



# EEMUA Publications

**EEMUA publications are developed to fulfil a need for guidance in a particular area of engineering or as a result of changed or new regulatory expectations. EEMUA's publications help to define or clarify what is good practice and provide the foundation for its training and competency courses as well as the shorter e-learning modules.**



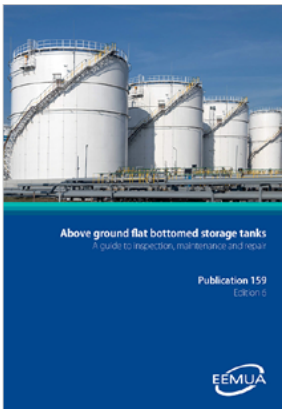


# EEMUA Publications

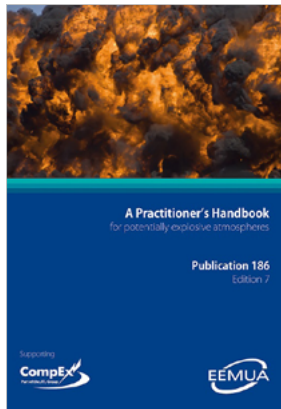
## Introduction

EEMUA's members come together in working groups and committees to share the breadth and depth of their engineering expertise. These cooperative efforts allow EEMUA to develop industry leading guidance and other publications that promote good practice. Engineers around the world recognise the technical quality of EEMUA guides because they are written by industry, for industry in a way that can be applied cross-sector.

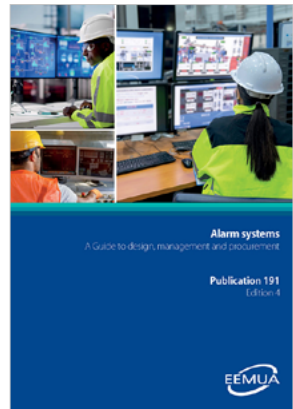
Overall, EEMUA has developed more than 200 engineering guides, handbooks, information sheets, regulatory briefings and other publications. These include:



**EEMUA Publication 159:**  
**Above ground flat bottomed storage tanks – a guide to inspection, maintenance and repair.**



**EEMUA Publication 186:**  
**A Practitioner's Handbook for potentially explosive atmospheres.**



**EEMUA Publication 191:**  
**Alarm systems – a guide to design, management and procurement.**

International standards bodies, such as the ISO and IEC, have frequently used EEMUA's publications as the basis of formal standards, or adopted them in their entirety as new standards. EEMUA is continually developing guidance in new areas and providing new editions of existing guides.

EEMUA welcomes constructive comments on all its publications. If you have feedback to offer, please use our standard feedback form, which helps us deal with comments efficiently. Our technical committees consider all comments on publications and may incorporate them in future editions.

For reference purposes, EEMUA maintains a list of discontinued EEMUA publications. Previous editions of EEMUA publications may be made available to member company users only. Please contact [ask@eemua.org](mailto:ask@eemua.org) with the details of your request.

EEMUA publications can be purchased online at <https://www.eemua.org/new-shop>. Alternatively, please contact EEMUA by telephone +44 (0)20 7488 0801 or by e-mail: [sales@eemua.org](mailto:sales@eemua.org)

Most EEMUA publications can be purchased as a digital version. We also offer some publications as a print version. Please see the listings for more details.

The full catalogue of all current EEMUA publications is in the next section. A limited number of free reports, infographics and webinar recordings are also available on the EEMUA website (you will need to be logged in to view/download these).

**EEMUA Members have free access to digital copies of EEMUA publications and are entitled to a 25% discount when they purchase print copies.**

**Those on the Associate Company Scheme are entitled to a 50% discount when purchasing digital copies of EEMUA publications and a 25% discount when they purchase print copies.**

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## Section 1 – Automation, Control, Electrical

### 246 Guidelines for managing ignition risk by inspection of Ex electrical equipment in hazardous areas (including support of IEC 60079-17)

EEMUA 246 provides guidance on managing the ignition risks of Ex electrical equipment located in hazardous areas arising from flammable vapours and gases.

Inspection of Ex electrical equipment is critical to assuring the continuing integrity of the types of protection that enable its use in potentially flammable atmospheres, hence management of the major accident hazard ignition control boundary. However, such inspections are sometimes not carried out adequately both with regard to frequency of inspection, grade of inspection and completeness of the portfolio of Ex electrical equipment installed. This is due in part to the onerous requirements of IEC 60079-17 with respect to close inspection, in three years, of the several thousand pieces of Ex electrical equipment at a typical installation handling flammable fluids in major hazard industries (both onshore and offshore) or allied process industries. In addition, inspection of Ex electrical equipment is often carried out at the same level of inspection (frequency of inspection, grade of inspection, etc.) without adjustment for the different ignition risks that might apply. Furthermore, there is a lack of clarity in IEC 60079-17 regarding carrying out sample inspections, particularly with respect to detailed inspections.

The EEMUA 246 guidance is mapped against a Safety management system (SMS) framework which should be applied throughout the lifecycle of Ex electrical equipment located in hazardous areas arising from flammable vapours and gases. These guidelines further develop the Risk-based inspection (RBI) concept by providing an RBI sampling methodology which will complement an RBI inspection process that takes into account As low as reasonably practicable (ALARP) principles. The RBI methodology is intended for application to sampling of electrical equipment as defined within IEC 60079-17. The methodology applies random sampling to lots.

These guidelines are based primarily on the UK legislative and regulatory framework and international standards; yet its guidance is globally applicable, provided it is read, interpreted and applied in conjunction with relevant national and local statutory legislation and standards. Where the requirements differ, the more rigorous should be adopted.

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## 242 Proof testing good practice for Instrumented protective systems

The first edition of this guidance outlines good practice in carrying out proof testing of Instrumented protective systems (IPS) and writing proof testing procedures. EEMUA 242 provides an overview of the high level requirements for proof testing, including the intent behind the tests. Detailed guidance covers the testing of particular instrument types and how to document a proof test in a standard proof test routine template. This publication is intended for site engineers working with system designers on new IPS, but is also helpful for legacy IPS where documentation of the design is incomplete.

The emphasis is on the practical aspects of proof testing, given that every process plant has its own specific requirements and that the ideal of out of service end-to-end testing may rarely be achievable because of operating constraints. EEMUA 242 covers an area which is outside the scope of most standards, and for many users would be a very steep learning curve without guidance. It is based on the experiences of testing real process plant equipment and has been extensively reviewed by industry practitioners.

Applying EEMUA 242 may assist in fulfilling some of the requirements of Clause 16 of IEC 61511-1 which places specific requirements on Safety instrumented functions (SIFs), which are IPS protecting safety hazards with a required integrity of SIL (Safety integrity level) 1 or above. This guidance should be applied to IPS which are SIFs, but may also be applied to other IPS, including those protecting non-safety hazards or those with below SIL1 integrity. Overall requirements for proof testing of IPS and how this is related to the safety lifecycle is established in other documents such as IEC 61511.

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## 241 Guidance on the presence and operation of portable self-energised electrical/electronic devices in potentially explosive atmospheres (gas and dust)

EEMUA 241 is a practical guide for managing the presence and use of portable self-energised electrical and electronic devices within potentially explosive atmospheres. It provides a structured approach which can be followed by site personnel supervising and managing the presence and use of portable self-energised electrical and electronic devices on a day-to-day basis.

This publication provides guidance in relation to the electrical ignition risks within areas with potentially explosive atmospheres. It therefore includes:

- Vapours and mists – such as petroleum products;
- Gases – such as hydrogen; and
- Combustible dusts – such as food products and cement.

The guidance only covers electrical ignition risks from self-energised devices (including those powered by extra-low voltage). Therefore, mechanical sources of ignition and devices powered by mains electricity are not covered. However, some of the guidance within this document (such as Section 12) may have some useful guidance which can be applied to the use of equipment powered by mains electricity.

The guidance only covers portable devices, and as such does not cover any fixed equipment within the plant (such as lighting), or isolatable equipment which is fixed to vehicles (such as reversing cameras). It also only considers industrial facilities and does not aim to provide guidance on the use of portable self-energised electrical and electronic devices in public areas such as service stations or transportation on public roads.

