SLOVENSKI STANDARD
oSIST prEN ISO 17776:2015

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Industrija za predelavo nafte in zemeljskega plina - Plavajoči proizvodni objekti - Upravljanje nevarnosti večjih nesreč med načrtovanjem novih objektov (ISO/DIS 17776:2015)

Petroleum and natural gas industries - Offshore production installations - Major Accident hazard management during the design of new installations (ISO/DIS 17776:2015)

Erdöl- und Erdgasindustrie - Offshore-Produktionsanlagen - Leitfaden für Hilfsmittel und Verfahren zur Gefahrenerkennung und Risikobeurteilung (ISO/DIS 17776:2015)

Industries du pétrole et du gaz naturel - Installations des plates-formes en mer - Lignes directrices relatives aux outils et techniques pour l'identification et l'évaluation des risques (ISO/DIS 17776:2015)

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ICS:

75.180.10	Oprema za raziskovanje in odkopavanje	Exploratory and extraction equipment

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Petroleum and natural gas industries — Offshore production installations — Major Accident hazard management during the design of new installations

Industries du pétrole et du gaz naturel — Installations des plates-formes en mer — Lignes directrices relatives aux outils et techniques pour l'identification et l'évaluation des risques

ICS: 75.180.10

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

This second edition cancels and replaces the first edition (ISO 17776:2000), which has been technically revised and the title changed from *Petroleum and natural gas industries — Offshore production installations — Guidelines on tools and techniques for hazard identification and risk assessment* to the present title.

Introduction

The purpose of this International Standard is to establish requirements and provide guidance for the effective management of Major Accident (MA) hazards during the design of new offshore installations for the petrochemical and natural gas industries.

The management of MA hazards involves the application of engineering expertise and knowledge to provide the measures needed to meet the objectives set by the organizations involved in the project development. A range of tools for evaluating and assessing the likelihood and consequences of MAs is needed to help select measures to be implemented and to judge when sufficient measures have been provided.

This process is built on the underlying integrity provided by the application of internationally recognised codes and standards.

This International Standard covers the following main elements:

— establishing general requirements for identifying MA hazards and their causes;

— evaluating MA hazards to understand their likelihood and possible consequences;

— developing suitable strategies for managing MA hazards;

— progressively improving the understanding of MA hazards and their consequences to guide design decisions during the development phases of the installation;

— providing the measures needed to manage a MA;

— maintaining the measures throughout the life of the installation.

This International Standard should be read in conjunction with ISO 13702 and ISO 15544.

Petroleum and natural gas industries — Offshore production installations — Major Accident hazard management during the design of new installations

1 Scope

This International Standard describes processes for managing Major Accident (MA) hazards associated with the design and operation of offshore oil and gas production installations. It provides requirements and guidance on the development of strategies both to prevent the occurrence of MAs and to control and mitigate the possible consequences.

This International Standard is applicable to the design of

— fixed offshore structures, and

— floating systems for production, storage and offloading

for the petroleum and natural gas industries.

The scope includes all MA hazards with the potential to have a material effect on personnel, assets and the environment.

This International Standard is intended for large capital projects related to offshore operating installations. However, the principles are also applicable to small or simple projects or design changes to existing facilities, and can also be relevant to onshore production facilities.

This International Standard is not applicable to mobile offshore units and subsea installations, although many of the principles contained in this International Standard can be used as guidance. It does not cover the construction, commissioning, abandonment or security risks associated with offshore installations.

The decision to apply the requirements and guidance of this International Standard, in full or in part, is intended to be based on an assessment of the likelihood and possible consequences of MA hazards.

The technical content of this International Standard is arranged as follows:

a) Objectives: the goals to be achieved;

b) Functional requirements: activities considered necessary to meet the stated objectives;

c) Annexes: guidelines in support of the functional requirements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 31000, *Risk management — Principles and guidelines*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviated terms apply.

3.1 Terms and definitions

3.1.1
barrier
functional grouping of safeguards or controls selected to prevent the realisation of a hazard

Note 1 to entry: A barrier may be a passive, active or procedural measure and includes inherently safer design measures.

Note 2 to entry: Adapted from IOGP 415.

3.1.1.1
barrier element
physical, technical or operational component in a barrier system

3.1.1.2
barrier function
function intended to prevent, control, or mitigate undesired or accidental events

3.1.1.3
barrier management
general term to cover the coordinated activities to establish and maintain barriers such that they at all times maintain their function

3.1.2
control
limiting the extent or duration of a hazardous event

Note 1 to entry: This definition is applied to this International Standard; alternative definitions are used in other standards.

