

COMAH Competent Authorities

Operational Delivery Guide

Mechanical Integrity



Environment
Agency



Cyfoeth Naturiol Cymru
Natural Resources Wales



Office for
Nuclear Regulation

COMAH CA Operational Delivery Guide

Mechanical Integrity

Open Government status

Fully open

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Purpose

1. This Delivery Guide (DG) underpins the Competent Authority's (CA) programme to prevent, control and mitigate major accidents at COMAH sites from a mechanical engineering perspective. It does this by verifying plant is suitably designed, constructed and installed, and that ageing mechanisms which could cause plant deterioration and increased major hazard risks are recognised and are being managed effectively.
2. The Mechanical Integrity approach is intended to be part of the CA's suite of DGs used to benchmark COMAH sites, rather than being a standalone Strategic Topic. This DG can therefore be deployed as part of a CA multidisciplinary/multiagency approach to assess the effectiveness of the systems in place to manage the risks of major accidents at COMAH establishments. Risks to both people and to the environment arising from mechanical integrity failure may be addressed during interventions delivered under this DG.
3. The DG provides background information and describes the CA's approach for inspection of mechanical integrity arrangements. A separate Mechanical Integrity Intervention Tool (MIIT) provides the detailed technical criteria that CA specialist mechanical engineering inspectors will use during topic interventions.
4. This DG and the accompanying MIIT update and replace the CA Ageing Plant DG that was published in 2010.

Target audience

5. This DG is intended to be read by all operational staff within the Competent Authority, including CEMHD, ONR, EA, SEPA, and NRW, but principally used by the Mechanical Engineering discipline.
6. It may also be used by COMAH establishment operators to prepare for an intervention, or by non-COMAH sites as a source of intelligence.

Scope

7. This DG is provided to help gauge the effectiveness of an operator's Mechanical Integrity strategy, and to support the assessment of ageing issues and how well these are understood and managed. It should enable operational teams to:
 - 7.1 identify COMAH sites where plant design, installation or degradation is an issue with the potential to give rise to a major accident;
 - 7.2 better target inspections and interventions as part of the Profiling, Targeting and Strategy (PTS) approach;
 - 7.3 assess how well an operator is managing mechanical integrity and plant ageing, and record their performance in a consistent way; and
 - 7.4 identify issues, and to take action to secure improvements or arrange further interventions as required.

8. Although principally intended for use at establishments subject to COMAH, this DG can also be utilised at sites not subject to COMAH where mechanical integrity failure could lead to a significant incident and needs to be effectively managed.
9. This DG and the MIIT, when used at a COMAH establishment, apply to both the safety of people and the environment. Any reference to major hazard safety should therefore be considered to extend to the control of Major Accidents to the Environment (MATTEs).

Background

10. Ageing mechanisms such as corrosion, erosion, fatigue and obsolescence should be considered as part of a Mechanical Integrity management system. The issue of ageing plant is part of the overall management of the integrity of a site's assets; it is closely linked to the effectiveness of the inspection, testing and maintenance regimes and underpinned by adequate initial design. In practice, ageing plant issues are best tackled as part of overall inspection and maintenance plans related to mechanical integrity management, which in turn is a key element of a site's Safety Management System (SMS).
11. This revision to the CA's ageing plant program has been expanded to consider additional mechanical engineering aspects, building on the original Ageing Plant work started in 2010. It refocuses attention on mechanical integrity and how it is managed, and uses terminology and definitions that have been adopted by industry. It is based on:
 - 11.1 A review of the data captured since 2010;
 - 11.2 A review of industry practice that has evolved since the Ageing Plant Strategic Priority roll out in 2010;
 - 11.3 Compatibility and dovetailing with strategic topics (e.g. Major Hazard Leadership) and ways of working (e.g. PTS).
12. The main controls should focus on the prevention, control and mitigation of major accident hazards (MAH) arising from potential ageing related deterioration in, or failure of, plant or system performance. These include systems and procedures for:
 - 12.1 hazard identification, risk assessment and management of change;
 - 12.2 inspection and examination of the primary containment boundary, safety critical devices and structures supporting plant or safeguarding people and the environment;
 - 12.3 planned and reactive maintenance, including testing of safety-critical devices;
 - 12.4 management and leadership oversight of the above, including provision of appropriate levels of resource and competence.
13. The above rely on having the correct initial design, ensuring that the plant is suitable for its intended use at the outset. Some elements of design

consideration have been included in this DG so the scope has been widened relative to the previous Ageing Plant DG.

Revised Mechanical Integrity Approach

14. The intent is to address the challenges outlined above, and at the same time develop a strategy document that can be reinforced with industry, reaffirming the importance of the primary containment boundary and maintenance of the most COMAH critical equipment. Shortcomings can then be used as evidence to highlight wider Leadership and SMS issues, on the basis that a suitably robust SMS should identify any significant weaknesses before they are drawn to the attention of the operator by the CA.
15. Criteria are rationalised into four main topics aligned with the regulatory requirements of the Health and Safety at Work etc Act 1974, Management of Health and Safety at Work Regulations 1999 and the Provision and Use of Work Equipment Regulations 1998. The four topics are as follows:
 - 15.1 Design and Initial Integrity - to include consideration of:
 - a) initial design
 - b) initial construction, quality assurance standards and records, e.g., materials, welding etc.
 - c) the establishment and maintenance of safe operating limits (pressure, temperature etc.)
 - d) changes to the design and/or process.
 - 15.2 Inspection - to include consideration of:
 - a) identification of key equipment, especially the primary containment boundary
 - b) identification of potential deterioration and its impact
 - c) setting of written schemes of examination (WSEs) including scope and frequency of examinations
 - d) reporting and management of adverse findings
 - e) monitoring and review of effectiveness
 - f) definition of roles and responsibilities
 - g) postponements and deferment control
 - h) overdue examination
 - i) validation of new examination techniques and other checks and balances to validate current techniques and assumptions
 - j) materials quality assurance.
 - 15.3 Maintenance - to include consideration of:
 - a) asset register
 - b) identification, inspection, maintenance and testing of safety critical devices (e.g. non-return valves, remote operated shut off valves, relief valves etc)

- c) philosophy – proactive/reactive and a suitable balance
- d) condition monitoring and other preventative strategies
- e) spares holding and procurement
- f) drawing and document control
- g) mechanical isolation.