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## 227 Management of ageing electrical assets

EEMUA Publication 227 aims to provide a coherent, proactive system for managing certain ageing electrical assets.

Electrical equipment is often designed with a relatively long lifetime (typically 20 years) and the electrical engineer responsible for it has the challenge of ensuring the equipment's integrity over this period, if not well beyond it. In justifying the continued service of equipment, the engineer has to take commercial (reliability, availability, replacement costs) and safety considerations into account. This is a difficult task, and in addition to general good asset management practice, the electrical engineer requires specific guidance relating to:

- Identifying potential failure mechanisms on ageing electrical assets;
- Methods of detecting early signs of failure mechanisms;
- Ways of calculating remaining expected life of electrical assets;
- Maintenance methods to extend electrical asset life; and
- Demonstrating the benefits of replacing equipment before failures occur.

This publication is focused on six types of electrical equipment that the EEMUA Electrical Committee prioritised as those where additional guidance would be most useful, either due to a lack of other guidance or an increase in incidents related to ageing asset issues. These are: uninterruptable power supplies and battery systems; electrical drives; electrical protection devices; power cables; switchgear (HV and LV); and transformers. EEMUA 227 also provides general guidance on managing ageing electrical assets.

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## 226 On-line analysers: technical enquiry and bid evaluation

EEMUA Publication 226, 'Design and installation of on-line analyser systems: a guide to technical enquiry and bid evaluation' is intended as a guide to assist in the development of a specification or material requisition for analysers and their associated support systems. The Publication, which supersedes EEMUA Publication 138 S1, should be used for enquiry purposes and the subsequent assessment of the bids presented by the prospective vendors. EEMUA 226 is not intended as a design specification in its own right and design guidance has been deliberately omitted. It should be read in conjunction with EEMUA Publication 138, 'Design and installation of on-line analyser systems.' A new imprint of EEMUA 226 was published in July 2025. It added guidance on remote Factory Acceptance Testing (FAT).

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## 222 Guide to the application of IEC 61511 to safety instrumented systems in the UK process industries

This Guide, written by leading experts, including from the Health and Safety Executive, provides guidance and recommendations on the application of IEC 61511 for the specification and implementation of safety instrumented systems, systems designed to bring a process plant to a safe state should a hazardous incident occur. It is intended to explain how to use the IEC 61511 standard effectively and addresses the responsibility and deliverables of organisations involved in the specification, supply and maintenance of safety instrumented systems. IEC 61511, 'Functional safety – Safety instrumented systems for the process industry sector' is now widely accepted as the state of the art for such systems.

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## 214 Toolbox Guide: Electrical installation, inspection and maintenance in potentially explosive atmospheres

Available to purchase from CompEx® only, by email [CompexAdmin@jtltraining.com](mailto:CompexAdmin@jtltraining.com)

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## 209 Guide to the development and implementation of on-line analyser applications

Recognising that online analysers are expensive to install and maintain, EEMUA has published a new guide that will ensure these pieces of equipment are correctly selected, specified and installed to make certain they have the required performance and reliability to meet the business need and capture the intended benefit. EEMUA Publication 209 complements our existing EEMUA Publications: 138, 175, 187 and 226, which already provide detailed guidance on the installation, design and operation of process analyser systems.

**Digital version**

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## 201 Control rooms: a guide to their specification, design, commissioning and operation

This third edition of EEMUA Publication 201 was produced in response to changes in technology and good practice across industry. EEMUA 201 provides a comprehensive guide to the design of control rooms including the control building, physical aspects of the control room, working environment, console design, and control system graphics. Emerging issues are covered such as devices used outside of the control room, security and there is a stronger focus on human factors. The aim of the new edition is to provide improved guidance to people involved in the design of control rooms, both during new-build and modification projects as well as evaluating existing control rooms.

EEMUA 201 relates to human-computer interface (HCI) systems provided for people operating industrial processes and activities on facilities such as chemical plant, power stations and oil refineries. HCI systems are one of a number of key areas that can influence – and optimise – human performance in the area of a centralised control room, so important in maintaining process and major hazard safety. EEMUA 201 gives guidance on: the factors to take into account when designing an HCI; display hierarchies; screen display format design; and control room design attributes which affect HCIs. It is for use by engineers and managers in both user and contracting organisations. The objective is not only to make plants more operable, efficient and able to avoid abnormal situations, but to be able to better manage such situations should they occur.

EEMUA 201 is not a standard and is not intended to replace any. Designers will be expected to identify and adhere to any standards and regulations and any company and project specifications. The intention is that EEMUA 201 will provide guidance on how this can be achieved in the most effective way.

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## 191 Alarm systems – a guide to design, management and procurement

Alarm systems form an essential part of the operator interfaces to large modern industrial facilities. They provide vital support to the operators by warning them of situations that need their attention and have an important role in preventing, controlling and mitigating the effects of abnormal situations. Since it was first published in 1999, EEMUA Publication 191 has become the globally accepted and leading guide to good practice for all aspects of alarm systems.

- Providing clear guidance for both existing and new alarm systems
- Written by alarm systems experts working on high hazard sites
- Informed by real-world process safety experiences
- Acknowledged as good practice by leading regulators
- Aligned with international standards
- Contributing to plant safety, efficiency and compliance
- Globally applicable across a wide range of industry sectors

The publication, developed by users of alarm systems with input from the GB Health and Safety Executive, gives comprehensive guidance on designing, managing and procuring an effective alarm system. It is intended to help in improving existing systems and in developing new facilities during plant construction or during alarm system refurbishments. Both of the international standards for the management of alarm systems for the process industries, ISA 18.2 from the International Society of Automation and IEC 62682: 2023, are aligned with EEMUA 191.

The new Fourth Edition has been comprehensively updated and restructured to improve ease of use. The terminology has been aligned to that used in the latest editions of the standards and the opportunity has been taken to include new material on alarm management for remote sites.

EEMUA 191 is primarily concerned with alarm systems provided for people operating industrial processes. These include alarm systems in industries such as chemical manufacture, power generation, oil and gas extraction and refining and others. However, much of the guidance is generic and with appropriate interpretation can be applied in other sectors. For example, the guide has been used successfully as a basis for training in the rail and transport sectors, in the nuclear industry, and elsewhere.

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## **187 Analyser systems - a guide to maintenance management**

Analysers are used in industry to measure variables which significantly contribute to safety, environmental performance, asset protection and profit maximisation. The second edition of EEMUA Publication 187 covers performance target setting, strategies to improve reliability, methods to measure effective performance, and the organisations, resources and systems that need to be in place to allow this to occur. The new edition includes updated chapters on classifying analysers using a risk based approach, maintenance strategies, analyser performance monitoring, and a comprehensive glossary of terms.

**Digital version**

**£150 | Free digital version for members**

## **186 Practitioner's Handbook for potentially explosive atmospheres**

EEMUA Publication 186 offers guidance for safe installation, inspection and maintenance work in potentially explosive atmospheres when the failure to adopt safe working practices could result in the ignition of flammable gases or combustible dusts. It is concerned with ignition caused by electrical and mechanical sources and is based on the requirements of international and European standards, directives and regulations.

This seventh edition has been further updated to align with the latest versions of the relevant standards, in particular the fifth (2013) editions of IEC 60079-14 and 60079-17. EEMUA 186 interprets the relevant parts of the standards, and brings them together in one clear, understandable and easily navigable resource. The chapters on equipment, installation and inspection have been revised

extensively, including EEMUA's recommendations on barrier gland selection. There are separate chapters on: fuel filling stations; hazardous areas in the water and waste water industries and mechanical ignition sources. Application design engineering and the duties of the Responsible Person as defined in IEC standards are also covered.

Potentially explosive atmospheres occur in many industries, not only in onshore and offshore oil and gas, but also in chemicals, power generation, pharmaceuticals, food and beverages, manufacturing, maritime and utilities. Typical sites include petrochemical processing and refining plants, liquor distilleries, paint spraying plants, flour mills, woodworking plants and coal handling plants.

EEMUA Publication 186 is closely associated with the **CompEx®** training and competency assessment scheme which provides trainees with essential knowledge and practical skills for safe working in potentially explosive atmospheres.