3.1.3
emergency response
action taken by personnel on or off an installation to control or mitigate a Major Accident or initiate and execute abandonment

3.1.4
environment
surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation

3.1.5
environmental impact
any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services

3.1.6
escape route
route leading to the place where people muster, or to an area from which people can leave the installation in an emergency

3.1.7
evacuation
planned method of leaving the installation in an emergency

3.1.8
harm
injury or damage to the health of people, or damage to property or the environment

[ISO/IEC Guide 51:2014]

3.1.9
hazard
potential source of harm

[ISO/IEC Guide 51:2014]

3.1.10
hazardous event
event that can cause harm

[ISO/IEC Guide 51:2014]

3.1.11
individual risk
risk to which an individual is exposed during a defined period of time

3.1.12
inherently safer design
design which eliminates or reduces Major Accident hazards through measures that are permanent and inseparable from the design

3.1.13
Major Accident
MA
hazardous event that results in

— multiple fatalities or severe injuries; or

— extensive damage to structure, installation or plant; or

— large-scale impact on the environment (e.g. persistent and severe environmental damage that can lead to loss of commercial or recreational use, loss of natural resources over a wide area or severe environmental damage that will require extensive measures to restore beneficial uses of the environment)

Note 1 to entry: In this International Standard, a Major Accident is the outcome of realisation of a major hazard.

Note 2 to entry: This definition is intended to incorporate terms such as “Major Accident” as defined by UK HSE.

Source: IOGP Report No. 456.

3.1.14
major hazard
hazard with the potential, if realized, to result in a Major Accident

3.1.15
mitigation
limitation of the effects of a hazardous event

Note 1 to entry: This definition is applied to this International Standard; alternative definitions are used in other standards.

3.1.16
muster area
designated area to which personnel report when required to do so

3.1.17
performance standard
statement of the performance required of a system, item of equipment, person or procedure, and used as the basis for its management

Note 1 to entry: Performance standards are applied to active and passive barriers.

Note 2 to entry: Performance Standards can be expressed in qualitative or quantitative terms.

Note 3 to entry: Barrier performance standards address the functionality, reliability, survivability and interdependency of barriers under emergency conditions.

3.1.18
risk
combination of the probability of occurrence of harm and the severity of that harm

[ISO/IEC Guide 51:2014]

3.1.19
risk tolerance criteria
qualitative or quantitative criteria used to express a risk level that is considered as the upper limit in order for the activity or undertaking to be tolerable

3.1.20
temporary refuge
TR
place provided where personnel can take refuge for a predetermined period while investigations, emergency response and evacuation preparations are undertaken

3.1.21
tolerable risk
level of risk that is accepted in a given context based on the current values of society

[ISO/IEC Guide 51:2014]

3.2 Abbreviated terms

CFD	computational fluid dynamics
EER	escape, evacuation and rescue
ER	emergency response
ESD	emergency shutdown
F&G	fire and gas
HAZID	hazard identification
HAZOP	hazard and operability study
IOGP	International Association of Oil & Gas Producers
ISD	inherently safer design

LOPA	layer of protection analysis
MA	Major Accident
MOC	management of change
P&ID	piping and instrument diagram
PFD	probability of failure on demand
QRA	quantitative risk analysis
TR	temporary refuge

4 Major Accident hazard management overview

4.1 General

The process to manage MA hazards shall align with the principles and framework set out in ISO/IEC 31000, and shall

— establish the context prior to starting or executing any of the elements of the process;

— update the context throughout the process;

— apply a thorough process for communicating, consulting, monitoring and review.

In developing the context for managing MA hazards, 'lessons learned' from other organizations, accident reports and general safety bulletins made available for public review shall be taken into account where these identify additional hazards, additional measurers, or highlight deficiencies in the current measures for the management of MA hazards on offshore installations. This is part of a continual improvement effort which requires users to seek opportunities for improving their designs on a continual basis.

A process to manage MA hazards shall be applied throughout all stages of a project. Designs shall be regularly reviewed during their development and changed as necessary to achieve the strategies developed to meet the defined objectives and risk criteria.

Modifications to an existing installation shall be conducted under an appropriate management of change (MOC) process. To assess how any modification can change the likelihood or consequences of an MA, a good understanding is needed of the existing MA hazards and any new MA hazards introduced by the change. It is also necessary to understand the effectiveness of the current strategies to manage the existing MA hazards, in order to avoid compromising design measures already implemented to reduce risk.

If strategies for managing the MA hazards are not available, the requirements and guidance provided in this International Standard shall be used to identify the existing MA hazards and develop suitable strategies to manage them.

The outcome of this process is the measures necessary to manage each type of MA hazard for the life cycle of the installation. In order to determine the most effective range of design measures, a systematic analysis, using a range of tools and techniques, is needed to evaluate the likelihood and consequences of each identified MA hazard.

