6619 5

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Plant ageing - management of equipment containing hazardous fluids or pressure, HSE Research Report RR509, prepared by TWI Ltd, ABB Engineering Services, SCS (INTL) Ltd and Allianz Cornhill Engineering. <http://www.hse.gov.uk/research/rrpdf/rr509.pdf>

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Best practice for the procurement and conduct of non-destructive testing. Part 2: Magnetic Particle and Dye Penetrant Inspection, HSE Gas and Process Safety Technology Division, November 2001

Information for the procurement and conduct of non-destructive testing. Part 3: Radiographic Inspection in Industry, HSE Gas and Process Safety Technology Division, April 2008

Information for the procurement and conduct of non-destructive testing. Part 4: Ultrasonic Sizing Errors and their Implication for Defect Assessment. HSE Gas and Process Safety Technology Division, April 2008

Revision History

| Rev. | Section | Description | Date | Changed By |
|------|---------|-------------|----------|-------------|
| 0 | All | First Issue | 23/03/15 | P Stanworth |
| | | | | |
| | | | | |
| | | | | |