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## 175 Code of Practice for calibration and validation of process analysers

This comprehensively updated EEMUA Code of Practice provides a guide to the principles and methods used for calibrating and validating process (on-line) analysers. It provides detailed guidance on continued validation (in-service checking) and any required calibration adjustment, including the use of control charts. The publication is based on and supersedes the IP Codes 340/82, 341/82, 347/82, 348/82, 349/82 and 353/82. Though the basic principles outlined in the previous editions have not changed, there have been many changes to points of detail, including new and revised standards and other guidance which have been brought together in this revision.

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## 138 Design and installation of on-line analyser systems

This specification for on-line analysers encourages standardisation within industry, resulting in reduced design and construction costs, and improved safety.

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## Section 2 – Engineering, Procurement, Construction

### 235 Guidance on PWHT for P1 CMn steels

The removal of mandatory Post Weld Heat Treatment (PWHT) for P1 group CMn steels thicker than 0.75 inch in the 2014 edition of ASME B31.3 (and later editions) prompted EEMUA member companies to develop this publication. If PWHT is performed incorrectly, or neglected altogether, residual stresses can combine with load stresses to exceed a material's design limitations. This can lead to weld failures, higher cracking potential and increased susceptibility to brittle fracture.

EEMUA Publication 235 provides guidance to designers of piping systems on the threshold thickness for PWHT of P1 steels. It also advises on the benefit of PWHT for P1 steels when selected for low temperature applications, such as in the offshore oil and gas sector. EEMUA commissioned fracture mechanics specialists to create a new set of design curves for P1 steels based on ASME B31.3 and API 579 which are included in the publication.

**Digital version**

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### 234 90/10 Copper nickel alloy piping for offshore applications (Specification)

This First Edition, released in November 2015, replaces the combined and updated EEMUA Publications 144, 145 and 146, which have now been withdrawn. The new publication covers tubes (seamless and welded) for use in cooling and fire-fighting sea water service on offshore platforms, slip-on flanges (composite and solid), and fittings, including butt welding, socket welding, capillary brazing, compression, threaded, branch and saddle pieces. EEMUA Publication 234 has been fully updated to comply with current standards.

**Digital version**

**£240 | Free digital version for members**

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## 224 A guide to risk-based procurement

This new EEMUA guide to risk-based procurement covers quality assurance of safety-critical engineering equipment and materials. It includes suggested measures to assess risks and procurement recommendations and guidance. There is also a discussion of the root causes of equipment or materials not being fit for purpose and some examples of the problems experienced.

**Digital version**

**£150 | Free digital version for members**

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## 218 Quality requirements for the manufacture and supply of duplex stainless steels

This publication provides minimum quality requirements and recommendations for the manufacture and supply of duplex stainless steels. It covers all grades of duplex stainless steel and all components for both offshore (subsea and topsides) and onshore applications in the energy, chemical and other process industries. The publication is aimed at manufacturers, designers, purchasers, stockists and end-users of these materials, all of whom have a role in ensuring quality. The consequences of using duplex stainless steel components that fail to meet requirements can be extremely serious. EEMUA members have noticed inconsistency in the quality of duplex steel components globally, despite most manufacturers and stockists having quality systems and detailed manufacturing specifications in place: hence the reason for developing this Publication.

**Digital version**

**£285 | Free digital version for members**

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## 215 Industrial cooling tower fans and fin fans – Guide for design, maintenance and operation

This publication provides proven guidance for good design, maintenance and operation of mechanical draught cooling tower fans and fin fans used in air cooled heat exchangers. If fans are neglected until they fail, there is often extensive damage to the housing and danger of pieces of blade being thrown out. As well as causing damage to plant, this type of failure presents an unacceptable risk to the safety of personnel.

EEMUA 215 addresses the lack of accepted standards for rotating equipment such as fin fans and cooling tower fans and gives plant maintenance engineers or project engineers a framework for the maintenance routines and details of what is required. The new edition documents established good practice for assembly, repair, inspection and maintenance of fin fans and cooling tower fans as well as outlining the modes of mechanical failure.

**Digital version**

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## 211 Guidance on the specification of pressure vessels

EEMUA Publication 211 deals with the specification of pressure vessels for a variety of different circumstances not addressed in design codes. It brings together the practical lessons learnt about design, manufacturing and testing of pressure vessels based on users' experience. The guidance examines the circumstances under which repeat post-weld heat treatment (PWHT) may be waived, describes methods for assessing both existing and new pressure vessels for exceptional internal pressures, covers improvements in the specification and reliability of nozzles, gives a basic appreciation of creep and, new for this third edition, provides some background to the issues of fatigue in pressure equipment.

**Digital version**

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## 197 Specification for the fabrication of non-primary structural steelwork for offshore installations

This publication covers non-primary steelwork for all types of offshore installations, including FSPOs (floating production storage and offloading vessels). Topics include quality assurance, safety and environmental considerations; structural materials and welding consumables; qualification of welding procedures and personnel; construction, preparation and assembly; fabrication tolerances; inspection and NDT and acceptance criteria. The publication complements EEMUA Publication 158.

**Digital version**

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## 194 Guide to materials selection and corrosion control for subsea energy equipment

The Fourth Edition of EEMUA Publication 194 reflects the significant developments that have occurred in subsea materials technology and operational experience since the Third Edition was published in 2012.

EEMUA 194 is aimed at engineers and others involved in the design, specification, commissioning, operation, maintenance, repair or refurbishment of subsea energy equipment and related facilities, including for both the oil and gas, and renewables sectors. It provides a comprehensive overview of the current knowledge of the principles and practices of materials selection and corrosion control for these facilities. A new appendix in EEMUA 194 covers developments and issues with materials for the following offshore renewable energy forms: wind, wave and tidal.

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## 192 Guide for the procurement of valves for low temperature (non cryogenic) service

This publication has been prepared for users and contractors involved in the procurement of process valves for operation in moderately cold conditions, typically 0 C to -50 C, a temperature range typically not adequately covered by existing low temperature standards. The guide covers recommendations for design and functional requirements, materials, marking and testing. Appendices are included covering temperature limits of non metallic materials, proposed type test procedures and test acceptance standards.

**Digital version**

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## 185 Guide for hot tapping on piping and other equipment

Hot tapping, the term used when a branch is connected to a live or 'hot' piping system, is potentially hazardous particularly where flammable or toxic fluids are present. This publication offers guidance on how to carry out a safe and successful operation when hot tapping into metallic piping systems containing process fluids or their residues. It covers overall planning of the operation and includes hazard assessment and control, the constraints imposed by the nature, temperature and pressure of the process fluids, welding, testing and cutting (drilling/trepanning).

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## 179 A working guide for carbon steel equipment in wet H2S service

Developed largely from oil refinery experience, this publication is aimed at providing guidance on minimising the damaging effects of wet H2S (hydrogen sulphide) on process plant, taking account of operating conditions, risk assessment, materials selection, fabrication, inspection (both of new and in-service equipment) and repairs. It comprises recommendations based on practical user experience of working with equipment in wet H2S service, together with relevant from reputable sources. This guide is applicable to any process plant handling wet H2S, and should be used in conjunction with User Standards to derive a policy for addressing problems or potential problems in new and existing equipment.

**Digital version**

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## 176 Specification for structural castings for use offshore

In the construction of steel offshore platforms, cast nodes and lifting points may offer technical and/or economic advantages in manufacture compared with fabricated items. However, they must be comparable to fabricated items in terms of geometrical accuracy, weldability, and mechanical strength and toughness. Aimed at suppliers and purchasers alike, this Specification sets out the requirements for the design, manufacture and testing of carbon-manganese steel castings for use as structural members of offshore platforms, principally for North Sea conditions. Chemical and mechanical

properties are specified, together with the requirements for fracture toughness, non destructive testing and weldability testing. The separate responsibilities of purchaser and supplier are also defined.

**Digital version**

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## **161 Guide to the selection and assessment of silencers and acoustic enclosures**

EEMUA Publication 161 is a guide to the selection of silencers which are appropriate for use with various noise sources. It is aimed at the practising engineer with a limited knowledge of acoustics, to assist in the specification of the most suitable silencer for a particular purpose and to assess its operation when it is installed. The updated Second Edition includes references to relevant standards and regulations.