An integral part of decision-making is a framework which allows judgement of when the risks to human beings, the environment and assets are reduced to a tolerable level. Effective decision-making requires a transparent process which promotes dialogue and engagement with stakeholders to assist in identifying where improvements can be made in managing MA hazards.

4.2 Project management commitment

Project managers shall establish a broad view of the context of the proposed project and the associated risks to people, the structure, installation or plant and the environment over the lifetime of installation and beyond.

To ensure effective implementation of the process of managing MA hazards, the project management shall

— establish the context for the project, such as key development parameters and expectations of stakeholders;

— highlight the importance of managing MA hazards within the overall project objectives, and include stakeholders in the development of the objectives;

— establish and communicate objectives for managing MA hazards and risk to those involved, both internally and externally (in some jurisdictions these may be written into legislation);

— define the decision-making process related to managing MA hazards, including who is authorised to make decisions and the criteria to be used;

— develop the organization of the project team, with clear roles and responsibilities for managing MA hazards for all key personnel, including lead discipline engineers;

— make competent and sufficient engineering resources available to the project team (including safety and other technical disciplines needed to deliver the MA hazard management objectives);

— provide sufficient time and resources for managing MA hazards, particularly taking account of the iterative nature of the process;

— implement the measures which result from the process to manage MA hazards;

— define how the process for managing MA hazards and the outcomes will be documented.

4.3 Project management accountability

The project management shall be accountable for the effective implementation of the process for managing MA hazards across all contributors to the work, including design contractors, equipment/system suppliers and service providers. The project management shall endeavour to ensure that any such contracted organizations understand the requirements and are competent to conduct the specified tasks.

The lead safety engineer in the project organization shall be capable of specifying and commissioning work necessary for evaluating MA hazards and performing risk assessments. Where appropriate, that work may be supported by external consultants. The project management shall develop the terms of reference for the work, and shall decide how the results are to be used to manage any MA hazards.

4.4 Project plan to manage Major Accident hazards

The process to manage potential MA hazards for each of the design development stages shall be set out in a plan. This shall define the project-specific objectives needed to manage MA hazards and the criteria to judge their tolerability. The plan shall set out the key activities and when they shall be conducted in order to allow timely implementation of suitable MA hazard management measures.

The plan to manage MA hazards shall be developed at the earliest reasonable opportunity, updated for the start of each new phase in the project development and as required to accommodate new events and information. Further details can be found in Annex A.

4.5 Objectives of Major Accident hazard management

Many competent organizations define objectives, standards and criteria for managing MA hazards. In addition, some regulatory authorities also define minimum standards for specific types of incidents, and these can include criteria for tolerable risk.

Irrespective of whether such objectives, standards and criteria have been defined by regulation or the owner, the project management team, with the support of the lead safety engineer and other disciplines' engineers, shall define the specific objectives and criteria for MA hazard management which are applicable to the project or installation.

Suitable objectives, and any criteria that are needed to support them, shall address the following:

— eliminating or avoiding MA hazards where it is reasonable to do so;

— designing for maximum credible life of the installation without the need for extensive inspection, maintenance or operational activities;

— reducing the likelihood of MAs by providing facilities that can meet the full operational envelope, including foreseeable upset conditions;

— reducing the likelihood of MAs by providing the functionality to safely allow all foreseeable operational and maintenance activities;

— preventing escalation so that small incidents or problems do not lead to MAs;

— limiting the extent and duration of any MAs that do occur;

— providing protection for personnel on board while emergency response is undertaken and, if necessary, evacuation is planned.

4.6 Selection of hazard evaluation and risk assessment methods

The lead safety engineer is responsible for selection of appropriate methods for hazard evaluation and risk assessment. The methods chosen shall be dependent upon factors such as the size and complexity of the installation, the types of major hazard, the severity of the MA consequences, the degree of uncertainty, the level of risk, the number of personnel exposed to the risk and the proximity of environmentally sensitive areas.

The type of hazard evaluation and risk assessment performed may vary depending upon the scale of the installation and the life cycle phase when the analysis is undertaken. For example:

— for simple installations, such as wellhead platforms and other small platforms with limited process facilities, checklists based upon previous risk assessments of similar installations and operations may allow a consistent approach to MA hazard management which relies on conformance with applicable codes and standards;

— for new installations which are a repeat of earlier designs, the evaluations undertaken for the original design may be used providing they meet current objectives, standards and criteria, new knowledge and technology and they adequately cover any significant differences from the earlier installation which can affect the management of MA hazards. In some cases, the earlier hazard management work may be deemed sufficient or may mean that only limited new work is needed;

— complex installations, such as large production platforms with complex processing facilities, drilling modules and accommodation, shall always use a structured process for MA hazard management;

— for installations in the early design phase, evaluations will necessarily be less detailed than those undertaken during later design phases.