15.4 Integrity Management and Leadership - to include consideration of:

- a) oversight and understanding – either adequate reference to mechanical integrity within the organisations Health and Safety and Environmental leadership policy or suitable standalone mechanical integrity leadership policy
 - b) monitoring, audit and review, including setting appropriate key performance indicators
 - c) resource levels, independence and competence assurance
 - d) management of change including creeping change.
16. The Ageing Plant Gap Analysis included in the former DG will not be pursued in its current form, and the documents not added to further. It is intended to retain these records for historical and intelligence purposes. Going forward, any specific issues should be identified by the Mechanical Engineering Specialist for incorporation in to the site PTS record, which should be updated after each visit. Scoring should still be added to other relevant HSE recording systems, as well as being recorded in Inspection Reports.
17. It is expected that intervention topics will be identified in accordance with the intervention strategy for the establishment developed within the PTS framework. Under normal circumstance, it is not expected that Mechanical Integrity visits will be done as a stand-alone topic for existing establishments; however, they may be justified for relatively new sites where there is little intelligence, or where there is meaningful and substantive change on an existing site, e.g., new ownership or major re-organisation. Equally, it may be that Mechanical Integrity visits are used as the basis for exploration of the Major Hazard Leadership topic on COMAH sites. It is expected that a judgement against the Mechanical Integrity criteria is done by the Mechanical Engineering Specialist following any planned visit where integrity is discussed or any investigation on the site where integrity failure is a key factor. There should be a feedback loop into the PTS via the COMAH Intervention Manager (CIM).

Inspection of nuclear licensed facilities

18. Note that for COMAH enclaves on nuclear licensed sites, management of mechanical integrity must be set in the context of the overall safety management system related to nuclear safety, rather than considering COMAH in isolation. All CA staff engaging with these sites must contact ONR prior to undertaking any interventions to ensure regulatory interactions are consistent, and that consideration is given to the holistic site hazard profile.

19. Following an inspection on a nuclear licensed site, the team/inspector must discuss the outcomes with ONR inspectors before providing a performance rating or taking any associated follow up action that may arise.

Performance rating

20. The performance rating approach will be consistent with other CA DGs, ranging from 10 (exemplary) to 60 (unacceptable), with the same descriptors detailed in Table 1 below.
21. The rating(s) assigned after an inspection will be based on the CA's judgement of the extent to which the principles in the MIIT are reflected in practice.
22. Four scoring fields are to be used - the previous topics associated with 'Safety Critical Equipment' and 'Resources' have been incorporated into 'Maintenance' and 'Leadership and Management' respectively. A new score for 'Design and Initial Integrity' has been created.

Table 1 Performance Rating Table

TOPIC PERFORMANCE SCORE					
60	50	40	30	20	10
Unacceptable	Very Poor	Poor	Broadly Compliant	Fully Compliant	Exemplary
Unacceptably far below relevant minimum legal requirements.	Substantially below the relevant minimum legal requirements.	Significantly below the relevant minimum legal requirements.	Meets most of the relevant minimum legal requirements.	Meets the relevant minimum legal requirements.	Exceeds the relevant minimal legal requirements.
Degree of non-compliance extreme and widespread.	Degree of non-compliance substantial.	Degree of non-compliance significant.	Degree of non-compliance minor and easily remedied.	No non-compliance.	No non-compliance.
Most success criteria are not met.	Many success criteria are not fully met.	Several success criteria are not fully met.	Most success criteria are fully met.	All success criteria are fully met.	All success criteria are fully met.
Failure to recognise issues, their significance, and to demonstrate adequate commitment to take remedial action.	Failures not recognised, with limited commitment to take remedial action.	Limited recognition of the essential relevant components of effective safety and environment management, but demonstrate commitment to take remedial action	Management recognise essential relevant components of effective safety and environment management, and commitment to improve standards.	Management competent and able to demonstrate adequate identification of the principal risks, implementation of the necessary control measures, confirmation that these are used effectively, and subject to review.	Management competent, enthusiastic, and proactive in devising and implementing effective safety and environment management systems to 'good practice' or above standard. Actively seek to further improve standards.
INDICATIVE CA ACTION					
Prosecution / Enforcement Notice.*	Enforcement Notice* / Letter.	Enforcement Notice* / Letter.	Letter / Verbal warning.	None.	None.

Inspection outcomes

23. The findings from the inspection should be confirmed to the dutyholder in writing. On nuclear licensed sites, ONR inspectors must be consulted before any written communication with the site.
24. The Specialist Mechanical Engineering Inspector should discuss their findings with the COMAH Intervention Manager (CIM). The CIM should review the relevant establishment strategy and intervention plan in the light of the inspection findings as required under the PTS framework.
25. Performance scores of 40, 50 or 60 should raise fundamental concerns about the organisation's ability to manage major hazard risks. In particular, the specialist mechanical engineering inspector and CIM should consider whether the inspection findings justify including further interventions targeted

at underpinning SMS or leadership arrangements in the establishment strategy and intervention plan.