**Digital version**

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## **158 Construction specification for fixed offshore structures**

The updated Third Edition of this publication defines the essential requirements for cost effective construction of primary structures of offshore installations. Topics include material requirements, allowable welding consumables, welding quality and personnel requirements, fabrication tolerances as well as inspection and non-destructive testing acceptance levels. The latest edition incorporates any necessary considerations for offshore wind constructions, while the rest of the publication has been updated in accordance with the latest versions of the relevant regulations and standards. This Publication reflects a consensus view of offshore construction companies with regard to both fabrication and acceptance criteria for structures to be installed worldwide.

**Digital version**

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## **154 Guidance to owners on demolition of vertical cylindrical steel storage tanks and storage spheres**

EEMUA Publication 154 provides guidance on good practice for the end of life safe demolition of storage tanks and spheres. It would typically be used by a facilities or integrity manager. This guidance is intended to assist the owner in evaluating the acceptability of the demolition methods proposed and the steps necessary to ensure a satisfactory and safe outcome.

In the last thirty years many storage tanks have been demolished worldwide. In some cases the owners entered into contracts with demolition contractors without sufficient knowledge of the problems involved. As a consequence a number of serious and sometimes fatal accidents have occurred. EEMUA 154 specifies the minimum responsibilities of the owners of the tank that is being demolished as well as those of the selected contractor.

**Digital version**

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## 149 Code of Practice for the identification and checking of materials of construction in pressure systems in process plants

Primarily aimed to minimise process piping system failures owing to use of incorrect material, this code of practice covers in service equipment as well as new equipment. Many of the recommendations also apply to a wide range of equipment that can be so checked, either on site or at manufacturers, stockists or fabricators.

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## 143 Recommendations for tube end welding: Tubular heat transfer equipment Part 1 – Ferrous materials

EEMUA Publication 143 is designed to help identify the appropriate techniques for and limitations of tube end welding. It would typically be used by a procurement engineer, specifier, designer or materials engineer.

This second edition takes ISO 15614-8:2016 as the primary source and adds further clarification for the user in a number of areas. These include: the constrictions of use of each joint type; requirements and practicalities for testing procedures and qualification of welders; recommendations on the preparation of tubes and tube-plates; guidance on maximum values on preheat and interpass temperatures; additional controls on welding parameters and on the Inspection and Test Plan (ITP). The first edition was produced to establish standardised procedures for the design, fabrication, inspection and testing of welded joints between heat exchanger tubes and tube-plates.

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## 141 A Guide to the use of EEMUA 140 Noise procedure Specification

This guide's purpose is to facilitate the use of EEMUA Publication 140. The updated Third Edition of this Guide is based on the experience of a number of companies, and the material in this guide should prove helpful in any case where noise limits have to be set.

**Digital version**

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## 140 Noise procedure Specification

This Specification defines the latest procedures for controlling noise in plant and equipment in accordance with international standards. It indicates the method of specifying maximum acceptable noise levels, describes acceptable methods of test for determining noise emission from equipment and gives a guide to methods of calculation and presentation of data. It does not set noise limits as the acceptable limit for any location will depend on factors relevant to that location. Edition Three has been updated to include reference to the sound intensity method of measuring noise from equipment, and references to relevant standards and regulations – available as an addendum.

**Digital version**

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### 133 Specification for underground armoured cable protected against solvent penetration and corrosive attack

This specification defines the requirements of the petroleum industry for underground armoured cables for use where protection against solvent penetration or corrosive attack is required. This second edition updates the Specification to be compatible with the latest British (BS), European (EN) and International (IEC) standards and includes in its scope all types of electrical cables including instrument and communications.

**Digital version**

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### 105 Factory stairways, ladders and handrails (including access platforms and ramps)

This handbook, first published in 1954 and regularly updated, gives guidance on the design and general construction of factory stairways, ladders, access platforms, ramps and handrails. It includes information on regulations and standards, basic design and design methodology. The guide is intended for use by engineers, architects and those responsible for specifying access installations. Access equipment manufacturers and their subcontractors will also find the guidance useful. The new eighth edition has been updated to include all current standards and regulatory requirements.

**Digital version**

**Print version**

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### 104 Noise: A guide to information required from equipment vendors

A brief introduction to noise, for vendors as well as purchasers, and a guide to the information that users may require. Examples of a Preliminary Noise Enquiry and a detailed Noise Specification are included.

**Digital version**

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### 101 Lifting points – a design guide

The second edition of this EEMUA guide specifies the design, fabrication, preferred types and marking of lifting points on process plant in accordance with European Directive 2006/42/EC on machinery which came into force on 29 June 2006. EEMUA Publication 101 defines the rated load for design purposes applicable to each lifting point and recommends the safe working load for associated lifting gear and applications. It will be found useful in lifting and safe handling during the installation, maintenance and dismantling of plant, including machinery, sub-assemblies, components and equipment.

**Digital version**

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## **EEMUA Publications Bundle Control of noise in equipment and plant - EEMUA 140, 141, 161**

There is a need to control noise within and around industrial installations for a variety of reasons, including meeting health and safety work area noise limits and environmental noise criteria for community noise. EEMUA has updated its suite of guidance documents aimed at this aspect of industrial asset management: EEMUA Publication 140, defines the latest procedures for controlling noise in plant and equipment in accordance with international standards; EEMUA Publication 141 is a guide to facilitate the use of EEMUA 140; and EEMUA Publication 161 is a guide to the selection of silencers which are appropriate for use with various noise sources.

**Digital version**

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## Section 3 – Equipment Operation and Maintenance

### 251 UK Pressure Equipment - A guide to the interpretation of the Pressure Equipment (Safety) Regulations 2016

EEMUA 251 has been produced to help Users, Competent Persons and Owners of pressure equipment achieve their legal requirements before pressure equipment is put into service in the United Kingdom.

The document has been developed by the Pressure Equipment Consultation Forum (PECF), Safety Assessment Federation (SAFed) and the Engineering Equipment and Materials Users Association (EEMUA) in consultation with LRQA and other stakeholders within the pressure equipment industry. It has been prepared using technical advice provided by the Health and Safety Executive (HSE).

Within this document are references to UK Legislation, GB Regulations and variations of the two. EEMUA 251 was published in 2025; at the time of publication the UK had legislated to continue recognition of CE marked equipment. The relationships of UK Legislation, GB Legislation and CE marking will likely change as technical and administrative divergence commences. The reader is encouraged to confirm the in-force legislation. In producing this document, the authors noted that many of the roles and responsibilities referenced overlap; caution should therefore be exercised when only reading a single or selected set of guidelines.

EEMUA 251 is a companion document to others in the UK PEDG/EEMUA series, namely: EEMUA 237, EEMUA 245 and EEMUA 248.

**Digital version**

**Free digital version for all**

### 250 Guide to the management of pressure equipment defined-life repairs

EEMUA 250 supports users in managing defined-life repairs by offering guidance on when to shut down pressure equipment versus applying a temporary repair. It highlights risk-based decision-making, life cycle considerations, and strategies for maintenance and inspection, especially where existing industry guidance on repair duration, extension, or conversion is limited.

In the event of an actionable inspection finding, an in-service leak or in-service damage, users typically must decide on whether to install a defined life repair or shutdown and install a permanent repair. The purpose of this EEMUA publication is to provide an overview with respect to the life cycle

management of defined-life repairs for pressure equipment. It provides guidance for users to consider when deciding if it is safer to shutdown and perform a permanent repair as well as providing key points to consider when selecting a defined-life repair, assessing the risks and when developing their maintenance, inspection, and replacement strategies post installation.

The primary function of a defined-life repair is to allow the system to return to or remain in service with limited interruption to production until a planned permanent repair can be installed. Although there is industry guidance available on the selection of defined-life repairs (e.g. ASME PCC-2, ISO 24817 and EI composite repair guidance), at the time of publication there was limited known industry guidance covering the life cycle management of defined-life repairs, for example:

- How long can a defined-life repair remain in service?
- How to extend the life of a defined-life repair?
- How to make a defined-life repair permanent?

Each company's organisational structure will vary in terms of maintenance, engineering, and inspection departments. As such, it is the responsibility of the user or pressure equipment owner to determine the strategy for defined-life repairs within their organisation. The strategy should be endorsed by the relevant technical authority for the company. This publication advises that a risk-based approach is adopted to allow flexibility in application of defined-life repairs to the relevant situations, to ensure correct prioritisation based on the overall repair life cycle, and to ensure that the selected defined-life repair does not adversely affect the safe operation of the system.

It is expected that the reader has a basic competency in static equipment design and as such the level of detail contained within this guidance document has been set appropriately.

EEMUA 250 was developed by engineers who work in the power generation, chemical production, and oil and gas sectors. Although the use of this document was originally targeted for static pressure equipment, it is recognised that it may be applicable to a range of other industries – shipping, mining, steel, nuclear, water and wastewater, and food and beverages. It is the responsibility of the user to ensure specific details relating to their industry are considered when applying the guidance from this document.

**Digital version**

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## **245 UK Pressure Equipment - A guide to pressure system installation where site assembly is required under the control of the end user**

EEMUA 245 provides practical advice on how legal compliance should be demonstrated where on-site manufacture and assembly of pressure equipment are undertaken under the direct control of the intended user of the equipment. It has been created to help a range of stakeholders (including designers, purchasers, installation contractors and users) understand the roles and activities when assembling pressure equipment on site. The guidance primarily relates to pressure systems containing a relevant fluid as defined under the Pressure Systems Safety Regulations 2000 (PSSR).

The need for EEMUA 245 has arisen after many years of questions and interpretations of Regulations and is perhaps more important as the UK evolves in its relationship with other trading partners.

The publication has been developed by the Pressure Equipment Consultation Forum (PECF), Safety Assessment Federation (SAFed) and EEMUA in consultation with Lloyd's Register and other stakeholders within the pressure equipment industry. It has been prepared using technical advice from the GB Health and Safety Executive (HSE).

**Digital version**

**Free digital version for all**

## 243 Guide to mechanical connector selection and lifecycle

EEMUA Publication 243 provides an overview of the selection, installation and maintenance of a variety of mechanical pipe connector designs which can be used as an alternative to hot work.

The primary function of the connectors covered in this guidance is to join two pipes whilst maintaining pressure containment and not for the purpose of leak sealing or providing mechanical strength to a damaged section of piping. EEMUA 243 focuses on key points for Users to select the most appropriate mechanical connector for the specific application and when developing their maintenance and inspection strategies for these components post installation.

The design of the mechanical connectors included in EEMUA 243 are often proprietary and are classed as ASME B31.3 Unlisted Components. For this reason, the User should work closely with the OEM when developing their strategy, while using this guidance to supplement their knowledge and considerations. The remit of EEMUA 243 does not cover threaded fittings, flanged joints, or mechanical clamp repairs (as defined by ASME PCC-2).

This publication was developed by engineers who work exclusively in the oil and gas sector, as well as OEM technical specialists. Although the use of EEMUA 243 was originally targeted for the topside and upstream industry, it is recognised that it may be applicable to a range of other industries including: shipping, mining, steel, chemicals, nuclear, water, and food and beverages. It is expected that the reader will have a basic competency in piping design.

**Digital version**

**£135 | Free digital version for members**

## 236 Risk management of legacy systems with potential for excess overpressure

EEMUA Publication 236 provides guidance on the development of a risk based approach for the management of overpressure for legacy systems. It provides a basis for understanding the risk associated with exceeding code allowable overpressures, and will help equipment operators make the decision as to whether procedural and/or physical plant modifications are required to maintain safe operations.

Applicable to legacy systems only, the guidance defines a standardised approach that can be used to aid prioritisation of effort towards code compliance. As a result, EEMUA 236 helps operators focus action where it will reduce or eliminate risk fastest and most effectively whilst also providing a framework for demonstrating the ALARP principle (As low as reasonably practicable) where strict adherence to code may not be easily achievable without incurring disproportionate or excessive cost.

**Digital version**

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## 230 Ageing rotating equipment – a guide to maintenance and operation

This Publication has been developed in order to aid those operating ageing rotating equipment. The guide outlines a condition based maintenance methodology for finding deterioration mechanisms. Additionally, it details the appropriate regular service and inspection regime, which is still the principal means of identifying age related modes of failure. Where possible, appropriate mitigation steps are described. The contents of this guide have been written for and by engineers in the petrochemical, process and power industries. The specific equipment covered in the Publication scope are pumps, fans, compressors, generators, motors, gearboxes and certain types of turbine. Users may determine that equipment not listed here is suitable to fall under the scope of EEMUA 230. However, this is done at the user's discretion.

**Digital version**

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## 223 Pressure equipment testing after repair, modifications or re-rating: a guide to the Pressure Test Waiver

This Publication has been developed, in close liaison with the British Health & Safety Executive (HSE), to assist owners and operators of pressure equipment to determine where it may be permissible to waive a hydrostatic pressure test before re-introducing equipment into service and instead rely on other forms of integrity assurance. EEMUA 223 relates to 'in-service' situations, such as testing after major modification, significant repair or re-rating, rather than new build.

**Digital version**

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## 208 Guide to life-cycle management of pressure relief systems

This publication addresses the primary aspects of pressure relief system management throughout the full life-cycle, from design through construction, commissioning and operation. It provides advice on the full range of activities involved in the successful management of these systems. The Guide aims to fill the gaps in current design guides and provide assistance in interpreting some of the standards, code issues and topics that are known to cause difficulties. The overview it provides of the management of pressure relief and the links made between the design process and the operation and life-cycle issues which are the concern of plant management, are applicable to any industry operating a pressure relief system. It is intended for use by those who have responsibility for any aspect of such systems.

**Digital version**

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## 205 A Guide to the production testing of valves for the energy, process and related industries

EEMUA Publication 205 sets out recommended production tests to be applied to the main types of valve used in the energy, process and related industries: ball, plug, gate, butterfly and globe. It is a common assumption that valve test and product standards contain all that is required to ensure adequate performance, but this is not always the case. By adopting the tests specified here, EEMUA expects that the user's requirements will be better fulfilled, particularly for critical services.

**Digital version**

**£99 | Free digital version for members**

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## 200 Guide to the specification, installation and maintenance of spring supports for piping

A common problem faced on construction sites and operating plants with certain piping systems, is a lack of specialist knowledge on effective and safe setting and maintenance of piping spring supports, particularly where there is a significant temperature difference between the hot (operating) and cold (shutdown) conditions of the plant. This publication aims to address this problem by providing data on the specification of piping supports (in particular the information required by the manufacturer), information to be recorded in the pipe support index, installation and commissioning procedures, in-service inspection and maintenance, and dynamic restraints.

This publication addresses the problem. It covers the specification of piping supports—in particular the information required by the manufacturer—the information to be recorded in the pipe support index, installation and commissioning procedures, in-service inspection and maintenance, and, as a separate section, dynamic restraints.

**Digital version**

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## 199 On-line leak sealing of piping: Guide to safety considerations

Certain types of leak from pressurised piping (including valves) may be effectively contained by on-line sealing methods involving the use of elastomeric compounds. These (essentially temporary) repair methods were originally developed for application to leaking steam and condensate systems. However with additional safety precautions, they may be applied to process piping systems containing flammable, corrosive and/or toxic fluids. The publication gives guidance on the limits of application of the technique, the factors to be considered when evaluating the feasibility of its use, the preparation and execution of the procedure and the type of risk assessment required.

**Digital version**

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## 188 Guide for establishing operating periods of safety valves

This Guide sets out the issues to be considered in determining and reviewing operating periods for safety valves, including guidance on the periods between consecutive inspections and on setting necessary control procedures. The second edition revises and updates the original 1999 edition. It is a companion volume to EEMUA Publication 184 Guide to the Isolation of Pressure Relieving Devices.

**Digital version**

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## 185 Guide for hot tapping on piping and other equipment

Hot tapping, the term used when a branch is connected to a live or 'hot' piping system, is potentially hazardous particularly where flammable or toxic fluids are present. This publication offers guidance on how to carry out a safe and successful operation when hot tapping into metallic piping systems containing process fluids or their residues. It covers overall planning of the operation and includes hazard assessment and control, the constraints imposed by the nature, temperature and pressure of the process fluids, welding, testing and cutting (drilling/trepanning).

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## 184 Guide to the isolation of pressure relieving devices

In order to permit their removal and replacement without plant shutdown, pressure relieving devices may need to be isolated from the equipment they protect. However, the installation of isolating valves around protective devices is potentially hazardous as it introduces the risk of a system being left unprotected against over-pressure due to the relief path being inadvertently closed off. Existing standards offer little or no detailed guidance in this area.

EEMUA 184 plugs the gap by expanding on the guidance given in API RP 520 Part II and incorporating EEMUA Information Sheet 50 – The Importance of isolation management around relief systems. It outlines the case for using relief valves as a layer of protection, gives advice on managing safe isolation and stresses the importance of safe de-isolation after completion of relief system work. EEMUA 184 provides several examples in loss prevention history where the failure to adequately manage relief system isolations has been a major factor in causing process safety incidents.

It is essential to conform to local statutory legislation or regulations in relation to the use, and isolation of, relief devices. In some countries, conformance to certain standards and codes may be a mandatory requirement and specific standards, such as those pertaining to boilers, may specifically prohibit the installation of isolation devices.

**Digital version**

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## 182 Specification for integral block and bleed valve manifolds for direct connection to pipework

This specification covers integral block and bleed valve manifolds for direct connection to pipework, used as a replacement for individual block and bleed valves at tapping points in piping systems and also in larger arrangements for equipment and main process isolation. The aim of the specification is to ensure that such installations are fit for purpose and of the required integrity.

**Digital version**

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## 177 Guide to the UK Pressure Systems Safety Regulations (2000)

EEMUA Publication 177 gives practical guidance on the interpretation of the UK Pressure Systems Safety Regulations (PSSR) 2000 relating to the periodic Examination of Pressure systems and certain associated aspects, and considers in particular Regulations 2, 7, 8, 9, 10 and 13, plus Schedule 2. The PSSR contains a complex series of requirements and allows for a considerable element of experienced, professional judgement by the User and/or Competent Person, together with a demand for careful interpretation.

Significantly, the new edition of EEMUA 177 includes guidance on the Postponement of Examinations within Regulation 9; a revision to the guidance on Regulation 10 Action in case of Imminent danger; additional guidance on Regulation 13 Modification and repair; together with other key points of interest based upon actual use of Pressure systems covered by the PSSR.

EEMUA 177 brings clarity by explaining how to approach specific aspects of the PSSR and helps minimise unclear areas that can cause confusion about what to do with respect to the Regulations. An example of this is with Regulation 10 wherein EEMUA 177 provides a flowchart that helps the Competent Person decide whether it is a case Imminent danger and needs to be reported to the HSE. The requirements under Regulation 10 are also given context with other relevant legislation.

This publication was produced by a working group of EEMUA's User Inspectorate Committee (UIC), which brings together experts from a range of industry sectors. Whilst the guide refers throughout to UK regulations and practice, much of the general advice is relevant to practice outside the UK.

EEMUA 177 does not refer in detail to the other Regulations already clearly expounded in the British Health and Safety Executive (HSE) Approved Code of Practice, Safety of Pressure Systems (ACOP) L122, which is freely available from the HSE. This EEMUA guide, therefore, should not be read in isolation, but should be used to augment the existing ACOP.

**Digital version**

**£95 | Free digital version for members**

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## 168 Guide to pressure testing of equipment

EEMUA 168 Edition 3 provides guidance on if, when and how pressure testing can be carried out on pressure equipment and systems, based on risk assessment and a safe system of work. Significantly, the new edition introduces a competency framework for pressure testing personnel.

The guidance applies to the lifecycle of pressure equipment and systems, from manufacture, and throughout their operating lifetime. It is applicable to all types of non-transportable industrial pressure equipment and systems, including pressure vessels and pipework. Some alternatives to pressure testing are also considered, and when it may be appropriate to employ them.

The publication is aimed primarily at the operatives, supervisors and leaders managing and carrying out pressure testing at manufacturers' works, repair shops and industrial sites. The guidance aims to ensure that these organisations are fully aware of the risks and can use competent and qualified staff as well as formulate safe systems of work, to reduce risks to as low as reasonably practicable.

This publication was revised through a working group of engineers from EEMUA member companies and representatives from industry partners including the IMechE Pressure Systems Group (PSG) and the Pressure Vessels Manufacturers Forum (PVMF).

**Digital version**

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## 151 Liquid ring vacuum pumps and compressors

This publication specifies the minimum requirements for general service, including basic design, materials and auxiliary equipment. It is a composite standard covering all the components and ancillaries, piping, instrumentation and controls, inspection and testing, as well as data from vendors. The publication has been written in API format, for use both in Europe and North America.

**Digital version**

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## Section 4 – Inspection and Integrity Management

### 249 Factors to consider when managing the mechanical integrity of dead-legs on industrial facilities

EEMUA 249 brings together guidance for operators to consider when managing the risk posed by piping dead-legs in all types of process plants and storage facilities. It supplements existing guidance by challenging assumptions, highlighting specific learning points identified by members of EEMUA and providing examples of inspection needs.

The publication was issued following a number of meetings of the Engineering Equipment and Materials Users Association Dead-leg Forum – involving members of EEMUA on the front line of dealing with dead-legs across petrochemical, chemicals and gasses facilities. The forum was formed after the UK regulator, the Health and Safety Executive, issued a Safety Alert describing the catastrophic failure of a dead-leg that released a large quantity of flammable hydrocarbon within an operating unit. The learning from this event was addressed and it sparked a wider review of the whole management process for the integrity of dead-legs. In the forum, members openly exchanged views on the challenges they faced through the complete management cycle of dead-legs and were able to highlight particular issues that warranted special attention. Management approaches that form good practice were identified.

The guidance can be used by companies that are establishing their management process for dead-legs and equally by companies with existing policies and procedures, to challenge that they meet good practice in this area.

**Digital version**

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## 248 A guide to the information to be supplied to the PSSR competent person for drawing-up a written scheme of examination

This publication has been written to aid stakeholders in the process of transfer of knowledge from those responsible for the manufacture of equipment, assemblies and systems to the User/Owner and Competent Person, who are responsible under the Pressure Systems Safety Regulations 2000 (PSSR) for a Written Scheme of Examination (WSE).

To draw up an effective WSE and enable effective examinations, inspections, repairs and modifications to the equipment once it enters service, the transfer of such information and knowledge is imperative. In the UK, it is illegal to operate pressure systems which fall under the PSSR without establishing Safe Operating Limits and having a suitable WSE in place.

**Digital version**

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## 240 Factors to consider when managing High Temperature Hydrogen Attack on petroleum and chemical facilities

EEMUA Publication 240 provides guidance on the key elements of managing High Temperature Hydrogen Attack (HTHA) and provides a checklist of issues that have been identified within EEMUA member companies. It aims to supplement company policies and procedures, and assist facility personnel to manage equipment exposed to HTHA. This publication focuses primarily on equipment constructed from carbon steel though aspects of the contents are generally relevant to equipment constructed from other materials. EEMUA 240 is intended to advance the discussion with regulators, such as the British Health and Safety Executive, as to what constitutes good practice in this key area.

**Digital version**

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## 238 A guide to civil, structural and building asset management in process, industrial and production environments

EEMUA Publication 238 provides a systematic risk-based approach to raise awareness and criticality of civil infrastructure, and defines a suitable method to manage civil infrastructure assets.

EEMUA 238 details how a systematic civil and structural facilities management process based on inspection, asset planning, assigning of roles and responsibilities, determination of asset criticality and conducting risk evaluations, allows civil and structural facilities to be robustly managed. The following areas are covered:

- Guidance on likelihood of failure of specific civil and structural infrastructure types.
- Guidance on classification of detected defects.
- Detailed guidance on degradation mechanisms and consequences for structural integrity.
- Guidance on inspection criteria.
- Guidance on common requirements for risk assessment.

EEMUA 238 emphasises that proper management of civil infrastructure assets is as important as management of all other assets, equipment and components of an industrial plant.

**Digital version**

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## **237 UK Pressure Equipment: Global conformity assessment – a guide to site installed assemblies**

The second edition of EEMUA 237 takes account of the separation activities of the UK from the EU and provides guidance to avoid non-conformity of pressure equipment against legal requirements when it is assembled on the site of a user. It specifically gives guidance to avoid problems that can arise when global conformity assessment is carried out.

The publication was revised through a collaboration of engineers and representatives from the Pressure Equipment Consultation Forum (PECF), Engineering Equipment and Materials Users Association (EEMUA), the Safety Assessment Federation (SAFed), LRQA (an assurance provider) and other stakeholders within the pressure equipment industry. Technical advice was provided by the GB Health and Safety Executive (HSE). The publication is issued jointly by EEMUA and SAFed (as PEDG1).

EEMUA 237 provides guidance to help users (such as EEMUA member companies), manufacturers, project engineers, installation contractors, and other parties to achieve their legal duties and ensure pressure equipment and Written Schemes of Examination can be certified prior to use, particularly when assembly has taken place on users' sites.

Reference is made to the UK Pressure Equipment (Safety) Regulations, Pressure Systems Safety Regulations, and the Provision and Use of Work Equipment Regulations.

**Digital version**

**Free digital version for all**

## **232 Specifying, procuring and managing third party inspection services**

This users' guide is provided for operators to build their own working practices for specifying, managing and procuring third party inspection services. Primarily based around UK legislation, the publication has been written to complement the Chemical and Downstream Oil Industry Forum (CDOIF) document: Guidance on the use of external contractors in the management of ageing plant. Users operating plant in other countries should also find this guidance useful. The guide has been developed due to the perceived differences between the use of in-house and third party inspection bodies. As well as guidance on policy, organisation and scheduling, the guide provides sample checklists and a code of conduct for non-destructive testing (NDT) inspections.

**Digital version**

**£84 | Free digital version for members**

## 231 The mechanical integrity of plant containing hazardous substances – a guide to periodic examination and testing

EEMUA Publication 231 provides guidance and good practice on safely managing the combined hazards of stored energy and dangerous substances through maintaining the integrity of systems and equipment by periodic examination and testing.

The publication is based on the well-established Written Scheme of Examination (WSE) model in the UK Pressure Systems Safety Regulations and associated Approved Code of Practice. As such, EEMUA 231 underpins the approach that integrity management is a matter for the whole plant life cycle. The chapters are listed below:

- Overview of integrity management throughout the plant lifecycle
- Legislative considerations
- Examination policy
- Organisational arrangements for integrity management
- Written Scheme of Examination
- Delivery of periodic examinations
- Reporting of examinations and integrity assessment
- Postponement of examination
- Record keeping
- Change, review and audit
- Overview of relevant legislation (and their interaction)
- Overview of issues to consider in a Written Scheme of Examination
- Overview of Risk based inspection

This second edition of EEMUA 231 adds a new section on leadership, a fundamental aspect of managing health and safety effectively, and provides guidance on the relief streams that protect equipment or systems. EEMUA 231 has been given greater clarity by combining the sections on Reporting of examinations and Post examination integrity assessment. There is also a clearer demarcation between the roles of Integrity Assessor and Competent Person.

EEMUA 231 has been developed and written by EEMUA and the Safety Assessment Federation (SAFed) in consultation with the Health and Safety Executive, together with other interested stakeholders who use such plant, including operators, inspection bodies and providers of specialist services to the process industries. The GB Health and Safety Executive (HSE) states in its Foreword to EEMUA 231 that it: 'considers maintenance of the integrity of plant containing hazardous substances to be a fundamental element of good process safety management. To this end, we believe this document provides a sound basis from which to develop arrangements for the management and delivery of periodic examinations aimed at achieving this.'

[Digital version](#)[Print version](#)

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**For print version see website for details**

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## 206 Risk Based Inspection – a guide to effective use of the RBI process

The risk based approach to inspection of industrial plant is now an accepted practice. It is possible to determine and monitor consistently the mechanical integrity of industrial plant, or other such engineering assets, by using risk based methodologies. This guide has been written by industry to enable use of risk-based inspection (RBI) to its best effect. EEMUA 206 has been developed with assistance from the GB Health & Safety Executive and will help businesses to interpret and use the HSE Report 'Best Practice for Risk Based Inspection as a Part of Plant Integrity Management'

**Digital version**

**£87 | Free digital version for members**

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## 193 Managing competence assurance for personnel undertaking in-service inspection of pressure equipment

This EEMUA Publication is a recommended practice for Inspection Bodies operating in the process, energy and related industries, whose primary responsibility is for pressure equipment. It presents a structured training, development and competency assessment process for inspection personnel. This revised Second Edition incorporates changes in practice and legislation since first publication in 1998. The scope of this EEMUA Publication is limited to in-service inspection of industrial pressure equipment which is taken to mean all inspections excluding new build and commissioning.

**Digital version**

**£196 | Free digital version for members**

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## 181 A guide to risk based assessments of in-situ large Ex 'e' and Ex 'N' machines

This guide provides a practical method to undertake a comparative evaluation of the risk of incendive discharges occurring in large Ex 'e' and Ex 'N' high voltage machines installed in potentially explosive atmospheres before 1997.

**Digital version**

**£122 | Free digital version for members**

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## 149 Code of Practice for the identification and checking of materials of construction in pressure systems in process plants

Primarily aimed to minimise process piping system failures owing to use of incorrect material, this code of practice covers in service equipment as well as new equipment. Many of the recommendations also apply to a wide range of equipment that can be so checked, either on site or at manufacturers, stockists or fabricators.

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## Section 5 – Storage and Distribution

### 247 Statistical analysis of in-service tank floor inspections

EEMUA 247 covers situations where the aim is to carry out a partial coverage inspection on an above ground storage tank floor. The guidance focuses on planning and evaluation of the inspection. The inspection requirements defined at the planning stage and the evaluation analysis methodology are intended to be such that, upon completion of the inspection and analysis, there is sufficient information available to support integrity decisions. This covers specifically a sufficient understanding of the condition of the floor area of interest, including that not directly covered by the inspection.

It is important to note that EEMUA 247 does not address the process for making integrity decisions based on the information delivered by the inspection and evaluation. It is expected that the user already has in place a framework for decision making, for example, an integrity management process and associated risk based inspection methodology, and this should continue to be followed. In addition, this guidance is intended to address above ground storage tank floors specifically. It does not address other elements of the tank, e.g. shell or roof, and does not address other tank or pressure system component types.

EEMUA 247 addresses situations where metal loss, in the form of corrosion, of the floor plates is the primary degradation mechanism of concern. It is not applicable in cases where other degradation mechanisms, such as cracking or preferential weld corrosion, are intended to be addressed by a partial coverage inspection. The publication is intended to supplement EEMUA 159 which addresses inspection, maintenance, and repair for above ground storage tanks.

**Digital version**

**£149 | Free digital version for members**

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## **244 Above ground horizontal rectangular metallic storage tanks – a guide to their specification, installation, commissioning, inspection, maintenance, repair and disposal**

EEMUA Publication 244 is aimed at owners and operators of above ground rectangular metallic storage tanks and covers a range of topics, from how to specify the design, through inspection, maintenance and repair, to decisions at 'end-of-life' and safe disposal. The scope of this document is generally for tanks that are sited on 'high hazard' sites (e.g. COMAH) or other sites where tank failure may lead to significant health, safety or environmental consequences. It covers tanks generally used for storage (at atmospheric pressure) of flammable liquids with a flash point of 23°C or higher e.g. diesel, kerosene etc. but it may be applicable to other uses if considered suitable by the reader.

Tanks containing highly or extremely flammable substances with a flash point less than 23°C (e.g. petrol, methanol etc.) are excluded as these are more appropriately covered by other industry guidance. Also excluded are: underground/buried tanks; lined tanks; tanks for transport containment; Intermediate bulk containers (IBCs) and similar containers; cylindrical tanks; spherical tanks; irregular shaped tanks; and insulated tanks.

EEMUA 244 is intended as a general guide, and not a design standard and the reader is assumed to be an owner and operator rather than a tank provider or manufacturer. For this reason, other than by reference to design standards, fabrication and manufacturing techniques are not covered. Reference to mainly UK guidance is given but it is assumed that other relevant local and international references, including design standards, should be followed in jurisdictions other than the UK.

**Digital version**

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## **225 Above ground plastic tanks: a guide to their specification, installation, commissioning, inspection, maintenance, repair and disposal**

EEMUA 225 provides practical, pragmatic guidance to owners and operators on all stages of the lifecycle of above ground plastic tanks. The publication fills a major gap in industry knowledge by detailing good practice in the management of these tanks which are too often viewed as 'fit and forget' items compared to steel tanks. Taking into account the specific conditions of tank usage, EEMUA 225 can help to reduce the risk of failure in service and enable the extension of service life where appropriate.

The guidance is aimed mainly at cylindrical plastic tanks being operated at atmospheric pressure or at pressures above the liquid head up to 0.5 barg. It is not therefore intended for tanks which would be classed as pressure vessels under the Pressure Equipment Directive (PED), although some of its content may still be relevant and useful to users operating plastic pressure vessels in what are usually quite specific applications.

**Digital version**

**£208 | Free digital version for members**

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## 217 Safe and effective operation of storage tanks

This publication looks beyond the extensive existing standards and procedures, focusing on process safety areas in which higher risks exist. It covers oil movements in refineries, terminals and storage depots, and includes liquids stored under atmospheric pressure and LPG stored under pressure or under refrigerated and cryogenic conditions.

**Digital version**

**£242 | Free digital version for members**

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## 213 Emission reduction from oil storage tanks and loading operations

The prevention and control of emissions of volatile organic compounds (VOCs) from storage tanks containing oil or chemical feedstocks or products is addressed by this new EEMUA Publication. Emission reduction has become of primary importance, not only for economic reasons but increasingly to minimize the impact on the environment. The Publication begins by introducing the main theory on how emissions can be minimised by focusing on the source of emissions. It then guides tank owners and operators, manufacturers, designers and specifiers to the most suitable tank type for particular feedstocks based on the true vapour pressure (TVP) of products. Background theories on possible solutions to prevent or reduce emissions are provided. Guidelines are also given on the treatment of the escaping vapours when the achieved level of emissions does not match the intended level or statutory requirements.

**Digital version**

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## 207 Double concrete tanks for liquefied gas – guide to design, construction and operation

This pioneering guide draws together good and best practices for the engineering of double-walled concrete tanks (with or without metal liner) intended for the bulk storage of refrigerated gas liquids. It is unique in bringing together guidance for specifying the design, materials selection, fabrication, installation, testing commissioning and operational requirements of refrigerated and cryogenic storage tanks made from double (pre-stressed) concrete tanks as an alternative for tanks constructed with 7% or 9% Ni steel inner tanks.

Following the guide should reduce the risk of mistakes and poor practice during design, construction and commissioning. The publication should also resolve many of the technical issues encountered during double concrete tank projects, thus reducing the need for 'technical debate' and improving project timescales, costs and quality. Similarly, it should provide the engineering contractor with detailed information that will minimise the risk of obtaining varying quotations from tank constructors; it benefits the tank designer by giving them a clear basis for their calculations; and it informs tank construction companies of the quality of testing and examination required for materials, construction methods and tank structure.

**Digital version**

**£1,923 | Free digital version for members**

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## 190 Guide for the design, construction and use of mounded horizontal cylindrical steel vessels for pressurised storage of LPG at ambient temperatures

This guide addresses the design, materials selection, fabrication, installation, in-service inspection, testing and maintenance of mounded vessels for pressure storage of LPG. Mounded storage is generally safer than other methods of storing LPG, but the vessels, supported as they are on compacted soil foundations, are more liable to be affected by soil settlement than conventionally supported vessels. The guide therefore includes soil investigation and foundation design, in addition to considerations of pressure containment and corrosion protection.

**Digital version**

**£177 | Free digital version for members**

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## 183 Prevention of tank bottom leakage - a guide for the design and repair of foundations and bottoms of vertical, cylindrical, steel storage tanks

Leakage from storage tanks may lead to extensive environmental pollution and be a financial loss to owners. This guide addresses the problem of tank leakage caused by loss of integrity. Such loss is almost always caused by deterioration of the tank bottom, which itself may be caused by corrosion or by deterioration of the foundation. This second edition is a comprehensive update that takes account of changes in standards, regulations and improvements in technology. EEMUA 183 gives guidance on a range of topics affecting tank bottom integrity including: design considerations for various types of tank foundations and bottoms; causes of tank bottom leakage; inspection records and techniques; corrosion protection; leak detection systems; and membranes as soil barriers.

**Digital version**

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## 180 Frangible roof joints for fixed roof storage tanks: Guide for designers and users

Under abnormal operating conditions, vertical fixed roof storage tanks may experience rapid increases in vapour pressure which overwhelm venting devices and lead to tank failure. EEMUA 180 gives guidance to designers and users of such tanks on the practical steps that can be taken in design, operation and maintenance to predispose the roof-to-shell joint to fail in preference to the shell-to-bottom joint, thereby ensuring retention of the tank's contents. Such relatively weak roof-to-shell joints are known as 'frangible roof joints'. Guidance is also provided on how to determine the actual frangibility of tanks built before 1985 (the date where frangibility became known as a design requirement).

**Digital version**

**£114 | Free digital version for members**

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## 159 Above ground flat bottomed storage tanks – a guide to inspection, maintenance and repair

EEMUA Publication 159 is considered to be the most comprehensive users' guide available on above ground vertical cylindrical, steel storage tanks. It is also used worldwide by regulators as an example of what good practice looks like.

EEMUA 159 is intended to assist in the establishment of essential inspection and maintenance requirements in order to minimise in-service problems and extend the useful life of these storage tanks. It offers guidance on tanks built to BS, EN or API standards for the storage of petroleum and chemical feed-stocks and products, and non-refrigerated gases. These standards include BS 2654, API 620 and API 650, DIN 4119-1 and -2, CODRES, G0801 and EN 14015. In addition, since EEMUA 159 contains information on many topics that are not covered in API 653, the EEMUA publication can be considered complementary to the API standard.

The publication sets out key features for planning and executing inspection, maintenance and repair works. It includes descriptions of the key tank components that require inspection and maintenance, degradation mechanisms and common inspection techniques, and details on tank lifting. Appendices offer guidance on how to perform assessment calculations on tank components, illustrated by means of sample calculations, as well as on repair methods.

The Sixth Edition includes three integrity assessment levels of increasing complexity. The use of integrity assessment levels helps to understand that different kinds of rejection limits can exist for the same component. This edition offers revised chapters on tanks and their components, degradation mechanisms and failure modes, general inspection techniques and interpretation of inspection data, tank foundations and hydrotesting. Revised flowcharts for assessing the fit-for-purpose of the tank bottom, shell and roof are now available.

This edition contains guidelines on change of service, guidance on new inspection methods and technologies including robotics and drones. It provides increased guidance on settlement assessment and a new chapter on stainless and duplex steel tanks. The guidelines for hydrotest exemption for major repairs and the remaining life calculations for bottom pitting have also been updated.

**Digital version**

**Print version**

**£395 | Free digital version for members**  
**For print version see website for details**

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## 147 Recommendations for refrigerated liquefied gas storage tanks

Edition 3 expands on the internal inspection advice and includes a new section dedicated to external inspection. It draws on the recommendations given in its sister publication [EEMUA 159: Above ground flat bottomed storage tanks – a guide to inspection, maintenance and repair](#). Selection criteria detail the performance standards of the different types of RLG tanks against the normative operational and accidental loads. Advice is given on the risk assessment to determine which type of tank would be most appropriate for the site selected. Information about commissioning and de-commissioning of RLG tanks is also provided.

When Edition 1 of EEMUA 147 was published in the mid-1980s it was the first publication in the world to define the various types of refrigerated liquefied gas (RLG) tanks available and define the full containment tank. It provided design and construction recommendations which were later adopted into a number of internationally accepted standards. There are now numerous tanks that have been constructed to these standards and operated successfully and safely for many years. As a consequence, Edition 2 did not replicate this data but concentrated instead on recommendations on the operation, inspection and maintenance of RLG tanks and included the new double concrete tanks design options.

**Digital version**

£119 | **Free digital version for members**





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